

# Guidelines for Managing Canada Warbler Habitat in the Atlantic Northern Forest of Canada



## Acknowledgments

This project originated from Canada Warbler International Conservation Initiative (CWICI) work towards a full life-cycle conservation plan. At a 2015 CWICI workshop, habitat requirements of the Canada Warbler on the breeding grounds was identified as a major knowledge gap. One of the most widely-supported actions was to develop guidelines for those interested in conserving or managing Canada Warbler habitat. Pour la version française, cliquez ici.

Environment and Climate Change Canada (ECCC) contributed in part to the preparation of these guidelines with a contract to High Branch Conservation Services. The project builds upon a recent effort, funded by the Northeast Regional Conservation Needs Program, to develop habitat guidelines for the Northeast and Mid-Atlantic regions of the United States. We thank the twenty-one conservation, wildlife, and forestry professionals from nine regions (provinces and states) who provided comments on earlier drafts of this publication. We are also grateful to those who generously provided unpublished reports, photos, and expert opinion, including: Karen McKendry (Nova Scotia Nature Trust), Doug Van Hemessen (Nature Conservancy of Canada), Patrick Nussey (Nature Conservancy of Canada), and Sean Lemoine (Canadian Wildlife Service). Finally, we acknowledge the experts who contributed to the related US publication, Guidelines for Managing Canada Warbler Habitat in the Northeast and Mid-Atlantic Regions.

Recommendations made in this report reflect the authors' opinions and are based on a thorough review of the relevant literature, including an analysis of habitat in western Nova Scotia and several empirical studies conducted within 150 km of the focal region in Vermont, New Hampshire, and Maine. Future updates of this document should incorporate new knowledge and results from eastern Canada as they become available.

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Report template by Dan Lambert and Len Reitsma. Cover photos: top row (l-r) Nature Conservancy of Canada, Len Reitsma, Laura Achenbach and John Brazner; center William H. Majoros (CC BY-SA 3.0), bottom row (l-r) Andy Reago and Chrissy McClarren (CC BY 2.0), Brian Gratwicke (CC BY 2.0), Andy Reago and Chrissy McClarren (CC BY 2.0).

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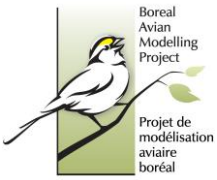




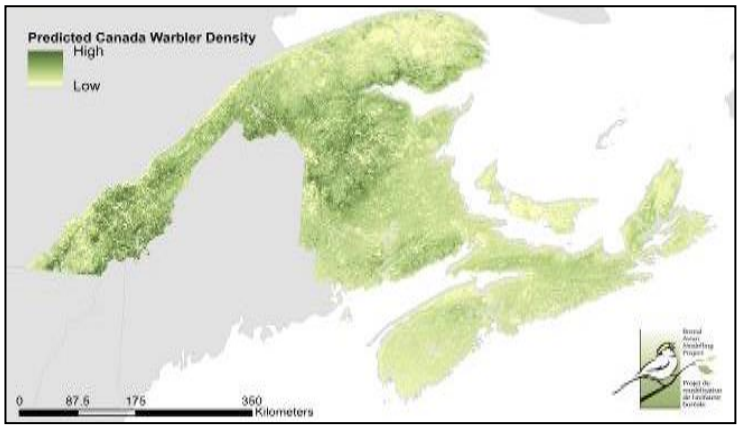
# Contents

## Introduction

*Species profile*

The Canada Warbler (*Cardellina canadensis*) is a small, active songbird with a slate-colored back, bright yellow underparts, and a distinct whitish eye-ring. A necklace of bold, black streaks adorns males of the species, but is less distinct on females and young birds. This long-distance migrant is insectivorous and relies on dense understory vegetation for foraging and cover.[1,2] It nests in forests on or near the ground, usually in mossy hummocks or beneath root masses, ferns, or other ground features.[3,4] Its breeding range extends from eastern British Columbia, across southern Canada and the Great Lakes region to Nova Scotia as well as south along the Appalachian highlands from New England to northern Georgia. Canada Warblers overwinter in northwestern South America, primarily in and east of the Andean foothills.[5]

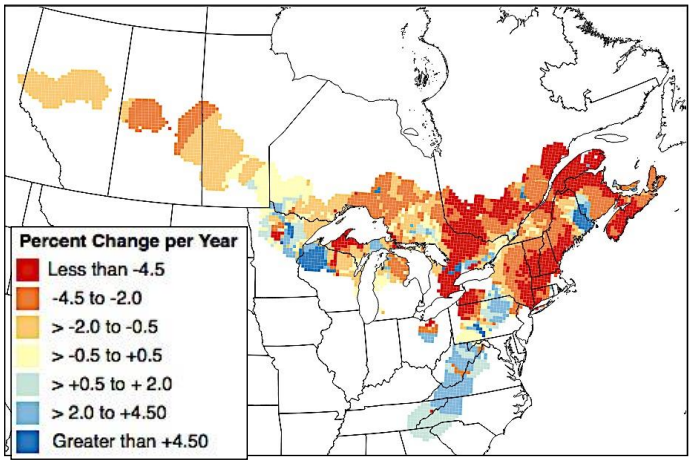
The Atlantic Northern Forest of Canada includes the Canadian portion of Bird Conservation Region (BCR) 14. This encompasses the Gaspé Pensinula and South St. Lawrence River of Québec (QC), New Brunswick (NB), Nova Scotia (NS) and Prince Edward Island (PEI).




Predicted population density of Canada warbler in the Atlantic Northern Forest of Canada in 2012, ranging from low to high.[48]

In this region, Canada Warblers are often found in moist-to-wet deciduous and mixed forests with a dense understory of shrub or fern foliage, openings in the canopy, emergent song perches, and uneven ground littered with woody debris.[6,7] Forested wetlands, bog edges, riparian thickets, and small seeps between upland forest stands provide suitable habitat for this insectivore, as do regenerating harvest gaps, and natural canopy gaps in wet forests. Habitat requirements in much of this region share some similarities with the northeastern US, where Canada Warblers are most abundant in moist deciduous and mixed forests that feature canopy openings,[8,9] exposed song perches and uneven ground littered with woody debris.[4,6,10] Breeding territories often occur in clusters[11] which consist of several breeding pairs in relatively close proximity to each other. In the Canadian portion of BCR 14, Canada Warblers typically arrive in mid-to-late May and leave for their wintering grounds in late August.[12]

*Status and conservation concerns*



Canada Warbler population trends, 1966-2012.[49]

The Canada Warbler is listed as Threatened in Canada under the *Species at Risk Act*[13] and as a Species of Greatest Conservation Need in nearly every US state where it breeds. Provincially, it is listed as Endangered in Nova Scotia,[14] Threatened in New Brunswick,[15] and as a species likely to be designated as threatened or vulnerable in Québec.[16] Its NatureServe ranking is S3B (uncommon, breeding) in Nova Scotia and New Brunswick, S2M (imperiled, migrant) in PEI, and S3S4B (uncommon to widespread, breeding) in Québec.[17,18] Canada Warbler populations in BCR 14 have declined by an average of 4.2% per year since 1970 and 2.9% per year since 2005, with the strongest declines occurring in New Brunswick.[19]

The decline could be partly explained by low survival of first year birds,[20] particularly on the wintering grounds where agricultural development has caused significant forest loss and fragmentation. Canada Warblers also face a relatively high risk of mortality from collisions with buildings during migration.[21] Threats to breeding habitat vary regionally, but include loss of forested habitat, degradation of wooded wetlands, and over-browsing of the understory by deer.[5] Effects of these factors on Canada Warbler populations in the Atlantic Northern Forest remain unknown. Likewise, it is not clear how forest management has influenced regional populations.

Canada Warblers receive legal protections under the Species at Risk Act,[13] that states no person shall kill, harm, harass, capture or take an individual nor damage or destroy its residence (i.e., nest) or critical habitat (if designated). The Government of Canada's Recovery Strategy for the Canada Warbler (*Cardellina canadensis*) in Canada contains more discussion of issues related to habitat quantity and quality.

*Purpose of the guidelines*

The purpose of these habitat management guidelines is to describe the conditions and processes thought to benefit Canada Warblers and other native species that depend on similar habitats in the focal region (see Table 1 for a list of associated species). We hope that public and private land managers, forestry professionals, and conservation planners find the guidelines useful in accomplishing their stewardship objectives.

