

Urban Canopy Assessment

An estimate of coverage within the City of Cornwall



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Final Report

Abstract

The urban canopy coverage within the City of Cornwall, as of Spring 2019, was digitized using Geographic Information System (GIS) software and high-resolution aerial photography. Through GIS tools, the total urban canopy coverage was calculated to be approximately 19.9 km². This represents a canopy coverage estimate of 32% within the City of Cornwall.

Additional GIS analyses were performed to determine the canopy coverage on a 1 km square grid and 500-meter square grid basis across the city to produce a visual map to identify canopy coverage within the city boundary.

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Table of Contents

Abstract	i
Table of Contents.....	ii
List of Figures	ii
Introduction.....	1
Methodology.....	1
Results.....	5
Additional Analyses	5
Limitations	5
References	9

List of Figures

Figure 1: DRAPE image at 1:10,000 scale	2
Figure 2: DRAPE image at 1:500 scale.....	3
Figure 3: DRAPE image at 1:500 scale with Urban Canopy digitized	4
Figure 4: Estimated Urban Canopy Coverage.....	6
Figure 5: Urban Canopy Coverage Estimate (percent) by 1km x 1km Grid	7
Figure 6: Urban Canopy Coverage Estimate (percent) by 500m x 500m Grid	8

Introduction

An urban canopy can provide many benefits such as heat mitigation, storm water management, carbon storage and sequestration, improved air quality, and shade (Green Infrastructure Ontario Coalition, 2016).

Of interest to watershed management is the role trees and an urban canopy can play in controlling stormwater runoff and protecting surface waters from sediment and nutrient loading. In cities, trees can play an important role in stormwater management by reducing the amount of runoff that enters stormwater and combined sewer systems. Trees, acting as mini-reservoirs, control stormwater at the source (USEPA, 2013).

In 2019, the City of Cornwall created the *Cornwall Environment and Climate Change Committee*, of which the Raisin Region Conservation Authority was a member. The committee was initially tasked with reviewing a *Tree Canopy and Natural Vegetation Protection and Enhancement Policy*.

This report is intended to provide a preliminary estimate of the urban canopy coverage within the City of Cornwall.

Methodology

The urban canopy was digitized manually within ESRI ArcMap software. A GIS technician traced the urban canopy outline in the software using a high-quality aerial image. The image used was from the Digital Raster Acquisition Project Eastern Ontario (DRAPE), 2019.

The DRAPE image for the City of Cornwall was acquired in the spring of 2019 under the best conditions possible to achieve cloud free, snow free, ice free, and smoke free captures. Normally this photo would have been acquired with “leaf-off” conditions; however, due to a late spring thaw and persistent early snow presence, by the time the image was captured, the leaves were fully engaged thus allowing visualization of the canopy (Figure 1).

The orthophotography has a pixel resolution of 16cm and is accurate to 45 centimetres on the ground at 95%. The imagery was acquired by a Vexcel UltraCam X and Vexcel UltraCamEagle digital cameras and was later orthorectified using an elevation dataset generated through image correlation.

Digitization was done at a minimum of 1:500 scale view (Figure 2). The GIS technician would zoom in as necessary to clarify proper delineation of the canopy and to isolate shadows. The canopy of all trees, bushes, and shrubs with an approximate minimum height of 2 meters were digitized (Figure 3). The 2-meter cut-off height is consistent with other North American communities including the 2019 assessment of Canada’s Capital Region (City of Ottawa et al, 2019).

