Potential Switchgrass Implementation Locations on Saskatchewan Agricultural Farms for Biofuel Production

Emma Solomon and Daphne Varmah
TCU Science & Engineering

Abstract

Switchgrass generates cellulosic ethanol, classified as an alternative fuel by federal definition. For switchgrass and other vegetation to become biofuel we have to look specifically at the cellulose microfibril and extract the glucose. This extraction leads to the fuel being produced. Switchgrass can deposit organic matter deep within the soil profile as the roots expand into the subsoil for nutrients and water. Not only is switchgrass a good biofuel product, but the carbon sequestration that comes along with planting this grass is highly beneficial. Due to the roots reaching deep into the soil, switchgrass is low maintenance while adding nutrients. In this project, we will be researching possible farms in Saskatchewan, Canada preferably in close proximity to ethanol biorefinery plants for maximum switchgrass plantation, in order to seek possible expansion of biofuel production in Saskatchewan. We will be looking at farms, proximity of farms to biorefineries, and soil make up.

Background

Switchgrass is an adaptable perennial herbaceous plant native to North America. There are two ecotypes, including upland and lowland in which switchgrass grows. Since the mid-1980s, switchgrass has been mainly used as a renewable biofuel source for research. So far, switchgrass has been used in various forms of biofuel conversion processes, including cellulosic ethanol production, biogas, and direct combustion. As a biofuel source, switchgrass has a lower demand for fertilizers and pesticides, which allows switchgrass to produce good yields on the land of the best part of soil type. The climate benefits of biofuels are mainly manifested in (1) the use of alternative fossil fuels; (2) reducing greenhouse gas emissions during biofuel production, mainly through soil accumulation and avoidance of greenhouse gas emissions. This project discovers future application and study of switchgrass.

Objective

The objective of this project is to find suitable agricultural land near biorefineries for biofuel production in Saskatchewan.


Data

The data for this project was collected from ArcGIS Online and the Saskatchewan GeoHub. This includes the generalized province boundary of Saskatchewan, Canada, ethanol biorefinery locations, and the Western Canada Sedimentary Basin. The Prairie Landscape Inventory (PLI) - Mixed Grassland Classification data is from the Saskatchewan GeoHub which is constructed by the Saskatchewan government.
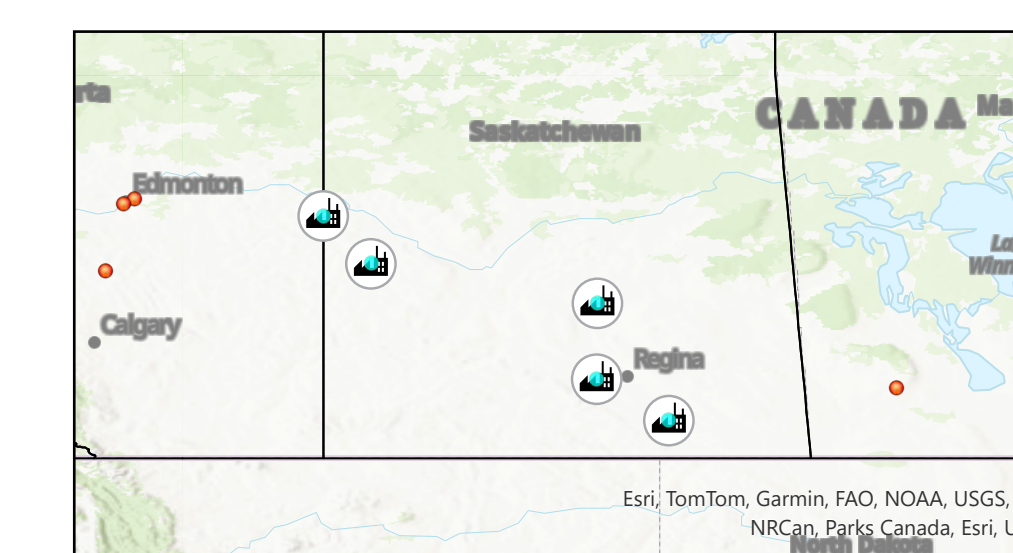
Methods