Effective approaches to conserving Canada Warblers and associated species will vary throughout the region, depending on prevailing land uses, threats to the species, and wildlife management priorities. In recognition of this heterogeneity, these guidelines offer a range of forest conservation and management strategies that can be selectively applied based on local knowledge and stewardship objectives. We separate sections of the guidelines into two groups: those targeted at wet-poor forest ecosystems, and those for upland habitats. In general, forest preservation may be effective for sustaining Canada Warbler populations on large tracts that contain the requisite wet mixedwood/deciduous forest composition, vertical canopy structure, and ground complexity. Harvest-based strategies are likely to be most useful in areas of active forest management, especially large holdings that include upland habitats and/or forested wetlands. In these areas, managers can ensure that suitable habitat for Canada Warbler is growing into place as older habitat ages or is removed by harvesting.

This report summarizes our best understanding of how landscape and stand-level features relate to Canada Warbler abundance in the Atlantic Northern Forest. However, few studies have examined Canada Warbler habitat quality or response to forest management in the eastern provinces. Therefore, descriptions of desired conditions and recommended practices draw heavily from research conducted in adjacent regions (primarily the northern New England states of Vermont, New Hampshire, and Maine). We advise caution in applying these guidelines to areas with very little empirical data (*e.g.*, PEI and QC), and suggest this document be periodically updated to reflect new knowledge.

## Where to Create and Sustain Habitat

*Landscape characteristics*

Efforts to conserve Canada Warbler habitat should focus on forested ecosystems that are likely to maintain suitable conditions over time, especially poorly drained areas where saturated soils and standing water favor the dominance of shrubs in a treed habitat with broken canopy cover. Wetland and riparian forest canopies are frequently disturbed by beaver activity and by the mortality and subsequent uprooting of shallow-rooted trees, which creates canopy gaps and promotes the growth of dense

Canada Warbler habitat on the Chignecto Isthmus of Nova Scotia, near Pugwash. Characteristic dense shrubby understory in canopy gaps, among small trees, provides ideal cover for nesting and foraging. Photo by Nature Conservancy of Canada.

shrubby understory that provides protective cover for nesting and foraging. In addition, swamps and streamside forests supply abundant flying insects to feed breeding adults and their offspring.

Landscapes managed for forest products, among other values, can also supply Canada Warbler habitat. A well-planned harvest regime can ensure a spatially dynamic and continuous supply of young forest that can provide habitat characteristics needed by this species, if the effects of fragmentation are limited. A viable forest products industry may also safeguard against agricultural, residential, and urban development, which have degraded breeding habitat in more densely populated regions, particularly in the northeastern US.

Locations of Canada Warblers (yellow circles) defending breeding territories near recent clearcuts (~2-5 years) in southwestern Nova Scotia. Data from Cindy Staicer, Dahousie University; basemap © ESRI 2014

Silvicultural approaches to habitat management are best suited to large industry holdings and Crown lands leased for forestry operations. These present the opportunity to maintain desired conditions across major management units. Small woodlots and forest reserves can play a complementary role if they help to uphold wetland integrity and forest cover across the region.


Deciduous shrubs, saplings, and small trees (2-6 m high) provide ideal cover for Canada Warbler nesting and foraging in a mature stand. Photo by Ben Kimball.

Landscape configuration of Canada Warbler appears to be important. Levels of abundance and occupancy are positively correlated with forest area and continuity.[22–24], although the minimum required area is not known. For most of this region, Canada Warblers preferentially select landscapes with >50% forest cover,[25] especially in those landscapes that contain woodland tracts of 400 hectares or more.[24] Another study, from the northeastern US, found that where Canada Warblers use wet areas they are more likely to

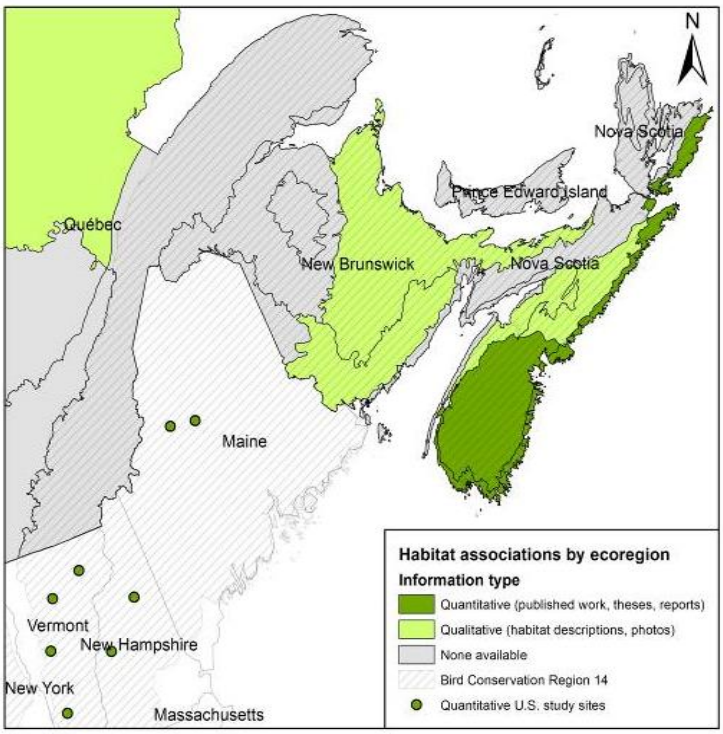
inhabit small forested wetlands than large open wetlands or forested wetlands isolated by development. Also, treed swamps with heterogeneous edges and long, irregular perimeters appeared to offer more habitat value than those with simple boundaries.[22]

The accompanying map products, "Spatial Management Planning for Canada Warbler in the Atlantic Northern Forest" (available via Nature Canada and BAM), give insight into opportunities for conservation and management. These products detail scenarios for areas intended for forest preservation, and for areas under active forest management. These will help users target areas for management interventions as well as avoid impacting high population centres for the Canada Warbler. We encourage managers and woodlot owners to download these products and consider their relevance to their own land holdings.

**Desired Habitat Conditions**

*Forest composition*

Composition of Canada Warbler habitat has been researched unevenly across the Atlantic Northern Forest (see map at right), but a growing number of studies suggest some variation in habitat association across the region. Across most of Atlantic Canada, this species is found in wet areas, including treed swamps, treed fens, and treed peatlands. At higher elevations, they also use talus slopes and upland seeps embedded within hardwood stands. We were unable to find suitable studies and data for the development of these guidelines in Cape Breton (NS), the Gaspé Peninsula and South St. Lawrence (QC), or PEI (though PEI lacks evidence of an established breeding populations). As such, we recommend these guidelines be interpreted with caution and may not be suitable in areas with no quantitative or qualitative information (see map). In particular, users should be cautious in the inland northeastern portion of the Gaspé Peninsula in Québec, which represents the border between the Great Lake-St Lawrence forest and the Acadian forest, as well as any areas considered boreal or hemiboreal forest zones within BCR14.




Map showing available data on Canada Warbler habitat in the Canadian ecoregions of the Atlantic Northern Forest, as well as sites from the U.S. for which quantitative data is available.

In mainland Nova Scotia, Canada Warblers breed in wet canopy gaps of mixedwood forest with a large component of black spruce, red maple, and to a lesser extent, red spruce and balsam fir. Shrub species include speckled alder, wild raisin, mountain holly, rhodora and/or Canada holly with an understory of cinnamon fern and sphagnum moss. Canada Warbler habitats mainly occur in Nova Scotia Forest Ecosystem Classification ecosites 4, 8, and 12.[6] Rarely, Canada Warblers are found in eastern white cedar swamps in southwestern Nova Scotia and New Brunswick.

Canada Warbler habitat in a red maple swamp, with a wet forest floor and thick cover of cinnamon fern. Photo by John Brazner & Laura Achenbach.

In southern New Brunswick, Canada Warbler breeding habitats are similar in vegetation composition to Nova Scotia, but with more sphagnum moss and less cinnamon fern. Bare ground has been observed at some sites, as well as a prevalence of balsam fir regeneration. In some areas of New Brunswick and PEI, this species uses more calcareous wetlands, including seeps in upland hardwood habitats with Wyellow birch and black ash. In Québec, Canada Warblers make greater use of seeps between upland habitats than wet forest sites, as well as regenerating forest stands, though data are scarce.

However, information about Canada Warbler productivity is not available from the Canadian portion of the Atlantic Northern forest and further research is needed to fill data gaps. Still, research conducted in adjacent states indicate that that Canada Warblers select habitat based more on understory structure than vegetation species composition.[10,27]

*Forest structure*

Throughout this region, Canada Warblers select structurally complex forests featuring a broken or partially open canopy with prominent song perches visible above a leafy understory and uneven forest floor.[6,28,29] However, in Québec, one study found that Canada Warblers will use stands with canopy cover of at least 80%, as well as strong sapling cover.[26] Canada Warblers will use both unharvested wet forests, as well as regenerating mesic and upland areas following even-aged and partial harvests.[1,4,8,9,30–34]

Specific elements contributing to structural complexity differ somewhat among regions, landforms, and forest types. Although most of the studies referenced were conducted outside the Canadian portion of BCR 14, the conditions described are generally consistent with qualitative descriptions of Canada Warbler habitat in the Atlantic Northern Forest (with exceptions in Québec, though these guidelines may best apply to the Sugar Maple – Linden forest areas).

