Landscape Conservation Cooperatives (LCCs) are applied conservation science partnerships that provide scientific and technical support for conservation at landscape scales—the entire range of an identified priority species or groups of species.

LCCs will support biological planning, conservation design, prioritizing and coordinating research, and designing species inventory and monitoring programs. They will also have a role in helping partners identify common goals and priorities to target the right science in the right places for efficient and effective conservation.

By functioning as network of interdependent units rather than independent entities, LCC partnerships can accomplish a conservation mission no single agency or organization can accomplish alone.

Additional information can be found at [http://www.fws.gov/science/shc/lcc.html](http://www.fws.gov/science/shc/lcc.html)
Vermont is located in the North Atlantic LCC (number 10 on map). In this large area, scientists have identified a handful of target species for conservation planning and monitoring. The overall goal of landscape planning is to predict how these species will fare in the face of human population growth (increasing development) and climate change and to develop pro-active conservation plans to conserve species in light of these threats.

**Conservation Species:**

In this exercise, we’ll focus on two of these species.

The ‘ovenbird’ is a forest-nesting songbird that has was selected as a target species because:

1. It is sensitive to habitat requirements (probability of occurrence is directly linked to proportion of forest cover).
2. It has several qualities that allows unbiased monitoring. On a spreadsheet grid, the probability that an ovenbird will occur in a pixel, given it is forested, is the proportion of cells in the “queen” neighborhood that are forested.

The ‘bobolink’ is a grassland songbird that was selected as a target species because:

1. It is a grassland obligate and responds quickly to environmental stressors, particularly draught.
2. During non-drought years, the probability of occupancy of a grassland pixel is 0.3. However, when drought occurs, the probability of occupancy drops to 0.1 for the next 10 years.

**Your Challenge**

As a first step of the LCC initiative, a USFWS biologist has asked you to come up with a rapid-prototype model that integrates landscape pattern, species occurrences, and predicted climate impacts on both ovenbirds and bobolinks for the next 100 years.

The landscape, as you know, is enormous. Because this is a prototype, you focus on a small region in Vermont that consists of 100 pixels in a 10*10 spreadsheet grid. The size of each grid cell is 1km$^2$.

The starting conditions are as follows:

- The landscape consists of 20% development, 20% agriculture, and 60% forest. You can assume a random placement of these types for the initial landscape.
- Human population size is 500,000 people, with a growth rate of 2% annually. As the human population grows, forest or agriculture is converted to development.
- The average probability of drought is 0.1, but climate models predict that this will increase to 0.2 in 100 years. The spatial scale of climate predictions is such that the probability of drought occurs not on a pixel by pixel level, but rather on a 5*5 pixel scale (so there are four of these in your map).

The objectives of the model are to:

- Predict how occupancy patterns of ovenbirds and bobolinks will likely change over the next 100 years.

- Inform the USFWS regarding whether random development versus clustered development will better protect species. (Clustered development is a case where, if a pixel must convert to development, it is constrained to occur next to existing development).

- Identify at least one strategy for identifying ‘key’ pixels that should be targeted for conservation.