

*Conservation Assessment
for
Swainson's Thrush (Catharus ustulatus)*



Photo: Maria Bajema

USDA Forest Service, Eastern Region

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This Conservation Assessment was prepared to compile the published and unpublished information on the Swainson's Thrush and provides information to serve as a Conservation Assessment for the Eastern Region of the Forest Service. It does not represent a management decision by the U.S. Forest Service. Though the best scientific information available was used and subject experts were consulted in preparation of this document, it is expected that new information will arise. In the spirit of continuous learning and adaptive management, if you have information that will assist in conserving the Swainson's Thrush, please contact the Eastern Region of the Forest Service - Threatened and Endangered Species Program at 310 Wisconsin Avenue, Suite 580 Milwaukee, Wisconsin 53203.

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EXECUTIVE SUMMARY

This is a Conservation Assessment providing a summary of readily available information on the distribution, status, ecology, habitat, management, population biology, and potential threats to the Swainson's Thrush (*Catharus ustulatus*). Although the entire range of the species is discussed, emphasis is placed on the eastern region of the USDA Forest Service. The Swainson's Thrush issue of The Birds of North America series (Evans Mack and Yong 2000), a compilation of research findings from many sources, is a key reference used extensively in the development of this assessment.

The Swainson's Thrush is one of the North American spotted thrushes within a guild of ground-foraging, mainly insectivorous birds (Noon 1981), and is described as a complete long-distance (nearctic-Neotropical) migrant. It breeds in the western and northern U.S. to Alaska and Canada, and winters from southern Mexico to northern Argentina. Across its breeding range, this species occurs from sea level to 2,000 m (6,562 ft) or higher, and is strongly associated with coniferous forests or conifer components in mixed forests. The nests of the Swainson's Thrush are most frequently found in the understory 1m to 2.4 m (3.2 ft to 7.9 ft) above ground (Evans Mack and Yong 2000). In the Northeast and Midwest, their nests are most commonly found in understory balsam fir (*Abies balsamea*), spruce, or eastern hemlock (*Tsuga canadensis*) (Bull 1974, Harrison 1975, D. Flaspohler pers. comm. 2003). Although there are conflicting regional differences, the Swainson's Thrush is considered a generalist regarding forest succession and is found in both mature forests and early successional habitats. (Evans Mack and Yong 2000).

Although this thrush is still considered one of the most common birds of northern spruce-fir forests across much of its range, populations are declining in some areas, even where abundant (Evans Mack and Yong 2000). The global heritage status rank for Swainson's Thrush is G5, Demonstrably Secure. The United States and Canadian national ranking is N5B, Demonstrably Secure-Breeding (NatureServe 2003). Although not listed nationally or regionally as a species of conservation concern, local population declines warrant attention. The Swainson's Thrush is currently listed in Wisconsin as a Species of Special Concern, and in Pennsylvania as a Candidate Rare Species. It is a Regional Forester's Sensitive Species on one National Forest, the Chequamegon-Nicolet in Wisconsin.

Threats to Swainson's Thrush include habitat loss and habitat fragmentation, conversion of forest to agriculture and urban land use, and the consequential increase in nest predation (Clark et al. 1983, Saab 1999, Evans Mack and Yong 2000). There is evidence that tropical deforestation on the wintering grounds poses a moderate threat (Panjabi 2001). Other threats include mortality from radio tower impacts during migration and habitat alteration from deer herbivory (Robbins 1991, Robinson 1996).

Understanding how sensitivity to fragmentation and habitat requirements vary over its breeding range will be important for conserving future populations of the Swainson's Thrush (USGS 2003). One general approach to Neotropical migratory bird conservation that may solve many, if not most of the problems identified for them as a group is to enlarge tract sizes and conserve existing large tracts of forests (Robinson 1996).

However, for Swainson's Thrush there is contradicting evidence on its sensitivity to forest tract size (Freemark et al. 1995, Evans Mack and Yong 2000).

Several research priorities are listed by Evans Mack and Yong (2000), however they state that productivity on the breeding grounds is arguably the most serious problem facing the Swainson's Thrush, thus research investigating the factors affecting nest success are most important.

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NOMENCLATURE AND TAXONOMY

Scientific name: *Catharus ustulatus* (Nuttall 1840)

Subspecies: Six subspecies currently recognized that segregate into two groups, russet-backed (*ustulatus* group) and olive-backed (*swainsoni* group) *

Common name: Swainson's Thrush, formerly known as Olive-backed Thrush

Family: Muscicapidae

Order: Passeriformes

Synonym(s): *Turdus ustulatus* (Nuttall 1840)

* Subspecies limits are being debated (Ellison 1998).

DESCRIPTION OF SPECIES

A more detailed description of the Swainson's Thrush is given in Evans Mack and Yong (2000), but only summarized here. Swainson's Thrush is one of the North American spotted thrushes. It is similar in size, coloration, and plumage to the Gray-cheeked Thrush (*Catharus minimus*). Other similar species include Verry (*C. fuscescens*), Hermit Thrush (*C. guttatus*), Wood Thrush (*Hylocichla mustelina*), and Bicknell's Thrush (*C.*

bicknelli). Swainson's Thrush is best distinguished from all other North American thrushes by its buff colored eye-ring and lore (region between the bill and eyes).

Dwight (1900) (in Evans Mack and Yong 2000) describes the measurements and plumage of Swainson's Thrush. He states that it is medium-sized with olive-brownish upper-parts, has a distinct buffy eye-ring, white under-parts, and brownish black spotting on the throat and breast. The upper-parts and tail vary geographically from olive to reddish olive, grayish olive, or ashy brown. The overall length is 16.1 cm to 19.3 cm (6.3 in to 7.5 in). Both sexes are similar in size and color. Juvenile plumage is described as upperparts olive brownish and spotted below and above, with wing and tail feathers darker than body feathers.

The Swainson's Thrush commonly sings from a high perch often at night (Roberts 1932, Cornell Lab of Ornithology 2003). Its flutelike song spirals upward, differing from the descending or variably pitched songs of other thrushes. Hoffman (1904) (in Roberts 1932) says "It is unmistakably the voice of a thrush like a Veery's song inverted, going up instead of down the scale, but throatier, more gurgling, inferior in purity, richness, and suggestiveness to those of the three other common thrushes." During migration, Swainson's Thrush gives a soft bell-like *peep*, similar to a spring peeper (*Hyla crucifer*) (Evans Mack and Yong 2000).

LIFE HISTORY

Reproduction

There is evidence of strong breeding-site fidelity in adults (Evans et al. 1998). Pair formation occurs at the breeding grounds with males arriving before females. Breeding home range varied from 1 ha to 2.1 ha (2.5 ac to 5.2 ac) as reported in studies in New Hampshire, Ontario and Idaho (Evans Mack and Yong 2000). In Algonquin Provincial Park, Ontario, territory dimensions ranged from 0.12 ha to 5.14 ha (0.30 ac to 12.71 ac), and territory height extended to 6.1 m (20 ft) above ground (Martin 1960). Across its range, Swainson's Thrush eggs are generally laid from mid-April to late June, with latter dates presumed to be renests (Evans Mack and Yong 2000). In Wisconsin, Robbins (1991) notes that it is not exceptional for spring migrants to linger south of the breeding range through June 5th, with a range of recorded nests with eggs observed from June 17th to as late as July 17th.

Nests are a bulky well-made cup, more elaborately and neatly constructed than those of other thrushes (Cornell Lab of Ornithology 2003). The Swainson's Thrush usually nests in a small conifer 1 m to 6 m (0.3 ft to 19.7 ft) off the ground and close to the trunk on a horizontal branch (Harrison 1975). Nest diameters range from 9.4 cm to 15.4 cm (3.7 in to 6.1 in) and are constructed of a variety of vegetative materials (summarized in Evans Mack and Yong 2000), including twigs, mosses, bark, grasses, leaves and hair (Harrison 1975). The nests are often concealed with an outer covering of living green moss

(Cornell Lab of Ornithology 2003). See Site Specific Habitat (p.12) for more discussion on the location of nests. Clutch size varies from 1 to 5, with 4 the most common. Eggs are blue to greenish blue with reddish or brown speckles. Only the females incubate, with eggs hatching in 10 to 14 days. Males sing near the nest throughout incubation, and deliver food to the female at an unknown frequency. Both adults share in feeding the young, with insects making up most of the nestling diet (summarized in Evans Mack and Yong 2000).

Ecology

Swainson's Thrush is morphologically and behaviorally similar to the Gray-cheeked Thrush (Sabo 1980). In Vermont, Swainson's Thrush overlaps the Veery and Hermit Thrush in its habitat selection at the lower elevations (Kibbe 1985), however the Swainson's Thrush is generally found at higher elevations than Hermit Thrush (Peterson 1988). A population overlap between the Swainson's and Hermit Thrush, but not with the Veery, was reported along the Maine coast (Morse 1972). On West Virginia's Shavers and Cheat Mountains, oscillations of Hermit Thrush populations in some years may result in encroachment on Swainson's Thrush (Hall 1983). Peterson (1988) reports that in New York, Hermit Thrush often replace Swainson's in disturbed forests and bogs. Morse (1972) also suggests that Swainson's is socially subordinate to the Hermit Thrush. Dilger (1956) agrees that these two species overlap more than other thrushes, and suggests that they minimize competition by separating their niches: Hermit Thrush using interior edges and foraging on the ground, while Swainson's Thrush lives in the forest interior and forages more in the canopy. In addition, Noon (1981) notes that the Swainson's Thrush generally uses more mature forest habitats than Hermit Thrushes. In New Hampshire, annual population densities of Swainson's Thrush and five other bird species were shown to fluctuate more in typically low-density habitat for the species than in higher-density habitat (Sabo and Holmes 1983).

The Swainson's Thrush is within a guild of ground-foraging, mainly insectivorous birds (Noon 1981). However, food items include both insects and fruits. Based on analysis of stomach contents of over 400 individuals (Beal 1915 in Evans Mack and Yong 2000), insects and plant material comprised 63.5% and 36.5% respectively. Of the insects, 16% were beetles, 15% ants, 11% true bugs, 10% caterpillars, 6% bees and wasps, and 6% flies. Fruits included elderberries, blackberries, raspberries, huckleberries, false Solomon's seal (*Smilacina racemosa*), and sumac. Other specific food items include mosquitoes, crane flies, treehoppers, cicadas, spiders, millipedes, snails, sowbugs, earthworms, and domestic and wild cherries (Cornell Lab of Ornithology 2003). Ants (33%) and beetles (40%) comprised the bulk of food items of 34 Swainson's Thrush individuals sampled in a northern hardwood forest in New Hampshire (Holmes and Robinson 1988). Holmes and Sherry (2001) found high densities of Swainson's Thrushes in years concurrent with an irruption of a caterpillar species, but then observed a decline after caterpillar numbers abruptly decreased. Of special note is that the Swainson's Thrush is an important consumer of spruce budworm moths (*Choristoneura fumiferana*)

and saddled prominent caterpillars (*Heterocampa guttivitta*) during years of irruptive outbreaks (Langelier and Garton 1986, Crawford and Titterton 1979 in Evans Mack and Yong 2000).

