Northumberland county

Northumberland County Forest Management Plan

2021-2041

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Introduction

The purpose of the Forest Management Plan (FMP) is to set the overall, high-level, long-term direction of the Northumberland County Forest. The intent is to provide an overall vision and identify goals for the Forest with the outcome being management actions that culminate in the realization of this vision.

Forest management is complex with operations and outcomes that overlap, that work together and that are opposing. In all, balancing these actions and identifying procedures and timings that can minimize results that slow progress towards the vision and leveraging actions that can maintain positive progress is the overall goal of management planning. Despite the relationships between most, if not all, management actions to adequately be able to plan for and carry out tasks it easiest to breakdown areas of forest management into three areas:

1) Natural and Cultural Heritage Conservation
2) Silvicultural Operations
3) Recreation Operations

Supporting all these components is community. The Northumberland County Forest is owned and managed by municipal government but is for the benefit of the community which has many different meanings depending on who is being asked (Figure 1). The reason for the County Forest's acquisition, restoration and conservation should not be forgotten. The lands were acquired through the work of the "Special Committee on Reforesting the Waste Lands of the Counties of Northumberland and Durham" with the purpose of stabilizing the soil, reduce the potential for flooding in the local watersheds, provide a sustainable wood supply and provide a place for wild game to persist. The intent is that management of the Northumberland County Forest provides and balances all these community benefits while making decisions and plans that ensure that future benefits are not compromised, and that intrinsic and environmental benefits are not superseded by unsustainable consumption or financial gain. Conversely, in providing benefits to the community, the community supports the Northumberland County Forest, whether financially, the provision of time or through sharing of ideas and feedback, community support ensures its persistence.

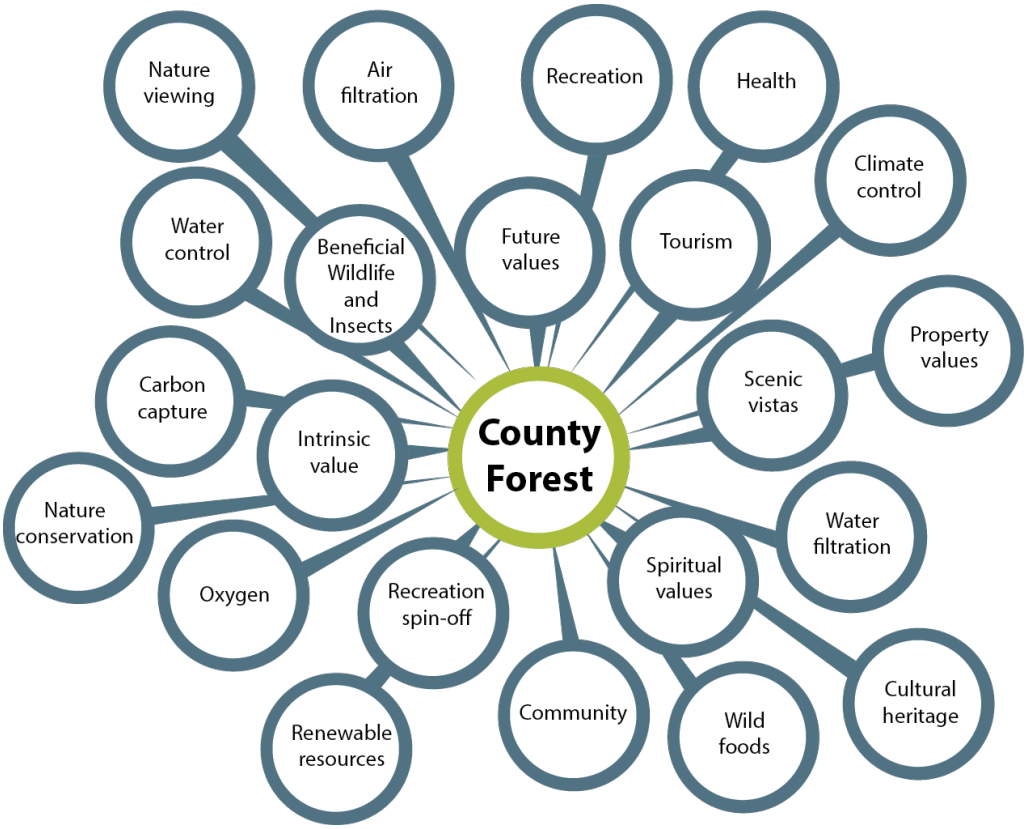


Figure 1. Some of the many benefits from the Northumberland County Forest.

The Forest Management Plan establishes long-term direction for the Northumberland County Forest by defining the Vision, Goals and Objectives for a 20-year period. The Management Plan portion is treated as the overall visioning and provides direction and framework for more specific shorter-period operational plans. These operational plans must be developed following the long-term direction to attain the vision. When these operational plans are developed, they must include the goals and objectives in this plan and can replace any specifics that were provided in earlier versions. Once complete with long-term direction and operational plans this will form the Northumberland County Forest's Management Plan.

Influential Factors

Management of the Northumberland County Forest requires attention to different factors that directly impact and interact to influence management decisions such as:

1. Controls on forest succession and tree growth
    a. Past land uses (e.g., attempts at agriculture)
    b. Historic land cover
    c. Plantation management systems
    d. Climate change
    e. Invasive species, pests and disease
    f. Timber harvesting practices
2. Conservation including natural and cultural heritage
    a. Culturally important/historic sites
    b. Conservation Values (e.g., Species/habitats at risk)
    c. Invasive species
    d. Area sensitive species
    e. Local land uses
    f. Provincial and local land use legislation
3. Social desires
    a. Recreation
    b. Wild food collection
    c. Economic returns/Impacts on taxation
    d. Forest certification
    e. Local economic impact and tourism
    f. Wildfire control

Recognition of Forest Size

South of the Canadian Shield, Ontario's landscape was once covered by large tracts of contiguous forests, savannahs, grasslands, and wetlands. Land conversion for agriculture and the built environment has resulted in widespread loss of a large proportion of these natural features. There are very few large tracts of natural lands remaining south of the Shield, yet many area sensitive species that require large, continuous tracts of forest, grassland, wetland

and so on to meet their habitat needs. The overall importance of the Northumberland County Forest as a large natural area and its benefits to area-sensitive species cannot be overstated.

General Description of Northumberland County Forest

The Northumberland County Forest is 2 235 hectares (5 524 acres) and is primarily made up of 2 large, contiguous parcels and 3 additional small parcels near the main tracts. Approximately 98% of the County Forest is in the Township of Alnwick/Haldimand and the remainder (~2%) is in the Township of Hamilton (Figure 2).

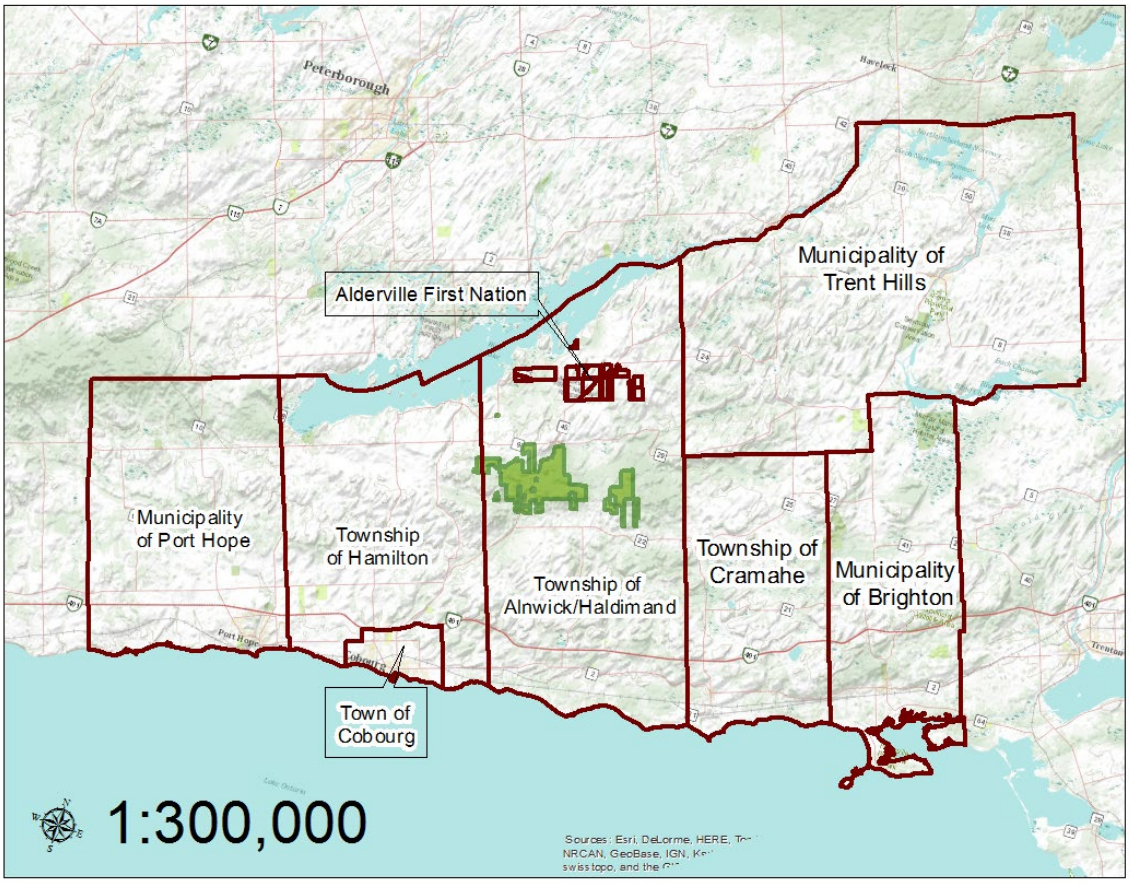


Figure 2. Map of the Northumberland County, its municipal boundaries, and the Northumberland County Forest (green).

Tenure

The Corporation of the County of Northumberland owns and manages all lands known as the Northumberland County Forest. Neighbouring properties are patented lands (privately owned) and are owned by lower-tier municipalities (e.g., Hamilton Township and the Township of Alnwick/Haldimand), Non-government Organizations (e.g., Nature Conservancy of Canada) and the Province of Ontario (i.e., Ontario Parks).

Establishment History

The need to establish the Northumberland County Forest is the result of the intersection of geological history and post-glacial natural heritage and cultural heritage. Most of the Northumberland County Forest is located on the eastern end of the Oak Ridges Moraine, a landform from the most recent glaciation that rises above the landscape north of, and running parallel to, Lake Ontario. It is made up of deep deposits of sand and gravel, so it is very well drained with typically dry soil.

Historically, the area of the Oak Ridges Moraine where the Northumberland County Forest is located was covered in forest as well as open oak savannahs and prairies. Because of the openness and well-drained land, it likely appeared to be a prime area for agriculture; easy to clear and easy to manage. Following land clearing and crop planting, however, the little topsoil that existed was depleted or was blown off the land, especially on higher hills and ridges. The result was a barren sand-covered landscape that was unstable, no longer arable and that began eroding and/or blowing away.

Prior to European settlement, land in the Northumberland County Forest area was dominated by large Red, Black, White and Bur oak, White and Red pine, Bitternut Hickory, Sugar and Red Maple, Largetooth Aspen, Quaking Aspen and American Beech. Lowland areas were dominated by Eastern White Cedar, Eastern Hemlock, Balsam Fir and Tamarack. In general, these species are still well-represented, but some species have taken over dominance (e.g., Red Pine, Quaking Aspen, Sugar and Red Maple) with some in lower abundances (e.g., American Beech) due to overharvesting, past land practices, pests, and disease. The large diameters that were once common are now rare.

Open grasslands such as oak-pine savannah and tallgrass prairie also existed throughout the area including the County Forest. Historic records from botanists and land surveyors suggest that large areas of prairie and oak savannahs were present between Rice Lake and Lake Ontario (Figure 7). At least 170km^2 and up to 300km^2 of the area is estimated to have been covered by Tallgrass prairie and oak savannah (Bakowsky and Riley 1994). These ecosystems had scattered trees: oaks, pines, and maples in varying densities (i.e., 5 to 75% cover) and were covered in tall, warm-season grasses, wildflowers and shrubs that tolerated the dry, nutrient poor, sandy soils and were maintained by fires caused by lightning strikes and lit by First Nations (Elliott 1998).

In the book The Backwoods of Canada (1836), Catherine Parr Traill wrote “We have now ascended the plains, a fine elevation of land for many miles scantily clothed in oaks and here and there bushy pines”. As well, “a number of exquisite flowers and shrubs adorn these plains which rival any garden in beauty” and “the trees, too, though inferior in size to those in the forests are more picturesque, growing in groups or singly, at considerable intervals, giving sort of a park-like appearance”.

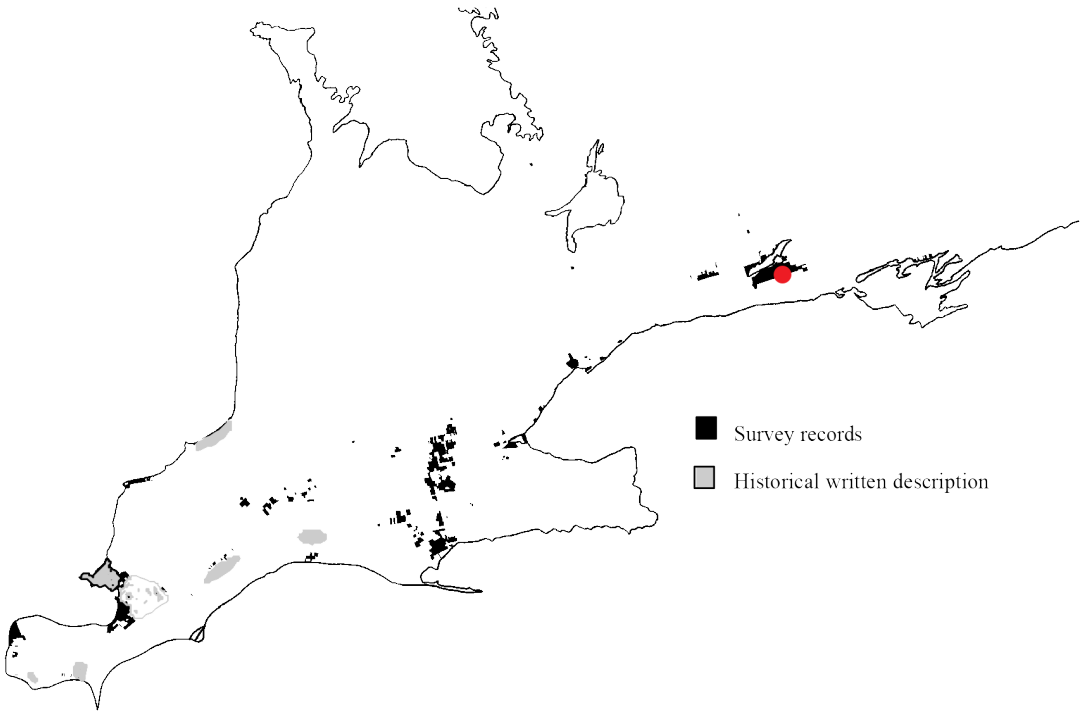


Figure 3. Illustration of the historical extent of prairie and savannah in Southern Ontario. Red circle shows the location of the Northumberland County Forest (source: Bakowsky and Rodger 1998).

As European settlement increased in southern Ontario in the early 19th century, forest harvesting also increased to supply the needs of the British and French naval forces, harvesting pine for masts, spars, and hulls. After suitable stock for shipbuilding was exhausted, the second wave of timber harvesting sought square red and white pine logs for export to the United Kingdom. Changes in trade policies between Canada, the United Kingdom and the United States then resulted in increased export of pine sawlogs to the United States (Elliott 1998).

At the same time as intensive timber harvesting was taking place, forests and grasslands were increasingly being cleared and converted to farmland. The high pace of logging resulted in a scarcity of wood and increased environmental repercussions such as flooding and farming quickly depleted the thin layer of topsoil (Borczon, 1986). Dry, nutrient poor, and exposed sandy "wastelands" were developing with concern about this practice in southern Ontario being voiced as early as the 1830's. An indication of this was the population decline shown in census records between the 1860's and the 1930's, a time when immigration was increasing the population in many other areas (Broderick 1982). These abandoned, sandy wastelands were a common occurrence throughout southern Ontario's and a large-scale reforestation effort was identified as a potential solution. Proponents of this solution included farmers, foresters, politicians, and the public (Teitelbaum and Bullock 2012).

In 1910, the council of the United Counties of Northumberland and Durham went to Queen's Park as delegates to the Ontario legislature (Figure 3). Their goal was to explain the severity of the situation in Northumberland and Durham Counties such as streams drying up and droughts on farms. The Counties estimated that 5 600 hectares (14 000 acres) were being affected by these conditions. The delegation proposed that the province lend the funds required for reforestation. The Counties would pay interest on the loan until the trees became marketable and once sold, the Counties would repay the principal.

The proposal was not accepted, but in 1911 the province enacted *The Counties Reforestation Act* to allow Counties to take out loans for up to $25,000 to purchase land for reforestation. Due to the lack of success of that program, *The Counties Reforestation Act* was revised and became *The Reforestation Act*. This act allowed Counties to enter into agreements with the provincial Minister of Lands and Forests to reforest, develop and manage County-owned lands at the province's expense (Borczon 1986).

The Northumberland County Forest was established in January 1924 with the purchase of 409 hectares (1,011 acres; Figure 4) and is a product of Ontario's 1922 *Agreement Forest Program*. The United Counties of Durham and Northumberland entered into a forest management agreement with the Ontario Department of Lands and Forests (becoming the Ontario Ministry of Natural Resources) to manage the reforestation and cutting of trees.

In 2001, 7 years after the Province started terminating the Agreement Forest Program, management of the Northumberland County Forest became the County's responsibility. The County did not have a structure for forest management in place at that time, so management focused on silviculture was contracted to a private company and timber harvest revenues were placed in reserve. At the same time, social and legislative pressures (e.g., Oak Ridges Moraine Conservation Plan) on the Forest's management were growing. In 2006, with the hiring of a forest management intern and the provision of a Forest Department budget, the County initiated the move to management beyond the limited silvicultural focus.

Figure 4. United Counties of Northumberland and Durham delegates at Queen's Park requesting funding for reforestation in 1910 (Archives of Ontario. Scanned from Borczon 1986).

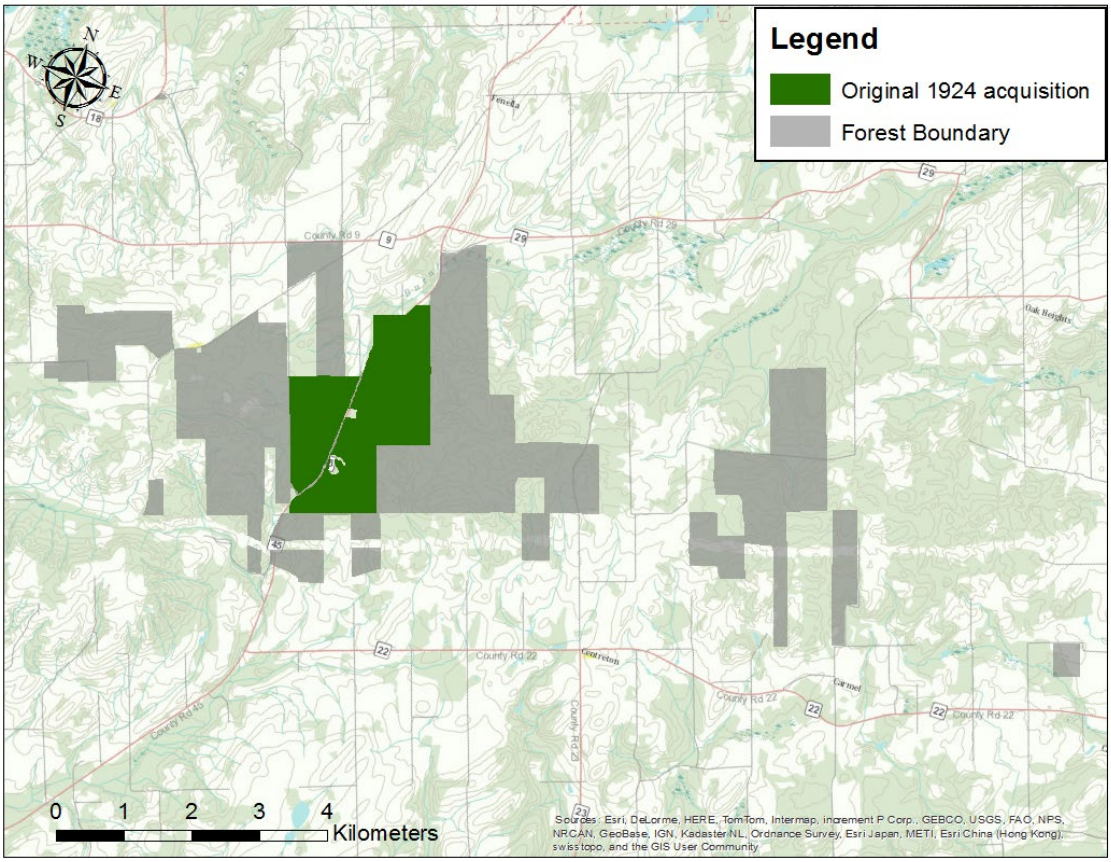


Figure 5. Map showing the first lands that were acquired to establish the Northumberland County Forest in 1924.

Surficial Geology

The bedrock lying very deep below the Northumberland County Forest is a Paleozoic dolomite and limestone of the Ordovician and Silurian ages (Crins et al. 2009). Above the bedrock, the substrates form the glacial Oak Ridges Moraine formation from the Wisconsin Glacial Stage approximately 13,000 years ago.

The Oak Ridges Moraine is an interlobate kame moraine and is the result of glacial till and erratics being deposited between the Simcoe and Ontario lobes that formed during the melt of the Laurentide Ice Sheet (termed glacial retreat). Water filling the area between those lobes carried silt, sand, cobbles, and boulders and left an aggregate formation stretching nearly 160km from the Niagara Escarpment to the Trent River. The peak of the Oak Ridges Moraine is generally underlain by ~200m of gravelly sand, although it can be up to 300m thick.

For the most part, the Northumberland County is on Pontypool Sand with smaller areas being underlain by loam and sandy loam (Figure 5).

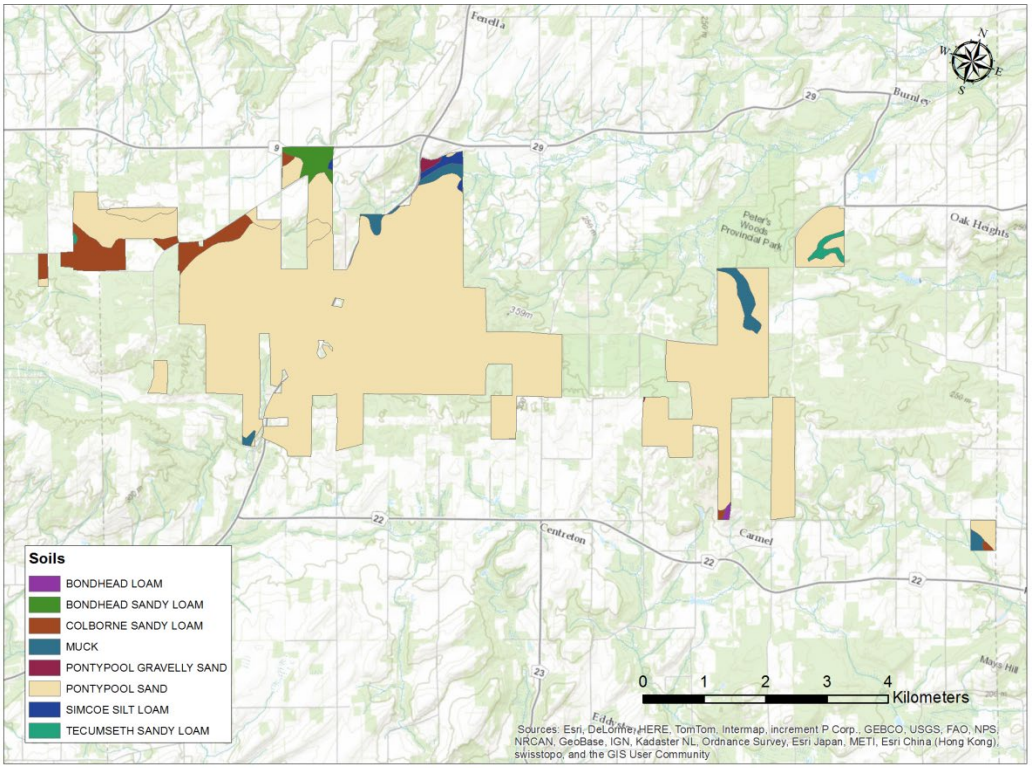


Figure 6. Map of the soils of the Northumberland County Forest.

Basic Hydrology

A significant attribute of the Oak Ridges Moraine is its ability to filter, store and regulate water resources from initial precipitation to long-term aquifer storage. Precipitation on the Oak Ridges Moraine is filtered by the deposit's aggregate layers before moving into large aquifers and finally being slowly released into cold headwater streams and groundwater.

Water that begins in the Northumberland County Forest Located on the easternmost wedge of the Oak Ridges Moraine feeds Burnley Creek, Cold Creek, Piper Creek, Baltimore Creek, Cobourg Brook, Shelter Valley Creek, Salt Creek, Goose Creek and other streams and creeks flowing into Rice Lake and Lake Ontario (Figure 6).

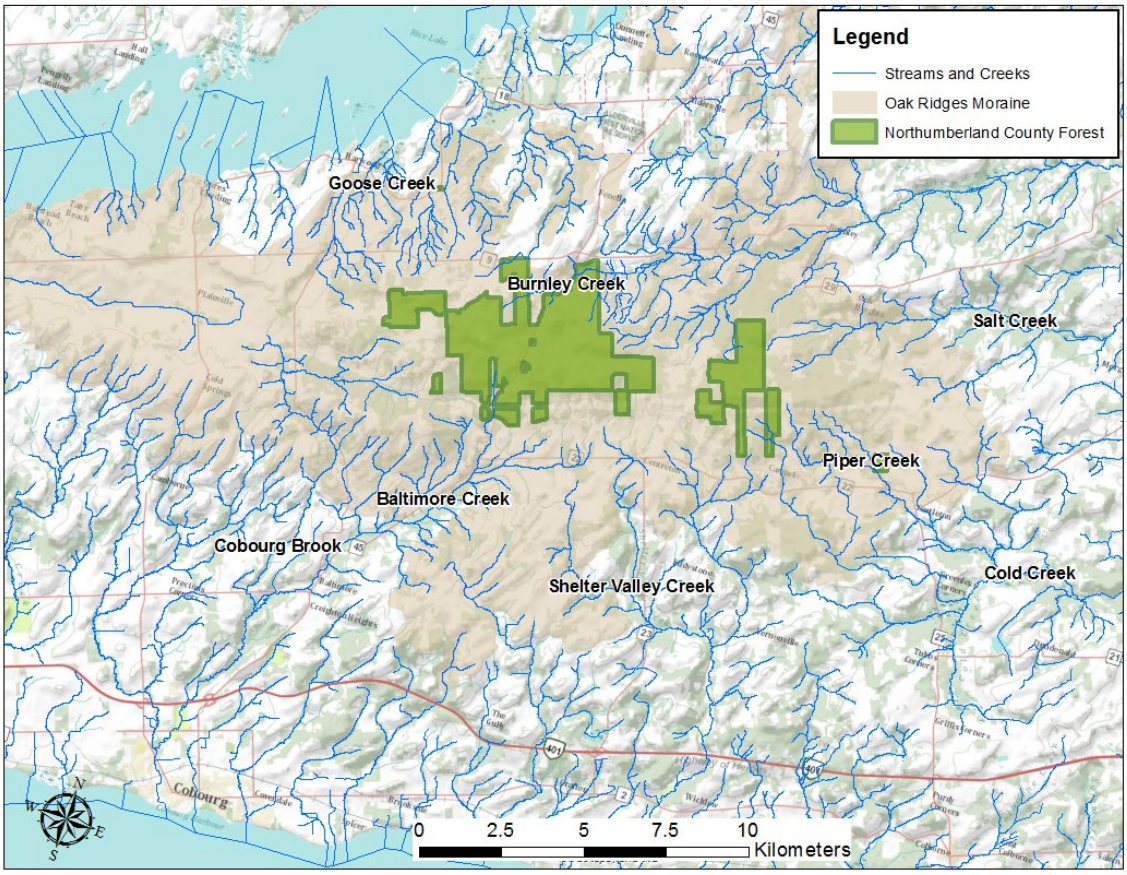


Figure 7. Map of streams with headwaters that begin in and around the Northumberland County Forest.

Ecozone and Ecodistrict

Northumberland County Forest is in the Mixedwood Plains Ecozone of Ontario, the Lake Simcoe-Rideau Ecoregion 6E (Figure 7) and the Oak Ridges Ecodistrict 6E-7 (Figure 8) and borders Peterborough Ecodistrict 6E-8 at its northernmost extent. The Mixedwood Plains Ecozone is south of the Canadian Shield (Precambrian Shield) and has one of the mildest climates in Canada and Ecoregion 6E is classified as the Humid High Moderate Temperature Ecoclimatic Region. Mean climatic variables for the Ecoregion are shown in Table 1.

Table 1. Mean climatic variables including temperature, growing season and precipitation for Ecoregion 6E.

Mean Annual Temperature range	4.9 – 7.8°C

Mean Growing Season range	205-230 days
Mean annual precipitation range	759-1087mm
Mean summer rainfall range	198-281mm

More than 57% of Ecoregion 6E's land is cropland, 38.1% is a diverse mix of forest types and the remaining 4% is water (Crins et al. 2009).

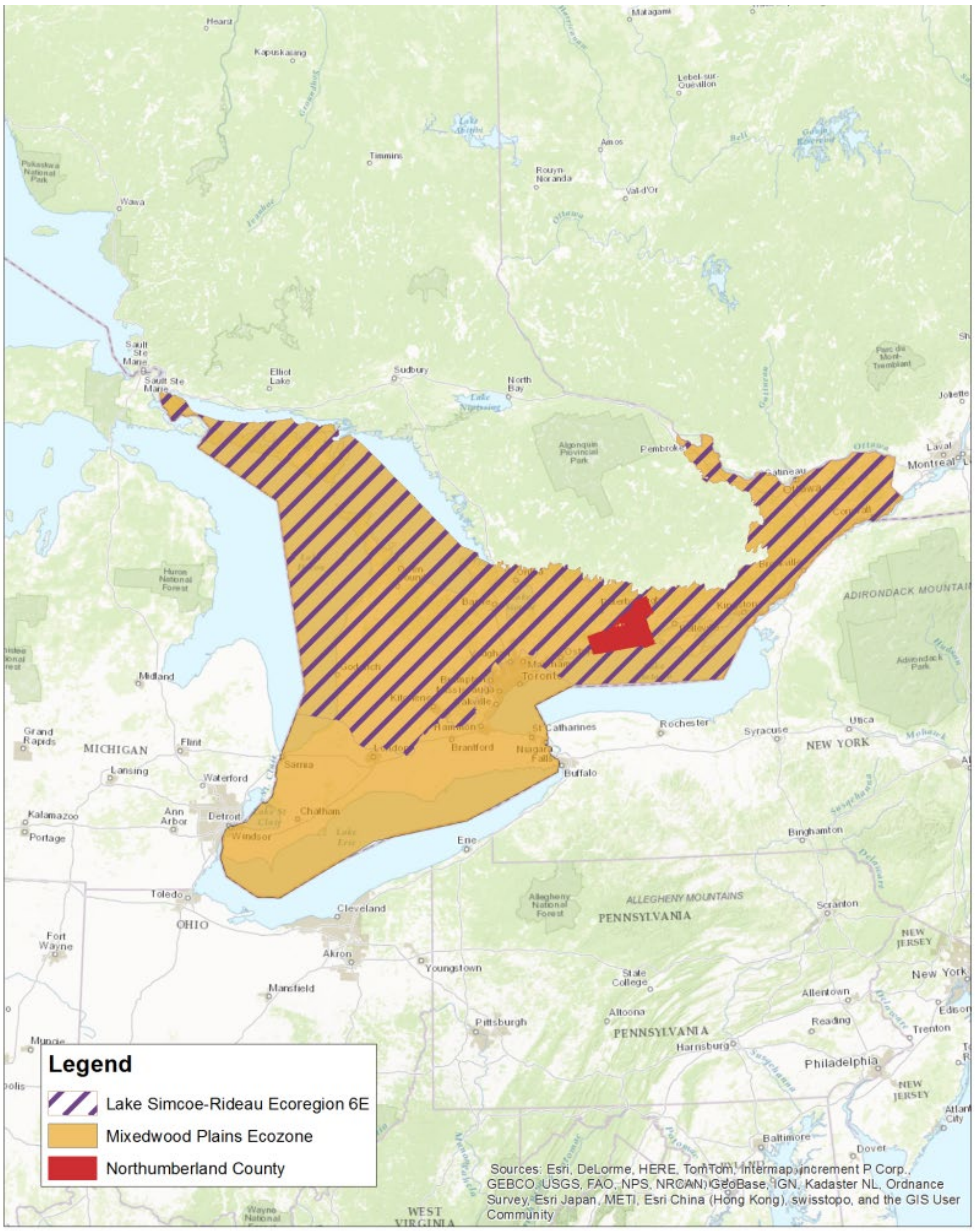


Figure 8. Map showing Northumberland County (red polygon) within the boundaries of the Mixedwood Plains Ecozone and the Lake Simcoe - Rideau Ecoregion.

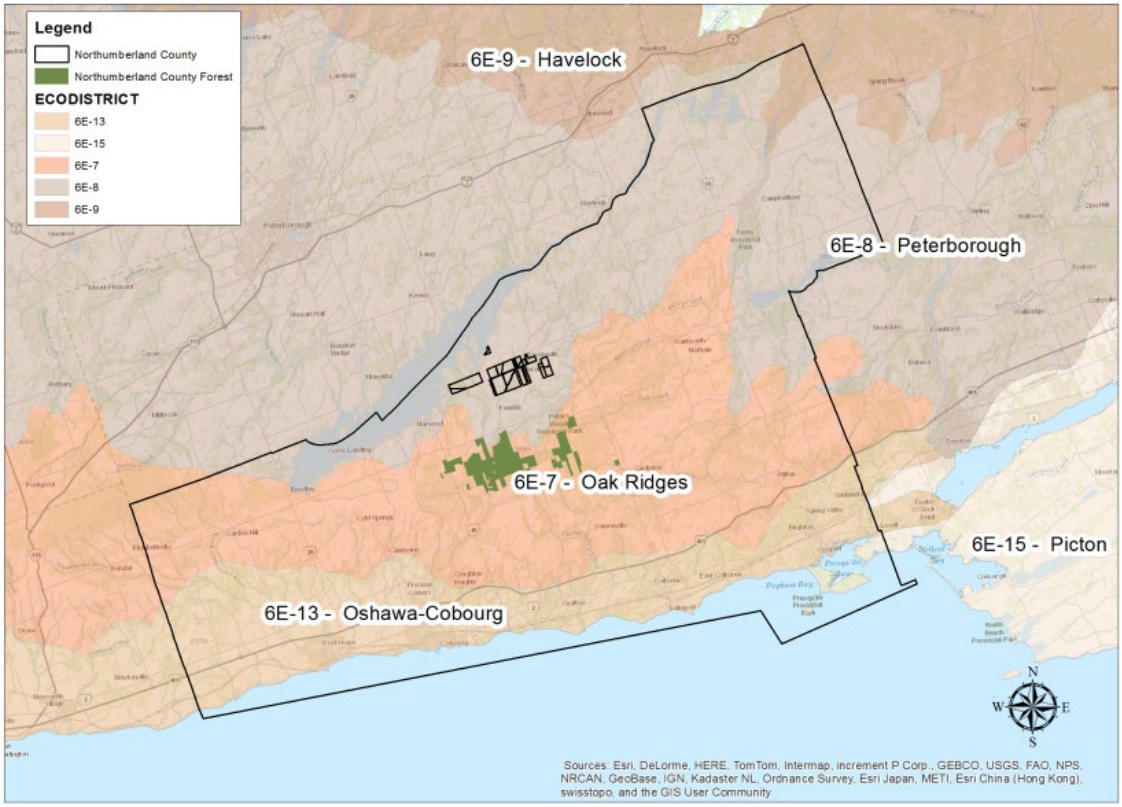


Figure 9. Map showing Northumberland County (Black line) and the Northumberland County Forest (green polygon) within some of Ecoregion 6E Ecodistricts.

Recreation

Until the mid-2000s, recreational trail use was a largely unregulated activity. In the 1940's the Northumberland Ski Club, a volunteer group formed and entered into an agreement with the County to manage the downhill ski runs at the location that is now known as the Scout Camp (Figure 10). User groups such as the Northumberland Forest Skiers, Northumberland Trail Riders and Great Pine Ridge Snowmobile Association brought some organization to the recreational trail system, but under the Ontario Ministry of Natural Resources and Forestry management, recreational users were, for the most part, left to their own devices.

In the 1970's, the MNRF (then Ministry of Natural Resources) began to try to be more systematic, especially with snowmobiling and the provision of a nature trail from the headquarters on Dunbar Road. Documentation appears to show that they proposed dedicated trail networks and communicated concern for the growing off-road motorcycle use and its possible impact on hikers and the potential growth of ATV's. It is unclear what direction County Council gave, but a memo from the District Forester to the District supervisor in 1972 suggests

doubt towards receiving council direction. The lack of direction and regulation allowed trail networks to flourish and many areas quickly filled with trail, particularly motorized single-track trails.

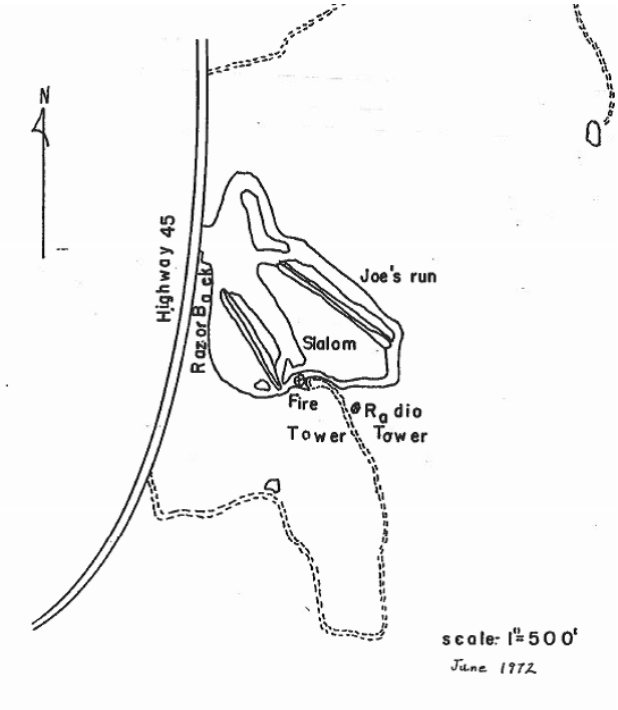


Figure 10. Map showing location of previous ski runs and nearby access trails off County Road 45.

