

VARIED THRUSH

(Ixoreus naevius)



**Prepared for Millar Western Forest Products'
Biodiversity Assessment Project**

Prepared by:

Doyon, F., P.E. Higgelke and H.L. MacLeod

**KBM Forestry Consultants Inc.
Thunder Bay, Ontario**

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1.0 CONSERVATION AND THE EFFECT OF FOREST ACTIVITIES

1.1 Introduction

The Varied Thrush (*Ixoreus naevius*) is frequently confused with the American Robin, as the two are similar in size, shape, and feeding habits (Godfrey 1986). The Varied Thrush can be distinguished from the robin, however, by the broad stripes across its chest (Salt and Salt 1976).

The Varied Thrush is a resident of the western portion of North America, from north-central Alaska to north-western California (Bent 1949; Salt and Salt 1976; Godfrey 1986; Semenchuk 1992; Wells *et al.* 1996, Figure 1). The bird inhabits a narrow range in the western part of Alberta, along the mountain foothills (Salt and Salt 1976; Romito *et al.* 1995) between April and October. It over-winters in coastal British Columbia (Bent 1949).

Farr (pers. comm. 1999) pointed out that there is a shortage of empirical information

on the habitat preferences of this species in Alberta. Though this HSM has been created using the results of the best known research, it is important that local information be incorporated as it becomes available.

1.2 Effects of Forest Management Activities

The Varied Thrush has been observed to use second-growth forests. Farr (1995) suggested that the bird is rare in stands less than 50 years of age in the Rocky Mountain Foothills Natural Region. Additionally, as the bird prefers spruce/fir forests (Bent 1949; Salt and Salt 1976; Godfrey 1986; Farr 1995), timber harvesting activities that cause a shift in tree species composition can influence habitat suitability.

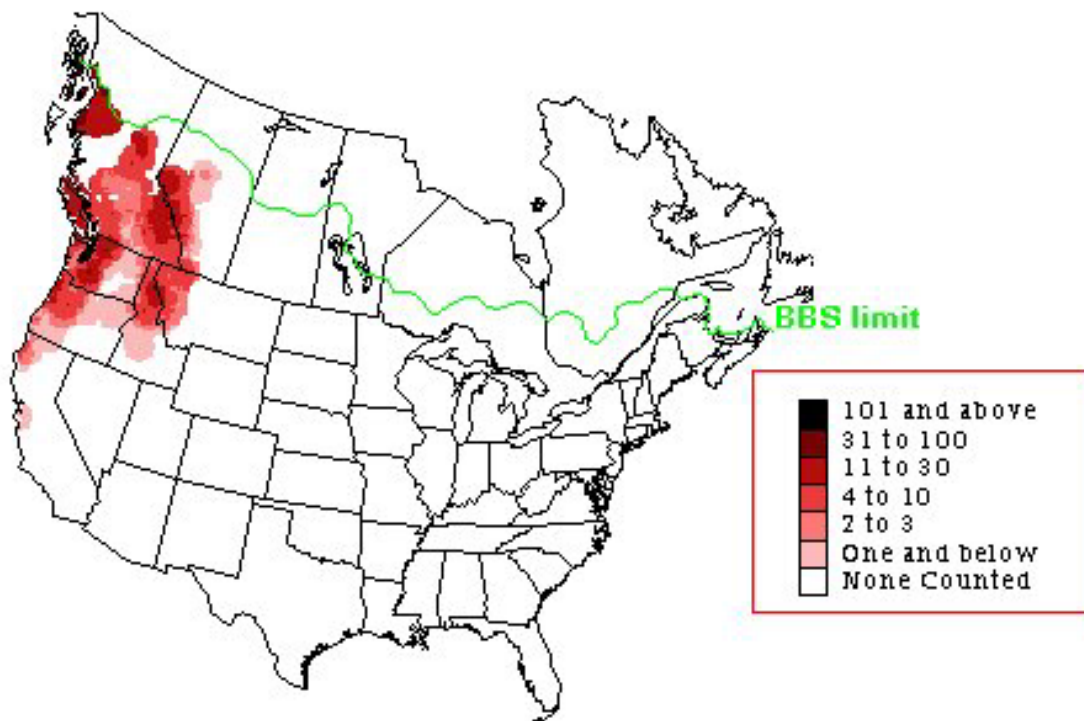


Figure 1. Breeding distribution of the Varied Thrush in North America, BBS data (Gough *et al.* 1998).



