

# Conserving the Bicknell's Thrush

Stewardship and Management  
Practices for Nova Scotia's  
High Elevation Forest



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Canada 

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# Summary

This document outlines what is known about the natural history, distribution, habitat, population size, and conservation status of the Bicknell's Thrush, a rare songbird that nests in Nova Scotia's high elevation and coastal forests. It also summarizes the threats facing this species in Nova Scotia and across its north-eastern North American breeding range. The core of the document provides Best Management Practices, summarized below, for Nova Scotia's high elevation forest, defining actions necessary to protect and conserve Bicknell's Thrush.

## **Best Management Practices for Bicknell's Thrush**

- ✱ *Developments that involve land clearing should avoid areas where Bicknell's Thrush is found.*
- ✱ *Industrial forest stands that support Bicknell's Thrush should not be pre-commercially thinned until after the trees are no longer at a successional stage that is suitable for nesting, as determined by further research.*
- ✱ *If clearing or pre-commercial thinning in Bicknell's Thrush habitat cannot be avoided, the following mitigation strategies should be employed:*
  1. *Activities should be performed outside of the songbird breeding season, before June 1st and after July 31st, to prevent the destruction of nests, eggs, nestlings, fledglings or adult birds.*
  2. *Patches of intact, unthinned forest should be left whenever possible. These patches should:*
    - ~ *cover at least one quarter hectare;*
    - ~ *be located 20 to 50 metres from the uncut or unthinned edge; and,*
    - ~ *contain intact undisturbed underbrush.*
- ✱ *Nova Scotia's industrial forest should be managed with a "no net habitat loss" policy such that the amount of Bicknell's Thrush habitat does not decrease.*



*Industrial forest in Cape Breton.  
Photo © Becky Whittam*

# Introduction



*Bicknell's Thrush.*  
Photo © Dan Busby

The Bicknell's Thrush (*Catharus bicknelli*) is a small, secretive songbird found in Nova Scotia primarily in the highlands of Cape Breton. It was listed as *Vulnerable* under the Nova Scotia Endangered Species Act in 2002, meaning that there is concern for the future existence of this species in Nova Scotia.

Nova Scotia is known internationally for its unspoiled natural capital: its lands, waters and wildlife. These values are at the heart of recreational and economic activities enjoyed by all Nova Scotians. The Bicknell's Thrush is a unique part of Nova Scotia's biodiversity, and the integrity of its summer home in the highlands of Cape Breton is critical to its continued existence in the province.

The Wildlife Division of the Nova Scotia Department of Natural Resources (NS DNR) has responsibility to conserve the diversity of the province's wildlife species and the integrity of their habitats. One of the fundamental ways of achieving this goal is to advance stewardship of wildlife habitat on public, private and corporate lands, through partnerships with industry, non-government agencies, the federal government and other organizations. A stewardship approach encourages all Nova Scotians to take responsibility for the well-being of their environment.

The mission of Bird Studies Canada (BSC), a not-for-profit organization, is to advance the understanding, appreciation, and conservation of wild birds and their habitats in Canada. This document was developed by Bird Studies Canada in partnership with the Nova Scotia Department of Natural Resources to promote stewardship of Bicknell's Thrush habitat in Nova Scotia.



*Cape North, Cape Breton.*  
Photo © Becky Whittam

# Purpose and Audience

This document will help Nova Scotians to be good stewards of wildlife and wildlife habitat. It was written as a guide to assist organizations and individuals to understand how they can minimize negative impacts to Bicknell's Thrush and Bicknell's Thrush habitat in Nova Scotia. It is intended to serve as both an educational and management tool for those who have responsibility for, or interest in, Bicknell's Thrush habitat in Nova Scotia. The target audience includes the following groups.

## ***Landowners, land users and land developers***

These are individuals and organizations who own, use or develop land with Bicknell's Thrush habitat for recreation, forestry, communications or other purposes. The majority of Bicknell's Thrush habitat in Nova Scotia is government-owned, either federally (Cape Breton Highlands National Park), or provincially. Few private landowners host Bicknell's Thrush habitat. The forestry companies that lease provincial crown land from Nova Scotia for the management and harvest of timber are considered land users and are a key audience for this document.

## ***Conservation Community***

The conservation community includes individuals and organizations who work to protect and conserve wildlife and natural resources in Nova Scotia. These groups can be instrumental in helping to raise awareness about Bicknell's Thrush and its highland habitat. They include land trusts, naturalist and birding groups, and other environmental non-governmental organizations.

## ***Biologists and Scientists***

Research required to guide stewardship action is highlighted in this document. Biologists, scientists and academics working with the International Bicknell's Thrush Conservation Group ([www.bicknellsthrush.org](http://www.bicknellsthrush.org)) will play a key role in conducting this research.

## ***Government Departments and Agencies***

This target group includes provincial and federal departments and agencies responsible for managing Bicknell's Thrush habitat as well as enforcing rules and regulations relevant to conservation of Bicknell's Thrush and its habitat.

## ***General Public***

Very few Nova Scotians would recognize the name Bicknell's Thrush or would be aware of the threats facing this vulnerable species. This document provides non-biologists with a basic understanding of Bicknell's Thrush conservation needs. It can serve as an educational tool for members of the interested public who wish to learn more about this rare species.



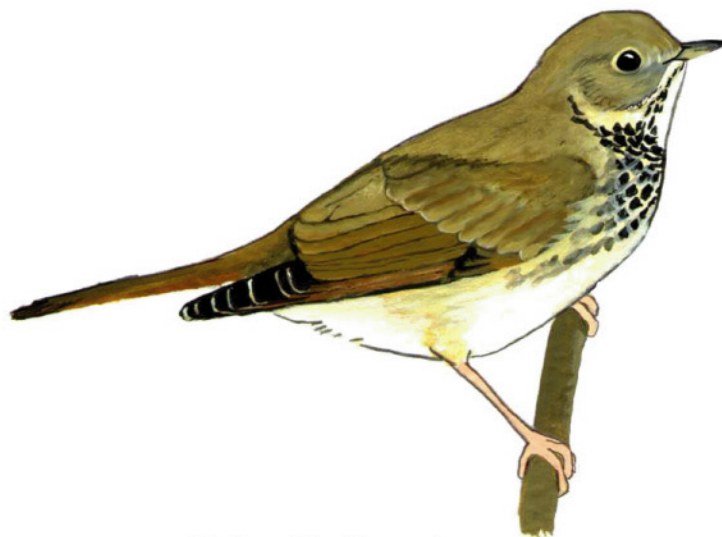
*Adult Bicknell's Thrush. Photo © Emily McKinnon*

## The Bicknell's Thrush

This section provides the most current natural history information on the Bicknell's Thrush, its status, distribution, and habitat preferences.

