



Northern Bog Aster Plant Habitat Suitability

Around Queen Elizabeth II Wildlands Provincial Park, Ontario

Introduction

Haliburton County is the hub of Tourism because of its aesthetic beauty and have many parks and lakes. It is called Haliburton Highlands because it forms one of the highest elevations in Canada. The county has such a diversified flora and fauna species. The region is habitat for around 840 plant species. Northern Bog Aster is one such plant that Haliburton county is concerned for protecting. The stretch for habitat suitability of this plant considered here is Queen Elizabeth II Wildlands Provincial Park whose some part is in Haliburton county. Though Rush Aster (other common name) is common in Ontario but it is not observed everywhere because of its habitat demands. It has been noticed in the park previously (data collected from Botanist) which suggests that the environment of the park and surroundings may be suitable for this species.

This is a perennial flowering plant. The average height range of plant rated is about 20 to 70 centimeters. The overall form of the plant is slender and of herbaceous category. Flowers are white colored and sighted during Summer and Autumn season (Ontario wildflowers website). The discrete characteristics of Wood aster is that it is small with stiff and isolated leaves texture.

Criteria Selection

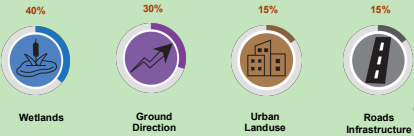
Based on the research from various sources it is found that wetlands are the best fit where Bog Aster can be grown. The wetland types suitable for these are mainly bogs and fens followed by swamps and marshes too. So this factor is given the highest weightage of 40%. Wetlands data is retrieved from Ontario Geobase data portal.

Then another factor that aid the growth of plant is the sunlight availability. It needs the presence of sunlight or should be partly shady in the afternoon. According to C. Maier (2018), the land direction which supports the sunlight presence in the northern hemisphere is southeast. The second best choice would be East or west and the last choice should be north one. Therefore, to create the aspect direction suitability surface of ground, Digital Elevation Model downloaded from USGS Earth Explorer website is used.

The third criteria consideration includes the urban development in the area. It is categorized into two categories, one is urban landscape which includes industrial, residential, commercial, retail and quarry areas and the other one is Roads or infrastructure presence in the area. So the idea behind this is that plants won't grow in these areas as they are having covered land surface with construction materials. Therefore, this land is unsuitable for habitat while the land far from it is suitable.



Figure. Model Builder Weighted Overlay Tool



Methods

To create 4 suitability surfaces each for 4 measures, ArcGIS Pro's Geoprocessing tools were utilized for various operations or queries like merge, clipping the layers to study area extent, dissolve features, raster dataset tools and for final Reclassification. The cell size of final surface was set same as of Digital Elevation Model.

- 1) Wetlands**
Majority of the area is having wetlands classified as unknown especially the Park area as obtained from data's attribute table, therefore a simple approach was taken of considering the distance to wetlands.
- 2) Aspect**
Elevation range in the area is from 202 m to 408 m. Aspect tool was used to obtain the slope direction surface from Digital Elevation Model of cell size 20 x 20 m. Then Reclassify tool was used to provide definition of suitability according to the criterion. Flat areas were given middle level of suitability.
- 3) Urban Landscape**
The workflow required 2 layers, one of Buildings and one of Landscape classification because the landscape classified into urban development didn't include the buildings location in the area. So, both of the layers were merged. Merge tool was dissolved (dissolve tool) was put the area to avoid the repetition of areas that were classified under both. Then they were using Euclidean Distance and Reclassify tool. Landscape suitability surface was formed whose workflow is shown in figure below.
- 4) Roads Infrastructure**
Being unsuitable for the plant growth, the suitability definition was given low, proximity to roads is not suitable for habitat while for areas are suitable. Buffer of 25 m was created around roads to make suitable for Euclidean Distance tool.

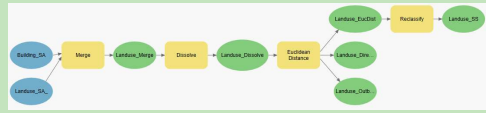
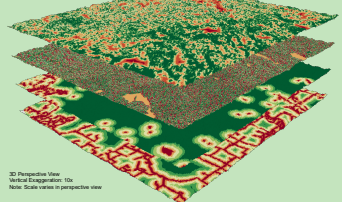


Figure. Workflow of creating Suitability Surface for Urban landscape criteria.



Wetlands
Aspect
Landscape
Roads

Table. Suitability Definitions for all 4 Criteria

Suitability Rating	Suitability Definition			
	Wetlands	Aspect Direction	Urban Landscape	Roads
7	Less than 50 m	South	1500 m to maximum of 11000m	1500 m to maximum of 6500m
6	50 to 100 m	Southwest and Southwest	1000 to 1500 m	1000 to 1500 m
5	100 to 150 m	East and West	800 to 1200 m	750 to 1000 m
4	150 to 200 m	Flat areas	400 to 800 m	400 to 750 m
3	200 to 400 m	Northeast	200 to 400 m	200 to 400 m
2	400 to 750 m	Northwest	100 to 200 m	100 to 200 m
1	700 m to maximum of 1500 m	North	Less than 100 m	Less than 100 m

Source: © 2014 Esri
Northern Bog Aster (Photograph) by Nick, Albert F. WJ (2018). Wetlands Canada (Data Layer).
Haliburton Highlands Land Trust
https://www.haliburtonhighlandslandtrust.com/2018/01/01/northern-bog-aster-plant-photos/

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Northern Bog Aster (Photograph) by Glenn, R. (2015). Wetlands Canada (Data Layer).
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3D Perspective View
WebGL Exaggeration: 10x
Note: Scale varies in perspective view



Results

The study area is having wetlands that covers around 16% of the area and they are widely spread in the region.

This makes the final suitability surface also reflect the same meaning the higher area that is appropriate for this plant is spread across the whole area.

It is interesting that less than 1% of the area is least suitable for the growth of this plant. And 4.7% of the study area meet all the criteria and is found to be highly suitable.

Around 60% of the area is on the suitability side. The final layer showing suitability rating is seen in pie chart.

Therefore, much of the land is suitable for the plant growth if Wetlands ecology is preserved.

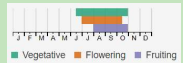


Figure. Vegetation, Flowering, Fruiting stage for Northern Bog Aster.
Source: New York Natural Heritage Program. (2022). Best time to see. Online Conservation Guide for Erythronium boreale.
Retrieved 11 June 2022 from: <https://gdn.nyhp.org/northern-bog-aster/>

Challenges and Limitations

It was difficult to find the data about wetlands that has good classification of all wetlands polygons in this area. Many of the classified wetlands were having the Unknown category.

Thus, if this data were available the analysis would have been more accurate as the plant is having much suitability for habitat in Bogs and Fens Wetland class.

Even though these plants are highly habitat for calcareous mineral content in soils. But the data found about the same did not covered the whole study area as well only the part of it that belongs to City of Kawartha Lakes.



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Created using ArcGIS Pro 2.8.0 and ArcGIS Desktop
Project Co-ordinator: Systems, 1945, 1950, 1972, 2011
Durham: North American Datum 1983

Wetlands (2018). Online Conservation Guide for Erythronium boreale.
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