In general, for both mature wet forest and regenerating upland forest, we recommend the following structure:

- Canopy height (overstory): <16 m [6,10,27,35]
- Canopy cover (overstory): 5-85% [6,8,9,32,34–36]
- Basal area of overstory trees: <20 $m^2$/ha [6,8,9,32,36]
- Subcanopy height: 1.8-5 m [6,27,34,37]
- Subcanopy cover: 40-70% [4,6] with high foliage volume [29]
- Moderate to high density of woody shrubs and saplings [4,29,34]
- ≥ 12 song perch trees[1] per ha; may occur individually, at the edges of forest openings, or aggregated in small groups so as to provide 5-10 "singing areas" per ha [29,35]
- ≥ 4.5 m of open canopy around or adjacent to each of these singing areas [29,38–40]

Male Canada Warbler singing from display perch Québec. Photo by Carl Savignac.

Dense shrub cover of speckled alder (*Alnus incana* subsp. *incana*) in Canada Warbler habitat in south-central Nova Scotia. Photo by Cindy Staicer.

Canada Warblers nest in area of high downed woody debris and high ground cover for concealment. Photo by Michael Williams.

[1] Whereby song perch trees are any tree that emerges above the subcanopy (≥ 3 m) and is spatially distinct from neighbouring trees

- Uneven forest floor with downed woody material (logs, branches, stumps, and root masses) comprising >10% of the ground cover [3,4,6,35]
- Moderate to high herbaceous plant, fern and moss cover (but not strictly ferns) [25,35]

To function as Canada Warbler habitat, suitable forest structure should predominate over at least 0.5 ha, the average size of a territory core. Because full territories average between 0.7 and 1.5 ha and are frequently clustered in neighborhoods,[11] large patches with > 4 ha of suitable habitat offer more value than small patches. Forested connections among habitat patches also enhance their value.

*Forest age and configuration*

As Canada Warblers breed in both uneven-aged forests, including mature wet forests,[6,27] and young, even-aged stands (saplings to poles),[1] we separate our recommendations based on forest group: mature wet forest, and upland regenerating forest.

*Mature wet forest*

- Forested wetlands and naturally disturbed areas in old forests (such as those maintained by gap dynamics) often provide habitat where occupancy can be sustained over time, unlike harvested areas, which undergo successional changes.
- Habitat quality may be higher in naturally occurring wet forests than human-disturbed upland forests, but the data required for such a comparison are lacking.[29]

*Upland regenerating forest*

- Light partial harvests which retain understory shrubs and residual trees may increase abundance of Canada Warblers over other harvesting methods like clearcuts.[4,8,9,31]
- Based on review of areas where harvests have occurred, Canada Warblers are most abundant after regenerating saplings become well established among residual trees, providing suitable structure after 3-10 years, and persisting for a further 15 years or more. Timing is influenced by site conditions, pre-existing and retained understory, and browsing pressure, and likely neighbourhood demographics.[4,8,26,33,34,36,41,42]
- Abundance decreases as shrub layer cover is reduced.[23]
- Canada Warblers may not colonize in clearcuts > 1 ha if no trees are retained. However, males may use perimeter trees for song perches and visual display.[4]
- Residual patch retention of at least 30%, preferably in large groupings of trees, may promote Canada Warbler abundance.[38,40,43]

**Recommended Practices**

Based on reviewing scientific literature for potential effects of common conservation and forestry practices on Canada Warbler, we recommend the following general methods to maintain and create habitat. Each province administers regulations to protect habitat along watercourses, in wetlands, and in other habitat occupied by species at risk. Refer to Appendix I for a summary of legal requirements in your region.

Specific interventions should be tailored to each site's conditions and regional context. In certain areas, the best approach to sustaining Canada Warblers and associated species may be conservation of forested tracts that include suitable habitat. Elsewhere, active management may be effective at promoting desired conditions. Managers can refer to the appropriate spatial prioritization that accompanies this report for suggested areas to apply conservation and management techniques on their landholdings. Managers who encounter difficulty in selecting among land conservation and forest management practices are encouraged to consult their local or provincial wildlife biologists for guidance. For definitions of forestry terminology, see this glossary.

*Land conservation*

We recommend the strategies below for use by conservation planners and land trust personnel working in regions with low to moderate levels of human development. These may also be appropriate for designating reserves or special treatment areas in managed forest landscapes. See Scenario 1 maps for suggested conservation areas.

- Focus conservation resources on large forested areas (>400 ha) where Canada Warblers are known to occur, especially where wet forest, dense understory, and relatively open canopy are naturally maintained (*e.g.*, red maple swamps, peatlands, ravines, and treed bogs). Minimize forest loss and fragmentation within such areas and consider reforestation of adjacent lands as opportunities allow.
- Conserve forest blocks with low edge-to-interior ratios to maximize forest cores and minimize edge effects such as nest predation and penetration of invasive plants. For guidance, refer to ECCC's publication "How Much Habitat Is Enough?".
- Connect suitable habitat patches with forested corridors to connect individuals with potential breeding sites during dispersal. Shrubby utility rights-of-way may serve this connecting function. Develop easements and stewardship plans that allow for forest management where it has potential to improve Canada Warbler habitat.
- Consider connectivity at regional scales.

*Forest management planning and forestry operations*

The following strategies are intended for landowners, land managers, and forestry professionals.

- To provide a continuous supply of breeding habitat, always maintain 12-20% of the managed forestland in a suitable condition.
- Avoid harvesting and road building in forested wetlands.
- Use natural Canada Warbler population centres (*e.g.*, red maple swamps, black spruce/red maple bogs) by harvesting nearby upland stands at least every 15 years.
- Implement silvicultural systems that are most likely to produce the desired conditions: gap-group shelterwood cuts, seed-tree cuts, and clearcutting with reserves.
- Where engaging in natural dynamics forestry, harvest trees in 0.2-0.8 ha groups, with mid-story trees left scattered in the openings. Spatially and temporally cluster the harvests to increase probability of occupancy.
- Maintain a mix of hardwoods and softwoods at stand and landscape levels by using natural regeneration forestry and limiting hardwood herbicides on softwood sites.
- Implement thinning and/or crop-tree release after the stand height exceeds 4.5-6 m to open the canopy and enhance understory structure (see top right).
- In harvest areas >1 ha, retain at least 12 standing trees/ha that reach at least 1 m above the subcanopy and range from large saplings to trees <15 m in height. They should be dispersed individually or grouped in 5-10 clumps (depending on conditions and tree species), with at least 4.5 m of separation among these singing/visual display centres.

Stand in northern Maine, thinned stand in o promote dense understory structure. Photo by Dan Lambert.

Manual and cut-to-length harvesting affords opportunities to enhance forest floor structure by topping and delimbing at the stump. Harvests conducted by feller-buncher call for other approaches to retain debris on site, including retaining low-quality standing trees. Photo by Bill Stack.

- Follow ECCC's guidance to reduce incidental take for technical information on nesting periods and zones to support activity planning to reduce risks to migratory birds, their nests and eggs. Avoid engaging in potentially destructive or disruptive activities in key sensitive periods and locations. If nests containing eggs or young are encountered, the area should be avoided until the young have naturally left the vicinity, even if the nest was found outside the dates of the general nesting period.
- Minimize compaction of soil (especially organic surface horizons) and removal of ground vegetation, moss cover, downed woody material, stumps, hummocks, and root masses of ferns and trees. These essential habitat features conceal nests and offer protective cover to parents tending eggs and young.
- Where possible, harvest on snowpack and restrict heavy machines to temporary routes and landings.
- Protect patches of advanced regeneration and woody material by minimizing travel and maximizing trail-spacing and machine reach. Patches measuring 0.1-0.2 ha may serve as future territory cores.
- If practical, top and delimb trees near the stump to enhance woody debris and forest floor structure.

*General Recommendations*

- Restrict off-road use of all-terrain vehicles.
- Limit beaver trapping where they are not damaging roads or high-value timber, as they create irregular wet habitats used by Canada Warblers.
- Follow best practices in invasive plant control in areas where invasive plants are common or a threat.

## Managing for Multiple Benefits

Current understanding of Canada Warbler ecology is incomplete, particularly with respect to area requirements, site fidelity, population characteristics, and reproductive performance. However, we can use knowledge of this bird's habitat associations to provide a foundation for stewardship actions that benefit wildlife and people.

