Mapping Occupancy Probability of the Golden-Winged Warbler

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BACKGROUND

The Golden-winged Warbler (*Vermivora chrysoptera*) is a species of North American migratory warbler whose populations have been rapidly declining in recent decades. One hypothesized cause of this is habitat losses in both the breeding and wintering grounds (Fig. 2). Building an understanding of the landscape composition that creates suitable habitat for this species is integral for effective management. Here we present an application of a model created to assess the probability of occupancy of Golden-winged Warblers in the Appalachian region based off of land cover (Schold & Bulluck, 2018). This model examines occupancy at two ecologically-relevant scales. The 100m scale represents the area in which nesting would typically occur, and the 500m scale the area in which foraging and nestling dispersal would occur. Using the results of this model, we will create occupancy maps at each scale, then overlay the two to predict the occupancy. This poster presents the occupancy map produced by the 100-meter moving window analysis.

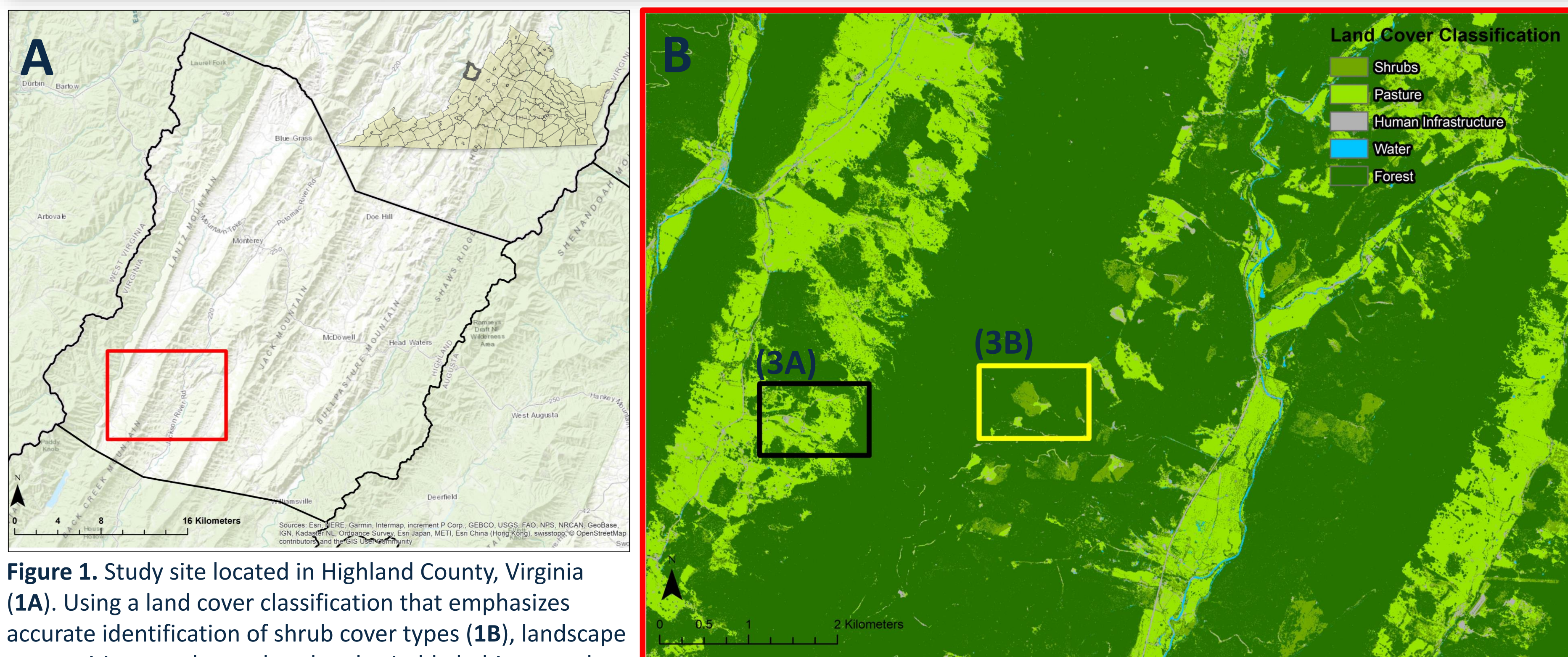## STUDY SITE – HIGHLAND COUNTY, VA

Figure 1. Study site located in Highland County, Virginia (**1A**). Using a land cover classification that emphasizes accurate identification of shrub cover types (**1B**), landscape composition may be analyzed and suitable habitat may be identified.