### *Sight and sound*

The Bicknell's Thrush is a small, sparrow-sized bird that measures 16 to 18 centimetres long and weighs just 25 to 30 grams. It has an olive-brown back with a hint of chestnut on its tail, a grayish-white under belly, and a buffy upper breast with dark spots. It can be distinguished from other similar thrush species by its smaller size, yellow lower bill, and less distinct eye-ring.



*Bicknell's Thrush.  
Illustration © Andrea Kingsley*

The Bicknell's Thrush is seldom seen, even by skilled birdwatchers. This is because it dwells in locations difficult for people to access – high elevation and, to a lesser extent, coastal forests characterized by dense spruce and fir trees – and because it is rare. The species is usually identified by its hauntingly beautiful four-part song, heard most commonly at dawn and dusk. The song has two to three low introductory plucking notes followed by three high-pitched vibrant rolling phrases that slur downward, with an intense closing phrase that rises slightly at the end:

*“Chook-chook-chook, wee-o wee-o wee-o, tee-ti-ter-eeee”*

*...It seemed as if the bird was blowing in a delicate slender golden tube, so fine and yet flute-like and resonant the song appeared. At times it was like a musical whisper of great sweetness and power.*

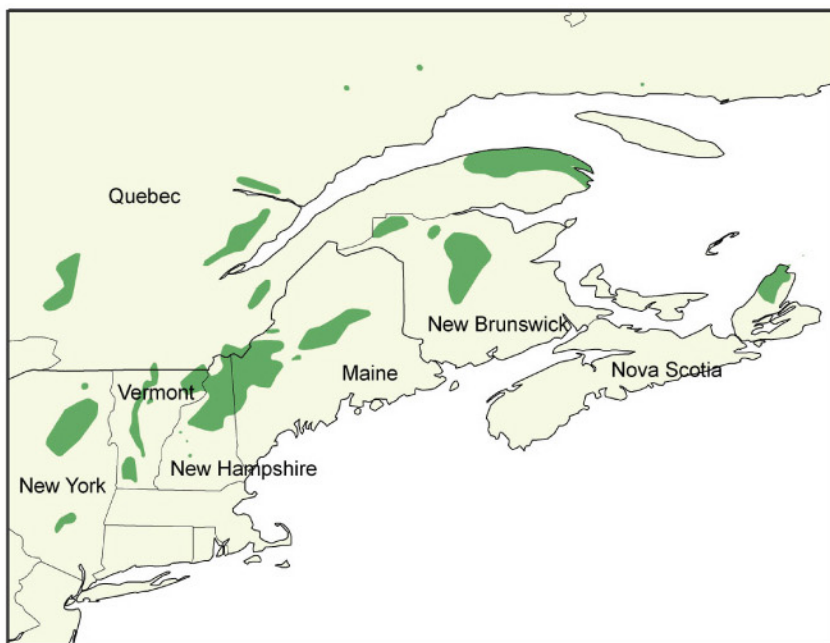
John Burroughs 1904

Prior to 1995, the Bicknell's Thrush was considered a subspecies of the Gray-cheeked Thrush. A study by Canadian scientist Henri Ouellet convinced the American Ornithologists' Union in 1995 that the Bicknell's Thrush was genetically unique and it was deemed a separate species.

### **Breeding Distribution**

The Bicknell's Thrush breeds only in northeastern North America, from the north shore of the St. Lawrence River in Quebec, east to Cape Breton Island Nova Scotia, and southward to the Green Mountains of Vermont and the Catskill Mountains of New York.

Because the Bicknell's Thrush breeds in relatively small and isolated pockets of high elevation and coastal forests, its breeding range is said to be fragmented. Fragmentation increases the species' vulnerability to being extirpated from one or more of the relatively small areas in which it breeds.

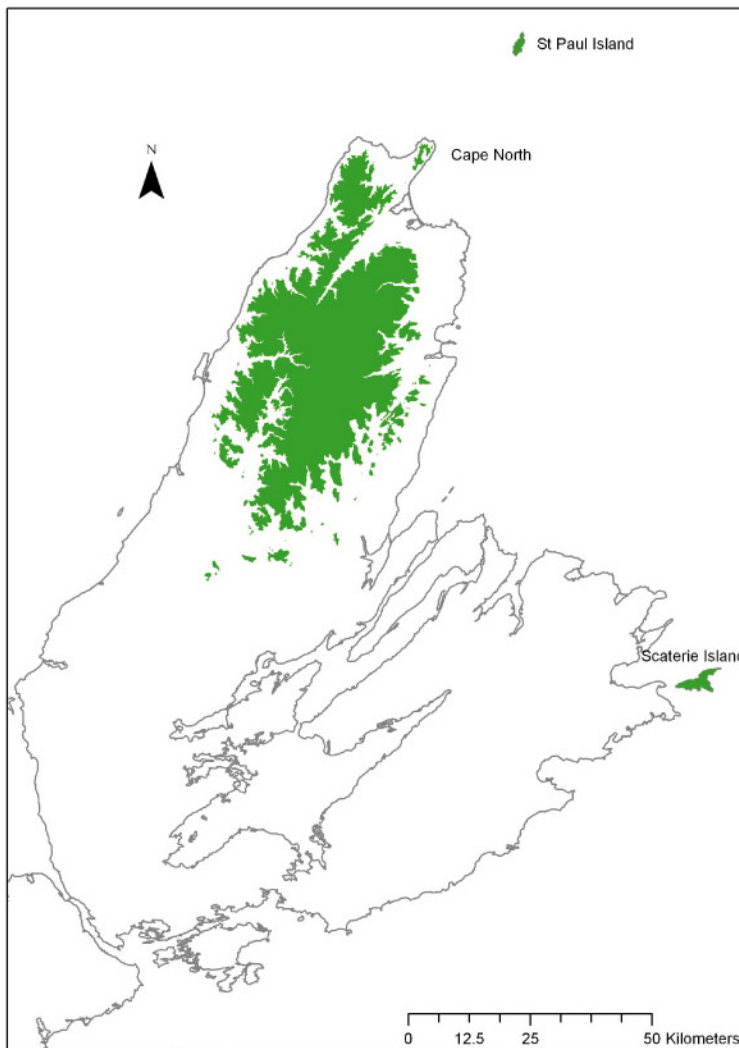


*Breeding range of  
Bicknell's Thrush.  
Map © Vermont Center  
for Ecostudies*

In the Canadian Maritimes, the Bicknell's Thrush breeds in the highlands of northwestern and north-central New Brunswick, as well as in the highlands of Cape Breton and St. Paul and Scaterie Islands, Nova Scotia. The species seems to have disappeared from several coastal breeding locations where it was once found, for example: in Nova Scotia, Seal and Mud Islands and Cape Forchu; in Quebec, the Magdalen Islands; and in New Brunswick, Fundy National Park and Grand Manan Island.

