



Growing Switchgrass in Unused Urban Parcels: A Site Selection Analysis Using GIS and ModelBuilder

Andrew Manza
University of Washington Tacoma
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Purpose

In 2008 petroleum products accounted for 94% of all energy consumed by the transportation sector in America. Contrast this to biofuels, such as ethanol, which only accounted for 3% of energy consumed. This reliance on petroleum is not likely to change soon. However, as concerns grow over carbon dioxide emissions, supporting hostile foreign governments by importing oil and the environmental impacts of oil production - recently highlighted by the BP oil spill - sources of cleaner, sustainable energy will be sought out and become profitable.

One source of ethanol is switchgrass, a perennial grass that grows in a wide variety of climates and land conditions. Switchgrass can be grown on marginal lands, saving prime agricultural land for food production. Another possible location for growing switchgrass is unused or vacant urban land. Undeveloped or vacant parcels provide no benefit to cities, using these parcels to grow switchgrass could generate economic benefits and also can revitalize polluted or contaminated land. Current yields for switchgrass are 10 tons per acre. Up to 100 gallons of ethanol can be produced per ton of switchgrass.

Objective

The goal of this project is to use a site suitability analysis to determine if unused or vacant parcels in Tacoma, Washington are feasible locations to grow switchgrass. The process developed will also be modeled using ArcGIS Model Builder so the analysis can be applied to any location given the appropriate data.

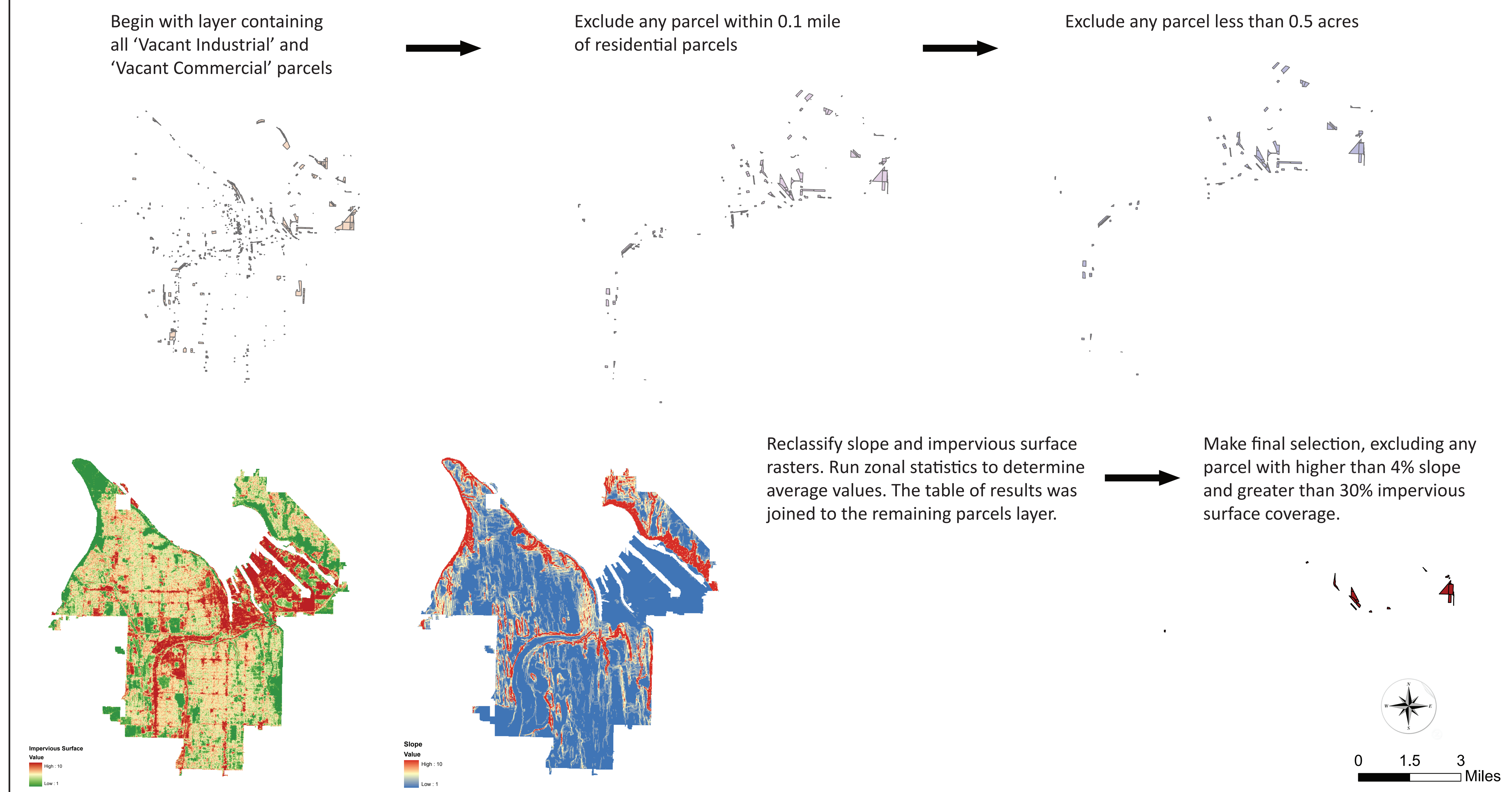
Site Requirements

- Vacant Industrial or Vacant Commercial land designation
- Minimum area of 0.5 acres
- Cannot be located within 0.1 mile of residential parcels
- Impervious surface coverage not to exceed 30%
- Less than 4% slope

