Conserving Forests and Preserving Housing Affordability

Joint Center for Housing Studies Working Paper

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Julia Smachylo, John R. Meyer Dissertation Fellowship

Cover image Julia Smachylo

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This paper explores and contributes to scholarship on the escalating related concerns of environmental conservation and housing affordability.[1] Situated within contemporary approaches to environmental governance, I explore the use of forest management incentives in southern Ontario to analyze their particular spatial intersection with socio-economic variables and land use change dynamics, with a focus on the relationship between conservation and housing affordability. Research on forest management incentive programs in Canada and the United States has focused on participation and landholder characteristics, but the spatial and development implications tied to changing land valuation dynamics and the impact of environmental regulations has not been extensively covered.[2] Additionally, there is very little published about the ways in which property tax incentive programs, aimed at conserving forest resources in urban, peri-urban and rural residential areas are affected by changing land values and how these programs might impact affordability for owner households. Thus, while the main initiative of these environmental incentive programs has been on forest stewardship, this paper explores their knock-on effects in terms of their externalities. Within this context I addressed three questions: (1) What is the impact of incentive programs on conserving forests—particularly where are they being used and by whom, (2) the effect on housing affordability for current owners—particularly those of modest means, and lastly, (3) what is the effect on affordability for people of modest means who don't currently own homes in the area—either current renters or those looking to move to the region.

Using a mixed-methods approach that combines qualitative and quantitative analysis to triangulate my results, this study brings together semi-structured interviews with statistical and spatial analysis to illuminate the multi-scalar dynamics of these programs, combining

[1] Recent research highlights concerns over environmental gentrification and the displacement of low-income residents from neighborhoods undergoing environmental improvements and the inherent tendency of these projects to further ingrain existing power relations and aggravate disparity (Pearsall and Anguelovski, 2016; Checker, 2011).

[2] For scholarship on private land conservation in Ontario see Drescher and Brenner (2018). Some excellent critical work on property tax and environmental conservation has been conducted in the US context by Kay (2017; 2016; 2015) whose research explores conservation finance, property tax regimes, access and enclosure.

regional and site-specific data with the perspectives of urban planners, environmental consultants and landowners.

My analysis focuses on Ontario's Managed Forest Tax Incentive Program (MFTIP), one of the most notable forest conservation programs offered in Canada (Cockwell, 2012). To qualify for the program, landowners are required to have at least four hectares of eligible forested land and must submit an approved forest management plan every ten years to stay in the program. [3] Once in the program, landowners are taxed at 25 percent of the municipal property tax rate set for residential properties, and the land is converted (for the time it remains in the program) from its previous use to the managed forest property class.[4] While in the program, landowners participate in the active management of their property through forest stewardship activities, which may include such things as: habitat management, environmental protection and restoration, tree planting, maintenance and commercial harvesting, and the development and preservation of trails (MNR, 2012). The MFTIP program began in the mid-90s and at present has approximately 18,900 properties enrolled covering a total area of 1,854,000 acres in southern Ontario (MNRF, 2020). Within the Region of Peel there are approximately 352 participating parcels of land totaling 10,793 acres (See Figure 1).