Add data from ArcGIS Online
Create separate maps for each variable
Create one map with all variables including: province boundary, ethanol biorefineries, sedimentology, and farm yields.
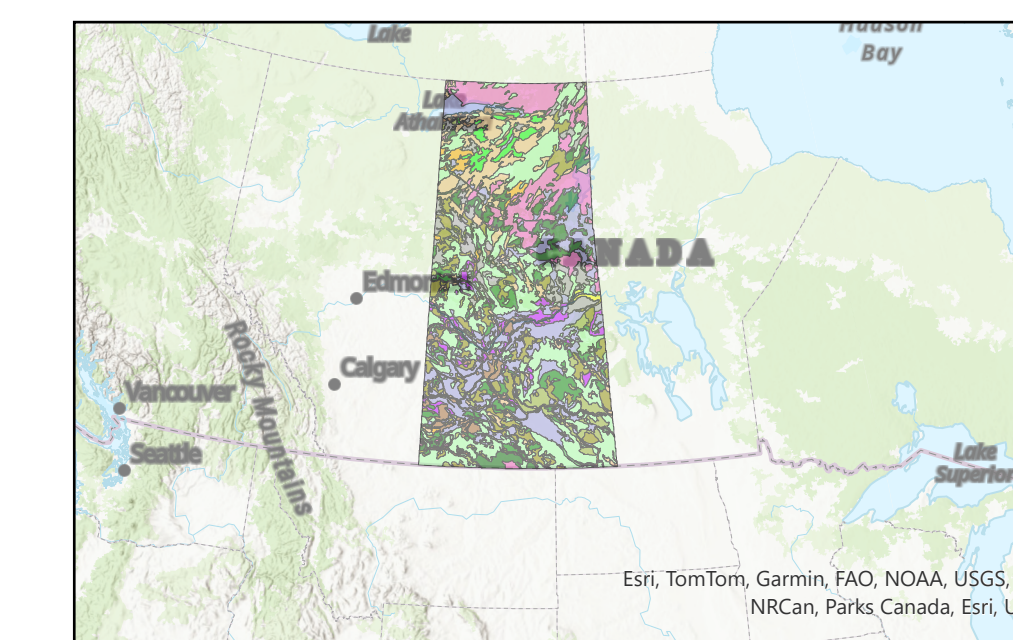

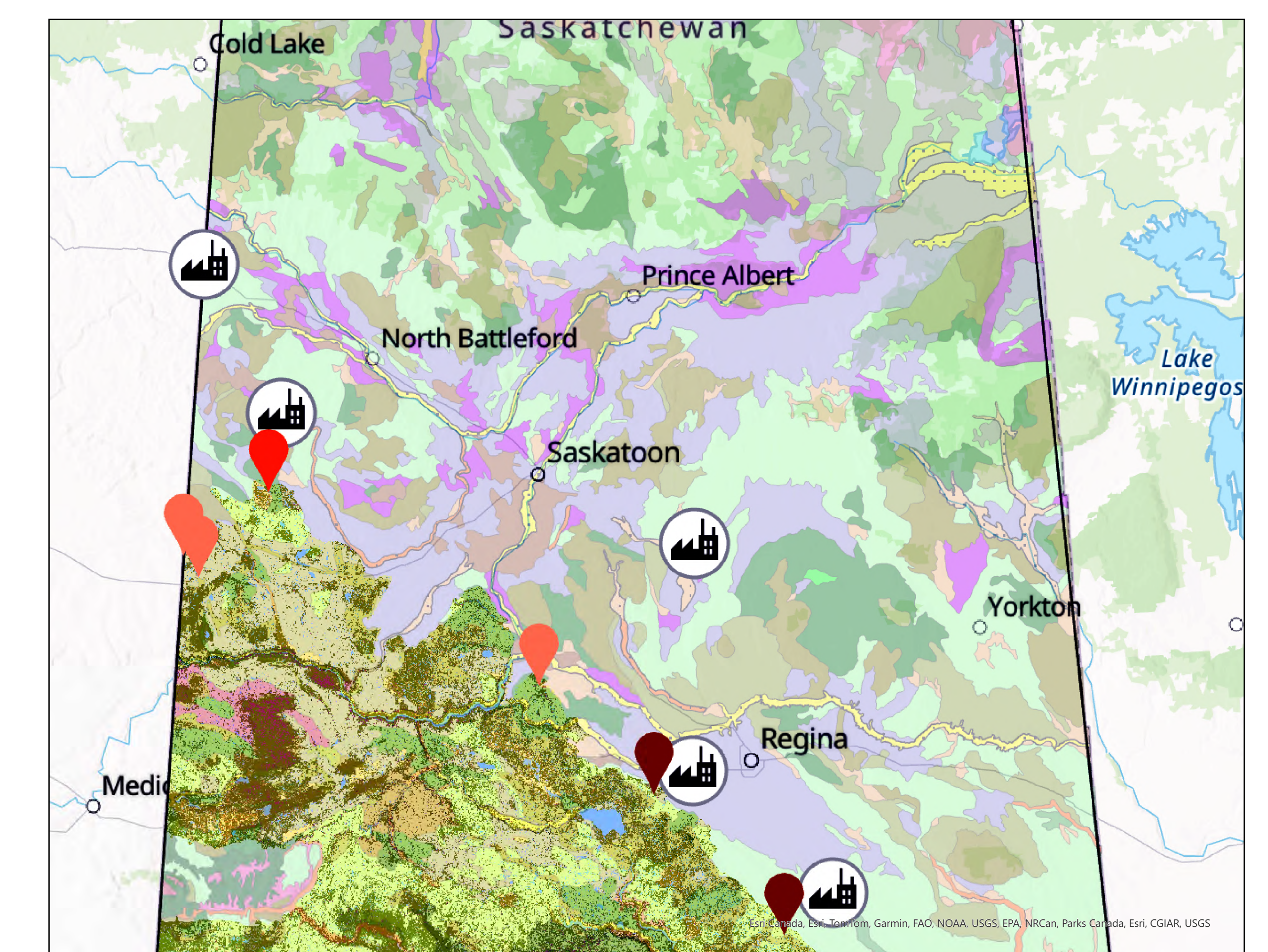Georeferenced the raster layer of the annual farm yield 2019
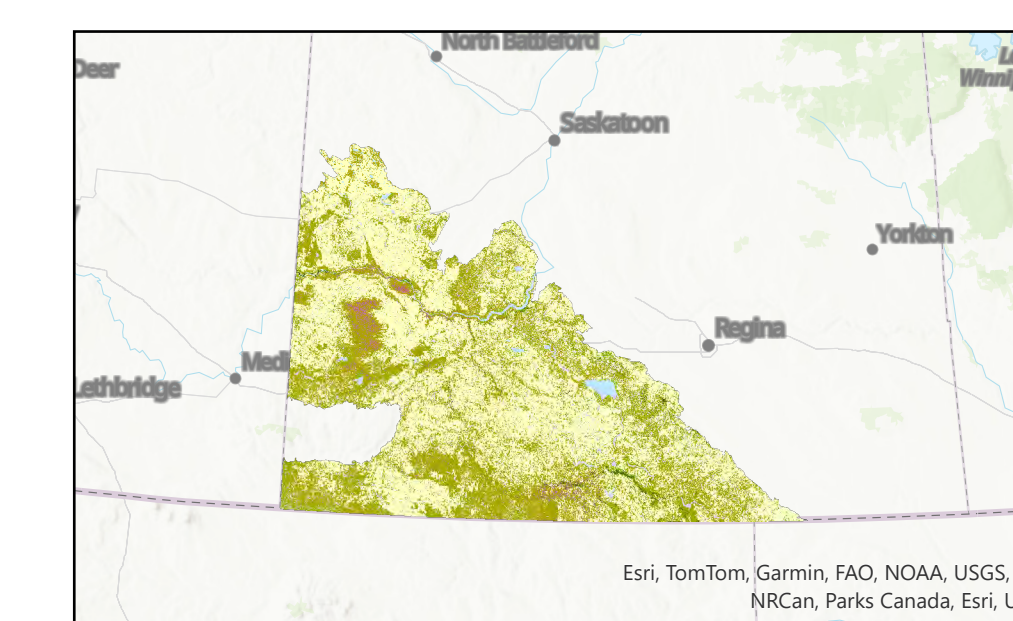
Created a query for Saskatchewan, made layer selection and clipped (biorefineries)

