
CLAY-COLOURED SPARROW

REPRODUCTIVE HABITAT

HABITAT SUITABILITY INDEX (HSI) MODEL

VERSION 5

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1. INTRODUCTION

Habitat Suitability Index (HSI) models predict the suitability of habitat for a species based on an assessment of habitat attributes such as habitat structure, habitat type and spatial arrangements between habitat features. This HSI model for the clay-coloured sparrow (*Spizella pallida*) applies to forests of the Foothills Model Forest (FMF) in west-central Alberta. The intended use is to predict habitat suitability at landscape scales and over long-time periods. The model will be used to determine potential changes in clay-coloured sparrow habitat area and carrying capacity throughout an entire forest management cycle (200 years). The model was developed using literature review.

2. SPECIES DESCRIPTION AND DISTRIBUTION

The clay-coloured sparrow is a small, 13-14 cm, sparrow with an unstreaked breast and a brown ear patch bordered by dark lines (Salt and Salt 1976). The vocalization sounds like 2-4 insect-type buzzes. Clay-coloured sparrows are associated with dense shrub habitat in non-forested areas or clearings. They also inhabit forest/clearing edges if sufficient shrub cover is present to construct a nest.

The clay-coloured sparrow is a common summer resident throughout Alberta (Salt and Salt 1976). They breed from the interior of British Columbia east to Quebec (Godfrey 1986), although only in isolated areas in western Quebec. Clay-coloured sparrows winter in south-western United States and Mexico (Salt and Salt 1976). Clay-coloured sparrows are commonly found in the Parkland and Grassland regions of Alberta and the river valleys in the Rocky Mountains (Salt and Salt 1976). The clay-coloured sparrow is considered a sensitive species in Alberta because of a long-termed decline in numbers (Yellow A Status; Wildlife Management Division 1996).

3. FOOD

Clay-coloured sparrows feed on seeds and insects (Salt and Salt 1976) and will forage and collect food for their young at feeding areas away from nesting areas (Knapton 1979). Foraging areas are often open areas with sparse, short vegetation such as cropland and pastures (Knapton 1978).

4. COVER

Clay-coloured sparrows occur in open habitats supporting dense shrubbery (Godfrey 1986, Salt and Salt 1976, Westworth et al. 1984). Forested areas with mature overstory cover are avoided (Westworth et al. 1984). Clay-coloured sparrows occurred in open habitats supporting a low shrub layer, or were in suckering growth of clearcuts and poorly regenerating portions of 14 year old stands (Westworth et al. 1984). In the grasslands of Alberta, clay-coloured

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sparrows were associated with low shrubs, usually snowberry or willow (Owens and Myres 1973). Grass and forb successional growth (5-10 yr), and shrubs (10-20 yr), and young growth (15-40 yr) were used by clay-coloured sparrows for feeding and nesting in Alberta (MacCallum and Ebel 1985).

5. REPRODUCTION

Females build the nests (Ehrlich 1988) which are usually located < 2 m above the ground in bushes or small conifers and occasionally on the ground (Godfrey 1986). Nests are constructed of grass (Godfrey 1986) and lined with hair (Peterson 1961, Godfrey 1986). Three to 5 blue spotted eggs are produced (Salt and Salt 1976, Godfrey 1986, Ehrlich 1988). Both sexes incubate for 10-12 days and both feed the young (Ehrlich 1988). Often two broods are raised in a summer (Ehrlich 1988). Nests are often parasitized by brown-headed cowbirds (Knapton 1978).

In Manitoba, nests were usually constructed within 5 m of the territory edge rather than in the centre of the territory (Knapton 1979). In the grasslands of Alberta, nests were in undisturbed and grazed areas (Owens and Myres 1973).

6. HABITAT AREA

Clay-coloured sparrow nesting territory boundaries are small and exclusive once boundaries between territorial males have been established in mid-May (Knapton 1979). The small territories are a result of feeding areas not being included in the nesting territory (Knapton 1979). In Manitoba, males showed a high rate of return to the same forested area from one year to the next, and often returned to the exact territory they held the previous year (Knapton 1979). Females showed a low rate of return to the same forested area and only rarely returned to the same territory or the same mate in succeeding years (Knapton 1979). Territories were found in a clumped distribution pattern, as a result of the distribution pattern of *Symphoricarpos* spp. which provided protected nest sites (Knapton 1979). The surrounding marshes, tree bluffs, weedy fields, and pure stands of other shrubs (e.g. silver-berry; *Eleagnus commutata*) were not defended. Mean territory size ranged from 0.07-0.10 ha (Knapton 1979). Larger territories contained proportionally less dense ground cover of *Symphoricarpos* spp. (Knapton 1979).