Although placed within a ground-foraging guild, Swainson's Thrushes in New Hampshire spent less than 50% of their foraging time on the ground, and foraged in the sapling layer (2.1 m to 8 m) (6.9 ft to 26.2 ft) more often than did other species of this guild. Together with Veerys, the Swainson's Thrush also differed from other ground-foragers by flying more often and spending more time in the foliage searching for prey (Dilger 1956, Holmes and Robinson 1988). Swainson's Thrushes often perch on low twigs and branches and dive to the ground when prey is spotted (Holmes and Robinson 1988).

A life span of over 11 years for Swainson's Thrush was reported in New Hampshire by Nichols et al. (1981).

Migration

The Swainson's Thrush is shy and elusive on the breeding grounds, but are often easier to observe during migration because they sing frequently and are found in more open, urban habitats (Roberts 1932, Hall 1983). However, this is contradicted by Mueller and Berger (1967) who suggest that of the thrush species, the Swainson's and Gray-cheeked are the most difficult to observe and identify during migration. Also, thrushes rarely escape mist-nets, which increases their probability of being caught and accurately identified (Mueller and Berger 1967).

A detailed migration account of the Swainson's Thrush is given by Evans Mack and Yong (2000) with numerous sources cited, and is only summarized here. The species is described as a complete long-distance migrant. It breeds in western and northern U.S. and Canada, and winters from southern Mexico to northern Argentina. Returns from banded migrants connect migration stops in Michigan, Wisconsin, and Illinois to sites in Panama and wintering sites in Columbia. Migrants banded in Wisconsin and Minnesota have been recaptured during migration in Alabama, Manitoba and Alberta, and as summer residents in British Columbia. Forests in the Midwest and Northeast are important as migration stopovers in spring; eastern populations migrate along the west coast of the Gulf of Mexico, then through Mississippi Valley states, and then expand north and east. In the fall, the Swainson's Thrush is a less common migrant in the Midwest, being more common on the East Coast, Florida, and the Gulf Coast in Alabama.

It is generally assumed that most north temperate migratory passerines molt in the vicinity of their breeding areas prior to migration. However, in a study in New York and Ontario, some molting Swainson's Thrushes were captured during late July to mid-September at sites away from the breeding range. This suggests that some birds leave

their breeding areas before starting to molt, or when they are still in the early stages of molt. (Cherry 1985).

HABITAT

Range-wide Habitat

Across its breeding range, Swainson's Thrushes occur from sea level to 2,000 m (6,562 ft) or higher (Evans Mack and Yong 2000). In the montane forests of the northeast, highest densities were found at 800 m (2,625 ft) to 1200 m (3,937 ft) (Noon 1981).

This thrush is generally considered a specialist regarding forest type, showing a strong association with coniferous forests or conifer components in mixed forests (Green 1995, Evans Mack and Yong 2000). A dense overstory canopy is generally an important habitat attribute for this species (Evans Mack and Yong 2000), but they also use forests with large canopy gaps, probably to facilitate their habit of hawking for insects (Noon 1981). In the mountainous areas of the northeast, Noon (1981) noted that Swainson's Thrush occupied habitats with moderate shrub density containing at least some coniferous trees in the understory. In the Rocky Mountains, this species is also associated with the understory shrub layer in coniferous forests (Hutto and Young 1999). Temple et al. (1979, citing several studies) noted that the density of breeding Swainson's Thrushes in the mixed hardwood-coniferous forests of northcentral and northeastern U.S. were highest (21 pairs/40 ha) (99 ac) where spruce-fir was dominant. In New England, DeGraaf et al. (1992) report that the special habitat need for this species is coniferous and mixed forests, specifically preferring saw timber-sized balsam fir, red spruce (*Picea rubens*)-balsam fir and red spruce, as well as seedling northern hardwoods.

Although there are conflicting regional differences, range-wide the Swainson's Thrush is considered a generalist regarding forest succession and is found in both mature forests and early successional habitats (Evans Mack and Yong 2000). Results from bird surveys in varying successional stages of lowland conifers across the northeast showed the highest Swainson's Thrush abundance in mature northern white cedar (*Thuja occidentalis*), with much less occurrence in shrub-scattered conifers, young or low black spruce (*Picea mariana*), medium to mature black spruce, and tamarack (*Larix laricina*) (Dawson 1979). Also in the northeast, Smith et al. (1993) list the breeding habitat for this thrush as mature forest (not specific as to tree species). However, in the broad northern hardwood forest region of Canada and continental U.S., Noon et al. (1979) reported Swainson's Thrush in 20 % of the disturbed early successional and 15 % of the undisturbed mature habitats surveyed. DeGraff and Rappole (1995) also report that, particularly in the northeast, this species occurs in recent clearcuts with existing thickets in low damp areas.

Generally, in the western parts of its range the Swainson's Thrush prefers mixed-conifer old growth, especially on moist slopes, but also occurs in aspen forests with dense

understories, willow, and alder (DeGraff and Rappole 1995). Several authors state that in the Rocky Mountains, Swainson's Thrushes are relatively more abundant in old-growth or uncut stands (Johnston 1949, Hutto et al. 1993, Hejl et al 1995 cited in Evans Mack and Yong 2000). This is in contrast with Hutto and Young (1999) who report consistent use of older (pole/sapling) clearcuts and young forests, and common use of all types of early to mid successional forests in the Rocky Mountains.

A wider variety of habitats are used in migration, but there seems to be a preference for areas with dense undergrowth. Their winter range is quite variable in elevation and habitat, ranging from high cloud forests to forest-pasture edges (Evans Mack and Yong 2000).

Province, State and National Forest Habitat

The Swainson's Thrush breeds in all the Canadian Provinces. In Ontario, this species is associated with mature forests (Clark et al. 1983), with no records in bogs, young fire-origin paper birch (*Betula papyrifera*)-aspen or birch/aspen spruce/fir, and immature eastern white pine (*Pinus strobus*) habitats (Martin 1960). Densities of breeding males in descending order of habitat type were black spruce-cedar, black spruce, eastern hemlock, and lowest in mixed spruce-fir/hardwoods (Martin 1960). In the boreal mixed-wood forests of Saskatchewan (predominately white spruce [*Picea glauca*] and trembling aspen [*Populus tremuloides*]), the Swainson's Thrush is significantly more abundant in older forests (140+ years), and least abundant in 50 to 60 year old forests (Cumming and Diamond 2002). In southern Saskatchewan, the Swainson's Thrush was significantly more abundant in mixed-forests (more than 25% of canopy consisting of two or more tree species---black and white spruce, jack pine [*Pinus banksiana*], trembling aspen) when compared to homogenous forest types (i.e. > 75% of a single species) (Hobson and Bayne 2000). In New Brunswick, the Swainson's Thrush occupied 89 of 90 survey sites (99%) in regenerating clearcuts, where the dominant tree species were white birch, balsam fir and pin cherry (*Prunus pennsylvanica*) (Nixon et al. 2001). In the Northwest Territories, Machtans and Latour (2003) describe this species as a "habitat generalist". In Alberta, they reached a density of 0.61 per ha in old forest (75 yr. to 100 yr. post-fire) compared to a density of 0.36 per ha in young forest (logged 25 years ago) (Rangen et al 2000).

The Swainson's Thrush is reportedly found in the transition zone where the deciduous forest ends and the montane-fir forest begins in Vermont (Faccio 2004). They breed in both undisturbed and selectively logged mixed coniferous/deciduous forests at higher elevations, with prime habitat in dense vegetation near streams (Kibbe 1985). Appropriate habitat for the species, including second growth mixed coniferous/deciduous communities, is well distributed throughout the Green Mountain National Forest (USDA Forest Service 2002a).

The Swainson's Thrush is very common in and north of New Hampshire's White Mountains. It rarely breeds below 300 m (1,000 ft) in elevation, or above 1,370 m (4,500

ft) and is most abundant between 460 m (1,500 ft) and 1,070 m (3,500 ft) (Elkins 1994). Sabo (1980) reports the mean elevation selected in the White Mountains as 1020 m (3,346 ft). It was one of the most common ground-foraging species reported in a northern hardwood forest at the Hubbard Brook Experimental Forest between 1974 and 1978 (White Mountain National Forest). However, it was noted that a boreal coniferous forest was only a few hundred meters in elevation away from this deciduous forest where Swainson's Thrushes are known to be more abundant (Holmes and Robinson 1988).

In Maine this thrush was reported by Morse (1972) to be a forest interior species that was found in dense stands of spruce forests on large islands and on the mainland. However, in the absence of congener species, the Swainson's Thrush tends to occupy a wider range of habitats than it does in their presence.

In New York the Swainson's Thrush is found statewide at moderately high elevations that range from about 549 m (1800 ft) to somewhere near 1219 m (4000 ft), especially in the Adirondack and Catskill Mountains (Peterson 1988). It occurs in mixed and deciduous forests, but favors conifer habitats (Peterson 1988), especially undisturbed red spruce and balsam fir forests (Dilger 1956). At lower elevations it may occupy hemlock-northern hardwoods, but in the mountains it favors spruce-fir (usually black spruce in lower elevations and red spruce on the slopes of high peaks) (Peterson 1988, Ellison 1998). It also is found in black spruce-tamarack bogs (Ellison 1998). The presence of a conifer component appears necessary to this species, since in New York their nests are usually found in conifers (Dilger 1956).

Almost all Swainson's Thrush atlas reports in Pennsylvania come from the northern hardwood forests containing hemlock above 304 m (1,000 ft) in the Allegheny High Plateau, either in dense undergrowth stands or as mature trees (Brauning 1992). The Swainson's Thrush is also found in second growth in Pennsylvania, but perhaps only where conifers predominate (Brauning 1992). Specific reports vary from clearcut edges to interior old growth (Brauning 1992). On the Allegheny National Forest, this species occurs primarily in hemlock, with a good population in old growth hemlock-beech (*Fagus grandifolia*) in the Tionesta Scenic and Research Natural Areas (B. Nelson pers. comm. 2003). In one Pennsylvania study, Haney and Schaadt (1996) report that Swainson's Thrushes were more than twenty times as abundant in old growth hemlock-hardwood as in second growth. However, they believe that the species was found in old growth due to a preference for conifers, and not the forest's age.

