A Pilot Suitability Analysis to Identify Implementation Sites in the New York Champlain Valley

Wildlife-Friendly Farming

Project Overview

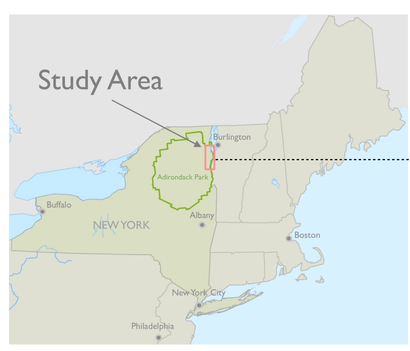
The unique working landscape of the New York Champlain Valley contains an abundance of diverse wildlife habitat and is a focus area for many conservation groups. The region is also home to numerous farms, and agriculture is a crucial sector of the local rural economy. While most residents are supportive of agricultural activity there remains some concern among conservation groups regarding the potential negative impacts of farming on wildlife populations and their habitat. **Wildlife-friendly farming (WFF)**, a set of farm management practices ranging from non-lethal predator control to the establishment of wildlife habitat on the farm, is one possible solution for mitigating some of the negative impacts associated with traditional farming activities while maintaining a farm's economic viability. A number of local conservation organizations including Wildlife Conservation Society (WCS) and the Eddy Foundation are in the early stages of developing programs and resources to help farmers adopt WFF practices in the Champlain Valley. However, little information currently exists to inform decisions regarding where to focus initial WFF efforts. The aim of this pilot suitability analysis was to utilize publicly available datasets to identify agricultural land that is most suitable for the implementation of WFF practices in the NY Champlain Valley to inform local WFF initiatives.

Methodological Approach

This analysis involved a two-step process. Step 1 consisted of creating individual suitability layers that each represent some spatial or physical phenomena that is relevant to WFF. These individual suitability layers, which are each discussed in further detail below, were combined in Step 2 to create the final composite suitability map to the right. Each time layers were combined they were assigned a weight reflecting their importance to the resulting composite layer.

The analysis used fuzzy membership and reclassify, two geoprocessing tools in ArcMap, to assign a value between 0 and 1 to each pixel in a given layer based on its membership of a specified set. A value of 1 indicates full membership and a value of 0 indicates no membership. Using the riparian habitat input layer as an example, map pixels existing in a zone designated as 'riparian' were assigned a value of 1 (full membership). This value decreased linearly as distance from the nearest riparian area increased. Map pixels that were more than 200 m from a river or stream were assigned a value of 0.