Shortly after management was assumed by the County, it was recognized that the trail network was causing ecological damage and in addition to significant social discontent that some regulation and planning was needed. The difficulty was that the planning would have to be retroactive and not subject to good trail planning from a “clean slate”. Existing trails made use of old farm roads and forest management access roads. The use of good recreational trail design principles was not used which is problematic because of steep topography and very erosive substrates.

In 2005, the County began a process of developing and implementing a trail management plan. It was highly controversial with many groups at complete odds over the desired result and an initial protectionist reaction by the recreational users to not lose any of the existing trail. The major issues identified through public consultation included the environmental impacts of trail users, ongoing conflicts between trail users, and safety and liability concerns.

With a renewed and active Forest Advisory Committee the County began working with Forest User groups to identify and commit to a multi-use trail network that balanced the diverse needs, viewpoints, and concerns. To help guide a path to resolution the Forest Advisory Committee adopted the following guiding principles for developing recreational policies and trail proposals.

Guiding principles for developing recreational policies:

1. Protect and enhance the ecological integrity of the County Forest Ecosystem
2. Honour and comply with all legal requirements that apply to the County Forest and its ecosystems
3. Allow only uses that do not harm or have adverse effects on the integrity of the forest ecosystems
4. Review and assess future trail recommendations in the context of other forest uses and activities such as forest production, fire protection and other recreational uses
5. Provide for the enforcement of all of the forest policies, by-laws and programs
6. Obtain input through the ongoing involvement of the Forest Advisory Committee

Guiding factors in trail proposals:

1. Must adhere to the provincial legislative requirements
2. Reduce the number of trails and restore significantly degraded sites
3. Work towards shared trails for compatible users
    a. Work together to maintain a trail system
    b. Share trails in opposite seasons
4. Maintain motorized regional trail linkages and connectivity
5. Minimize potential for conflict among users
6. Minimize taxpayers operating costs and legal liability exposure
7. Provide clear, understandable, and enforceable designated use areas and rules

These guiding principles brought the groups together and provided a common goal. After a few years of consultation and meetings, the critical turning point was the development of the *Ecological Sensitivity and Land Use Atlas*.

The Atlas was a compilation of map overlays that provided an understanding of the ecological and social sensitivities and land uses on and adjacent to the County Forest. The report's objectives were:

- To identify natural environment and land use characteristics of the Northumberland County Forest (NCF).
- To identify significant and/or sensitive environmental features and functions and discuss implications of these on the management needs of the NCF.
- To identify current land uses and management activities and discuss implications of these on the future management needs of the NCF as it relates to environmental health.

As user groups recognize that they want to be in the Forest because of its naturalness and ecology, most came to respect the restrictions and considerations required and there was a clearer path towards agreement of a transformed recreational trail network.

In 2009, Northumberland County Council approved the Northumberland County Forest Trails Network Study. The Trails Network Study recommended "a balanced trails network system that protects the environment while providing a wide variety of recreational uses to County residents and visitors and allows for the rational management and development of the Forest."

The County Staff Proposal aimed to generate the following results:

- Ensure that the County performs its due diligence to abide by the provincial legislative requirements
- Rehabilitation and restoration of significantly degraded sites
- Provide for a variety of motorized and non-motorized uses, many on shared trails
- Minimize potential for conflicts among users
- Minimize taxpayers operating costs and legal liability exposure
- Implementation of clear, understandable, and enforceable designated use areas, by-laws

Since 2009, there have been many enhancements to the recreational trail system including improvements to parking areas and trailheads, vegetation management along the trails, the hiring of summer trail crews, upgraded signage, map improvements and trail repairs and upgrades. Additionally, there have been trail developments that include the creation of trails with universal design principles. The recreational trail program is also supported by the 2017 Northumberland County Forest Recreational Trail Standards and the Northumberland County Forest Signage Standard.

Forest Advisory Committee

The first Northumberland County Forest Advisory Committee (known as the Forest Users Committee) was established in 1992 and operated until approximately 2002 and included most recreational uses of the forest.

In 2003, a new user committee was formed with the intent of representing a larger array of users as well as being more of a "sounding board", for discussions about designated trails planning. The collaboration and feedback from this group led to the creation and adoption of the Designated Trails Study (2009). At that time, management of the County Forest was focused

on getting the recreational trail system under control and developing a framework for a designated trails network.

Since the adoption of the designated trails network, the information going to the Forest Advisory Committee had broadened to include silviculture and ecological restoration, yet the forest advisory committee has maintained its core composition of recreational user groups. Furthermore, some of the groups no longer exist (e.g., Northumberland Forest Skiers), some groups attend irregularly, some groups had very little activity in the forest, some groups are not represented (e.g., hunters) and some groups had little information transfer between the representative and their membership.

Climate Change

Climate change will affect the Forest's ecosystems and recreation. It is predicted that the Mixedwood Plain Ecozone will be more susceptible to drought in the future (Crins et al. 2009).

The main changes that are expected include:

- Changes in tree growth
- Timing of seasonal events
- More frequent, unpredictable, and extreme disturbances
- Shifts in the precipitation regime
- Increased maximum temperatures with greater potential for drought and frost damage
- Increased risk of forest fire
- Shifts in the ranges and populations of pests, disease, and invasive species

The extent of vulnerability and the sensitivity and potential effects on the Northumberland County Forest are not known and would require a vulnerability assessment. For example, if the Northumberland County Forest is subject to annual summer drought, then decline in the health of red oak, a major component of the County Forest's tree cover could be expected (e.g., Crosby et al. 2015). Conversely, longer growing seasons could benefit tree species that are more resilient to the effects of climate change, therefore benefit their growth. As well, trees that are stressed and changing environmental conditions could result in different or increasing populations/amounts of pests, disease, or invasive species. Effective forest management that ensures the maintenance and promotion of biodiversity and forest health will provide a good basis for the Forest to be resilient to the effects of climate change.

Although there is not a lot of science on methods to manage for climate change, most of the suggestions to this point are to increase stand biodiversity in diversify stand structure as a resilience strategy. Resistance strategies are less readily available, but there are some suggestions that reduced stand densities in younger forests (D'Amato et al. 2013, Clark et al. 2016)

Fire risk is both directly and indirectly related to climate change as it relates to drought. The drought may cause direct risk by drying the organic matter on the forest floor and therefore increasing fire risk, but it may also increase fire hazard by causing decline in the health of trees and potentially increasing the availability of dead wood fuel.

Changes in forest operations may occur because of climate change. A shorter winter season, drier summer and fall and more intense storms could result in less sustainable operating time frames. Preferably, harvest operations take place in the winter months, although this must be balanced to an extent with market needs for supply to ensure that we are getting the best value for timber products. In the winter months, snow cover and frost in the soil protects the ground from damage by logging equipment, forest roads are more resistant to damage and bark damage on the remaining trees is greatly reduced. The effects of climate change must continue to be considered.

Changes to recreation may include reduced opportunities for winter activities, greater potential for damage by forest users during spring and fall and increased soil displacement and user-caused fire risk because of summer droughts.

Changes in natural heritage management and restoration may include increased response needs for invasive species, altered approaches to plantings and silvicultural methods.

Legislation

Management of the Northumberland County Forest is subject to- and influenced by- (but not limited to) the following legislation:

- Accessibility for Ontarians with Dissabilities Act, 2005 (Provincial)
- Endangered Species Act, 2007 (Provincial)
- Fish and Widlife Conservation Act, 1997 (Provincial)
- Forestry Act, 1990 (Provincial)
- Greenbelt Act, 2005 (Provincial)
- Highway Traffic Act, 1990 (Provincial)
- Invasive Species Act, 2015 (Provincial)
- Migratory Bird Conventions Act, 1994 (Federal)
- Motorized Snow Vehicles Act, 1990 (Provincial)
- Municipal Act, 2001 (Provincial)
- Municipal Freedom of Information and Protection of Privacy Act, 1990 (Provincial)
- Oak Ridges Moraine Conservation Act, 2001 (Provincial)
- Occupiers' Liability Act, 1990 (Provincial)
- Off-Road Vehicles Act, 1990 (Provincial)
- Ontario Trails Act, 2016 (Provincial)
- Species At Risk Act, 2002 (Federal)
- Trespass to Property Act, 1990(Provincial)

High Conservation Value Forest (HCV) Assessment

The conservation of biodiversity, rare and at-risk species and culturally important sites is an overarching factor throughout management of the County Forest. Within FSC®'s framework, the protection of biodiversity, natural and cultural heritage and rare, threatened and endangered species is incorporated or is the key feature in FSC® Principles 5 through 9.

The focus of Principle 9 is maintaining or enhancing the attributes that define High Conservation Value Forest (HCV). The HCV concept was developed by the FSC® to maintain significant environmental and social values within the context of forest certification (Brown et al. 2013). HCV's are likely to be important at a larger (e.g., regional, provincial or national scale) and may have some legislation or provincial/national framework or planning associated with them. As a result, an assessment of Conservation Values was undertaken, based on the assessment process outlined in the Rainforest Alliance's "Locally Adapted Standards for Assessing Forest Management in the Great Lakes/Saint-Lawrence" Appendix E. Where a Conservation Value does not meet the criteria of an HCV, we deemed it a Value of Conservation Concern (VCC) as it may be of local or regional concern or is commonly important within silviculture planning (e.g., in the OMNRF's Stand and Site Guide). Where it does meet HCV assessment criteria, it was defined in one of the 6 HCV categories outlined by FSC®, and its location is considered High Conservation Value Forest (HCVF).

In, following the framework in the Rainforest Alliance's locally adapted standards (as explained above), some interpretation and context was needed as the direction or intent of standards were not clear or the expectations needed to be contextualized within the scale, risk, and intensity of the Northumberland County Forest operations. Thus, identification, assessment, and development of standards for Conservation Values including HVC's and VCC's also included referring to:

- Common Guidance for the Identification of High Conservation Values (Brown et al. 2013)
- Common Guidance for the Management and Monitoring of High Conservation Values (Brown and Senior 2014)
- FSC Step-by-step guide; Good practice guide to meeting FSC certification requirements for biodiversity and High Conservation Value Forests in Small and Low Intensity Managed Forests (SLIMFs) (Robinson et al. 2009)
- High Conservation Values and Biodiversity identification, management and monitoring; Small, low intensity and community Forests; Forest Stewardship Council briefing note 4 (ProForest 2008)
- Simple monitoring methods; Small, low intensity and community Forests; Forest Stewardship Council briefing note 5 (ProForest 2008)
- WWF Canada – High Conservation Value Forest Support Document (WWF Canada 2005)

To assess and identify the presence of High Conservation Values, Significant Areas and Species-at-risk we used:

- Data collected by Northumberland County Forest Staff (e.g., avian point counts, nightjar counts, amphibian counts, general observation records) and staff knowledge.
- Data collected by the Nature Conservancy of Canada (i.e., Eastern Hog-nosed Snake records, Black Oak Woodland/Savanna)
- Data from the OMNRF Natural Heritage Information Centre (i.e., Natural Areas Data, element occurrences for species of conservation concern, element occurrences for plant and wildlife concentration areas).
- List of the Odonates of Northumberland County, Ontario. 2010. Compiled by Colin D. Jones (cross-referenced with habitat information for probability of presence in the Northumberland County Forest).
- List of the Vascular Plants of Northumberland County, Ontario. 2011. Compiled by Clive E. Goodwin.
    - This list includes major inventories performed throughout the County.
- Rare Vascular Plants of Ontario; 4th Edition. 2009. Oldham and Brinker.

As a precautionary measure, rare species and species at risk that are not known to occur in the Northumberland County Forest, but that may occur locally or regionally or where there is suitable habitat in the Forest, have been identified to ensure that management guidance is available if a species occurrence is found. As well, the identification of these species ensures that County Forest Staff, volunteers and interested forest users know which species are of interest.

Based on the results of the Conservation Values identifications, we developed management objectives for HCVs (Table 2). Management objectives are based on the overall aim of HCV management being to "maintain and, where possible, enhance significant and critical environmental and social values as part of responsible management" (Brown and Senior 2014).

Table 2. High Conservation Values assessment and management objectives.

HCV 1 - Forest areas containing globally, regionally or nationally significant concentrations of biodiversity values.
The Northumberland County Forest does not have any "Significant concentrations" of endemic, rare, threatened or endangered species. As outlined in the assessment, the occurrence of some species would be considered Category 1 HCV's, such as: ○ Mottled Duskywing ○ Ghost Tiger Beetle ○ Northern Barrens Tiger Beetle

- Pale-bellied Frost Lichen

Other species identified as possible Category 1 HCV's would not only need to be found to occur on site, but would also need to be found in populations meeting a larger threshold to be a significant concentration (e.g., Eastern Hog-nosed Snake).

Best Management Practice: The Northumberland County Forest does not have significant concentrations of rare, threatened and endangered species, but does have occurrences of those types of species. The Forest does provide a portion of habitat for some species-at-risk that make up a larger regionally significant occurrence such as Eastern Hog-nosed Snake, but the population is unknown.

All efforts shall be made to ensure that there is no impact to species-at-risk with management modifications outlined in the ***Operational Standards***. Where habitat can be restored to support an absent species-at-risk or to increase a population, efforts will be made to do so. Additionally, the protection and enhancement of habitat as outlined under HCV3 will generally support this Best Management Practice as many rare species or species-at-risk are dependent on rare habitats such as Black Oak Savannah/Woodland and Sand Barrens.

If and when an HCV1 is found or found in sufficient concentration to meet the HCV1 threshold, management objectives (General HCV management objective, Specific HCV management Objective and Management Targets) will be developed based on locations and population.

HCV 2 – Forest areas containing globally, regionally or nationally significant large landscape level forests, contained within, or containing the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance

The Northumberland County Forest is not part of a globally, regionally or nationally significant large landscape-level forest.

Best Management Practice: The Northumberland County Forest is a large, continuous forest within Southern Ontario's fragmented and de-forested landscape. As a result, it is important as a large forest for species that depend on large forested areas and contains viable populations of most, if not all, forest-dependent species within the Great Lakes-St. Lawrence Forest area. Management Activities must consider ensure that the Forest is not further fragmented and any actions that can be taken to increase the coverage of forested area around it should be pursued.

HCV 3 – Forest areas that are in or contain rare, threatened or endangered ecosystems

The Northumberland County Forest contains 3 ecosystems that can be defined as Category 3 HCV's: (1) Black Oak Woodland/Oak Savannah, (2) Sand Barren, (3) Provincially Significant Wetland.

Black Oak Woodland/ Oak Savannah and Sand Barren are generalized descriptors for ecological land types that can be further specified, but that are considered between S1 and S3 (Critically Imperiled to Vulnerable based on NatureServe conservation status subnational ranks, respectively).

General HCV Management Objective	Specific HCV Management Objective	Management Targets
• Rare or threatened ecosystems/habitats are maintained with no increase in risk of loss. • No rare or threatened habitats are lost because of management actions.	• Maintain or enhance Black Oak Woodlands, Savannahs, Sand barrens or Tallgrass prairies in the Northumberland County Forest. • Protect the Burnley Creek Headwaters Wetland Complex Provincially Significant Wetland.	• Maintain all present sand barrens (41ha). • Maintain and improve a minimum of 160ha of Black Oak Woodland and Oak Savannah. • No alteration of the Burnley Creek Headwaters Wetland Complex Provincially Significant Wetland (26ha). • Respond, within capacity to degradation of HCV's by invasive species and recreational use.

HCV 4 – Forest areas that provide basic services of nature in critical situations

The Northumberland County Forest is not essential, on its own, for maintaining critical ecosystem services, but it does provide important ecosystem services, particularly by improving water infiltration into soil, water retention and water filtration. These services help reduce the risk of flooding in creeks and streams that flow south into Lake Ontario and north into Rice Lake. As well, the forest helps to protect and provide clean drinking water to its north and south, particularly for rural residents and communities on wells.

Best Management Practice: Current management activities do not pose a risk to these services. Overarching consideration should always be given to:

- Potential water contamination (e.g., fuel/oil spills).
    - Workers in forest have spill response training/plans
- Deforestation that increases run off reduces water infiltration and increases soil evaporation losses.
    - Take all reasonable measures possible to reduce the amount of land converted to non-forested land including recreation accessories.

- The susceptibility of the forest soils to erode with loss of vegetative cover.
    - Maintain vegetative cover.
    - Manage equipment use (e.g., specific machinery) on steep slopes.
    - Manage recreation infrastructure to reduce erosion or erosion potential.

HCV5 – Forest areas fundamental to meeting basic needs of local communities

The Northumberland County Forest does not have any areas fundamental to meeting the basic needs of local communities. The Forest does provide benefits to local communities, but the communities are not dependent on the Forest for subsistence or medicine, for example.

Best Management Practice: Management activities will ensure that consideration is given to maintaining and not impacting the communal benefits of the Forest. Some of the benefits to local communities include:

- Collection of wild foods (e.g., deer and turkey hunting, berries, mushrooms)
- Maintenance of health (e.g., recreation, spiritual retreat from urban life)
- Economic development (e.g., sustainable timber harvesting, tourism-related spending)

HCV 6 – Forest areas critical to local communities' traditional cultural identity

HCV6

There are no known sites of HCV 6 value. These can be defined as:

- Forest that is critical to local communities' traditional cultural identity (e.g., religion, spiritual well-being, cultural use of forest products)
- These may include everything from historical sites to sacred values to traditional management practices.

Best Management Practice: If an HCV 6 site is identified, we will work with the community to determine the values and their extent and the types of protection/conservation standards that are needed for its protection and the method of monitoring those values.

Conservation Values (Table 3) shall be identified and surveyed for on a continuous basis and as resources permit. To do this, changes in federal and provincial species-at-risk listings and designations must be regularly re-visited. HCV designations, monitoring and management plans will be made public with the updating and renewal of the 5-year operating plan. In the interim, if a change occurs such as new occurrences being found, information about distribution changes, listings change or new management procedures change, it will be the Forest Manager's duty to update lists and maps and ensure that an amended management and monitoring plan exists. As well, the Natural Heritage Services staff shall consult the appropriate

experts or stakeholders depending on the value, its risk because of operations, and the sensitivity of revealing its occurrence.

In addition to changes in Conservation Values, some known values are very difficult to identify (e.g., snake hibernacula), others may have a known general location, but unknown specifics (e.g., old homesteads) and others would require a large amount of detailed research and assessment that are not feasible to be undertaken all at once (e.g., assessment of black oak woodlands and savannahs). As resources permit and pre-harvest surveys are performed, we will update our Conservation Value data to the best of our abilities. In a situation where a value may exist, but we are unsure of its extent we will use the precautionary principle and treat the situation as though it exists.

Table 3. Known and potentially occurring High Conservation Values in the Northumberland County Forest.

High Conservation Values			
Common Name	**Scientific Name**	**Known to occur**	**Comment**
HCV 1			
Acadian Flycatcher	*Empidonax virescens*	Yes – no breeding records	Nesting pair = HCV1
American Ginseng	*Panax quinquefolius*	No	Occurrence = HCV1
Black Ash	*Fraxinus nigra*	Yes –Three locations in the forest	Occurrence = HCV1
Butternut	*Juglans cinerea*	Yes – no concentration	Archivable concentration = HCV1
Cerulean Warbler	*Setophaga cerulean*	No – no concentration	5 or more concentrated nesting pairs = HCV 1
Eastern Hog-nosed Snake	*Heterodon platirhinos*	Yes – no concentration	Abundances similar to protected grasslands = HCV1
Mottled Duskywing	*Errynis martialis*	No	Occurrence = HCV1
Northern Barrens Tiger Beetle	*Cicindela patruela*	No	Occurrence = HCV1

Pale-bellied Frost Lichen	*Physconia subpallida*	No	Occurrence = HCV1
Red-headed Woodpecker	*Melanerpes erythrocephalus*	No	3 or more nesting pairs = HCV 1
Rusty-patched Bumble Bee	*Bombus afinis*	No	Occurrence = HCV1
HCV 2			
None.			
HCV 3			
Black Oak Woodland, Oak Savannah		Yes	
Sand Barren		Yes	
Provincially Significant Wetland		Yes	Burnley Creek Headwaters Wetland Complex
HCV 4			
None.			
HCV 5			
None.			
HCV 6			
None.			
Values of Conservation Concern			
Common Name	**Scientific Name**	**Known to occur**	**Comment**
Autumn Coralroot	*Corallorhiza odontorhiza*	Possibly	Occurrence based on historic record
Black Ash	*Fraxinus nigra*	Yes	Scattered trees in small concentrations

Black Bear Den	*Ursus americanus*	Yes	No den sites known
Black Purseweb Spider	*Sphodros niger*	No	
Blanding's Turtle	*Emydoidea blandingii*	No	
Butternut	*Juglans cinerea*	Yes	One archivable tree known
Canada Warbler	*Cardellina Canadensis*	Yes	
Cerulean Warbler	*Setophaga cerulean*	No	
Common Nighthawk	*Chordeiles minor*	Yes	
Conservation Reserves			
Mammal dens	N/A	Yes	Include red fox and coyote in NCF
Dragonflies and Damselflies of Conservation Concern	N/A	No	
Eastern Hog-nosed Snake	*Heterodon platirhinos*	Yes	
Eastern Ribbon Snake	*Thamnophis sauritus*	No	
Eastern Whip-poor-will	*Antrostomus vociferous*	Yes	
Ghost Tiger Beetle	*Cicindela lepida*	No	
Louisiana Waterthrush	*Seiurus motacilla*	No	
Milksnake	*Lampropeltis triangulum*	Yes	

Monarch	*Danaus plexippus*	Yes	
Nests/communal roosts in cavities (American Kestrel, Barred Owl, Eastern Screech Owl, Great horned Owl, Northern Saw-whet Owl, Chimney Swift)	N/A	Yes	Some species (e.g., Barred Owl) known to occur and nest, but actual cavities not identified
Rare plants associated with Oak Savannah, Oak Woodlands and Sand Barrens	N/A	Possibly	Occurrence based on historic records
Rare plants associated with streams, wetlands and riparian areas	N/A	No	
Red-headed Woodpecker	*Melanerpes erythrocephalus*	No	
Rugulose Grapefern	*Sceptridium rugulosum*	Possibly	Occurrence based on historic record
Sleepy Duskywing	*Errynis brizo brizo*	Possibly	Occurrence based on historic records
Snapping Turtle	*Chelydra serpentine*	Yes	
Stick nests; common raptors (Barred Owl, Great Horned Owl, Long-eared Owl, Common Raven, Red-tailed Hawk, Broad-winged Hawk, Cooper's Hawk, Sharp-shinned Hawk, Merlin)	N/A	Yes; some	

Stick nests; uncommon raptors (Red-shouldered Hawk, Northern Goshawk)	N/A	Species known to occur, but no stick nests identified.	
West Virginia White	*Pieris virginiensis*	No	
Western Chorus Frog	*Pseudacris triseriata*	Yes	
Wood Thrush	*Hylocichla mustelina*	Yes	
Ponds		Yes	
Historic homesteads and other buildings		Yes	

Conservation Reserves

Inclusion of conservation reserves and protected areas within the HCVF framework is not straightforward, as described by WWF-Canada (2005). In the Rainforest Alliance's Locally Adapted Standards for Assessing Forest Management in the Great Lakes/Saint-Lawrence Region, Question 6 of HCV1 is:

"Does the forest lie within, adjacent to, or contain a conservation area:

a) designated by an international authority,

b) legally designated or proposed by relevant federal/provincial/territorial legislative body, or

c) identified in regional land use plans or conservation plans?"

Legally protected areas such as conservation reserves and Areas of Natural and Scientific Interest may not necessarily be HCVF simply on account of their designation. In their *High Conservation Value Support Document*, the World Wildlife Fund (WWF-Canada 2005) suggests that:

"Legally protected areas and conservation areas with clear policy basis and effective biodiversity protection mechanisms do not *need* to be identified as HCVF's. However, each should be evaluated for HCV's."

The Oak Ridges Moraine is the only legally protected conservation reserve (Oak Ridges Moraine Conservation Plan (ORCMP; O. Reg. 140/02) under the Oak Ridges Moraine Conservation Act (S.). 2001, c.31)). More than 95% of the County Forest is designated as a Natural Core Area under the ORCMP. Natural Core Areas are "areas with a high concentration of key natural heritage features, hydrologically sensitive features or landform conservation areas."

Some of the permitted uses of a Natural Core Area under O. Reg. 140/02 that apply to the management activities in the Northumberland County Forest include:

a) Fish, wildlife, and forest management

b) Conservation projects and flood and erosion control projects

c) Agricultural uses

d) Low-intensity recreational uses

e) Unserviced parks

f) Uses accessory to the above-mentioned uses

Most of the County Forest borders on lands designated as Natural Core Area, although some neighbouring properties are Countryside Areas with a smaller proportion being Natural Linkage Areas. Countryside areas can be generally considered to be lands that maintain rural landscape and uses including agriculture, recreation, parks and open space and some residential development and aggregate extraction. Natural Linkage Areas are identified for their potential to provide support to the corridor systems for the movement of plants and animals.

As there is clear direction for protection through legislation and policy, we did not include the Oak Ridges Moraine as an HCVF. The Oak Ridges Moraine Act was created as a mechanism to protect multiple high level HCVs without being specific (e.g., c.31, s. 4(a) – protecting the ecological and hydrological integrity of the Oak Ridges Moraine Area) and therefore, the HCVs are not identifiable. We included the Oak Ridges Moraine as a conservation concern so that we are mindful of it within our operations and to ensure that any atypical operations that may arise will conform to the Natural Core Area regulations.

Management Direction

The following are long-term management goals for the forest. Overarching the goals and objectives is the overall management direction for the County Forest:

Vision

A County Forest where the mosaic of forest, wetland, woodland, savannah, sand barren and tallgrass prairie is a model of multi-use management for the many intrinsic, ecological and community benefits.

Goals

To realize this vision, the Forest Management Plan has been developed with the goals shown in Table 4.

Table 4. Management goals that will contribute to realizing the vision for the Northumberland County Forest.

Goal 1	A community that is engaged, has pride in and celebrates the Northumberland County Forest for its many values.
Goal 2	Natural heritage conservation that preserves, enhances, and restores lands for the best possible ecological health and integrity.
Goal 3	A model recreational trail system that provides high-quality and safe experiences for a variety of user types.
Goal 4	An exemplary silviculture program that supports conservation goals and provides social benefits.

Actions

The following are major actions that are required to meet the goals outlined in the Forest Management Plan (Table 5). This is not a comprehensive set of basic or recurring tasks needed to manage the NCF but are major projects to be completed with their timing milestones. Further details for these actions are provided in the text of the Management Plan.

Table 5. Major management actions and their deadline for completion for implementing the Forest Management Plan.

Goal 1. A community that is engaged, has pride in and celebrates the Northumberland County Forest for its many values.	
Action 1. A	Prepare a cultural heritage and values document in coordination with Alderville First Nation and other interested Williams Treaty, Clause 2 signatories. This, as a whole or a portion, will be inserted either into the

	Indigenous Communities section and if only a portion, then the remainder will be inserted as an appendix. **Completion date:** 2027
Action 1. B	Evaluation and strategy for First Nation community participation in forest management developed in cooperation with Alderville First Nation. The first aspect of this project will be to perform an evaluation of the desire and scope of the project. This, as a whole or a portion, will be inserted either into the Indigenous Communities section and if only a portion, then the remainder will be inserted as an appendix. **Completion date:** 2030
Action 1. C	Develop a continuous community consultation program. Once developed this will be inserted into the Community Engagement Section. **Completion date:** 2023
Action 1. D	Develop a five-year volunteer plan while holding volunteer events in the interim. **Completion date:** 2024
Action 1. E	Develop a two-year outreach and education strategy. This will be followed by the development of a 5-year outreach and education strategy (2026-2030) that will coordinate with the other operational plans. **Completion date:** 2023
Goal 2. Natural heritage conservation that preserves, enhances, and restores lands for the best possible ecological health and integrity.	
Action 2. A	Prepare a terrestrial habitat data collection protocol. **Completion:** 2022
Action 2. B	Prepare a wildlife and target species inventory and monitoring protocol. **Completion:** 2023
Action 2. C	Perform a wildlife habitat modeling exercise. **Completion:** 2024
Action 2. D	Prepare recurring 5-year conservation operations plan. **Completion date:** 2025 (for 2026 plan)

Goal 3. A model recreational trail system that provides high-quality and safe experiences for its many users.	
Action 3. A	Review forest use by-laws and set fines. **Completion date:** 2022 Additional reviews should occur, at a minimum, every five years.
Action 3. B	Prepare a review and summary for options for off-leash dog use. **Completion date:** 2024
Action 3. C	Prepare 5-year recreational operations plan and 20-year access road maintenance outlook. **Completion date:** 2025
Goal 4. An exemplary silviculture program that supports conservation goals and provides social benefits.	
Objective 4. A	Annually consider/review opportunities for non-conifer harvest operations. **Completion date:** Annually
Objective 4. B	Prepare a timber sale analysis and plan. **Completion date:** 2025
Objective 4. C	Prepare recurring 5-year silvicultural operations plan. **Completion date:** 2025 (for 2026 plan)
Objective 4. D	Prepare an Annual Harvest Area assessment and plan. **Completion date:** 2024
Additional (5). The following are actions that support more than one goal for Northumberland County Forest management and are therefore included as additional.	
Action 5. A	Revise compartment boundary delineation. **Completion:** 2022
Action 5.B	Create database of recreational and access assets. **Completion:** 2024
Action 5. C	Complete Desired Future Condition Assessment and Mapping

	Completion: 2025
Action 5. D	Develop a wildfire risk reduction and control management plan. **Completion date:** 2027
Action 5. E	Develop a land securement and boundary demarcation strategy. **Completion date:** 2026
Action 5. F	Inventory natural and built assets to contribute to the County Asset Management Plan. **Completion date:** 2023
Action 5. G	Perform a financial reserves review. **Completion date:** 2023

Community

Indigenous Community Engagement

Northumberland County will continue to engage and partner with the Williams Treaty, Clause 2 First Nations. As determined in earlier consultations with regional First Nations about the Forest's management and planning, Alderville First Nation will be the lead community for engagement. Some regional consultations may be more appropriate or desired and guidance will be sought from Alderville First Nation. To support this Forest Management Plan and to provide direction to future management and operational planning, two initial projects with Alderville First Nation are proposed.

The first project is a document prepared by Alderville First Nation which would provide the indigenous history of the area and would identify indigenous cultural heritage values known to or that could exist in the forest. Additional details would identify how they can be preserved, their locations communicated and how they can be accessed. Where appropriate, these could be identified and included in Conservation Value Operational Standards.

The second project which would require scoping through dialogue with the Alderville First Nation community would be a strategy that could include ideas and evaluation of opportunities for partnerships including, but not limited to, data collection, knowledge and information sharing and outreach and education programming and skills development. The intent in listing these items is not to limit the scope of the assessment but to provide examples and provide a basis for dialogue.

The first project will be completed by the 5-year renewal period for the Management Plan. The second project, if pursued, must be completed by the end of the 10-year period. Ideally, the project plan including the scope and expected milestones of the second project will be part of the first project. As these are completed, they will replace this section of the plan.

Community Consultation

Although not directly managed by a community, the Northumberland County Forest is a community forest in the sense that it is used primarily by our community, provides benefits to our community, is supported financially by our community and major decisions and overall decisions are made by elected officials in a democratic setting. The current approach has been that staff, and previously consultants or the OMNRF, made recommendations that were either approved or rejected by County Council. Public opinion was gathered through conventional information provision-feedback received consultations which was generally neither engaging or activating. Some management did take place because of public requests, but these have not been major or regular.

The goal for public consultation, however, should be to mature public participation as suggested by Robson and Rosenthal (2014) from consulting to keep government accountable to a helping role where people participate in decision-making and conflict resolution which helps build trust and capacity. To realize this the community needs to be activated and engaged to

participate in active listening, thoughtful argument, and reflection, needs to work towards shared goals and identify as a fundamental unit of deliberation.

Current approaches to public consultation have been conventional with presentations or information disseminated at an open house or with materials posted online with feedback forms. These approaches can be suitable for some consultation, but overall consultations need to be more creative and engaging. Staff must adopt the idea that through high-quality public consultation there is a better potential for a more knowledgeable community and to receive more feedback from a diverse audience, higher quality feedback, ideas that can improve plans, buy-in on projects and an activated public that wants to participate and support activities.

It is not desirable to create a blanket consultation strategy and suggest that there is one best approach for public consultation. Each project requires its own public consultation plan that considers the following:

- Who is the target audience?
- What are the best methods to reach the target audience?
- Where is the best place to reach the target audience?
- What is the best method for gathering and compiling feedback?
- In what capacity will the community activate during and after consultation?
- What is the best methods for communicating the results and responses to feedback received during consultation?
- How do we maintain ongoing discourse about a project or future projects?
- How do we maintain consistency, allowing for incremental improvements, for similar projects so that there is predictability for the community?

Some consultation plans will be more formalized, documented and presented as a strategy that will be carried out throughout the planning and approvals process. For very large projects with more advanced consultation strategies the best approach will be to gather information from the community on how to best perform those consultations, a pre-consultation for consultation. Other consultation plans will not be formal and will be smaller-scale and routine. Where a project has the potential need for volunteers, could have significant social effects or has the potential to negatively affect reputation it is best to pursue more in-depth public consultation, even for smaller plans.

In addition to project-based consultation, a continuous consultation system for feedback and recommendations will be developed. This system does not need to be a single method, for example it could be an online feedback system as well as regularly reoccurring surveys. A plan for this continuous consultation program will be completed by 2023 and will replace this section of the plan. This should be re-evaluated on an annual basis and amended when changes are made.

Forest Advisory Committee

Northumberland County will maintain a Forest Advisory Committee that is composed of user groups, special interest groups and general public. There is no single model for these types committees and they may range from full management control to a body that is notified of government management actions. The County recognizes that by having a committee-based structure that not all interests and voices are heard, and that not all differences of opinion within those interests are brought forward by committee representatives. However, logistically this approach provides a balance between efficiency, continuous feedback, and targeted response from interested groups. Wherever, possible the County will continue to support and promote the dissemination and gathering of information from committee members that represent a special interest group.

The Forest Advisory Committee will serve as a resource, information, and active support group to Natural Heritage Services for management of the County Forest and other relevant activities of the Natural Heritage Service (e.g., Weed Control, Forest Conservation) or Northumberland County when requested and appropriate. Like public consultation, the goal for the forest advisory committee should be to activate forest advisory committee members to be engaged and participatory. Not only should committee members act as a sounding board for forest management activities, but they should also be bringing forward ideas and looking for and suggesting opportunities to participate and support management activities.

County staff's primary role at the meetings will be a resource to provide information to the committee on updates, opportunities, dependencies, and restrictions including political foresight that they may or may not be knowledgeable of. This is especially important for the technical information regarding matters such as legislation, best management practices and proper management techniques. Ideally, through this process, the committee becomes more knowledgeable about these matters and the opinion or comments of the staff member become less necessary and became more of a request when the committee recognizes that they are needed and could provide context, facilitation, or education.

The critical factor in this approach being successful is the willingness of the committee to be participatory and to recognize, understand and respect the planning that has been done to manage the forest and develop plans. This requires a re-framing of the committees from the role of audience to the role of participants and the role of Natural Heritage Service staff from lecturers to facilitators, educators, and resources. Ideally, committees become self-managing including organizing and running meetings. The County will continue to provide support to them in terms of space and financial support (where budgeted). The committees may come forward and request resources from the County and this will be discussed with staff and appropriately budgeted for.

The Forest Advisory Committee is formed of two sub-committees, a recreational committee, and a natural and cultural heritage committee. The purpose of the sub-committees is to make the meetings the most efficient possible by focusing the presentations, discussions, and work planning among the groups. The two sub-committees then have representatives that meet as a central liaison committee (representatives roundtable) to share information between

sub-committees. A balance and activation of the representatives is being sought in this structure. The committee structure should be reviewed on a regular basis and adapt based on the success of the committee operations.

Partnerships

Maintaining partnerships is critical for information and knowledge sharing as well as operating efficiently. Partnership involvement should include the development of coordinated projects, pursuing funding and carrying out operating activities such as coordinating volunteer programs, timber sales, restoration activities and delivering outreach.

Current partnerships with the following organizations should be maintained and enhanced.

- The Eastern Ontario Model Forest/Ontario Woodlot Association
- The Rice Lake Plains Joint Initiative which includes the following member groups:
    - Ganaraska Region Conservation Authority
    - Lower Trent Conservation
    - Willow Beach Field Naturalists
    - Northumberland Land Trust
    - Alderville Black Oak Savannah
    - Nature Conservancy of Canada
    - Lone Pine Trust
    - Sir Sandford Fleming College
    - Tallgrass Ontario
    - Ontario Parks
- Community Forest Managers (group composed of community forests and conservation authorities throughout Ontario)
- Recreational user groups, including but not limited to the Oak Ridges Trail Association, Northumberland Trail Riders, Northumberland District ATV Riders Club, and the Great Pine Ridge Snowmobile Association

In addition to the organizations listed above, partnerships with other governmental, non-profit, and for-profit organizations should be considered whenever there is opportunity for an improvement in service delivery.

Academic partnerships

Academic partnerships can benefit the Northumberland County Forest by providing applied research and applied learning that contribute to realizing the NCF's goals. For example, Fleming College students visit the forest as part of their trail building and forestry programs and have performed chainsaw training in the Forest and carried out mapping projects.

Opportunities for engaging academic institutions in management activities such as data collection, monitoring, mapping, restoration projects and tending are plentiful and often cost less to provide a little financial support where needed (for example bussing costs have been covered in the past) compared to hiring contractors and the number of students can expedite work more quickly. Having a central location for teaching, research, labs space, accommodation, and equipment such as the Scout camp, would be beneficial in supporting these programs and deriving further benefits.

Volunteers

The employment of volunteers has been an under-used resource that would enhance service delivery. As well, volunteer programs will improve public engagement and support. As identified through consultation performed for the Northumberland County Natural Areas Regional Volunteer Strategy there are many opportunities for volunteers to support current and additional programming for activities including, but not limited to, administration, outreach, advertising, recreation, silviculture, and conservation.

Formal opportunities for volunteers include, but are not limited to:

- Outreach
- Planting
- Tending
- Invasive species management
- Tree marking
- Trail monitoring
- Recreational information
- Trail maintenance
- Conservation concern monitoring
- Support at public consultation and engagement sessions

In addition to more formal volunteer efforts, informal volunteer efforts should be supported. These informal efforts could include citizen science and hazard reporting where anyone can provide information to the County and where some asynchronous training is provided.