Summer surveys in West Virginia found Swainson's Thrush at the very highest elevations and almost exclusively confined to spruce forests, but occasionally in the mixed stands located adjacent to the spruce (Hall 1983, Buckelew et al. 1994, K. Karriker pers. comm. 2003).

In Michigan, Murray (1991) states that most of the breeding range for Swainson's Thrush coincides with its preferred nesting habitat of conifer or conifer dominated mixed forest. However, the Michigan Breeding Bird Atlas data shows that most breeding activity for the species is concentrated (17 of 18 records) in northern hardwood forests, both with and

without canopy-level conifers. Habitat for Swainson's Thrush does not appear to be limiting across the Upper Peninsula, including the Ottawa and Hiawatha National Forests (USDA Forest Service 2002b).

The Swainson's Thrush is common in the northeast, rare in the north central, and very rare in the north and northwestern portion of Minnesota (Green 1995) (Figure 4). It is primarily dependent on conifer species (Niemi and Hanowski 1992), and is mostly found in the mature coniferous forests (Niemi and Pfannmuller 1979), especially in mature white cedar stands where its density was recorded at about 0.125 pairs/16 ha (Hanowski et al. 2003). This thrush is also associated with closed canopy black spruce-tamarack communities (Green 1995). It is common on Minnesota's Superior National Forest and uncommon on the Chippewa National Forest (Figure 6).

On the Superior National Forest in Minnesota, Green and Niemi (1980) list Swainson's Thrush as one of the primary breeding species in the black spruce-tamarack community. Hanowski et al. (2003) report that the highest occurrence on this Forest was in saw timber sized white cedar (0.301 individuals per survey), followed by mixed swamp conifer (0.227), fir/aspens/paper birch (0.209), white cedar poles (0.208), upland black spruce poles (0.194), and in lesser abundance in all other types surveyed except regenerating black spruce and saw-sized aspen/white spruce where it did not occur. At this time the Superior National Forest lists the Swainson's Thrush as a Management Indicator Species for lowland cedar forests (M. Shedd pers. comm. 2004).

On Minnesota's Chippewa National Forest, Swainson's Thrush is much less abundant and occurred in only nine of 28 habitat types surveyed (Hanowski et al. 2003). In contrast to the Superior National Forest surveys, the Chippewa reported the highest occurrence in northern red oak (*Quercus rubra*) pole habitat (0.037 individuals per survey) followed by saw-sized ash (*Fraxinus spp.*)/elm (*Ulmus spp.*)/red maple (*Acer rubrum*) (0.035), saw-sized sugar maple/basswood (0.02), paper birch poles (0.011), quaking aspen poles (0.008), black spruce poles (0.007), mixed swamp conifer poles (0.004), jack pine (0.004), and regenerating quaking aspen (0.003) (Hanowski et al. 2003). The proposed revisions for the Land and Resource Management Plans for the Superior and Chippewa National Forests have linked Swainson's Thrush to mature and older upland spruce-fir and lowland conifer forests (USDA Forest Service 2003b).

In Wisconsin the species is found in northern conifer swamps and bogs (Hoffman and Mossman 1993), in the limited boreal forests along Lake Superior's shore (Mossman et al. 1990), and less frequently in the abundant northern mesic forests (Hoffman 1989). On the Apostle Islands National Park, this thrush is reported in a variety of habitats including boreal forests, aspen/birch, conifer forests, northern hardwood and northern hardwood-hemlock, and even in bogs, clearings, and sand/shrub habitat (J. Van Stappen pers. comm. 2003). Temple et al. (1979) suggested that Swainson's Thrush numbers would increase on the Apostle Islands if spruce and fir forest types increased in abundance.

On the Chequamegon-Nicolet National Forest (CNNF), Swainson's Thrushes are somewhat more common on the Nicolet than on the Chequamegon land base. Their

habitat has been described from results of two breeding bird surveys that are conducted on this Forest (The Nicolet National Forest Bird Survey and the Chequamegon National Forest Bird Survey conducted by NRRI). On the Nicolet land base, this species shows a definite preference for the northern hardwood forest type (Figure 1), and more specifically northern hardwoods with a conifer component in the understory (R. Howe pers. comm. 2004). A different habitat preference has been reported for the Chequamegon land base (Hanowski et al. 2003). Here Swainson's Thrush occurrences were highest in pole sized mixed swamp conifer and saw timber sized jack pine types (0.061 and 0.059 individuals per survey respectively), with much lower densities recorded in sugar maple (*Acer saccharum*) and sugar maple/basswood (*Tilia americana*) hardwood types (0.009 and 0.005 individuals per survey respectively). A biological evaluation conducted by the CNNF for Swainson's Thrush (USDA Forest Service 2003a) listed key habitats as mature lowland conifer and mixed upland deciduous/conifer, and dense conifer understory. McRae (1995), working with data from the Nicolet National Forest Bird Survey, showed that local abundance of 10 Neotropical migrants (including the Swainson's Thrush) were positively correlated with percent upland conifer-hardwood forest within 500 m (1640 ft), and negatively correlated with the percent upland open habitat within 250 m (820 ft).

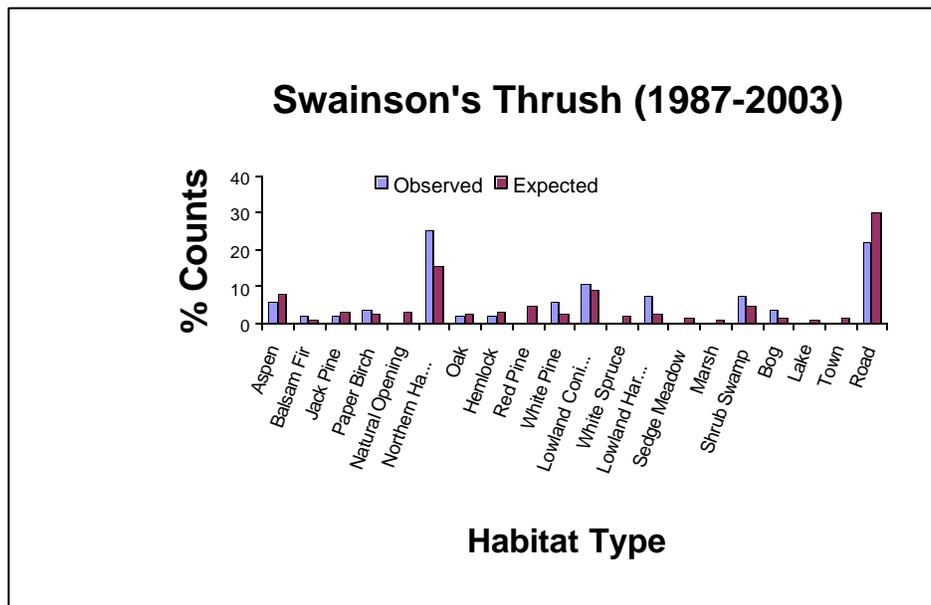


Figure 1. Observed and expected distribution of Swainson's Thrush by habitat type and road sites on the Nicolet National Forest Bird Survey from 1987 to 2003* (source: Nicolet National Forest Bird Survey web site)

*The “expected” bars represent the proportion of all bird counts that fall into that habitat category. Therefore, if a bird species shows no selectivity, then the observed and expected would be the same. Road points are randomly located, and are not analyzed by associated habitat.

Site Specific Habitat

In Ontario, the Swainson’s Thrush is associated with conifers, a high canopy density, and intermediate tree density indicative of undisturbed forests. Unlike many reports, in Ontario this species is associated with stands that have very little understory (Clark et al. 1983). In mixed-wood jack pine forests of the boreal region of Saskatchewan, Swainson's Thrush occurrence was positively correlated with the presence of canopy white birch, which was the most important predictor for this species. Another predictor for this thrush in the same region was a canopy closure of 71% to 100% in the jack pine (mixed-wood) forests (Kirk and Hobson 2001). In 11 to 22 year old pine plantations in British Columbia, Swainson's Thrush had a strong selection for nesting in patches of dense deciduous vegetation that remained following timber stand improvement. However, within these deciduous patches they still favored conifer trees for nesting slightly more than deciduous trees (Easton and Martin 2002).

In Vermont, the Swainson’s Thrush uses mixed coniferous-deciduous forests with conifers in the understory, a moderate density of shrub and ground cover, and moderate tree diversity and basal area density (Noon 1981). In subalpine spruce-fir forests of New Hampshire, the Swainson's Thrush is associated with 64% canopy cover, 9 m (29.5 ft) canopy height, and high conifer foliage (Sabo 1980). In Minnesota, the Swainson’s Thrush is a conifer-dependent species that requires >70% conifers in a stand (Green 1995). In Wisconsin, Robbins (1991) states that this species is associated with both mixed spruce and maple forests, but in the hardwood forests, an understory conifer component seems important (D. Flaspohler pers. comm. 2003, R. Howe pers. comm. 2004). In New Hampshire this species also prefers areas with large openings in the canopy that facilitate its habit of hawking for passing insects (Noon 1981).

Swainson’s Thrush nests are most frequently found in the understory 1 m to 2.4 m (3.2 ft to 7.9 ft) above ground, particularly in dense deciduous shrubs or conifer saplings. Less frequently but consistently they are also found >3 m (9.8 ft) above ground on horizontal branches away from the boles of larger diameter trees. Nests are found in a variety of tree and shrub species depending on geographic location (several sources cited in Evans Mack and Yong 2000). In New York, nests are most commonly placed low in a balsam fir, eastern hemlock and small spruce trees, and are usually well concealed (Bull 1974 in Peterson 1988). All nests found in one New England study were either in spruce (N = 11), or in balsam fir (N = 10) (Harrison 1975). Five of 6 (83%) Swainson’s Thrush nests found in Wisconsin were 1.5 m to 2.7 m (5 ft to 9 ft) high in understory conifers (4 in balsam fir, 1 in hemlock), with one nest 7.6 m (25 ft) high in a maple tree (D. Flaspohler pers. comm. 2003).

