Ruffed Grouse

Ruffed grouse was selected as a representative species for the Designing Sustainable Landscapes project of the North Atlantic LCC (https://scholarworks.umass.edu/designing_sustainable_landscapes/). The habitat clusters (ecological systems) and associated wildlife species that it represents generally comprise mixed-aged forests within close proximity to open habitat. The ***Landscape Capability* (*LC*)** index integrates habitat capability, climate suitability and prevalence into a single index that reflects the relative capacity of a site to support the species.

***Habitat capability* (*HC*)** -- The *HC* index considers five factors representing: (1) ecological system, representing the capability of each system to provide the required invertebrate food and nesting locations needed for breeding, (2) biomass, representing forest structure and development (i.e., seral stage), (3) topographic slope, (4) forest patch size, (5) landscape-scale forest extent, representing the amount of suitable breeding habitat in the landscape surrounding the homerange, and (6) small extent development, representing short-distance edge effects such as changes in microclimate, vegetation structure and access by predators that occur on a scale of tens to a few hundred meters from a developed or agricultural edge. The *HC* index represents the relative capacity of a site to provide the habitat needed by the species based on current scientific knowledge.

***Climate niche* (*CN*)** - The *CN* index considers five climate variables representing: (1) growing season precipitation, (2) annual precipitation, (3) maximum summer temperature, (4) minimum winter temperature, and (5) annual temperature and is based on a statistical model derived from 5,522 Breeding Bird Survey (BBS) route segments distributed through the Humid Temperate Domain. The *CN* index represents the probability of the climate being suitable for the species based on its current distribution in relation to current climate.

Prevalence index - The Prevalence index is based on the proportional presence of the species across space and is derived from a smoothing of the presumed present and absent locations of the same BBS route segments as used for *CN*. The prevalence index represents the species' relative occurrence based on its current distribution without consideration of environmental determinants and is intended to address biogeographic factors other than habitat or climate (e.g., disease) that influence the species' current distribution.

***Landscape Capability* (*LC*)** - The *LC* index is computed as the product of the *HC*, *CN* and Prevalence. Thus, the index computed for 2010 reflects the gradient of worst (0) to best (maximum value) sites within the landscape that support this species during the breeding season. Note, we also compute this index for the future (e.g., 2080) based on output from the landscape change model.

Model performance was evaluated using an independent dataset (eBird occurrence data; 830 present locations and 2,137 absent locations) and determined to be acceptable (Kappa = 0.45, Deviance explained=30%, AUC = 0.89).