Figure 1: DRAPE image at 1:10,000 scale



Figure 2: DRAPE image at 1:500 scale

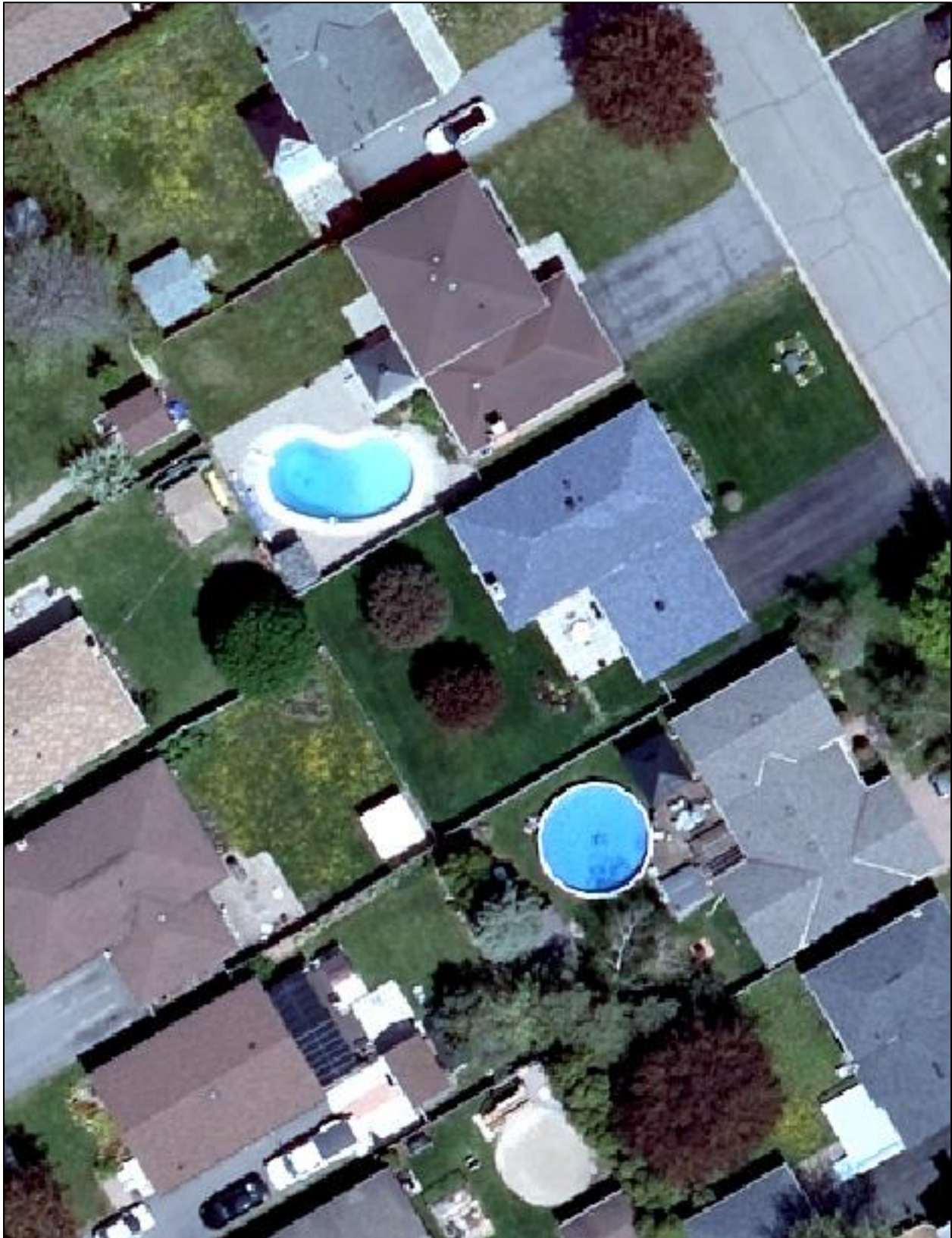


Figure 3: DRAPE image at 1:500 scale with Urban Canopy digitized



Results

The urban canopy within the City of Cornwall was digitized by manually tracing a series of 40,388 discrete polygon shapes overtop of the DRAPE aerial imagery. Using ArcMap tools, the individual shapes were *merged* to remove any overlap and *dissolved* to create a single polygon shape. A *clip* operation was performed by overlaying the City of Cornwall municipal boundary over the canopy layer to produce a final polygon representing the urban canopy for the city (Figure 4).

The area of the urban canopy shape was calculated within the software to be 19.9 km². The total area within the City of Cornwall's urban boundary was determined to be 62.0 km². The urban tree canopy coverage for the City of Cornwall in the spring of 2019 was therefore estimated to be 32%.

Additional Analyses

Since that the urban canopy was digitized in a GIS program, it affords a multitude of additional analyses.

A basic spatial analysis was performed by overlaying a simple 1km x 1km square grid over the city. The percentage of canopy coverage per cell was computed and colour coded. The result is a map that permits a quick visual representation of canopy coverage by general location (Figure 5). This process was also repeated for a finer grid of 500 meters x 500 meters (Figure 6).