DISTRIBUTION

Range-wide Distribution

Evans Mack and Yong (2000) summarize the reported breeding range of Swainson's Thrush from several sources. It is a nearctic-Neotropical migrant that breeds as far north as Alaska and northern Canada and winters primarily in South America (Figure 2). In the western United States its breeding range extends to the Pacific Coast throughout Washington, Oregon, and mainly coastal California. In the interior west, it breeds in Idaho, Montana, Nevada, Utah, Colorado, Wyoming, New Mexico, Arizona, and South Dakota. In the central United States the Swainson's Thrush breeds in Minnesota, Wisconsin, and Michigan. In the northeast, breeding occurs in Maine, New Hampshire, Vermont, Massachusetts, New York, Pennsylvania, West Virginia, and possibly Connecticut and Virginia (Figure 3). The Partners In Flight (PIF) Program estimates that 51% to 75% of Swainson's Thrushes breed in temperate North America, and 11% to 25% breed in the Midwest region of North America (Thompson et al. 1993a).

Swainson's Thrushes winter from southern Mexico to Peru, Brazil, and Argentina (Cornell Lab of Ornithology 2003), and during the winter, "...are one of the most abundant birds in young second-growth forests in Costa Rica" (DeGraaf and Rappole 1995:376). This species has been reported during winter bird counts in North America, but in low numbers (North American Breeding Bird Survey, BBS).



Figure 2. Range-wide Map for Swainson's Thrush (source: Canadian Wildlife Service 2003)

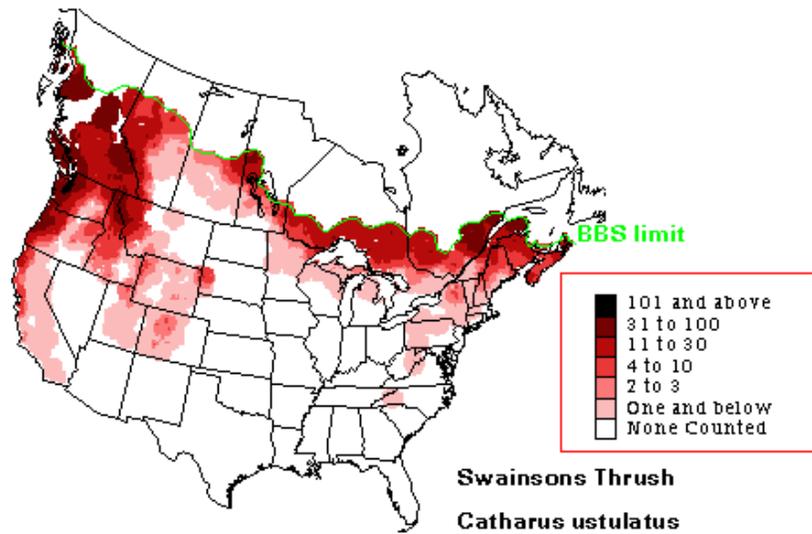


Figure 3. Breeding Range of Swainson’s Thrush (source: North American Breeding Bird Survey)

State and National Forest Distribution

Statewide breeding distributions for Swainson’s Thrush in Minnesota, Wisconsin and Michigan are shown in Figure 4. Counties with confirmed Swainson’s Thrush breeding in New Hampshire, Vermont, New York, Pennsylvania, and West Virginia are shown in Figure 5. The distribution of this species for the national forests in Minnesota and Wisconsin is given in Figure 6. See sections on Status for more information on distribution and abundance.

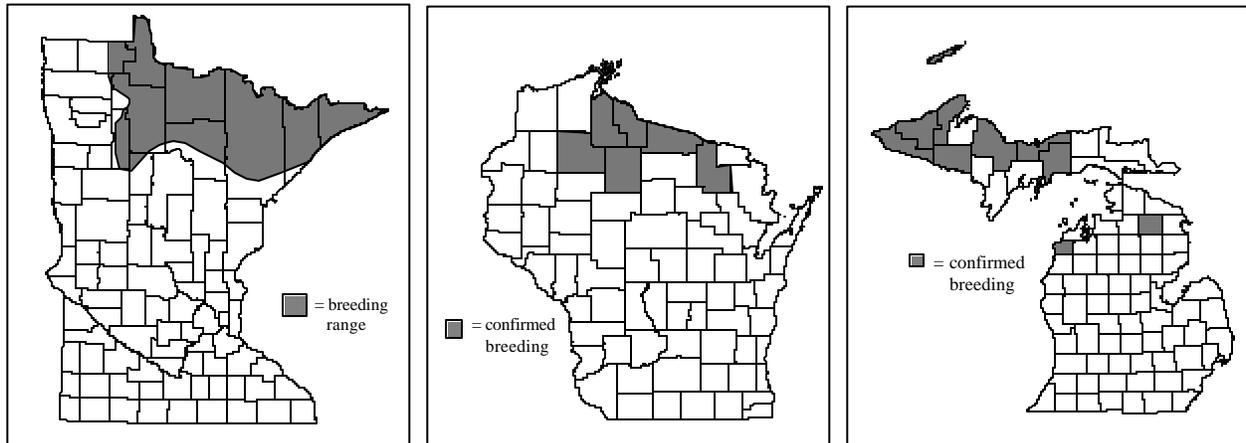


Figure 4. Breeding range of Swainson’s Thrush in Minnesota, and counties with confirmed breeding in Wisconsin and Michigan (source: Minnesota Ornithologist Union, Wisconsin Breeding Bird Atlas, and Michigan Breeding Bird Atlas)

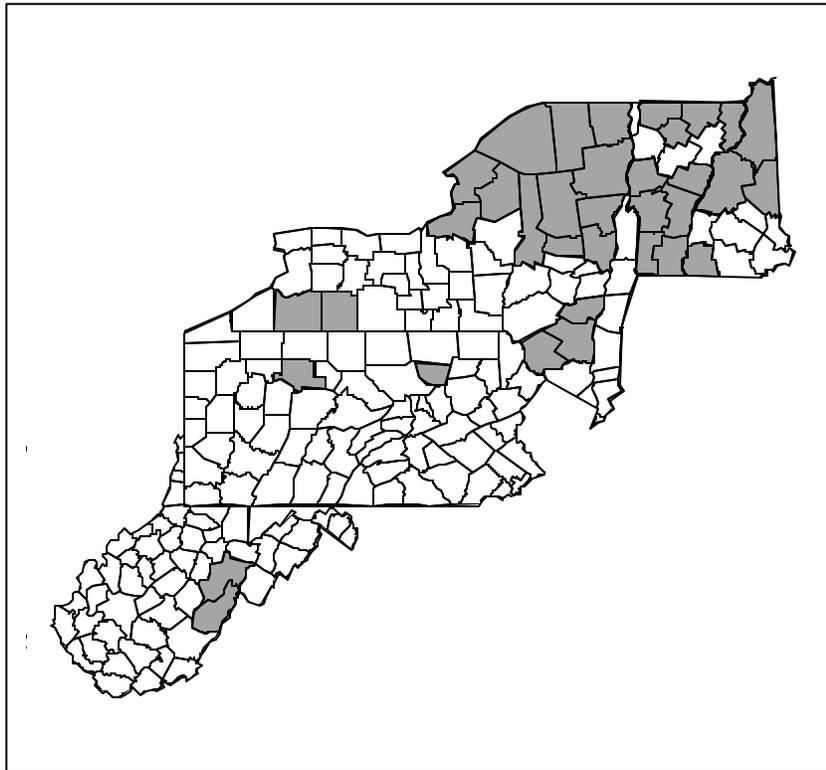


Figure 5. Counties with confirmed breeding for Swainson's Thrush in West Virginia, Pennsylvania, New York, New Hampshire, and Vermont. (source: Breeding Bird Atlas information)

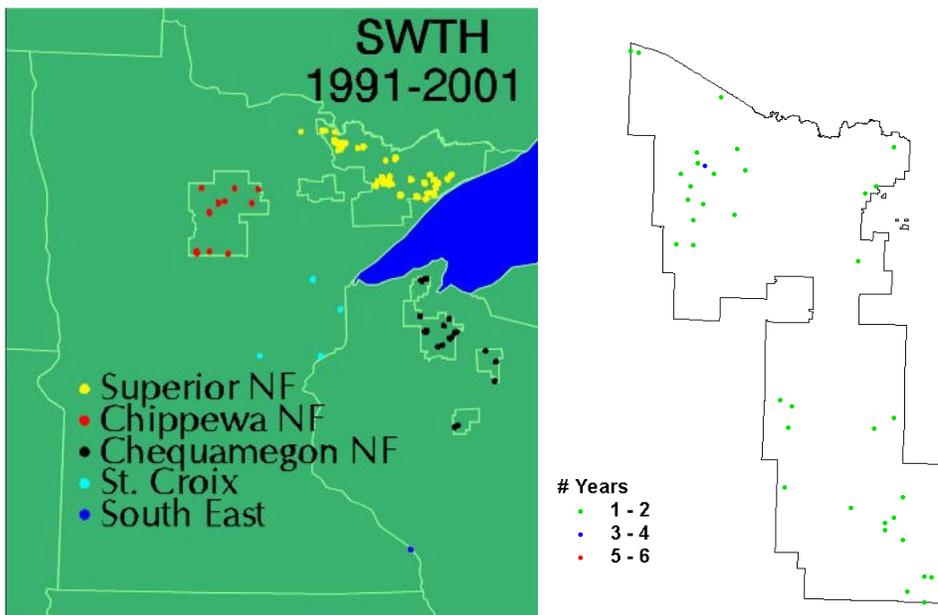


Figure 6. Distribution of Swainson's Thrush on the Superior, Chippewa, and Chequamegon National Forests from 1991 to 2001 (source: Natural Resource Research Institute) and on the Nicolet National Forest from 1987 To 2003 (right) (from Nicolet National Forest Bird Survey).

STATUS

Range Wide

The BBS indicates that the Swainson's Thrush is undergoing a significant 0.8% per year decline in the United States and a 0.5% per year decline of questionable statistical significance and credibility range-wide (Table 1, Sauer et al. 2003). These rates are somewhat low relative to other declining Neotropical migratory birds, but they nonetheless warrant attention. The map of BBS trends (Figure 7) shows no clear geographic trend, with areas of both decreasing and increasing trends occurring throughout North America.

It appears that the small and inconsistent population decline across the Swainson's Thrush range may be responsible for the low conservation rankings listed in Table 1. Within Swainson's Thrush's range, moderate PIF scores of 15 to 17 predominate, while Heritage Status Ranks are "demonstrably secure" or "apparently secure" for the vast majority of states and provinces in which it occurs (Figure 8).