The Bicknell's Thrush shares its habitat in Nova Scotia with many other bird species. For example, the Blackpoll Warbler and Fox Sparrow are both high elevation and coastal forest specialists. A number of more wide-ranging species are also commonly found with Bicknell's Thrush, including the Swainson's Thrush and White-throated Sparrow.

*Bicknell's Thrush breeding range in Cape Breton, Nova Scotia.*  
Map © BSC and NS DNR



*Blackpoll Warbler*  
Photo © Jim Stevenson



*Cape Breton Highlands.*  
Photo © Greg Campbell



## Breeding Habitat

The Bicknell's Thrush traditionally nests in dense, often stunted coniferous forests that are typically found on coastal headlands and especially at high elevations (above 380 metres) in Nova Scotia. These forests are composed primarily of balsam fir and black spruce and are sometimes referred to as krummholz (meaning trees stunted by harsh climate) or taiga. Taiga is a Russian term meaning "land of little sticks", and originally referred to the forest communities found south of the arctic tundra, consisting primarily of coniferous trees like stunted spruces and firs, mixed with deciduous birches and aspens. The meaning of taiga has been expanded to include all of the subarctic and subalpine forests of the northern temperate zone, such as those at high altitudes (i.e., subalpine) in the Cape Breton highlands.



*Stunted high elevation forest typical of Bicknell's Thrush habitat in Cape Breton Highlands National Park.  
Photo © Becky Whittam*



*Cape Breton Highlands. Photo © Dan Busby*

Bicknell's Thrush has been found in stands where tree density is as high as almost 50,000 stems per hectare, with an average young tree height ranging from 3.4 metres in New Brunswick to 5 metres in Nova Scotia.

The occurrence of Bicknell's Thrush in these modified industrial forests is likely a consequence of the species' innate adaptation to disturbed forest habitats. Historically, natural habitat for the Bicknell's Thrush would have been fire-burned areas, forest stands damaged by insects such as spruce budworm, or areas of wind blow-down, in addition to the chronically disturbed krummholz mentioned above.

The species is also found at high elevations in modified (or industrial) forests such as regenerating clear-cuts and conifer plantations about 10 to 15 years after cutting. Such forest is often dominated by dense stands of young balsam fir and white birch trees. These areas mimic the natural stunted forests found at the highest of elevations. In these regenerating and re-planted industrial forest sites,



*Regenerating balsam fir about ten years post-harvest.  
Photo © Emily McKinnon*

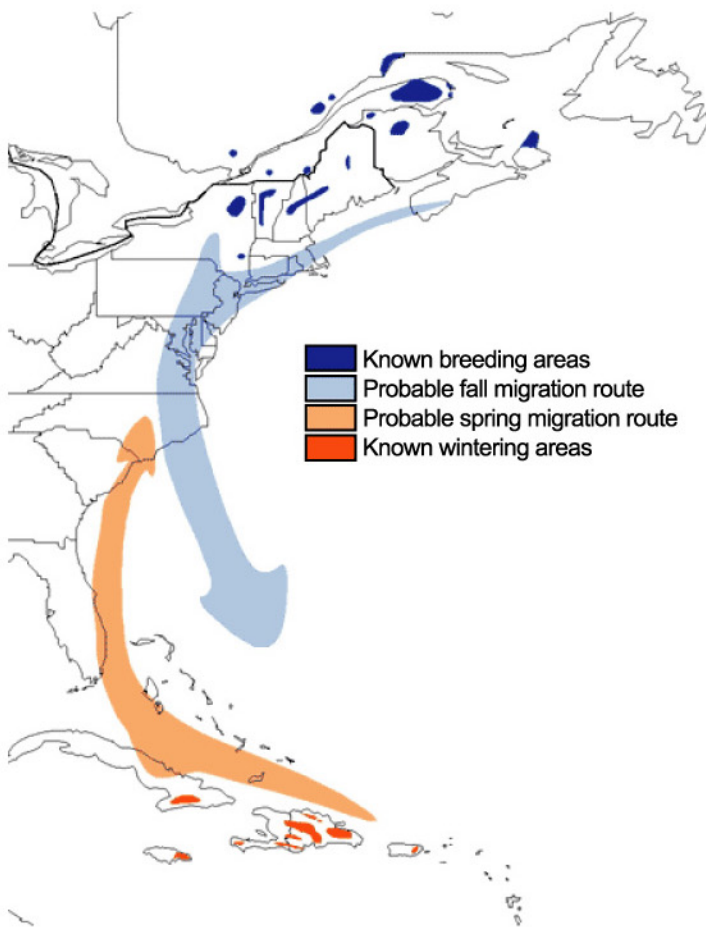
Forest management practices of today, however, often prevent the development of these natural habitats: fires are restricted, blow downs are cleaned up and re-planted, and insects are controlled. The modern-day occurrence of Bicknell's Thrush in post-harvest regenerating clearcuts and plantations likely indicates that the species is taking advantage of artificially disturbed habitats that are similar to naturally disturbed habitats of the past.

As noted earlier, the Bicknell's Thrush was historically found on some coastal islands in Nova Scotia but, with the exception of St. Paul and Scaterie Islands, these sites no longer host the species. Coastal habitat may be less preferred than high elevation habitat, which may explain why Nova Scotia's small remaining Bicknell's Thrush population is found primarily at high elevations.

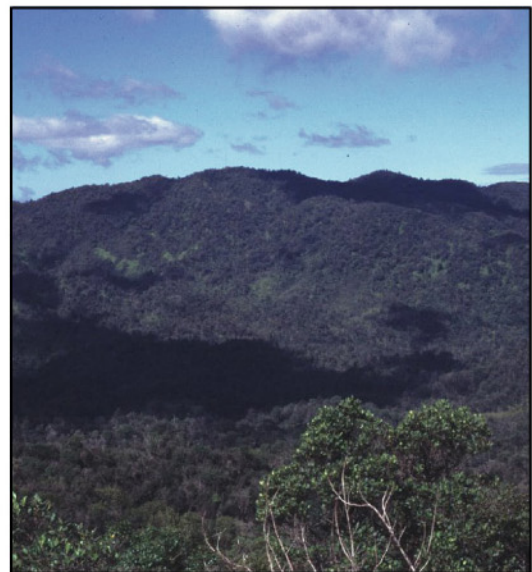
**Wintering Habitat**

The Bicknell's Thrush spends the non-breeding season, from September to May, on the larger Caribbean Islands, primarily in the Dominican Republic and Haiti (which together make up the island of Hispaniola).