*Associated species*

Throughout the year, a wide variety of native wildlife makes use of the dense cover and abundant food resources that characterize regenerating forests and canopy gaps within mature forests. Table 1 lists species likely to co-occur with Canada Warblers, although associated species may vary throughout the range. Maintaining uneven-aged moist-to-wet mixedwood and deciduous forests, as well as open bogs, shrub swamps, and herbaceous/shrub floodplains as Canada Warbler habitat could benefit co-occurring species, such as the Olive-sided Flycatcher and Rusty Blackbird.[6]




Managing forests for Canada Warblers may also benefit other listed species at risk, including the Olive-sided Flycatcher, Canada Lynx, and Wood Turtle.

**Table 1**. A partial list of species likely to co-occur with Canada Warbler listed by the Atlantic Canada Conservation Data Centre as ranging from 'critically imperilled' to 'apparently secure, uncommon but not rare, some cause for long-term concern'. Species of high or very high regional concern are shown in bold. Species co-occurrence varies across the region.

| Group | Species | Overlapping habitat(s) |
|---|---|---|
| Amphibians | Blue-spotted Salamander (*Ambystoma laterale*) | Moist-to-wet forests, vernal pools |
| Amphibians | Four-toed Salamander (*Hemidactylium scutatum*) | Mature damp forests with dense canopy cover and complex floor structure |
| Amphibians | Gray Tree Frog (*Hyla versicolor*) | Moist-to-wet forests, vernal pools |
| Birds | Black and White Warbler (*Mniotilta varia*) | Uneven-aged mixedwood and deciduous forest |
| Birds | Black-throated Blue Warbler (*Dendroica caerulescens*) | Mature deciduous or mixedwood forests with a dense understory |
| Birds | Black-throated Green Warbler (*Setophaga virens*) | Mixedwood forest |
| Birds | Golden-crowned Kinglet (*Regulus satrapa*) | Forests with a coniferous component, including spruce bogs |
| Birds | Gray Jay (*Perisoreus canadensis*) | Forests with a coniferous component, including spruce bogs |
| Birds | Great Crested Flycatcher (*Myiarchus crinitus*) | Uneven-aged mixedwood and deciduous forests and edges with snags |
| Birds | Northern Waterthrush (*Seiurus noveboracensis*) | Wet forests, damp thickets, alder swales |
| Birds | **Olive-sided Flycatcher (*Contopus cooperi*)** | **Bog edges, black spruce wetlands** |
| Birds | **Rusty Blackbird (*Euphagus carolinus*)** | **Vernal pools, swamps, red maple floodplains** |
| Birds | Tennesee Warbler (*Vermivora peregrine*) | Bogs, alder thickets |
| Birds | Veery (*Catharus fuscescens*) | Areas of dense understory and shrub cover near to water sources |
| Birds | Yellow-bellied Flycatcher (*Empidonax flaviventris*) | Bogs, edges of moist mixedwoods |
| Lichen | **Boreal felt lichen (*Erioderma pedicellatum*)** | **Uneven-aged forested wetlands** |
| Mammals | American Marten (*Martes americana*) | Mature mixedwood forest |
| Mammals | **Canada Lynx (*Lynx canadensis*)** | **Mature forests with dense undercover and downed wood for denning** |
| Plants | Northern Pitcher Plant (S*arracenia purpurea*) | Bogs with cover of sphagnum, including black spruce bogs |
| Plants | Poison Ivy (*Toxicodendron radicans*) | Wet forests with a red maple component |
| Plants | Virginia Chain Fern (*Woodwardia virginica*) | Moist acidic forests, similar habitat to cinnamon fern |
| **Reptiles** | **Wood Turtle (*Glyptemys insculpta*)** | **Vernal pools, wetland edges** |
| Trees | Eastern White Cedar (*Thuja occidentalis*) | Cedar swamps provide habitat |

*Ecosystem services*

In addition to wildlife conservation, many other ecological and social benefits arise from sustainable management of Canada Warbler habitat. These include: water quality protection, flood regulation, enhanced pollinator populations within shrubby openings, and support for local economies that rely on the forest products industry and nature-based recreation. Furthermore, Canada Warblers and other birds help control invertebrate pests, eating large volumes of Spruce Budworm larvae and other insect species in eastern forests.

A female Canada Warbler carries caterpillars to her nest. Photo by Len Reitsma.

*Comprehensive planning*

When implementing these guidelines, forest stewards should weigh the possible impacts on other species of concern not associated with Canada Warbler habitat. For example, conversion of older forests to young stands may adversely affect mature forest birds, such as Northern Goshawk and Blackburnian Warbler, unless measures are taken to sustain mature forests in the surrounding landscape. However, many mature forest species make extensive use of young forest during the post-breeding period to be successful, underscoring the importance of patch configuration for natal dispersal and pre-migratory movement.[44–47] Managers of large properties and regional conservation partnerships can deliver a broad range of benefits from forest protection and harvest activities that shift the landscape through cover types and age classes over time, ensuring a constant supply of late and early successional forest.

As most of the knowledge supporting these guidelines is from studies conducted in the US, these recommendations need to be validated in Canada through research collaborations with forest managers. In the meantime, we advise land stewards to select practices that are suited to the scale of their properties and to regularly consider new information about science-based approaches to managing habitat for native wildlife. When selecting sites, it will be useful to consult the accompanying report and maps, "Spatial Management Planning for Canada Warbler in the Atlantic Northern Forest" (available via Nature Canada and BAM). Ultimately, local knowledge of conservation issues and forest dynamics is key to making sound decisions related to location, extent, and intensity of management activity.

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# Field Guide to Managing Canada Warbler (*Cardellina canadensis*) Habitat

Companion to *Guidelines for Managing Canada Warbler Habitat in Atlantic Canada**

**Status**: Federally listed as Threatened in Canada, Likely to Be Designated As Threatened or Vulnerable in Québec, Threatened in New Brunswick, and Endangered in Nova Scotia.

**Habitats**: Moist-to-wet deciduous, coniferous, and mixed forests with thick understory and open or broken canopy, including swamps, treed bogs, shrub thickets, riparian forests, bushy ravines, young forests, and tree-fall gaps

**Special requirements**: Complex forest floor, leafy subcanopy with trees 1.5-5 m high, open and elevated perch sites for singing

**Territory size**: Typically 1-2 ha, ranging between 0.2 and 3 ha

**Diet**: Primarily mosquitoes, flies, moths, and caterpillars captured by flycatching, gleaning, and hover gleaning

**Nest:** On or near the ground, hidden in mossy hummocks, or beneath root masses, down wood, base of large wet forest fern species, and clumps of grass

**Associated species**: Varies geographically, including: Black-and-White Warbler, Magnolia Warbler, Northern Waterthrush, Olive-sided Flycatcher, Rusty Blackbird, Veery, Canada Lynx, Wood Turtle, and others

**Recommended Forest Management Practices:** When conducted in the appropriate context, some methods of timber harvesting can enhance habitat quality for Canada Warblers and associated species. However, conservation benefits through timber harvesting may be low in areas where suitable habitat occurs naturally, especially in areas where the potential to introduce invasive species through such activities presents a significant threat. For more discussion of where to create and sustain habitat, consult the complete guidelines and accompanying maps. The following table summarizes options for creating the desired, stand-level conditions.

| Starting Condition | Objective | Management Options* | Desired Condition |
|---|---|---|---|
| High canopy cover and low shrub/ sapling density | Open canopy and increase light to the understory | - Gap-group shelterwood<br>- Clearcut with reserves<br>- Seed-tree harvest<br>- Clearcut<br>- Patch cut<br>- Group selection | - Canopy height: <16 m<br>- Canopy cover: 5-85%<br>- Canopy tree basal area: <20 $m^2$/ha<br>- Subcanopy height: 1.8-5 m<br>- Subcanopy cover: 40-70%<br>- Moderate to high density of woody shrubs and saplings<br>- ≥ 12 song perch trees per ha, emerging ≥ 3 m above the subcanopy, including trees along edge of forest openings<br>- Uneven forest floor with down wood covering ≥10% of the ground<br>- Moderate to high herbaceous plant, fern and moss cover (not just ferns) |
| Open or even forest floor | Enhance forest floor structure | Leave/recruit snags in future stands<br>Top and delimb felled trees near the stump<br>Leave slash and logs<br>Girdling | |

* Guidelines may not apply equally across the region due to habitat differences, particularly in Québec

** For definition of terms, refer to the British Columbia Ministry of Forests and Range's Glossary of Forestry Terms.

- Protect saplings, shrubs, and forest floor by minimizing travel and maximizing trail spacing and machine reach.
- To reduce risk to migratory birds and their nests, harvest on snowpack/frozen ground and avoid felling/skidding during periods of nesting and fledgling activity. Consult Environment and Climate Change Canada for nesting periods and general guidance on incidental take avoidance.
- Retain song perch trees scattered such that individuals and clumps are surrounded by > 15.5 m openings. Choose stems that reach at least 1 m above the regenerating layer. In larger cuts, consider creating blocks of 4 ha or more with these conditions.