2.0 HABITAT USE INFORMATION

2.1 Food Requirements

The Varied Thrush is primarily an insectivorous bird (Bent 1949), moving leaf litter on the forest floor with its feet in search of ants, beetles, spiders, bees, wasps, flies, caterpillars, grasshoppers, crickets, larvae, and worms on which it feeds during summer (Bent 1949; Salt and Salt 1976; Godfrey 1986; Semenchuk 1992). In addition, it will consume small fruits and berries when they are available (Salt and Salt 1976; Wells *et al.* 1996). The bird uses the understorey of second-growth forests (> 50 years) as foraging habitat (Semenchuk 1992). Optimal summer foraging habitat supports abundant insect populations (Campbell *et al.* 1988). Research by Farr (1995) has shown that Varied Thrush abundance is associated with relatively open shrub understoreys dominated by low shrubs (< 3 m height), suggesting that a dense layer of shrubby vegetation may interfere with the bird's foraging behaviour.

2.2 Cover Requirements

Suitable cover for the Varied Thrush consists of mature pure coniferous or coniferous-dominated mixedwood forests (Bent 1949; Salt and Salt 1976; Godfrey 1986; Peterson and Peterson 1983; Thormin 1989), but not pure deciduous stands (MacCallum and Ebel 1985). In particular, it is the dense and moist understorey of mature spruce or fir forests that are most appropriate as Varied Thrush habitat (Bent 1949; Salt and Salt 1976; Godfrey 1986). To provide the dense and dark environment that is optimal for these birds, it is assumed that potentially necessary habitat features include canopy closure of at least 75% with spruce/fir representation of at least 70%. Research by Farr (1995) in the Rocky Mountain Foothills Natural Region has shown, however, that Varied Thrush in that area will inhabit stands of minimum 30% canopy closure and 10% spruce and/or fir composition.

2.3 Reproduction Requirements

The Varied Thrush will breed in the same coniferous stands in which it feeds (Semenchuk 1992). The bird constructs its nest of twigs, moss, grass, bark, and mud against a small conifer between 1 and 10 m above the ground (Bent 1949; Salt and Salt 1976; Godfrey 1986; Campbell *et al.* 1988; Semenchuk 1992). Females lay an average of three to four eggs and tend to them as the male defends the territory (Bent 1949; Salt and Salt 1976; Godfrey 1986). Varied Thrushes in the Rocky Mountain Foothills Natural Region are most abundant in stands with trees of height greater than 9 m (Farr 1995).

2.4 Habitat Area Requirements

Bird counts have shown that densities of Varied Thrush populations range from 0.3 to 5.4 pairs per km² (Mannan and Meslow 1984; Wetmore *et al.* 1985) and likely vary between locations with different habitat suitability. It has been suggested by MacCallum and Ebel (1985) that six pairs per km² is the maximum breeding density, giving each pair a territory of 16.7 ha. It is important that breeding birds are not crowded. When nests are positioned too close together, the young tend to leave the nest early, while their tails are still short and while they are still fairly helpless (Semenchuk 1992), reducing the survival rate of fledglings. For the purposes of this HSM, we will allocate 19.6 ha (circle of radius 250 m) for each Varied Thrush family.

2.5 Landscape Configuration Requirements

To our knowledge, there was no information available at the time of model development on the landscape configuration requirements of the Varied Thrush.