Here the species is not restricted to high elevations, but is widely distributed primarily in broadleaf-dominated forests from sea level up to 2,220 metres. It is also known to winter in much smaller numbers in Jamaica, Puerto Rico and Cuba, although at higher elevations.



*Bicknell's Thrush breeding and wintering areas.  
Map © Environment Canada*



*Wintering habitat, Dominican Republic.  
Photo © Kent McFarland*

## Life History

The Bicknell's Thrush leaves its Caribbean wintering grounds in late spring and arrives at its Nova Scotian breeding grounds in late May or early June. Its breeding system is different from most other songbirds. Several males share a territory, with different males singing from the same song perch within the area. The female is more territorial, and will aggressively chase other thrushes during the nest building and egg laying period.

The cup-shaped nest is usually built by the female and placed 1 to 5 metres above the ground, often at the base of branches against the trunk of a small tree. Three or four greenish-blue eggs are laid in mid-June, which hatch after about 12 days of incubation by the female. Within a nest, eggs can come from different fathers and several males may share the chore of feeding the young.



*Bicknell's Thrush nest.*  
Photo © Kevin Fraser



*Bicknell's Thrush nestlings.*  
Photo © Kevin Fraser



*Bicknell's Thrush feeding chicks.*  
Photo © Yves Aubry

Young leave the nest, or fledge, 9 to 13 days after hatching, yet continue to be fed by adults for another 14 days. They forage close to the ground, mostly on invertebrates such as beetles, ants and insect larvae. And, like the robin, which is also a thrush, they will eat fruits during fall migration in September.

## Population Size and Status

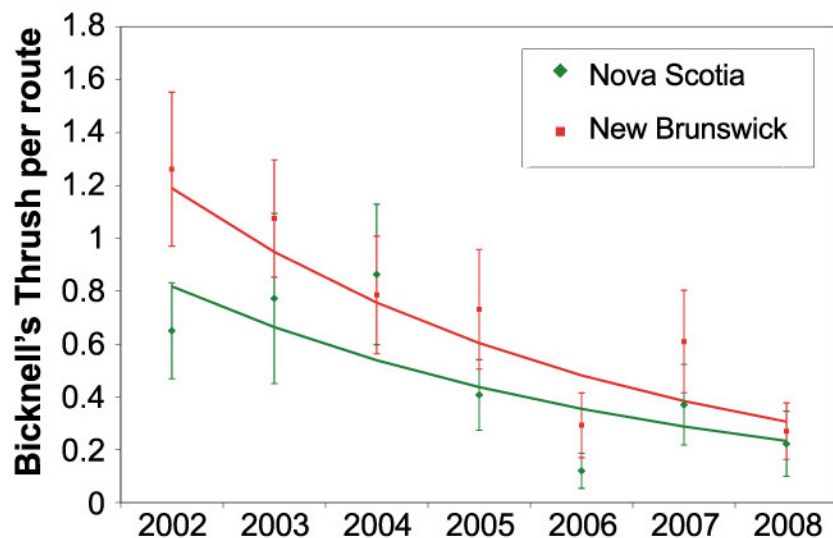
The Bicknell's Thrush is one of the rarest songbirds in North America, with a world-wide population estimated at 25,000 to 50,000 individuals. For comparison, it is worth noting that there are an estimated 50,000 to 70,000 pairs of Blue Jays in the Maritime provinces alone! There is no precise estimate of the Canadian population of Bicknell's Thrush but there are likely around 30,000 individuals breeding in Canada, with perhaps 500 to 1,000 in Nova Scotia.



*View from a HELP route at dusk.  
Photo © Emily McKinnon*

BSC staff and volunteers monitor Bicknell's Thrush and other high elevation bird species through the High Elevation Landbird Program, HELP, which began in 2002. HELP monitors populations of Bicknell's Thrush, Swainson's Thrush, Winter Wren, Blackpoll Warbler, White-throated Sparrow and Fox Sparrow along 28 survey routes in the Cape Breton highlands, and 43 routes in New Brunswick's central and western highlands.

Starting at dusk or dawn, surveyors silently listen for the songs of target species at five stops along their one kilometre survey route. Each route is monitored once per year from the 4th to the 26th of June, when territorial singing is at its peak.



*Declines in Bicknell's Thrush on HELP routes in Nova Scotia and New Brunswick. Data © BSC*

Seven years of HELP data indicate bad news for Bicknell's Thrush in the Maritimes. Bicknell's Thrush is declining along survey routes in both Nova Scotia and New Brunswick at a rate of about 19% annually. These declines are occurring on routes both within and outside of Cape Breton Highlands National Park.

## Conservation Status

The Bicknell's Thrush was designated as a Species of Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 1999, and it was listed as Vulnerable under the Nova Scotia Endangered Species Act in 2002. These designations mean that the species is experiencing imminent threats.

Recent declines make it very likely that the Bicknell's Thrush will be designated as nationally Threatened or Endangered when it is re-assessed by COSEWIC in late 2009. An Endangered species is considered to be facing extinction and the need for action is urgent.

## Threats

On its breeding grounds, Bicknell's Thrush is at risk from 1) climatic warming, 2) atmospheric threats such as acid rain and mercury, 3) habitat loss and degradation from forestry and development, and 4) direct mortality from predation, forestry activities during the breeding season, and migration hazards. On its Caribbean wintering grounds in the Dominican Republic and Haiti, where an estimated 90% of the global population is concentrated from October to May, it is threatened by widespread loss of forested habitats.

This section of the document focuses on breeding ground threats, particularly those related to forestry and land development as these threats can be mitigated through habitat stewardship in Nova Scotia. Threats from climate change, mercury and acid rain as well as loss of wintering habitat are described at the end of the document for educational purposes.

### Threats to Habitat

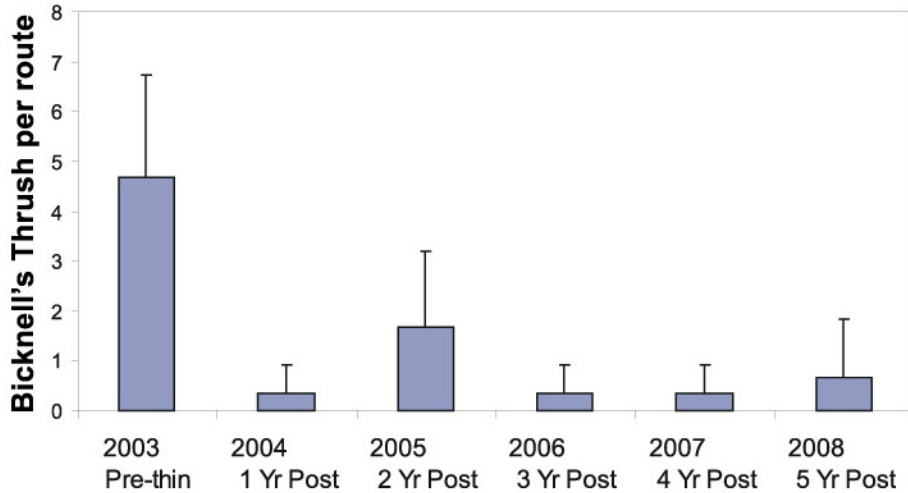
#### Forestry practices: pre-commercial thinning

The dense high elevation industrial forest used by Bicknell's Thrush about 10 to 15 years after cutting in both New Brunswick and Nova Scotia unfortunately coincides with the time when these young forests are thinned by foresters to increase the growth of remaining trees. This practice is termed pre-commercial thinning and is a serious threat to Bicknell's Thrush habitat.