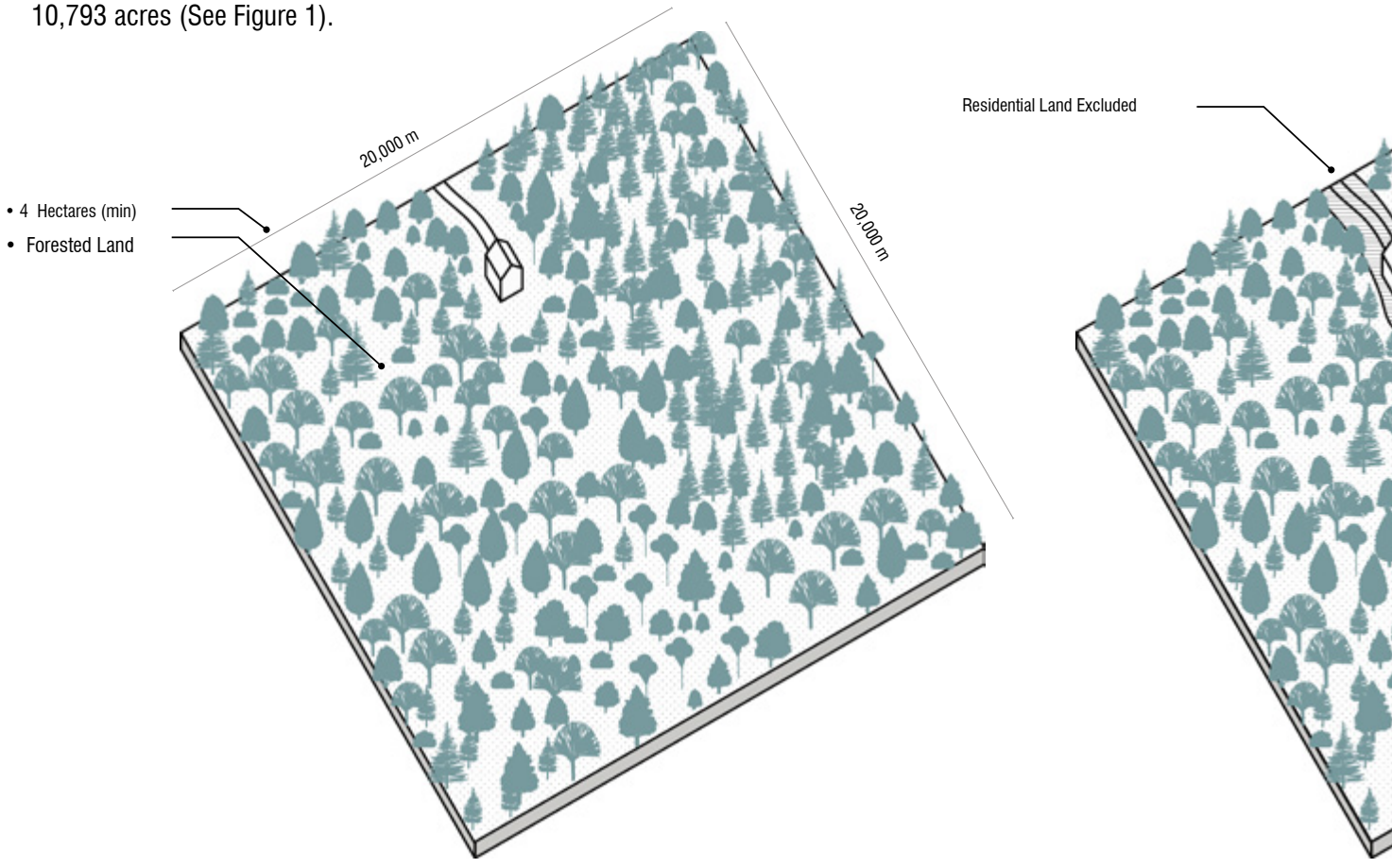