By 2024, a five-year volunteer program plan will be developed. This plan will include a plan for the phasing in of a volunteer program including task identification, recruitment, training, oversight, scheduling, and recognition events as well as milestones and annual and 5-year review metrics. The volunteer plan will also assess opportunities for partnerships within the volunteer program.

During the development of the volunteer plan, there will at least be one outreach event, one planting event, one trail maintenance event and vegetation management event held using volunteers. A citizen science tool, for example a project within iNaturalist, with associated training will also be developed.

Annual volunteer event metrics include the number and type of event and the number of volunteers engaged will be summarized in the annual report. The 5-year volunteer plan will replace this section, or at least be referred to in this section and referred to in an appendix. This section will also be replaced with a schedule for the preparation of the subsequent volunteer plan updates.

Outreach and Education

Outreach and education activities span all management areas and can be used to as educational tools to educate about management activities, rules, respectful trail use, natural or cultural heritage values. Additionally, outreach and education can support other activities such as public consultation by providing pre-emptive educational information and communicating results, informing the public of upcoming management actions or infrastructure changes, volunteer activities, volunteer recognition.

Some keys to a successful communications program will be ensuring that the messaging includes topics from all facets of management including recreation, conservation, and silviculture and that include information of general interest as well as regulations. Multiple modes of reaching the public should be used so that people are being reached both at and away from the Forest. Modes can include the use of social media including written and video messaging, print and radio advertising, interpretive signage, printed media, in-person activities. Whenever possible, education and outreach should seek to include partners to leverage their knowledge, skills, capacity, demonstrate cooperation and, where appropriate, improve consistency of messaging.

A public outreach and education plan will be developed to complement other operational plans. The education and outreach plan shall be completed in 2023 and will replace this section. The plan will cover 2024-2025 and then a subsequent plan will be prepared for the 2026-2030 period to complement and cover the same period as the other operational plans. In the interim, the following education and outreach activities will be completed.

Interpretive Signage

At least two (2) interpretive signs will be developed and installed per year during this interim period. These signs could include signage relating to a rare habitat or species, management activities, stand history.

Media

Continue with radio advertising with a minimum of six (6) different advertisements per year. Radio advertising should focus on regulations, recreational trail etiquette and announcements of management activities.

For online social media, no single platform is identified to recognize the shifting patterns of app usage. Staff should continually reassess the app(s) being used for its ability to engage and emerging trends should be sought. Social media outreach should also focus on education about natural and cultural heritage features and silviculture information being more prominent than etiquette, regulatory and construction notices.

Future public consultations should assess which media sources provide the best return on investment for outreach and education.

In-person outreach

In-person outreach can occur as guided hikes, stationary booths, speaking engagements, public events, and live social media events. These can serve many different purposes and can be carried out with partners, include the use of volunteers, occur on- and off-site and can cover a variety of topics. Prior to a longer-term plan, staff should host at least one guided hike, one stationary event such as an educational booth at the Beagle Club Trailhead during cross-country ski season and hold one live social media event per year. Planning must also include an event for the 2024 celebration of the 100-year anniversary of the Forest's establishment.

Zoning

The following zoning system (Table 6, Figure 11) with special management zone (SMZ) overlays (Figure 12, Figure 13, Figure 14, Figure 15) shall be implemented as an interim system to guide forest management. This overlay-based zoning system will be replaced with a zoning system that will be specific to each compartment where each compartment contains specific operational direction with the objective of reaching a desired future condition. Additionally, trail zoning will be on a trail-by-trail basis following the Northumberland County Forest Recreational Trail Standards, although new trail development can be attributed to a compartment.

These boundaries are approximate. If a more ecologically sensitive habitat can be protected by making minor boundary adjustments, then it provides a more desirable outcome. There may also be small changes, such as the outline of Special Management Zones or the addition of other Special Management Zones where monitoring and assessment determines that there is a location of interest that should have management considerations. There should also be consideration given to cultural management zones, especially the areas of historical cultural significance. These are not included on the maps due to their sensitivity, but existing mapping and location knowledge must be referred to by staff in management decisions. Similarly, species of conservation concern must be considered in addition to these zones as an overlay when management decisions are being made and management activities are being carried out.

The following activities may occur throughout Forest despite any zoning:

- Trail management activities on existing trails including trail repairs or trail re-routes to improve trail maintainability or mitigate risk.
- Hazard tree removal to mitigate risk.
- Research that is consistent with overall management direction and goals.
- Commercial timber harvesting is permitted in all zones but may be explicitly restricted or modified by the Special Management Zone overlay and is subject to Operational Standards.

Table 6. Zoning system including permitted uses, management considerations and special management zoning overlays for the Northumberland County Forest.

Resource Management Zones										
Zone Code	Conservation / Restoration	Timber Harvesting	Non-motorized Recreation (NMR)	Motorized Recreation (MR)	Non-motorized Recreation Development	Motorized Recreation Development	Hunting	Scout Camp	Additional Comments	Area (ha)
RMZ-A	●	●								44
RMZ-B	●	●					●			231
RMZ-B-01									• Requires further assessment prior to additional management direction	88
RMZ-C	●	●	●							411
RMZ-C-01	●	●	●		●					15
RMZ-C-02	●	●	●		●					118
RMZ-D	●	●	●	●			●			265
RMZ-D-01	●	●	●	●	●	●	●			143
RMZ-D-02	●	●	●	●	●		●			88
RMZ-D-03	●	●	●	●	●		●			400
RMZ-D-04	●	●	●	●		●	●			215
RMZ-D-05	●	●	●	●		●	●			107

RMZ-D-06	●	●	●	●		●	●			108
RMZ-E	●	●	●	●						218
RMZ-SC	●	●	●					●		29

Special Management Zones

Zone Code	Feature	Management Goal	Restrictions	Management Considerations	Area (ha)
Forest					
SMZ-FOR-01	Natural Forest/Valleyland	Late seral forest	• Motorized recreation prohibited • Minimize non-motorized recreation • No commercial timber harvesting	• Timber harvesting for specific circumstances (e.g., pests and disease) • Promote oak/maple/white pine canopy and shade tolerant shrubs (e.g., arrowwood, beaked hazel, New Jersey Tea)	6.7
SMZ-FOR-02	Natural Forest/Slopes	Late seral forest	• Motorized recreation prohibited • Minimize non-pedestrian recreation • Timber harvesting permitted to achieve management goals	• Timber harvesting may be necessary under specific circumstances (e.g., pests and disease). • Promote oak/maple/white pine canopy and shade tolerant shrubs (e.g., arrowwood, beaked hazel, New Jersey Tea)	7.8
SMZ-FOR-03	Natural Forest/Valleyland	Late seral forest	• Current trails permitted	• Timber harvesting may be necessary under specific circumstances (e.g., pests and disease) • Promote oak/maple/white pine canopy and forest maturation • Ash component will be a concern when Emerald Ash Borer infestation occurs	8.7
SMZ-FOR-04	Natural Forest/Valleyland	Late seral forest	• Current trails permitted; some alteration of trails in this area may be necessary and relocating them upslope to follow contour may be permitted	• Timber harvesting may be necessary under specific circumstances (e.g., pests and disease) • Promote oak/maple/white pine canopy and shade tolerant shrubs (e.g., arrowwood, beaked hazel, New Jersey Tea)	6.1
SMZ-FOR-05	Natural Forest/Valleyland	Maintain late seral forest	• Current trails permitted; alteration of trails in this area may be necessary and relocating them upslope to follow contour may be permitted	• Timber harvesting may be necessary under specific circumstances (e.g., pests and disease) • Promote oak/maple/white pine canopy and shade tolerant shrubs (e.g., arrowwood, beaked hazel, New Jersey Tea)	9.1
SMZ-FOR-06	Natural Forest/Valleyland	Late seral forest	• Recreation prohibited	• Timber harvesting may be necessary under specific circumstances (e.g., pests and disease) • Promote oak/maple/white pine canopy and shade tolerant shrubs (e.g., arrowwood, beaked hazel, New Jersey Tea)	10.1
SMZ-FOR-07	Natural Forest	Late seral oak forest	• Recreation prohibited • Commercial timber harvest prohibited	• Timber harvesting may be necessary under specific circumstances (e.g., pests and disease) • Promote oak/maple/white pine canopy and shade tolerant shrubs (e.g., arrowwood, beaked hazel, New Jersey Tea)	15.0

SMZ-FOR-08	Natural Forest/Valleyland	Late seral forest	• Current trails permitted • Trail re-routing to improve sustainability permitted • Timber harvesting permitted only with strong indications that it will successfully promote the management goals	• Promote oak/maple/white pine canopy and shade tolerant shrubs (e.g., arrowwood, beaked hazel, New Jersey Tea)	15.9
SMZ-FOR-09	Natural Forest/Black Oak Woodland	Restore open oak woodland	• Current trails permitted • Trail re-routing to improve sustainability permitted • Addition to non-motorized Woodland Trails network could be considered (minimized amount) • Timber harvesting permitted only with strong indications that it will successfully promote the management goals	• Manage invasive species • Increase vegetation complexity (especially grasses and wildflowers) • Commercial harvesting to promote oak and white pine • Prescribed burning should be considered	73.9
SMZ-FOR-10	Natural Forest/Black Oak Woodland	Restore open oak woodland	• Current non-motorized trail permitted. Additional trail development prohibited • Timber harvesting permitted only with strong indications that it will successfully promote the management goals	• Manage invasive species • Increase vegetation complexity (especially oak composition, grasses and wildflowers) • Timber harvesting to promote oak and white pine	12.4
SMZ-FOR-11	Natural Forest	Late seral forest	• Recreation prohibited	• Timber harvesting may be necessary under specific circumstances (e.g., pests and disease) • Promote oak/maple/white pine canopy and shade tolerant shrubs (e.g., arrowwood, beaked hazel, New Jersey Tea)	4.8
SMZ-FOR-12	Natural Forest/Black Oak Woodland	Restore open oak woodland	• Recreation prohibited • Timber harvesting permitted only with strong indications that it will successfully promote the management goals	• Manage invasive species • Increase vegetation complexity (especially oak composition, grasses and wildflowers) • Harvesting to promote oak and white pine	9.6
SMZ-FOR-13 and SMZ-FOR-14	Natural Forest	Late seral forest	• Recreational Trails may be considered • Timber harvesting permitted only with strong indications that it will successfully promote the management goals	• Timber harvesting may be necessary under specific circumstances (e.g., pests and disease) • Promote oak/maple/white pine canopy and shade tolerant shrubs (e.g., arrowwood, beaked hazel, New Jersey Tea)	12.9 and 23.6
SMZ-FOR-15	Natural Forest/Black Oak Woodland	Restore open oak woodland	• A single stretch of recreational trail may be considered • Timber harvesting permitted only with strong indications that it will successfully promote the management goals	• Manage invasive species • Increase vegetation complexity (especially oak composition, grasses and wildflowers) • Harvesting to promote oak and white pine • Very suitable area for prescribed burning	37.8

SMZ-FOR-16	Natural Forest	Late seral forest	• Recreation prohibited • Timber harvesting prohibited	• Maintain moist coniferous and mixed-deciduous forest	8.6
SMZ-FOR-17	Natural Forest/Black Oak Woodland	Maintain oak woodland/Late seral forest	• Current trails permitted • Trail re-routing to improve sustainability permitted • Timber harvesting prohibited	• Manage invasive species • Timber harvesting may be necessary under specific circumstances (e.g., pests and disease) • Promote oak/maple/white pine canopy and shade tolerant shrubs (e.g., arrowwood, beaked hazel, New Jersey Tea) • Conifer plantation harvesting permitted to edge of oak woods	2.1
SMZ-FOR-18	Natural Forest/Valleyland	Late seral forest	• Current trails permitted • Trail re-routing to improve sustainability permitted • Minimal non-motorized trail development related to Lookout Mountain may be considered • Commercial timber harvesting permitted with strong emphasis on the goal of late seral deciduous woodland • Commercial timber harvesting prohibited on steep valley slopes	• Promote oak/maple/white pine canopy and shade tolerant shrubs (e.g., arrowwood, beaked hazel, New Jersey Tea)	109.8
Black Oak Woodland, Tallgrass Prairie, Savannah					
SMZ-SAV-01	Tallgrass Prairie	Restore tallgrass prairie/oak savannah	• Minimize recreation to current amount or less	• Reduce amount of trails if possible • Promote expansion of prairie plants/savannah • Reduce conifer and increase oak canopy • End off-trail and closed-trail recreation traffic (particularly motorized) • Manage invasive species	2.3
SMZ-SAV-02	Tallgrass prairie/Oak Savannah	Restore tallgrass prairie/oak savannah	• Recreation prohibited	• Manage invasive species • Restore to scattered oak-pine with open barrens • Increase vegetation complexity • Conifer plantation harvest permitted to edge of opening	6.2
SMZ-SAV-03	Oak-Pine Savannah	Restore oak-pine savannah	• Current trails permitted • Trail development may be considered with special attention to natural heritage conservation (Ex. a universal interpretive trail).	• Manage invasive species • Restore to open prairie and scattered oak-pine with barren characteristics • Increase vegetation complexity • Conifer plantation harvesting permitted	13.7
SMZ-SAV-04	Tallgrass prairie/Oak Savannah	Restore tallgrass prairie/oak savannah	• Current trails permitted • Development of a short section of non-motorized trail for interpretive	• Manage invasive species • Restore to open prairie and scattered oak-pine with some barren characteristics • Increase vegetation complexity • Commercial harvesting of forest to boundary of opening permitted.	6.1

			purposes may be considered	• Highly suitable candidate for restoration through prescribed burning	
Sand Barren					
SMZ-SNB-01	Sand Barren	Restore sand barren	• Recreation prohibited	• Manage invasive species • Restore to more open barren • Protect from recreational use	3.8
SMZ-SNB-02	Sand Barren	Restore sand barren	• Recreation prohibited	• Manage invasive species • Restore to scattered oak-pine with open barrens • Conifer plantation harvest permitted to edge of opening	1.8
SMZ-SNB-03	Sand Barren	Restore sand barren	• Recreation prohibited	• Manage invasive species • Restore to scattered oak-pine with open barrens • Increase vegetation complexity (especially grasses and wildflowers) • Conifer plantation harvest permitted to edge of opening (heavy harvesting at edges beneficial)	13.7
SMZ-SNB-04	Sand Barren	Restore sand barren	• Recreation prohibited	• Manage invasive species • Increase barren area • Increase vegetation complexity (especially grasses and wildflowers) • Conifer plantation harvest permitted (preferably once ground is frozen)	6.6
SMZ-SNB-05	Sand Barren	Restore Sand Barren	• Current trail permitted	• Manage invasive species • Maintain barren area • Conifer plantation harvest permitted to edge of opening (heavy harvesting at edges beneficial)	0.2
SMZ-SNB-06	Sand Barren	Restore sand barren	• Current trail permitted although re-routing outside of barren or fencing to contain users would improve barren quality	• Manage invasive species • Maintain barren area and develop low-density oak-pine where barren does not exist • Increase vegetation complexity (especially grasses and wildflowers) • Conifer plantation harvest permitted to edge of opening (heavy harvesting at edges beneficial) • If trail is maintained through barren, aggregate surface and fencing would improve condition and keep people on trail; Some fencing along trail also beneficial	2.26
SMZ-SNB-07	Sand Barren	Restore sand barren	• Current trail permitted	• Manage invasive species • Maintain barren area • Maintain barren area and develop low-density oak-pine where open barren does not exist • Increase vegetation complexity (especially grasses and wildflowers) • Conifer plantation harvest permitted to edge of opening (heavy harvesting at edges beneficial)	8.0

SMZ-SNB-08 and SMZ-SNB-09	Sand Barren	Restore sand barren	• Recreation prohibited • Harvesting conifer plantation to boundary of sand barren permitted	• Manage invasive species • Maintain barren area • Increase vegetation complexity (especially grasses and wildflowers) around periphery • Conifer plantation harvesting permitted to edge of opening (heavy harvesting at edges beneficial) • Large effort to block recreation from entering sand barren needed	0.3 and 0.8
SMZ-SNB-10	Sand Barren	Restore sand barren	• Recreation prohibited	• Manage invasive species • Maintain as open barren • Conifer plantation harvesting permitted to boundary of opening	2.0
SMZ-SNB-11	Sand Barren	Restore sand barren	• Recreation prohibited • Conifer plantation harvesting permitted	• Manage invasive species (especially Scotch Pine) • Maintain as open barren • Conifer plantation harvesting permitted to boundary of openings; heavy harvesting would be beneficial • Harvest in winter	1.7
SMZ-SNB-12	Sand Barren	Restore sand barren	• Recreation prohibited • Conifer plantation harvesting permitted	• Manage invasive species (especially Scotch Pine) • Maintain as open barren • Conifer plantation harvesting would be beneficial, but retain some mature pine including Jack Pine • Harvest in winter	2.3
Wetland, Pond					
SMZ-WET-01 and SMZ-WET-04	Wetland/Pond	Protect pond	• Recreation prohibited	• No buffer for timber harvesting to convert from plantation • Operations equipment must avoid pond and wet areas • Operations permitted within 50m when ground frozen	0.2
SMZ-WET-02 and SMZ-WET-03	Wetland/Coldwater Stream (Burnley Creek Provincially Significant Wetland)	Protect wetland	• Recreation prohibited in wetland • Non-motorized trail on dry border of SMZ-WET-03 could be considered	• No commercial harvesting or operating equipment in management zone • Conifer plantation harvest permitted to convert to natural mixed forest	5.7 and 20.9
SMZ-WET-04	Wetland/Pond	Protect wetland/pond	• Current trail permitted • Commercial timber harvest prohibited	• Timber harvesting may be necessary under specific circumstances (e.g., pests and disease) • Ash component will be a concern when Emerald Ash Borer infestation occurs. Continue treating some ash and remove non-treated ash • Reclaim old trails	0.4

SMZ-WET-05	Pond	Protect pond	• Current trail (red trail permitted in current location).	• No buffer for timber harvesting to convert from plantation • Operations equipment must avoid pond and wet areas • Operations permitted within 50m when ground frozen	0.03
SMZ-WET-06	Wetland/Pond	Protect wetland/pond	• Recreation prohibited	• No buffer for timber harvesting to convert from plantation • Operations equipment must avoid pond and wet areas • Operations preferable when ground frozen	0.2

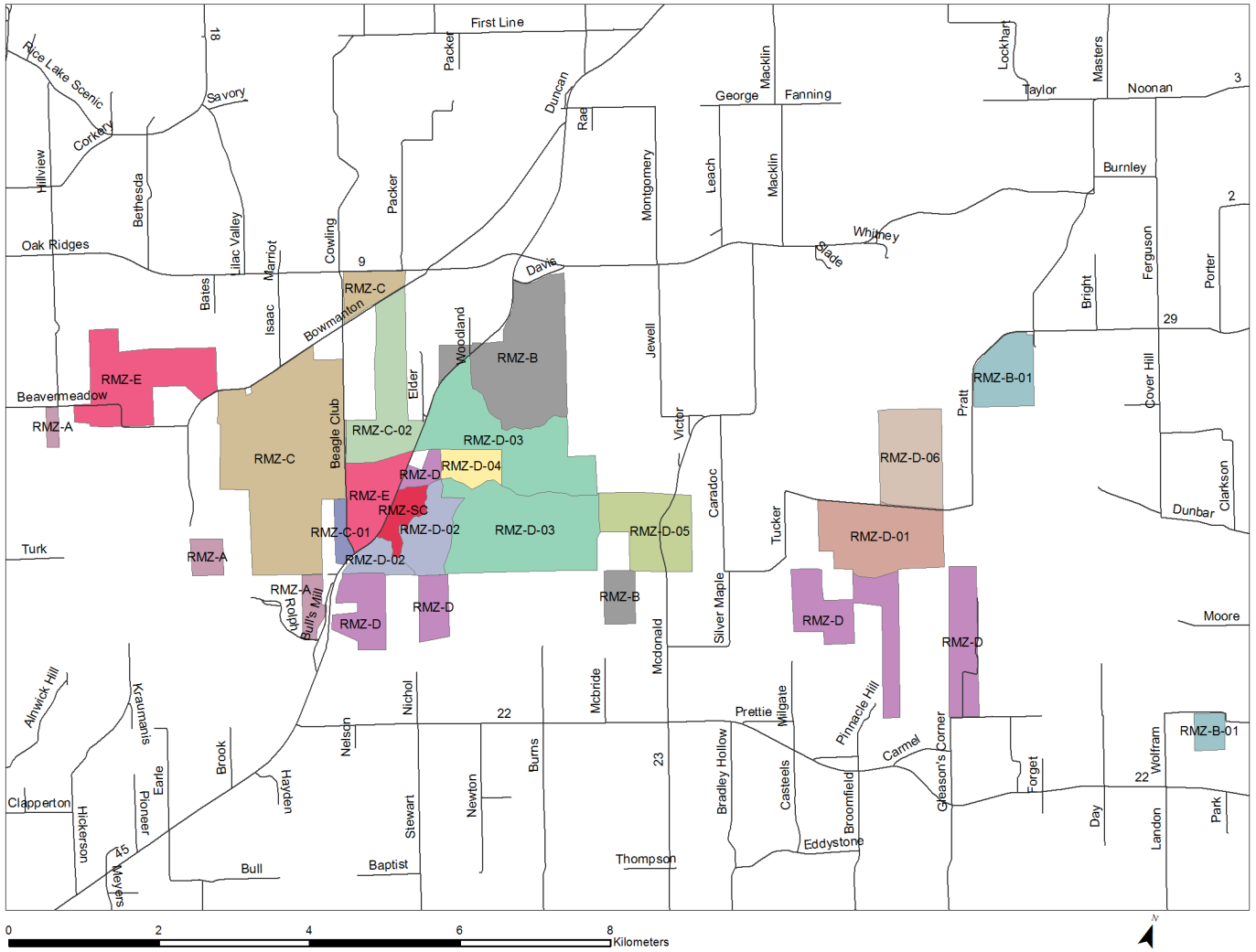


Figure 11. Map of Northumberland County Forest zoning.

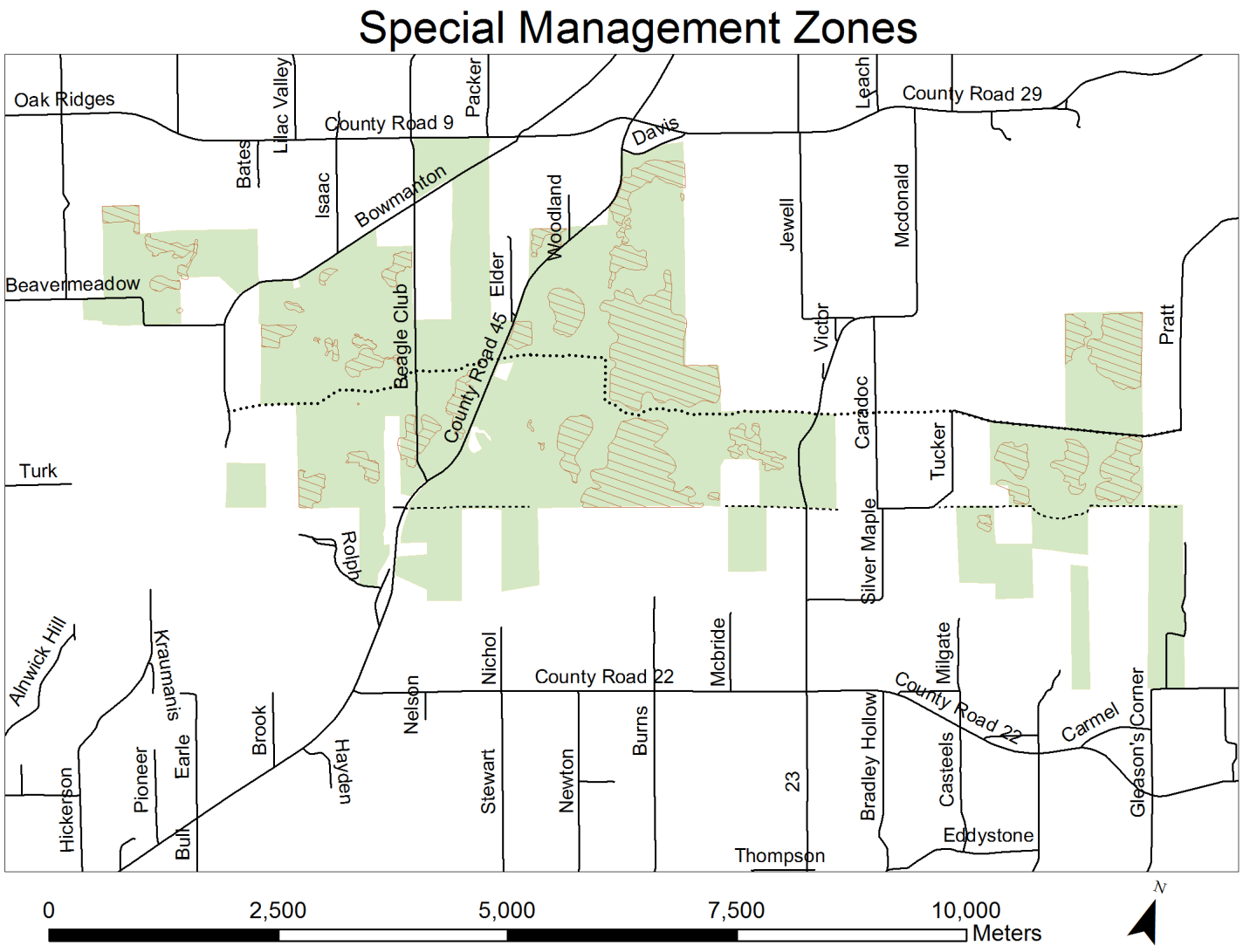


Figure 12. Map showing overview of all special management zone overlays in the Northumberland County Forest.

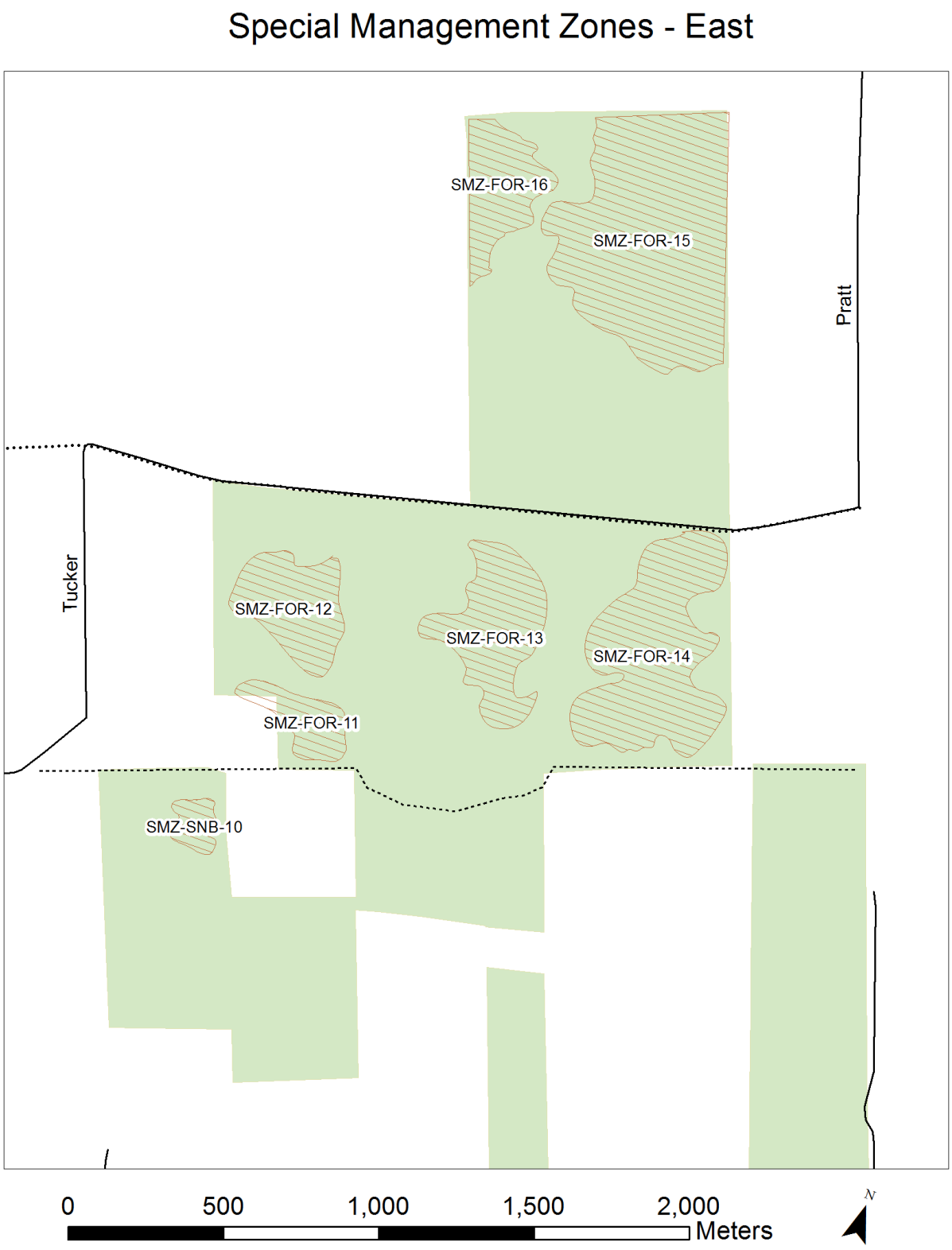


Figure 13. Map showing special management zones for the eastern portion of the

Northumberland County Forest.

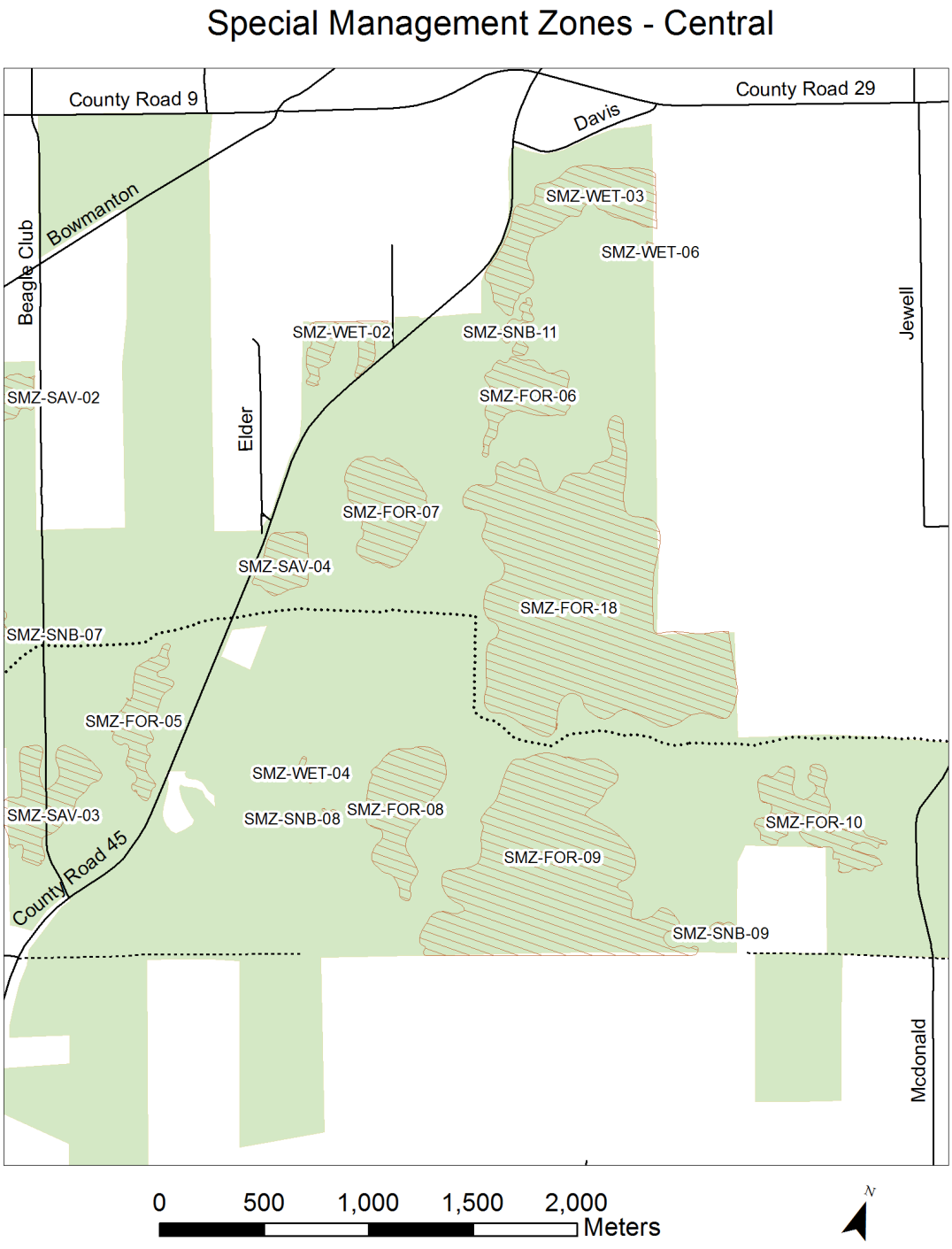


Figure 14. Map showing special management zones for the central portion of the Northumberland County Forest.

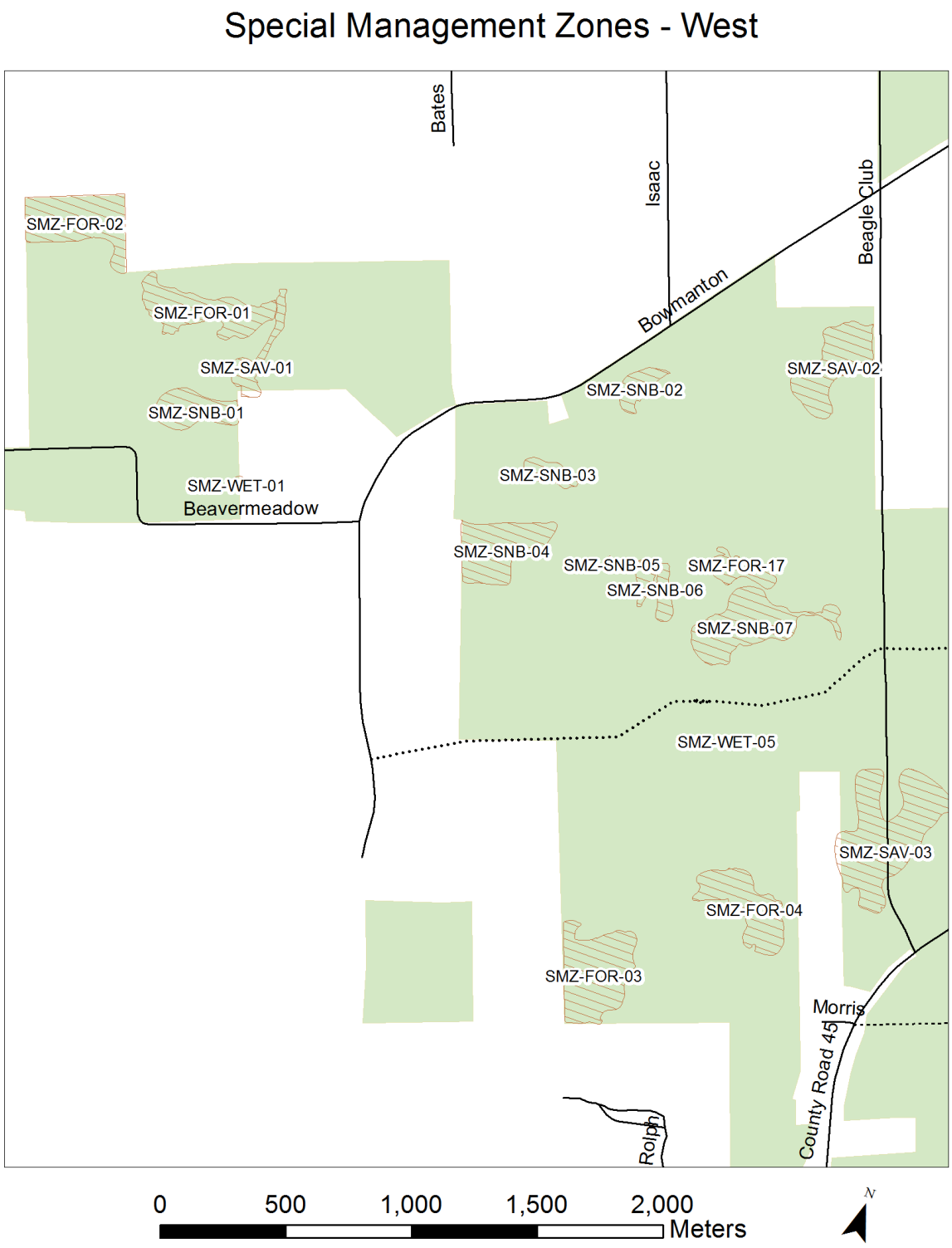


Figure 15. Map showing special management zones for the western portion of the Northumberland County Forest.

Asset Delineation

To support planning and data collection and the revision of zoning, the Forest's compartment boundaries and recreation and access mapping must be revised.

Compartment Boundaries

There are many inconsistencies in the mapping and the basis of the compartments is lot and concession lines. In some cases, compartments should be combined, and some compartments should be split to recognize the mosaic that exists within them. Finer scale delineation will improve management abilities and outcomes. Re-delineation of compartment boundaries must be completed in 2022.

Recreation and Access

To support management of recreation and access infrastructure, recreational assets including trails, picnic areas, rest areas, trailheads, signage, and access roads will be digitized into a database and compartmentalized into groupings of assets (i.e., signs on a specific trail) or segments (i.e., smaller segments of trail). This delineation must be completed by 2024.

Desired Future Condition

Desired Future Condition Mapping will be completed by 2025 to provide the basis for subsequent 5-year silvicultural, conservation and recreation operational plans.

Compartments

Once compartment mapping has been completed, each compartment should have a defined desired site condition including a usage assessment. The intent is not to have a rigid end state that must be met as that is unrealistic within a dynamic natural system with continued growth, succession, uncontrollable environmental disturbances as well as financial constraints. The intent is to have a defined goal to manage for a future forest state at a large scale that is defined and implemented on a compartment-by-compartment basis. This information will allow for improved assessment and estimation of the forest's future inventory as well as conservation and silvicultural approaches and will direct identification and inventorying of actions and needs for operational planning.

Desired future site conditions should include at least the following compartment details and are ideally measurable with time estimates provided:

- Canopy species composition and structure
- Regeneration species composition and structure
- Specific vegetation
- Specific habitat
- Harvesting strategy
- Renewal/plantings
- Tending/maintenance, including prescribed burning
- Monitoring/surveys

- Desired wildlife or insect species if there are specific species of conservation interest

Furthermore, these conditions should be identified for intervals such as 10, 50 and 100 years to recognize the time frame for goals and succession.