*Before pre-commercial thinning (left) and after pre-commercial thinning (right).  
Photos © Sarah Chisholm*

Research in New Brunswick by BSC, Dalhousie University and the University of New Brunswick has shown that the abundance of Bicknell's Thrush is significantly lower in forest stands following pre-commercial thinning. Bicknell's Thrush is still detected in thinned stands, but is usually heard singing from within the un-thinned patches that thinning crews are required to leave around standing dead wood or other hazards.



*Average number of Bicknell's Thrush detected along three routes in New Brunswick from pre-thinning to five years post-thinning. Data © BSC and S. Chisholm, Dalhousie University*

### Land development: wind power, communication towers and ski hills

Strong winds at high elevations and along the sea coast help to create the dense, stunted forest used by Bicknell's Thrush. Not surprisingly, these areas are also ideal sites for wind farms. While as of yet there has been no conflict between Bicknell's Thrush habitat and wind farm construction in Nova Scotia, the clearing of land necessary for turbine placement and construction of roads and power lines makes wind farm development a potential threat to Bicknell's Thrush habitat.



*Wind farms require clearing of forest habitat for roads and infrastructure. Photo © Greg Campbell*

Another form of land development that impacts high elevation habitat is the construction of communication towers. Such development is escalating in Canada and in Nova Scotia with the rapid increase in cell phones, pagers and digital television. Construction of communication towers involves forest clearing, road building, power line installation, and the erection of buildings or containers with associated chain-link perimeter fences and lighting, and could similarly contribute to destruction and fragmentation of Bicknell's Thrush breeding habitat.

In more southerly sections of its breeding range in New Hampshire and Vermont, Bicknell's Thrush is also threatened by the loss of high elevation forest habitat from the development and enhancement of ski resorts. A noteworthy insight to emerge from studies of Bicknell's Thrush in these locations is the importance of maintaining large unfragmented blocks of high quality habitat to support core populations of Bicknell's Thrush. A strong population in each area will then be available to re-colonise the smaller more marginal patches of nearby habitat that remain after the forest is fragmented to create ski runs.

### Biological sources of habitat change: Spruce Budworm and Moose

Bicknell's Thrush habitat can be substantially altered by major infestations of Spruce Budworm. The budworms feed voraciously on balsam fir and white, red and black spruce, causing large numbers of dead and dying trees. After the infestation passes and the forest starts to regrow into dense new underbrush, there is a subsequent large increase in forest habitat of the kind preferred by Bicknell's Thrush.

A large moose population in Cape Breton Highlands National Park and, to a lesser extent, outside of the Park, has caused widespread habitat change over the last 30 years. Moose browse selectively, preferring aquatic plants in the summer and woody plants in the winter. They generally prefer to eat hardwood trees, but will select balsam fir during particularly severe winters. In addition, by browsing on young hardwood trees they remove the shade layer, thereby inhibiting the regrowth of new young softwood trees. The moose in Cape Breton Highlands National Park are therefore changing the composition of the forest, to the degree that they may be impacting Bicknell's Thrush habitat.



*Moose in Cape Breton.  
Photo © Sydney Bliss*

## **Threats to Individuals: Direct Mortality**

### **Human Sources**

During the breeding season, male Bicknell's Thrushes engage in large circle-shaped display flights at heights of 25 to 75 meters, which may make them vulnerable to collision with wind turbine blades.

In the industrial forest, pre-commercial thinning is most often conducted from May-September, encompassing the entire Bicknell's Thrush breeding season. The nests, eggs and nestlings of Bicknell's Thrush and other bird species are destroyed by thinning, a process which is referred to as "incidental take".

### **Predation**

American researchers have found that Bicknell's Thrush breeding success follows a biennial pattern. Breeding success is low in summers following years with especially abundant balsam fir cone crop, which happens every other year. This pattern of breeding success has been traced to population cycles of red squirrels, which feed heavily on cone crops. (Spruce and fir cones are one of red squirrels' main foods.) A copious cone crop results in a high red squirrel population, which in turn leads to increased squirrel predation of Bicknell's Thrush eggs and nestlings the following year. Although HELP surveyors count the number of red squirrels observed on each route annually, so far no relationship has been detected between squirrel numbers and Bicknell's Thrush abundance in Nova Scotia or New Brunswick.

Young Bicknell's Thrushes that have recently fledged are quite susceptible to predation because they are poor flyers and they persist in conspicuously begging food from adults for at least a week after leaving the nest. They are taken by avian predators such as Sharp-shinned Hawks and Saw-whet Owls and also by mammalian predators like weasels.

## **Legal Protection and Requirements**

This section describes the existing Nova Scotia laws that help to protect Bicknell's Thrush and what is legally required of land users and developers with regard to Bicknell's Thrush and its habitat.

### **Species Protection**

Under the Nova Scotia Wildlife Act it is an offence to take or kill any wildlife species, including Bicknell's Thrush, unless there is a regulated open hunting season for that species. In addition Section 51 of the Act makes it an offence to harm bird nests and eggs. The species and its nest are also protected in Canada under the federal Migratory Birds Convention Act (1994).