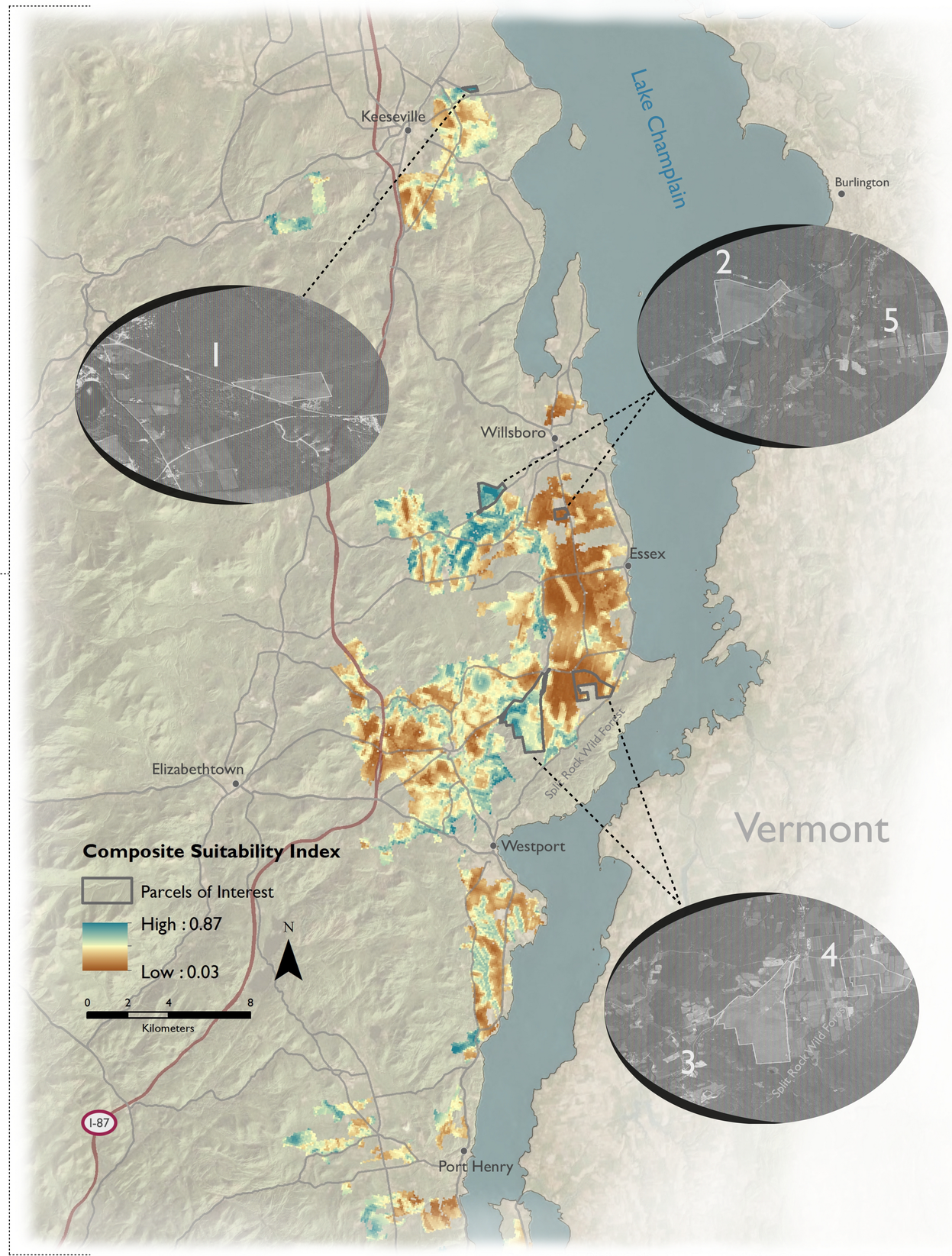
The analysis was restricted to land under protection of New York State Agricultural District Law. Each agricultural district (referred to as parcels) is a collection of individual properties. Zonal statistics were calculated for each parcel. Mean pixel values for each of the individual suitability layers and the composite suitability map are reported for selected parcels of interest in the table below.



Discussion of Results

Five parcels were selected to discuss the fitness of the suitability model. Parcel 1 received the highest mean suitability index value - the average value of a cell in the 36 acre parcel was 0.697. This was largely due to the presence of, or proximity to, existing wildlife habitat (mean habitat value = 0.848). Parcels 2-5 were selected based on their proximity to nearby parcels with disparate suitability values. Parcel 4 highlights a potential shortcoming of the model. Despite abutting Split Rock Wild Forest - a 3,700 acre forest tract with diverse wildlife habitat - it received a low mean suitability score (0.13). Note that the analysis is also affected by the modifiable areal unit problem (MAUP) that results from aggregation of point-based measures into districts. It is important to recognize that the parcel boundaries discussed here are arbitrary to a degree, and this should be taken into account when drawing conclusions from the analysis.

Agricultural Land Suitability for Implementation of WFF Practices



Zonal Statistics for Selected Parcels of Interests

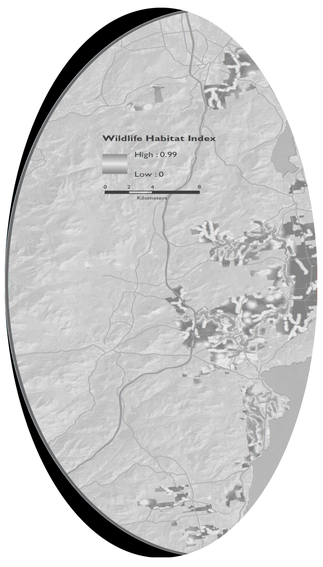
	Parcel 1	2	3	4	5
Area (acres)	36	266	1075	390	72
Mean Suitability Index Value	0.70	0.65	0.50	0.13	0.09
Mean Habitat Value	0.85	0.60	0.47	0.05	0.02
Mean Connectivity Value	0.61	0.76	0.54	0.10	0.04
Mean Ag Productivity Value	0.52	0.60	0.50	0.36	0.32