2.6 Sensitivity to Human Disturbance

Though Varied Thrushes do not generally appear to be sensitive to human disturbance during summer, they are secretive and are easily disturbed at the nest when breeding (Semenchuk 1992; Farr pers. comm. 1999). The reviewed literature did not recommend, however, the distance that people should keep from Varied Thrush nests. As this information becomes available, it should be incorporated into the model by decreasing the suitability of habitat within that distance of human access routes.



3.0 MODEL

3.1 Envirogram

The elements that are thought to influence a Varied Thrush’s selection of habitat are the availability of food resources, its nesting requirements, and shelter from inclement environmental conditions. The forest attributes that impact the bird’s ability to successfully complete its life cycle are shown in the envirogram below (Figure 2).

The foods required by the Varied Thrush change with the seasons. Since it is present in Alberta only during spring and summer, this is the only period of relevance for the model. At this time, the bird is primarily insectivorous. If insects are assumed to be readily available in all habitat types in spring and summer, foraging habitat quality is related to the density and height of the shrub layer, because shrubs may interfere with feeding movements. Whenever fruits and berries are available, the bird also tends to exploit this resource.

To provide the birds with suitable nesting sites, both average tree height and cover conditions are important. Appropriate cover is a function of the canopy closure and tree species composition of the stand. Though the literature indicated that both stand age and tree height are variables contributing to the quality of nesting habitat, they are interrelated (*i.e.*, as the stand ages, the trees tend to become taller). For this reason, only tree height, and not stand age, is included in the HSM for the Varied Thrush.

3.2 Application Boundaries

Season: This model produces SI values for spring and summer habitat.

Habitat Area: Home range size used for home range smoothing is 19.6 ha for a family unit.

Model Output: The model assigns a SI value for foraging and nesting habitat suitability to each 25 m pixel of forested habitat.

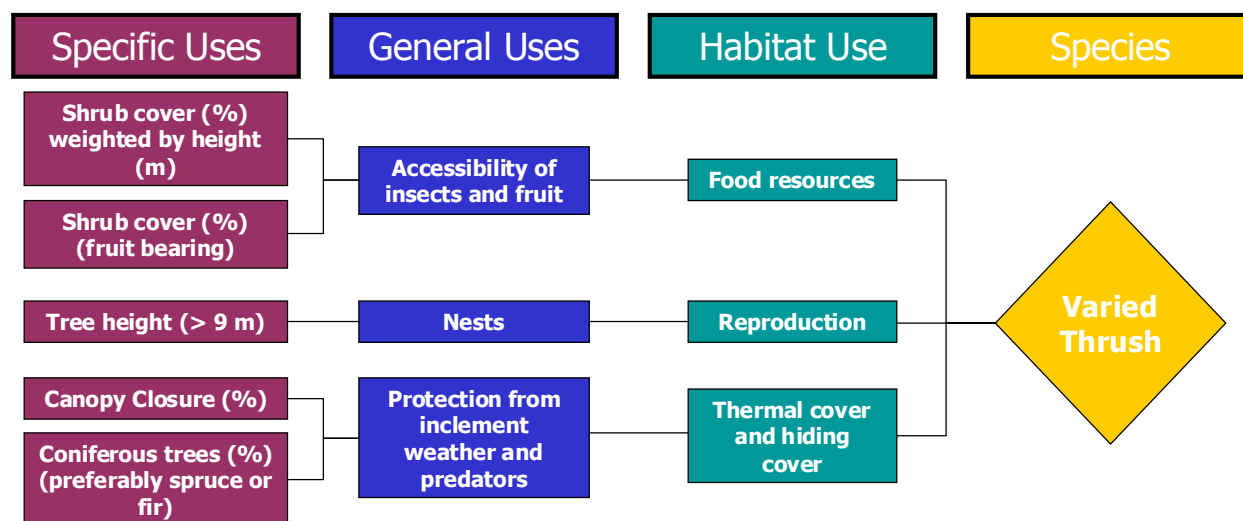


Figure 2. Envirogram of the Varied Thrush based on available habitat information for HSM development.