As noted earlier, Bicknell's Thrush is currently designated as Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). COSEWIC designations on their own do not provide species at risk any official protection. In order for a species at risk to receive official protection under federal legislation, it



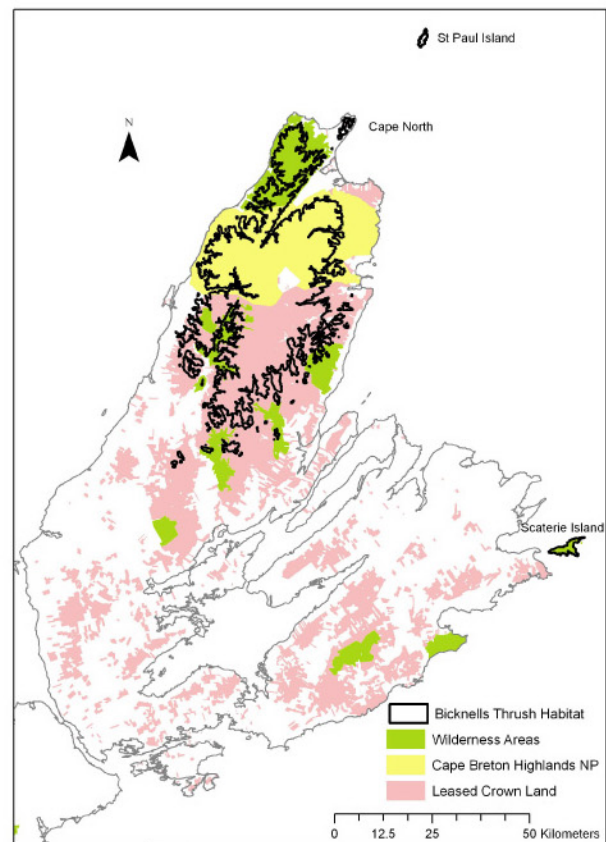
must be listed under the federal Species at Risk Act (SARA). The status of the Bicknell's Thrush is scheduled to be re-assessed by COSEWIC in November 2009. If it is determined that the species is at risk, it will then undergo the process to be added to the list of Wildlife Species at Risk under SARA. Once added to the list, SARA prohibitions apply only to species listed with status designations of Endangered, Threatened and Extirpated. These prohibition sections declare that it is an offence to: 1) kill, harm, harass, capture, or take; 2) possess, collect, buy, sell or trade; or, 3) damage or destroy the residence (e.g. nest or den) of one or more individuals of an Endangered, Threatened or Extirpated species. Therefore, if COSEWIC recommends a change in the national status of Bicknell's Thrush to Threatened or Endangered, the species may eventually receive more protection under SARA.

Under the Nova Scotia Endangered Species Act, Bicknell's Thrush is listed as Vulnerable, but it receives little protection from the Act because the prohibitions against injuring, killing, disturbing dwelling areas, etc., only apply to Threatened or Endangered species. If the species is reassessed federally, a provincial reassessment will follow.

### **Habitat Protection**

A fundamental requirement for the conservation of Bicknell's Thrush in Nova Scotia and throughout its range, is protection of its habitat. The Wildlife Act gives the provincial government authority to protect wildlife habitat by setting aside lands as Wildlife Sanctuaries or Wildlife Management areas. The Wilderness Areas Protection Act provides for the creation of provincial Wilderness Areas. There are six provincial Wilderness Areas that fall within the habitat range of Bicknell's Thrush in Nova Scotia, protecting 5,472 hectares of Bicknell's Thrush habitat.

Bicknell's Thrush habitat also receives some measure of protection from the Environmental Assessment Regulations under the Nova Scotia Environment Act. Many development projects that impact large areas of land are required to undergo Environmental Impact Assessment. This process considers the proposed project's impact on Endangered, Threatened, Special Concern and Vulnerable species and their habitats as listed under the Nova Scotia Endangered Species Act or the federal Species At Risk Act. Developers can determine if their project will impact any high priority habitats, including Bicknell's Thrush habitat, using the NS DNR's Significant Species and Habitats Database.



*Bicknell's Thrush breeding range in Cape Breton, Nova Scotia in relation to land use.*

*Map © BSC and NS DNR*

In addition, resource users wishing to use provincial crown land are required to determine the classification of this land through the NS DNR's Integrated Resource Management (IRM) process. For example, Cape North at the tip of Cape Breton is an important breeding site for Bicknell's Thrush. It is classified as Category 2 through the IRM process, which requires that any resource development in this area be under certain restrictions.

Finally, a large portion of Bicknell's Thrush habitat in Nova Scotia (61,500 hectares, or 41%) is contained within Cape Breton Highlands National Park, and is thus protected by the Canada National Parks Act.

### **Legal Requirements for Forest Harvest**

The Wildlife Habitat and Watercourses Protection Regulations under the Forests Act of Nova Scotia require forest companies to retain at least some wildlife habitat on all harvested sites. These regulations specify that for each harvest area larger than three hectares, the forest operators must leave ten trees of the same species mix, and at least the same diameter and height, as the harvested trees.

In addition, the trees must be grouped together in clumps in order to provide superior patches of wildlife habitat. If a company is harvesting a large stand of forest, one clump of at least 30 trees is required for each eight hectare area cut, with clumps situated no more than 200 metres apart and placed 20 to 200 metres from the uncut edge.



*Forest harvest in Nova Scotia.  
Photo © Bill Burt*



*Pre commercial thinning.  
Photo © Athol Forestry*

Although these clumps are good for some wildlife species, it is not known whether they benefit Bicknell's Thrush, because at present almost nothing is known about this species' use of mature harvestable forest stands. Generally, it is believed that the Bicknell's Thrush uses younger regenerating stages of industrial forest, rather than mature stands that are ready to be harvested. Leaving clumps of trees in areas undergoing precommercial thinning is likely a better practice to protect habitat for Bicknell's Thrush, but at present there is no legal requirement for this action.

# Stewardship: Best Conservation and Management Practices for Nova Scotia's High Elevation Forest

The best conservation and management guidelines that are presented below will address threats caused by both land development and forestry as identified earlier in this document. They are provided so that land owners, users and developers can avoid and reduce negative effects on Bicknell's Thrush and its optimal habitat in Nova Scotia.

## *Maintain existing Bicknell's Thrush habitat to the degree possible*

Bicknell's Thrush optimal habitat in Nova Scotia can be described as forest with the following characteristics:

- ~ elevation 380 metres or higher
- ~ 30% or more conifer stems
- ~ very high stem density (20,000 to 50,000 stems per hectare)
- ~ tree height over 3 meters

The precautionary approach to land development is recommended when developments are proposed in Bicknell's Thrush optimal habitat. In other words:

- ✦ *Developments such as roads, recreational trails, wind farms, and communication towers that involve even minor amounts of land clearing, should avoid areas where Bicknell's Thrush is found.*

To determine if Bicknell's Thrush has ever been found in a specific area, contact BSC Atlantic at 506-364-5047 or email [generalinfo@bsc-eoc.org](mailto:generalinfo@bsc-eoc.org)

If the area slated for development has not been shown to support Bicknell's Thrush in the past but is close to areas that have or recently had Bicknell's Thrush, or falls within the potential habitat range of the species, the precautionary approach should still be followed. It is recommended that BSC personnel, a provincial biologist, or a skilled birder survey the area during the bird breeding season to determine with high certainty the presence or absence of Bicknell's Thrush. If Bicknell's Thrush is found, the area should be avoided.



