

Hops Farm Site Suitability Analysis, MN

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1 INTRODUCTION

The demand for locally produced products is growing in many industries all over Minnesota. This is especially true in the craft brewing market. People are looking for a locally brewed products made from local ingredients as well. One ingredient vital to many brewed products is hops. Hops are the female flowers of the hop plant used for stability and flavoring of beer and other beverages (figure 1). Historically, hops have been produced in the Pacific Northwest in the United States per the Hop Growers of America. Interest in hop production is increasing in Minnesota to meet the demands of the “locally produced” movement. In 2013 the Minnesota Hop Growers Association was formed to support those interested in hop production.

According to Michigan State University, Hop production is ideal when the following conditions are met:

- Grown between latitudes of 30 and 55 degrees for proper day length during the growing season.
- Full sun and rich soil.
- Well-drained soil.
- Soil with a pH of 6.5 to 8.0.



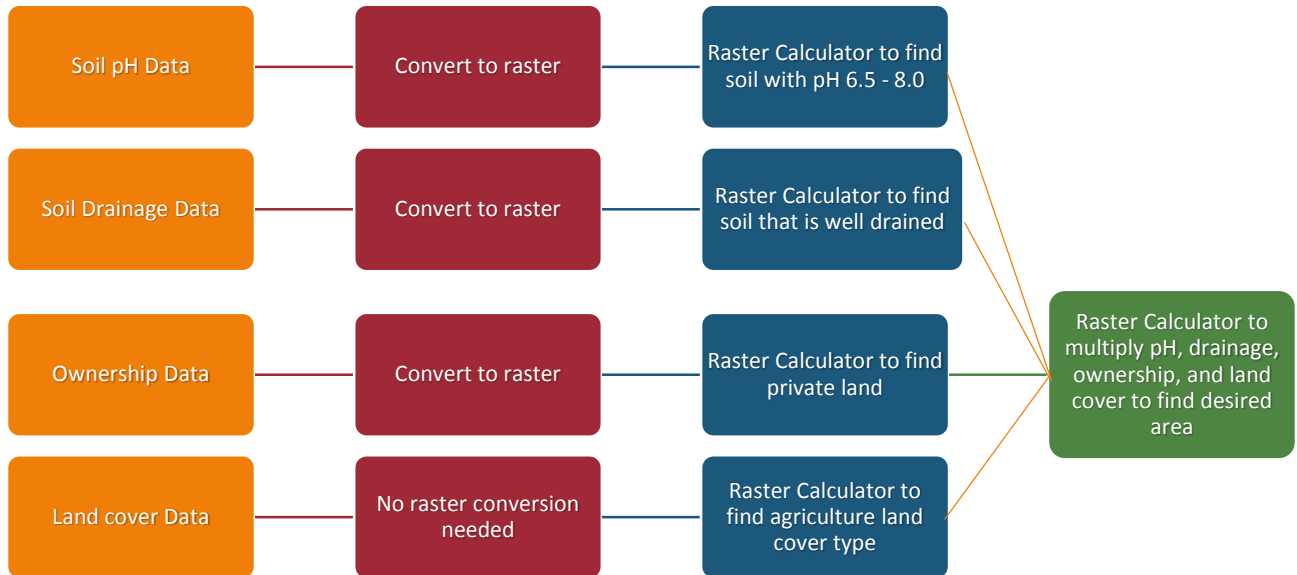
Figure 1: Hop flowers

This analysis will identify suitable sites for hop farms that meet the required growing conditions so that hop production can be increased within Minnesota. The entire state of Minnesota will be included in the analysis because it lies within the desired latitudes of 30 and 55 degrees. Areas with soil that is classified as well drained with a pH 6.5 to 8.0 will also be identified. In addition, the land cover type must be classified as agriculture with ownership listed as private so that it is ready for crop production and possible purchase.

2 METHODS

For this site analysis data was obtained from multiple data sets. Data sets were gathered from the MN Data Deli and include: NLCD 2001 Land Cover, MN Soil Atlas, GAP Stewardship, and the MN county boundaries data set.