# Field Guide to Managing Canada Warbler Habitat



*Harvests that retain residual trees and woody material (left) provide two key habitat elements, prominent song perches and complex ground structure. Clearcuts and first-cut gap-group shelterwoods (above right) may develop suitable subcanopy structure within five years (below left). Regenerating patch and group cuts (below right) may also support breeding Canada Warblers, especially if clustered or located near rivers or swamps (bottom right).*



## Appendix I: Partial review of forestry and wildlife legislation and policy applying to management of the Canada Warbler in the Atlantic Northern Forest of Canada

**Prepared by Jamie Simpson and Alana Westwood (last update August 2016). Note: This list of major legislation is not exhaustive. As of May 2017, critical habitat has not been defined for this species in Canada.**

**1. Acts, Regulations and Policy Documents**

| Juris-diction | Statute | Type | Implem-entation Year |
|---|---|---|---|
| QC | *Sustainable Forest Development Act,* 2010, c A-18.1 | Act | 2010 |
| | *Regulations Respecting Standards of Forest Management in the Domain of the State*, c A-18.1, r 7 | Regulations | 2016 |
| | *Act Respecting Threatened or Vulnerable Species*, c E-12.01 | Act | 1989 |
| NB | *Crown Lands and Forests Act*, RSNB 1973 c C-38.1 | Act | 1973 |
| | Forest Management Manual for New Brunswick Crown Land, June 2014 Interim Manual | Guidelines | 2014 |
| | *Clean Water Act*, SNB 1989, c C-6.1 | Act | 1989 |
| | *Species At Risk Act*, SNB 1996, c E-9.101 | Act | 1996 |
| | *Watercourse and Wetland Alteration Regulation – Clean Water Act*, 2003-16, 90-80 | Act | 2003 |
| | Watercourse and Wetland Alteration Technical Guidelines, 2012 | Guidelines | 2012 |
| NS | *Crown Lands Act*, RS 1989, c 114 | Act | 1989 |
| | *Forests Act*, RSNS 1989, c 179 | Act | 1989 |
| | *Wildlife Habitat and Watercourses Protection Regulations*, OIC 2001-528, NS Reg 138/2001 | Regulations | 2001 |
| | *Endangered Species Act*, 1998, c11 | Act | 1998 |
| | Code of Forest Practice, 2012 FOR 2012-3 | Regulations | 2012 |
| | *Scott Maritimes Pulp Limited Agreement (1965) Act*, RS, c 415 | Act | 1965 |
| | Nova Scotia's Old Forest Policy | Guidelines | |
| PEI | *Forest Management Act*, RSPEI 1988, c F-14 | Act | 1988 |
| | *Forest Renewal Program Regulations*, pursuant to s25 of the Forest Management Act RSPEI 1988, c F-14 | Regulations | 1988 |
| | *Environmental Protection Act*, RSPEI 1988, c E-9 | Act | 1988 |
| | *Watercourse and Wetland Protection Regulations*, pursuant to the Environmental Protection Act RSPEI 1988, c E-9 | Regulations | 1988 |
| | Moving to Restore a Balance in Island Forests: Prince Edward Island Forest Policy (2006) | Guidelines | 2006 |
| | Ecosystem-based Forest Management Standards Manual, 2014 | Guidelines | 2014 |
| Federal | *Fisheries Act*, RSC, 1985, c F-14 | Act | 1985 |
| | *Migratory Birds Convention Act, 1994*, SC 1994, c 22 | Act | 1994 |
| | *Species at Risk Act*, SC 2002, c 29 | Act | 2002 |

**2. Cross comparison table of legal requirements (normal text) and guidelines (blue text) governing forestry as relating to Canada Warbler (CAWA) habitat in provinces in BCR14***

| Juris-diction | Land Type | Watercourse Buffers | Clearcut size restrictions | Provisions for habitat retention relevant to CAWA | Species at risk requirements relevant to CAWA |
|---|---|---|---|---|---|
| **QC** | Crown | • No clearcutting within 20 m of peat bogs with a pond, swamps, marshes, lakes or permanent watercourses<br>• No machinery within 5 m of watercourse<br>• Where buffer zones has a slope less than 40%, tree cutting permitted providing that the permit holder does not reduce the number of live trees with a diameter of 10 cm or more of all species<br>• Strip cutting and clearcutting are prohibited in the buffer zone<br>• Opening sizes for hardwoods: 75% of cuts 25ha or less, 90% 50ha or less, no openings >100 ha | • Ranges from 100 to 150 ha<br>• Cutting without assuring regeneration and without protecting soil is prohibited<br>• Opening sizes in fir and mixed forest: 70% of cuts ≤50 ha, 90% ≤100 ha, no openings >150 ha<br>• Opening sizes in spruce forest: 20% of cuts ≤100 ha, 70% ≤100 ha, no openings >150ha<br>• Must leave a buffer strip ≥100 m between cuts where one or both are ≥100-150 ha, and 60 m where the cuts are <100 ha, until regeneration in cuts is 3 m in height | • Certain wildlife areas are off-limits to forestry<br>• Special management requirements for certain wildlife species and exceptional forest ecosystems<br>• Holder of management permit shall preserve a 60 m buffer strip around ecological reserves | • Not specified |
| | Private | • Not specified | • Chief forester responsible for determining annual allowable cut (AAC) | • At discretion of Chief Forester | • Not specified |
| **NB** | Crown | • Cutting within 30 m of watercourse or wetland requires permit (does not apply on if under approved management plan)<br>• Major amendments require permission, minor amendments do not<br>• No grubbing within 30 m for watercourses ≥0.5 m, or within 10 m for those <0.5 m<br>• No harvest of non-merchantable wood within 10 m of watercourse<br>• Use of heavy machinery not permitted within 15 m of watercourse unless on approved road<br>• Partial harvesting zones and recommendations range from 3-90 m depending on environmental and wildlife variables | • Maximum size opening limited to 100 ha unless otherwise authorized<br>• On steep slopes, maximum openings are 20 ha (exceptions for blowdown)<br>• No more than 40% old softwood forest habitat can be cut in a single management period (25 years) | • Habitat protected through recovery plan or protection orders issued by the Minister | • Not specified |
| | Private | • Cutting within 30 m of watercourse or wetland requires a permit | • Not specified | • Habitat protected through recovery plan or protection orders issued by the Minister | • Not specified |
| **NS** | Crown | • For watercourses ≥0.5 m, buffer zone is 20 m, with width increasing by 1 m for each 2% of | • Forest management techniques must be designed to facilitate suitable regeneration, | • Recovery plan designates core habitat | • Cannot destroy the nest of an |

| | | | | | |
|---|---|---|---|---|---|
| | | slope up to 60 m<br>• No forestry vehicles within 7 m of watercourse, no openings in tree canopy larger than 15 m<br>• Understory vegetation and non-commercial trees within 20 m to be retained to the extent possible | mimic natural disturbance, sustain nature ecosystem structure and function, and involve selection cutting or individual tree harvesting (see Code of Forest Practice, August 2012)<br>• At least 10 living or partially living trees must be retained per ha of forest cut, and in clumps ≥ 30 trees, at least one clump per 8 ha area, and situated no more than 200 m apart or away from edge of stand<br>• Operator ensures snags and CWD similar to natural patterns | • Under the *Forests Act*, the Minister shall ensure that wildlife and wildlife habitats are managed<br>• Forest management will be planned to protect, conserve, and enhance habitat for species at risk | endangered species |
| | Private | • Partial harvesting (min of 20 m2/ha basal area) only within 20 m of watercourse (>50cm width)<br>• No forestry vehicles within 7 m; see notes for more details (applies to Crown and private land) | • Forest management techniques must be designed to facilitate suitable regeneration, mimic natural disturbance, sustain nature ecosystem structure and function, and involve selection cutting or individual tree harvesting (see Code of Forest Practice, August 2012)<br>• At least 10 living or partially living trees must be retained per ha of forest cut, and in clumps ≥ 30 trees, at least one clump per 8 ha area, and situated no more than 200 m apart or away from edge of stand<br>• Operator ensures snags and CWD similar to natural patterns | • 10 living trees left per hectare of clearcutting; snags and coarse woody debris at natural levels (not enforced to my knowledge) (applies to both Crown and private lands)<br>• Recovery plan designates core habitat<br>• Forest management will be planned to protect, conserve, and enhance habitat for species at risk | • Cannot destroy the nest of an endangered species |
| **PEI** | Crown | • No cutting within 20 m of watercourse without licence or permit | • Whole-tree harvesting not acceptable for clearcuts, but for other types of harvest<br>• Buffer strips between clearcuts must be at least 15 m<br>• Retention is at least 15 trees/a of at least 18 cm DB, with at least 5 legacy trees | • Minister may prohibit alteration of any watercourse or wetland<br>• Coarse woody debris retained on all sites with a minimum of 200 pieces/ha | • Not specified |
| | Private | • No cutting within 20 m of watercourse without licence or permit | • Silviculture funding on private land<br>• Incentives for ecosystem-based forest management standards exist | • Not specified | • Not specified |