*Bicknell's Thrush.*  
Photo © Emily McKinnon

### **Maintain areas of optimal industrial habitat as long as possible**

Forestry companies should work with researchers to determine which forest stands meet optimal habitat characteristics for Bicknell's Thrush. Generally, forest stands reach conditions optimal for Bicknell's Thrush 10 to 15 years after cutting or planting. Surveys should then be conducted to determine which of these stands support Bicknell's Thrush.

- ✱ *Industrial forest stands that support Bicknell's Thrush should remain un-thinned until the trees are no longer at a successional stage that is suitable for nesting, as determined by further research.*

### **Avoid clearing, construction and thinning during the breeding season**

The Bicknell's Thrush has a low reproductive rate, so every breeding season is invaluable to maintain bird numbers in an already reduced and declining population. Therefore:

- ✱ *If clearing, construction and/or thinning in Bicknell's Thrush breeding habitat cannot be avoided, activities should be performed outside of the bird breeding season, before June 1st and after July 31st, to prevent the direct destruction of nests, eggs, nestlings, fledglings or adult birds.*

### **Leave patches of intact forest in cleared and thinned areas**

- ✱ *When forest clearing and thinning in Bicknell's Thrush breeding habitat cannot be avoided, patches of intact forest should be left whenever possible. These patches should:*
  - ~ cover at least one quarter hectare;
  - ~ be located 20 to 50 metres from the uncut or unthinned edge; and
  - ~ contain intact undisturbed underbrush.

### **Maintain an adequate supply of optimal habitat in the industrial landscape**

Long term impacts of pre-commercial thinning on Bicknell's Thrush may not be detrimental provided that excessive amounts of Bicknell's Thrush habitat are not thinned in a single year, and a specific rotation of un-thinned, just thinned and re-grown areas is maintained on the landscape to ensure sufficient breeding habitat. Presently, however, there is a lack of information on how much habitat is currently being used by Bicknell's Thrush in the industrial forests of Nova Scotia, and how much unthinned area is required for the current breeding population to remain stable or increase in size. Until such research is completed, land managers should consider the following guidance:

- ✱ *Nova Scotia's industrial forest should be managed with a "no net habitat loss" policy such that the amount of Bicknell's Thrush habitat does not decrease.*

This means that forest operators should stagger areas that are to be pre-commercially thinned over time. For example, managers could ensure that for every stand of optimal Bicknell's Thrush habitat which is thinned, an unthinned stand of approximately equal area will reach optimal characteristics (i.e. 10 to 15 years of age) the following year.

## Conclusion

The Bicknell's Thrush is a unique and fascinating part of Nova Scotia's rich natural heritage. This document aims to protect the Bicknell's Thrush in Nova Scotia by providing guidance to land owners, land users, and the public on how best to protect the high elevation forests used for breeding by this species. Working together, governments, industry, private landowners and conservationists can help this species and hopefully reverse the declines that have been seen over the last decade.



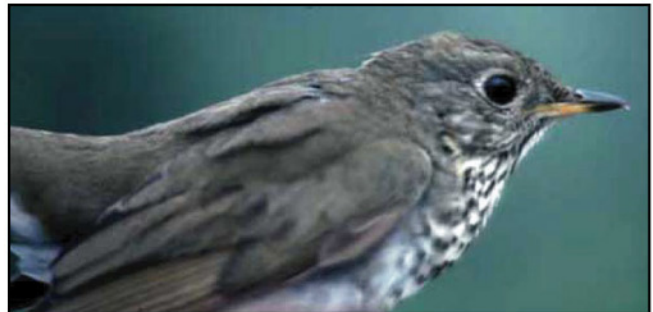
*Simeon Lake, Cape Breton Highlands  
National Park.  
Photo © Becky Whittam*

## Useful Information Sources

### *International Bicknell's Thrush Conservation Group*

The website of the International Bicknell's Thrush Conservation Group ([www.bicknellsthrush.org](http://www.bicknellsthrush.org)) provides information on the work of this partnership as well as the individual agencies that make up its membership. It also provides links to other websites with information on Bicknell's Thrush natural history, monitoring programs, research and conservation. It is updated regularly.

The International Bicknell's Thrush Conservation Group (IBTCG) is developing a detailed Conservation Action Plan for Bicknell's Thrush that summarizes specific priority actions, grouped under Research, Monitoring, and Forestry, that should be undertaken within the next five years to conserve the species.



*Bicknell's Thrush.  
Photo © Steven Faccio*

## **Local agencies**

The following agencies can provide guidance on surveying and managing Bicknell's Thrush habitat in Nova Scotia.

Bird Studies Canada – Atlantic Region  
PO Box 6227, Sackville, NB E4L 1G6  
generalinfo@bsc-eoc.org  
506-364-5047  
www.birdscanada.org

Canadian Wildlife Service – Atlantic Region  
PO Box 6227, Sackville, NB E4L 1G6  
506-364-5044  
nature@ec.gc.ca  
www.ns.ec.gc.ca/wildlife/

Nova Scotia Department of Natural Resources – Wildlife Division  
Provincial Building  
136 Exhibition St  
Kentville, Nova Scotia B4N 4E5  
902-679-6091  
www.gov.ns.ca/natr/wildlife/

## **Additional threats facing Bicknell's Thrush**

This section outlines additional threats facing the Bicknell's Thrush. Actions to address these threats are being identified and undertaken by the International Bicknell's Thrush Conservation Group.

### ***Climatic Warming***

Researchers have predicted that climate change is likely to have a significant impact on high elevation habitats, including the high elevation forests where the Bicknell's Thrush breeds. The climate and types of vegetation found on a mountain transform rapidly as the elevation increases. This results in narrow habitat zones, called ecotones, that change abruptly with height. As climate warms, characteristic habitat zones will shift upward, and plants and animals adapted to higher elevations will become confined to increasingly higher, smaller and more isolated patches of their preferred habitat. Because the Bicknell's Thrush is a high elevation specialist that is already restricted to fragmented patches of habitat, and because it is rare, it is likely to be seriously threatened by climate change. The changes in summer temperature projected to occur this century could, in time, reduce the availability of its preferred spruce-fir habitat by over 95%.

## Acid Rain

### Effects on trees

During fossil fuel combustion, sulfur dioxide and nitrogen oxides are released into the air, they mix with water vapor, and become sulfuric and nitric acid – the main components of acid rain. Acid rain leaches essential metal nutrients such as calcium from the leaves of trees and from forest soils. Calcium is vital to physiological functions of cell formation and sugar and water transport in plants, and if there is insufficient calcium available trees will experience stunted growth and be more susceptible to environmental stressors such as winter freezing injury, drought, pests and disease. When soil becomes acidic, aluminum ions, which are normally present in soil in an insoluble nontoxic form, dissolve into water and become toxic to plants. Aluminum impairs growth of fine capillary roots and prevents them from taking up calcium, further weakening trees.