Densities cited are 0.12 territories/ha in grasslands near Drumheller, Alberta (Owens and Myres 1973), 0.27 pairs/ha in clearcuts near Medicine Lake in central Alberta (Westworth et al. 1984) and 0.2 pairs/ha in logged areas in Minnesota (Niemi and Hanowski 1984).

7. HSI MODEL

7.1 MODEL APPLICABILITY

Species: Clay-coloured Sparrow (*Spizella pallida*).

Habitat Evaluated: Critical reproductive habitat (nesting and cover).

Geographic area: This model is applicable to the Foothills Model Forest in west-central Alberta.

Seasonal Applicability: Spring to Early Summer (May-July).

Cover types: This model applies to all forest and non-forest habitat areas of the Lower and Upper Foothills, Montane and Subalpine Natural Subregions (Beckingham et al. 1996) since suitability is determined from structural characteristics within stands rather than classified forest stands directly. The model should also be broadly applicable to other habitat areas dominated by vegetation similar to that in this region, including pure deciduous, mixedwood and pure coniferous forest types, as well as wetland and riparian forests, meadows, shrublands, and areas regenerating after forest harvesting.

Minimum Habitat Area: Minimum habitat area is defined as the minimum amount of contiguous habitat to which the model will be applied. The high mobility of this species should result in all suitable habitat being available to it, regardless of interspersions with other habitat types. Therefore, no minimum contiguous habitat area is specified.

Model Output: The model will produce Habitat Units (HU) of reproductive habitat for a large geographic area based on the sum among all stands of the product of HSI value and stand area. The performance measure for the model is carrying capacity (pairs of clay-coloured sparrows/ha). These HU must be correlated to estimates of carrying capacity for a large area to verify the model's performance.

Carrying Capacity (Breeding Pairs per ha where HSI = 1.0): Based on the highest density reported in the literature at Medicine Lake, Alberta (Westworth et al. 1984), the current estimate of the carrying capacity for an optimal hectare of habitat is 0.27 pairs per hectare.

Verification Level: The reliability of this model has not been evaluated against local data. The verification level is 4: local data was used to develop model, but model predictions have not been tested.

Application: This HSI model is designed to assess habitat suitability for relatively large forested landscapes using generalized species-habitat relationships and stand-level vegetation inventory. Its purpose is to predict relative changes in clay-coloured sparrow habitat supply at the landscape level over long time periods (200 years), for integration with forest management planning. The model is not designed to provide accurate prediction of suitability or use at the stand level. Approximate population size can be calculated by assuming linear habitat-population relationships, but the model is not designed to provide accurate population density estimates. Any attempt to use the model in a different geographic area or for other than the intended purpose should be accompanied by model testing procedures, verification analysis, and other modifications to meet specific objectives.

7.2 MODEL DESCRIPTION

The HSI model for clay-coloured sparrow habitat assumes reproductive habitat is a limiting resource and that food is available if reproductive habitat is present. Clay-coloured sparrows are generally found within a single contiguous clearing or other area, and may exist in areas near human use, so spatial attributes have not been included in the model. Open shrubby areas are thought to be the best habitats for these birds and all attributes must be present for the stand to be rated as suitable habitat.

7.2.1 Habitat Variables and HSI Components

Clay-coloured sparrows build nests and breed in habitats with low dense shrubs and little tree canopy closure or in areas with short trees in regenerating forest stands. These characteristics are represented in the model as % shrub cover, used to predict the HSI component S_1 , shrub height (m), used to predict S_2 and tree canopy closure for trees ≥ 2 m in height, used to predict S_3 (Table 1).

Table 1. Relationship of habitat variables to life requisites for the clay-coloured sparrow HSI model.

HSI Component	Life Requisite	Habitat Variable	Habitat Variable Definition
S_1	Nesting sites and cover	Shrub Cover (%)	Percent of ground covered by a vertical projection of shrub crown areas onto the ground.
S_2	Nesting sites and cover	Shrub Height (m)	Top height of all shrub stems.
S_3	Territory space	Tree Canopy Closure and Sapling Cover ≥ 2 m in height (%)	Percent of ground covered by a vertical projection of tree and sapling crown areas onto the ground. Includes trees ≥ 8 cm diameter at breast height (dbh at 1.3 m) and saplings ≥ 2 m in height.

7.2.2 Graphical HSI Component Relationships

- S_1 The clay-coloured sparrow prefers shrubby areas, so the component S_1 has been set to increase linearly from 0-1 over the range 0-50 % cover. This remains at 1 for higher covers (Figure 1a).
- S_2 The clay-coloured sparrow prefers shrubs of low to moderate height (< 3 m). S_2 has been set so the suitability is 1 up to 2 m height and then decreases linearly to 0 at 3 m (Figure 1b).
- S_3 Areas with moderate to high tree canopy closures are not associated with this species. Thus, component S_3 is 0 for all tree canopy closures > 10 %. Less than or equal to 10 %, suitability increases to 1 at 0 % tree canopy closure (Figure 1c).