*No specifications for wood volume limits or rotation length for any provinces

**3. Land Ownership**

| Province | Forest Area (ha) | Crown Land (ha) | Proportion Crown (%) | Private Land (ha) | Proportion Private (%) |
|---|---|---|---|---|---|
| QC | 76.1 million | 70.0 million | 92 | 6.1 million | 8 |
| NB | 6.1 million | 3.2 million | 53 | 2.9 million | 48 |
| NS | 4.3 million | 2.0 million | 47 | 2.3 million | 53 |
| PEI | 0.25 million | 0.03 million | 13 | 0.2 million | 87 |

**4. Annotated Summary of Acts, Regulations, Policies and Guidelines by Province**

**Québec**

*Sustainable Forest Development Act*, c A-18.1

- Applies to State lands, to privately owned forests, and to forests held under a title of ownership by a Native landholding corporation … to the extent provide for in this Act
- Land Divisions:
    - Biological refuges: Minister may designate forest areas as biological refuges in order to protect certain mature or overmature forests that are representative of Quebéc's forest heritage and foster the maintenance of the biological diversity of those forests … managed so as to ensure their continued protection 27 … Forest development activities are prohibited in a biological refuge (unless authorized) 30
    - Exceptional Forest Ecosystems: Forest ecosystems that are of special interest for the conservation of biological diversity, because of their scarcity or age, for instance, may be classified as exceptional forest ecosystems. 31 All forest development activities are prohibited in an exceptional forest ecosystem (unless authorized) 34
    - Chief Forester responsible for preparing sustainable forest development manual to be used for determining allowable cuts 46(3)
    - Chief forester responsible for determining allowable cuts for forest development units, local forests, and certain residual forests 46(5)
    - Allowable cuts to be determined with objectives including sustainability of forests, impact of climate change on forests, the natural dynamics of forests including composition, age structure and tree distribution pattern, maintenance and improvement of the productive capacity of forests, and diversified use of forests 48

*Regulations Respecting Standards of Forest Management in the Domain of the State*, c A-18.1, r7

- S2: Management permit holders shall maintain 20m buffer strips along the banks of peat bogs with a pond, swamps, marshes, lakes, or permanent watercourses
- S4: tree cutting permitted in buffer zones that have a slope of less than 40%, provided that the permit holder does not reduce the number of live trees with a diameter of 10 cm or more of all species; strip cutting and clearcutting are prohibited in the buffer zone
- S7: no machinery activity within 5 m of a watercourse (except for roadbuilding activities)
- S43: areas off-limits to forest management activities:
    - Caribou calving area north of 52$^{nd}$ parallel; cliff inhabited by a colony of birds; muskrat habitat; an island or peninsula inhabited by a colony of birds;
- S46: holder of management permit shall preserve a 60 m buffer strip around ecological reserves (unless boundary of reserve is delimited by a road)
- S47: holder of management permit shall preserve a 30 m buffer strip on either side of highways until regeneration in cutting area next to buffer strip is 3 m in height; 20 m buffer on either side of portage trails
- S48: holder of management permit shall preserve a 60 m strip around a bear den during winter; this strip may be harvested during summer
- S62: in a heronry over 6 nests, no person may apply pesticides for the purpose of controlling an insect infestation or a cryptogamic disease, or cultivate a sugar bush

- S63: the site of a herony and the innermost 200 m of the 500 m strip of land surrounding it shall be left intact (and no application of phytocides). Within the remaining 300 m, no cutting of trees, roadwork, sand pits, preparatory work for forest production purposes, application of phytocides, pruning, or forest drainage between April 1 and July 31; outside of this period, roads by be built but not exceeding 5.5 m in width.
- S65: in a waterfowl gathering area, no person may carry out activities involving the application of pesticides for the purpose of controlling an insect infestation or a cryptogamic disease, or the application of phytocides
- S66: management permit holders may not cut trees, carry out preparatory work for forest production purposes, or pruning in the floodplain of a waterfowl gathering area, except between June 16 and March 31 of each year; cutting must be limited to no more than 30% of the trees over a 10-year period.
- S69: in an area frequented by caribou south of the 52nd parallel, permit holders must leave the vegetation intact in areas used by caribou for calving, breeding or winter feeding; no clearcutting over an area greater than 50 ha
- S70: in white-tailed deer yard, permit holders may not carry out clear cutting in hardwood and hardwood-dominant mixed stands over an area greater than 25 ha, or in softwood and softwood-dominant mixed stands over an area greater than 10 ha; for strip cutting, total area of cut and residual strips may not exceed 25 ha in hardwood and hardwood-dominated stands, or 10 ha in softwood and softwood-dominant mixed stands; the vegetation used by white-tailed deer for shelter and food shall be left intact
- S71: in softwood and softwood-dominant mixed stands within a white-tailed deer yard, a permit holder must leave a buffer strip at least 60 m wide between 2 areas of clear cutting until those areas reach a height of 7 m
- S74: opening sizes (clearcutting or strip cutting): (cut blocks larger than 100 ha shall be shaped so that their length is at least 4 times its average width)
    - hardwood zone: no more than 25 ha for at least 70% of the areas cut; no more than 50 ha for at least 90% of the areas cut; and no more than 100 ha for all areas cut
    - fir and mixed forest zone: no more than 50 ha for at least 70% of the areas cut; no more than 100 ha for at least 90% of areas cut; no more than 150 ha for all areas
    - spruce forest zone: no more than 50 ha for at least 20% of areas cut; no more than 100 ha for at least 70% of areas cut; no more than 150 ha for all areas cut
- s75: permit holders must leave a buffer strip of at least 100 m between cuts where one or both of the cuts are 100 to 150 ha, and 60 m where the cuts are less than 100 ha, until regeneration in the cut areas is 3 m in height (note, for additional regulations and exceptions to cut block sizes and buffer zones between cut blocks, see regulations 76 – 79)
- s89: cutting without regeneration and soil protection is prohibited

*Act Respecting Threatened or Vulnerable Species*, c E-12.01

- s17: no person may, in the habitat of a threatened or vulnerable plant species, carry on an activity that may alter the existing ecosystem, the present biological diversity or the physical or chemical components peculiar to that habitat.

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**New Brunswick**

*Crown Lands and Forests Act*, RS 1973 c C-38.1

- No provisions of note

Forest Management Manual for New Brunswick Crown Land, June 20014 Interim Manual [not law – guidelines only]

- 4.3.3.3: maximum opening size is limited to 100 ha; DNR may authorize larger openings
- Operations adjacent to a numbered provincial highway require a 30 m standing timber buffer along the right-of-way edge
- Harvesting of steep slopes shall be conducted in accordance with the Steep Slope Harvesting Standards (s 10.5)
- Harvesting of tolerant hardwood and tolerant hardwood/softwood stands shall be conducted in accordance with the Best Management Practices for Crown Land Tolerant Hardwood/Softwood Stands (a 10.6)
- 4.3.4.2 ‘major amendments’ (reducing watercourse buffer zones etc) are permitted if permission received from DNR; minor amendments (not defined) are permitted without need for permission from DNR
- 4.4.3.1 Watercourse crossings: for natural watercourses 0.5 m or wider, no grubbing within 30 m except for the area immediately under the roadbed; for natural watercourses less than 0.5 m in width, no grubbing within 10 m except for the

area immediately under the roadbed; no harvest of non-merchantable wood within 10m of the watercourse except for the roadbed area