METHODOLOGY

- Using a fine resolution (5m) land cover classification of a section of Highland County, Virginia (Fig. 1), landscape level habitat characteristics were calculated in FRAGSTATS.
- Simpson's Diversity and Percent Shrub Cover were calculated with a 100-meter moving window
- Metrics were used to calculate probability of occupancy using the linear model (parameterized by Schold et al., 2018):

$$Pr_{100m}(occ.) = 0.538 * S - 0.555 * P + 0.815$$

where:
- $Pr_{100m}(occ.)$ – probability of occupancy with a 100-meter moving window
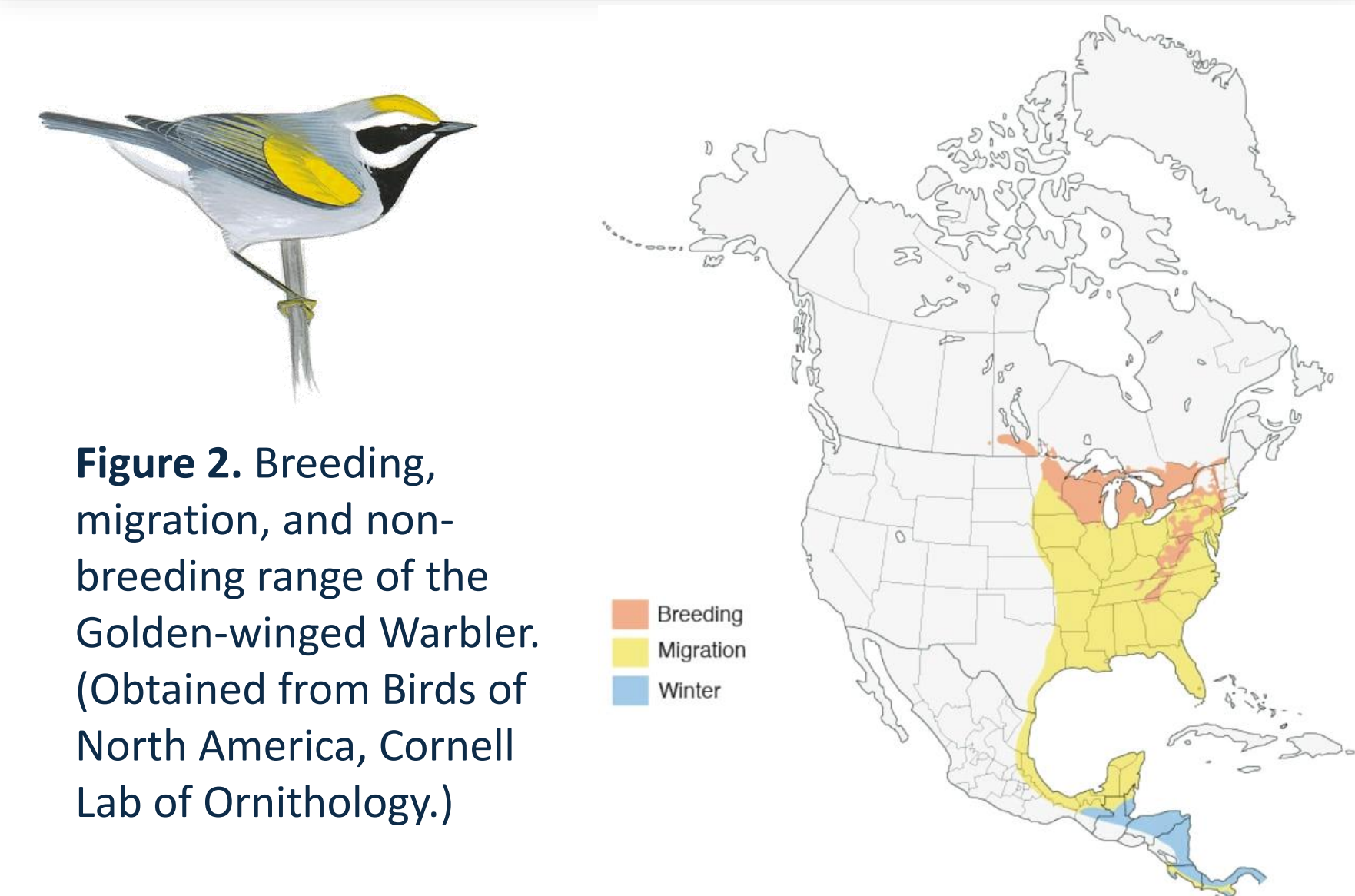- S – Simpson's Diversity Index
- P – Percent Shrub

Figure 2. Breeding, migration, and non-breeding range of the Golden-winged Warbler. (Obtained from Birds of North America, Cornell Lab of Ornithology.)