These optimistic assessments appear to contradict evidence of population declines in some areas. For example, the BBS shows a significant decline of -1.7% ($P = 0.00$) in the northern forests of the Northeast U.S. (the Northern Spruce-Hardwoods physiographic region) (Sauer et al. 2003). Overlapping this region are additional PIF regions where conservation scores for the Swainson's Thrush never exceed the moderate value of 17. Examination of the process PIF uses to determine these scores reveal four factors that may explain this contradiction (Panjabi 2001). (1) Swainson's Thrush is often reported as being one of the most abundant birds in suitable habitat, even in some areas where it is now declining (Evans Mack and Yong 2000). (2) It has a large breeding and wintering range. (3) There are no particularly pressing threats to breeding or wintering habitat; at least no more so than other species threatened by habitat fragmentation. (4) Areas on the periphery of Swainson's Thrush's range (such as Northeast U.S.) are not seen as vital for the conservation of the population as a whole, probably because of the limited distribution and relatively low densities in those areas. These factors address the welfare of the population as a whole, but they do not, however, appease concerns about potential local extinction or drastically reduced populations in certain politically defined areas such as Wisconsin and Pennsylvania.

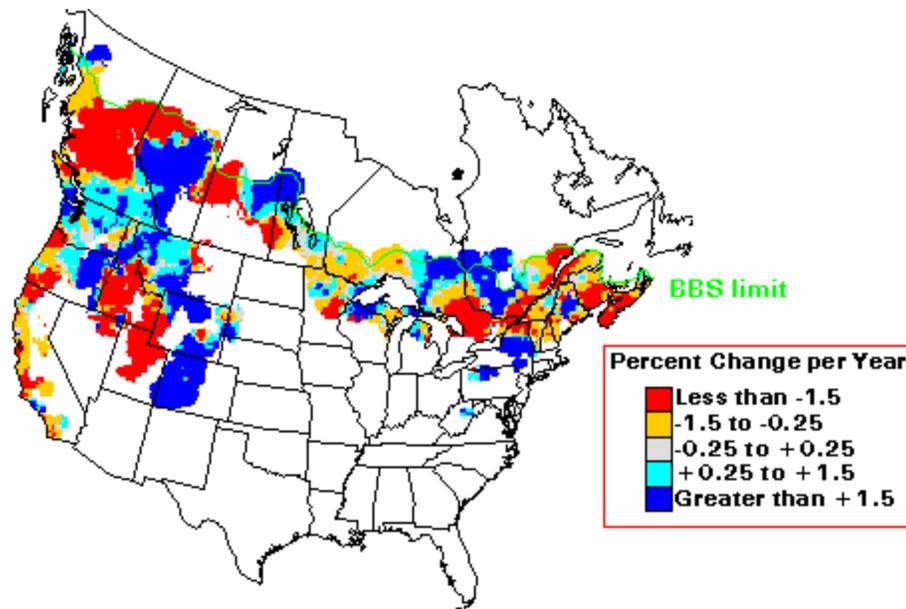


Figure 7. Annual population trend of Swainson’s Thrush from Breeding Bird Survey routes in the United States and southern Canada, 1966-1996; data is summarized as the percent change per year for each route (Sauer et al. 2003).

State Status

Here we focus on states in the North Central and Northeast U.S. that have national forests. Among northeastern states Pennsylvania and West Virginia have the most limited distributions for Swainson’s Thrush. Brauning (1992) reports that it is the rarest nesting thrush in Pennsylvania, most often found in state and national forests in the northern third of the state. The Pennsylvania Breeding Bird Atlas has records in less than 1% of the survey blocks, with confirmed breeding in two counties and probable evidence of breeding in seven additional counties (Figure 5). Brauning (1992) found evidence of a decline of the Swainson’s Thrush in Pennsylvania by comparing current low abundance to a few reports from before the year 1900 that found locally high abundance. Brauning reasons that this decline may have been caused by a reduction of second-growth forests with coniferous understories.

Buckelew and Hall (1994) report that, “...a small but healthy disjunct population has existed in the higher mountains in the spruce belt of West Virginia.” Hall (1983) concluded that Swainson’s Thrush was an uncommon to very common local summer resident in West Virginia and reported densities of 0.17 per ha in censuses where they were found. This is a relatively high density, but they have a very restricted range in the State. The West Virginia Breeding Bird Atlas reports confirmed or probable breeding in only eight survey blocks spanning two counties in the Monongahela National Forest (Buckelew and Hall 1994, Figure 5), and Hall (1983) reported summer records in four

additional counties in the eastern part of the state. Hall (1983) surmised that the population had declined somewhat in recent years, but the BBS has insufficient data to detect a trend in West Virginia. Note that there is a discrepancy between the “apparently secure” ranking for Swainson’s Thrush given in Table 1 and Figure 8, and the “critically imperiled” ranking given by the West Virginia Natural Heritage Program web site.

In Vermont, the Swainson’s Thrush is widespread, but relatively uncommon, and there is strong evidence of a population decline. It occurs throughout most of the state, but attains highest densities in the higher elevations of the Green Mountains and Northeast Highland regions (Kibbe 1985). Kibbe (1985) surmised that the Swainson’s Thrush has always been a relatively uncommon species in Vermont. However, BBS indicates a significant decline of -5.1% per year from 1966 to 2002 (Table 1). This trend was confirmed by Faccio (2004), who detected a decline of -11.5% per yr. ($P=0.086$) for Swainson’s Thrush in 17 high elevation sites in the Northeast U.S. ($N = 9$ in Vermont) between 1991 and 2000.

The New Hampshire Breeding Bird Atlas shows Swainson’s Thrush in nearly every survey block in and north of the White Mountains (the northern one-third of the state), where it is one of the most abundant species between 610 m and 1070 m elevation (2000 ft to 3000 ft) (Elkins 1994). In New Hampshire, Sabo and Holmes (1983) found high densities in 10 ha of northern hardwoods at 600 m elevation and in 50 ha of subalpine balsam fir and red spruce at approximately 1000 m elevation (0.53 birds/ ha and 0.75 birds/ ha, respectively). However, south of the White Mountains records are sparse (Elkins 1994). Elkins (1994) noted evidence of Swainson’s Thrushes declining in New Hampshire using BBS data from 1966 to 1984 and personal observations, however BBS data from 1966 to 2002 show a population increase of questionable statistical significance (Table 1).

The New York Breeding Bird Atlas shows the Swainson’s Thrush occurring in the vast majority of survey blocks in the Catskills, Adirondacks, and Tug Hill, with many of the occurrences confirmed as breeding, while records are sparse elsewhere in the state (Peterson 1988, Ellison 1998). It is uncommon to common at moderately high elevations in these areas (Peterson 1988). Peterson (1988) notes that there were reports of Swainson’s Thrush’s high abundance in New York during the early 1900’s, and thus concludes that abundance has changed little since then given current abundance. This speculation is confirmed by a stable BBS trend (Table 1).

In the North Central U.S., Swainson’s Thrush is limited to the northern-most forests where conifers are abundant. In Michigan, Swainson’s Thrush is found in all counties of the Upper Peninsula (UP), though they nest only in small numbers there and in two counties in the northern Lower Peninsula (Figure 4). Breeding records are concentrated in Isle Royale and the western two-thirds of the UP (Murray 1991). Murray (1991) speculates that Swainson’s Thrush densities in Michigan are similar to those in the recent past, though the BBS shows a possible declining, though statistically insignificant, trend (Table 1).

In Wisconsin, Robbins (1991) describes Swainson's Thrush as an uncommon breeder in mixed spruce and maple forests of the northern counties (Figure 4). It is relatively rare in the Nicolet National Forest, where only three records for every 100 point counts occurred (Nicolet National Forest Bird Survey, Figure 6). Contrasting this is Lake Superior's Apostle Islands National Park, where the species is considered common (Temple and Harris 1985) with > 100 records from breeding bird surveys conducted from 1994 to 2003 (J. Van Stappen pers. comm. 2003). The Wisconsin Breeding Bird Atlas confirmed breeding in 10 survey blocks spanning six counties and found probable evidence of breeding in 24 survey blocks in seven additional counties. The BBS, using data from seven transects, detected no long-term change in Swainson's Thrush's population in Wisconsin (Table 1), however some researchers suggest that there has been a dramatic decline in recent years (R. Howe pers. comm. 2003).

In Minnesota, the Swainson's Thrush is very rare in the northwest, rare in the north central, and common in the northeast (Green 1995, Figure 4). Highest densities in the state are in the Superior National Forest and Boundary Waters Canoe Wilderness Area, particularly in mature lowland conifers (Green and Niemi 1980; Niemi and Hanowski 1992). It is uncommon in the Chippewa National Forest (Niemi and Hanowski 1992). Hanowski et al. (2003) report a stable population trend from 1991 to 2003 in the Superior National Forest (1.1% per yr. $P=0.32$), while the BBS detected a credible increasing trend (though statistical significance is questionable) from 1966 to 2002 throughout the state (Table 1).

The North Central and Northeast U.S. are important areas for Swainson's Thrush migration. In Michigan, Murray (1991) states that, "At the height of their migration, Swainson's Thrushes often seem to outnumber all other species combined." In Wisconsin, on the western shore of Lake Michigan, Swainson's Thrushes accounted for 21.5% of the migrating birds caught (7678 individuals) during the autumns of 1958 through 1963 (Mueller and Berger 1967). During spring migration in New York, the Swainson's Thrush was traditionally the most common migrant thrush, though in the last decade it has declined and been surpassed by Hermit Thrush (Ellison 1998). In West Virginia, Swainson's Thrush is a common migrant (Hall 1983), though banding records and reports of both spring and fall migrations indicated a population decline (Buckelew and Hall 1994).

Table 1. Breeding bird survey trends, state listings, and conservation priority assessments for the Swainson's Thrush.

State/Province	Trend ¹	Credibility		State Listing	PIF Assessment	
		P-value	Index ²		Score ³	Heritage Status Rank ⁴
Illinois	-	-	-	Not listed	-	-
Indiana	-	-	-	Not listed	-	-
Maine	0.4	0.77	3	Not listed	15/17	demonstrably secure
Michigan	-2.0	0.55	2	Not listed	17	vulnerable/apparently secure
Minnesota	2.1	0.18	3	Not listed	17	not ranked
Missouri	-	-	-	Not listed	-	not ranked
New Hampshire	2.5	0.11	1	Not listed	15/17	demonstrably secure
New York	0.1	0.93	1	Not listed	14/16	demonstrably secure
Ohio	-	-	-	Not listed	-	not ranked
Ontario	0.1	0.89	1	Not listed	17/19	demonstrably secure
				Proposed		
Pennsylvania	2.9	0.40	2	Candidate Rare	16/14	imperiled/vulnerable
Quebec	-0.9	0.32	1	Not listed	14/19	demonstrably secure
Vermont	-5.1	0.02	2	Not listed	15/17	demonstrably secure
West Virginia	-	-	-	Not listed	-	apparently secure
				Special		
Wisconsin	0.6	0.54	2	Concern	17	imperiled
United States	-0.8	0.04	3	Not listed	-	demonstrably secure
Survey-wide	-0.5	0.09	1	-	-	demonstrably secure

¹ Percent change per year 1966 to 2002 (Saurer et al. 2002)

² Credibility Index: 1 = very low abundance, very small sample, or very imprecise; 2 = low abundance, small sample size, imprecise, or inconsistent trend over time; 3 = > 13 samples, moderate precision, and moderate abundance.