New points: went to geoprocessing and created feature class, named the classes in relation to their level of viability, selected the locations on the map and changed colors: level one: burgundy, level two: orange, level three: light orange.
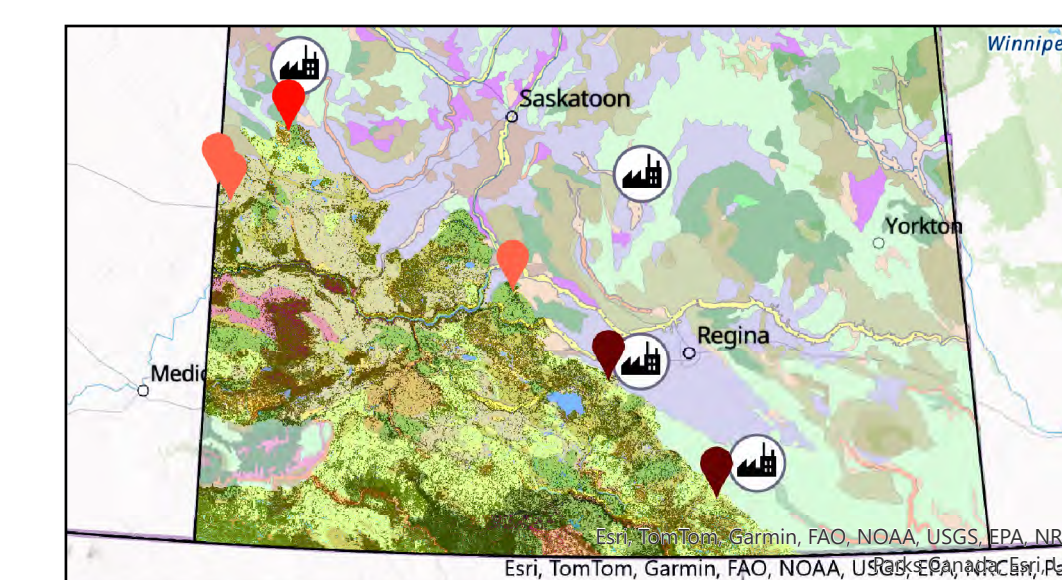
Results

Conclusion

References