RESULTS

- With the 100-meter window, we found lower probabilities of site occupancy in areas with many cover types and little shrub cover (Fig. 3A).
- The highest areas of occupancy were found in areas with high amounts of shrub cover (Fig 3B).
- Given the model parameters, occupancy across the entire extent was relatively high, with a range in values from 43-135% (Fig. 4).
- A large portion of the extent was homogenous forest, resulting in a value of zero for each of the landscape metrics, so the modal predicted occupancy was the intercept, 81.5%.
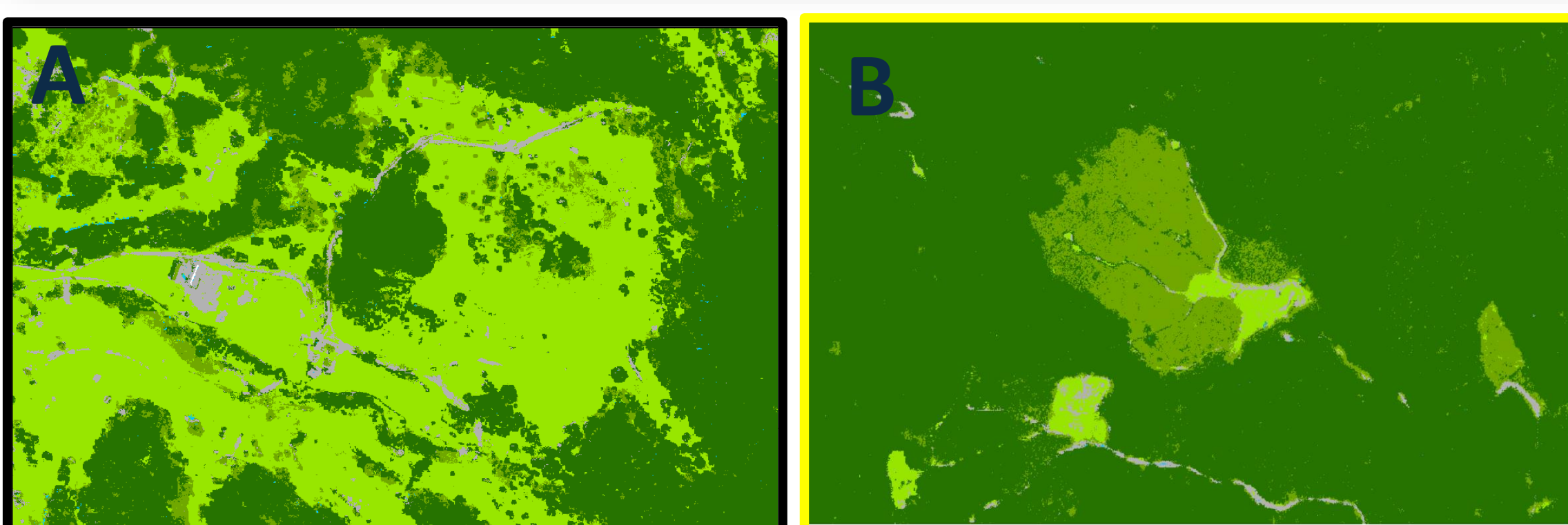