³ Score increases with conservation concern. Scores are associated with physiographic regions, so multiple scores indicate multiple physiographic regions with different scores in a state.

⁴ From NatureServe (2003). Dual rankings indicate uncertainty.

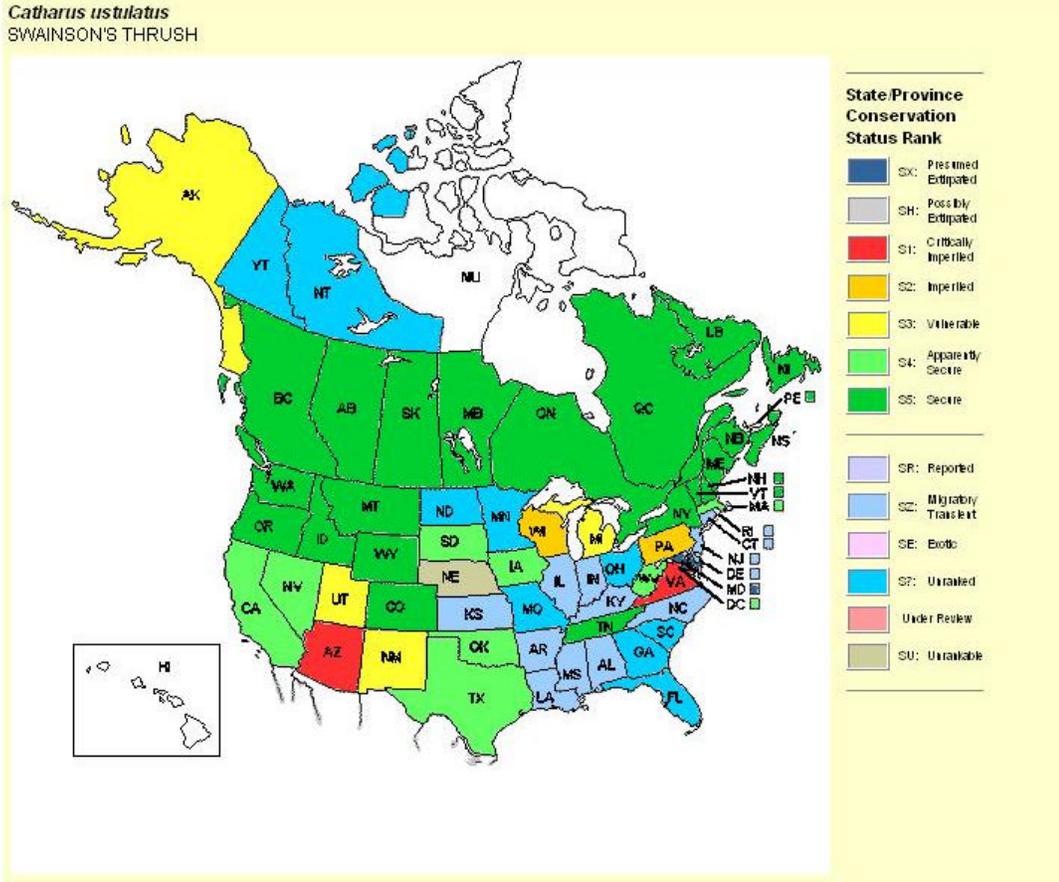


Figure 8. State and Province Conservation Status Rank for Swainson's Thrush (source: NatureServe 2003)*.

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National Forest Status

The Chequamegon-Nicolet National Forest (CNNF) in Wisconsin is the only national forest in the eastern region where the Swainson's Thrush is listed as a Regional Forester's

Sensitive Species. It is listed as “present but not determined to be at risk” on the Green Mountain National Forest in Vermont, White Mountain National Forest in New Hampshire/Maine, Allegheny National Forest in Pennsylvania, Monongahela National Forest in West Virginia, Hiawatha and Ottawa National Forests in Michigan, and the Superior and Chippewa National Forests in Minnesota.

The Swainson’s Thrush is considered a common species in the White Mountain National Forest in New Hampshire and Maine. However, it has indicated a less than stable population with an overall decline in annual relative abundance at the lower elevations, and sharp increases and decreases in abundance at the higher elevations. Breeding bird surveys conducted on the Forest recorded 0.428 and 0.394 Swainson’s Thrushes per survey point for low elevation surveys (1993 to 2002) and high elevation surveys (1993 to 1999) respectively (MacFaden and Capen 2000, Deming et al. 2001, L. Prout pers. comm. 2003).

On the Green Mountain National Forest in Vermont, this thrush species is common in both higher elevation and mid-slope mixed coniferous/deciduous communities. Its population is apparently stable or increasing in appropriate habitat (USDA Forest Service 2002a, C. Grove pers. comm. 2003), indicating the importance of this Forest to the Swainson’s Thrush, since there is strong evidence of a decline statewide.

In West Virginia, summer records of Swainson’s Thrush include Tucker, Grant, Pendleton, Randolph, Pocahontas, and Webster Counties. The Cranberry Glades in the Monongahela National Forest is thought to be the southernmost nesting location, although definite nesting has only been documented from Randolph and Pocahontas Counties (Hall 1983). The West Virginia Breeding Bird Atlas found confirmed and probable breeding in eight survey blocks within the boundary of the Monongahela National Forest (Buckelew and Hall 1994, K. Karriker pers. comm. 2003).

For the Lake States national forests, breeding Swainson’s Thrushes are uncommon in Wisconsin and Michigan and in Minnesota’s Chippewa National Forest. They are common to fairly common throughout the breeding season in the Superior National Forest in northern Minnesota (Green and Niemi 1980, Hanowski and Niemi 1991), and was the most common thrush species recorded on a 1991 survey of the Superior Forest’s Boundary Waters Canoe Wilderness Area (Niemi and Hanowski 1992). Swainson’s Thrush abundance was 2% of Ovenbird (*Seiurus aurocapillus*) abundance (the most common bird species) in the CNNF and the Chippewa National Forest, while it was 16% of Ovenbird abundance in the Superior National Forest using point survey data from 1993 to 1994 (Howe et al. 1996).

On the CNNF in Wisconsin, breeding bird surveys recorded 49 Swainson’s Thrush occurrences (approximately 6 per year) on the Nicolet land base from 1989 to 1996 (Nicolet Forest Bird Survey 2003), and 31 (approximately 3 per year) for the Chequamegon land base from 1991 to 2002 (Hanowksi et al. 2003). Some researchers believe this indicates a decline for this species on the Nicolet land base (R. Howe pers.

comm. 2002, Figure 9), but most believe that there are too few records to determine a trend on the Chequamegon land base (USDA Forest Service 2002).

Michigan’s Ottawa National Forest breeding bird survey recorded 27 Swainson’s Thrushes (approximately 2 per year) from 1992 to 2002, indicating low occurrence, but observations are too few to indicate any trend (J. Soltesz pers. comm. 2003). Annual point counts on the Hiawatha from 1989 to 2002 recorded a total of 258 Swainson’s Thrushes over a 14-year period (an average of 18 per year, with a high of 36 birds detected in 2000 and a low of 8 in 1997). No apparent population trend can be detected from these data (USDA Forest Service 2002b, J. Ekstrum pers. comm. 2004). Records for the species are generally well distributed across the Hiawatha, but are more abundant in the northern part of the Forest’s East Unit (USDA Forest Service 2002b). In Minnesota, 52 Swainson’s Thrushes were recorded for the Chippewa National Forest (approximately 4 per year) from 1991 to 2002, while 888 individuals (approximately 74 per year) were recorded for the Superior National Forest during the same period (Hanowski et al. 2003).

Swainson’s Thrush (habitat sites)

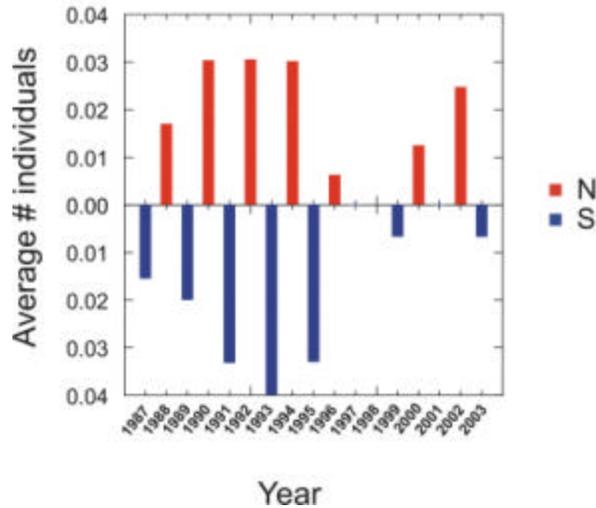


Figure 9. Average number of Swainson’s Thrush records during the Nicolet National Forest Bird Survey on non-road sites on the north half (N) and on the south half (S) of the Forest from 1987 to 2003.

POPULATION BIOLOGY AND VIABILITY

The downward population trend of Swainson’s Thrush in some areas is clear, but the reasons are not. Nest parasitism from Brown-headed Cowbirds (*Molothrus ater*) does not

appear to be a problem, yet predation rates are high. Loss of breeding habitat, such as mature conifer forest, and forest fragmentation may be contributing factors (Evans Mack and Yong 2000). However, the Swainson's Thrush is relatively abundant in some early-successional habitats, such as regenerating conifer forests in the west (Evans Mack and Yong 2000).

