**Habitat Suitability Index Model: Mary Hunnicutt**

The following is a template of a habitat suitability model like the ones I have developed for all the other experts. I think this might be the best way to get your input without meeting in person. The model is divided into five primary sections: 1) model applicability (where and when does this model apply), 2) a written description, 3) a graphical model showing the relevant habitat variables and their relationship to life history requisites (e.g. food and cover), 4) a graphical representation of the relationship between habitat suitability and each habitat variable, and 5) A mathematical representation of the model. I have included questions or instructions to help guide you through each section but I have avoided including any examples related to masked bobwhite so as not to influence your opinion. I will complete section 5 based on the information you provide in the other sections. Let me know if you have any questions or need any guidance on any of this and thank you for taking the time to fill this out.

**Section 1.Model Applicability:**

1.1 Geographic area. What geographical area does this information cover? Does this information pertain to only habitat in AZ or also in MX. For example, if the optimal habitat differs between geographical areas you can indicate that in the sections below and include both areas here.

1.2 Season. Similarly, what season(s) does this model cover? If the optimal habitat differs between seasons you can specify that in the sections below.

**Section 2. Model Description**:

2.1 Overview. The purpose of this model is to consider the ability of assessed habitat to meet the food, reproductive, and cover requirements of masked bobwhite as an indicator of overall habitat suitability.

2.2 Written Documentation.

The following section is to provide a written documentation of the logic and assumptions used to interpret the habitat information for masked bobwhite in order to explain the variables and equations that are used in the HSI model. If possible, present each critical habitat requirement (e.g. food, cover, reproduction) and describe the variables which contribute to it, the reasoning behind including those variables, and the optimal level of each variable.

A Brief Example for BBFL (completely made up based on my knowledge of the species!)

1. Cover- BBFLs require approximately 20% canopy cover of ponderosa pines. Cover much greater than 40% will decrease foraging opportunities and less than 10% will decrease perch sites. Ground cover should consist of a mixture of perennial grasses and low shrubs (such as buckthorn). Approximately 15% canopy cover of smaller tree and larger shrub species, such as Gambel’s Oak and Mexican Locust provides shelter from predators.
2. Reproduction- BBFLs nest in several related pine species such as Ponderosa and Apache pines. Suitable nest sites are on branches 5-10m from the ground on branches approximately 2-4inches in diameter. Nests are frequently located at branch forks where one fork of the branch is over the other thereby providing overhead protection for the nest from nest predators. This particular branch configuration is common among Ponderosa and Apache pines but rare among other species. BBFLs nest in loose colonies so habitat patches must be of adequate size so that approximately 10-15 nesting pairs will be able to find nest sites and maintain small territories (~50m diameter). BBFLs are often found in areas that burned with moderate to high severity approximately 20-30 years prior. Similar conditions can be found in heavily maintained areas, such as campsites, where trees are thinned and understory is kept open through regular maintainence.
3. Food. BBFLs are aerial insectivores and as such require somewhat open understory to capture their prey. Historically, patchy moderate to high severity fires have provided adequate vegetation suppression for this. The cover estimates mentioned above describe the optimal habitat for both prey capture and predator protection. Aerial insect abundance is an important food source and I have documented BBFLs consuming Nueroptera, Ephemeroptera, Diptera, and Coleoptera insect Orders.

**Section 3. Graphical Representation**

**Figure 1.** This figure is to represent the relationship between measured habitat variables, critical life history requirements, and habitat suitability for masked bobwhites. I have included an example from my BBFL description above but if you are a little daunted by this I can draw one up for you based on your statements above and you can approve/modify/disapprove my efforts.

Measured Habitat Variable Life Requisite Model Output

Ponderosa Cover

Apache Cover

Low Shrub Cover

Food

Small Tree Cover

Grass Cover

Suitability Index

Cover

Aerial Insects

Nest Sites

Reproduction

**Section 4. Suitability Functions and Graphs**

This section is to provide specific relationships between each habitat variable and suitability of the habitat for masked bobwhites while holding all other variables constant at their optimal levels. I have provided an example below for one of the habitat variables I discussed above for BBFLs. For each variable you describe above just draw what you expect the suitability function to look like and describe what the variable is and how you would measure it. I will take your drawings and create a function that closely matches and return it to you for approval. The Y-axis for each graph is labeled “Suitability” from 0-1. Suitability can be thought of as the carrying capacity of the habitat with a value of 1 having the maximum carrying capacity (or most suitable habitat). It will be helpful for me if you identify the values of inflection points on the graph explicitly so that I can better match your drawing. Also, be sure to specify the units of the X-axis and label the intervals. I have provided a bunch of blank graphs but feel free to add more if necessary (or not use some).

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | Description | Suitability Function | Suitability Graph |
| Tree cover | Canopy Cover of Apache and Ponderosa Pines. Canopy cover is measured as the proportion of area covered by these species using a densitometer while standing on the ground. | (Beta PDF with α=5, β=20) | C:\Users\dominic\Documents\Work\Current Projects\MBQ\BBFL sample.emf |
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**Equations.**

The final habitat suitability index score is a result of the combination of suitability scores from component variables. The equations which describe this combination are governed by the assumptions and relationships described in section 2.2. Additive equations imply each variable in the equation can compensate for other variables with low scores unless otherwise noted. Multiplication implies a score of zero for any variable results in a suitability score equal to zero (i.e. both variables must have non-zero scores for the habitat to be suitable). I will develop these equations based on the information you provide unless you feel that you would rather do that.