

## Biodiversity Representation

### Biodiversity Representation – Minimum Representation Target – Biodiversity Representation

These values represent unique vegetation communities, the foundation of ecosystems that contribute to the biodiversity of Ontario. The targets set for these values ensure that all native forests, wetlands, grasslands and other vegetation communities are represented appropriately in the preferred scenario.

Biodiversity or biological diversity in the context of this process refers to the totality of the genes, species, ecosystems and habitats that combine to make up the natural areas of the watershed. In the absence of complete data on all natural areas and their inhabitants, a surrogate of vegetative communities on soil types will help us capture a fuller range of possibilities. The literature suggests that it is better to err on the side of caution when there is not sufficient data to support a definitive target.

#### Datasets

1. OMAFRA Soils Mapping (County Soil Surveys)
2. NPCA NAI ELC Community Series Mapping
3. Soil Landscapes of Canada

Derived Soils Matrix + Natural Area Community Types = Surrogates for Biodiversity Representation

As governing factors in determining what vegetation species grow, soils mapping was classified into both a wetness regime and texture gradient to develop biodiversity representation surrogate mapping units in combination with Community Level ELC mapping.

In terms of wetness, drainage properties were used to aggregate soil mapping units based on a modified approach previously published (Snell, 1998) to infer natural vegetation communities from soils information. *Upland areas* are generally dry sites with small amounts of moisture. *Mesic areas*, are sites with a moderate or well balanced supply of moisture (typical temperate hardwood forests). *Lowland Areas* are generally wetter sites with more frequent and longer durations of saturation, flooding or ponding.

Detailed texture properties we used to aggregate soil mapping units into a generalized soil texture classification. Mixed Clay/Loam are clay dominant soils, mixed silt/loam are silt dominant soils, and mixed sand/loams are sand dominant soils.

Beyond the matrix developed by combining these two soil properties into distinct mapping units, the source soils mapping also was used to identify disturbed soils (ie. fill along canal lands), escarpment and beach areas.

Since the natural areas mapping was already discretized to the ecological community cover level, the wetness and texture information was only used to infer further breakdown of the most dominant and suitable communities. Deciduous Forest, Woodland and Savannah communities were lumped as Deciduous Wooded communities and then separated into biodiversity representation units by further intersection with the resulting soils matrix. Successional Communities were likewise derived by combining Meadow and Thicket communities with the soil inferences. The various wetland and unique communities were distinct enough to stand alone as individual units without further breakdown by soil classification

The final units created are *surrogates* for biodiversity representation in the absence of vegetation level mapping. They are a representation of the spatial variability of conditions across the landscape that generally contributes to the distribution of species.

**Discussion**

The discussion related to these targets focused on the fact that the literature currently suggests a minimum threshold of 5% composition for each biodiversity type present across the landscape. In the context of our study area, a biodiversity type is represented by the unique combinations of soil type (as per the County Soils Mapping), and vegetation community types (as per the Natural Areas Inventory) present.

Biodiversity Surrogates list – the combination of vegetation type on soil type as the biodiversity surrogate including percent composition across study area (see Figure Biodiversity Representation by Soil Landscape).

<b>Biodiversity Representation Surrogate Unit</b>	<b>Current Percent Composition (Study Area*)</b>
Bluff Communities	0.005
Bog Communities	0.333
Coniferous Wooded Communities	1.427
Deciduous Wooded Communities on Beach Areas	0.024
Deciduous Wooded Communities on Disturbed Soils	3.349
Deciduous Wooded Communities on Lowland Areas with Mixed Clay/Loam Soils	6.068
Deciduous Wooded Communities on Lowland Areas with Mixed Sand/Loam Soils	0.203
Deciduous Wooded Communities on Lowland Areas with Mixed Silt/Loam Soils	0.840
Deciduous Wooded Communities on Lowland Areas with Organic Soils	0.057
Deciduous Wooded Communities on Lowland Areas with Unknown Soil Textures	0.124
Deciduous Wooded Communities on Mesic Areas with Mixed Clay/Loam Soils	7.250
Deciduous Wooded Communities on Mesic Areas with Mixed Sand/Loam Soils	0.452
Deciduous Wooded Communities on Mesic Areas with Mixed Silt/Loam Soils	5.407
Deciduous Wooded Communities on Upland Areas with Mixed Clay/Loam Soils	0.176
Deciduous Wooded Communities on Upland Areas with Mixed Sand/Loam Soils	0.504
Deciduous Wooded Communities on Upland Areas with Mixed Silt/Loam Soils	1.854
Deciduous Wooded Communities on Upland Escarpment Areas	0.862
Marsh Communities	6.816
Rock Barren Communities	0.063
Shoreline Communities	0.363
Successional Communities on Beach Areas	0.007
Successional Communities on Disturbed Soils	5.129
Successional Communities on Lowland Areas with Mixed Clay/Loam Soils	7.230
Successional Communities on Lowland Areas with Mixed Sand/Loam Soils	0.156
Successional Communities on Lowland Areas with Mixed Silt/Loam Soils	0.869
Successional Communities on Lowland Areas with Organic Soils	0.104
Successional Communities on Lowland Areas with Unknown Soil Textures	0.094