The below graphic is an overview of the analysis process:



The first area to identify is soil pH levels between 6.5 and 8.0. The MN soil atlas data file was first converted from a polygon shapefile to a raster format. The Raster Calculator was then utilized to create a new raster layer only containing the land areas with the specified pH levels.

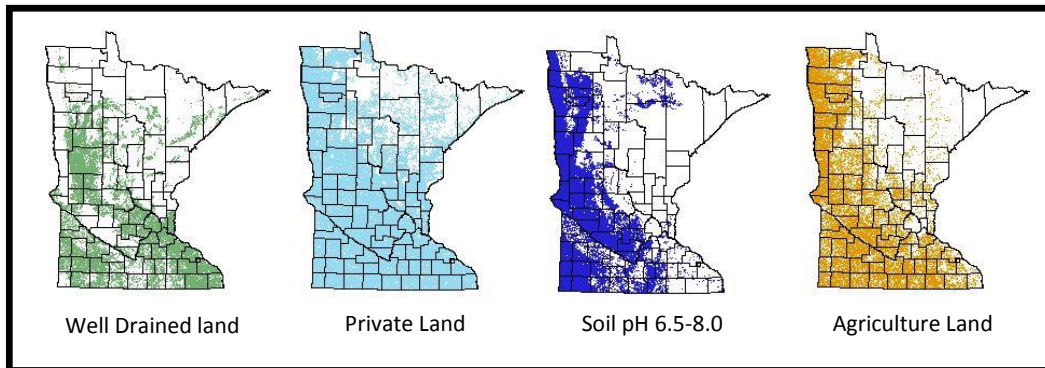
The second area to identify is soil that is well drained. This again used the MN soil atlas data file so it was already converted to raster format. The Raster Calculator was then utilized to create a new raster layer only containing the land areas specified as “well drained”.

The third area to identify is who the land is owned by. The GAP Stewardship data file was first converted from a polygon shapefile to a raster format. The Raster Calculator was then utilized to create a new raster layer only containing the land areas categorized as “private”.

The fourth area to identify is the land cover type of agriculture. The NLCD 2001 Land cover data file was first converted from a polygon shapefile to a raster format. The Raster Calculator was then utilized to create a new raster layer only containing the Land cover types categorized as “agriculture”.

Lastly, utilizing the Raster Calculator the four newly created layers were then multiplied. This produced a new layer containing only land areas containing all desired conditions. The data MN counties data file was then added for a visual reference as to where these areas are within the state.

This image shows each individual layer before combination in the final stage:



3 RESULTS

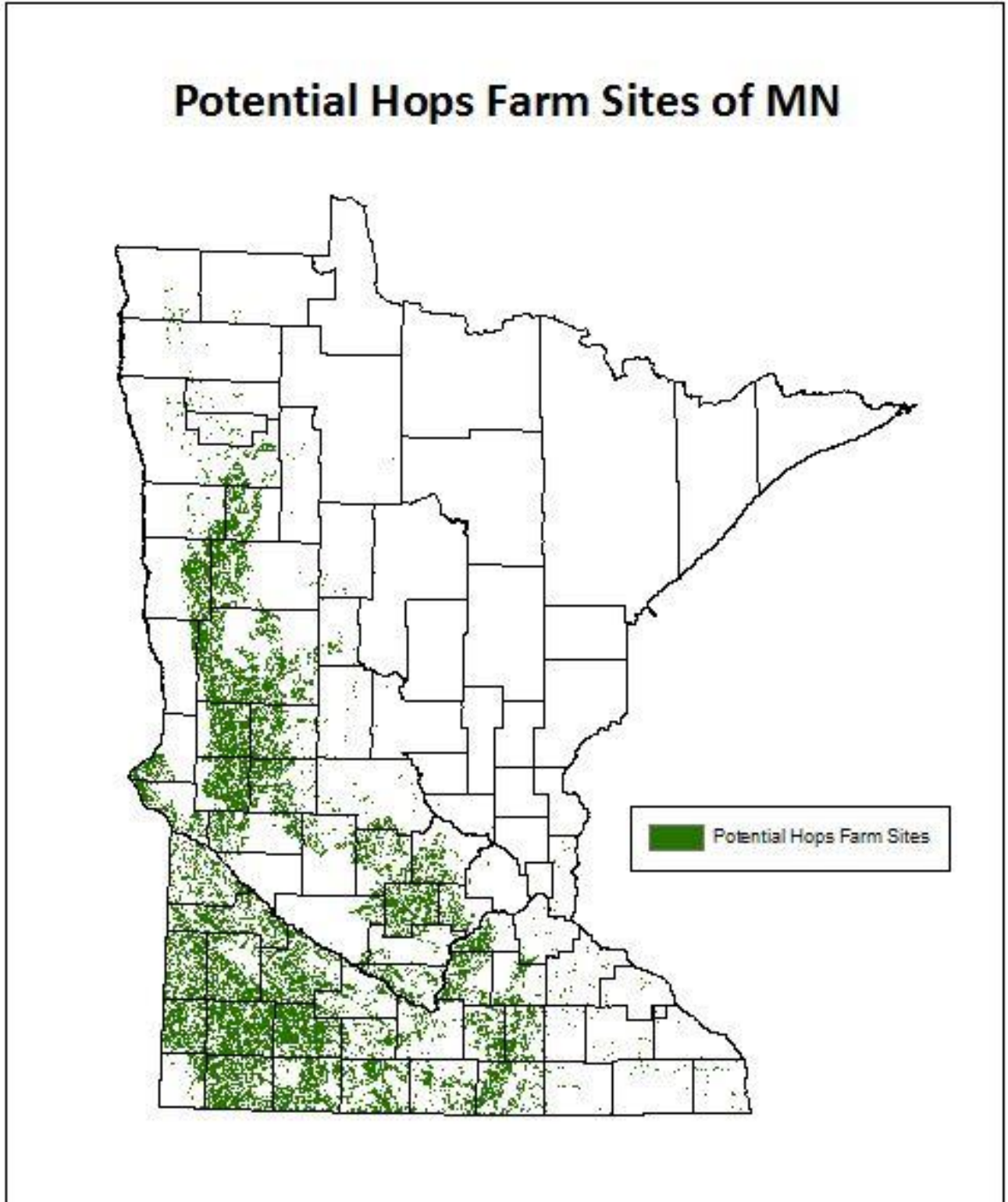
The analysis shows a total of 6,145,643 acres are ideal sites for hops production within the state of MN based on the search criteria in this analysis. Figure 2 on the next page displays these sites. To get to that final figure, each condition was analyzed separately. Each layer displayed the number of cells within that layer that contained the desired attribute.

To calculate the number of acres this analysis used a cell size of 50 x 50. The numbers of cells containing the specified attribute were then multiplied by 2,500 to account for the cell size. That number was then multiplied by 0.00024711 to obtain the number of acres contained within the specified area. Those final acre calculations are shown in the table below for each analysis layer as well as the final layer.

According to the USDA, in the U. S. the average pounds of hops produced per acre is 1,969 and the average price per pound is \$2.64. Thus, every acre of hops production is on average worth \$5,198. In addition, hops grown in Minnesota and utilized locally could bring even more profit for the farmers due to reduced storage and transportation fees since they will be used locally.

Layer	# acres
Soil pH	2019580.545
Well Drained	1843080.584
Ownership	3880353.875
Agriculture	23542953.48
Final	6145643.038

Figure 2:



4 CONCLUSION

As demand grows for locally produced products such as craft brewed beverages, the demand for locally grown hops will increase as well. This analysis has shown there are many sites that are well suited for hops farming in Minnesota. Further exploration of these sites will be necessary to determine feasibility of the sites for hops production, but this analysis provides a good starting point.

5 REFERENCES

Hop Growers of America, 2008, www.usahops.org

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USDA, "2013 Hop Production Up Thirteen percent from last year", 2013, http://www.usahops.org/userfiles/image/1388461395_National%20Hop%20Report-NASS%2012-13.pdf