Recreation and Access

The desired future condition will be assessed for each asset, asset grouping, or segment. For roads and trails this will include attributes of the corridor and surface whereas for other assets this would include any desired changes in design. Furthermore, the desired future condition database should include:

- short-term desired conditions
- long-term desired conditions
- monitoring intervals
- maintenance requirements and intervals
- details for renewal and maintenance or decommissioning
- prioritization and timing of repair

These conditions may be updated where unplanned changes in structure or composition occur. Updates will be documented and retained for auditing and for reference to inform future management approaches.

Natural and Cultural Heritage Conservation

The County Forest natural and cultural heritage are the result of its glacial origins and cultural history of First Nations inhabitation and management, European settlement, abandonment and restoration, protection of remnant habitats, silvicultural management and shifting cultural use. The interplay of these features and history creates a complex narrative for explaining the progression of cultural and natural heritage. The result is many interesting natural and cultural heritage features, but information about their presence and condition are lacking.

To understand and properly explain the story as well as use the information to inform management decisions, new and old information is needed. At the same time, we continue to pursue and implement management based on the best-available knowledge to ensure that we are conserving cultural and natural heritage while managing shifts in cultural use and value of the forest and the health and integrity of the Forest's natural heritage.

There are many potential conservation projects ranging to small-scale, to potentially large-scale inventories, stewardship, and restoration. Managing of the Northumberland County Forest's natural and cultural heritage will focus on:

- Maintaining a significant large natural area
- Rare ecosystem conservation
- Species-at-risk stewardship
- Invasive species abatement
- First Nations' culturally significant features
- Settlement / Agricultural sites
- Data collection

In addition to direct management actions outlined in this section, indirect conservation activities are included in silvicultural and recreational management activities such as plantation conversion, operating guidelines and trail closure and remediation. As these are outlined within the plans associated with those topics they are not included here despite their benefits to conservation.

Maintaining a Significantly Large Natural Area

The Northumberland County Forest is ecologically significant because of its overall area alone. Regardless of the Forest's habitat composition at a generalized, coarse-scale the large natural area provides habitat for many area-sensitive species. Typically, the Forest's management activities focus on a smaller scale, where individual ecological communities are focused on to improve habitat for select species or to restore a piece of rare habitat. By focusing on a coarser scale, simply the conservation of such a large, nearly continuous piece of natural area in the settled landscape of southern Ontario is significant on its own. Management activities that follow will improve the ecological health and integrity of the area. The key concept is to keep

common forest-dependent species common while maintaining or increasing rare species populations.

Invasive Species Management

Forest biodiversity, composition and health can be threatened by invasive species which usually have no naturally enemies and can be affected both positively and negatively by forest management activities (OMNRF 2015). Often pests and disease that are of concern are also non-native, invasive species. Presently, the main species of concern in the Forest are:

- Dog-Strangling Vine (Black Swallowwort/Pale Swallowwort; *Vincetoxicum rossicum*)
- Scotch Pine (*Pinus sylvestris*)
- White Sweet Clover (*Melilotus albus*)
- Garlic Mustard (*Alliaria petiolata*)
- Silver Poplar (*Populus alba*)
- Japanese Knotweed (*Fallopia japonica*)
- European Buckthorn (*Rhamnus cathartica*)
- Common Goldfish (*Carassius auratus*)
- Emerald Ash Borer (*Agrilus plannipennis*)
- Beech Bark Disease (*Neonectria faginata*)
- White Pine Blister Rust (*Cronartium ribicola*)

Potential future pests and diseases that we are currently aware of having the potential of affecting the County Forest include, but are not limited to:

- Giant Hogweed (*Heracleum mategazzianum*)
- Wild Parsnip (*Pastinaca sativa*)
- Phragmites (European Common Reed; *Phragmites australis australis*)
- Hemlock Woody Adelgid (*Adelges tsugae*)
- Asian Long-horned Beetle (*Anoplophora glabripennis*)
- Oak Wilt (caused by *Ceratocystis fagacearum* fungus)
- LDD (*Lymantria dispar dispar*)

The greatest potential concerns are Hemlock Woolly Adelgid, Oak Wilt and LDD. The identification of future pests and areas that may be affected should be known to staff so that they can monitor for their presence. Opportunities to be involved in any research, early detection and public education/outreach should be pursued.

The response to pests and disease could vary from the need for a mechanical treatment (e.g., containment and removal of infected trees), chemical treatment (e.g., pesticide) or operational management such as salvage logging.

Managing invasive species, pests and diseases often require large amounts of resources. Some solutions are possible through labour alone (e.g., pulling Garlic Mustard, cutting Scotch Pine), while others require chemical treatment (e.g., Dog-strangling Vine, Silver Poplar) and some require specialized equipment, training, and long-term treatment (Emerald Ash Borer). Prioritization and potential management strategies for invasive species are shown in Table 7, but adaptive management is required for new species or changes in abundance or effects. Invasive species management should be targeted at abatement or control for:

- negative effects to conservation values
- locations where the health and safety of visitors, including staff, is at risk
- locations where an invasive species is having deleterious effects on silvicultural goals

Table 7. Management strategies and prioritization for invasive species, pests and disease.

Species	Suggested Management	Priority
Black Locust	• Focus control in sand barrens and oak savannah • Herbicidal treatment that controls the tree's root system is most effective • Basal treatment for stems<15cm dia. Spray up to 50cm up bark where possible and until runoff reaches the ground line. • Cut-stump treatment for stems >15cm dia. or where non-target effects are a concern • Foliar spray for very small trees such as seedlings. • Best when applied mid-summer to early fall • Herbicide application during dry periods will improve control • Pulling, digging, cutting, and burning are not effective treatments.	High
Dog-strangling Vine	• Chemical treatment is necessary • Target areas where Conservation Values, regeneration or trail safety is being affected	High
Japanese Knotweed	• Treatment of infested area should occur immediately	High

	• Sites must be planted immediately following treatment • Mowing and cutting monthly throughout growing season with chemical control of new growth • Digging of young plants and new infestations can work	
Scotch Pine	• Mature trees should be targeted during timber harvesting operations • Saplings should be targeted when potential to affect Conservation Values is high • Treatment requires mechanical removal (commercial harvest to hand pulling) • Girdling can be used where the risk of a standing dead tree is low, its effect on conservation will be neutral or beneficial	High
Knapweed species	• Herbicidal treatment is most effective; applications should ideally focus on the rosette in spring and fall • Foliar applications before flowers open is acceptable • Persistent pulling can be effective on small populations	High
White Sweet Clover	• Hand pulling can be successful on sandy sites, before seed set; If prior to seed set, flowering material can be left on site • Foliar herbicide should be used on larger populations • Site should be planted with larger stock after treatment	High
Burdock (Common; Giant)	• Cutting of bolting flowerheads to reduce seed bank can be successful over a number of years • Spraying with foliar herbicide if spraying in area or for large, dense infestations • Herbicide most effective	High

Silver Poplar and European Buckthorn	• Treatment (herbicidal and mechanical) should be targeted at sand barrens or when they can be treated incidentally to other management • Could be considered high priority if negatively affecting conservation values	Medium
LDD	• Use foliar treatments for large areas or to protect high conservation values. Treatments must consider potential effects to other lepidopteran species such as Mottled Duskywing. • Monitor presence during their cyclical highs using egg mass counts • Monitor defoliation including species and extent either through visual observation or remote sensing • Individual trees such as at trailheads or rest areas could be managed by egg mass removal	Medium
Garlic Mustard	• Hand pulling should continue when found • Large patches that have the potential to affect Conservation Values, regeneration or that could be spread by trail users should be chemically treated • All staff should know how to identify this species	Medium
Thistles (Bull Thistle; Canada Thistle; Nodding Thistle; Sow Thistle	• Control should focus on preventing seed production • Small populations can be hand pulled or cut; focus pulling on plant after bolting, but before flowering • Cutting must be below soil surface • Spraying rosettes can be effective	Medium
White Pine Blister Rust	• Spraying rosettes can be effective • Pruning branches where infection is further than 10cm from the stem can work; pruned material can be left on forest floor as clipped material does not pose a risk of spread (an intermediate host is required)	Low

	• Natural Resources Canada suggests treatment when infestation is on >8% of trees and where White Pine is a significant component • When infection is extensive, treatment may not be effective	
Emerald Ash Borer	• Continue treating select trees with systemic pesticide that have been treated (aesthetic, functional and conservation value) • Treatment should use pesticides that are not neonicotinoids	Low

Conservation Targets

Table 8 identifies the focal targets for natural and cultural heritage activities that are carried out during the development of a Conservation Operations Plan and to also use as guidance for that plan. There are many reasons that these could change even in the first five years of the plan, but at the time of writing these were identified. There must be flexibility in the approach to managing natural and cultural heritage to adapt to changes in the environment, culture, policies, new feature identification and forest characteristics.

Table 8. Targets for natural and cultural heritage conservation planning and activities in the Northumberland County Forest.

Focus	Target
Rare Ecosystem Conservation	• Oak Woodlands/Oak Savannah • Tallgrass Prairie • Sand Barrens • Burnley Headwaters Provincially Significant Wetland • Very mature patches of mixed-deciduous forest
Species-At-Risk	• Mottled Duskywing • Eastern Whip-poor-will • Common Nighthawk • Wood Thrush • Eastern Hog-nosed Snake • Canada Warbler • Note that not all species-at-risk are included in this list as these are the focal species for targeted management and act as umbrella species whose conservation benefits other species.
Invasive Species	• Abatement when risk to conservation values

First Nations' culturally significant features	• Requires First Nations input
Settlement sites/contemporary historical importance	• Old homestead sites • Sites related to settlement (e.g., post office) • Uncommon agricultural remnants (e.g., stone walls) • Fire Tower

2022-2025 Conservation Plan

Conservation of the BHPSW and mature patches of mixed-deciduous forest requires few management actions. Management of these areas will be achieved through a mainly passive approach as outlined in the special management zone plans. Some woodland management through timber harvesting can benefit the overall conservation approaches.

In general, the focus of Natural Heritage conservation and restoration is on the stewardship and restoration of Oak Savannah, Tallgrass Prairie and Sand Barrens. Many high-quality savannah and sand barren remnants exist in the County Forest and surrounding lands (Catling 2008) and the density and number provide a strong argument for targeting restoration and enhancement of those habitats.

The conservation, perpetuation and restoration of Oak Savannah, Tallgrass Prairie and Sand Barrens require interventions to restore and expand the current amount and extent of these habitats. These are disturbance-based habitats, typically requiring major weather or wildfire events, but exist and have existed in greater extent in the County Forest area because of climate and the harsh, dry conditions from the sandy soil Moraine soil. As disturbance-based ecosystems, there was likely some shifting of the habitats among the landscape because of land succession, but there is not enough land available to manage these rare and at-risk ecosystems as an ever-changing mosaic at a landscape-scale. Rather, to preserve and maintain these ecosystems on the landscape interventions are required for the remnants that we have. The window of opportunity to successfully use fire to encourage oak dominated forests is being continually reduced by the conversion of forest to other species (Abrams 2005).

The main restoration and conservation actions for these habitats are:

- Further investigation of the quality and extent of remnants
    - e.g., size, connectivity, indicator species present
- Removal of Invasive Species
- Prescribed burning
- Herbicidal and mechanical control of vegetation
- Planting

The schedule in Table 9 outlines a strategy for managing conservation and restoration of rare habitats from 2022 to 2025. These are also target habitats for members of the Rice Lake Plains Joint Initiative and the schedule may change if there are opportunities to gain efficiency or improved use of resources through coordination of efforts (Coarse cost estimates are provided in Appendix 1). Furthermore, the schedule may change if new information such as an area with a high potential for successful restoration is found or new science about a management practice.

Table 9. Schedule of natural heritage conservation restoration and maintenance activities for 2022-2025.

SMZ	Area (ha)	Invasive species	Planting	Understory treatment	Canopy treatment	Prescribed burn	Comment
2022							
SAV-03	12.4	MC	SH	X			• Mechanically remove woody competition • Chemically treat DSV • Plant prairie species, especially grasses
FOR-12 and FOR-11	17.5	M	SH	X	X	X	• Mechanically remove woody competition • Plant prairie/savannah vegetation
SNB-06	2.25	MC	SH				• Mechanically remove woody competition • Chemically treat DSV • Plant sand Barren species
FOR-09	22.5	M			X		
SNB-07	6.19	MC	SH		X		
SAV-02	7	MC	TSH	X	X		• Mechanically remove woody competition • Treat DSV and Buckthorn • Plant prairie species
2023							

SAV-03	12.4	MC	TSH			X	
SNB-07	6.19	MC	SH				
SNB-04	7	M		X	X		
SAV-02	7	MC	TSH	X	X		
SNB-03	1.6	MC	SH				• Control conifer regeneration • Treat locust, buckthorn, honeysuckle, DSV • Plant sand barren/prairie vegetation
FOR-12 and FOR-11	17.5		SH				• Plant prairie and open oak woodland plants
2024							
FOR-09	22.5		T			X	• Plant oaks to fill in gaps from thinning
SNB-04	7	MC	TSH	X	X		• Control regeneration and canopy • Treat locust, buckthorn, honeysuckle, DSV
SNB-02	1.7	MC	SH				• Control conifer regeneration • Treat locust, buckthorn, honeysuckle, DSV • Plant sand barren/prairie plants
FOR-15	38.4	M		X	X		•
SNB-06	2.25	MC	SH				• Control conifer and aggressive regeneration • Plant sand barren vegetation
SAV-02	7	MC	TSH	X	X		

2025							
SAV-03	12.4	MC	SH	X			
FOR-12 and FOR-11	17.5	M	SH	X		X	• Plant oak woodland species
SNB-04	7	MC	TSH	X	X		
FOR-08	27.8	M			X		
SNB-06	2.25	M, C	SH				
FOR-09	22.5	M	TSH	X	X		• Plant oak woodland species

- In the invasive species column M= Mechanical treatment and C=Chemical treatment
- In the planting column T= Tree, S=Shrub and H= Herbaceous vegetation
- X's indicate that activity is planned

Culturally Significant Features for Indigenous Peoples

Presently there, Natural Heritage Services staff do not know of any areas or features of indigenous cultural significance in the Northumberland County Forest. Understanding indigenous values and use of the NCF is needed to incorporate into management planning and conservation. As Identified in the Community section of this FMP, Northumberland County will work with Alderville First Nation to prepare a cultural heritage values document.

Agricultural and Homestead Sites

There are obvious signs of the agricultural and homestead past throughout the Forest with rock piles and hedgerows. As well, there are hidden remnants of houses, farming outbuildings, fencing and the landscaping that went with them scattered throughout the forest. In some cases, trees have been planted right up to the foundations and. In all cases, vegetation is beginning to or has encroached into the remains. There are also indications on old maps that there may have been at least one church and the Bowmanton post office in the County Forest. There are also more contemporary cultural heritage features such as the remains of the ski hill that was in the location that is now the "Scout Camp" as well as the concrete base of the Fire Tower that was on top of that hill.

The main action that will be carried out is the investigation and mapping of settlement features, either when they are discovered or when they are searched for based on old maps. Settlement features such as foundations and significant rock walls will be protected from management activities, although invasive species management other ecological restoration activities may occur around sites if they will not damage them.

Future actions that should be considered and will require additional resources and partnerships to carry out include:

- The creation of a County Forest image archive from donated photographs (e.g., scanning)
- Development of an oral history of the Forest through documenting people's memories
- Documentation and preservation of artefacts
- Interpretive signage regarding features such as rock piles and old farmstead sites

Cultural heritage conservation actions will require collaboration with interested parties such as academic institutions, historical societies, and volunteers. Greater detail on plans for cultural heritage conservation should be provided in the 2026-2030 conservation plan and a significant plan should be included in the 2031-2035 plan.

Data collection

Data collection could be considered the largest gap in managing the Northumberland County Forest. Data are needed to make most informed management decisions and to monitor changes and identify management successes. The following are high priority natural and cultural heritage assessments:

- Annual breeding bird inventories
- Nighthawk and Whip-poor-will inventories
- Mottled Duskywing and host plant (New Jersey Tea) surveys
- Permanent sample plots
- Map homestead and other agricultural and settlement history features
- Data that would support refinement and quality assessment of Oak Savannah
- Investigation of potential sand barren and oak savannahs in compartments 69, 12, and 13 among others.
- Use of old habitat data and air photos to assess the persistence of rare habitats such as sand barrens which would have a greater potential for rare species to be there.

To adequately survey and monitor the County Forest would require more resources than we currently or expect to have. Therefore, one of the

If opportunities for data collection arise, surveys of the following would be particularly beneficial:

- Botany
- Lichens
- Hydrology
- Bird productivity
- Detailed soil analysis
- Small mammals
- Moths
- Tiger Beetles

Conservation Values Monitoring

The intent of HCV monitoring is: "to evaluate the effectiveness of management strategies and prescriptions and must be tied directly to management objectives. Ideally monitoring will commence before management activities are implemented, to establish baseline conditions (Brown and Senior 2014). The scale, risk and intensity of Northumberland County Forest's operations are low and many identified conservation values are not known to occur but have been identified *just in case*.

Many currently identified conservation values do not occur in operable harvest areas but are in wetlands or open oak woodlands. More likely these areas may have activities related to ecological restoration and enhancement that are for stewardship of the value. Monitoring plans outlined in Table 10 account for financial and human resources available, particularly in identifying HCV's outside of harvest areas, finding, and monitoring difficult to survey species

such as Eastern Hog-nosed Snake, and performing recurring standardized surveys across the landscape. Furthermore, natural changes that occur because of natural processes and that negatively affect the presence or persistence of a species at risk, such as habitat succession, maturation or disturbance events, must be recognized as uncontrollable and that static habitat maintenance may be neither desired nor practical.

Based on the aforementioned factors, the main monitoring strategies include:

- Training staff, volunteers and users on conservation value identification and reporting
- Pre-harvest monitoring of Conservation Values using appropriate methods (e.g., walk-through observations, incidental sightings, and standardized bird surveys).
- Implementation of operational modification markings for identification of Conservation Values to harvest operators.

Table 10. Monitoring plan for Conservation Values.

Conservation Value	Monitoring	Comment
Acadian Flycatcher Canada Warbler Cerulean Warbler Common Nighthawk Eastern Whip-poor-will Louisiana Waterthrush Red-headed Woodpecker Wood Thrush	• Develop information on species identification for staff, volunteers and public. • Perform standardized bird surveys throughout harvest areas or in suitable habitat within or abutting operating areas during breeding season prior to operations. • Monitor adherence to operating modification markings. • Monitor adherence of tree marking and operations to prescriptions. • Assess presence in breeding season post-harvest.	• Changes in abundance (positive or negative) should be assessed and the variables causing these changes should be determined. Operational standards should be amended where negative effects are observed.
American Ginseng Autumn Coralroot Black Ash Butternut[2] Pale-bellied Frost Lichen	• Develop information on species identification for staff, volunteers and public. • GPS locations (point or polygon, whichever is most applicable) and survey abundance.	• Changes in abundance and health (positive or negative) should be assessed and the variables causing these changes should be determined.

Rare plants associated with Oak Savannah, Oak Woodlands and Sand Barrens Rare plants associated with streams, wetlands and riparian areas Rugulose Grape Fern	• Monitor adherence to operating modification markings. • Monitor adherence of tree marking and operations to prescriptions. • Assess distribution and abundance in growing season following operations. • [2]Perform health assessment on each individual.	Operational standards should be amended where negative effects are observed. • Do not include American Ginseng on any publicly available maps
Blanding's Turtle Eastern Hog-nosed Snake Eastern Ribbon Snake Milksnake Snapping Turtle Western Chorus Frog	• Develop information on species identification for staff, volunteers and public. • Very difficult to monitor species. • Visual searches for individuals or evidence throughout all activities within stands slated for operations during this 5-year plan. • Visual searches by all staff should be always taking place.	• Changes in abundance (positive or negative) should be assessed (given that actual counts are difficult) and the variables causing these changes should be determined. Operational standards should be amended where negative effects are observed. • Opportunities for monitoring and coordination with academic/non-government organizations should be sought and fostered. • Funding for monitored should be sought. • Do not include all species on any

		publicly available maps
Black Purseweb Spider Dragonflies and Damselflies of Conservation Concern Ghost Tiger Beetle Monarch Mottled Duskywing Northern Barrens Tiger Beetle Rusty-patched Bumble Bee Sleepy Duskywing West Virginia White	• Develop information on species identification for staff, volunteers and public. • GPS locations (point or polygon, whichever is most applicable) and survey abundance and host plant abundance[1]. • Monitor adherence to operating modification markings. • Monitor adherence of tree marking and operations to prescriptions. • Perform visual searches for individuals in the year following harvest operations within or abutting suitable habitat. • Post-harvest monitoring to assess increases in invasive species that may impact habitat or food source for 2-years following harvest within or abutting the conservation value.	• Changes in abundance (positive or negative) of individuals or host plants should be assessed and the variables causing these changes should be determined. Operational standards should be amended where negative effects are observed. • Do not include all species on any publicly available maps
Black Oak Woodland, Oak Savannah Sand Barren Provincially Significant Wetland Ponds	• Monitor adherence to operating modification markings. • Monitor adherence of tree marking and operations to prescriptions. • GPS feature boundaries. • Post-harvest monitoring to assess increases in invasive species for 3-years following harvest within or abutting the conservation value. • Post-harvest monitoring after two years, but before 5 years to assess regeneration and implement any	• Assess causal factors for any non-compliance related to operational standards. Amend standards to include these reasons as threats. As well, list any restoration activities needed following operations under the operational standards.

	interventions to promote oak and shrub regeneration.	
Black Bear Den Nests/communal roosts in cavities (American Kestrel, Barred Owl, Eastern Screech Owl, Great horned Owl, Northern Saw-whet Owl, Chimney Swift) Stick nests; common raptors (Barred Owl, Great Horned Owl, Long-eared Owl, Common Raven, Red-tailed Hawk, Broad-winged Hawk, Cooper's Hawk, Sharp-shinned Hawk, Merlin) Stick nests; uncommon raptors (Red-shouldered Hawk, Northern Goshawk) Mammal dens	• Develop information on species identification for staff and volunteers. • Very difficult to monitor. • Visual searches for individuals or evidence throughout all activities within stands slated for operations during this 5-year plan. • Visual searches should be taking place at all times by all staff.	• Do not include locations on any publicly available maps. • Changes in abundance (positive or negative) should be assessed (given that actual counts are difficult) and the variables causing these changes should be determined. Operational standards should be amended where negative effects are observed.
Conservation Reserves	• Ensure screening is performed during harvest prescription preparation for stands abutting conservation reserves. • Ensure that operations abutting these sites are discussed with conservation partners that own/manage the land.	• Assess causal factors for any non-compliance related to operational standards. Amend standards to include these reasons as threats. As well, list any restoration activities needed

		following operations under the operational standards.
Historic homesteads and other buildings	• Monitor adherence to operating modification markings. • Monitor adherence of tree marking and operations to prescriptions. • GPS feature boundaries.	• Do not include locations on any publicly available maps. • Assess causal factors for any non-compliance related to operational standards. Amend standards to include these reasons as threats. As well, list any restoration activities needed following operations under the operational standards.

Habitat

By the end of 2022, a habitat data collection protocol for the Northumberland County Forest shall be prepared. This data collection protocol will be developed in coordination with silvicultural operations and the data collection needed to support it. Depending on the inventory methodology there may be different protocols for forest, prairie and sand barren or the same protocol may be used. The complexity of the protocol(s) must consider the efficiency of performing them. The protocol should consider the use of the data for other means such as wildlife habitat modeling.

Wildlife and Targeted Vegetation Inventories

By the end of 2023, an inventory plan will be created that includes protocols for general wildlife monitoring as well as targeted rare and species-at-risk inventories and monitoring. The reason for the collection of these data should not only be considered for restoration or preservation activities, but also monitoring before and after management activities such as timber harvesting and trail construction. These protocols, beyond typical methodology and

timing, will include strategies for performing them include the use of volunteers and harvesting of citizen science data.

Modeling wildlife habitat

A wildlife modeling exercise should be performed using forest data. It is recommended that the exercise use Ecological Land Classification ecosite and significant wildlife habitat guidance where appropriate. For some species more detailed assessments could be performed where data permit. Performance of this mapping should be considered in the collection of data and could be used for targeted conservation, restoration, and monitoring activities. These data would also support other management activities by providing a primary assessment of potential impacts of activities. Wildlife habitat mapping can also be used to predict changes based on desired future conditions. Wildlife Habitat modeling will be completed by 2024.

Conservation Planning

To strengthen the coordinated approach to natural areas management, the next 5-year operational plan will be a combined conservation, silviculture, and recreation plan and will follow the operating periods shown in Table 11. This plan will be based on the desired future conditions and will provide 5-years of guidance for natural and cultural heritage conservation operations. The 5-year conservation operations plan will be complete in 2025 to be implemented in 2026 and will replace this section of the FMP. Its timing will then conform to other 5-year schedules.

Table 11. Future 5-year operational planning terms and the year that they must be prepared.

Preparation Year	Operating period
2025	2026-2030
2030	2031-2035
2035	2036-2040
2039	2040-2044

Recreation

The intent for managing the County Forest's recreational trails is to ensure that the trails are safe, enjoyable and require minimal resources for their maintenance. This Plan outlines many tasks that will be carried out based on the current state of the recreational trail program. Recreational trail management has many influences including:

- User volumes
- Recreational pursuits and desires
- Environmental conditions (e.g., climate change)
- Ecological factors
- Resources (e.g., funding)
- Risk management
- Legislation (e.g., AODA)
- Local tourism initiatives

As these influences change, the guidelines and actions in this Plan will need to adapt.

The main guiding documents for recreation in the Northumberland County Forest is the Trails Network Study, the Northumberland County Forest Recreational Trails Standard and the Northumberland County Forest Signage Standard. The Trails Network Study guided the current designated trails program and recreation by-law and was amended in 2013.

Health Benefits of Recreation

In 2012, the median age of Northumberland County was 48.3 years of age, 7.9 years older than the provincial median. By 2034, it is projected that the population aged 65 and up in Northumberland County will increase by 94%, while people between 15 and 64 will decrease (between 15% and 20%). The Central East LHIN found comparatively high chronic disease such as diabetes, hypertension, heart disease and risk factors such as weight and physical inactivity in our district and the Health Unit has identified a consistent need for increased access to recreation for low income families in rural areas as well as more varied recreation in rural areas.

Ecological Effects of Recreational Trails

Understanding of the ecological effects of recreation, positive or negative, is limited. The effects on abiotic components (e.g., water, soil, air) are much clearer and understood than the biotic effects. Furthermore, biotic effects are not consistent among wildlife, some species become habituated, some avoid and some are even attracted to recreation (Whittaker and Knight 1998). As well, the recreation is the proximate cause while the ultimate cause may be less clear or may be related to one type of use or location. Effects from recreational use can include:

- Wildlife disturbance

    - Mortality from consumptive uses
    - Mortality from collision
    - Mortality from dogs
    - Effects on habits such as avoidance or attraction as well as altered habits
    - Stress (perceived predation threat)
    - Effects of noise and vibration
- Spread of invasive species
- Trampling/grazing of vegetation
- Toxic effects of pollution
- Dust

Given the lack of knowledge about the ecological effects of recreation and, by extension, the lack of known management practices beyond the typical avoidance of sensitive features, Natural Heritage Service staff must keep aware of new science and support/promote monitoring and assessing the effects of recreation on the Forest's ecosystems.

Where ecological impacts by recreation may be foreseeable, management actions should be implemented. These may include:

- Temporary or Permanent Trail Closure
    - A trail may be temporarily closed in response to a non-permanent feature such as a nesting raptor or species-at-risk
    - Permanent closure/re-routing of trail may be needed where there are no other mitigation options available.

Mitigation

    - Effects may be mitigated through the installation of permanent or temporary barriers
- Advertising
    - A promising factor in advertising is that users are more likely to alter their behaviour for convincing ecological rationales compared to social rationales (Marion and Reid 2007).
    - Interpretive signage to provide overall education or site-specific concerns
    - Regulatory or warning signage
    - Radio, print or social media ad campaigns

Some immediate concerns for negative environmental effects are:

- Recreational use of sand barren off the trail on the Green B Loop
- Recreational use of "sand pits" in compartments 44 and 48

- The effects of noise and associated vibration from Off-road Vehicles

Regulations and Enforcement

Enforcement of Forest regulations is important for:

- Ensuring the physical sustainability of trails
- Ensuring social sustainability of trails
- Managing liability

By-Laws

There are two County Forest By-Laws:

- By-Law 31-09; A By-Law to prohibit camping and alcoholic consumption in the Northumberland County Forest
- By-Law 21-10; A By-Law to govern the use of lands known as the Northumberland County Forest

By 2022, these By-Laws should be reviewed/revised to:

- consolidate the By-Laws and any Council resolutions that have not been appropriately consolidated
- reflect any changes to forest management
- amend the designated trails so that they are not referred to in a static map, but to be reflected by trail type and posted signage.
- review the set fines approved by the province

Following review/revision of the by-laws, reviews of the by-law and set fines should occur every five years at a minimum.

Policies

Current policies should not be considered static and may be amended to accommodate and aid changes and should occur when needed.

Current Policies include:

- Tree Risk Management
- Recreational Trail Signage Standards
- Recreational Trail Standards

Risk Management

Risk management is “a process of protecting you and your organization by minimizing accidents and their adverse effects (Wyseman 2014).” Eliminating the risk or the hazard is not

the intent and is not practical in forest and recreational trail management. The intent is to do what is reasonable in caring for the land and the recreational user to manage liability. To fully eliminate risk would mean eliminating recreational opportunities and therefore risk tolerance must be balanced with providing recreational opportunities for residents.

An element of risk is often part of the motivation for pursuing outdoor recreation activities. The challenge of this management plan is to balance the benefits of outdoor recreation while minimizing the inherent exposure to risk. The County can mitigate and manage risk by using best practices in trail design, standards, repairs, and maintenance as well as installing proper signage and performing and documenting assessments and maintenance.

The County of Northumberland has a duty to adopt reasonable standards, and to ensure that they are being applied on the trail network. Under the Occupier's Liability Act (R.S.O. 1990), the occupier is required to "take such care as, in all the circumstances of the case, is reasonable to see that persons entering the premises, and the property brought on the premises by those person are reasonably safe while on the premises". When entry "is for the purpose of recreational activity and no fee is paid for the entry or activity", a modified duty for the occupier is applied. The person entering the property is considered to have willingly assumed the risks and therefore occupier must not "create a danger with the deliberate intent of doing harm...and not to act with reckless disregard...".

Negligence occurs when duty of care is owed (i.e., Occupier's Liability Act), the standard of care for this duty is breached and this breach causes or contributes to harm or loss. As the County owes a modified duty of care, standards that are reasonable, recognizing the willing assumption of risks by the user and resources available to Natural Heritage Services, and that are set in policy will define that duty.

To reduce danger and to not act with reckless disregard, the County will:

- Perform hazard assessments
- Maintain standards for signage, trails, hazards, and inspections
- Install risk management signage
- Remove hazards that are unusual or hidden
    - Where the hazard cannot be removed or removing it would negatively impact the recreational user's experience, warning signage will be installed.

The standards and policies that are developed and implemented must be reasonable given our resources (i.e., staff). Northumberland County must also recognize the value for user safety and liability management in implementing these policies.

Risk Assessment

The following is a risk assessment for the County Forest (Table 12). The risks are dominantly associated with recreational use and therefore have been included in this section (with wildfire being a more general risk). This risk assessment was developed using the following risk matrix (Figure 16) and was based on the past known or expected occurrences.

Likelihood				
	Probable (Occurs regularly)	Medium	High	High
	Possible (A chance that it will occur; i.e., has occurred in the past or reasonable evidence to suggest it will)	Low	Medium	High
	Unlikely (Not known to occur or occurs very rarely)	Low	Low	High
		Minor (Minimal harm or loss)	Moderate (Significant harm or loss)	Serious (Catastrophic harm or loss)
		Consequence		

Figure 16. Risk matrix for determining risk rank for recreational activities in the Northumberland County Forest.

Table 12. Risk assessment for common hazards in the Northumberland County Forest.

Hazard	Likelihood	Consequence (Effect)	Risk Rank	Management Actions	Discussion
Threatening wildlife (e.g., bears)	Unlikely	Serious	High	• Warn of bears in area, especially when bears acting in a threatening manner are reported. • Warn of other wildlife when some type of threatening action occurs. • Highly threatening incidents will be reported to MNRF.	• The Northumberland County Forest is a wild area and bears are common throughout this region. Reports of "threatening" bears must also be assessed in terms of the actions of the user as they may have been the cause of the situation (examples: dogs of leash, running from bear, food). • The threat of wildlife, especially bears, is also affected by the actions of neighbouring landowners which is out of the County's control. If a bear has become habituated to humans through feeding, whether inadvertent such as compost piles or purposeful such as

					hunters baiting bears, they become more dangerous as they are associating humans with food.
Hazard Trees	Unlikely	Serious	High	• Continue effecting Forest Tree Risk Management Policy	
Forest Operations	Unlikely	Serious	High	• Perform regular site inspections and address concerns with operator • Install risk management signage at access points to main operating areas and at trailheads. • Close trails in the area of forest operations if necessary. • Contract restrictions that prohibit operations	• Forest operations are a regular, nearly annual, occurrence in the County Forest. Users are warned of the operations and because operations are only near trails for short periods, the risk of exposure is low. • Forest users are warned of the operations the potential risks and closing off areas cannot be reasonably done. • Forest users must take personal responsibility in recognizing the

				on weekends and statutory holidays. Restrictions may be removed when operations are in an area where no approved recreational trails exist.	obvious and not hidden risk of approaching operating machinery.
Wildfire	Unlikely	Serious	High	• Develop and implement a fuel management strategy. • Participate in wildfire control exercises. • Develop an educational program for risk reduction neighbouring landowners (e.g., FireSmart program) • Provide authority to Natural Heritage Services staff in communication	• Possible causes of wildfire are: ○ Lightning strike ○ Campfires/bonfires on County Forest lands and on neighbouring properties ○ Discarded cigarettes within the County Forest as well as public highways ○ Heat/sparks from equipment • A known problem for wildfire control is a lack of water access close to the County Forest.

				with Alnwick/Haldimand Fire Chief to manage forest use during high risk periods. • Ensure all Natural Heritage Service vehicles are equipped with fire extinguishers. • Maintain forest access roads for fire access (develop and implement forest road maintenance strategy).	
Poison Ivy	Probable	Minor	Medium	• Develop an abatement strategy to use annual herbicidal treatment for some areas of poison ivy within available resource levels.	• Poison ivy is widespread throughout the County Forest and its populations spread through the movement of seeds by wildlife as well as root sprouting. • Eradication is not an option and populations that are abated may

					return to an area. It will be a continuous task. • Users must take responsibility for their exposure at control once contacted. The control can be quite simple through washing with soap and water. • Users must be made aware of its presence by the County at trailhead locations.
Other dangerous noxious weeds	Unlikely	Moderate	Low	• Abatement as soon as possible when observed.	
Lyme Disease/Black-legged Ticks	Unlikely	Moderate	Low	• There is nothing that the County can do to manage this situation. • If many reports begin surfacing of black-legged ticks, or if a case of Lyme disease is reported from the County	• Communication, advertising, and recommendations for dealing with Lyme disease are the responsibilities of the Province and the local health unit. • Users that venture off trail or that have dogs

				Forest or immediate surrounding area, then Forest users will be notified through trailhead postings and radio advertisements. • Manage vegetation along narrow trails (clearing widths). Wider trails have less risk of exposure as there would be little or no contact with surrounding vegetation.	that are off-leash or walk off the managed trail corridor are exposing themselves to greater risk. The County is providing a managed trail corridor with managed vegetation and this reduces risk. Narrow trails such as single-track will continue to have a slightly higher risk.
Lost persons	Unlikely	Moderate	Low	• Maintain emergency location numbers. • Maintain trail signage. • Provide maps	• Lost persons will be dealt with by first responders. • There are few areas in the forest where a lost person would not encounter a trail. Most trails lead to residences or busy roads.

				• Warn forest users of potential lack of cell phone signal.	
Slip and Fall	Possible	Minor	Low	• Plow and Sand Parking Lot • Sanding/salting around outhouses and trailhead signs • Warning of potential for slipping provided at trailhead • Warning signs posted when extraordinary slippery conditions exist	• Managing slippery conditions on trails during winter is neither reasonable nor should be expected by forest users. Users should expect to encounter slippery conditions. • Managing slippery conditions on trails could impact the user's experience and have negative environmental consequences.
General Recreational Injury	Unlikely	Moderate	Low	• Warning signage at trailhead. • Permitted use signage indicates trail appropriateness and communicates other users that	• As there are no unusual structures constructed on the trails, users of the Forest are willingly assuming risks and the County must ensure it does not willfully create a hazard. Users are responsible for knowing

				may be encountered. • Trail and signage standards are developed, followed and reasonably communicated • Trails and signage are inspected regularly • Develop and implement a trail condition and mitigation strategy • Regular patrolling and enforcement of regulations (Forest staff, volunteers, Ontario Provincial Police)	their abilities and acting with care and control. • The County cannot control the actions of a Forest User in their personal care and control during trail use. • Installed hazards such as communication tower, benches, fire tower cement blocks should be assessed for marking or protection needs. • Sand Pit areas that are not trail uses and do not meet trail standards should be closed to recreational use.
Horse control / conflict	Unlikely	Moderate	Low	• Maintain permitted use signage to indicate appropriateness of trails as well as communicate	• The County cannot control the actions of a Forest User in their personal care and control during trail use. This is further exacerbated by the care

				• Maintain etiquette signage.	and control of a horse and its rider.
Hunting accident	Unlikely	Serious	Low	• Promote all users wearing blaze orange during hunting seasons • Post warning signage at trailheads during hunting seasons • Maintain closure of motorized trails on November 1 to reduce the number of users in the hunting area	• The amount of hunting has been limited by County Forest by-laws. • Additional discharge regulations have been implemented (distance from trail, discharge in direction of trail). • The types of hunting permitted are generally sit and wait types of hunting which helps ensure that hunters can set up further than 50m from a trail.
Stinging insects	Unlikely	Moderate	Low	• Where it is possible to control stinging insects at trailheads or picnic areas actions will be taken (i.e., nest destruction). • If a nest is found along a trail and is reported to be	• Individual stinging insects, such as those visiting waste receptacles cannot be reasonably controlled. • Control requires that a nest can be identified.

				causing problems, staff will take reasonable measures to control it.	
Other uncontrollable risks (biting insects, weather)	N/A	N/A	N/A	N/A	• The risk of exposure to weather (heat, cold, lightning, rain) and insects such as stinging insects cannot be controlled by Northumberland County. • These are the inherent risks of being outdoors and exist regardless of location. These are considered a risk that is accepted by the Forest user. • It is not reasonable for the County to attempt to mitigate these risks.
General Comments	• Likelihood is based on present conditions and having a dangerous contact with the hazard (e.g., mauling by bear not just sighting; strike by hazard tree, not just potential existence). The probability can change over time.				