Individual Suitability Layers

Important spatial and physical characteristics that determine whether a site is suitable or desirable for WFF practices include existing habitat, regional and local connectivity, and agricultural productivity potential. A suitability layer was created to represent each of these phenomena. These layers were then combined to create the composite suitability map to the right. Individual layers were created using the inputs listed below. The corresponding weight that was assigned to each layer is listed in parentheses.

Wildlife Habitat (50%)

Land that contains or is near existing riparian areas and habitats that are of conservation interest to WCS were given a higher score, as was land with a higher degree of ecological integrity.



Input layers

- Riparian habitat (40%)

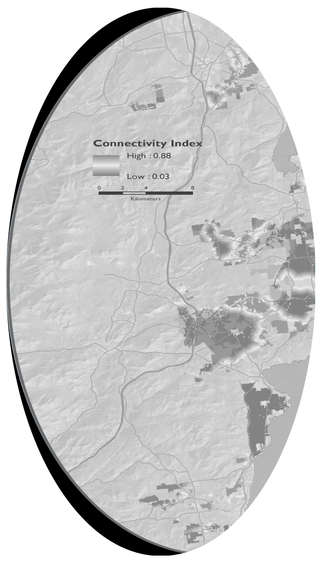
  Habitat that exists at the interface between land and a river or stream.
- Habitats of conservation interest (40%)

  Central Hardwood Swamp, Central Oak Pine, & Northeastern Floodplain Forest
- Ecological Integrity (20%)

  Refers to the ability of an ecosystem to support ecological processes and species diversity.

Connectivity (30%)

Connectivity refers to the degree to which a landscape facilitates wildlife movement. Land with better connectivity received a higher score.



Input layers

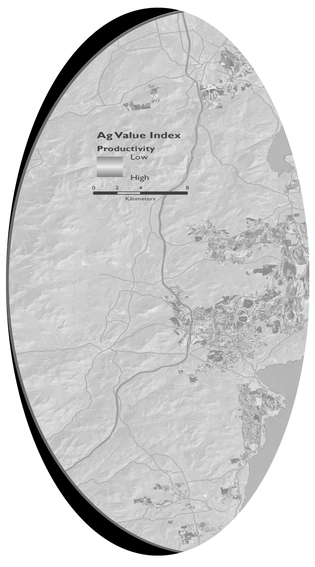
- Core habitat & connectors (50%)

  Patches of wildlife habitat and the corridors that connect them.
- Local connectivity (50%)

  The degree of connectedness of a 90m x 90m cell with its surroundings within a 3km radius.

Agricultural Productivity (20%)

This layer assumes that less productive farmland is more desirable for WFF practices. Land with steep slopes and low soil productivity was prioritized.



Input layers

- Slope (50%)
- Soil productivity potential (25%)

  The inherent capacity of a soil to produce nonirrigated commodity crops.
- Soil wetland potential (25%)

  Soils that appear to have been drained for agriculture and could potentially be converted back to wetland.

Conclusion

Overall, the model created and implemented in this suitability analysis appears to have value for informing decisions regarding WFF initiatives in the NY Champlain Valley. Of course, there are many non-spatial factors that determine where WFF is likely to be successful such as a farmer's willingness and ability to adopt WFF practices. The model could be significantly improved by including protected land (e.g. Split Rock Wild Forest) in the Wildlife Habitat suitability layer. Additionally, using individual parcel boundaries instead of aggregated agricultural districts would allow for identification of specific farms for the implementation of WFF management practices.

Sources

Data sets

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Images

Header image: http://www.publicdomainpictures.net/view-image.php?image=229980&picture=wheat-field
Footer image: https://pixabay.com/en/sheep-goats-flock-quadruped-1563110/

Map Projection: NAD 1983 UTM Zone 18N

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