Additional analyses could be performed such as: urban canopy coverage on public lands, canopy coverage on city owned property, canopy coverage by official plan zoning, canopy coverage by stormsewershed, and canopy coverage by neighbourhood to name a few.

The dataset can also be analysed to estimate the overall or local impact to canopy coverage due to clear-cutting of certain areas (i.e. known future subdivision developments).

The dataset may also prove useful in identifying priority areas for planting and or maintenance.

Limitations

This assessment is intended to be a preliminary estimate and has not been reviewed by a Registered Professional Forester. The canopy delineation was performed manually by hand using operator judgement to determine if the vegetation exceeded the 2-meter height cut-off for tree canopy coverage. This assessment is not intended to be a replacement for field data collection. An improved assessment could be made with multispectral color infrared imagery and light detection and ranging data (LiDAR).

Figure 4: Estimated Urban Canopy Coverage

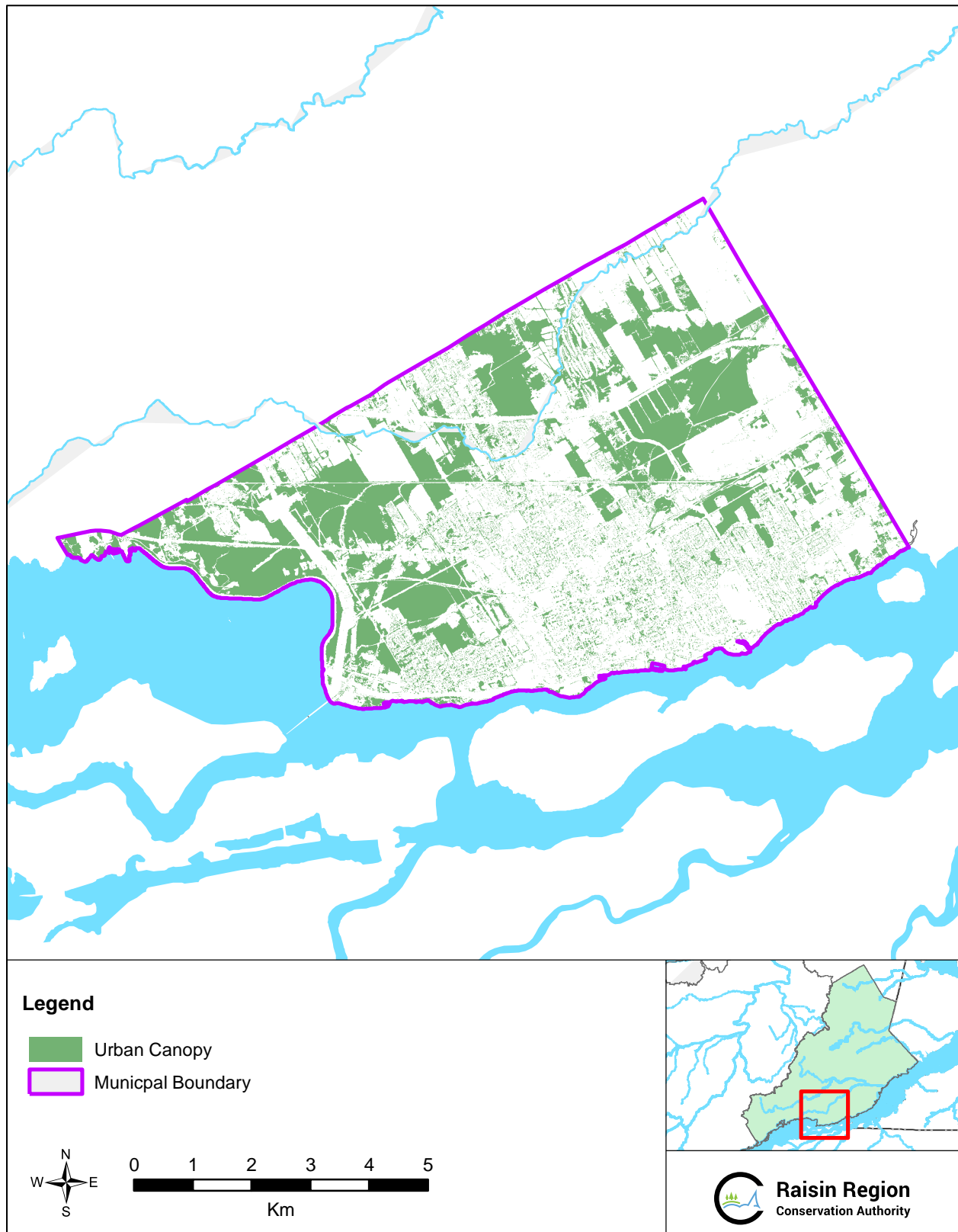


Figure 5: Urban Canopy Coverage Estimate (percent) by 1km x 1km Grid

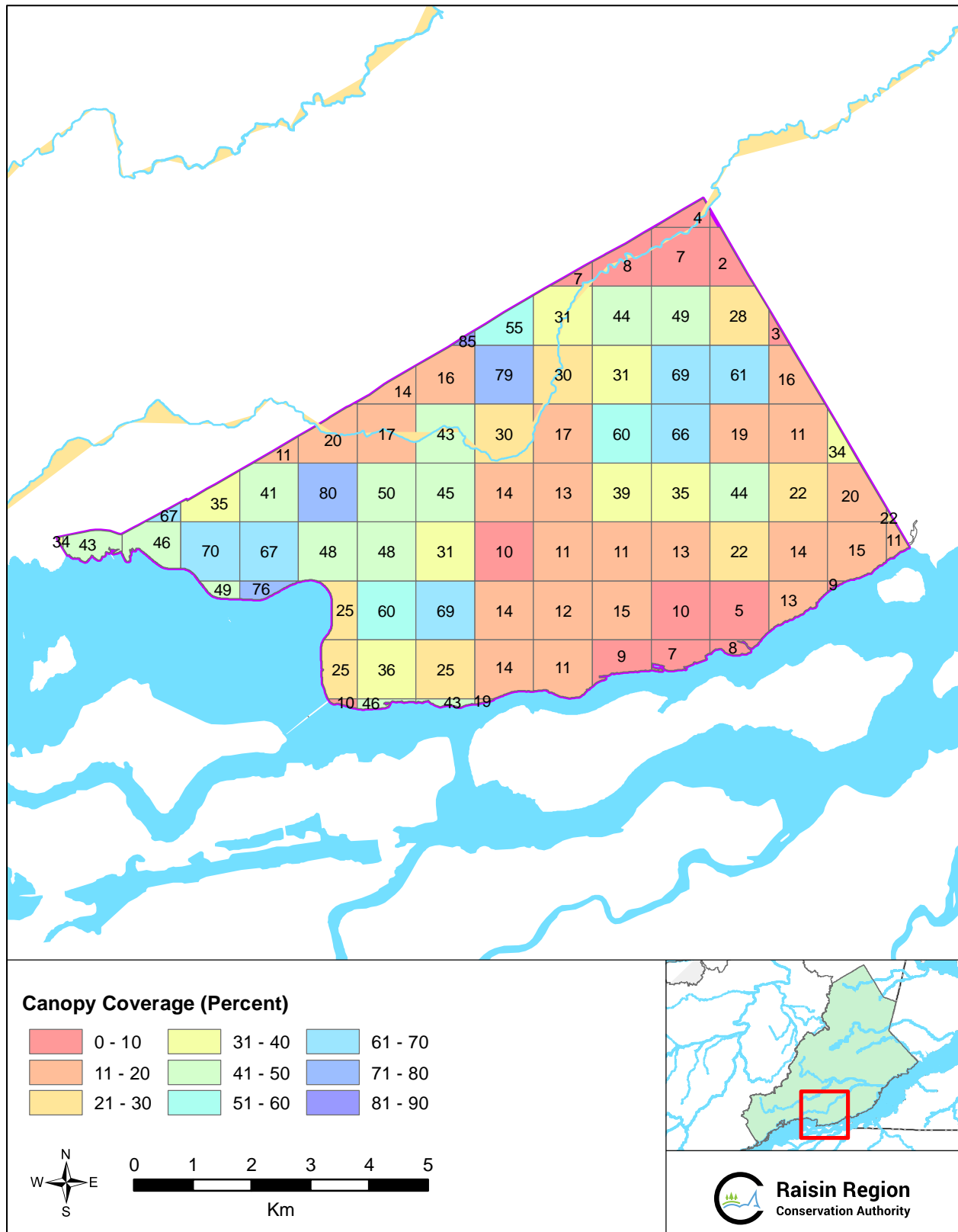
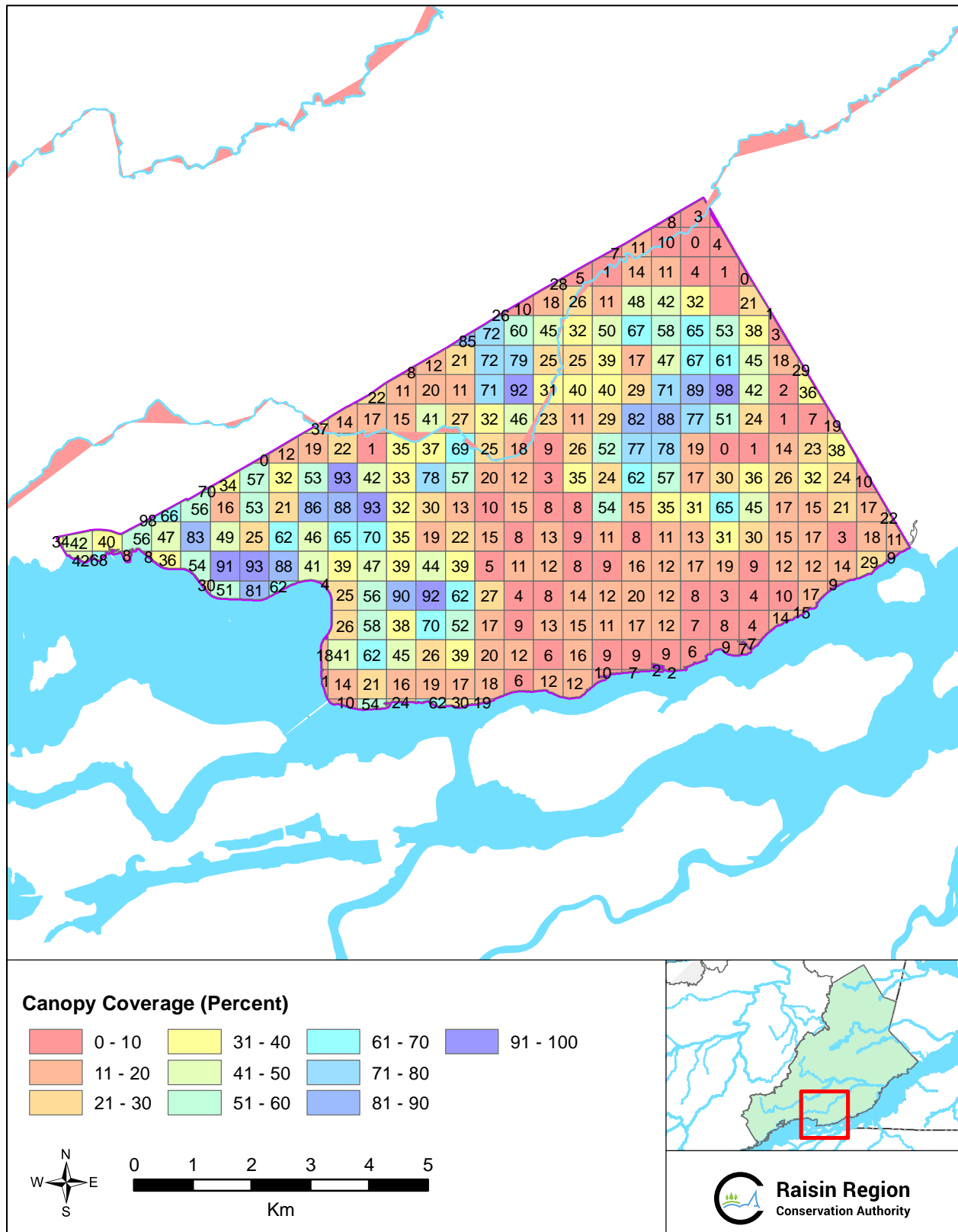


Figure 6: Urban Canopy Coverage Estimate (percent) by 500m x 500m Grid



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