3.3 Model Description

The HSM structure for Varied Thrush habitat follows the envirogram (Figure 3). As suitable cover is a required element of both foraging and nesting habitat, variables influencing cover quality are included in both sets of calculations.

The SI_{food} consists of variables indicating the percentage of the forest floor covered with shrubs, weighted by height. Shrub cover weighted by presence of fruit-bearing species determines the potential for fruit production. Since it seems that the Varied Thrush will not suffer in absence of fruit if sufficient insect resources are available, the presence of fruit-bearing plants in proximity to cover habitat improves the SI rating through the use of a bonus function. The cover variables, percent coniferous and canopy closure, are also included in this calculation.

The $SI_{nesting}$ includes only one nesting variable - the average height of the trees in the stand. In addition, the cover variables described above are considered in this SI.

3.4 Habitat Variable SIs

Food

The SI_{food} is made up of the following habitat variables: % shrub cover weighted by height (S_{f1}), % shrub cover weighted by species (S_{f2}), % coniferous weighted by species (S_{c1}), and canopy closure (S_{c2}). Suitability is high with

light (5 to 15%) shrub cover less than 3 m tall, not including shrubs < 25 cm. It begins to decline at 15% coverage to a minimum at 25% (Figure 4). Suitability increases with fruit-bearing shrub coverage (Figure 5) to a maximum of 1 at 20% and begins to decline when cover reaches 60%, to a minimum at 80%. Though it is likely that the Varied Thrush prefers some types of soft mast over others, to our knowledge, this information was not available. As the fruit preferences of the bird are discovered, the model should be altered accordingly. As shown in Figure 6, a stand with more than 10% coniferous representation will suffice but 70% softwood representation is preferred. Deciduous trees are not as suitable and are weighted 0.2. Habitat suitability increases linearly with canopy closure. The birds are not thought to utilise stands with less than 25% canopy closure and habitat is considered optimal if there is at least 75% cover (Figure 7).

Nesting

Aside from the cover characteristics described above, the only habitat variable necessary for breeding is average tree height (S_{n1}). Figure 8 shows that habitat suitability increases linearly with tree height to a maximum at 9 m height.

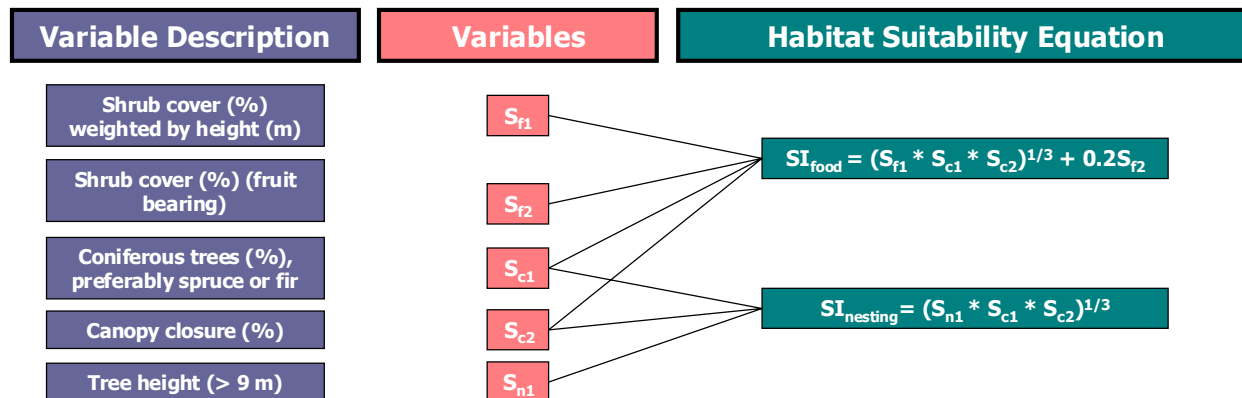


Figure 3. HSM structure for the Varied Thrush within Millar Western’s FMA area.