Results

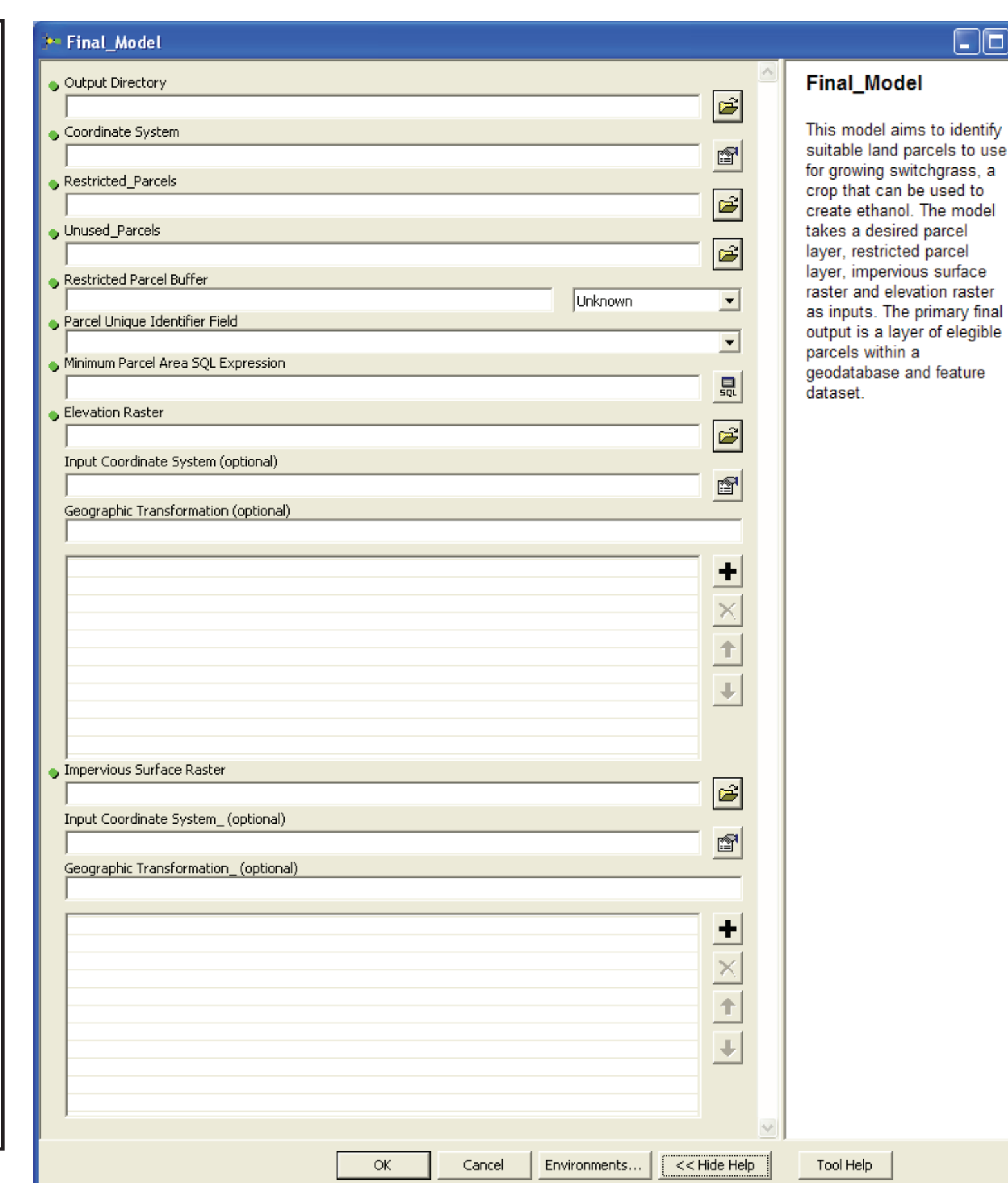
Out of 881 potential sites, 18 met all the criteria. Average parcels size is 5.21 acres, total area is 92.25 acres. These sites can produce a maximum 92250 gallons of ethanol per year. At current market price of \$2/gal parcels can generate \$185000 per year. The total assessed value of the 18 parcels is \$16.8 million. This operation would not be cost effective.

Process



Model Builder

The site suitability analysis was modeled using ArcGIS Model Builder. The model was designed to be as general as possible so any set of parcels can be analyzed with the correct inputs. The 4 major data inputs required are an unused parcel layer, restricted parcel layer, elevation raster and an impervious surface raster. The user also can choose the output directory, coordinate system, restricted parcel buffer distance and parcel area requirements.



Acknowledgements

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