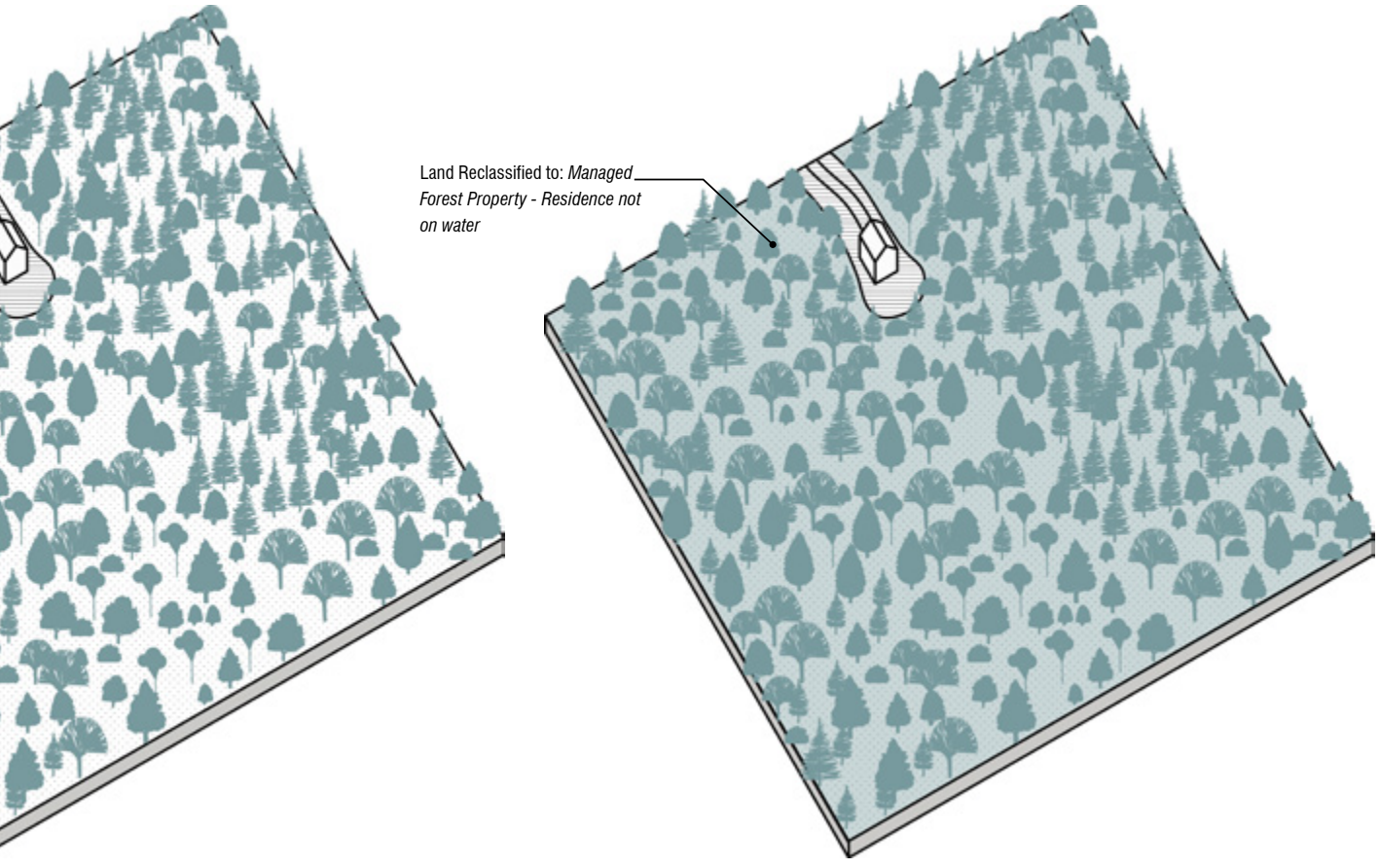