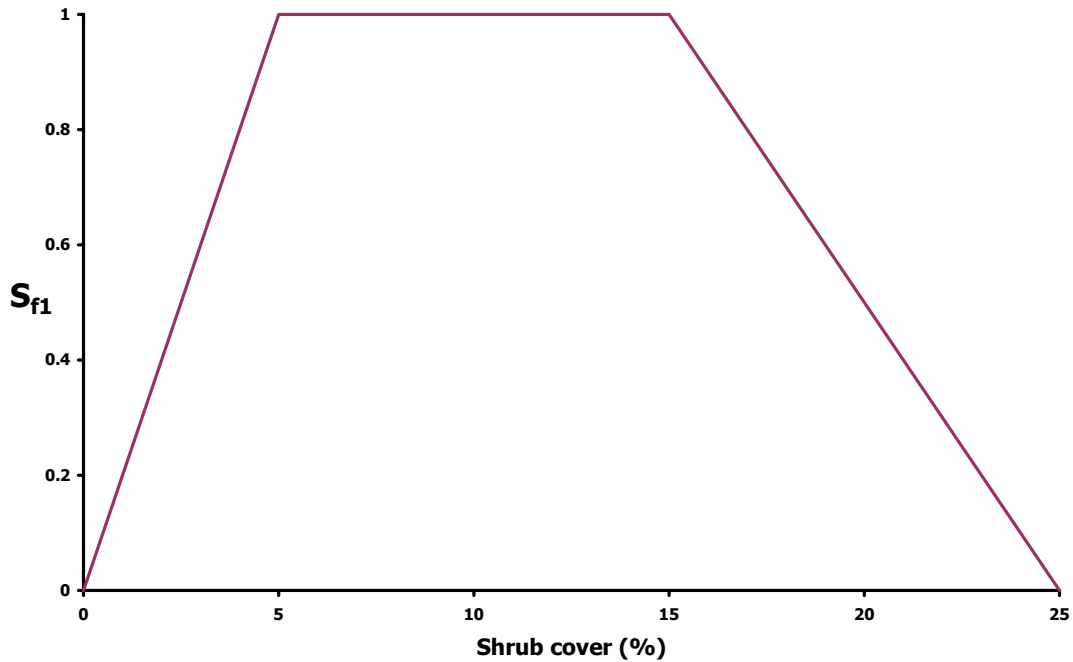


Figure 4. Varied Thrush foraging habitat suitability in relation to shrub cover within Millar Western’s FMA area. Weighting: shrubs 0.25 - 3 m height = 1, others = 0.