Martin et al. (1996) estimated that bird species with a clutch size of four and one brood annually require a nest success exceeding 76 % to maintain populations, and if renesting occurs, a nest success of 45% is needed. Evans Mack and Yong (2000) summarize Swainson's Thrush nest success from various studies in Alaska (29%), British Columbia (26%), California (7% and 29%), Idaho (48 %) and Vermont (18% and 36%). In coastal California, Gardali et al. (2003) estimated annual rates of survival for Swainson's Thrush using capture-recapture analysis from 2651 birds captured over 22 years of mist-netting. Their results showed a 56% survival rate for adults and 25% for juveniles. These findings support the common assumption that juvenile survival is about half of adult survival. This species is generally considered to have one brood per season (Evans Mack and Yong 2000), but there is some evidence of double-brooding (see Life History-Reproduction; p.6). The estimated proportion of total females that rear at least one brood ranges from 18% to 50% (Evans Mack and Yong 2000).

There is no direct evidence of metapopulation and source-sink dynamics for the Swainson's Thrush, but empirical and theoretical evidence suggest that these processes are important when considering population biology and viability of NTMBs (reviewed in Donovan et al. 1996).

A biological evaluation conducted by the CNNF concluded that Swainson's Thrush populations are expected to remain stable or increase under all alternatives of the proposed Land and Resource Management Plan (USDA Forest Service 2003a). Further, it suggests that long-term distribution of the species within the forest would remain at present levels. However, because the species is at the edge of its range on the CNNF and has a specific nesting habitat requirement (dense conifer understory), it is vulnerable to the effects of forest management and deer herbivory (USDA Forest Service 2002).

POTENTIAL THREATS

Habitat Loss

Forest area for two of the habitats used most by Swainson's Thrush, conifer lowland and spruce-fir upland, have decreased more in the last 150 years than any other forest or non-forest type in northern Wisconsin and Minnesota (Figure 10, Snetsinger and Ventura, unpublished data). Additional declines are shown in Forest Inventory and Analysis (FIA) data, where spruce-fir and aspen-birch (which often has a conifer component) have declined 20% and 32% respectively in the last 50 years in the northcentral and northeast U.S. (Table 2, USDA Forest Service 2003c).

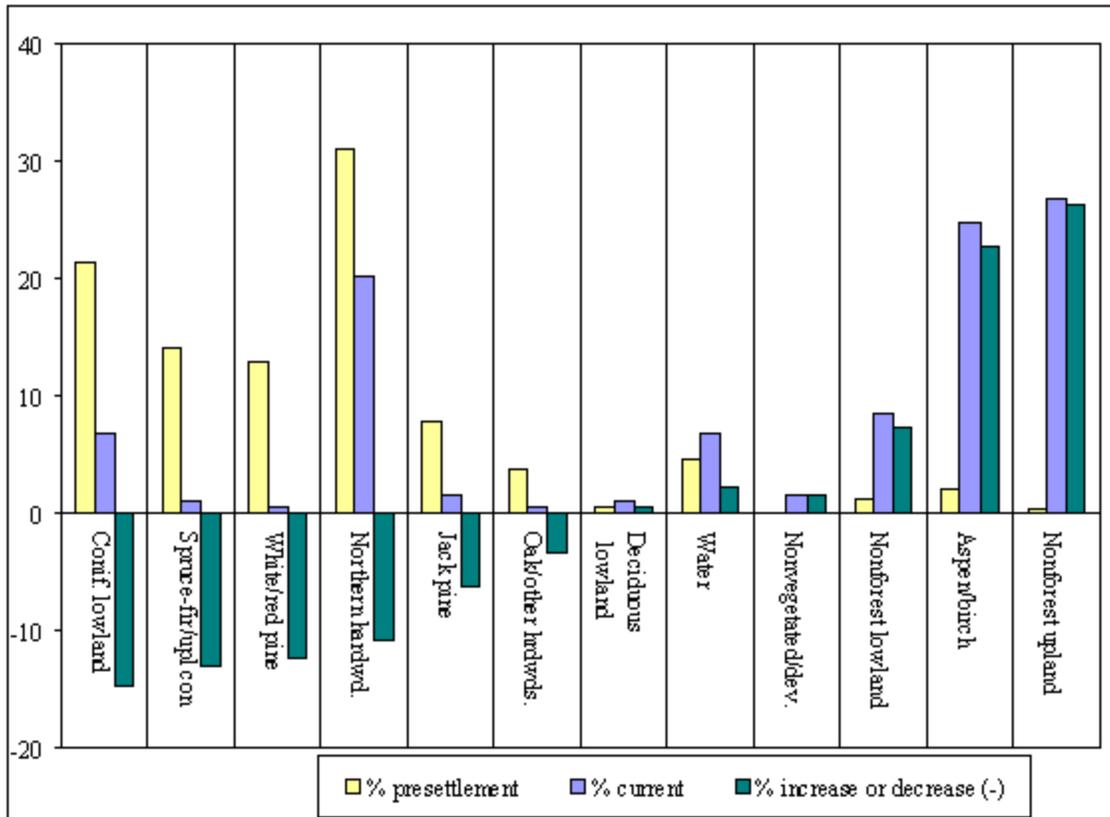


Figure 10. Percent change in land cover since mid 19th century for northern Minnesota and Wisconsin (source: Snetsinger and Ventura, unpublished)

Table 2. Acres (x 1000) by grouped forest type for the northeastern and northcentral states from 1953 to 2002 (source: USDA Forest Service 2003c)

Year	Pine	Spruce-Fir	N. Hardwoods	Aspen-Birch
1953	8,940	18,887	23,248	24,637
1977	11,362	17,468	34,300	19,149
1987	13,030	16,421	42,263	17,346
1997	10,512	15,185	50,210	16,818
2002	10,198	15,156	50,476	16,840

One factor responsible for this habitat loss is the forest simply being replaced by urban or agricultural land use—this is discussed more in the next section. Other factors do not result in removal of forest, but instead result in conversion of suitable into unsuitable habitat, often through active management. The replacement of diverse, mixed-species forests with planted monocultures (e.g., pine plantations) has unpredictable effects on Neotropical migratory birds (NTMBs) (Robinson 1996). The paucity of understory vegetation in pine plantations may result in unsuitable habitat for Swainson’s Thrush. Swainson’s Thrush did nest in conifer plantations in British Columbia, but nest locations

were strongly associated with dense deciduous vegetation not typical of these forest types (Easton and Martin 2002). Another management practice that may render habitat unsuitable for Swainson's Thrush is intensive timber harvesting coupled with short rotations, which can reduce or eliminate conifers (Green 1995). Brauning (1992) suggested that the potential decline of Swainson's Thrush in Pennsylvania was due to reduced conifer composition after heavy, widespread cutting. Conversely, another potential cause is forest succession, particularly in northern hardwood stands in the northcentral and northeast U.S. Trees in these stands all regenerated at the same time after clear-cutting in the late 1800's and early 1900's, resulting in a simple vegetation structure where dense canopies, unbroken by natural disturbance or asynchronous succession, prevent growth of conifers in the understory. This suggestion is supported by Holmes and Sherry (2001), who found Swainson's Thrush density declining as a New Hampshire forest matured and the shrub layer became shorter and sparser. Based on this finding one might presume that single-tree or selective cuts could produce the vegetation structure and composition that may benefit Swainson's Thrush, as was found by Medin and Booth (1989, cited in Evans Mack and Yong 2000).

It is important to emphasize, however, that there is contradiction among studies investigating the response of Swainson's Thrush to timber harvest. In Ontario, Swainson's Thrush density increased with time since selective cutting (0.63 / point count in stands not cut within the last 30 yr, 0.48 / point count in stands select cut 15 to 20 yr ago, and 0.33 / point count in stands select cut <15 yr ago [differences not statistically significant]) (Jobes et al. 2004). Regarding the effects of clear cutting on Swainson's Thrush, Evans Mack and Yong (2000) noted immediate declines, whereas Webb et al. (1977) found no significant response to logging (including harvesting 100% of mature trees) in New York. Evans Mack and Yong (2000) suggest that cutting may adversely affect habitat initially, but that 20 or more years later the same area may support fairly high Swainson Thrush densities because of dense regrowth. This variation in response to harvest is likely due in part to regional differences in habitat associations and differences in landscape context (Robinson and Wilcove 1994), and further suggests that Swainson's Thrushes are habitat generalists regarding forest succession.

Habitat Fragmentation and Urbanization

Habitat fragmentation is widely regarded as detrimental to NTMBs, and the Swainson's Thrush is no exception. Threats related to habitat fragmentation include area-sensitivity, cowbird parasitism, nest predation, edge effects, lack of natural disturbance, loss of old-growth, reduced habitat heterogeneity, restricted dispersal, exotic species, and altered microclimate characteristics (Lynch 1987; Saunders et al. 1991; Robinson and Wilcove 1994; Robinson 1996). However, habitat fragmentation is a complex and often misunderstood concept that becomes ambiguous when applied in the real world (Bunnell 1999). There is contradictory evidence that the Swainson's Thrush is area sensitive with some research finding sensitivity (reviewed in Freemark et al. 1995), and others finding none (reviewed in Evans Mack and Yong 2000). In an agricultural landscape in Alberta, Canada (Hannon 1992, in Evans Mack and Yong 2000), Swainson's Thrush was not found in aspen patches < 10 ha (24.7 ac), whereas in the northern Rocky Mountains,

Swainson's Thrush abundance was not affected by patch size or edge (Evans 1995). However, Evans (1995) reports fewer Swainson's Thrush nests and decreased nest success in fragmented landscapes. Indeed, it is accepted that fragmentation has adverse effects on nest productivity for many NTMBs (Wilcove 1985; Robinson et al. 1996; Marzluff and Restani 1999, Rodewald 2002). However, after an extensive literature review, Marzluff and Restani (1999) concluded that avian nest productivity was generally not affected by 'edge effects' in forested landscapes managed for timber production, and instead emphasized that managers focus their concern on the intensification and spread of agricultural and urban land use. In contrast, Manolis et al. (2000:1088) state that "Previous evaluations have suggested that edge effects are found mainly in agricultural landscapes, but our results suggest that these effects also may be common in extensively forested NHCF [Northern Hardwood-Conifer Forest Region] landscapes." In addition, Marzluff and Restani (1999:166) discussed that management in predominately forested landscapes could adversely affect birds in ways other than nest productivity, such as through, "isolation, rate of habitat shifting, and overall habitat loss."

The conversion of forest to agriculture or urban land use in landscapes adjacent to suitable habitat is a threat for Swainson's Thrush. In Idaho, Swainson's Thrush abundance was more strongly associated with natural, non-fragmented landscapes than any of the other 31 species surveyed in the study (Saab 1999). In Ontario, Swainson's Thrush was found to be intolerant of vegetation disturbance associated with cottage development (Clark et al. 1983). In California, Swainson's Thrush density was found to be "positively related to broad riparian corridors and high native vegetation volume, and negatively related to variables associated with intense development." (Rottenborn 1999:298).