- 4.5.2.4 Heron and Raptor Nest Tree Retention:
  - Trees supporting raptor or heron nest not harvested
  - Treed buffer zones are maintained around heron and raptor nests (as defined in Table 2)
  - Harvesting in buffer zone limited to no more than 30% of basal area
  - No harvesting within the buffer zone around an active heron next during nesting season
  - No new roads within specified distance of a raptor or heron nest
  - Buffer zones range from 15 to 100 metres, depending on species; nesting season no-activity zone ranges from 100 to 200 metres; no new road zone ranges from 50 to 400 metres
- 4.5.3.4 Watercourse buffers:
  - No travel zones (that is, wheeled or tracked vehicles) range from 3 to 30 metres depending on channel width, bank slope, wind-throw potential, fish habitat, waterfowl use, provincially significant wetlands, provincially designated watersheds, wildlife travel corridors, aquatic recreation use and aesthetics; partial harvesting only zones range from 3 to 90 metres depending on the above mentioned variables; partial harvesting restrictions vary depending on the variable at issue (ranging from a requirement to leave non-merchantable trees and shrubs, to maintaining 50% canopy closure, no more than 30% removal of stems within a 10 year period, and basal area greater than 18 m2/ha; cavity trees not to be cut; no more than 30% of dead and dying trees cut in any 10 year period
- 4.5.4.2 Old Softwood Forest Habitat
  - No more than 40% of area providing OSFH within an OSFH block can be cut in a single management period (25 years); no more than 30% of basal area cut at one time, and maintain basal area of 18 or more m2/ha and crown closure of 50% or more; no more than 30% of dead trees to be cut; no cavity tree over 45 cm diameter to be cut
- 4.5.5 Deer Wintering Area Management (not addressed in this report)
- 10.5 Steep slope harvesting standards: maximum clearcut 20 ha; maximum width perpendicular to slope is 200 m; exceptions allowed if more than 50% of stand has blown down
- 10.6 Best Management Practices for Crown Land Tolerant Hardwood and Tolerant Hardwood/Softwood Stands: no more than 10% residual stems damaged; meet objectives set by DNR (not defined)

*Watercourse and Wetland Alteration Regulations* (under the *Clean Water Act*)

- Cutting of trees within 30 metres of a watercourse or wetland requires a permit

Watercourse and Wetland Alteration Technical Guidelines [not law – guidelines only]

- Cutting trees within 30 metres of a watercourse or wetland requires an alteration permit; the permit allows the holder of the permit to cut up to 30% of merchantable trees within the 30 metre zone every 10 years
- Use of heavy machinery is not permitted within 15 metres of the shoulders of a watercourse unless on an approved access road
- Watercourses subject to the permitting requirements are those on private land that are depicted on 1:10,000 orthophoto maps, and those on Crown land that are at least 0.5 metres in width
- For watercourse not subject to the permitting requirements, clearcutting is permitted up to 3 metres from the shoulders of the watercourse
- Unless deemed necessary by the Minister of Environment, alterations on Crown land to a watercourse that drains less than 600 ha or to a wetland do not require a Permit provided that an operating plan approved by a Regional Director of the NB DNR is in place: 3(3) (e.1) and (f) of *Watercourse and Wetland Alteration Regulation*

*Species at Risk Act*, Bill 28 (apparently not yet proclaimed into force, this bill replaces the previous *Endangered Species Act)*

- Habitat of species at risk not directly protected by the Act; rather, protection of habitat comes through recovery plan 29(1) or protection orders issued by the Minister 31(1)

**Nova Scotia**

*Endangered Species Act*, 1998, c11

- Species-at-risk working group created 9(1); provides list to Minister of species at risk in the Province 10(1)(a)
- No person shall destroy, disturb or interfere with or attempt to destroy, disturb or interfere with the specific dwelling place or area occupied or habitually occupied by one or more individuals or populations of an endangered or threatened species, including the nest, nest shelter, hibernaculum or den of an endangered or threatened species 13(1)(c)
- The Minister shall … appoint a recovery team and prepare a recovery plan for the species 15(1)
- A recovery plan shall … identify habitat of the endangered or threatened species; and identify areas to be considered for designation as core habitat 15(4)

*Crown Lands Act* RS 1989, c 114

- Object and purpose: provide for the most effective utilization of Crown lands
- No person shall cut or remove timber or other resources on or from Crown lands unless that person is expressly authorized to do so pursuant to this Act or the regulations (29(1)

*Forests Act*, c 179 RSNS 1989

- 9 Forest management techniques to be used on Crown lands and recommended for use on privately owned lands shall (a) be designed to facilitiate suitable natural regeneration wherever practical and involve selection cutting or the harvesting of individual trees or groups of trees within a stand and the shelterwood harvest system involving one or more partial cuts …
- 10 The Minister shall ensure that wildlife, wildlife habitats and the long term diversity and stability of the forest ecosystems, water supply watersheds and other significant resources are managed.

*Wildlife Habitat and Watercourses Protection Regulations*, OIC 2001-528, NS Reg 138/2001

- Wildlife Clumps:
    - 4(1) on any harvest site comprising an area greater than 3 ha of forest land, the forestry operator shall ensure that at least 10 living, or partially living, trees are left standing for each hectare of forest land cut.
    - 4(2) The trees required to be left standing pursuant to subsection (1) shall be … (c) clumped together in accordance with the following: (i) each clump shall contain no fewer than 30 trees, (ii) there shall be at least one clump for each 8-hectare area, or part thereof, of forest land cut, (iii) where there is more than one clump, clumps shall be situated no more than 200m apart and at least 20 m but no more than 200 m from the edge of the forest stand being cut, (iv) where there is one clump, it shall be situated at least 20 m but no more than 200 m from the edge of the forest stand being cut, and (v) there shall be no harvesting of trees within any clump.
    - 4(3) clumps cannot be cut until the next harvest
    - 4(4) A forestry operator shall ensure that levels of snags and coarse woody debris on all harvested sites are similar to natural patters to the fullest extent possible
- Watercourse buffer zones:
    - 6(1) for watercourses at least 50 cm width, buffer zone is at least 20 m;
    - 6(2) where the slope of the buffer is more than 20%, the width of the buffer zone increases by 1 m for each additional 2% of slope to a maximum of 60 m in width;
    - 6(3) within the buffer zone, no forestry vehicles within 7 m of the watercourse (unless at an approved crossing); basal area at least 20 m2/ha; no opening in the tree canopy larger than 15 m at its greatest dimension
    - 7 for watercourses less than 50 cm width, no forestry vehicles within 5 m of the watercourse, except at approved watercourse crossings
    - 8 for all watercourses, understory vegetation and non-commercial trees within 20 m of the watercourse are retained to the extent possible
    - 9 for all watercourses, no activities within 20 m of the watercourse that would result in sediment being deposited in the watercourse

Nova Scotia's Old Forest Policy, 2012, Report FOR 2012-4

- Objective is to establish a network of old forests

Code of Forest Practice, August 2012 FOR 2012-3 (guidelines only – although supposed to be mandatory on Crown lands administered by DNR)

- Landscape level planning: strive for stand conditions, spatial pattern, size, type, composition and age that is representative of the range of local natural variability (1.1.1)
- Four levels of forest management intensity: conservation reserves; extensively managed forests; intensively managed forests; forest conversions (1.1.3)
- Extensive forest lands: mimic natural disturbance and sustain natural ecosystem structure and function (based on Forest Ecosystem Classification) (1.1.5)
- Extensive forest: promote regeneration of native species typical of ecosystem (1.1.6)
- Extensive forest: tree species diversity maintained or restored to natural range of variation by using FEC (1.1.7)
- Extensive : no use of offsite and exotic tree species in planting (1.1.8)
- Ecological Landscape Classification used to characterize landscape spatial structure, natural disturbance processes and forest composition (1.2.1)
- FEC is the stand level operational guide for applying ecosystem based management (1.2.2)
- Forest management will be planned to conducted to protect habitat for species at risk (1.3)
- Forest management will be designed and conducted to conserve and enhance habitat for Nova Scotia's wildlife species (1.4)
- Access to forest resources will be placed strategically in areas adjacent to provincial wilderness areas and parks to minimize conservation impacts (1.5.1)
- Designated watersheds will have no more than 25% of the area in a state of recent (5 years or less) forest harvest (1.6.2)
- Timber harvest and biomass removal from a site will remain below rates that would impair long term site productivity (1.6.5)
- Forest management will be designed and conducted with consideration of the potential effects of climate change, and opportunities to maintain and enhance forest carbon sinks (1.7)
- Harvested forests will be renewed in a timely fashion to produce high stocking of trees of commercial value (2.1.3)
- Appropriate pest and fire protection measures, which may include biological or chemical means, will be undertaken to ensure forest health and vigour (2.1.6)
- Growth projections will be updated regularly to improve their accuracy (2.1.9)
- Silviculture activities will be assessed regularly for growth results (2.1.10)
- Accurate forest inventories will be maintained and the latest information used in forest management planning (2.1.11)
- Timber harvests will be scheduled to optimize productivity (2.2.2)
- Natural regeneration is encouraged (2.2.3)
- Harvested areas to be planted or seeded if adequate natural stocking of preferred crop trees cannot be established (2.2.4)
- Vegetation management (chemical, mechanical and manual methods) undertaken when survival or growth of crop trees is hindered by competing vegetation (2.2.6)
- High quality commercial crop trees will be selected during density management activities (2.2.8)
- Commercial thinning will be timed and at intensities to ensure stand stability and long term value (2.2.11)
- Silviculture activities will be designed to improve timber quality attributes (2.2.12)
- Timber harvest and biomass removal from a site will remain below rates that would impair long term site productivity (2.3.10)
- Pesticides and herbicides will be used only when deemed necessary to prevent crop tree mortality or growth loss (2.3.13)
- Forest managers will attempt to create and maintain large forest patches and connections among them, avoiding fragmentation by roads and rights-of-way (3.1.1)
- Timber harvest operations will provide for abundances and distributions of canopy openings, legacy trees, dead trees, and cavity trees that are consistent with the landscape management objectives and assigned management intensity level (3.1.2)
- Forest management will contribute to and be guided by IRM plans at the ecodistrict level (4.1.1)
- Where scenic vistas are important, forests will be managed for diverse canopy structures without large visible clearcut harvest areas (4.2.1)
- Forest practices bordering protected areas will be designed and conducted in consultation with protected area managers (4.2.2)