Successional Communities on Mesic Areas with Mixed Clay/Loam Soils	6.319
Successional Communities on Mesic Areas with Mixed Sand/Loam Soils	0.410
Successional Communities on Mesic Areas with Mixed Silt/Loam Soils	6.285
Successional Communities on Upland Areas with Mixed Clay/Loam Soils	0.070
Successional Communities on Upland Areas with Mixed Sand/Loam Soils	0.116
Successional Communities on Upland Areas with Mixed Silt/Loam Soils	0.854
Successional Communities on Upland Escarpment Areas	0.024
Swamp Communities	36.155

\*These are not the current percent compositions values by the individual Soil Landscape distribution units that were used in most scenarios.

### **Table 7: Biodiversity Surrogates**

The literature also suggests that where composition is currently less than 5% then all of the remaining area is to be included i.e. target set to 100%. This is based on the rationale that those biodiversity types representing less than 5% by composition may either be inherently less common in the landscape or have been removed due to human activities and should be, at a minimum, maintained at their current abundance.

The SDT did consider using a minimum threshold of 3% for representation, as also suggested in the literature, however, the group agreed to use 5% for the Baseline.

There was a discussion about what data we do have and how accurate it is. It was accepted that the Natural Areas Inventory Community Series data is very accurate for this purpose but that it would be better to apply it at the Community Class level for ease of analysis. The group would also like to see more field verification of the data in the future.

### **Data Gap**

There is a lack of biodiversity data across the watershed.

Suggestions for data that would be helpful included:

- Ecological Land Classification (ELC) to the EcoSite level would negate surrogate requirements
- Pre-settlement vegetation mapping would provide better and more local guidance for setting representation thresholds

### **Decision**

Date: June 2, 2011

**5% minimum representation for biodiversity by soil landscape.**

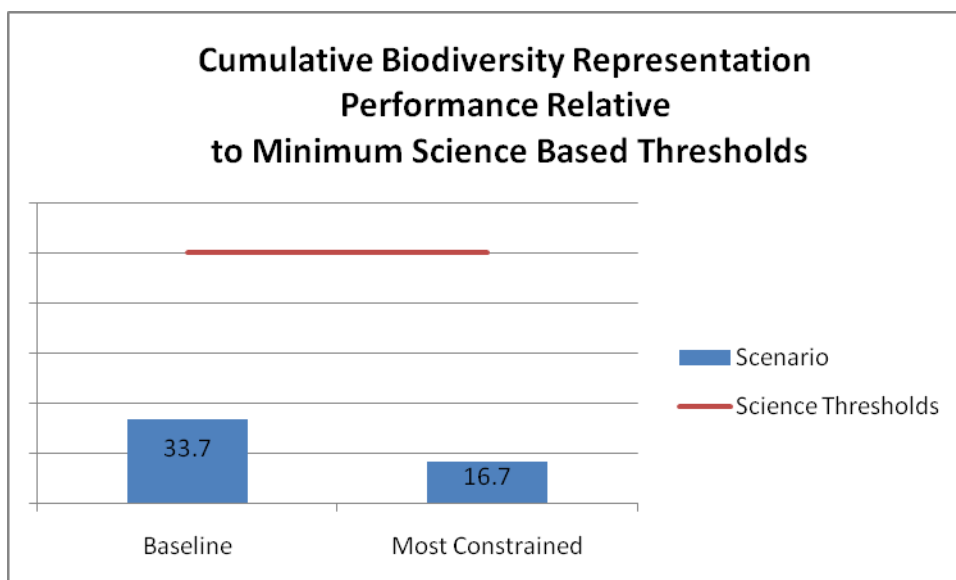
**Where there is less than 5%, the target is set at 100% of what exists by soil landscape.**