	• Consequence is based on the most probable consequence. Most, if not all, of these hazards have a potential range of consequences. • Natural spaces have inherent risks and hazards and people choosing to take part in recreational activities are willingly accepting of the hazards/risk associated with the activity. • Northumberland County does not purposefully create or install obstacles for recreational trails. As such users are encountering natural and typical obstacles within acceptable thresholds that are outlined in the trail standards. Any user accessing the trails is willingly accepting the risks associated with those standards. • Risk management measures can negatively affect the desired experience for recreational users or could have negative environmental consequences in the Northumberland County Forest. Therefore, there must be a balance of risk mitigation/management actions and effects on user experience in a natural area/setting as well as negative environmental effects. • Wildfire is not completely related to recreation or people using the Forest and this is reflected later in the Management Plan under Fire Management.

Poison Ivy Abatement

The following will be used to prioritize the locations for poison ivy herbicidal treatment to reduce risk of trail user contact (Table 13). Trails have been categorized based on the potential for users to avoid the plants on their own.

Table 13. Trail-based prioritization for control of poison ivy.

Category	General Name	Priority
ST-1	Non-motorized Single-track	High
ST-2	Non-motorized Single-track (Pedestrian)	High
ST-3	Non-motorized Single-track (All uses)	High
ST-3a	Non-motorized Single-track (Beagle Club Trails)	Highest
ST-4	Motorized Single-track	Medium
UT-1	Universal Trail (Pedestrian)	Highest
UT-2	Universal Trail (all)	Highest
DT-1	Non-motorized Double-track	Medium
DT-1a	Non-motorized Double-track	Medium
DT-2	Motorized Double-track	Low
FR-1	Forest Roads	Low
FR-2	Emergency Access Roads (maintenance)	Low

Prioritization will be cross-referenced with the following thresholds for treatment based on amount and distribution along trail (Figure 17).

	One side of trail	Both sides of trail	On trail
Very sparse -intermittent plants; clusters of a few plants with distance (>10cm) between them-	Low	Low	Medium
Sparse – plants not forming a dense cluster (e.g., ground, or non-poison ivy vegetation is visible throughout cluster)	Low	Medium	High
Dense – other vegetation is very sparse among poison ivy and ground is generally not visible.	Medium	High	High

Figure 17. Matrix for assessing priority of poison ivy control based on density and presence.

To use these prioritizations, first target the higher priority trails and then schedule the work based on higher priority areas along those trails. The approach will not be to spot spray each area in sequence of priority but look for patterns in the distribution of priorities where

efficiency would be gained. This will result in some areas of lower priority being sprayed before all areas of higher priority but provides better resource allocation.

Recreational Concerns

Management activities and strategies outlined in this management plan address some recreational concerns. Despite any solutions being presented here, more research and community engagement into developing priorities, assessing relationships, evaluating cause and effect, and identifying corrective actions is needed for concerns listed in Table 14. These recreational concerns are generally long-term engrained activities which may no longer be socially acceptable, or they present a greater risk than is acceptable to the County. Within the first 5-years of the plan, the County should consult with the Forest Advisory Committees as well as the public to asset the root causes of these concerns and to develop solutions.

Table 14. List of recreational concerns that require solutions.

Recreational concern
Off-road vehicle use in sand pits as they are not trails and the Centreton sand pit has blind entrances/exits into it.
Potential for collision between off-road vehicle users and on-road vehicles (trucks/cars) on forest roads.
Dangerous trail conditions (visibility, erosion) in hydro corridor. This was made worse by Ontario Hydro's 2016 clearing as they did not leave any vegetation which opened it up even more.
Firearm target practice in forest, especially in hydro corridor and sand pits.
Trail degradation by off-road vehicle use during closed seasons.
Use of sand pits for parties/bonfires.
Use of cross-country ski trails by hikers and snowshoers during the skiing-only period.
Use of single-track trails by horseback riders.
Use of non-motorized trails by motorized users, especially Woodland trails.
Dog waste on trails and at trailheads.
Horse waste on trails.
Trail use by all users when trails are muddy and soft.
Damage to parking areas by off-road vehicles doing "doughnuts".
Poor trail user etiquette (e.g., mountain bikes overtaking hikers without warning).
Enforcement of off-leash dog regulation.

Trail and Access Infrastructure

The focus of trail infrastructure management will be to:

- Manage safety through closure, repair, signage and re-routing
- Managing use and regulation through signage and experience
- Managing emergency access through repair and re-routing

Activities will be based on presently identified sites of concern and inspection and assessment protocols defined in the Trail Standards and Inspection policy. It is expected that more concerns will be identified through inspection and assessment outlined in the trail standards, but it is also prudent to identify known concerns in this document.

Northumberland County recognizes that users do not desire "tame" experiences and will always aim to balance that with the need for well-designed trails that manage the risk of injury, respect the obligation of duty of care to the user as well as seek to have sustainable/maintainable infrastructure. Furthermore, staff recognize the sentimental attachment that some forest users have to the existing trails and seek to make the fewest changes necessary to manage liability and long-term costs.

Infrastructure maintenance and development should be managed using a broad 20-year infrastructure management strategy with more detailed 5-year operational plans. This strategy should include maintenance of, but not limited to:

- Trails including trailbed and corridor maintenance, construction, and decommissioning/rehabilitation
- Signage
- Trailheads
- Parking areas
- Picnic areas
- Rest areas

A strategy such as this should be based on the amount of risk some needs pose as well as the cost of carrying out the work. The intent is to spread out costs as evenly as possible over time to ensure consistent and predictable budgets while making repairs or alterations to high-risk areas within a reasonable time-period. The long-term lack of repairs has resulted in a large backlog that is not feasible to clear in the short-term.

Recreational Trails

Trail Maintenance

During the development of the 5-year recreation infrastructure operations plan, the focus of trail maintenance should be to repair areas of trail that require significant ongoing/recurring maintenance.

Trail Closures

Trail closures will help to offset infrastructure development to help minimize the overall trail footprint in the Forest and to remove trail sections that are poorly designed and receive little use. Proposed trail closures (Table 15) are mostly in the Beagle Club trails area although one short trail section is a multi-use motorized trail that leads into the hydro corridor off County property. Trail closures would involve some stopping up with brush and planting with shrubs and trees. These are generally lower priority, and the costs of planting will come later. Where

stopping up with brush is desired, that can be done by staff when time allows. The planting can then be re-assessed as natural growth may be enough.

Table 15. Proposed trail decommissioning.

Trail	**Problem**
Unnamed section from Busch Road to Green A/B split.	Steep and prone to erosion; very little use.
Section of Thomas Trail from Wilson to Busch Rd.	Steep and prone to erosion; very little use.
Thomas from Ryerson to Wilson.	Steep in places and not used.
Unnamed trail linking Ryerson and Thomas.	Not used.
Unnamed trail from Ruffed Grouse into hydro corridor and connecting back to Red Pine.	Leads to unsafe trails in hydro corridor. Unnecessary linkage.
Sections of motorized multi-use trail that cross Beavermeadow Road (Kinglet Loop area) (31i; 31j)	Crossings have very low visibility because of crossing at 90° corners of road. New trail to be built on north side of Beavermeadow to facilitate loop without crossing.

Sand Pit Closures

The Centreton and White oak Road sand pits are not considered part of the recreational trail infrastructure / assets and require closure in response to multiple safety concerns including partying, non-trail-based motorized use and non-hunting firearms use. The following table outlines the current concerns, possible closure methods and estimated costs (Table 16).

Table 16. Description of problems/concerns for recreational use of sand pits and commentary on their decommissioning.

Location	**Problem**	**Closure Method**
White Oak Trail Sand Pit	○ Current concerns include high-risk use by off-road vehicles, use for firearm target practice and use for parties/bonfires	During logging operations, debris was piled in strategic areas to limit access. Continue monitoring the results of this practice and use larger physical barriers such as boulders and rock piles in strategic locations.

Centreton Sand Pit	○ Current concerns include high-risk use by off-road vehicles, use for firearm target practice and use for parties/bonfires	Planning required to determine the best solution. Using information collected from blocking the White Oak Trail Sand Pit a plan should be developed for implementation by 2026. Options that currently exist are to fill areas with boulders, rocks and other forest debris to stop disturbance and/or move the trail that runs along the south side to limit access.

Access Roads

Northumberland County Forest's access roads serve as emergency access routes, timber extraction routes and recreational trails, therefore the attempt is to balance ease of access for emergency, durability and access for logging machinery and trucks and user safety and experience.

In 2013, a significant amount of repair and re-construction was performed on the forest access roads to improve the durability and maintainability as well as accessibility for emergency response of the forest access roads. A consultant, Kay and Associates, carried out site visits across the Forest and provided direction into repairs. As the main concern in the resiliency of forest access roads given that all Northumberland County Forest roads are sand is water management, particularly:

- Ensuring drainage or infiltration or the water on the trail surface
- Reducing the distance and velocity of water traveling on trails

To perform these repairs, most of the focus is on:

- Addition of aggregate for increase height and hardness of the trailbed
- Slope reduction
- Managing cross-slopes and drainage ditches/swales
- Armouring slopes where water must drain down or across
- Re-routing sections of trail where the layout does not allow for permanently resilient trails and where a reasonable alternative exists.

Repairs or upgrades will reduce annual maintenance costs, potential for access obstacles to emergency response, potential for user injury and improved conditions for recreational users.

The following outlines a 4-year access road improvement strategy (Table 17) but does not include trail repairs on smaller single-track or double-track trails where the work is generally

performed in house by the trail crew, by volunteers or in collaboration with Sir Sandford Fleming College.

The strategy should not be considered rigid in timing, year of completion for activities within this period should be adaptable to changes in cost and conditions and to complement other management activities (estimated costs are shown in Appendix 2). Furthermore, this plan requires that Natural Heritage Service staff carry out a large portion of the work. As these works are highly variable by site and not highly engineered with easily estimated costing, the estimates were based on a small number of previous works in the County Forest and these should be refined as more knowledge and information is gained. As well, the schedule can be amended to be shorter or longer depending on shifts in liability, funding, material costs and the County's desired standard of care.

Table 17. Strategy for forest access road maintenance for 2022-2025.

Trail	Section	Requirement	Method
2022			
Morris	16A	Armour and improve visibility at hill	Bulldozing and aggregate
Morris	16B	Armour and improve visibility at hill	Bulldozing and aggregate
Morris	16C	Armour and improve visibility at hill	Bulldozing and aggregate
Morris	16C	Armour and improve visibility at hill	Bulldozing and aggregate
Minaker	7A	Armour and manage water	Bulldozing and aggregate
2023			
Dunbar	25N	Fill low area and raise road crossing; decommission trail on south side	Aggregate
Dunbar	25O	Fill and armour at road crossing	Aggregate
Dunbar	25F	Improve visibility, reduce slope and widen	Bulldozing
Dunbar	25K	Fill low spots, ditching, and armour corner	Bulldozing and aggregate
Dunbar	25L	Ditching, re-work (cross-slope), and armour	Bulldozing and aggregate

Dunbar	25L	Ditching, re-work (cross-slope), and armour	Bulldozing and aggregate
Dunbar	25L	Ditching, re-work (cross-slope), and armour	Bulldozing and aggregate
2024			
Dunbar	25H	Ditching, re-work (cross-slope), and armour	Bulldozing and aggregate
Dunbar	25P	Ditching, re-work (cross-slope), and armour	Bulldozing and aggregate
Dunbar	25M	Fill low area and decommission trail on south side	Aggregate
Beagle Club	36B	Raise approach to parking area	Aggregate
Beagle Club	36C	Raise approach to parking area	Aggregate
White Oak	17b	Widen, reduce and repair slopes. Consider moving trail to north to follow contour and maintain elevation.	Bulldozing and excavation
2025			
Largetooth	18C	At corners, widen to improve visibility and armour	Bulldozing and aggregate
Huckleberry	22A	Fill low spot and armour	Bulldozing and aggregate
Huckleberry	22F	Raise and ditch	Bulldozing and aggregate
Huckleberry	22G	Fill, ditch, and armour	Bulldozing and aggregate
Pinnacle Hill	23A	Fill, ditch, and armour	Bulldozing and aggregate

Road allowance ownership

Some of the access roads and trails referred to in this table are owned by the Township of Alnwick/Haldimand. As a result, the benefits of resources put into them may not be fully realized by the County over the long-term and although the investment is not precarious, some of the damage that is done to the infrastructure cannot easily be managed by the County. Ideally, the County should seek transfer of road allowances that are bound by County Forest on two sides with the addition of some stretches of road allowance and unmaintained roads from

the municipality to better protect those investments and continue to provide high-quality and safe recreational experiences.

New Trail Development

Trail development should focus on repairs and re-routes of current infrastructure. Table 18 provides recommendations for new trail development and are prioritized based on risk and community need/desire. The current network was determined based on extensive consultation and reduced the footprint and impact of recreation on the Forest's natural heritage. New trails beyond those created for repairs and re-routes should be for opportunities to improve accessibility, access to scenic vistas, provision of rest areas and to solve major user conflicts. Most new trail developments outlined could be done by staff and volunteers and require little material and cost beyond machinery rentals, but some would require some hiring of a contractor. These should be scheduled within regular annual planning where resources permit.

Table 18. Proposed new trail developments.

Location	Description	Rationale	Priority
Woodland Trails	Additional trail to form 2,5, and 12 km loops (as well as a 15km if possible. These would build off the existing trails. Trails should provide similar experience to Beagle Club trails. Approximate amount of new trail: 8km that can be built in different phases.	The goal is to reduce pressure on the Beagle Club trails by providing similar and greater opportunities elsewhere. This is particularly important in winter to create a more attractive reason for non-skiers to use an alternate area. This would also provide an opportunity to re-route some of the poor layout on the Sweet Fern trail and could incorporate some of the existing access trails in compartment 73.	High
Ridge Road	Connector between Ridge Road and either trails along County Road 45 (to south) or to safer crossing location at Beagle Club Road (to north); the best	Crossing at Beagle Club Road is very dangerous with no visibility for users crossing or northbound vehicles.	

	layout requires further investigation. Approximate amount of new trail: 300m (south route), or 400m (north route)		
Oak Ridges Trail at Morris Road	Create a trail to loop back to Morris Road parking lot (currently linear). Approximate amount of new trail: 1km	Increase alternate opportunities for Beagle Club trail users, especially in winter. The easiest possibility is to come back along snowmobile trail, but this increases risk to users and is not the best, but simpler solution. Multiple cases of users becoming lost in trying to return from this trail have been reported.	
Trail linking Huckleberry Road and Dunbar at East End	Develop a trail (including using a portion of the old trail) to link the roads. The current trail through this area is closed but is being used regularly by ATVs that drive off-trail around “blow out” area.	This trail would improve forest management access to these Forest stands.	
Woodland	Stacked loop universal trail developed to the north of parking area and Black Oak/Sweet Fern Trail.	Provides an additional trailhead with universal trails. These trails would traverse an area with greater topography than other universal trails, providing a different trail experience.	
Beagle Club	Develop short spurs from current Beagle Club trails to small “lookouts” as rest	Expand the current trail network’s experience from more exercise-	

	and vista appreciation areas.	based to include more nature appreciation.	
Woodland	Connector between Purple Finch and Black Oak/Sweet Fern trail.	Provides an alternative route to large, open sandy area that exists on the Black Oak/Sweet Fern trail section at the north.	
Woodland	Re-route the “chute”	Current trail goes directly downhill and is unsustainable with poor water management.	
Lookout Mountain	Develop an additional section of multi-use motorized trail extending southeastward.	This would allow for the very popular, current trail to be made into a one-way trail thereby reducing liability and pressure.	

Parking Areas

There are 5 maintained parking areas in the County Forest and most appear to provide suitable amounts of parking. Parking only seems lacking at the Beagle Club parking lot, especially during special events, peak use periods such as thanksgiving and when a horse trailer parks there. The following are suggested parking lot improvements (Table 19). As these improvements are not critical, but beneficial, no timeline has been provided and opportunities to perform the work when resources are available should be capitalized on.

Table 19. Recommended parking lot improvements.

Lot	**Improvement**	**Comments**
Beagle Club, Carstairs, Morris, Woodland	Surface treatment to manage potholes within lot and where it meets the hard surface roads as well as damage caused by off-road vehicles doing “doughnuts”.	Not required in horse trailer area of Woodland Rd.

Beagle Club	Additional parking spaces through removal of berm on southeast end and possibly addition of fill on northeast end.	Required, especially during events, holidays and when cross-country ski conditions are good.
Beagle Club	Designation and signage as prohibited area for horse trailer parking.	There is too much traffic to safely unload horses here and waste and trailer cleanout not appropriate at this location. Also reduces pressure on Beagle Club trails.
Woodland	Eliminate bulb in parking lot and replace with grass and shade trees. Eliminate extra turning area at northeast portion of horse trailer area. These are unnecessary pieces of infrastructure that result in unnecessary maintenance costs.	Development of rest area would be ideal, but current vandalism and theft precludes this possibility. Consider if these conditions improve.

Hunting

Hunting for White-tailed Deer and Wild Turkey hunting shall remain in place. The current hunting program balances risks and social concerns with the provision of reasonable opportunities to harvest wild foods. Reassessment of hunting opportunities or regulations should occur if:

- Hunting risk or hazards changes
    - significant increases in hunter numbers or activity
    - increases in unsafe activity
    - changes in permitted firearms that increase or are perceived to increase risk
- wildlife populations change
    - population increases of invasive wildlife
    - increases in wildlife impeding conservation efforts
    - declines in hunted or associated species

Off-leash dogs

One of the most contentious regulations is the need to have dogs leashed throughout the County Forest. Dog walkers are possibly the greatest number of users in the County Forest and many, if not most, do not leash their dog or do so only at the trailhead or when they encounter

staff. Most users of the County Forest are there to experience the freedom that is offered by being on trails and not in town. Some users, such as horseback riders and cyclists that bring their dogs with them cannot reasonably leash their dogs.

Some concerns with off-leash dogs are:

- Waste on trails
    - which requires responsible dog owners regardless of leash regulations, although they would be more aware of the dog defecating when they are on leash
- Safety of other users
    - Includes perceived safety as some users may be afraid of dogs even if they do not pose a risk
    - Dog may not be experienced with horses and an encounter with a horse could cause harm to the rider
- Disturbance of wildlife
    - Many dogs will pursue wildlife and even if they do not catch the animal, they are causing a disturbance and stress to the animal.
    - Dogs that do not pursue the animal may still be causing a disturbance through the animal's perceived predation risk, so their presence off-trail may be increasing the trail's area of influence
- Safety of owner
    - Negative interactions with bears have been shown to increase
- Safety of dog
    - Dog could potentially interact with dangerous wildlife such as porcupines
    - Other users that are afraid or are threatened by a dog (real or perceived) may act in a way that harms or puts the dog at risk of harm.
    - A dog without experience interacting with horses may act in a way that results in the horse kicking it.

To manage the conflicts, liability and environmental disturbance of off-leash dogs an off-leash strategy should be developed. Options for this strategy could include, but are not limited to:

- Maintain the status quo
- A designated subset of off-leash trails, or
- An off-leash dog area, or
- Continued use of all trails by off-leash dogs, or
- No permitted use by off-leash dogs.

Through consultation with the community and development of alternative options as well as consideration of risk/liability a strategy/solution proposal will be prepared by 2024.

Special Events

In 2013, County Council approved the establishment of a County Forest special event permit that is administered by the Forest Manager. In 2016, a fee that is waived for non-profit organizations was established for a special event permit within the County's Fees and Charges By-Law. No changes to the permit system are recommended, but there should be continual review of the costs to administer the permits and to ensure that the appropriate level of insurance is being requested.

Recreational User Group Agreements

The intent of recreational user group agreements is to leverage membership in an organization for instilling good stewardship of the forest and trails. User groups have promoted entering into land use groups with the benefits to the County being educating members on responsible trail use, endorsing proper trail etiquette, providing an organized group of volunteers, and providing a mechanism to communicate with their users. This can only be realized where users are members of a group that is active and is providing this support. These benefits are not realized through the sales of short-term passes such as day use permits or weekend permits. Where a permitting system is implemented rather than a 3rd party membership requirement, it may require legal review to understand any changes in liability under the Occupier's Liability Act.

There is an obvious benefit to entering into land use agreements with recreational user groups, but realizing those benefits requires that the group supports:

- the goals and vision for the County Forest.
- users becoming long-term members of their group to truly realize the benefits of membership.
- communicating the value of and promoting training for safe use, good stewardship, and proper etiquette for recreational trails.
- the value of proper trail repair including proper training, tools, methods, and costs.
- recreational trail and volunteer policies.
- the value and benefits of conservation and silviculture programs.
- short and long-term planning and the needs for implementing these plans.

The County Forest's recreational user groups vary in size, organization and activity and recreational user group agreements must recognize this variation, as it can influence how they can implement the above supports. Furthermore, user groups may have associated provincial legislation or policies that supersede or limit the application of these supports.

Recreational Operations Planning

To coincide with the development of the conservation and silviculture plans a 5-year recreational trail and infrastructure 5-year plan will be prepared for the 2026-2030 period and for subsequent 5-year periods thereafter. This plan will focus on reducing risk, reducing recurring maintenance costs, and planning relatively consistent and realistic annual budgeting. At a fine-scale, the 5-year recreational operations should include, but is not limited to:

- Poison Ivy abatement
- Trail infrastructure maintenance and decommissioning
- New trail development
- Parking area infrastructure maintenance and development
- Picnic and rest area maintenance and development
- Major planned hazard tree removals
- Signage maintenance, renewal, and replacement

Additionally, the 5-year plan should include a more coarse-scale 20-year overview for access road maintenance. Access road maintenance is a much larger cost compared to the smaller recreational trails. Although it is a coarse scale approach and recognizing that condition and costs can change during that period, this will help in guiding budget decisions and subsequent plans. The recreational operations should be prepared by 2025 for implementation in 2026.

Silviculture

The Northumberland County Forest's silviculture program is the core function of the Forest's management. The Forest was restored to stabilize and improve degraded lands and forest management focused on silvicultural management and timber production. Other benefits of the Forest were recognized, but as the forest was managed under agreement with the, currently named, Ontario Ministry of Natural Resources and Forestry its primary objective was production of quality wood and wood products and reforestation of large tracts of land. The other benefits were more by-products of silviculture. The OMNRF defined this as managing for forestry purposes:

"the production of wood and wood products, provision of proper environmental conditions for wildlife, protection against floods and erosion, recreation and protection and production of water supplies."

Ultimately, this goal remains today as silvicultural management with the goal of wood and wood products remains the foundation of the County Forest's management.

Silvicultural Targets

The focus of the County Forest's silvicultural management for the duration of this plan will be:

Convert conifer plantations to natural forest given site conditions and regeneration

Support ecological restoration and conservation goals

Maintain a natural mosaic of forest types and age/succession class variation across the landscape

Improve future timber stock quality

Improve resilience and resistance to climate change and wildfire

Attain the best social/community benefits from timber sales

Maintain 3rd party forestry practices certification

Forest Management Certification

The Northumberland County Forest has achieved and maintained Forest Stewardship Council® (FSC®) certification (FSC® C018800) through the Eastern Ontario Model Forest's Forest Certification Program. The FSC® is an international, membership-based, non-profit organization that supports environmentally appropriate, socially beneficial, and economically viable management of the world's forests.

In the Eastern Ontario Model Forest's group certification program, the Northumberland County Forest is one of many managed forests within a group certificate. Third party auditing of forest management practices to international standards is performed at the group level, so NCF practices contribute to the overall audit results. Management planning and decisions for the Northumberland County Forest are not universally applied within the group certificate. Therefore, the practices and guidelines implemented in this Forest Management Plan may differ from those used in other forests within the group certificate. This ensures that management decisions can be adapted to local social and environmental impacts and needs. Joint management within the certificate occurs through feedback from the other members of the group certification through the Eastern Ontario Model Forest's Certification Working Groups.

Timber Supply

In 2016, Kestrel Forest Consulting prepared a 20-year timber supply analysis for conifer plantations. Stand data updated in the previous 4-years were used in stand density management diagram models developed by the OMNRF to determine thinning levels based on stand growth.

For the duration of this Management Plan, annual harvests are expected to be approximately 42ha with approximately with approximately 11 000m^3 harvested annually. Volume, quality, and value are increasing compared to recent and past harvests as the forest matures and reaches utility pole and large dimensional lumber size and quality. According to the analysis, the area of conifer plantation available for timber harvest begins to decline in approximately 2036 as many stands have had their final removals. Final removals should be

considered where the understory is well-developed in a free to growing state with desired height, density, and species composition of regeneration. Partial final removals should occur only where the risk of damage to the regeneration is lower than the risk of not releasing the regeneration and the value of retaining residual cover is high. Once the plantations have had their final removals, stands will be managed as deciduous or Mixedwood forest types.

The results of the timber supply analysis should be considered a coarse overview of future stocks and revenues and not a precise assessment. The assessment provides valuable general insight into the NCF's forest development but should not be used as a definitive assessment. Some of the differences between the expected timber supply from the Timber Supply Analysis and the actual timber supply that will be observed will be the result of:

- Low stems per hectare (ex. <400) counts which could not be properly accounted for using stand density management diagrams.
    - The extent of these areas as evident in Figure 18 suggests a large area with potential error or variation.
- Tree height growth that is lower than expected for a site curve and which affects prediction with density management diagrams.
- Inaccurate stand delineation resulting in stand summary input errors
- Low sampling intensity
- Inability to account for or report within stand inventory variation for heights, diameters, and stems per hectare, particularly in larger stands

Improved stand delineation and more specific analysis through the desired forest condition assessment should help refine this analysis.

The Northumberland County Forest is not known for producing quality hardwoods, but some forethought in carrying out "improvement" harvests in deciduous and mixed deciduous forest. Deciduous harvests would have a larger proportion of fuelwood than sawlog quality trees, but management would facilitate a shift towards better future timber quality. This would be the best strategy for improving the future timber supply for the Northumberland County Forest.

The following are common and standard actions taken by comparable community forests in preparing for the predicted decline in revenues because of declining coniferous timber volume (Table 20).

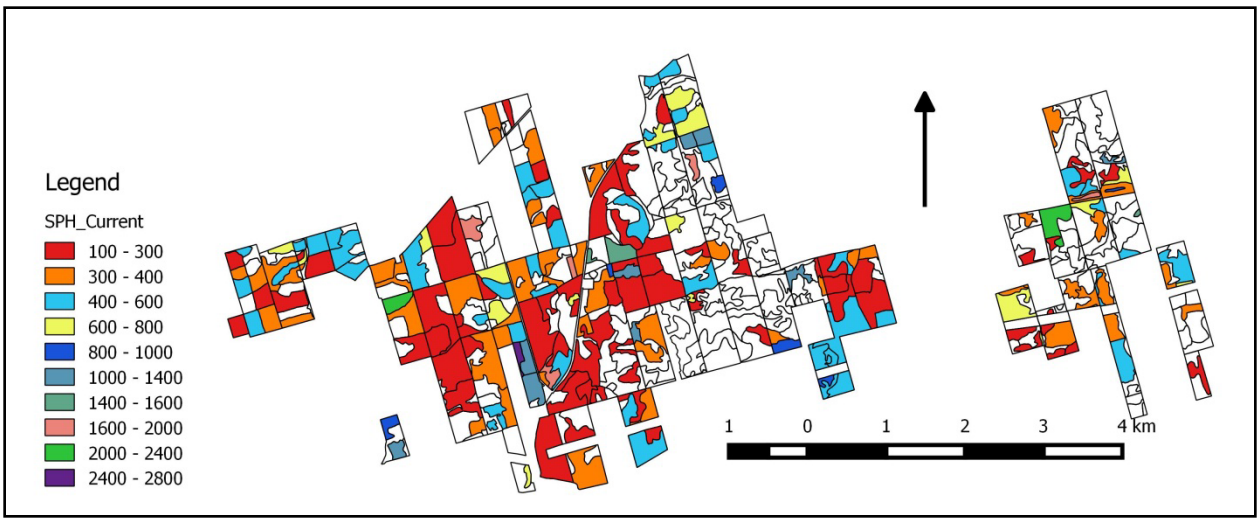


Figure 18. Map of stems per hectare (SPH) for conifer plantations in the Northumberland County Forest (as of 2016).

Table 20. Solution for the decline in timber revenues with declining operable conifer plantations.

Solution	Benefit
Use of surplus revenues to purchase and afforest additional land.	This would ensure sustainability in that future plantations would be available for harvest as current timber sources run out. This would also benefit residents by providing additional recreation areas and by providing ecosystem services. The afforestation may also be useable within the cap and trade carbon market for additional long-term revenue. It is unlikely that enough land will be afforested to balance the loss of revenue generation by current conifer plantation supply, but it would relieve some tax levy pressure in the future.
Inclusion of decline in long-term budgets.	Recognizes that the benefits of the forest go beyond the small financial contribution of timber harvesting.
Placement of surplus revenue in a reserve for future operational use / levy offsetting.	Will serve to provide near term offsets to declining revenue.
Performing deciduous stand improvement harvests for	These good forest management practices will provide an alternative future revenue source depending on the residual and regenerating timber. This may not be lucrative

future higher-quality forest stands.	as mature plantation harvests in the short-term and may even have a cost (for removal of unmerchantable stems) but would be an investment in sustainable harvesting that is practiced throughout Ontario's crown and community forests.
Implementing tending treatments to produce higher quality future timber.	This is contingent on availability of opportunities and appropriate methods. In most cases this would involve using prescribed burning and mechanical/chemical treatment of understory to guide regeneration composition, growth and successional communities in a desired direction.
Consideration of new markets	The current practice of lump sum timber sales works well administratively but may not realize the full value of the product. Lump sum sales rely on estimates rather than actual volumes and bids are likely conservative to reduce the buyer's potential loss. A volume sale would ensure the buyer only pays for the harvested volume and would likely increase the value by reducing the risk of loss is reduced. Additionally, where the volume is underestimated, the County would realize greater revenue.

Silvicultural Standards

Systems

Typically, silvicultural operations in the Northumberland County Forest will use selection or shelterwood silviculture systems (Table 21).

Table 21. Descriptions and characteristics of typical silvicultural systems used in the Northumberland County Forest.

Silviculture System	Description	General Characteristics
Plantation thinning	Period partial harvests that are timed based on crown closure, stems per hectare and understory development.	• Overall goal is to transition afforested conifer plantations to mixed deciduous forest. • Early thinnings use row thinning with some selective marking.

		• Generally, mid-term thinnings remove between ¼ to 1/3 basal area removal. Amount of removal depends on understory development and desired regeneration. • Goal is to uniformly space canopy by selectively removal less desirable stock. • Final removal retains 100 to 200 stems per hectare when understory reaches desired height, density and composition.
Shelterwood	Most of the overstory trees are removed in a series of two or more harvests for the purpose of establishing and sheltering regeneration under a residual canopy.	• Even-aged future stand • Regeneration established in 30-70% full sunlight • Regeneration period <20% of the intended rotation • Final removal creates >70% full sunlight
Selection	Periodic partial harvests timed based on basal area recruitment using vigour, risk and species preference, to select trees for harvest and retention.	• All-aged future forest • Regeneration established in >70% residual cover (~<30% full sunlight) • Dense mature forest cover maintained in perpetuity

Regeneration

The intent of the silvicultural systems used in the Northumberland County Forest is to allow for and promote natural regeneration. In the past few decades, little renewal and tending has been performed to manage the future forest resources, despite renewal and tending being standard practices required to achieve stated silvicultural goals and objectives. Given the outlook for the forest, more attention should be given to manage desired species compositions, tree form and health and to support conservation targets. Renewal and tending activities could include:

- Mechanical seed bed preparation

- Seed and seedling planting
- Mechanical and chemical species selection
- Mechanical and chemical tending for spacing and desired species composition

Regeneration targets must be specified in prescriptions and should be based on desired future conditions. Where targets are not being met, desired future conditions should be modified to accommodate natural regeneration or more intensive renewal and treatments are necessary and should be included in annual plans and/or 5-year silvicultural operations planning.

Harvest period

Harvest timing is influenced by the potential for negative effects on factors including:

- Reproductive cycle of conservation concerns
- Residual damage (e.g., bark scraping, sapling damage)
- Rutting and ground cover damage
- Recreational access

In most cases, this means that the suitable operating period will extend from August 1 to April 1. There may be some circumstances where a shift outside of this period is warranted, but it must be justified. Justification should give particular attention to the factors listed above. In addition to those restrictions on harvest timing, site conditions such as wet sites or sites with more organic soils, may require shut down periods in mid to late fall (October through November) and in early spring (March and April). There may also be locations where a shortened harvest period is warranted.

Contracts will specify that if rutting or other damage is excessive or is becoming excessive because of environmental conditions that the County can require conditions to be shut down until they become favourable.

Salvage Harvesting

Salvage harvesting can be an appropriate silvicultural response, including circumstances such as widespread damage caused by environmental events, wildfire, or pests and disease. Current pests and diseases such as Emerald Ash Borer and Beech Bark Disease as well as upcoming pests such as Hemlock Woolly Adelgid do not post much of a threat to the County Forest. Generally, the tree species affected by those pests and diseases are in low abundances in the Northumberland County Forest.

The main concern is Red Pine decline which is a generalized term that can be a result of root diseases or nutrient deficiency. Signs of root disease have not been found in the declining stands in the Northumberland County Forest, so it is more likely that the decline is a result of alkaline soils that make iron insoluble and unavailable for tree health (McLaughlin et al. 2010).

This is further antagonized by drought stress, particularly in trees that are shallow rooted because of roots avoiding the C horizon (*Ibid*).

At sites where there is Red Pine decline and they are included in the 5-year operating schedule the site should be harvested based on the physical characteristics of the decline (e.g., per "Recommendations based on the level of plantation decline" in McLaughlin et al. 2010). Where a site is undergoing severe decline but is not included in the 5-year operating schedule, a Registered Professional Forester should evaluate the site and assess whether the trees may survive into the next operating cycle where it can then be prioritized. Otherwise, justification may be made to amend the schedule to include the area of decline.

Salvage harvesting may also be needed in emergency situations. An emergency could include:

- Pest or disease outbreaks that need to be stopped immediately and have the potential to spread because of hesitation.
- Forest loss because of a disaster where hesitation will result in spoilage of the wood, would increase other hazards such as fire hazard or would limit access to the site.

In an emergency, Natural Heritage Service staff, in consultation with the County CAO (or their designate) will decide on undertaking a salvage harvest. Where it is not an emergency, the salvage operation will require the preparation of a plan and an amendment to the harvest schedule.

Wildlife Trees

In selection and shelterwood harvests, wildlife tree retention should focus on trees with wildlife value such as cavity trees, mast trees, scattered coniferous tree and supercanopy trees. Tree marking will follow standards identified in Ontario's Guide to Conserving Biodiversity at the Stand and Site Scale (OMNR 2010) and the Ontario Tree Marking Guide (OMNR 2004) when available.

Silvicultural Operation Prescription

A silvicultural prescription is the first step in silvicultural decision-making where a treatment is chosen from a range of potential combinations that are suitable for a site and that will contribute achieving long-term management direction (OMNR 2010). The prescription indicates what the management objectives are in terms of the silviculture system to be employed, the quality of products considered, the implementation of measures concerned with non-timber values, and the long-term goals for the designated area (OMNRF 2015). The prescription also outlines the objectives for the site and identifies any area of concern, HCVs, the expected rotation time, any modifications or restrictions to timing, equipment and harvest system and any post-harvest tending needed. This information provides tree markers with direction, allows

for planning future forest operations, provides a target for post-harvest surveys to be compared against and provides all forestry workers associated with the operations about any areas-of-concern and modifications made as a result.

Prescriptions will be approved by an associate or full member of the Ontario Professional Foresters Association and shall at a minimum have the following:

1. Location and Ownership
2. Site and stand condition
3. Desired future forest condition
4. Conservation values within or adjacent to operations
5. Habitat, biodiversity and recreation conditions
6. Last silvicultural operation
7. Objectives
8. Tree marking direction
9. Paints/marks
10. Estimated time until next silvicultural operation
11. Renewal or tending needs
12. Author and legal approval
13. Reference to other documents

Tree Marking

Tree marking will follow the guidance of the silvicultural prescription and will be performed by a certified tree marker or under direct supervision of a certified tree marker.

Silvicultural Operations Start-up

Before timber harvest begins a start-up meeting will occur. At this start-up meeting, staff will discuss the following with at least one representative from the contractor and one representative from a sub-contractor (if appropriate). Items to be discussed at the start up meeting will include:

- Conservation Value modifications/restrictions
- Recreational modifications/restrictions
- Harvest inspections

- Landing area locations
- Utilization standards
- Ground works (e.g., road work, landing clearing)
- Tree marking
- Boundaries
- Bills of Lading
- Safety signage
- Equipment use and expectations (e.g., skid/forwarder trail coverage)
- Residual damage
- Slash management
- Fire and environmental damage management
- Material and equipment storage and safety
- Operator certifications and health and safety
- Invasive species

In-harvest Inspections

During active timber harvesting operations, Natural Heritage Service staff or contractors will perform regular inspections. These inspections are qualitative assessments of potential concerns that are encountered such as:

- Haul road construction and safety
- Landing location, size and conditions
- Harvest practices
    - Trespass and unmarked tree harvesting
    - Waste of merchantable timber
    - Slash and debris management
    - Extraction trail condition and coverage
    - Cutting practices: Residual damage, lodged trees, and stump height
    - Contractor safety practices
- Adherence to any special conditions

The results of these inspections are logged, and any notes related to these or other features as well as any discussions with contractors on their practices/expectations are documented. For

the most part, these inspections are a way to minimize the potential of timber harvesting standards not being followed.

Post-harvest Damage Assessments

In some cases, post-harvest damage assessments will be performed as the work progresses throughout the stand to ensure that standards are being followed. In other cases, such as when snow covers the harvest operations and the features being monitored become covered, the assessments will be delayed until conditions permit ideal sampling. The intent of damage and waste assessments are to have a quantitative measure to ensure standards are being met.

To quantify and assess post-harvest damage, we will implement a hybrid survey approach using plot and strip sampling. Plot sampling will be used for assessing residual damage while strip sampling will be used to assess extraction trails and utilization. This will result in a stratified plot design that uses the strip samples as the transect line. Strips will be 10m wide (5m on each side of centerline) and 100m apart for a nominal cruise intensity of 10%. We will aim for a minimum actual strip cruise intensity of 10% (10m width with 100m spacing between strips). Plots will be circular with an area of 0.4ha (11.3m radius) and will be spaced at equal intervals along the strip cruise transect.

Residual Damage Standard

A minimum of 90% of the residual trees (stems of 10cm DBH and greater) must be free of major damage. Major damage is defined as (Table 22):

Table 22. Residual damage standards for trees greater than or equal to 10cm DBH.