Figure 3. Insets of Fig. 1B, illustrating the differences in landscape composition which lead to changes in occupancy (see extents indicated in Fig. 4). (**3A**) shows an area of low occupancy, while (**3B**) shows an area of high occupancy.
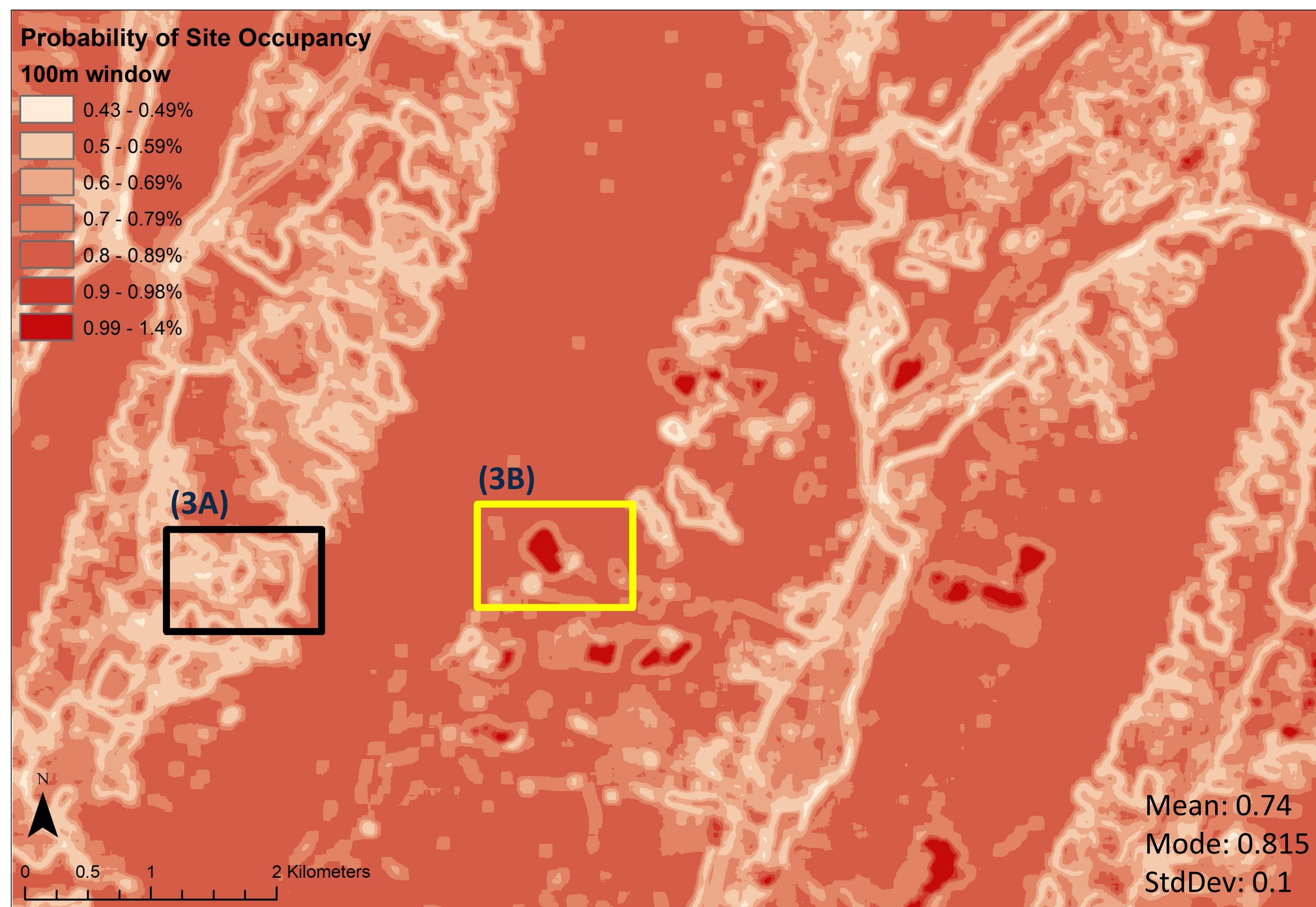

Figure 4. Probability of occupancy based on Simpson's Diversity Index and Percent Shrub with a 100-meter window size. Values may exceed 100% due to the linear fitting of the model.

Mean: 0.74
Mode: 0.815
StdDev: 0.1

CITATIONS:

- Schold, E., Albrecht-Mallinger, D., & Bulluck, L. (2018). Scale-dependent predictors of golden-winged warbler (*Vermivora chrysoptera*) occupancy dynamics in western Virginia. Manuscript submitted for publication.
- Schold, E. & Bulluck, L. (2018). Using an object-based random forests classification framework to surmount the challenges of identifying shrub in a mountainous landscape. Manuscript submitted for publication.

MOVING FORWARD

- Results can be used to further refine model and direct to types of landscape that need more work
- Can be combined with the model at the 500-meter window
- Illustrate suitable landscape types for the Golden-winged Warbler and predict where they could be found for future studies