Habitat Loss and Fragmentation on the Wintering Grounds

In general, the majority of evidence suggests that the Swainson's Thrush is mostly limited by factors on the breeding grounds. Johnson and Geupel (1996) concluded that the Swainson's Thrush was mostly limited by reproduction and survival of young during the summer because there was a strong correlation between abundance of young one year and abundance of adults the following year. In addition, they reported the Swainson's Thrush using a wide range of habitats on their wintering grounds, so deforestation there likely is not limiting. Further, Evans Mack and Yong (2000) reviewed other studies that demonstrated high winter grounds survivorship.

However, there is some concern over tropical deforestation and its effects on the Swainson's Thrush. Partners In Flight listed the Swainson's Thrush as a moderate risk (3) for threats on wintering grounds, indicating that a "Slight to moderate decline in the future suitability of non-breeding conditions is expected" (Panjabi 2001:10). Petit et al. (1993) considered 123 NTMBs and listed Swainson's Thrush as one of 60 that are most vulnerable to tropical deforestation, however this listing is somewhat tempered because of their use of moderately disturbed habitat. Holmes & Sherry (2001) surmised that wintering habitat is a factor contributing to declines of Neotropical migratory birds, even

those that use second-growth habitat in winter, because logging affects habitat quality and thus the ability of birds to survive over winter and migrate.

Disease, Predation, and Parasitism

The Centers for Disease Control list Swainson's Thrush as one of the many bird species that have tested positive for the West Nile Virus. However, the impact of this disease on this species is unknown.

Evans Mack and Yong (2000:20) state that, "High rates of predation of eggs and young [are] potentially the most limiting factor for reproductive success." This is probably an irreversible fact inherent in the population demography of most birds, but nest predation can be increased by habitat fragmentation and the consequential introduction or increase in abundance of predators that benefit from human land conversion, such as domestic cats, Raccoon (*Procyon lotor*), Blue Jay (*Cyanocitta cristata*), and American Crow (*Corvus brachyrhynchos*). The rarity of documented predation of adults indicates that it is unlikely a factor of concern for this species (Evans Mack and Yong 2000). Nonetheless, predation (summarized in Evans Mack and Yong 2000) of adults by Sharp-shinned Hawks (*Accipiter striatus*), and Merlins (*Falco columbarius*) has been reported.

Rates of Brown-headed Cowbird parasitism on Swainson's Thrush nests are generally very low, even in areas where Brown-headed Cowbirds are abundant. Evans Mack and Yong (2000) conclude that Brown-headed Cowbird parasitism is not a factor of concern for Swainson's Thrush population viability, and instead emphasize high nest failure rates due to predation.

Other Natural or Human Factors

Excessive deer populations have substantial negative impacts on forest vegetation structure, potentially lowering productivity and reducing suitable habitat for the Swainson's Thrush and other species associated with dense shrub layers (Robinson 1996).

Robbins (1991) emphasized radio and television (TV) transmitter towers as sources of mortality for Swainson's Thrush, citing an account where 822 birds were found dead near one TV tower in Eau Claire, Wisconsin over an 18 year period. In another account, on one day in 1962 a total of 25 and 128 Swainson's Thrushes were collected beneath TV towers in Wisconsin and Minnesota, respectively (Kemper et al. 1966). It is not clear whether these numbers are due to an attraction towards these TV towers, the height of the towers, or because a particularly large Swainson's Thrush migration was taking place in the areas.

SUMMARY OF LAND OWNERSHIP & EXISTING PROTECTION

Since the Swainson's Thrush is a habitat generalist, logically it should occur on widespread areas of public, industrial, and private land ownerships. Across the Swainson's Thrush range in Eastern U.S. there are approximately 3,177,000 ha (7,850,000 ac) of national forest land (approximately 11% of all forested lands) in the states of Vermont, New Hampshire, Pennsylvania, West Virginia, Michigan, Wisconsin, and Minnesota. An additional 27% (approximate) of the forested land in these states is in other public or forest industry ownership (USDA Forest Service 2003c).

The Swainson's Thrush is protected under the Migratory Bird Treaty Act of 1918 in the United States, and the Migratory Bird Convention Act of 1916 in Canada (US Fish and Wildlife Service 2004). This species also receives state protection through individual state wildlife codes.

As a Regional Forester's Sensitive Species on the CNNF, the Swainson's Thrush is included in Biological Evaluations for projects on the Forest, with the objective of maintaining viability under the National Forest Management Act. (similar wording in Burhans et al. 2002).

The National Environmental Policy Act of 1969 (NEPA) requires the federal government to coordinate federal plans, functions, programs, and resources for policies that will affect the human environment, in cooperation with state and local governments and other concerned public and private organizations. The Swainson's Thrush receives some habitat protection under NEPA through disclosure of the effects of management practices and applying mitigation measures to any adverse impacts (similar wording in Burhans et al. 2002).

SUMMARY OF EXISTING CONSERVATION AND MANAGEMENT ACTIVITIES

Understanding how sensitivity to fragmentation and habitat requirements varies over its large range will be important for conserving future populations of the Swainson's Thrush (USGS 2003). One general approach to Neotropical migratory bird conservation that solves many, if not most of the identified problems, is to enlarge tract sizes and conserve existing large tracts (Robinson 1996). However, there is conflicting evidence of area sensitivity and the use of edges for this species (see section on Potential Threats for a discussion on the affects of timber harvesting). Maintaining forested landscapes around suitable habitat and preventing the spread of agricultural and urban land use around these habitats likely is very important to the Swainson's Thrush as it is with many other species.

In Saskatchewan, the Swainson's Thrush has been found to be significantly more abundant in mixed jack pine-hardwood forests than in pure stands of either jack pine or hardwoods. One suspected reason is that these mixed-woods provide a more diverse and

abundant food supply (Hobson and Bayne 2000, Kirk and Hobson 2001). In addition, Kirk and Hobson (2001) believe that avian biodiversity will only be maintained by maintaining mixed jack pine-hardwoods and not converting them to monocultures of either pine or hardwoods.

In Minnesota, where the Swainson's Thrush is considered conifer dependent, Green (1995) makes recommendations and lists several additional sources on management techniques to maintain and enhance both conifer forests and conifer components in mixed stands. Also, she believes that the mature mixed forests in Minnesota with a large conifer component will eventually succeed to conifer if left undisturbed. However, when these stands are commercially harvested they are often succeeded by a young aspen-dominated stand. As these aspen dominated stands mature they often develop a conifer understory, but with more intensive harvesting on shorter rotations, the conifer components could be reduced or eliminated in such stands. Therefore, a patch configuration of harvesting is recommended to maintain enough suitable habitat for conifer-dependent species such as the Swainson's Thrush and alternative silvicultural methods are suggested to encourage the retention of conifers in managed aspen stands. Combinations of either group selection, shelterwood, or seed tree harvesting at single or multiple stand entries are given as possible prescriptions to retain conifers in these mixed stands. Retention of residual conifers following final harvest cuts is also an important consideration. For conifer plantations, prescriptions to develop and retain understory shrubs and conifers include planting at lower than normal densities, thinning heavier than normally done, and prescribed burning.

A general review of silvicultural options for the management of Neotropical migratory birds is provided in Thompson et al. (1993b). Most if not all national forest management plans, or their amendments or revisions, contain general direction to promote landscape and stand level concerns for Neotropical migratory bird conservation. Two forests in the Lake States currently have specific language that addresses the management of the Swainson's Thrush and these are presented below.

The CNNF contains the following management direction for Swainson's Thrush (USDA Forest Service 2003a):

Guideline:

- Protect Swainson's Thrush nesting activities from May 15 – August 1 by prohibiting disturbance within stands with known nest locations.
- Encourage a conifer understory where Swainson's Thrush is present within stands of high quality habitat.

The Superior National Forest has the following management direction for Swainson's Thrush, which is listed as a Management Indicator Species for lowland white cedar in the Forest Plan (M. Shedd pers. comm. 2004):

Habitat:

At least 15-acre stands of lowland cedar, well stocked, but not with standing water during the breeding season.

Management Guideline:

Maintain 2/3 of existing cedar lowlands in at least 15-acre stands in good stocking (over 50%) and 20-acre stands in poorer stocking.

RESEARCH AND MONITORING

Existing Surveys, Monitoring, and Research

Smith et al. (1993) state that caution should be applied in evaluating the population status of Neotropical migrants relying solely on the US Fish and Wildlife Service Breeding Bird Survey database. Across the country there are numerous breeding bird surveys conducted by other federal, state, and non-governmental groups that help determine changes in distribution and abundance of individual bird species. Several of these surveys, as well as many research findings, have been cited in this document.

The Swainson's Thrush is shy and elusive on the breeding grounds, which makes them more difficult to survey (Roberts 1932). Other factors that may limit the detection of Swainson's Thrush during BBS surveys include the timing of surveys. This thrush is a common species in the Rocky Mountains, but it was rarely detected early in the breeding season. Then as the season progressed there was a strong increase in detectability (more pronounced than for any other species) (Hutto and Young 1999). In addition, their song can be confused with other thrushes (Roberts 1932, Cornell Lab of Ornithology 2003). Surveys from mist-netting studies probably provide a better population inventory, because thrush species rarely escape mist-nets, which increases their probability of being caught and studied by this technique (Mueller and Berger 1967). Nest surveys are very difficult because they are usually well concealed and hard to find and monitor (Bull 1974 in Peterson 1988).

Survey Protocol

There are many different bird survey and monitoring techniques described in the literature (Butcher et al. 1993, Ralph 1993, Bibby et al. 2000). A specific standardized protocol for counting songbirds and other small diurnal bird species in the Great Lakes Region of northeastern North America and adjacent Canada is described by Howe et al. (1998).

Research Priorities

Evans Mack and Yong (2000) list several research priorities. They state that productivity on the breeding grounds is arguably the most serious problem facing the Swainson's

Thrush, thus research on the factors affecting nest success are most important. Research should also focus and compare different forest habitats, with particular emphasis on looking at the regional differences in early and late successional habitats used by this species. Also, breeding biology is not well understood, and is an area where more research is needed. Other knowledge gaps include habitat requirements during migration, the distribution of stopover sites along migration routes, relationships among subspecies, and habitat use on the wintering grounds.

Understanding how Swainson's Thrush density and habitat quality are related is crucial, as it is for wildlife in general (reviewed in Wiens 2002). This is especially true for Swainson's Thrush given its use of diverse habitats and the paucity of information about factors affecting habitat quality.

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