- Forest management plans will identify places of aesthetic and spiritual importance and provide mechanisms to protect them (4.2.10)

*Scott Maritimes Pulp Limited Agreement (1965) Act* RSNS, c 415

- D. That all cutting of trees from the Licensed Land will be done in accordance with the Company's Management Cutting Plan as approved by the Province;
- E (i) The company will cut approximately 50,000 cords of wood of all kinds each year from the Licensed Land (some flexibility allowed); however, Company will be deemed to have complied with the terms of this clause if it complies with the Forest Management Plan … during first 30 years; (ii) thereafter, Company will cut such quantity of forest products from the Licenced Land as shall be mutually agreed upon and specified in the Management Cutting Plans; (iii) the Company, with consent of the Province, may exchange stumpage on the Licenced Land for stumpage on other Crown lands in cases where it is more economical and desirable for the Company to cut on such other Crown Lands pulpwood to be proceed at the Mill
- K The company will artificially regenerate trees of commercially desirable species wherever practicable on any portion of the Licenced Land cut over by the Company not found to be satisfactorily restocked ten years after the said cutting
    - Except for burnt areas where fire not caused by the Company (but such land reverts to control of Province)

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**PEI**

*Forest Management Act*, RSPEI 1988, c F-14

- Minister shall prepare and cause to be publicly reviewed a Forest Policy … 4(1)
- The Minister may place such restrictions on the harvesting or extraction of trees within twenty metres of a body of water or within 40 metres on either side of the midline of a designated scenic heritage road, as may be prescribed by regulation (19)

*Forest Renewal Program Regulations*, pursuant to s25 of the *Forest Management Act*

- To obtain assistance under the Forest Renewal program, landowners must (a) enter into a forest renewal agreement which shall specify the terms and conditions of the Forest Renewal Program which are applicable to that property… 3(2)

*Environmental Protection Act*, RSPEI 1988, c E-9

- The Minister may take such action as he considers necessary in order to manage, protect or enhance the environment or manage, protect or enhance environmental health including … exercising exclusive control over the quality, use, protection or alteration of all surface, ground and shore waters and all beaches, sand dunes, and wetlands within the jurisdiction of the province … the preservation of the environment within the jurisdiction of the province 3(1)
- The Minister may make regulations prohibiting the alteration of any watercourse, or wetland, or the water flow therein unless the alteration is authorized by a licence or permit… 25(1)(m)

*Watercourse and Wetland Protection Regulations*, pursuant to the *Environmental Protection Act*

- 2(1) no person shall, without a licence or a Watercourse or Wetland Activity Permit, and other than in accordance with the terms and conditions thereof, alter a watercourse or a wetland, or any part thereof, or water flow therein, in any manner, or engage in any of the following activities in or on a watercourse or a wetland: … (g) disturb, remove, alter, disrupt or destroy vegetation in any manner, including but not limited to the cutting of live trees or live shrubs …
- (3) the cutting of live trees and live shrubs in a wooded swamp is exempted from the prohibition in clause (1)(g)
- 3(3) no person shall, without a licence or a Buffer Zone Activity Permit, … alter or disturb the ground or soil within 15 meters of a watercourse boundary or a wetland boundary, or cause or permit the alteration or disturbance of the ground or soil, therein in any manner
- 3(4) no person shall, without a licence or a Buffer Zone Activity Permit … engage in or cause or permit the engaging in any of the following activities within 15 metres of a watercourse boundary or a wetland boundary: … (f) cut down live trees or live shrubs; (h) spray or apply pesticides in any manner.

Moving to Restore a Balance in Island Forests: Prince Edward Island Forest Policy (2006)

- Shift silviculture funding on private land from 90% renewal and 10% enhancement to 50% renewal and 50% enhancement activities
- Require pre-harvest management plans on private lands that receive funding

Ecosystem-based Forest Management Standards Manual, 2014

- Guidelines for professionals working on publicly-owned forest and those working on privately-owned forests intending to pursue incentives under the forest enhancement program
- All harvests to be prescribed in an approved forest management plan
- Whole-tree harvesting acceptable for non-clearcut harvests; not acceptable for clearcut sites
- Pioneer species sites are eligible for planting; sites dominated by mature forest species (rS, eH, BE, ewC, sM, rO, wP and rM) generally eligible for enrichment planting only
- No-cut buffer strips of at least 15 m must be left between clearcuts that exceed 2 ha
- All harvest sites must retain at least 15 trees per ha (at least 18 cm DBH); at least 5 health trees per ha (at least 18cm DBH and of good form) shall be left as legacy trees (ie, never cut)
- Coarse woody debris must be retained on all harvest sites, with a minimum of 200 debris pieces (at least 7.5 cm diameter and 2 m length) per ha;
- In plantations, 15% of stand must be non-planted species; where a stand contains a low density of rS, eH, wP, yB, sM, wA, blA, or rO, these individual trees are to be left as seed trees
- Clearcutting generally restricted to wS, bF, eL, bS, wB, tA, plantation rP, and rM in low lying areas that are mature or older; other stands considered on a case-by-case basis; clearcuts limited to 2 ha with minimum 15 m corridor between cuts until clearcut areas are 4 m in height (see manual for additional harvesting guidelines)
- Biomass Guidelines: biomass projects receiving public investment (either direct capital or operating assistance, or involvement of forest management programs):
- All harvests require pre-harvest management plan
- For clearcuts, no whole-tree removal
- Biomass harvest sites must be mapped and files submitted to the Forests, Fish and Wildlife Division
- If land being converted to non-forest use, then area is exempt from policy requirements; such sites will be monitored and if the conversion does not occur within 10 years then penalties may be levied for non-compliance with the standards of the Ecosystem-based Forest Management Manual

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**Federal**

*Fisheries Act*, RSC, 1985, c F-14

- 35(1) no person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery… unless in accordance with the prescribed conditions
- 36(3) … no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water … unless authorized by regulations

*Migratory Birds Convention Act, 1994*, SC 1994, c 22

- 5.1(1) no person or vessel shall deposit a substance that is harmful to migratory birds, or permit such a substance to be deposited, in waters or an area frequented by migratory birds or in a place from which the substance may enter such waters or such an area
- 6 (a) disturb, destroy or take a nest, egg, nest shelter, eider duck shelter or duck box of a migratory bird, or(b) have in his possession a live migratory bird, or a carcass, skin, nest or egg of a migratory bird except under authority of a permit therefor (Migratory Birds Regulations C.R.C., c. 1035).

*Species at Risk Act*, SC 2002, c 29

- 32(1) no person shall kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, and endangered species, or a threatened species

- 33 no person shall damage or destroy the residence of one or more individuals of a wildlife species that is listed as an endangered species or a threatened species, or that is listed as an extirpated species if a recovery strategy has recommended the reintroduction of the species into the wild in Canada
- 34(1) *SARA* applies to aquatic species protected or defined by the *Fisheries Act*, migratory birds protected by the *Migratory Birds Convention Act*, 1994, and species on federal lands, unless an order is made otherwise

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**Additional legislation and policy that may apply to Canada Warbler habitat (not an exhaustive list):**

New Brunswick

- *Clean Environment Act*, statute
- *New Brunswick Wetland Conservation Policy*, policies
- *Watershed Protection Designation Order*, regulations and guidelines
- *Wellfield Protected Area Designation Order*, regulations

Nova Scotia

- *Environment Act – Designation of a Protected Water Area*, guidelines
- *Guidelines for Biodiversity-Rich Landscapes under the Western Crown Lands Conceptual Plan 2015*, guidelines
- *Nova Scotia Wetland Conservation Policy 2011*, policies

PEI

- *A Wetland Conservation Policy 2007*, policies
- *Watercourse, Wetland, and Buffer Zone Activity Guidelines 2016*, guidelines