Type of Injury	Considered Major When:
Bark Scraped Off	Trees 10 to 31 cm at diameter at breast height (dbh): Any wound greater than the square of the dbh (i.e., for a 10 cm dbh tree a major wound is greater than 100 cm^2.)
	Trees 32+ cm at dbh: Any wound greater than 1,000 cm^2.
	Note: If the wound has ground contact (and for yellow birch) a major wound is 60% of the size shown above for all size classes (i.e., 60 cm^2 for a 10 cm tree or 600 cm^2 for any tree 32+cm at dbh).
Broken Branches	More than 33% of the crown is destroyed.
Root Damage	More than 25% of the root area exposed or severed.
Bole of Tree Broken Off	Any tree.

Bent Over	Any tree tipped noticeably.

To assess residual damage, the following equation is used based on the results from the plot assessments.

Major Logging Damage (%) = Total major damaged trees/Total Residual Trees X 100

Extraction Trail Coverage and Rutting Standard

The standards for extraction trails are thresholds for active harvest inspections and are quantifiable measures for use in post-harvest surveys. Extraction trails should not cover more than 20% of the forested area for selection cutting and 30% for shelterwood systems. Coverage can be difficult to measure during active operations, so this threshold should be assessed during post-harvest surveys as a measure of the effectiveness of active harvest inspections and make improvements for future harvests. In addition to the extraction trail coverage, the rutting and compaction standards in Table 23 shall be enforced throughout the harvest and monitored during harvest inspections.

Table 23. Rutting and compaction standards for extraction trails.

Compaction Category	Compaction per extraction trail	Maximum distance of compaction per landing	Operational status
Minor < 30 cm	Can be maintained over the length of the trail.	Can be maintained over the entire system of main extraction trails	None
Major > 30 cm but < 60 cm	120 m	480 m	If maximum distance is greater than 120 m, cease extraction on an individual trail. If maximum distance is greater than 480 m, cease extraction to an individual landing.
Extreme > 60 cm	30 m	120 m	If maximum distance is greater than 30 m, cease extraction on an individual trail. If maximum distance is greater than 120 m, cease extraction to an individual landing.

For total extraction trail coverage, the length and average width of extraction trail segments which are encountered in the sample are recorded and used to calculate the percent extraction trail coverage. For example (Table 24):

Table 24. Example calculation of extraction trail coverage from survey results.

Extraction trail length encountered	100m
Average width of extraction trails	10m
Total area covered by extraction trails (from above)	100m x 10m = 1,000m^2
Length of strip cruise	1000m
Area of strip cruise (width per methodology)	10m x 1,000m = 10,000m^2
% Extraction Trail Coverage	1,000m^2 / 10,000m^2 x 100 = 10%

Utilization (Wasteful Practices)

The intent of the utilization standard is to minimize the amount of wood waste on the landings through good utilization and by cutting and leaving unmarketable trees or pieces of trees in the woods. Due to market demands of this commodity, utilization will be different for each harvest. Some companies have access to different markets and market prices can make some marginal pieces of wood un-merchantable (e.g., cost of hauling pulp outweighs the financial benefits). In most cases leaving what may appear to be a merchantable piece of wood (within a reasonable amount) benefits the forest by returning nutrients to the soil and providing habitat for insects, salamanders, toads and foraging resources for birds and mammals. This is particularly the case in managed conifer plantations where woody debris will return some nutrients and improve stand structure.

Northumberland County recognizes that because harvest contractors seek to be efficient and profitable that they are not likely to leave merchantable wood in the forest. There may be situations, however, where trees are marked for silvicultural reasons and they meet merchantable standards, but a contractor does not have a market for them. In this situation, it is the expectation that the contractor will negotiate a solution and remove the timber.

Under the Eastern Ontario Model Forest's *Forest Certification Policies and Procedures Manual*, SOP 3.3 – Harvest Standard Operating Procedure, one wasteful practice is an infraction; it is a wasteful practice to leave any merchantable timber of any length in any part of a harvest. Because utilization is based on occurrences and not a proportion, the surveyor will be constantly looking for wasteful practices throughout strip cruises and plot assessments. The definitions of merchantable timber are as follows (Table 25):

Table 25. Specifications for merchantable timber.

Species	Minimum Diameter at small end
Conifer other than white pine, red pine, or hemlock where ½ of its total content is sound	10cm (4 inches)
White pine, red pine, or hemlock as well as poplar or white birch where ½ of its total content is sound	16cm (6 inches)
Any hardwood log other than poplar and white birch of which more than 1/3 of the total content is sound.	16cm (6 inches)

In addition to merchantable timber, utilization includes the following other wasteful practices:

High Stump: A tree must not be felled so that its stump height is greater than 30cm except that a tree may be felled so that its stump height is not greater than its diameter measured outside the bark at the point of cutting. Regardless of diameter, no tree may be felled so that its stump height is greater than 60cm.

Leaving merchantable trees: It is a wasteful practice to leave any merchantable trees standing that the logger has the right to harvest on any part of a harvest area. Leaving merchantable trees means:

- a standing conifer, poplar or white birch tree where more than ½ of the total content of wood is sound; or,
- a standing hardwood tree other than poplar or white birch, where more than 1/3 of the total content of wood is sound.

Leaving lodged trees: It is a wasteful practice to leave lodged trees in an area where harvesting operations have been carried on. Lodged refers to a tree that for other than natural causes does not fall to the ground after being partly or wholly separated from its stump, or displaced from its natural position.

Operating Standards for Conservation Values

HCV's and VCC's are both important in forest management and therefore have been treated the same in this plan. The intent of identifying HCV's and VCC's are to develop operational modifications, herein referred to as Operational Standards, to mitigate negative impacts and potentially have positive impacts on the values. To develop Operational Standards, we have assessed these features based on the following for each of the values:

- Presence/absence
- Locations
- Status and condition
- Habitat/key resources
- Potential threats

Operational Standards tables and their associated operational modifications are in Appendix 3.

2021 to 2025 Silvicultural Operations

Figure 19 details the conifer plantation harvest plan prepared by Kestrel Forestry Consulting for 2021 to 2025 with annual harvest area ranging from approximately 48 ha to 58ha. Annual breakdowns of locations and areas are shown in Figure 20 (2021), Figure 21 (2022), Figure 22 (2023), Figure 23 (2024), and Figure 24 (2025).

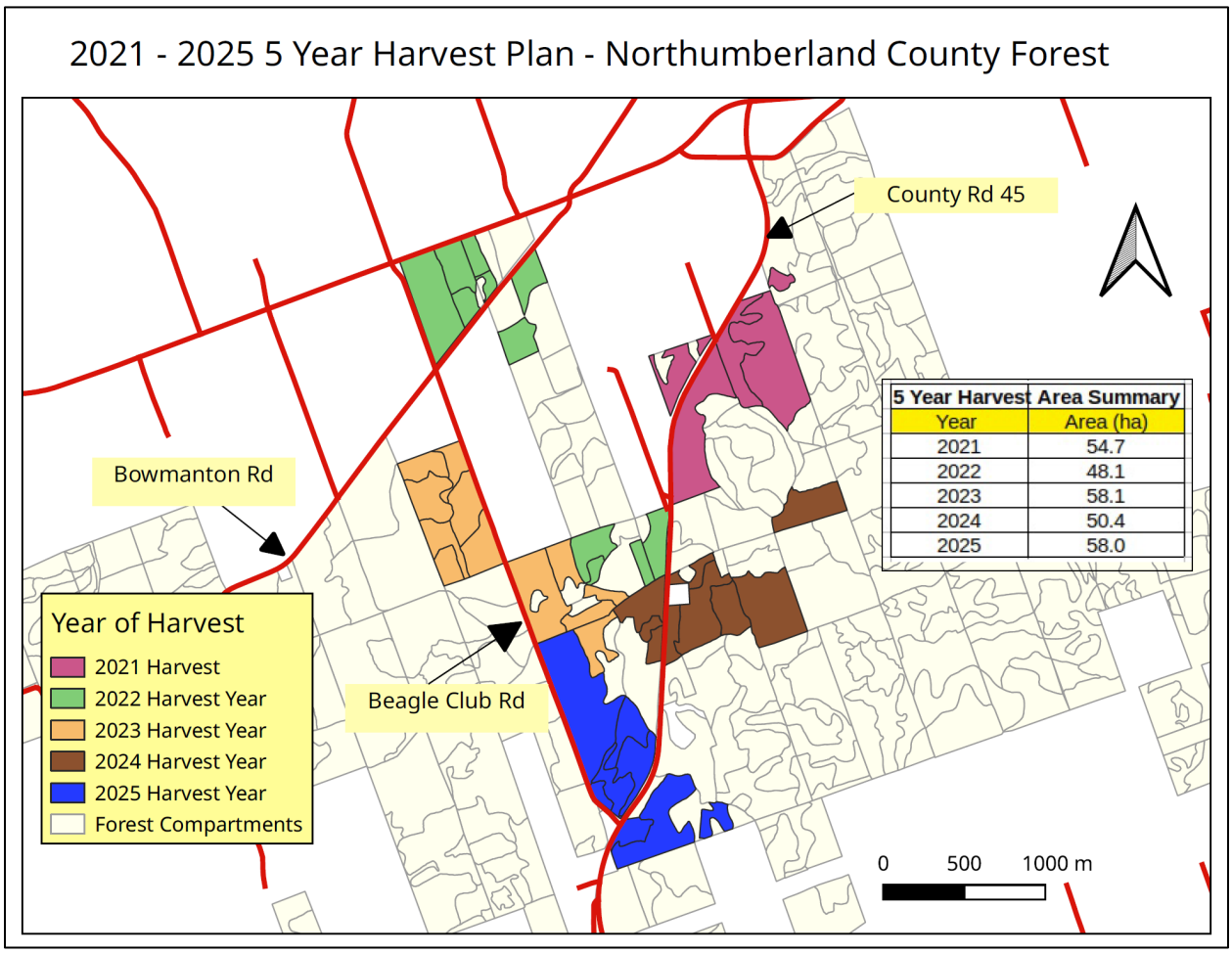


Figure 19. Five-year harvest operations plan for conifer plantations from 2021 to 2025.

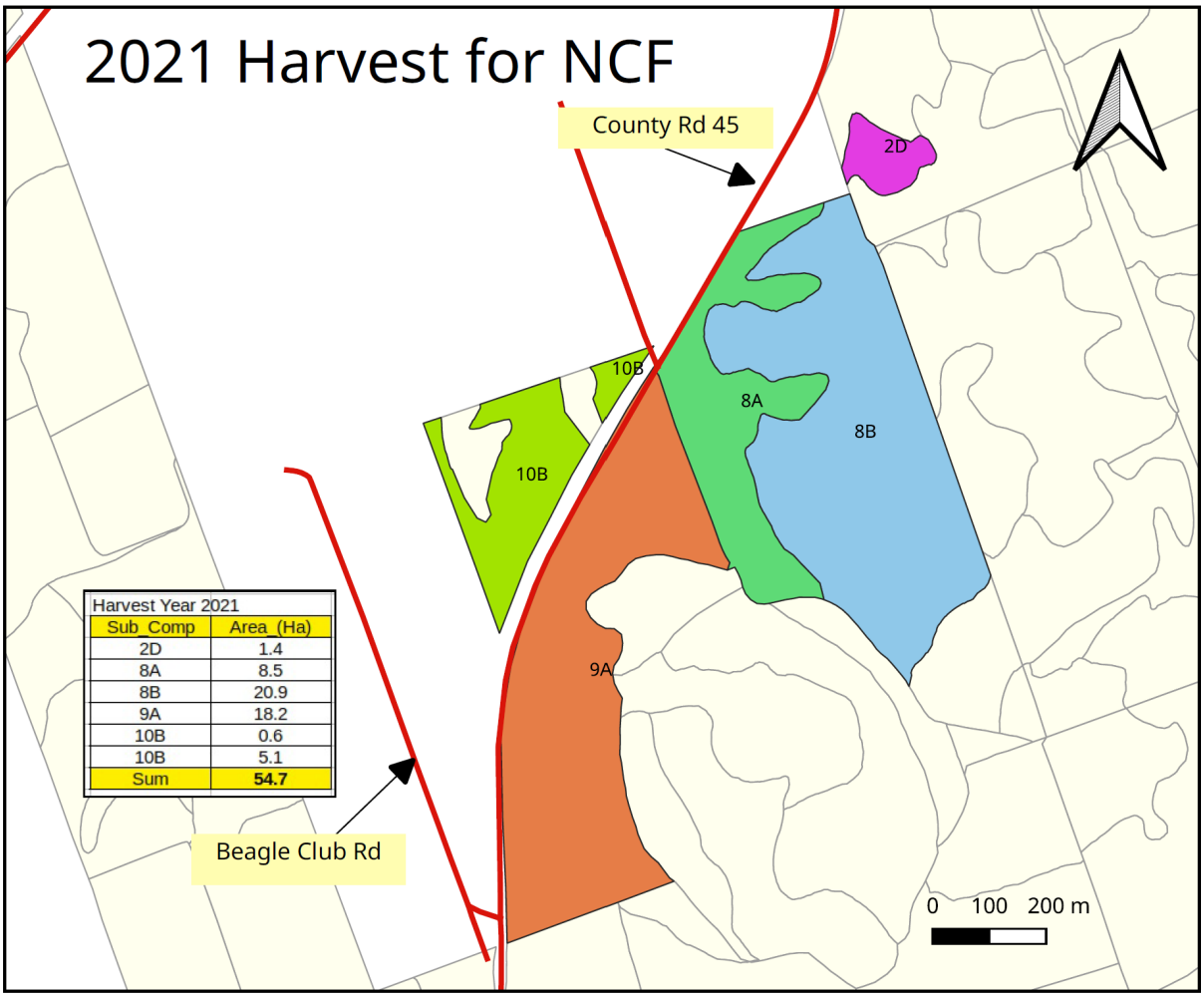
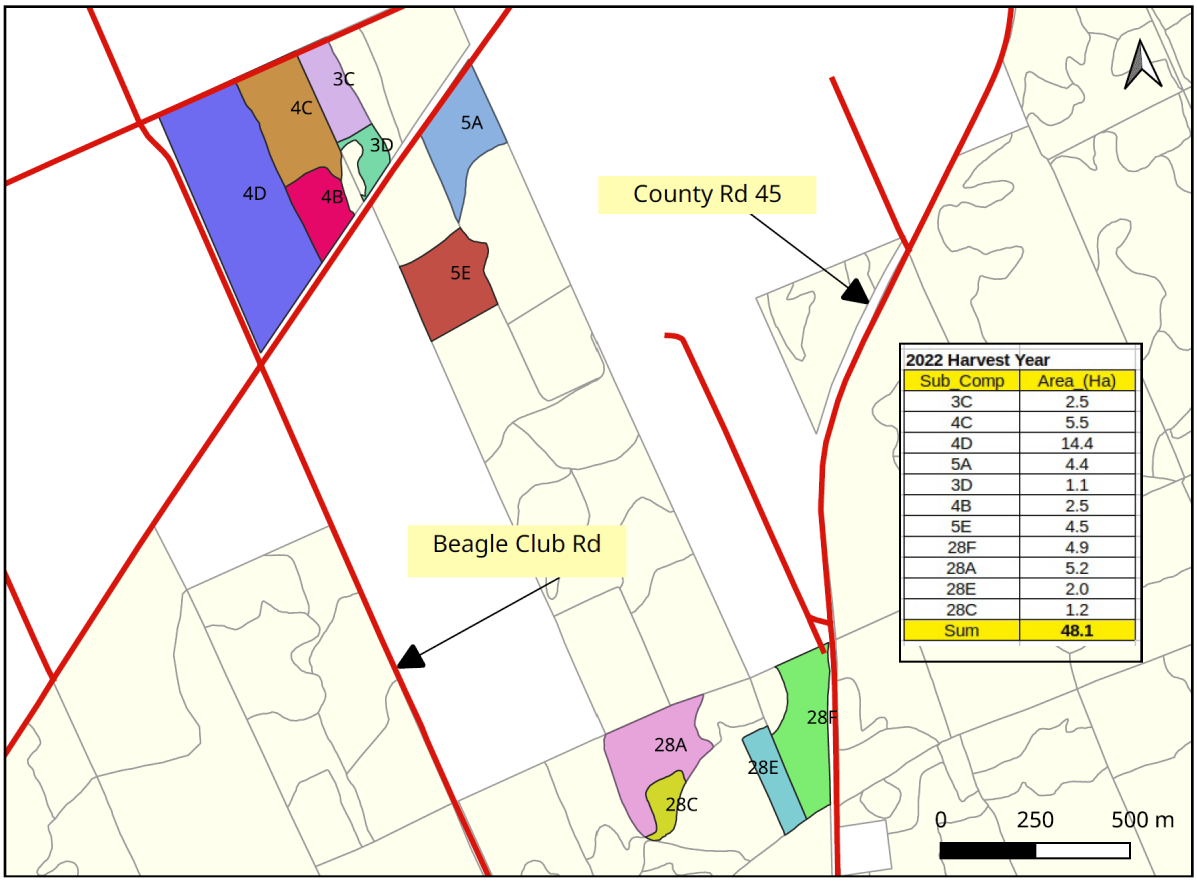


Figure 20. Location of 2021 conifer plantation harvest areas. Subcompartment id's and their areas are shown in the table in the image.



2022 Harvest Year	
Sub_Comp	Area_(Ha)
3C	2.5
4C	5.5
4D	14.4
5A	4.4
3D	1.1
4B	2.5
5E	4.5
28F	4.9
28A	5.2
28E	2.0
28C	1.2
Sum	**48.1**

Figure 21. Location of 2022 conifer plantation harvest areas. Subcompartment id's and their areas are shown in the table in the image. Flexibility in annual locations within the overall planned subcompartments may be required due to various influential factors.

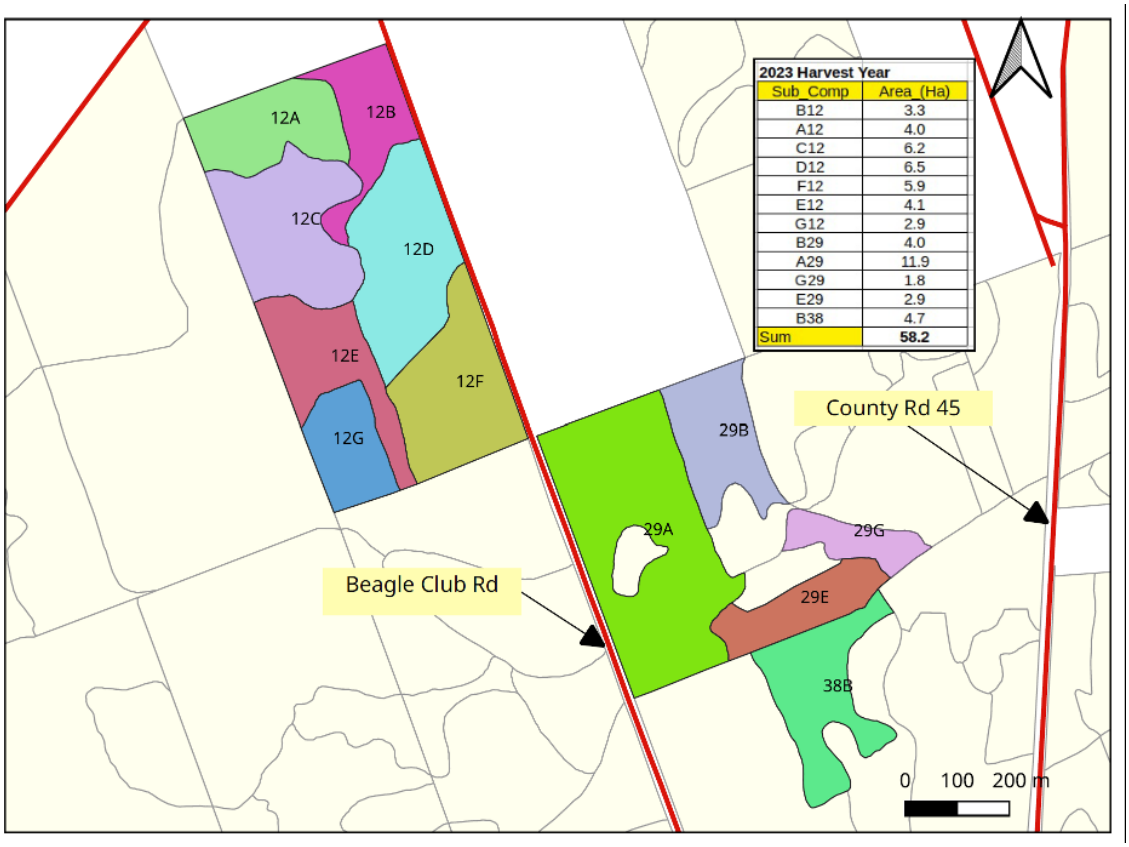


Figure 22. Location of 2023 conifer plantation harvest areas. Subcompartment id's and their areas are shown in the table in the image. Flexibility in annual locations within the overall planned subcompartments may be required due to various influential factors.

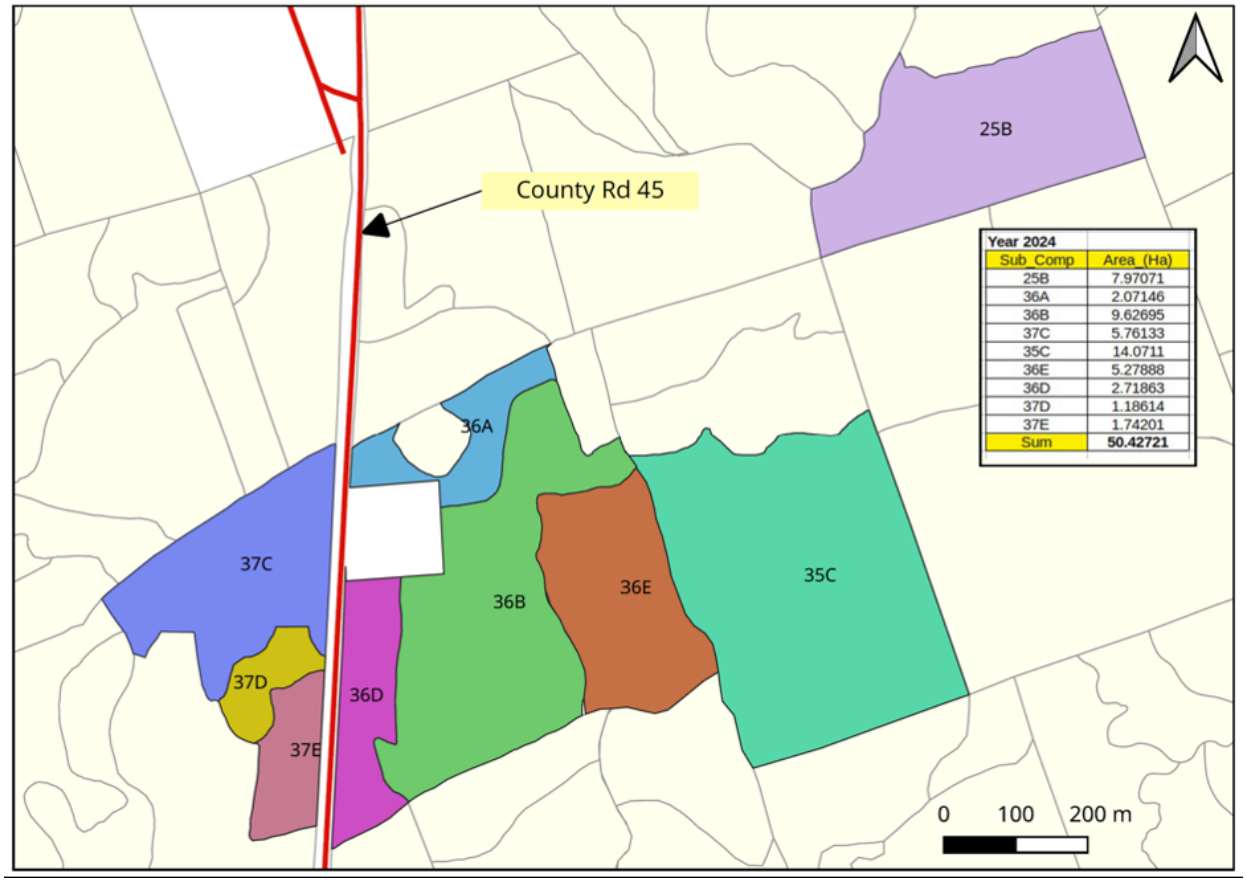
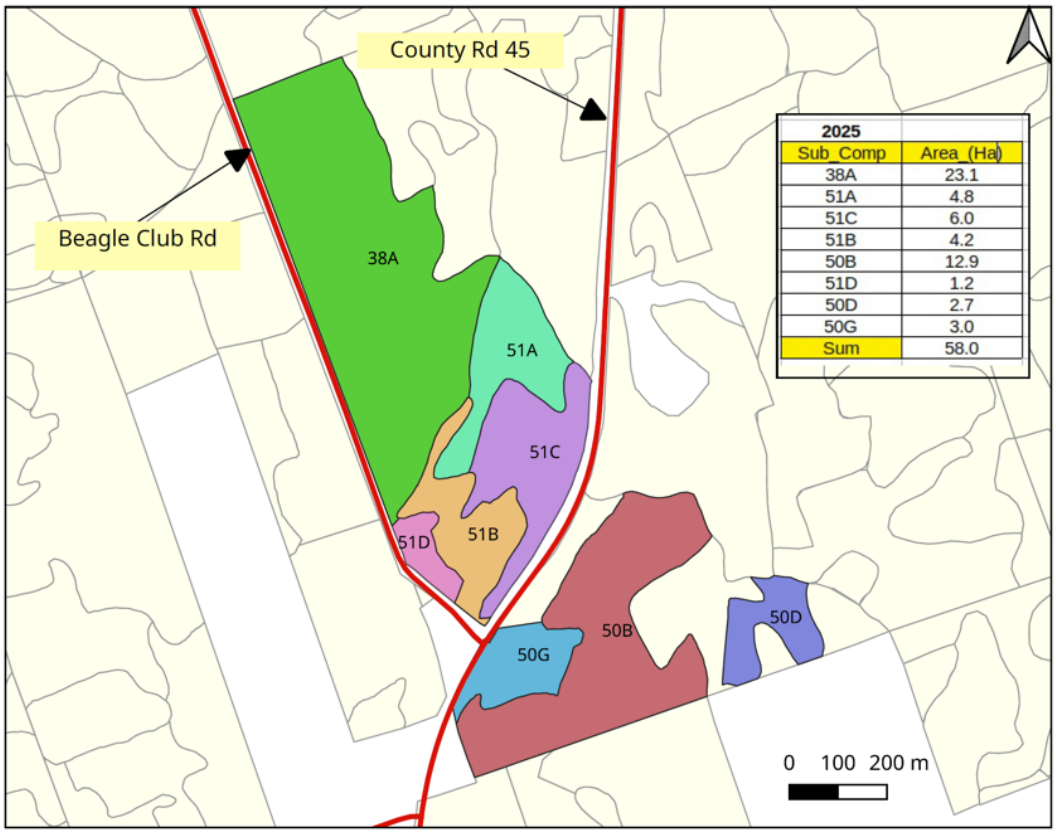


Figure 23. Location of 2024 conifer plantation harvest areas. Subcompartment id's and their areas are shown in the table in the image. Flexibility in annual locations within the overall planned subcompartments may be required due to various influential factors.



2025	
Sub_Comp	Area_(Ha)
38A	23.1
51A	4.8
51C	6.0
51B	4.2
50B	12.9
51D	1.2
50D	2.7
50G	3.0
Sum	58.0

Figure 24. Location of 2025 conifer plantation harvest areas. Subcompartment id's and their areas are shown in the table in the image. Flexibility in annual locations within the overall planned subcompartments may be required due to various influential factors.

Non-plantation forest

Planning for 2021-2025 harvest operations focused on conifer plantation management and did not include mixed deciduous or deciduous forest. Deciduous forest harvesting should be considered where it supports maintenance or restoration of areas of conservation value. Deciduous stands near conifer harvest areas should be considered for improvements to stand structure, species composition or regeneration annually. Future silvicultural operations plans should consider opportunities for non-plantation areas as well.

Timber Sales

Recently, timber sales have been performed using lump sum tendering. The benefits of this system are the ease of sales, flexibility on harvest timing if payment is received in full in the budget year. The negatives of this system are that it may not realize the full value of the harvested product. Lump sum sales rely on estimates rather than actual volumes and therefore

bids are likely conservative to reduce the buyer's potential loss. Furthermore, these estimates can be affected by wood quality and loss through defects and cull which can result in discrepancies between estimated and realized volume.

Another option is to implement volume sales which would ensure that a buyer only pays for the wood harvested therefore reducing the risk of loss to the buyer and a likely increase in revenue received for the product. As well, the current method of lump sum payment is restrictive to larger timber buyers as smaller businesses cannot afford to pay for large high-value tracts of timber. A negative of volume sales is that revenue for the wood harvested is not realized until it is scaled and therefore a protracted or delayed harvest can result in delayed receipt of revenues. This method would require the use of an accessible operational reserve that can be used and then restored to cover these fluctuations.

Timber sales must also consider the market and who the potential buyer could be. Sales of red pine have traditional market for the NCF. Hardwoods, particularly those with a range of sizes and species do not have a traditional market, but their harvest is needed for restoration and stand development and improvement. Buyers of this wood could include large mills but could also include local firewood vendors and smaller industries or cottage industries. Current sales methods exclude those potential purchasers for a variety of reasons including advertising of sales, amount of volume being sold and species mixtures. Developing a market for this timber would benefit conservation and restoration programs and could also provide local economic benefits including the development and maintenance of small business. Strategies for the sales of smaller diameter deciduous timber should not only rely on the traditional tendering methods.

To improve timber sales a more detailed review of current methodology and results and a strategy for different timber sales scenarios will be developed. This review should include consultation with traditional wood buyers as well as non-traditional local industries. This process will improve the marketing of timber as well as revenues. This review will be complete by 2025 and will replace this section when the next 5-year operational plan addendum is made.

Silviculture Operations Planning

Silvicultural operations will be managed using 5-year operational plans that adhere to the silvicultural focus. The operations plan will identify areas scheduled for harvest during that planning cycle.

- Detail the upcoming 5-years of harvest locations
- Provide general detail about the silvicultural approaches for each compartment
    - Silvicultural system
    - Harvest method
    - Renewal and Tending needs if already known

The Following are the needed operating plans and their production dates for the duration of this Management Plan (Table 26).

Table 26. Future 5-year operational planning terms and the year that they must be prepared.

Preparation Year	Operating period
2025	2026-2030
2030	2031-2035
2035	2036-2040
2039	2040-2044

Annual Harvest Area Assessment

A limitation in the preparation of 5-year operational plans is the lack of defined annual harvest area limits for sustainable harvesting. Current annual harvest area direction is based on recommendations made in the 20-year conifer plantation harvest outlook prepared in 2016 by Kestrel Forestry Consulting. This direction was based on resource data and stand density management diagrams. However, conifer plantation management is not based on typical stand rotation of continuous harvesting, but of stand replacement by other forest types through succession. Therefore, rather than harvesting solely based on incremental volume growth, harvesting must also consider stand structural characteristics that generally require in-field assessment. As well, experience has shown that the stand density management diagrams do not always work well for the stands in the Northumberland County Forest as height growth is often limited, likely due to the sandy soil conditions. Regionally calibrated density management diagrams are not available.

Forest management planning typically bases annual harvest area on a known rotation schedule for specific forest units and modeling is done over areas of thousands of hectares. For a forest this small with the complexity of stand conversion following restoration, it is suggested that staff should review different approaches and select a solution that will likely involve a mix of approaches. The best solution for this small of an area and the variability in the stands will likely rely heavily on the desired future condition assessment and the identification of management actions and timelines required to meet those conditions. As well, the desired future condition assessment and revised stand boundary delineation will refine the amount of each forest type and total area eligible for harvest which can be used for annual harvest area assessment. The annual harvest area assessment must be completed before silvicultural operations planning in 2025 and requires up-to-date stand inventories.

Fire Management

There has been a global increase in the wildfire size, severity and frequency which consequently results in related fatalities and firefighting costs (North et al. 2015). The long-term trend in Canada has been an increase in the number of fires and area burned between 1920 and 2013 (BJSWI 2013). NCF Management activities have not targeted the reduction of wildfire risk or improving the ability to fight and maintain control of a wildfire if one were to occur. The current approach has focused on the conversion of plantations to mixed deciduous forest to increase the amount of less flammable material (i.e. deciduous trees being less likely to ignite and spread fire than conifers). This does not account for increases in balsam fir understories and oak leaf litter which can increase laddering and fuel load, respectively.

As the NCF has not had regular wildfire to manage the fuel loads and recent droughts (e.g., 2012, 2016, 2019) have highlighted the potential risk of severe wildfire, attention must be placed on managing and preparing for it. The goals and objectives of the Ontario Ministry of Natural Resources and Forestry's Wildland Fire Management Strategy (2014) are appropriate for use in the Northumberland County Forest:

OMNRF Goals

1. Prevent loss of human life and injury;
2. Prevent and mitigate losses, economic disruption and social disruption;
3. Promote the understanding of the ecological role of fire and use fire to benefit resource management.

OMNRF Objectives

1. **Prevent:** The threat to people and values is diminished by reducing the number of human-caused wildland fires.
2. **Mitigate:** Property owners and land managers take action to mitigate the undesirable impacts of wildland fires on their property or other values.
3. **Respond:** All fires are assessed and receive an appropriate response.
4. **Understand:** The people of Northumberland (*edit from original Ontario*) are aware of and support the role of wildland fire.
5. **Apply:** Wildland fires and prescribed burns are safely and effectively used to reduce wildland fire hazards and meet ecological and resource management objectives.

To support these goals and objectives, the following 5 decisions for management actions must be considered (McCool et al. 2006). The fire management planning recommendations for NCF follows that template:

1. The content, audience and media needed for communicating risks of wildland fire threats and responses (under following heading: Communicating risks);

2. Management of fuels (under following heading: Fuel Management);

3. Identification and organization of local firefighting support (including equipment) (under following heading: Fire Response);

4. Management of information important to the fire suppression strategy (under following heading: also Fire Response);

5. Allocation and management of resources among agencies (under following heading: Fire Management Needs).

Fire Risk

The risk is the potential of a fire igniting; either human-caused or lightning-caused can be evaluated using fire danger rating systems that predict the potential for wildfire. In Ontario, between 1978 and 2011, approximately 60% of wildfires are human-caused and 40% are caused by lightning (BJSWI 2013). A coarse scale measure of fire risk for the Northumberland County Forest can be summarized by the interaction of temperature, wind and precipitation. At a finer scale, risk of ignition becomes more appropriate as it refers to the conditions of a forest stand and its interactions with weather such as drying within a specific forest type and duff characteristics. In an even more specific approach, fire risk would include the risk of ignition based on site and stand characteristics as influenced by weather as well as potential ignition sources (CIAFFC 2003). While risk of ignition is a concern, fire hazard is the aspect we have greater control over in preventing forest fires and is possibly of greater concern as it will dictate the control of a fire. There is some interplay between the hazard and the risk in forest fires as the risk of ignition is greater in some fuels than others.

The potential risks for causing wildfire in the Northumberland County Forest include, but are not limited to:

- Discarded cigarettes along County and municipal roads.
- Discarded cigarette butts at trailheads, lookouts and other rest areas along trails
- Lack of spark arrestors on off-road vehicles
- Abandonment and burning of stolen articles such as vehicles and off-road vehicles
- Bonfires from illegal parties and camping
- Bonfires or burning on neighbouring properties and Scout Camp
- Machinery used in timber harvesting
- Forest maintenance activities such as chainsawing and brushsawing (sparks and heat from machinery)

For some risks, such as the burning of abandoned vehicles, there is no communication that can be done. For other risks, such as the risk of wildfire caused by neighbouring fires or illegal fires in the forest, the fire rating signs that are maintained by the Township of Alnwick/Haldimand provide a strong message and can be seen when approaching the forest from almost all directions. Additionally, the fire ban signage that is attached to them or a nearby township sign provides more messaging during riskier periods.

Fire History

There is little information about fire history in the County Forest. The Ontario Ministry of Natural Resources and Forestry documented a fire in 1959 that burned approximately 24ha of 4-year-old and 7-year-old plantation (compartments 43a and 42h). The fire was the result of a neighbouring brushfire that got out of control.

There are signs of other fires in the Forest with the largest being mostly in compartment 49b. There are a few standing dead trees that are burned and some indication of burned bark on mature tree stems and some indication of ground fuels having been burned. This was found in spring of 2016 but based on the vegetation growth and litter cover at the site, the fire would have been a few years earlier. A smaller site exists in compartment 43h where, based on the remnants, it appears that a snowmobile caught (or was lit on) fire. The fire scorched the bark of a few trees, but it is likely that it occurred in winter as there was no indication of spread.

Campfires/bonfires are found regularly in the Forest, ranging from large “bush party” fires to very small cooking fires. In 2015, an unattended and lit campfire was found one morning by staff at the “foundation” on Dunbar Road, slightly east of County Road 45. In 2016, an attended, mostly smoldering, fire was reported to staff the morning after a party was held in the “Centreton sand pit” west of Huckleberry Lane.

Since 2007, there have been prescribed burns at multiple locations in the County Forest.

Communicating Risk

There are two main areas where fire risk needs to be communicated, the first is to manage the risk of causing a forest fire and the second is about managing the risk of a forest fire impacting a neighbouring residence. This communication will mainly be done through the fire risk rating signs that exist at 5 locations along the highways around the Forest. This will require maintaining the agreement and partnership to monitor the signs with Alnwick/Haldimand Fire and Rescue.

Other communications that should be developed include:

- The risk of “bonfires”
- The need for spark arrestors
- The risk of discarded cigarettes, especially by cars passing through the Forest
- Communication with neighbouring landowners about mitigating the risk to their properties.

- If possible, management actions should be used as demonstration areas (e.g., fuel reduction or if the County were to acquire a building, managing the surrounding vegetation and fuels through firesmart principles).

Fuel Management

The intent of fuel management is to reduce fire risk and fire hazards and potentially influence fire behaviour to a less severe state. By not managing the fuel, especially through prescribed burning, we are selecting for the potential of higher-intensity wildfire.

Fire Hazard and Behaviour

Fire hazard is a measure of the physical fuel characteristics, irrespective of weather, such as fuel loads (e.g., logging slash is a greater hazard than well-rotted needle duff), ladder fuels, canopy continuity sources (CIAFFC 2003) and ultimately relates potential forest fire behaviour. Assessing potential forest fire behavior ensures that the responders are prepared by understanding possibilities and can be used in planning to reduce the probability of ignition and the hazards in areas where forest fire behaviour will result in difficult fire control. Evaluating forest fire behaviour involves assessing interacting environmental factors such as fuel, weather and topography among others that influence how fuel ignites, how flames develop and spread, the shape of the fire perimeter and its intensity (Alexander and Cruz 2013).