### **Representation in the Learning Scenarios**

Niagara is nationally and provincially recognized for its high biodiversity. When looking at the Learning Scenarios, it is obvious that the communities that have the highest degree of conflicting use associated with them i.e. upland vegetation types, represent the smallest component of the existing natural cover inventory. Conversely, lowland communities in areas less suitable for other land uses, make up the vast majority of the remaining natural cover within the watershed.

## Representation in the Final Scenarios

**Figure 9: Cumulative Biodiversity Representation Performance Relative to Science Thresholds**

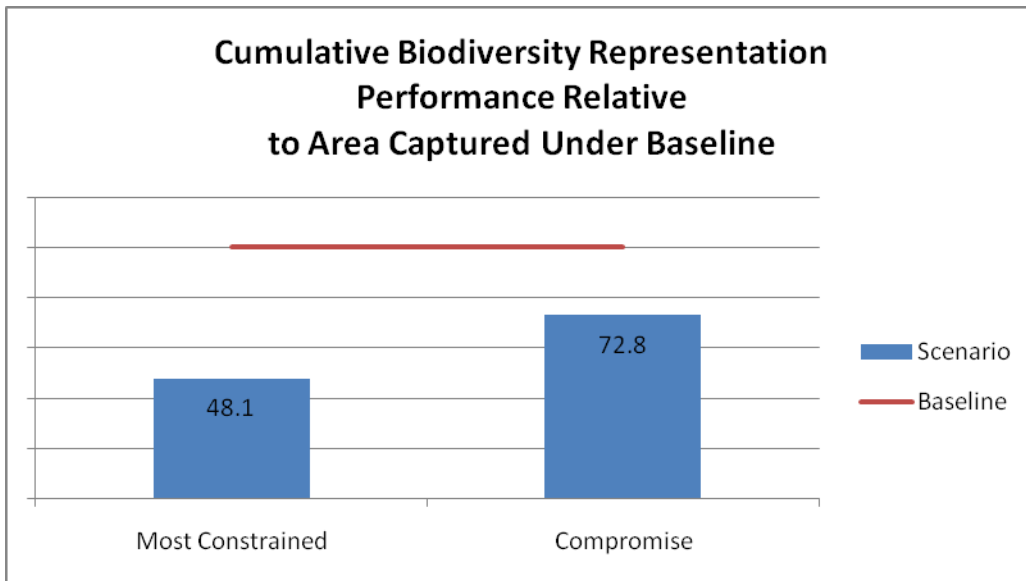


Biodiversity Representation targets as a group under the Baseline Scenario achieved only 33.7% of the science thresholds, resulting in 97.8% of the available natural area contributing to biodiversity targets.

Under the Baseline Scenario, the model needed to include almost all of the remaining natural cover across the watershed in order to achieve just over one third towards the targets set. This is largely due to the fact many of the surrogate units are well below the 5% minimum representation level, leaving very little opportunity to explore tradeoffs. Many representation units are at diminutive composition levels even at the scale of the entire study area (before considering composition at the distribution unit level) suggesting the input data may not be coarse enough. While resolving this would somewhat lead to better achievement rates relative to target it would still constitute similar significant contribution amounts of the available natural cover to do so.

Under the Most Constrained Scenario, Biodiversity Representation was limited to those areas that were not excluded. This led to the poor performance in relation to the targets.

Biodiversity Representation as a group under the Most Constrained Scenario achieved 16.7% of the science thresholds and 48.1% of the relative area based value held under the Baseline.



**Figure 10: Cumulative Biodiversity Representation Performance Relative to Baseline Comparator**

Biodiversity Representation as a group under the Compromise Scenario achieved 72.8% of the value in the Baseline.

**Recommendations**

Further field verify community series data in the next natural areas inventory

Further simplify the use of soils in surrogate development by using just the wetness regime instead of a wetness and texture matrix.

Consider breaking up soil landscape 569001 into zones east and west of the Welland Canal.

Swamp communities representation unit is too general and broad, consider breaking down into finer sub representation units.