Figure 1: Managed Forest Tax Incentive Program Land Reclassification

[3] The MFTIP program does not entail a permanent commitment to forest management and the reduction of property taxes. Landowners are able to exit the program.

[4] Property Tax in Ontario is calculated based on the municipal tax rate, education tax rate and property value of the home. A landowner's property value is determined by the Municipal Property Tax Corporation (MPAC) which is an independent body. Property tax varies between municipalities. In terms of this study Mississauga has the lowest property tax rate of 0.801% for 2019, followed by Caledon at 0.817% and Brampton with the highest at 0.99% (Graham, 2018).

My interest in the possible overlap between forest conservation and housing began in conversation with forest consultants, where the majority interviewed mentioned that most properties in MFTIP contained a primary dwelling, with some used as second homes, or as investment properties. While both landowners and forest consultants mention the tax incentive as one of the main reasons for their participation, in many cases, through their involvement in the program, landowners became increasingly committed to forest stewardship and sustainable management. Thus, while the main reason for joining the program might have initially been for the property tax savings, in the end the stewardship of the land was quite important to the vast majority of landowners interviewed. This pointed to an interesting overlap between the twin (and often competing) goals of environmental conservation and housing. With rising property taxes and increasing speculation from expanding urban development, and a recent increase in the value of agricultural land, in some cases the MFTIP program was considered by interviewees to help property owners continue to afford to stay on their property, or at least make increasing property taxes more manageable. In talking with municipal planning representatives, especially those working in and around large agglomerations such as Toronto and its expanding suburbs, from a land use standpoint they point to



*Once a property is admitted into the MFTIP the existing land use is converted to a Managed Forest Land Use classification.

the role of this incentive program in allowing for the retention of pockets of woodlands within areas that otherwise would be developed. Emerging from these conversations I became interested in the externalities of incentivized environmental management—where the overlap of programs on the same piece of land have been used to accomplish a variety of planning and management goals. Drawing from interviews with conservation authorities, environmental consultants and landowners, my broader research agenda investigates how incentives intended for the conservation of forests in southern Ontario, are being combined in unique and often unforeseen ways. In the following study I explore possible associations between incentivized forests in terms of land use change dynamics as well as the program's role in the preservation of housing affordability for current property owners and those interested in getting into the market.[5] A key consideration in this research is who is benefiting from these programs. This includes questions of affordability for future residents and/or homeownership opportunities for current residents who are renters. Are certain areas of the region experiencing housing stress able to leverage this subsidy, or are areas with wealthier homeowners with large tracts of land disproportionately benefiting? Overall, the intent of this study is to add a layer of additional complexity in considering the alternative effects of environmental incentive programs set within a broader argument that issues of housing affordability and environmental protection need to be considered together when developing policy.

Environmental Conservation and Housing

While those on the left are concerned with both environmental conservation as well as housing affordability, in practice these dual goals have led to conflict in their implementation. As stated by Sunding, *"housing affordability has emerged as a major national policy issue, and is seemingly in conflict with other mandates to protect and enhance environmental quality"* (2005, p. 1). For instance, environmental regulations in a region that is experiencing development pressures can on one hand help to meet environmental planing goals, such as the reduction of habitat fragmentation, the retention of ecosystem services, and the maintenance of recreation areas for residents. On the other hand, land, especially in areas experiencing growth pressure, is limited. In this case environmental regulations and programs can have an adverse impact on housing prices, as the scarcity of developable land can drive prices up and make the provision of housing increasingly expensive.

A seminal study by Frieden (1979) on balancing environmental concerns with the provision of housing in the United States highlights that these conflicts between often competing values are not as balanced as one might presume, where environmental regulation and elitism have been used to counter development proposals, in effect increasing housing prices due to a lack of supply. Additional scholarship which reviews

[5] In Canada the National Housing Strategy (2019) defines 'affordable housing' as a housing unit that can be owned or rented by a household with shelter costs (rent or mortgage, utilities, etc.) that are less than 30 per cent of its gross income. Whereas 'community housing' is defined as an umbrella term that typically refers to either housing that is owned and operated by non-profit housing societies and housing co-operatives, or housing owned by provincial, territorial or municipal governments (CMHC, 2019).

the impact of environmental regulations on the US housing market has been conducted by Kiel (2005) who argues that placing environmental restrictions on the use of land can decrease its value, or limit its supply, thereby driving up housing prices. In addition, there may be broader impacts of these environmental policies. For example, they can influence the price of materials used for construction, as well as increase processing times and costs of development. Of particular relevance to this paper is the impact of environmental regulations on affordability, where they have the potential to accrue local benefits for homeowners, while negatively affecting those households looking to get into the market.