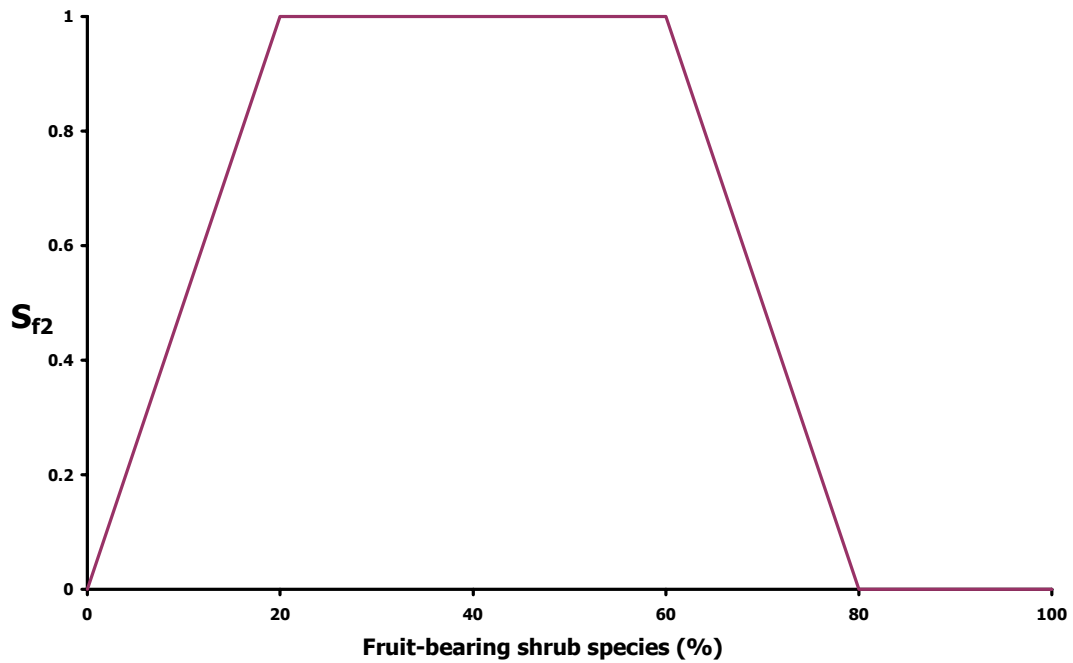


Figure 5. Varied Thrush foraging habitat suitability in relation to fruit-bearing shrub cover within Millar Western’s FMA area.

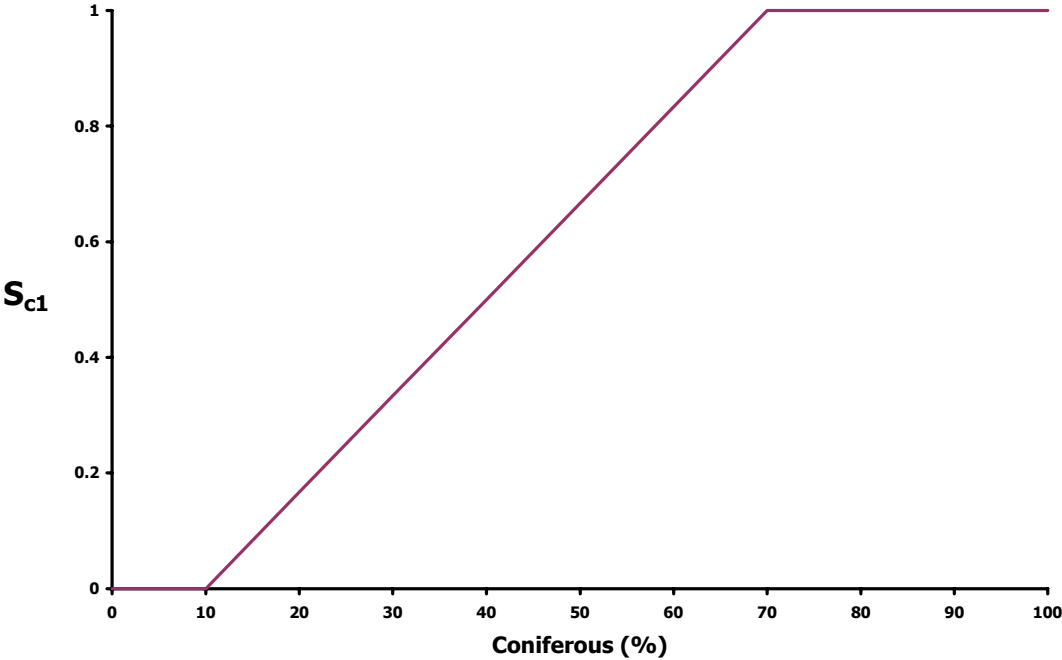


Figure 6. Varied Thrush cover habitat suitability in relation to tree species composition within Millar Western’s FMA area. Weighting: Spruce & fir = 1, other conifers = 0.8, deciduous = 0.2.