Trees damaged by acid rain lose needles and leaves, creating a more open forest canopy. This diminishes the ability of birds like Bicknell's Thrush to hide from predators, and may reduce the time they are able to spend feeding. Stunted and dying trees also give rise to poor quality forest habitat with fewer ideal feeding, roosting and nesting sites.



*Spruce trees in Maine, dead and dying from acid rain and fog.  
Photo © Paul Donahue*

### Worse in high elevation forests

Though acid rain affects a vast expanse of northeastern North American forest, it actually has a greater negative impact on high elevation forests inhabited by Bicknell's Thrush. High altitude forests in the northeast usually receive greater precipitation from low lying weather systems, and they are shrouded by clouds or fog more of the time. These fog and cloud formations that surround mountain tops are about 10 to 100 times more acidic than normal rainfall. The highest rates of acid rain deposition in North America occur along the crest of the Northern Appalachian Mountains, the north section of which coincides exactly with the range of Bicknell's Thrush.

### Effects on invertebrate prey: lower calcium availability

Acid rain damages more than trees in a high altitude forest. It affects the entire forest ecosystem, including species like the Bicknell's Thrush, because it alters both the quality and quantity of invertebrate prey. When they are breeding, birds require larger amounts of calcium-rich food to produce eggshells and to feed young nestlings with growing bones.

Calcium depletion of soils leads to fewer calcium-rich prey, such as snails, slugs, earthworms, and millipedes, which are important to breeding birds. In acidified forest soils these types of invertebrates can be up to eight times less abundant, and when they are present, they are lower in calcium. For example, in habitats exposed to acid rain, researchers found fewer forest-dwelling bird species, and birds traveled further to find food for their young and had much larger territories than usual, indicating that the habitat was of lower quality.

### Mercury Pollution

Increasing amounts of mercury are also released into the atmosphere as by-products of fossil-fuel combustion, waste incineration and industrial activities like smelting. Mercury is not easily taken up by organisms, and is non-toxic in its inorganic form. When it is transformed into methyl mercury by a bacterial process that occurs primarily in aquatic habitats, it becomes toxic to living organisms and can accumulate in their tissues over time. Very recent studies have found that toxic methyl mercury can also be produced by bacteria in moist terrestrial habitats like a forest floor, especially if the habitat is acidic, for example from acid rain. The methyl mercury is ingested by forest invertebrates like snails, slugs, woodlice, and millipedes, which in turn are eaten by predatory invertebrates such as centipedes and spiders, and then by birds. Methyl mercury increases in concentration as one organism eats another upwards through the food chain. High body levels of mercury can have adverse effects on birds, causing aberrant behaviour and adverse reproductive consequences including lower egg production, infertile eggs, and higher early hatchling mortality.

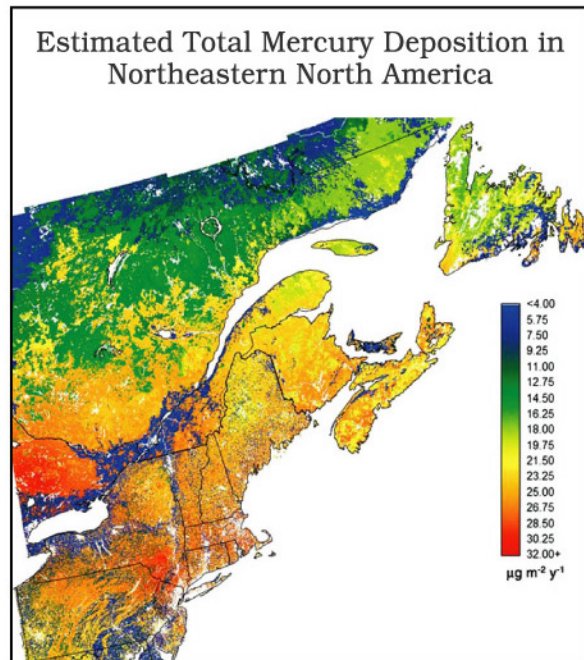


Figure from "Mercury Connections: The extent and effects of mercury pollution in northeastern North America", available at BioDiversity Research Institute

### Bicknell's Thrush accumulates mercury

Not surprisingly, researchers have found that invertebrate-eating forest birds in eastern North America are bioaccumulating mercury. New studies of mercury levels in forest bird species have shown that mercury blood levels in Bicknell's Thrush are higher than other terrestrial foraging thrushes like the Veery and Wood Thrush, and higher than Blackpoll Warbler, Yellow-rumped Warbler and White-throated Sparrow. Not only did Bicknell's Thrush have the highest levels, blood mercury concentrations in wintering Bicknell's Thrush in the Caribbean were generally 2 to 3 times higher than in birds sampled on breeding sites. Unfortunately, it appears that Bicknell's Thrush is being contaminated with mercury on both its breeding and wintering grounds.



## Acid rain and mercury work together to impact Bicknell's Thrush

Blood levels of mercury in Bicknell's Thrush are still relatively low compared to those in North American birds at the top of fish or aquatic insect-eating food webs. But because both acid rain and mercury pollution are highest right over its breeding range, they have a synergistic impact on Bicknell's Thrush. Firstly, conversion of inorganic mercury into toxic organic methyl mercury is facilitated in acidic environments. Secondly, acid rain leaches calcium from forest soils, reducing its availability to invertebrates, at a time when breeding birds have enhanced needs for calcium-rich prey to successfully reproduce. And, when birds' diets are low in calcium, both the uptake and the toxic effects of mercury are increased.

## *Wintering ground habitat loss*

In addition to having very particular breeding season habitat requirements, during the non-breeding season the Bicknell's Thrush also has quite specific habitat requirements – it depends on high-elevation broadleaf tropical forests in the Caribbean. Because the species spends more than half of the year in these warm mountain forests of the Dominican Republic and Haiti, extensive loss and degradation of forest habitat in these areas poses what is probably the greatest threat to the long-term survival of Bicknell's Thrush.

The species' wintering habitat has undergone extensive deforestation, primarily for subsistence farming, with the amount of native forest remaining at less than 1.5% in Haiti, and less than 10% in the Dominican Republic. Though some areas of montane broadleaf forest that make up Bicknell's Thrush wintering habitat are within National Parks in the Dominican Republic, illegal logging and clearing continue, partly due to a lack of enforcement. For example, on the western slopes of the Sierra de Neiba, a mountain range along the Haiti-Dominican Republic border, wintering Bicknell's Thrushes rely on small islands of high-elevation cloud forest. Sections of the Sierra de Neiba were formally given National Park status in 1995, but slash-and-burn agriculture and logging are still evident throughout the park. The section of the Sierra de Neiba range that extends into Haiti is already thoroughly deforested.