7.3 MODEL ASSUMPTIONS

1. All shrub species are equally useful for clay-coloured sparrow nesting.
2. Food, water and minerals are not limiting factors for the spring and summer distribution of this species.
3. Clay-coloured sparrows are not affected by human use, development or roads.

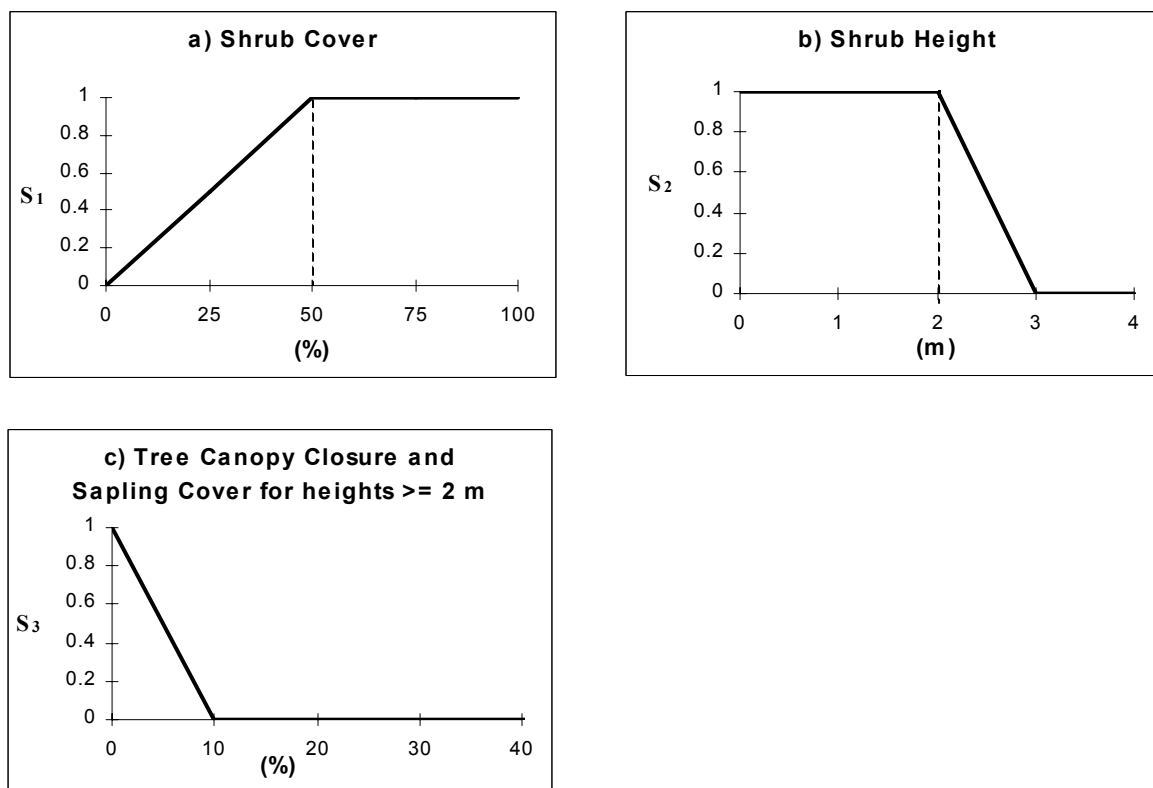


Figure 1. Graphical relationships between habitat variables and HSI components in the clay-coloured sparrow model.

7.4 EQUATION

All three variables are considered equal and noncompensatory (this means low values of one variable can not be compensated by high values of the others) in defining the quality of an area for reproductive habitat of clay-coloured sparrows.

$$HSI = S_1 \times S_2 \times S_3$$

8. SOURCE OF OTHER MODELS

No other HSI models for the clay-coloured sparrow were found.

Model History

All of the HSI models for the Weldwood Forest Management Area have undergone several revisions, and they will be revised again as new information becomes available. Contact Rick Bonar for information about the most current version.

- Version 1 (1989) was developed by the Weldwood of Canada, Hinton Division, Integrated Resource Management Steering Committee (IRMSC).
- Version 2 (1994) was revised by Barb Beck and Melissa Todd.
- Version 3 (1995) was written by Dan Gould in a habitat modelling course at the University of Alberta.
- Version 4 (1996) was edited and reformatted by Wayne Bessie.

- Version 5 (1999) was revised by Karen Graham, Rick Bonar, Barb Beck and Jim Beck to incorporate information from recent literature.

9. LITERATURE CITED

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