Risk and Hazard Reduction

As there is no way to modify some of the factors that cause severe fire behaviour (e.g., weather, topography), to prevent, mitigate and aid response capacity, management actions that modify fuels can change burning and alter the loss at small and large scales (Finney 2005). A second modification is to modify the stand characteristics with forest that is less likely to burn and to maintain a fire. This generally requires greater conversion to deciduous species and a denser green shrub layer.

The need is to reduce accumulated fuels because of fire suppression and forest management techniques (e.g., conifer plantations). Accumulation of fuels (the hazard) results in more severe fire behaviour and the extreme heat and flame length is more likely to result in crown scorch or crown fires, both of which result in tree mortality and the latter of which makes a fire that is more difficult to control.

There are 3 main management methods for altering fuel:

1. Prescribed burning
2. Forest thinning
3. Forest conversion

The first method, prescribed burning, is the only method that will reduce the fuel, thus altering the hazard and the risk. Furthermore, this method promotes the regeneration of oak trees and deciduous shrubs which provides a better future forest condition and can be controlled for desired intensity. Burns would not be needed annually for fuel reduction (versus for restoration), but would target areas of high risk ignition and with hazardous areas to create

fuel discontinuities and reduce the potential for ignition. Where prescribed burning for fuel management is performed, metrics should be kept on the amount of fuel before the fire, the amount of fuel remaining post-fire, amount of scorch, height of flames and rate of spread. This information will be important for characterizing the fire and assessing its response to modify it to ensure that objectives are being met in future fires.

Forest thinning will improve the discontinuity of ladder fuels and crowns, however, the impacts to fuel are more long-term as it will require a long time for the leaf litter (especially in conifer plantations) to decline and for lower hazard deciduous trees to fill the stand. As well, there would be a short-term increase from slash. In some cases, such as plantations with little or no merchantability (i.e., white pine, spruce, Scotch and Jack Pine) or red pine stands slated for final removal, the best approach may be thinning to reduce canopy continuity and then perform a prescribed burn afterwards to reduce the fuels including the slash. There may also be situations where forest thinning could mean understory thinning which is an uncommon approach to forest management in this region. This would be appropriate where there is proximity to values and where there are understory characteristics that could result in high fire severity.

Another management tool to reduce the severity of fire is to modify the forest characteristics by promoting less ignitable fuels and fuels that are less likely to build up or sustain a fire. Generally, this requires increasing deciduous vegetation (similar to forest thinning), but the intent of this approach is to convert through plantings or more heavy-handed site conversion approaches (complete forest removal followed by re-planting). This is a less desired approach as it is more costly and requires greater inputs over time.

Fire Response

The overarching reasons for pre-fire event planning are to reduce the negative impacts of fire, ensure response capacity and prepare for post-fire responses (McCool et al. 2006).

Ideally, the efforts put towards prevention and mitigation will reduce the fire severity and thus the resources required in a response situation. The responsibility for response is at the municipal level as the NCF is located outside the Ontario Ministry of Natural Resources and Forestry's fire region and the OMNRF will only provide support in extraordinary fire situations.

Water Access

There is little access to a suitable water source for wildland firefighting in the County Forest. Access to one local water source may no longer be available and previously created ponds in the Forest are no longer accessible or access is more difficult because of larger response vehicles. Furthermore, ponds that do exist in the area showed significant drying up in 2016 (during drought), which is likely to continue occurring. Historically, there were cisterns throughout the Forest as well as ponds. The cisterns fell into disrepair and became hazards and have mostly been removed.

The County should seek to acquire or create a large pond near the Forest. As there are few large ponds near the Forest, one will likely need to be created. This requires finding and

acquiring land that has water or the potential to retain water where water retention would not impact nearby wells (which is not likely a problem). This would serve multiple benefits as not only a stable and accessible water source but would also restore wetlands to the County where a significant number have been lost since settlement. It may be possible that this could be done with the support of other agencies such as Ducks Unlimited or Delta waterfowl as a habitat restoration project.

Fire Management Equipment

Fire management needs are the allocation and management of resources among agencies, which in the NCF's case are the County and the responders, particularly the Alnwick/Haldimand Fire Department. The County should continue to work with the township's fire department to ensure that they have adequate training and resources for wildland firefighting, recognizing the Natural Heritage Service's resource limitations and that the County Forest is not the only location of potential wildland fire and that the probability of wildand fire is greater on private property given the Forest's fire history compared to non-County Forest land. Furthermore, the Natural Heritage Service's annual financial contribution should be maintained and recognized as funds that the municipality has available for emergency response and equipment purchase like any other landowner's taxes.

Fire Risk and Fuel Hazard Management Strategy

A wildfire risk and hazard reduction assessment and management strategy will be carried out by 2027. Past analyses have simply used a coarse forest type approach where coniferous was more hazardous than mixed forest which was more hazardous than deciduous forest. However, it is much more complex than this and management options should be investigated. The suggested approach will be to characterize hazards in the forest through inventories, mapping, and modelling, followed by stakeholder consultation and development of a wildfire management strategy. This strategy will require funding beyond the current annual budget allocation.

It is likely that the fuel management strategy will involve fuel reduction through prescribed burning and the mulching of fuel to create horizontal and vertical discontinuities. The cost of this program will be beyond what is currently available in the Natural Heritage Service budget and will require additional future budget allocations.

Property

Boundaries

On the ground, the boundaries of some areas of the County Forest are difficult to discern and there is concern that the mapping currently being used (based on provincial parcel fabric and previous consultant mapping) may not be completely accurate in some areas. As a result, silvicultural operations can be affected because a boundary is not clear. Better defined boundaries will also benefit other aspects of forest management such as recreation, restoration and data collection for values. In some areas, the boundary is not clearly defined by fencing or vegetation change and there is a discrepancy between the County's GIS files and the provincial parcel fabrics. The cost to survey all of the boundaries of concern immediately and at one time is prohibitive, but throughout future budgets staff will continue to include surveying and will prioritize based on:

- The combination of a discrepancy in current mapping, provincial parcel fabric and unclear landscape definition
- Upcoming operations in that area
- Benefits to other programs such as recreation

When a boundary is surveyed, the County should request a GPS file from the land surveyor and should have the surveyor mark the boundary in the field. Small signage should be installed on posts along that boundary; this could either be performed by staff or by the contracted surveyor when resources permit. Areas where some boundary uncertainty exists are shown in Figure 25. These concerns should be first investigated by staff and then by land surveyors if needed as boundary may be apparent through vegetation or fencing when investigated on the ground.

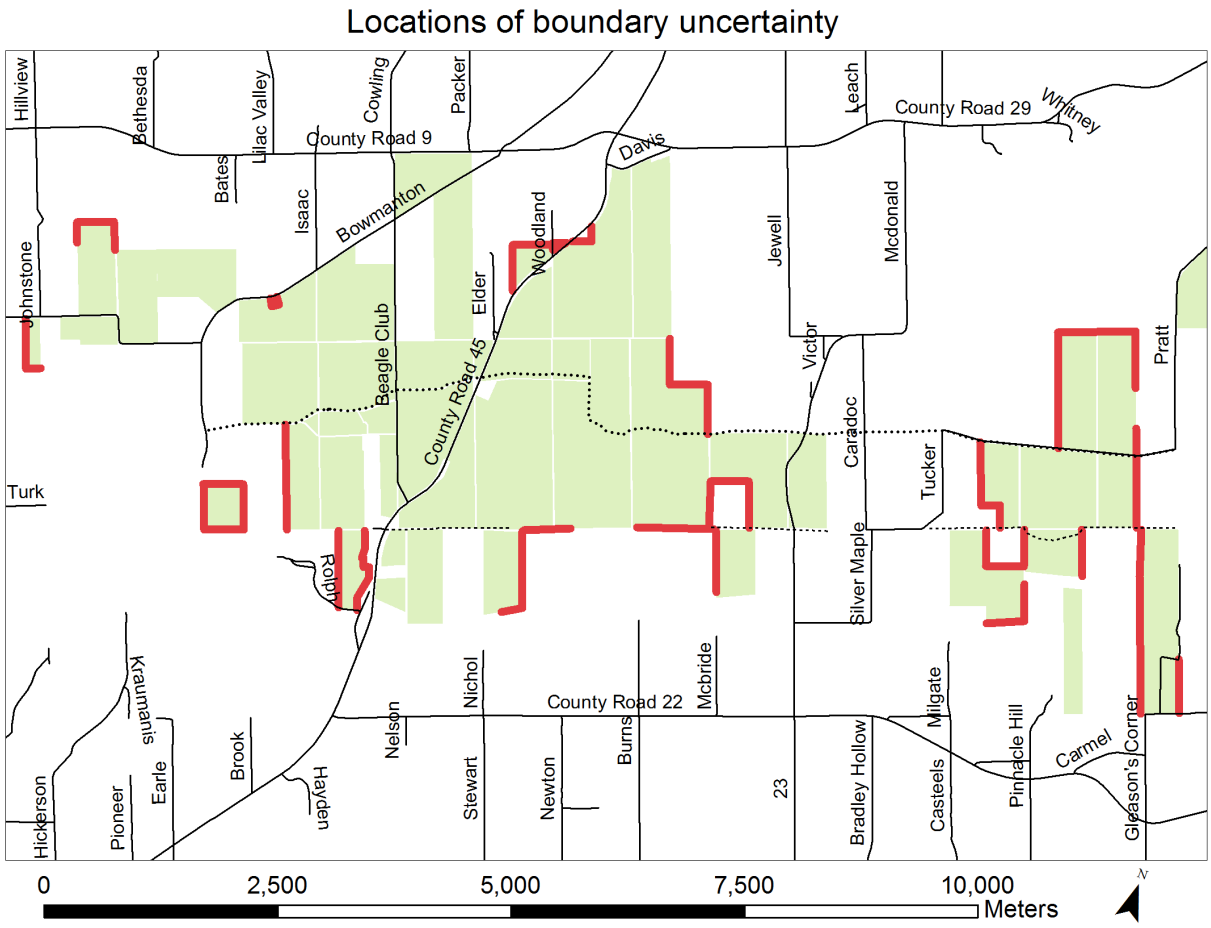


Figure 25. Map showing areas where boundary clarity must be assessed. Some areas have been surveyed/assessed since this map was prepared.

Additional Lands

Some of the benefits of the Northumberland County Forest are outlined in the introduction (Figure 1). Maintaining or increasing the area of land conserved as part of the Northumberland County Forest would enhance those benefits, particularly by increasing opportunities for recreation, ecological services such as water protection and timber revenues. This is particularly important given obvious future reductions in harvestable timber. Lands added to County Forest holdings, especially if it is marginal farmland restored to forest or natural lands would help in offsetting natural areas being lost to agricultural expansion or development. The Ontario Ministry of Natural Resources' management plans for the County Forest suggested that the County should seek to expand the County Forest throughout the Pontypool soils where the economics of agriculture were poor and where the economic and environmental benefits would be high if returned to a more natural state (e.g., Broderick 1982).

Some priorities for additional County Forest lands should include land with one or more attributes outlined in Table 27. In addition to these priorities, consideration should be given to

forest location. Creating a mosaic of forest fragments across the County would not be ideal for many reasons (e.g., management, monitoring, timber sale viability), but developing core forest areas throughout the County would increase the benefits of the ecological services and recreational opportunities and improve community impact by spreading out the provision of those benefits to more of the County community.

Table 27. Priority attributes for additional County Forest lands.

Characteristic
Abuts County Forest
Improve or clarify a current boundary
If farther than 2km from County Forest boundary, then >40ha
If within 2km of County Forest boundary, then >20ha
Improve emergency access to County Forest
Increase current or future recreational opportunity
Provision of ecological services (e.g., water filtration)
Potential for managing natural resources
Red Pine plantation <40 years old or opportunity to plant a red pine plantation
Potential to support tourism or economic development
Conserves or enhances significant woodland, significant valleylands
Identified as a priority in Northumberland County's natural heritage system
Potential to balance forest loss from land clearing
Improve managing trail infrastructure including access roads and parking areas.
Potential for coordination or complementing community partner projects.

In addition to strategically acquiring land, opportunities to manage forested lands already owned by the County (e.g., landfill buffer lands) through partnerships with other departments should be pursued.

By 2026, a securement strategy with a prioritization structure and financial plan will be completed that will replace this section. In the interim, the above priority attributes will be used in considering potential acquisitions.

Asset Management Planning

Natural heritage systems are the forests, wetlands and meadows that provide ecosystem services that support human prosperity and well-being. The Northumberland County Asset Management plan that is due in 2023 includes Green Infrastructure/Natural Asset Management. The NCF is a major component of the County's natural assets. Documenting and managing these assets now and in the long term provides essential climate change management and mitigation, health, biodiversity, ecological, economic, and social benefits to

the residents of the County. The County's Natural Heritage Service's staff will provide inventories of the County Forest's natural and constructed assets by July 2023 to ensure that its values are captured and represented.

Financial

The Northumberland County Forest generates revenue through its timber harvest program and the County levy funds the remainder of County Forest management costs. Timber revenues fund the cost of preparing for timber harvests and help subsidize other Natural Heritage Service programs such as recreation. In general, many users see the benefit of the Forest as just recreation. Other often overlooked benefits are the economic benefits provided by participation in healthy activities/exercise by residents, the social benefits of recreation and the ecosystem services provided by natural areas, especially large natural areas.

Timber revenues are expected to continue and being a commodity, long-term predictions of markets are not possible. The current timber supply outlook does demonstrate a steady future decline in revenues from conifer plantation harvesting, but Mixedwood and deciduous harvesting should also be pursued. Furthermore, expenditures that improve future timber stocks should be viewed as good investments.

The 2016 to 2020 Natural Heritage Services Strategic Plan included a SWOT (Strengths Weaknesses Opportunities Threats) analysis of various additional revenue-generating or revenue-offsetting programs. From that analysis, the following are opportunities that should receive continued consideration:

- Grants
    - Grants from funding agencies including federal and provincial governments, corporations and other agencies have been used and should continued to be sought to help offset costs. Previous funding has included burns, planting, trail repair and creation and invasive species management. Use of these grants will continue as opportunities arise.

- Gifting
    - There is no organized program for receiving and using gifts including donations, bequests, and gifts of land. Where possible gifted funds should focus on infrastructure repair and replacement, conservation projects or land acquisition.
    - Campaigns for funding towards specific projects activities should be considered to fund wholly or in part new projects. This would be particularly successful in support projects brought forward by the public such as forest advisory committee groups that they can champion.

- Ecosystem Services
    - Markets have been continuously developing for valuation and selling of credits for ecosystem services, particularly carbon credits for managed forest. County Forest staff will keep updated and evaluate what is occurring in the carbon market and other ecosystem service markets.

- Public Private partnerships
    - Service delivery that is relevant and complementary to the forest management goals by outside organizations (e.g., recreation equipment sales/rentals, trail tours, food vendor, campground operations/overnight accommodations, agroforestry) should be considered. The benefits to the County Forest could include, but are not limited to, infrastructure improvements, lease revenues, commission from sales and provision of front gate services. This type of partnership could fit in with a re- developed Scout camp or could occur on less used lands and where planning regulations allow. In addition to the benefits to the County Forest, local economic benefits could also be realized. When a feasibility study takes place for the Scout Camp, the potential for public private partnership will be explored.

- Sponsorship/advertising
    - Selling/leasing marketing rights for specific programs or infrastructure. This could take the form of trail naming, equipment purchase (bike pump), bench sponsors or advertising within the forest or on printed materials such as trail maps.

- Friends of Group
    - A friends of group founded by Northumberland County would likely be unsuccessful as this should be a community initiative to ensure engagement, support, and sustainability. The County should support any community initiative for initiation of a friends group recognizing that the group would have autonomy and be a partner and the friends of group would also have to recognize that they would need to support the County's priorities and policies.

Financial reserves

The County Forest has reserves for land acquisition, management planning, capital replacements and disturbance response. Reserves and their contributions should be reviewed to assess their size, use, annual contribution amounts, and target caps. The defined reason for the existence of the reserves should be reviewed to ensure that they can be accessed when needed, for example this could be accessing them to respond to invasive species and not just repairing their effects.

A reserve for unplanned variation in silvicultural revenues should be implemented where excess revenues from forest harvesting would be contributed to the reserve until there is an amount equivalent to one year of estimated harvest revenues. This reserve would then be accessed when because of lower commodity pricing, reduced area in harvesting or a deferred annual harvest occurs.

Some renewal and tending projects are not easily predictable as they may be a response to excessive undesirable regeneration, a poor seed crop or poor regeneration of desirable species such as oak. A reserve should be created to respond to these types of events and would be like the crown land system of Forest Renewal Trust and Forestry Futures Trust. This reserve would not be for typical planned or small-scale projects but would be reserved for larger areas or more complex projects. Contributions to this reserve could be a percentage of harvest revenues, a per hectare amount or based on harvest volumes by species and product.

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Appendix 1

Rough cost estimates for implement natural heritage conservation plans.

Year	Cost ($)
1	27,751
2	26,000
3	28,300
4	30,500

Appendix 2

Rough cost estimates for implementing identified forest access road and trail repairs.

Year	Cost ($)
1	25,000
2	32,000
3	26,000
4	28,000

Appendix 3 – Conservation Value Operational Standards

Value	Acadian Flycatcher (*Empidonax virescens*)
HCV category	HCV 1
Other HCV details **(e.g., SAR designation, S rank)**	• Provincial SAR designation: Endangered • Federal SAR designation: Endangered

Description/Habitat Guidance

- Occupies a variety of deciduous and mixed woodlands (maple-beech, oak-maple, beech-hemlock)
- Nests in mature, closed canopy forests with an open understory
- Riparian areas, swamps and ephemeral ponds are typical in suitable habitat.
- Favours forest with tall, closed canopies and high tree density.
- Forestry practices that remove large trees can negatively affect this species (especially diameter-limit tree harvesting)
- Activities that create habitat fragmentation such as the development of roads and trails can reduce contiguity of undisturbed forest.
- Species avoids human activity
- Species is at the northern extent of their range.
- Protect valleylands and swamps

Threats

- Disturbance intervals that are too short to allow for mature closed canopy forest.
- Acadian Flycatchers, will tolerate light selection cutting, although any cutting that opens up the canopy could be detrimental
- Selective logging could be detrimental. An increase in the understory should also be avoided since this will also cause population decline
- Moderate logging within territories will likely eliminate populations for years, if not decades, before the habitat is again suitable for this species.

Presence/Current Status

A single male Acadian Flycatcher was observed in suitable habitat for a short period during the breeding season in 2015. There was no sign of breeding and the territory was abandoned as it is unlikely that a mate was found.

Operational Standard

- Limit construction of infrastructure, even temporary, in suitable habitat.
- Retain mature Beech and Hemlock trees where possible.
- Do not harvest within nesting areas and territories.
- Only light selection harvesting within 250m of any nest sites/territories.

Value	American Ginseng (*Panax quinquefolius*)
HCV category	HCV 1
Other HCV details (e.g., SAR designation, S rank)	• Provincial SAR designation: Endangered • Federal SAR designation: Endangered

Description/Habitat Guidance

- Relatively undisturbed, mature sugar maple-dominated deciduous forest with low light saturation (>70% canopy closure).
- Typically found in areas with sparse shrubs (<25%), but diverse understory plants.
- Hydrological features within this area such as seeps and intermittent streams are necessary.
- Grows on thick (50-100cm), well-drained soils with neutral pH (6.5-7.5).
- Depends on surrounding area to maintain conditions that support life processes such as reproduction and dispersal.

Threats

- Harvesting for commercial trade (illegal).
- Damage to forest conditions by forest operations/management. This species is sensitive to habitat alteration as a result of its specific habitat needs, especially canopy closure/sunlight exposure.

Presence/Current Status

- Not known from the Northumberland County Forest, but known to occur locally in small patches.

Operational Standard

- Any markings required to implement operational standards must be temporary and discreet to ensure that populations are not at threat as a result of their demarcation.
- Follow Table 4.3.a (relevant sections for Large patches of American Ginseng and Small patches of American Ginseng) of the Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (OMNRF 2010); pg. 105 and 106.
- Generally compatible activities include:
    - Hiking and non-motorized vehicle use on existing recreational trails.
    - Maintenance or repair to an existing residence or structure.
    - Removal of invasive plant species in accordance with best management practices.

Value	Black Ash (*Fraxinus nigra*)
HCV category	Conservation Concern

Other HCV details **(e.g., SAR designation, S rank)**	• Provincial SAR designation: Endangered • Federal SAR designation: Threatened

Description/Habitat Guidance

- Prefers wetland habitat
- High tolerance of seasonal flooding

Threats

- Emerald Ash Borer

Presence/Current Status

- Small populations in three areas of the Forest, populations mapped.

Operational Standard

- Follow Table 4.1.c of the Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (OMNRF 2010); pg. 56
- Generally, the conditions on operations will be covered by wetland operational restrictions.

Value	Black Bear (*Ursus* americanus) den
HCV category	Conservation Concern
Other HCV details **(e.g., SAR designation, S rank)**	• N/A

Description/Habitat Guidance

- They are habitat generalists and can be anywhere.
- Dens are usually away from roads (>300m).
- Female typically choose areas with large trees (> 25cm dia; often white pine or hemlock) within 30m of the dens.
- Emerge from dens from early to mid-April (can be late April for females with cubs).
- Den construction begins in mid-October and most bears are in their den by early November (this can be moderated by food availability and snow cover and males can be later).
- Most dens are below ground excavations and are likely on well-drained upland sites and may be under fallen logs or under standing trees and stumps.
- Other den sites can be hollow logs, hollow trees and piles of debris.

Threats

- Damage or disturbance by equipment during silvicultural operations.
- Loss of large hollow trees.
- Disturbance can cause den abandonment which can cause increased winter weight loss.
- Dens may be for dormancy and for birthing/early maternal care, so disturbance can result in litter loss.

Presence/Current Status
• Black bears have been observed throughout the Northumberland County Forest. • There are no known or suspected Black bear dens in the County Forest, but they must exist.
Operational Standard
• Follow Table 4.2.k of the Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (OMNRF 2010); pg. 94

Value	Black Purseweb Spider (*Sphodros niger*)
HCV category	Conservation Concern
Other HCV details **(e.g., SAR designation, S rank)**	• G4G5 S1
Description/Habitat Guidance	
• Black Purseweb Spider: prefers grasslands, open woodlands and early successional forest.	
Threats	
• Habitat loss due to: 1.) forest succession/lack of disturbance, 2.) invasive species • Habitat destruction due to: 1.) harvesting equipment, 2.) recreation (particularly motorized vehicles) • Direct mortality from: 1.) recreation (motorized vehicles, bicycles), 2.) harvesting machinery.	
Presence/Current Status	
• Black Purseweb Spider: found locally • No known occurrences in County Forest	
Operational Standard	
• Refer to Black Oak Woodland, Oak Savanna standard. • This species can be quite mobile, so if found, restoration activities involving equipment should preferably occur during winter months within suitable habitat at its occurrence. • If found, pesticide use within suitable habitat where it occurs should be only used if all other possibilities are exhausted. If used, pesticides should be applied in a very careful/diligent and specific manner.	

Value	Blanding's Turtle (*Emydoidea blandingii*)

HCV category	Conservation Concern
Other HCV details **(e.g., SAR designation, S rank)**	• Provincial SAR designation: Threatened • Federal SAR designation: Threatened

Description/Habitat Guidance

- Nest sites in open habitat with sparse, low vegetation and high sun exposure and stable gravel, coarse sand, or a gravel and sand mixture (e.g., gravel pits and power lines).
- Typically prefers large wetlands and lakes.
- Suitable non-wintering habitat includes a variety of wetlands such as swamps, marshes, ponds, fens, bogs, slow-flowing streams, shallow bays, graminoid shallow marsh and slough forest habitats that are adjacent to larger marsh complexes. Wetlands are typically eutrophic, shallow, have soft-substrate of decomposing materials and emergent vegetation.
- Blanding's turtles depend on wetlands and surrounding terrestrial areas for their habitat.
- Overwintering sites include permanent bogs, fens, marshes, ponds, channels or other habitats with unfrozen, shallow water.

Threats

- Habitat destruction due to: 1.) harvesting equipment, 2.) recreation (particularly in nesting areas such as sand roads and paved road shoulders
- Direct mortality from: 1.) motorized recreation vehicles, 2.) harvesting machinery

Presence/Current Status

This species is not known to inhabit the Northumberland County but is known to occur in the area. There is very little ideal habitat for this species, but we have included it as a precaution in case it is found and to highlight that it is a possibility.

Operational Standard

- Any markings required to implement operational standards must be temporary and discreet to ensure that populations are not at threat because of their demarcation.
- No harvesting within 30m of nesting and overwintering sites (Critical habitat)
- 30m buffer around wetlands to maintain aquatic features and provide safe basking areas.
- Moderate tolerance to alteration of wetland complex habitat up to 2km from occurrence and 30m around these waterbodies.
- For general habitat protection, a wetland complex includes all wetlands within 500m of each other.
- When the occurrence is not within a wetland, the nearest suitable wetland should be considered the occurrence location.
- Wetlands with a moderate level of tolerance to alteration extend up to 2km from an occurrence and include 30m around those waterbodies.

- Area 30m to 250m around suitable wetlands/waterbodies that are tolerant of moderate alteration have a high tolerance to alteration. These areas are generally movement corridors between essential wetlands.
- Schedule operations between November 1 and February 28 in areas of suspected but unconfirmed

Value	Butternut (*Juglans cinerea*)
HCV category	• Retainable and Archivable Individuals: Conservation Concern • Archivable Concentration: Possible HCV 1
Other HCV details **(e.g., SAR designation, S rank)**	• Provincial SAR designation: Endangered • Federal SAR designation: Endangered

Description/Habitat Guidance

- Occur in deciduous and mixed forest at upland and lowland sites and across a variety of soil types.
- Grows best in partial or full light. Disturbances that increase exposure to light may be beneficial.
- Recruitment may be more successful closer to the parent tree.

Threats

- Butternut canker (pathogen) can kill the tree; no effective protection known.
- Damage to existing trees could result in the loss of a potentially resistant tree.
- Generally show low levels reproduction

Presence/Current Status

- There are no known stands of Butternut (i.e., concentration of significant species.
- One archivable butternut has been identified in the Carstairs area.

Operational Standard

- A qualified Butternut assessor must assess all trees.
- Follow Table 4.3.b of the Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (OMNRF 2010); pg. 109

Value	Canada Warbler (*Cardellina canadensis*)
HCV category	Conservation Concern
Other HCV details **(e.g., SAR designation, S rank)**	• Provincial SAR designation: Special Concern • Federal SAR designation: Endangered

Description/Habitat Guidance

- Nests in a variety of habitats, generally in areas with dense shrub layers.

- Most abundant in moist, mixed forests, but also found in riparian shrub forest on slopes and in ravines, in stands regenerating after disturbance and mature forest with canopy openings and a shrub layer.
- Nests are typically on or near the ground on mossy logs, roots, hummocks or along stream banks.
- This species is more abundant in the Boreal Forest or the southern Canadian Shield.

Threats

- Over-harvesting of mature (>90year old) upland forest; small canopy gaps within this forest that promote development of shrub layer are likely beneficial.
- The greatest threat to this species population may be habitat loss on the wintering grounds.

Presence/Current Status

- It is estimated that there are over 2.7 million Canada Warblers in Canada (2008 estimate), therefore the Northumberland County Forest population is not a significant concentration. This is, however a fairly high concentration (within a small area of similar habitat) at the southern extent of its breeding range.
- There are 7 locations of singing male Canada Warblers known from the Forest. Six of these locations are from within the Burnley Creek headwaters wetlands. One location is from a constructed pond and was only observed once in 2014 (possibly an unmated male).

Operational Standard

- Protection of the Burnley Creek Headwaters Wetland Complex (per PSW operational standards) would protect almost all known occurrences of this species in the Northumberland County Forest.
- No operations permitted within 200m of a nest during the breeding period (June 1 to August 15).
- In deciduous and mixed-deciduous forest, selection harvest within 200m of the nest permitted following residual stand and structure targets for old growth hardwood forest permitted.
- For coniferous and mixed-coniferous forest, within 100m of a nest site (active within past 5 years), maintain a minimum canopy closure of 70%. Within 200m of nest site maintain a minimum canopy closure of 60%.
- In all harvest operations creation of gaps that have a maximum opening equal to the maximum height of the stand may be beneficial in creating understory/nesting habitat.

Value	Cerulean Warbler (*Setophaga cerulean*)
HCV category	• Conservation Concern

	• Possible HCV1 – 5 or more nesting pairs
Other HCV details **(e.g., SAR designation, S rank)**	• Provincial SAR designation: Threatened • Federal SAR designation: Endangered
Description/Habitat Guidance	
• Prefers mature deciduous, particularly oak and/or hickory forest with a well-developed mid-canopy • Retain wildlife trees and downed woody material within the harvest site • Prefers approximately 70% canopy cover • Group selection harvesting can improve habitat • Shelterwood harvests that promote oak regeneration can increase population density and increase nest success.	
Threats	
• Overharvesting reducing the potential for large old trees, particularly oaks. • Overharvesting causing the reduction of canopy cover <70%. • Lack of disturbance resulting in even-aged, closed canopy forest.	
Presence/Current Status	
• No known occurrences in the Northumberland County Forest. There is some suitable habitat, so it is possible that this species may occur. • Breeding concentration of 5 or more pairs would be HCV 1.	
Operational Standard	
• Retain large diameter white oak trees whenever possible. • Group selection can improve cerulean warbler habitat when it conforms to other habitat guidance • Use shelterwood harvests that promote oak regeneration (crown thinning or seed cut) in suitable habitat (without known occurrence or outside of habitat pactch) • No complete removal of overstory during the second stage of shelterwood harvesting • Harvest only in non-breeding season. • Follow Table 4.3.f (Breeding habitat of cerulean warbler) of the Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (OMNRF 2010); pg. 122 • Critical breeding period considered to be May 1 through August 31.	

Value	Common Nighthawk (*Chordeiles minor*)
Category	Conservation Concern
Other HCV details **(e.g., SAR designation, S rank)**	• Provincial SAR designation: Special Concern • Federal SAR designation: Threatened

Description/Habitat Guidance

- Inhabits open habitats such as sand dunes, recently logged areas, burned over areas and forest clearings. Habitat mosaics that include the creation of openings are generally beneficial for this species.
- Found in recently logged (<20 years) or burned sites and naturally open clearings.
- Ground nesting species; Nests on bare ground.
- Suitable nesting sites and general habitat (openings and habitat mosaic) can be created through timber harvesting, by fire and by activities that clear ground cover
- Breeding period: May 1 to August 31.

Threats

- Habitat loss due to: 1.) forest succession/lack of disturbance, 2.) invasive species
- Habitat destruction due to: 1.) harvesting equipment, 2.) recreation (particularly motorized vehicles in barren areas), particularly during breeding season.
- Pesticide use could have direct (mortality) and indirect (e.g., insects for foraging) effects on this species.
- Increasing density by saplings and canopy closure likely negatively affect habitat suitability for this species.
- Logging during the breeding/nesting season can be highly detrimental as they may be sensitive to disturbance by logging activities.

Presence/Current Status

- Known from locations throughout Forest
- Particularly associated with sand barrens, but may inhabit other open areas of forest
- Nest sites/critical habitat difficult to identify as they are often observed flying over a large area while foraging.

Operational Standard

- Maintain 125m operations buffer from sand dunes, areas of exposed sand or known breeding sites during breeding season.
- Maintain 25m buffer from sand dunes or areas of exposed sand during non-breeding season, unless activities will improve the area.
- Activities that will increase vegetation cover at or near the ground or reduce open sand areas not permitted within 25m of a known nest site (within 5 years of a known nesting)
- Habitat restoration activities that increase potential nesting sites and are likely to be successful should be promoted.

- Care to ensure that invasive species (e.g., dog-strangling vine, sweet white clover, scotch pine) will not affect known or potential breeding areas must be taken.
- Refer to Sand Barren Operational Standard where appropriate.

Value	Conservation Reserves
HCV category	Conservation Concern
Other HCV details **(e.g., SAR designation, S rank)**	• Oak Ridges Moraine • Lands adjacent to Peter's Woods Provincial Park • Lands adjacent to Nature Conservancy of Canada properties

Description/Habitat Guidance

- These are areas that do not meet the definition of an HCVF, but are similar in their purpose or intent.

Threats

- Non-complementary land management.
- Spread of invasive species across property boundaries.
- Increased potential for infringement of recreational activities on conservation lands because of increased access.
- Trespass issues by timber harvest contractors.

Presence/Current Status

- Peter's Woods (Burnley-Carmel) lands exist between Northumberland County Forest main tracts.
- Abutted by the Nature Conservancy of Canada's Webber and North Burns Nature Reserve properties.
- Near the Nature Conservancy of Canada's Hazel Bird and Shelter Valley Cold Creek Headwaters.
- In general the objective of the adjacent conservation reserves are to protect, conserve and restore natural areas including woodlands but generally focused on prairie and savannah habitats.

Operational Standard

- The management activities in the Northumberland County Forest such as sustainable timber harvesting through Good Forestry Practices, trail-based recreation and ecological restoration will not negatively affect these areas and are complementary to their purposes and intent.
- Oak Ridges Moraine – subject to the policies of the provincial Oak Ridges Moraine Conservation Plan/Oak Ridges Moraine Conservation Act; the intent is to protect the Oak Ridges Moraine's ecological and hydrological functions.

• Management activities that occur on lands abuting a conservation reserve must be screened to ensure that they complement the management plans of those reserves. • Continued participation in the Rice Lake Plains Joint Initiative will help ensure that the objectives of this operational standard are met.

Value	Mammal dens [based on: Dens of furbearing mammals (e.g., Fisher) in enduring and transitory features; not including black bear]
HCV category	Conservation Concern
Other HCV details **(e.g., SAR designation, S rank)**	• Include Red Fox • Include Porcupine despite it not being fur bearing
Description/Habitat Guidance	
• Variety of habitats, locations and conditions.	
Threats	
• Damage and disturbance by silvicultural operations and equipment. • Damage to den site by harvesting.	
Presence/Current Status	
• Furbearing mammals are found throughout the Northumberland County Forest. One fisher den location is known, but they are likely found throughout.	
Operational Standard	
• Any markings required to implement operational standards must be temporary and discreet to ensure that populations are not at threat as a result of their demarcation. • Include Red Fox in group of fur bearing mammals that uses enduring features. • Follow appropriate standards in Table 4.2.k of the Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (OMNRF 2010); pg. 94 (appropriate boxes on pg. 97 and 98).	

Value	Dragonflies and Damselflies (Odanata) of conservation concern
HCV category	Conservation Concern
Other HCV details **(e.g., SAR designation, S rank)**	• Harpoon Clubtail (*Gomphus descriptus*) G4S3 • Variegated Meadowhawk (*Sympetrum corruptum*) G5S3 • Cyrano Darner (*Nasiaeschna pentacantha*) G5S3 • Painted Skimmer (*Libellula semifasciata*) G5S2 • Green-striped Darner (*Aeshna verticalis*) G5S3

	• Arrowhead Spiketail (*Cordulegaster obliqua*) G4S2 • Azure Bluet (*Enallagma aspersum*) G5S3 • Forcipate Emerald (*Somatochlora foricpata*) G5S3 • Common Sanddragon (*Progomphus obscurus*) G5S1 • Swamp Darner (*Epiaeschna heros*) G5S2S3 • Clamp-tipped Emerald (*Somatochlora tenebrosa*) G5S2S3

Description/Habitat Guidance

- Harpoon Clubtail: small forested streams.
- Variegated Meadowhawk: ponds and slow streams with sandy or cobble bottoms.
- Cyrano Darner: sheltered forest ponds and streams.
- Painted Skimmer: Marshy forest seepages, ponds and slow streams.
- Green-striped Darner: spring-fed ponds, marshy meadows and slow streams bordered by sedges.
- Arrowhead Spiketail: Small, rapidly flowing spring-fed forest streams and seepages with sandy bottoms.
- Azure Bluet: Fishless and semi-permanent ponds.
- Forcipate Emerald: bog pools and small forested streams.
- Common Sanddragon: Shallow streams and lakes with sandy bottoms.
- Swamp Darner: Wooded ponds and streams, including ephemeral pools and ponds.
- Clamp-tipped Emerald: Small forested streams with riffles and pools.

Threats

- Damage to wetland quality by siltation and pesticides.
- Alteration of habitat (especially riparian vegetation) as a result of harvesting.

Presence/Current Status

All statuses are from Jones 2010.

- Harpoon Clubtail: known to occur in Northumberland County.
- Variegated Meadowhawk: no known records, put possible.
- Cyrano Darner: no known records, put possible.
- Painted Skimmer: known to occur in Northumberland County
- Green-striped Darner: known to occur in Northumberland County
- Arrowhead Spiketail: no known records, put possible.
- Azure Bluet: known to occur in Northumberland County
- Forcipate Emerald: no known records, put possible.
- Common Sanddragon: no known records, put possible.
- Swamp Darner: known to occur in Northumberland County
- Clamp-tipped Emerald: known to occur in Northumberland County

Operational Standard
• Refer to PSW and Ponds for guidelines; other aquatic guidelines will provide protection for these species.

Value	Eastern Hog-nosed Snake (*Heterodon platirhinos*)
HCV category	Conservation Concern • Could be HCV 1 if it can be shown that it is present in abundances similar to grasslands such as the Nature Conservancy of Canada's Hazel Bird property.
Other HCV details **(e.g., SAR designation, S rank)**	• Provincial SAR designation: Threatened • Federal SAR designation: Threatened

Description/Habitat Guidance
• Prefers areas with well-drained, loose or sandy soils with vegetative cover and close to water. • Oviposition sites are open sandy soil (which they dig into) or in cavities under rocks or logs. Nests are likely in areas where there is enough sunlight to ensure warming of the ground. This may include a preference for south facing slopes. • Egg laying begins in late June with hatching in late August/early September. • Hog-nosed snakes do not hibernate communally. • Hibernation period: October to April. • Inhabit a mix of forest and/or fields.
Threats
• Habitat loss due to: 1.) forest succession/lack of disturbance, 2.) invasive species • Habitat destruction due to: 1.) harvesting equipment, 2.) recreation (particularly motorized vehicles in barren areas) • Direct mortality from: 1.) recreation (motorized vehicles, bicycles, dogs), 2.)harvesting machinery. • Sensitive to changes in toad populations (main food source). • Effects on wetlands/temporary wetlands used by American Toads (a main food source of Eastern Hog-nosed Snakes). • Collection of individuals for pet trade.
Presence/Current Status
Eastern Hog-nosed Snakes are known from a few locations within and around the Northumberland County Forest. Often, these are roadkilled individuals or those basking on roads. This species' actual population within the forest is unknown and they are very difficult to observe. One location is suspected of being a potential oviposition site as there are multiple records from that area and the habitat appears suitable.
Operational Standard

- Collection of individuals for pet trade.
- Any markings required to implement operational standards must be temporary and discreet to ensure that populations are not at threat as a result of their demarcation.
- 100m operations buffer from active (within 5 years) hibernation and oviposition sites.
- 50m buffer from potential hibernacula and oviposition sites.
- Harvest in areas of known activity during hibernation whenever possible.
- Identify and avoid disturbing potential hibernacula.
- Leave stumps in place or even dislodge slightly to give access to the root system.
- In known or potential habitat areas maintain and restore south-facing rocky areas near small forest openings or wetlands.
- Operational buffer of 25m from any seasonally wet areas/vernal pools within known habitat.
- Records and locations of this species to be publicly restricted.
- Refer to Sand Barren and Black Oak Woodland/Savannah operational standards.
- Habitat restoration activities that improve sand barren openness and are likely to be successful should be promoted.