Ruffed Grouse Landscape Capability Model

**Ruffed Grouse
Landscape Capability (LC) (2010)**

High
Low
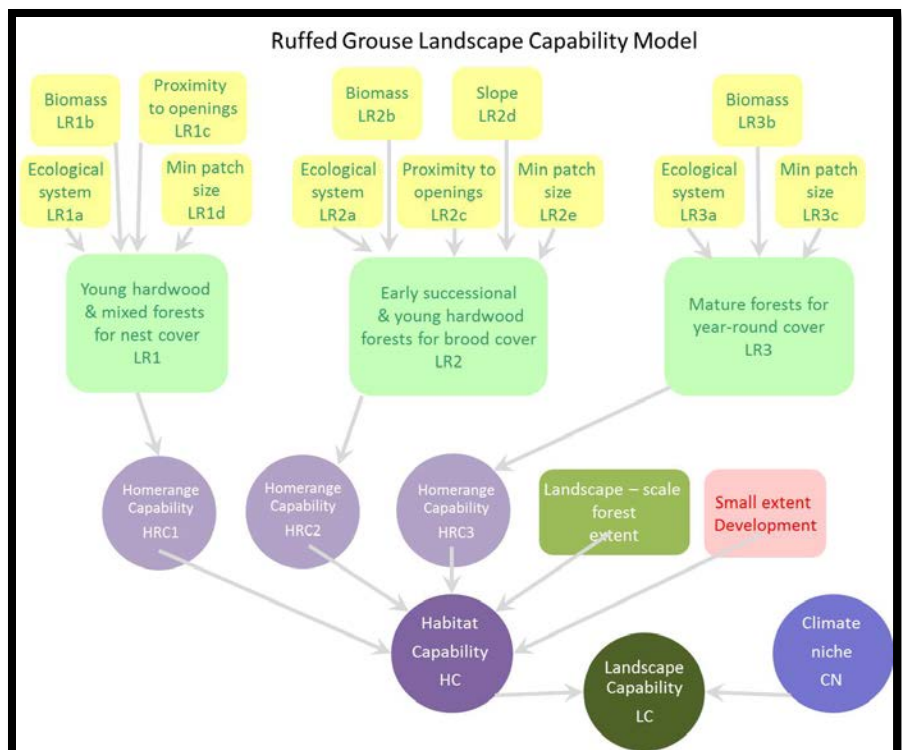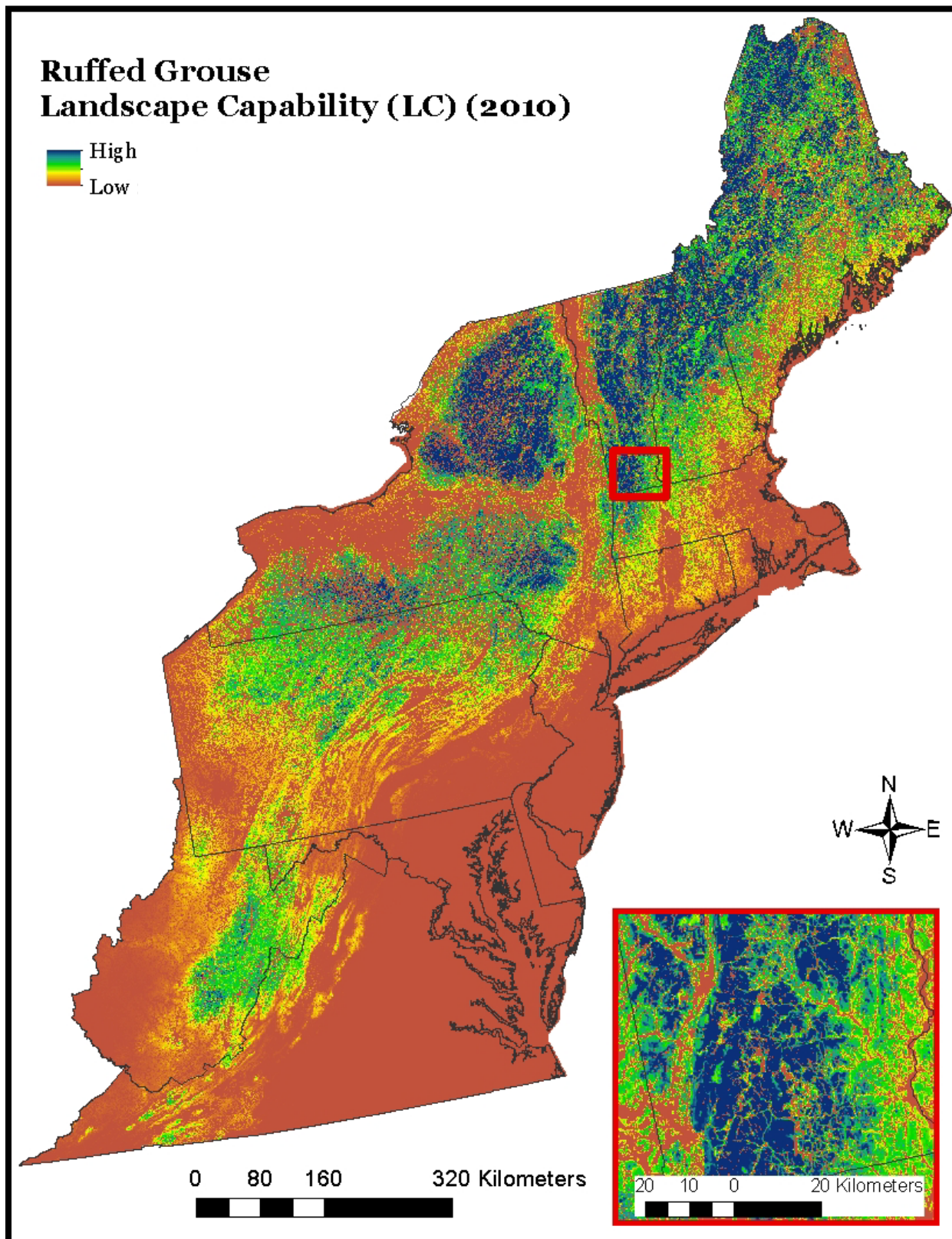
See technical document on species at https://scholarworks.umass.edu/designing_sustainable_landscapes/ for a detailed description of the Landscape Capability modeling process.