

**UNDETECTED CHANGES IN SCIO TOWNSHIP LAND COVER
MAY AFFECT ENVIRONMENTAL SUSTAINABILITY**

Norm Roller

Two types of land cover that often influence the sustainability of landscapes are tree canopy cover and impervious surfaces. Moreover, as tree canopy cover decreases impervious surfaces may increase. Detecting Impervious Surfaces and Tree Canopy, as discussed earlier in the plan, are typically very important factors when considering how to mitigate negative changes in climate, as described in other parts of this section of the plan. SEMCOG statistics for nearly this time period (shown in the table below) suggest that the area covered by Impervious Surfaces has not changed much, while the area occupied by Tree Canopy has expanded by 14%. As a result, the area in Tree Canopy after the change is now estimated at over half the total area of the township (see table below).

Scio Township Change in Tree Canopy and Impervious Surfaces

(Based on SEMCOG data 2010-2022)

	2010		2022	Change
Tree Canopy	37%	Tree Canopy	51%	+14%
Impervious Surfaces	11 %	Impervious Surfaces	10%	- 1%

Interestingly, such general and relatively large changes do not appear to have occurred in the area covered by Tree Canopy in Google Earth photos of the Township for about the same period of time (see figure below).

**2011 and 2022 Natural Color Google Earth
Photographs of Scio Township**



2011



2022

Comparing the Google Earth images side-by-side, it is easy to see that quite a bit of forest has been removed in the central and northeast areas of the township above Jackson Road (dark green (2011))

to lighter green (2022)). Closer inspection reveals new roads, driveways, and roofs in these areas. Since the latter are impervious surfaces, it seems like a loss of forest replaced to some degree by impervious surfaces has occurred. Because of the importance of knowing the real changes in the Tree Canopy and Impervious Surfaces, we will double check the accuracy of the 2022 SEMCOG land cover map and statistics. We will accomplish this by comparing 2022 land cover mapping results generated by processing 2022 Sentinel 2 satellite multispectral data to calculate independent estimates of the Tree Canopy and Impervious Surfaces areas.

Several factors justify this approach. Sentinel data are much higher in spatial resolution for the same spectral bands than previous earth resources satellites. In the visible and near infrared spectral regions it has 10-meter pixels. There are two satellites collecting the data so repeat coverage of an area is greater, which can increase the probability of getting useful data where cloudiness is an issue. Spectral coverage is also greater, including visible, near-infrared, short wave infrared and red-edge bands. Another factor in its favor is that the data are free.

A Sentinel 2 multispectral image with 10-meter spatial resolution of the area where forest loss is suggested by the appearance of the 2022 Google Earth images is shown in the first figure below. Many roads, driveways, and some roofs can be observed. This suggests that the loss of tree canopy cover hypothesis may be correct. Additional detail is shown in the enlarged image of Dexter, which clearly shows that roads, buildings (residential and commercial) and even sidewalks are visible. Note the relatively higher amount of tree cover per unit of surface area in the older residential parts of the Village.

Area Between Jackson and Huron River Drive

Sentinel 2 data, Aug 2022

Natural Color Composite



Dexter, Aug 2022 Sentinel 2, NCC



As a minimum we will produce a map and statistics from the Sentinel 2 data with the three categories which are contained in the SEMCOG 2012 map. We will also consider mapping other land cover/use categories that could be useful at the Township level, but which are not currently available from other sources or at suitable time intervals. These could include some agricultural categories.

Patch and Landscape Analysis

Including the analysis of land cover data derived from satellite data in the ESTF plan has another potentially very important benefit. It's not only the relative and absolute abundances of various cover types that determines their role and contribution to the robustness and resilience of an ecosystem. Equally, and sometimes more significant, is the size distribution, relative co-location (e.g., interspersion and juxtaposition), and the number, type, and length of edge combinations where cover types meet. The satellite maps can be converted to the polygon-based digital map format that forms the input data to patch and landscape analysis software. We will use Sentinel 2 data converted to cover type patches (polygons) and Fragstats software to produce spatially-based landscape metrics for areas of interest with the Township.

The capability to calculate these metrics would give the Township the ability to quantitatively analyze many different issues, including assessing habitat diversity within township park/preserves; comparing access to high quality landscapes for different neighborhoods; specific landscape features to look for when planning land acquisition; or, identifying where available trees could be planted to have the greatest effect on increasing local sustainability. This could be a park or preserve, an area under consideration for acquisition, or a potential development site needing an assessment of appropriate mitigation. In the latter case this type of analysis is likely to facilitate a deeper understanding of what is

going to be lost and provide a more detailed assessment of what constitutes a full and equivalent mitigation effort. Such information could also be used to identify local deficiencies in landscape components that would provide useful guidance for future land acquisition planning. Where and how many trees could be planted to provide the best benefit is also something that could be modeled and used as a planting guide.