Value	Eastern Ribbon Snake (*Thamnophis sauritus*)
HCV category	Conservation Concern
Other HCV details **(e.g., SAR designation, S rank)**	• Provincial SAR designation: Special Concern • Federal SAR designation: Special Concern

Description/Habitat Guidance

- Gravid females do not appear to need specific habitat
- Most frequently found along the edges of shallow ponds, streams, marshes swamps or bogs border by dense vegetation.
- Upland/drier areas adjacent to wetlands may be used for nesting. Live young are born in September.
- Hibernates communally in underground burrows, particularly old animal burrows and even ant mounds: October to April.

Threats

- Loss of wetland habitat.
- Declines in amphibian prey.
- Disturbance at nesting sites.
- Collecting for pet trade.
- Direct mortality from: 1.) recreation (motorized vehicles, bicycles, dogs), 2.)harvesting machinery.

Presence/Current Status

There are no records of this species in the Northumberland County Forest, but it is known to occur locally and some habitat in the Forest appears somewhat suitable.

Operational Standard

- Any markings required to implement operational standards must be temporary and discreet to ensure that populations are not at threat because of their demarcation.
- 100m buffer from active (within 5 years) hibernation sites.
- 50m buffer from potential hibernacula.
- Within 250m of an occurrence, harvest must retain >50% canopy cover.
- Harvests must retain wildlife trees and downed woody debris within 51-100m of hibernacula.
- Silvicultural operations that involve heavy equipment are not permitted within 100m of the hibernacula during the entering (Sept. 1 to Oct. 15) or emerging period (April 15 to June 1). These dates may be adjusted when more information becomes available.
- No new roads or landings may be constructed within 50m of the hibernacula and these operations should be avoided within 51-100m.
- Operations prohibited within 500m of wetland known to be inhabited by Ribbon Snakes from August 1 to October 1 for nesting.

Value	Eastern Whip-poor-will (*Antrostomus vociferus*)
Category	Conservation Concern
Other HCV details (e.g., SAR designation, S rank)	• Provincial SAR designation: Threatened • Federal SAR designation: Threatened

Description/Habitat Guidance

- Nests in early stage successional forest, semi-open forest, patchy forest with clearings or little ground-cover, open conifer plantations, rock or sand barrens with scattered trees, savannahs, old burns and so on.
- Selective logging that increases early and mid-successional woodlands can create habitat.
- Habitat is more dependent on forest structure than composition although often associated with pine and oak.
- Avoids wide-open spaces and closed-canopy forest (e.g., mature forest).
- Prefers sparse to moderate shrub and herbaceous cover.
- Breeding period: May 1 to August 31.

Threats

- Habitat loss due to: 1.) forest succession, 2.) invasive species
- Habitat destruction due to: 1.) harvesting equipment, 2.) recreation (particularly motorized vehicles in barren areas)

- Pesticide use could have direct (mortality) and indirect (e.g., insects for foraging) effects on this species.
- Increasing density by saplings and canopy closure likely negatively affect habitat suitability for this species.
- Logging during the breeding/nesting season can be highly detrimental as they may be sensitive to disturbance by logging activities.

Presence/Current Status

- Known from locations throughout County Forest
- Nest sites/critical habitat difficult to identify as they are often observed flying over a large area while foraging.

Operational Standard

- Maintain 125m operational buffer of known or suspected nesting, perching and roosting sites during breeding season.
- Maintain 25m buffer from sand dunes or areas of exposed sand during non-breeding season.
- No harvesting within 125m of a known nest site (AOC removed 5 years after last known nesting at that location).
- Habitat restoration activities that increase potential nesting sites and are likely to be successful should be promoted.
- Care to ensure that invasive species (e.g., dog-strangling vine, sweet white clover, scotch pine) will not affect known or potential breeding areas must be taken.

Value	Ghost Tiger Beetle (Little White Tiger Beetle; *Cicindela lepida*) and Northern Barrens Tiger Beetle (*Cicindela patruela*)
HCV category	• Ghost Tiger Beetle: Conservation Concern • Northern Barrens Tiger Beetle: possible HCV1
Other HCV details **(e.g., SAR designation, S rank)**	Ghost Tiger Beetle • Locally rare species • S3, G3G4 Northern Barrens Tiger Beetle • Provincial SAR designation: Endangered • Federal SAR designation: Endangered

Description/Habitat Guidance

- Sand barrens and forested areas with sparsely vegetated sand.
- Barrens Tiger Beetle may inhabit other sandy areas such as trails and roads.

Threats

- Habitat loss due to: 1.) forest succession/lack of disturbance, 2.) invasive species
- Habitat destruction due to: 1.) harvesting equipment, 2.) recreation (particularly motorized vehicles in barren areas).
- Vegetation of sand habitat by invasive species (e.g., Scotch pine, dog-strangling vine, white sweet clover, spotted knapweed).

Presence/Current Status

These species are not known to occur in the Northumberland County Forest, but Ghost Tiger Beetle does occur locally.

Operational Standard

- Maintain 50m buffer from sand dunes or areas of exposed sand for non-restoration activities.
- Habitat restoration activities that improve sand barren openness and are likely to be successful should be promoted.
- Care and practices to ensure that invasive species will not populate sand barrens must be taken (e.g., proper equipment washing before entering site).
- Refer to Sand Barren operational standard.

Value	Louisiana Waterthrush (*Seiurus motacilla*)
HCV category	Conservation Concern
Other HCV details **(e.g., SAR designation, S rank)**	• Provincial SAR designation: Special Concern • Federal SAR designation: Threatened

Description/Habitat Guidance

- Found in riparian zones in mature tracts of deciduous-mixed forests, prefers streams below steep-sided slopes in forests containing deciduous trees.
- Will also inhabit heavily wooded swamps
- Prefers headwater streams and wetlands of high water quality and well developed pool and riffle complexes.
- Fallen trees with exposed root masses and riparian banks with abundant crevices are preferred nest sites.

Threats

- Negative changes in water quality.
- Loss of high-quality wetland habitat.
- Loss of nesting features such as wooded slopes and tipped trees.

Presence/Current Status

There are no known records from the Northumberland County Forest and searches by the Canadian Wildlife Service in 2015 did not find any individuals. Local records of this species exist (e.g., Peter's Woods), but are not consistently present annually.

Operational Standard

- 100m riparian buffer from any wetland where this species is found.
- Refer to standard from Provincially Significant Wetland (HCV3)
- Assess harvesting in nearby areas that could cause siltation or affect water temperature of watercourses if this species is found.
- Protect ravine forests near the Burnley Creek Headwaters wetland complex from erosion and disruption by leaving at least a 10-metre buffer of trees along the top of the ravine slope.
- Follow Table 4.3.f (Breeding habitat of Louisiana Waterthrush) of the Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (OMNRF 2010); pg. 94 (appropriate boxes on pg. 97 and 98).

Value	Milksnake (*Lampropeltis triangulum*)
HCV category	Conservation Concern
Other HCV details **(e.g., SAR designation, S rank)**	• Provincial SAR designation: Special Concern • Federal SAR designation: Special Concern

Description/Habitat Guidance
• Habitat generalist: found in a wide variety of habitats from meadows to a variety of forest types. • Prefers open habitats. • Abundance positively correlated with regional forest cover. • Often found near buildings, particularly old structures • Ideal habitat structure includes water and basking/egg-laying components. • Hibernates in small mammal burrows, logs, gravel/clay and dirt banks, old wells and old building foundations that are moist (October to April/May). • Females lay eggs at in early June. Sites include rotting logs, leaf mounds, stumps, loose soil under coarse debris. • Oviposition sites can be communal.
Threats
• Road mortality. • Collection for the pet trade.
Presence/Current Status
Only one location/sighting known, although this secretive species likely inhabits areas throughout the Forest.
Operational Standard
• Any markings required to implement operational standards must be temporary and discreet to ensure that populations are not at threat as a result of their demarcation. • 100m buffer from active or potential (within 5 years) hibernation and oviposition sites. • Winter harvesting should be prioritized in areas that they are known to occur (although have very large territories. • Protection of old house foundations and wells (per cultural site AOC) will benefit this species.

Value	Monarch (*Danaus plexippus*)
HCV category	Conservation Concern
Other HCV details **(e.g., SAR designation, S rank)**	• Provincial SAR designation: Special Concern • Federal SAR designation: Threatened
Description/Habitat Guidance	

- Variable habitat requirements. Dependent on larval foodplant (milkweed) availability.
- Larval foodplant only found in woodland openings. These are generally recent harvests, sand barrens or oak savannah.

Threats

- Habitat loss due to: 1.) forest succession, 2.) invasive species
- Habitat destruction due to: 1.) harvesting equipment, 2.) recreation (particularly motorized vehicles in barren/open areas).
- Displacement of food plant by invasive species (e.g., Dog-strangling Vine, White Sweet Clover, Scotch Pine).
- Larval foodplant can be lost through succession (expected in recently harvested areas where the goal is forest succession).

Presence/Current Status

Individual Monarchs can be observed in openings (especially recently created openings for sand barren restoration) throughout the Northumberland County Forest. Where common milkweed (*Asclepias syriaca*) exists, Monarch can usually be found reproducing. Patches of flowers such as Butteflyweed, Bergamot, Woodland Sunflower and other woodland savannah species are an important nectar source.

Operational Standard

- Control dog-strangling vine in ovipositing areas
- Avoid damaging any milkweed species within the harvesting area
- Refer to related standards (e.g., sand barrens, oak savannah).
- No commercial harvesting within 10m of a living Milkweed plant.
- Preferably, management activities occur post-migration (outgoing) and pre-migration (incoming)

Value	Mottled Duskywing (*Errynis martialis*)
Category	HCV 1
Other HCV details **(e.g., SAR designation, S rank)**	• Provincial SAR designation: Endangered • Federal SAR designation: Endangered

Description/Habitat Guidance

- The Rice Lake Plains area appears to be one of the few remaining concentrations of this species' population and suitable habitat in Ontario.
- Open barrens, sandy patches among woodlands, and alvars.

- In Ontario, the Mottled Duskywing will only deposit their eggs on two closely-related plants: New Jersey tea (*Ceanothus americanus*) and Prairie redroot (*Ceanothus herbaceus*).

- **Threats**

- Damage to larval food species by invasive plants such as Dog-Strangling Vine, Scotch Pine, White-sweet Clover.
- Damage to larval food source and overwintering individuals.
- Pesticide use (direct contact with larvae and damage to larval food plant)

Presence/Current Status

- No recent observations of this species; targeted searches have taken place. Past observation from 1985.
- Species can be found within the region, including in a high concentration nearby and on a neighbouring property.
- Suitable habitat and larval food species can be found in Forest, particularly in burned areas and open Black Oak Woodlands.
- It is possible to probable that this butterfly inhabits the Northumberland County Forest.

Operational Standard

- Any markings required to implement operational standards must be temporary and discreet to ensure that populations are not at threat as a result of their demarcation.
- All equipment will be thoroughly washed before harvest to prevent the spread of dog-strangling vine, garlic mustard and white-sweet clover.
- Timber harvesting within suitable habitat during winter only.
- Avoid destroying any New Jersey Tea.
- Timber harvesting that reduces canopy closure no less than 40% can improve habitat conditions for New Jersey Tea.
- Timber harvesting operations prohibited within 50m of known egg laying/larval sites (within 3 years of last sighting).

Value	Nests/communal roosts in cavities occupied by American Kestrel, Barred Owl, Eastern Screech Owl, Great horned Owl, Northern Saw-whet Owl or Chimney Swift.
HCV category	Conservation Concern
Other HCV details **(e.g., SAR designation, S rank)**	• N/A

Description/Habitat Guidance

- Inhabit different forest types (except American Kestrel that inhabits clearings); habitat generalists that require forest cover and generally prefer mature forest.

Threats

- Damage/disturbance by silvicultural operations.

Presence/Current Status

- Barred Owl, Great horned Owl and Eastern Screech Owl are known to inhabit the County Forest. No nest cavities are known.
- American Kestrel has been observed in sand barren openings, but the possibility of nesting is not clear.
- Northern Saw-whet Owl and Chimney Swift are not known to nest in the forest. Saw-whet Owl uses the forest in migration and for overwintering and Chimney Swift have been observed foraging over the forest in day time.

Operational Standard

- Follow Table 4.2.f of the Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (OMNRF 2010); pg. 85

Value	Pale-bellied Frost Lichen (*Physconia subpallida*)
HCV category	HCV 1
Other HCV details (e.g., SAR designation, S rank)	• Provincial SAR designation: Endangered • Federal SAR designation: Endangered

Description/Habitat Guidance

- Grows on deciduous tree trunks (Ash, Black Walnut, Elm) as well as fence posts and boulders between 0.5m and 2m above ground.
- Most often found on Eastern Hop-hornbeam (Ironwood) in mature, humid forests.
- Requires high to moderate levels of shade.
- Sparsely vegetated, relatively open understory.
- Host trees often found on north facing (including northeast and northwest) slopes with a grade between 25 and 45 degrees.

Threats

- Sensitive to air pollution.
- Loss/damage by timber harvesting operations and fire.
- Sensitive to edge effects/microhabitat disturbance.

Presence/Current Status

- Not known from Northumberland County, but found in Peterborough and Frontenac Counties.
- Historic records include Brighton.

Operational Standard
• Little information is known about this species and how forest operations may affect it. • Refer to PSW. • 100m no operations buffer around occurrence. Existing roads and trails may be used as long as there is little or no site alteration that would affect microhabitat. • Within 200m of occurrence, harvesting should maintain at least 65% canopy cover. Harvest prescriptions should seek to maintain as much canopy cover as possible and suppress understory growth.

Value	Rare plants associated with Oak Savannah, Oak Woodlands and Sand Barrens
HCV category	Conservation Concern
Other HCV details **(e.g., SAR designation, S rank)**	• Autumn Coral-root (*Corallorhiza odontorhiza*): G5 S2 • Bicknell's Sedge (*Carex bicknelli*): G5 S2 • Bristly Buttercup (*Ranunculus hispidus var. hispidus*): G5 S3 • Canada Cinquefoil (*Potentilla canadensis*): G5 S2? • Cylindric (Slender) Blazing Star (*Liatris cylindracea*): G5 S3 • Grooved Yellow Flax (*Linum sulcatum*): G5 S3 • Canada Frostweed (*Helianthemum canadense*): G5S3 • Long-stalked Panic Grass (*Dicanthelium perlongum*): GNR S2 • Rue-anemone (*Thalictrum thalictroides*): G5 S3 • Sand Cherry (*Prunus pumila var. pumila*): G5 S3 • Side-oats Grama (*Bouteloua curtipendula*): G5 S2 • Sundial (Wild) Lupine (*Lupinus perennis*): G5 S3 • White-haired Panic Grass (*Dichanthelium ovale* ssp. *praecocius*): G5S3
Description/Habitat Guidance	
• Autumn Coral-root can occur in most dry, sandy woods including mature pine plantations. • Cylindric Blazing Star prefers moist sandy areas. • Rue-anemone prefers dry, open deciduous woods.	

Threats
• Habitat loss due to: 1.) forest succession/lack of disturbance, 2.) invasive species (e.g., Spotted Knapweed, Dog-strangling Vine, White Sweet Clover, Scotch Pine, Silver Poplar) • Habitat destruction due to: 1.) harvesting equipment, 2.) recreation (particularly motorized vehicles in barren areas). • Overspray by herbicide.
Presence/Current Status
• Long-stalked Panic Grass, Grooved Yellow Flax, Cylindric Blazing Star previously observed in County Forest (Brownell and Blaney 1996). • None of the other species have been recorded, but efforts to document vascular plants throughout the area are limited. • Canada Frostweed occurs in multiple open areas.
Operational Standard
• Any markings required to implement operational standards must be temporary and discreet to ensure that populations are not at threat as a result of their demarcation. • Refer to Sand Barrens and Black Oak Woodlands/ Savannah Operations Standards where applicable. • No disturbance by commercial harvesting within 20m. • Consideration of risk and alteration that may affect each species must be undertaken within 50m of an occurrence. • Restoration activities that may cause direct disturbance should be limited during the growing season and are preferably undertaken during frozen winter months. • Extra care should be taken to ensure that invasive species are not introduced/spread within the area of an occurrence.

Value	Rare plants associated with streams, wetlands and riparian areas.
HCV category	Conservation Concern
Other HCV details **(e.g., SAR designation, S rank)**	• Great St. John's Wort (*Hypericum ascyron*): G4 S3 • Green Arrow-arum (*Peltandra virginica*): G5 S2
Description/Habitat Guidance	
• Inhabits riparian areas of streams and rivers.	
Threats	
• Habitat loss due to invasive species (e.g., Dog-strangling Vine, Garlic Mustard)	

- Habitat destruction due to: 1.) harvesting equipment, 2.) recreation (particularly motorized vehicles in wet areas).
- Overspray by herbicide.

Presence/Current Status

- Great St. John's Wort: Not known from the Northumberland County Forest, but known on a neighbouring property within the Burnley Creek Headwaters wetland.

Operational Standard

- Any markings required to implement operational standards must be temporary and discreet to ensure that populations are not at threat as a result of their demarcation.
- Refer to PSW Operational Standards; this species would be protected by those standards.
- No disturbance by commercial harvesting within 20m.
- Consideration of risk and alteration that may affect each species must be undertaken within 50m of an occurrence.
- Restoration activities that may cause direct disturbance should be limited during the growing season and are preferably undertaken during frozen winter months.
- Extra care should be taken to ensure that invasive species are not introduced/spread within the area of an occurrence.

Value	Red-headed Woodpecker (*Melanerpes erythrocephalus*)
HCV category	Conservation Concern; Possible HCV1 (3 or more nesting pairs)
Other HCV details **(e.g., SAR designation, S rank)**	• Provincial SAR designation: Special Concern • Federal SAR designation: Threatened

Description/Habitat Guidance

- Prefers woodland edges and, but will inhabit open oak and beech forests, riparian forest as well as urban parkland, golf courses and pastures.
- Favours open areas with high density of standing dead trees.
- Requires standing dead trees/declining trees for foraging and nesting.
- Habitat preference may also include availability of acorns and nuts (e.g., beech nuts).

Threats

- Removal of snags and dying trees, particularly near woodland edges (conflicts with hazard tree removal for risk management at recreational trails along woodland edges.
- Use of pesticides that reduce insect abundance, especially those using standing trees and stumps.

Presence/Current Status

There are no known records of this species in the Northumberland County Forest. This is a rare species across the landscape and Northumberland County is known for its population. A single nesting occurrence of this species would be a location of Conservation Concern, while 3 or more nesting pairs would be considered for HCV 1 status.

Operational Standard

- Follow Table 4.3.f (relevant section for Breeding Habitat of Red-headed Woodpecker) of the Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (OMNRF 2010); pg. 124
- Restoration of low-density oak woodland may benefit this species, especially if it is near a woodland edge and even more so if it is abutting a pasture or native grassland.

Value	Rugulose Grapefern (*Sceptridium rugulosum*)
HCV category	Conservation Concern
Other HCV details **(e.g., SAR designation, S rank)**	• G3 S2

Description/Habitat Guidance

- Often found in previously disturbed (e.g., past grazing, cleared) low, swampy areas.
- May be found in second-growth forest, old fields and even trail sides.
- Typically found on sandy to silty soil with organic matter.
- Can be found in a variety of forest types, generally associated with moist conditions.

Threats

- Damage to individual plants by forest management operations.

- Excessive alteration to habitat, particularly soil moisture levels.

Presence/Current Status

- Reported from the Northumberland County Forest in Brownell and Blaney 1996. No recent records known.
- There has not been an effort to find this species.

Operational Standard

- Any markings required to implement operational standards must be temporary and discreet to ensure that populations are not at threat as a result of their demarcation.
- Species prefers slight to moderate disturbance, particularly to cause canopy gaps, so selection harvesting is compatible.
- Within 50m of an occurrence harvesting should only occur in winter season when ground is frozen.

Value	Rusty-patched bumble bee (*Bombus afinis*)
HCV category	HCV 1
Other HCV details (e.g., SAR designation, S rank)	• Provincial SAR designation: Endangered • Federal SAR designation: Endangered

Description/Habitat Guidance

- Habitat generalist that prefers open or semi-open habitats with flowering plants (e.g., prairies, savannah, low-density woodlands, marshes, sand dune, old field).
- Appears to prefer, or population is remnant in oak savannah.
- Active from April to October with peak population from July to September.
- Nests and overwinters in underground burrows/holes, hollow tree stumps or fallen deadwood.

Threats

- Broad-scale application of herbicides or pesticides (particularly neonicotonids) within or near regulated habitat, including areas where drift into regulated habitat may occur.
- Lack of disturbance to maintain oak woodland/savannah conditions
- Succession of openings resulting in loss of nectaring plants.
- Competition and loss of native flowering plants by invasive species with less beneficial flowers such as Dog-strangling Vine, White Sweet Clover and Scotch Pine.
    -

Presence/Current Status

There are no known occurrences of Rusty-patched bumble bee in the Northumberland County Forest. It is known from at least one location locally and possibly occurs.

Operational Standard

- Generally compatible activities include:

- Activities that help to maintain semi-open or open habitats which provide an abundance of food resources (flowering plants).
- Use of existing recreational trails.

Monitoring

- No damage or destruction of known habitat.
- Activities in regulated habitat can continue as long as the function of these areas is maintained and individuals of the species are not killed, harmed, or harassed.
- No commercial timber harvesting within 30m of nesting or hibernation site
- Known habitat includes:
  - Any area that is part of a prairie, savannah, woodland, marsh, sand dune, old field or similar area that has been used within the last 5 years.
  - Is within 500m of any area listed above and provides suitable foraging or is contiguous to this are, but is beyond 500m.
- Is beyond the above, but is within 1km and provides suitable foraging from April 1 to May 31.

Value	Sleepy Duskywing (*Errynis brizo brizo*)
HCV category	Conservation Concern
Other HCV details **(e.g., SAR designation, S rank)**	• G5 S1

Description/Habitat Guidance

- Larval food plant is oaks, particularly Bur Oak.
- Prefers oak or oak-pine forests, particularly more open and dry forest.
- Will also inhabit barrens where larval and adult (flowers for nectaring) food plants are available.

Threats

- Habitat loss due to: 1.) forest succession/lack of disturbance, 2.) invasive species (e.g., Spotted Knapweed, Dog-strangling Vine, White Sweet Clover, Scotch Pine, Silver Poplar).
- Lack of oak regeneration due to lack of fire.
- Habitat destruction due to: 1.) harvesting equipment, 2.) recreation (particularly motorized vehicles in barren areas).
- Overspray by herbicide.

Presence/Current Status

- Two records (identification unconfirmed but possible) from the 1990's in the Northumberland County Forest.
- Range is thought to be restricted to 3 locations in southern Ontario (Hamilton to Grimbsy, Lambton County and Norfolk County).

Operational Standard

- Any markings required to implement operational standards must be temporary and discreet to ensure that populations are not at threat as a result of their demarcation.
- Refer to Black Oak Woodland/Savanna and Sand Barren standards.
- Promote oak regeneration and young small oak in areas of occurrence.
- Timber harvesting within suitable habitat during winter only.
- Timber harvesting operations prohibited within 50m of known egg laying/larval sites (within 3 years of last sighting).

Value	Snapping Turtle (*Chelydra serpentina*)
HCV category	Conservation Concern
Other HCV details **(e.g., SAR designation, S rank)**	• Provincial SAR designation: Special Concern • Federal SAR designation: Special Concern

Description/Habitat Guidance

- Shallow water with a soft mud bottom and dense aquatic vegetation.
- Females lay eggs in sandy or gravelly areas.
- Females and hatchlings travel overland between wetlands and nest sites.

Threats

- Habitat destruction due to: 1.) harvesting equipment, 2.) recreation (particularly in nesting areas such as sand roads and paved road shoulders
- Direct mortality from: 1.) motorized recreation vehicles, 2.) harvesting machinery

Presence/Current Status

There are a few records of Snapping Turtle in the Northumberland County Forest. One observation appeared to be a female laying eggs on a forest road and a second observation was of a road killed individual near a pond. It is possible that there are others, particularly in some of the slower reaches of the Burnley Creek Headwaters wetlands.

Operational Standard

- Any markings required to implement operational standards must be temporary and discreet to ensure that populations are not at threat as a result of their demarcation.
- 30m operations buffer around suitable aquatic areas during non-hibernation months.
- Operations prohibition near nesting sites and travel corridors during non-winter months (if identified).
- Avoid developing road and trail networks in suitable aquatic areas.
- Whenever possible harvest areas within 250m of aquatic areas during hibernation

Value	Stick nests; common raptors (Barred Owl, Great Horned Owl, Long-eared Owl, Common Raven, Red-tailed Hawk, Broad-winged Hawk, Cooper's Hawk, Sharp-shinned Hawk, or Merlin)
HCV category	Conservation Concern
Other HCV details **(e.g., SAR designation, S rank)**	• Provincial SAR designation: N/A • Federal SAR designation: N/A
Description/Habitat Guidance	
• Not applicable. Inhabit a variety of habitats. Focus is on located nests. • Operational standard applies to nests used within 5 years.	
Threats	
• Damage/disturbance by operations.	
Presence/Current Status	
• All species are found throughout the Forest.	
Operational Standard	
• Follow Table 4.2.e of the Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (OMNRF 2010); pg. 82	

Value	Stick nests; uncommon raptors (Red-shouldered Hawk and Northern Goshawk)
HCV category	Conservation Concern
Other HCV details **(e.g., SAR designation, S rank)**	• Provincial SAR designation: Not at Risk • Federal SAR designation: Not at Risk • Uncommon stick-nesting raptors (Stand and Site Guide)
Description/Habitat Guidance	
Red-shouldered Hawk • Retain wildlife trees and downed woody material within the harvest area • Nests in dense, mature hardwood forest, especially bottomland forest. • Selective cutting that creates small openings in large forest stands may be the best habitat management treatment. • Managing for a crown closure of greater than 70% should prevent red-tailed hawks from displacing red-shouldered hawks. Northern Goshawk	

- Prefers mature trees for nesting and mature forest for foraging, but will inhabit a variety of forest ages and types.
- Prefers forest with canopy closure > 60% with an open understory.

Threats

- Significant alterations to habitat especially mature forest cover.
- Disturbance by equipment/operations.
- Displacement by Red-tailed Hawks (Red-shouldered Hawks only).

Presence/Current Status

Red-shouldered Hawks are found throughout the Northumberland County Forest, but there are no known nests of this species. Northern Goshawks are only found in a few locations, particularly at the northern edges of the Forest. There are no Goshawk nesting locations on record.

Operational Standard

- Follow Table 4.2.d of the Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (OMNRF 2010); pg. 77

Value	West Virginia White (*Pieris virginiensis*)
HCV category	Conservation Concern
Other HCV details **(e.g., SAR designation, S rank)**	• Provincial SAR designation: Special Concern • Federal SAR designation: N/A

Description/Habitat Guidance

- Inhabits mature or semi-mature, moist deciduous and mixed-deciduous woods (often dominated by Sugar Maple) with closed canopy and abundant herb layer and poorly developed shrub layer.
- Depends on host plants in the Mustard (Crucifer) family toothwort as the only larval food source. Commonly selects Two-leaved Toothwort (*Cardamine diphylla*), especially where large patches occur.
- Adult emerges April – May and dies by late June. Overwinters as pupa.

Threats

- Damage/destruction of larval foodplant and larval foodplant habitat requirements by forestry operations.
- Reduced canopy cover.
- Loss of larval foodplant because of invasive species (e.g., Dog-strangling Vine, Garlic Mustard).
- Garlic mustard may be used for egg laying, but larva cannot survive due to toxicity from leaves. It has been identified as one of the most serious threats (Burke 2013).
- Other threats identified (Burke 2013) include: damage to habitat by Off-road Vehicles and collection of spring wildflowers for food.

Presence/Current Status
• Not known to occur.
Operational Standard
• Any markings required to implement operational standards must be temporary and discreet to ensure that populations are not at threat as a result of their demarcation. • Follow Table 4.3.c of the Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (OMNRF 2010); pg. 111 • Combat Garlic Mustard in suitable habitat. • Light selective harvest should be used to maintain canopy cover (>60%, although ideally >75%). Harvesting and equipment travel through patches of toothwort prohibited where West Virginia White exists.

Value	Western Chorus Frog (*Pseudacris triseriata*)
HCV category	Conservation Concern
Other HCV details **(e.g., SAR designation, S rank)**	• Provincial SAR designation: Not at Risk • Federal SAR designation: Threatened
Description/Habitat Guidance	
• Inhabits marshes or wooded wet areas. • Uses temporary wetlands (seasonally dry wetlands without predators) for breeding • Forages and hibernates in terrestrial lowlands • Hibernates underground or beneath rocks, dead trees, or leaves.	
Threats	
• Habitat loss due to destruction or alteration of wetlands and surrounding terrestrial areas • Direct mortality of adults and tadpoles due to ATV's in wetland areas • Sensitive to pollutants, particularly herbicides and pesticides.	
Presence/Current Status	
One occurrence known in the forest from a seasonally inundated area that is highly damaged by motorized recreational vehicle use. Damaging use tends to occur particularly during the breeding season. It is possible that this species inhabits other areas but has not been encountered by surveyors.	
Operational Standard	
• 50m operations (e.g., timber harvesting, herbicide use) buffer around significant Woodland pool (i.e., pool >500m^2). Although this would be increased to 100m from April 1 to November 15. • Avoid developing road and trail networks in aquatic areas.	

Value	Wood Thrush (*Hylocichla mustelina*)
HCV category	Conservation Concern
Other HCV details **(e.g., SAR designation, S rank)**	• Provincial SAR designation: Special Concern • Federal SAR designation: Threatened
Description/Habitat Guidance	
• Prefers moist, deciduous hardwood or mixed stands, often previously disturbed (e.g., small-scale logging and ice storm damage), with a dense deciduous undergrowth and with tall trees for singing perches • Prefers canopy cover >/=70%, but with openings that promote growth of understory trees/uneven aged forest. • Selective logging, that maintains preferred habitat for this species may have little negative impact.	
Threats	
• Forest succession into even-aged, closed canopy forest. • Lack of understory succession. • Understory competition by unsuitable, invasive species (e.g., European Buckthorn)	
Presence/Current Status	
Occurs in multiple locations throughout Forest. Not a common species, but widespread especially in the eastern and westernmost ends of the Forest.	
Operational Standard	
• Within 250m of known nesting areas, maintain canopy cover >=70% • Where this species occurs, increase rotation periods to allow for old, large trees. • Harvest during non-breeding and non-migratory seasons.	

Habitat/Ecosystem Areas of Concern

Value	Black Oak Woodland, Oak Savannah
Category	HCV 2
Other HCV details **(e.g., SAR designation, S rank)**	• Dry Black Oak Tallgras Savannah (S1,G3) • Moist-Fresh Black Oak Tallgrass Savannah (S1,G2) • Moist-Fresh Black Oak-White Oak Tallgrass Woodland (S1,G2) • Dry Black Oak-White Oak Tallgrass Woodland (S1,G?) • Dry Black Oak-Pine Tallgrass Savannah (S1,G?) • Dry Black Oak Deciduous Forest (S3, G4?)
Description/Habitat Guidance	

Black Oak Woodland and Oak savanna can take many forms along a spectrum of canopy cover and tree species composition. Generally it is more open and has a high proportion of black oak, red oak and white oak on upland sites. Understory plants are also good indicators and include some combination of:

- New Jersey Tea
- Sweet Fern
- Arrowwood
- Maple-leaved Viburnum
- Fragrant Sumac
- Bracken Fern
- Woodland Sunflower
- Butterflyweed
- Wild Bergamot
- Frostweed
- Wood Lily
- Indian Grass
- Big Bluestem
- Canada Wild Rye
- Switchgrass

Threats

- Habitat loss due to: 1.) forest succession/lack of disturbance, 2.) invasive species (e.g., Spotted Knapweed, Dog-strangling Vine, White Sweet Clover, Scotch Pine, Silver Poplar)
- Habitat destruction due to: 1.) harvesting equipment.
- Disturbance of roadside vegetation during road work.

Presence/Current Status

Found throughout the County Forest in different condition/quality as well as with varying characteristics and composition. There is no definable best state, but indicators can be used for quality (e.g., Nature Conservancy of Canada report). Areas that are maintained in GIS database (as shown on maps in this report) are currently prioritized.

Operational Standard

- No prohibitions as selective harvesting can benefit this forest type. These activities are Best Management Practices.
- Care must be taken to ensure that any sand barrens or meadow areas are left unimpacted.
- Non-oak species should be primarily targeted.
- Operations occur once ground is frozen to minimize invasive species potential.
- Operators should not travel through patches of New Jersey Tea or Sweet Fern, but canopy openings near concentrations of these species are beneficial.
- Care should be taken when siting landings as open areas may have sensitive species. Creating new openings in forest, particularly in conifer-dominated areas preferable.
- All roadwork should be pre-screened with consideration to any important concentrations of rare/uncommon vegetation (e.g., New Jersey Tea, Big Bluestem, Indian Grass, Woodland Sunflower).

Note: Operational standards in this HCV will also benefit: Mottled Duskywing and Eastern Hog-nosed Snake.

Value	Ponds
HCV category	Conservation Concern
Other HCV details **(e.g., SAR designation, S rank)**	• Provincial SAR designation: • Federal SAR designation:

Description/Habitat Guidance

- There are 6 small ponds within the Northumberland County Forest.
- Most ponds are small <0.5ha and have been constructed for fire protection or for livestock watering.
- Although no fish species (except invasive Goldfish in one pond) are known to exist in these ponds, they are important for frogs, turtles and in one case Eastern Newt. As well, they are an important resource to other wildlife that rely on them for food and water.
- Ponds are locally uncommon to rare.
- Although they may not meet the definition, we will treat them all as Ponds with moderate potential sensitivity (MPS ponds) to forest management.

Threats

- Negative impacts related to silvicultural activity.
- Damage by recreational users, especially motorized users (ATVs and Off-Road Motorcycles) as well as horses entering them to drink.

Presence/Current Status

- Per description.

Operational Standard

- Follow Table 4.1.a (MPS ponds) of the Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (OMNRF 2010); pg. 39

Value	Provincially Significant Wetland (PSW)
Category	HCV 3
Other HCV details **(e.g., SAR designation, S rank)**	

Description/Habitat Guidance

- Burnley Creek Headwaters Wetland Complex.
- Identified as a Provincially Significant Wetland based on the Ontario Wetland Evaluation System.
- Stream will be considered a “Stream with high potential sensitivity to forest management operations” (HPS streams) as it is a coldwater stream known to contain Brook Trout.

- Contains regionally tree species (Black Spruce, Tamarack) as well as regionally uncommon bird species (White-throated Sparrow, Nashville Warbler) and a small population of species-at-risk (Canada Warbler).
- Other wildlife (e.g., Odonata and Lepidoptera) have not been adequately surveyed in this area.

Threats

- Negative impacts as a result of nearby silvicultural operations.
- Damage by recreational users, especially motorized users such as ATV's and Off-road Motorcycles.

Presence/Current Status

- Present east to west across the northern portion of the County Forest east of County Road 45, as well as at the north end of a small block on the west side of County Road 45.

Operational Standard

- First, follow Table 4.1.c (PSW) of the Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (OMNRF 2010); pg. 56
- Secondly, follow Table 4.1.b (HPS streams) of the Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (OMNRF 2010); pg. 48

Value	Sand Barren
Category	HCV 2
Other HCV details **(e.g., SAR designation, S rank)**	• Hay Sedge Sand Barren (S1,G?) • Dry Hay Sedge Sand Barren (S1,G?) • Slender Wheat-grass Sand Barren (S1,G?) • Dry Sweet Fern Sand Barren (S1, G?) • Bracken Fern Sand Barren Type (S2, G?)

Description/Habitat Guidance

- Open sandy areas with little or no vegetation.

Threats

- Habitat loss due to: 1.) forest succession/lack of disturbance, 2.) invasive species (e.g., Spotted Knapweed, Dog-strangling Vine, White Sweet Clover, Scotch Pine, Silver Poplar)
- Habitat destruction due to: 1.) harvesting equipment, 2.) recreation (particularly motorized vehicles in barren areas).

Presence/Current Status

- Slender Wheat Grass sand barren exists north of Dunbar Road, immediately east of County Road 45.

- Small areas that could be considered Dry Sweet Fern Sand Barren and Bracken Fern Sand Barren exist around larger sand barrens and within some Black Oak Woodlands.
- Other open sand barrens that do not fit the above categories exist throughout the Northumberland County Forest.

Operational Standard

- No equipment operation or disturbance where sand is exposed except for restoration activities.
- Harvesting activities should maintain a buffer of 20m from habitat edge where only felling and extraction are permitting. Habitat edge may include areas of non-exposed soil, but where associated vegetation exists.
- Extraction trails and harvester routes must be perpendicular to the edge of a sand barren within the 20m buffer.
- Equipment must be cleaned prior to being brought on site.
- Invasive species such as Dog-strangling vine, White Sweet Clover and Spotted Knapweed Should be treated (seeds removed at the very least) prior to harvesting in abutting stands.
- Areas within 150m of the edge of a sand barren must be harvested between October 1 and April 1 to minimize potential to breeding birds (e.g., American Woodcock, Common Nighthawk) and Tiger Beetles.
- Heavier cuts within 50m of a sand barren edge can be beneficial.
- Silvicultural prescriptions and management activities should seek to promote oak and white pine around sand barrens.

Cultural Areas of Concern

Value	Historic homesteads or other buildings.
Category	Conservation Concern
Other HCV details **(e.g., SAR designation, S rank)**	

Description/Habitat Guidance

- Locations of known buildings and other homestead accessories such as wells. Generally apparent because of old foundations
- Locations that were known to have a building, but there is no evidence on site (e.g., from old map).

Threats

- Damages by equipment during operations.

Presence/Current Status

Found throughout the Forest, these homesteads generally date anywhere from the early 1800s to 1950s. Not all locations are known or well-mapped. There can be difficulty in identifying all accessory areas. Improvements in mapping locations and collecting history data are needed.

Operational Standard
• No operating equipment or tree felling within 30m of buildings or ground-based evidence of buildings.