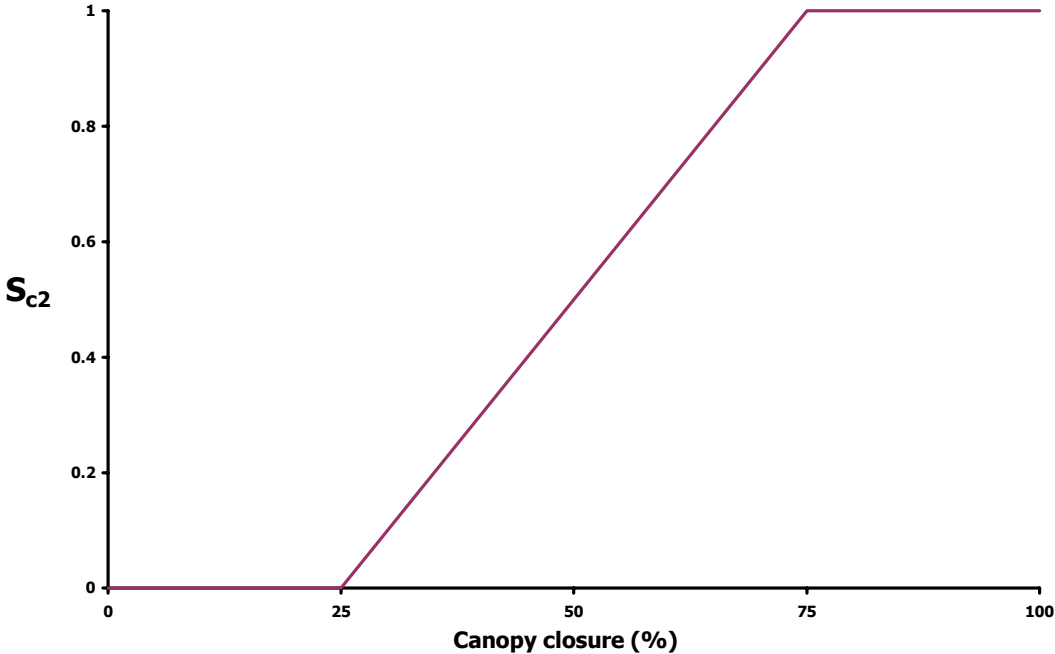


Figure 7. Varied Thrush cover habitat suitability in relation to canopy closure within Millar Western’s FMA area.

