Best Land for Agroforestry Near Amherst, MA

Introduction

Agroforestry is a way to expand farm production while maintaining the environmental benefits of forests (Martin, et al; USDA). There is a significant amount of potential for agroforestry in Massachusetts, because of its large amount of land currently in forests and its reputation as a leader in sustainable agriculture. The town of Amherst was used for this model because of its location in the fertile Pioneer Valley. How do we find the best land for agroforestry near Amherst, MA? For the purpose of this model, suitable land will need to be forested, fertile, affordable and generally upstream.

Methodology

The best land for agroforestry was found by continually narrowing down potential land using various datasets. The first step was to identify forested land located on excellent soil for agriculture. An SQL Query was used to select only the “Forest” category from the Land Use 2005 dataset. Nurseries, forested wetlands, orchards, cropland, and residential areas are classified as separate categories. Then, an SQL Query was used to select “Prime farmland soils” and “Farmland of statewide importance” from the NRCS SSURGO Soils dataset from MassGIS. These are the best and second-best soils for agriculture, respectively. The areas where the two layers intersect was used to establish our potential agroforestry land base.

Now that we have our land base, the next step was to find out how much of this land is reasonably affordable for a farmer to purchase. This was accomplished by using the Tax Parcel dataset to only select potential agroforestry land that is also located on properties valued at less than $150,000.

This last step created a new problem, which was that the process of narrowing down our land base has created awkward slivers of land that are too small to be of any value to a farmer. So this problem was solved by only selecting land from our land base that is three acres or larger in size. This still leaves some land in awkward shapes, but most of those pieces are eliminated in the next step.

Lastly, land that is upstream and away from most of the chemical run-off from neighboring farms was identified using a water flow accumulation model. Land that was generally upstream was identified by eliminating all land with a max flow accumulation of 2 (out of 4.75) or greater anywhere on the land piece.

Results

Five plots of land were identified south of Amherst that fit all of the criteria for suitable agroforestry land. The model seems to be a good preliminary step for finding suitable agroforestry land, but it most likely overestimates the amount of land that is suitable for agroforestry in reality. The largest shortcomings are due to differences in dataset collection times and inaccuracy of the flow accumulation model. The Land Use dataset was obtained in 2005, the NRCS SSURGO Soils dataset was collected over several time periods, the Tax Parcel dataset was last updated in 2015, and the satellite base layer collection time is unknown. The flow accumulation model should have been based on a 1/9 arc second NED dataset rather than a 1/3 arc second NED dataset. This would have provided enough resolution to give meaningful information about the small land plots in this model, but would have required a smaller land base area in order not to overwhelm ArcMap.

Data Sources

Satellite Basemap, ArcGIS Online.

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