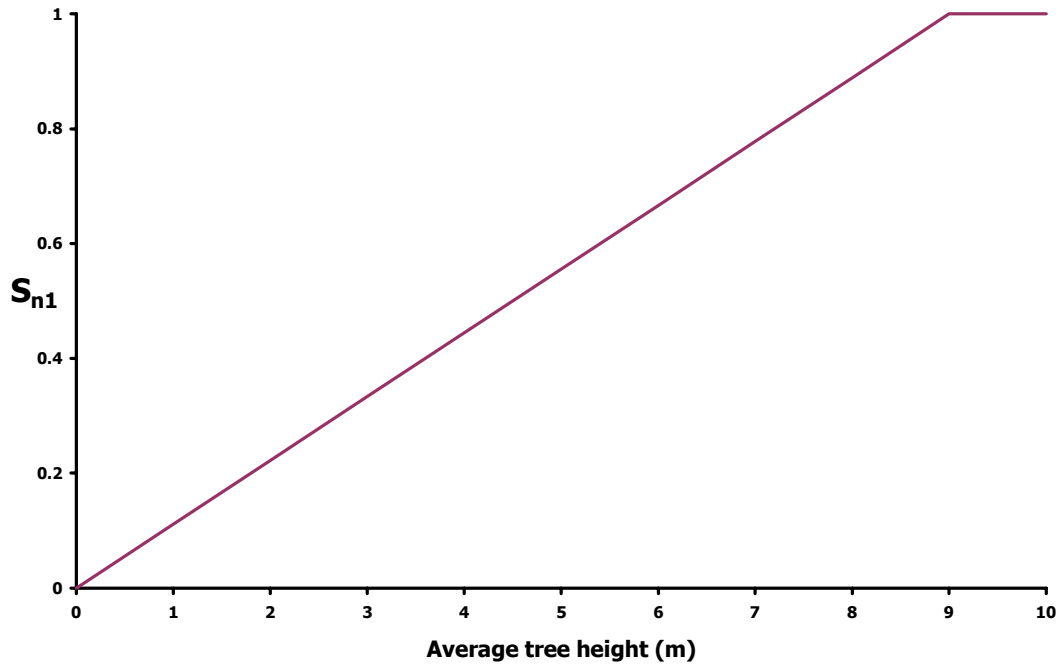


Figure 8. Varied Thrush nesting habitat suitability in relation to tree height within Millar Western’s FMA area.

3.5 Computation

Our goal is to create HSMs that allow the user to identify the potential impacts of proposed forest management strategies on Varied Thrush foraging and nesting habitats. Therefore, the outputs of the SI_{food} and SI_{nesting} calculations are considered individually to display trends in habitat availability.

Foraging Habitat Index

Accessibility of insects (space to perform foraging movements), along with the presence of fruits and berries, are taken into account in the SI_{food} equation. The foraging habitat suitability variables are combined with cover variables as follows. This calculation is performed for each pixel of forested habitat:

$$SI_{\text{food}} = (S_{f1} * S_{c1} * S_{c2})^{1/3} + 0.2S_{f2};$$

where $SI_{\text{food}} \leq 1$.

Nesting Index

Habitat elements important for nesting are tree height and cover quality, calculated in the equation:

$$SI_{\text{nesting}} = (S_{n1} * S_{c1} * S_{c2})^{1/3}$$

Home Range Smoothing

A home range size of 19.6 ha has been applied to the Varied Thrush HSM. Suitability index values for both foraging and nesting habitat for each potential home range within Millar Western’s FMA area are determined. A circular window of radius 250 m (19.6 ha) representing a Varied Thrush’ home range moves over the grid with each pixel, in turn, acting as its centre. The SI_{food} and SI_{nesting} values of each pixel within the window are averaged. These two values are applied to the pixel at the centre of the window and represent the SI values for the potential home range centred at that location.



4.0 EXTERNAL REVISION

On May 27, 1999, Arlen Todd, wildlife biologist with the Alberta Natural Resources Service, Fisheries and Wildlife Management Division, in Whitecourt, Alberta reviewed a draft version of the Varied Thrush model. As he stated that he has relatively little experience with this species, he did not suggest any specific alterations.

Dr. Daniel Farr, biologist working with the Foothills Model Forest in Hinton, Alberta provided comments on the Varied Thrush HSM on July 21, 1999. The following alterations were made based on his advice:

- 1) There is a definite shortage of empirical knowledge on Varied Thrush habitat selection in Alberta. Farr suggested that we make this clear in the document. In addition, relationships were often taken from data that were derived from only one study. It was recommended that this be mentioned.
- 2) We had included a statement that Varied Thrushes are not thought to be sensitive to human disturbance in the original document. Farr provided evidence suggesting that breeding birds are easily disturbed by human activity. This was incorporated into the literature review.
- 3) It was suggested that all of the models should be accompanied by a sensitivity analysis. The purpose of this "would be to identify suitability relationships and combining functions that, if changed, would have large effects on resulting SI values". It is part of our future plan to undertake this project.
- 4) A home range size of 19.6 ha was originally used for home range smoothing. It was pointed out that in poorer quality habitat, this area may not suffice. However, since this HSM is intended to predict the suitability of the home range in good quality habitat, we will continue to use this home range size.



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