In the study that follows I should be clear that the scope of the research does not address the impact of MFTIP on the provision of new affordable housing units (subsidized or community housing), rather, I investigate the overlap between environmental regulation and housing in the region in terms of the preservation of housing affordability for current owners and for lower or moderate income households. I navigate three arguments: (1) I begin by bringing a critical lens to highlight how environmental incentives based on a property tax reduction can be considered a form of housing subsidy. (2) Secondly, I investigate the overlap of forest incentives with a number of socio-economic variables to explore associations between program uptake at the Dissemination Area scale with a particular focus on the relationship between MFTIP, housing affordability and income in the Region of Peel in southern Ontario. (3) Third, I discuss forest land-use dynamics, as well as two distinct ways in which incentivized forests relate to housing. On one hand these programs keep property taxes low, an added benefit for households of more modest means. On the other hand, by reducing the supply of developable land (and making the area more attractive), these programs have the potential to drive up land values and make places less affordable, while potentially providing additional benefits for higher-income homeowners. Using a mixed methods study that includes spatial, statistical and interview data, I aim to shed light on the competing values of meeting both environmental and social goals within the urbanizing region of southern Ontario.

Affordability: Broadening the Scope

Housing affordability has been generally premised on two indicator variables (1) household expenses, and (2) household income. Thus if a household is spending more than a certain amount of its income on housing, it is perceived as unaffordable (Hulchanski, 1995; Knuty, 2005; Whitehead 2009; JCHS 2019). However, this definition has also received much criticism both for its rigidness in addressing varying affordability challenges and for its inability to acknowledge the socio-demographic characteristics and the heterogeneity of groups in need of assistance (Arnold and Skaburskis, 1988; Herbert *et al*, 2018). In response, scholars have investigated alternative approaches to housing affordability that go beyond economics, where affordability encompasses a range of contextual social and environmental considerations.[6]

[6] Within literature that critiques a purely economic measure, scholarship has highlighted additional criteria such as the consideration of issues of housing quality and supply (Mulliner et al 2013), poverty levels (Bunting et al 2008), as well as location and sustainability (Bogdon and Can, 1997).

One study that has been particularly salient in providing a road map through which to critique inherited definitions pertaining to housing is the research conducted by Wyly and DeFilippis (2010). In their paper on public housing in New York City, they critique the categorization of annual mortgage interest tax concessions to wealthy homeowners.[7] Turning the definition of public housing on its head, the authors include these seemingly 'invisible' tax concessions in their spatial analysis of assisted housing in New York. The act of complicating conceptualizations and showing how these concessions are actually a form of public housing illuminates the hidden power that these constructed categories can mask or reveal. In their paper they encourage us to reconsider our definitions of public housing to *'look at the many different kinds of housing subsidies—for poor, rich, and middle-class urbanites.'* (Wyly and DeFilippis 2010, p. 73).

In this paper I make a similar conceptual move, where I position the property tax reduction to landowners in the MFTIP program as a form of housing subsidy, essentially complicating conversations on what conservation entails by revealing the often invisible link between environmental management and housing. In a Canadian context this form of subsidy is known as a tax expenditure—a form of government spending through programs such as tax exemptions, deductions and rebates that are used for public policy goals (CPJ, 2015). In connecting tax expenditures to affordability, I use the definition employed by Statistics Canada (which is also the source of socio-economic data that was used in this research). Here, housing affordability is defined as those households that are paying upwards of 30% of their income on shelter costs. 'Shelter costs' in this case refer to the average monthly total of all shelter expenses paid by households that own or rent their dwelling. For ow ner households, this can include mortgage payments, property taxes and condominium fees, as well as the costs of electricity, heat, water and other municipal services (Statistics Canada, 2016). By reducing the property tax on forested land through their re-assessment as 'Managed Forest Property Class' I insist that these programs act as a form of shelter cost subsidy, and are thus directly linked to affordability. Therefore, one argument of this paper is that environmental property tax incentives should be recognized as a subsidy and included in discussions of affordability.[8]

Environmental Governance and Incentives: Equity and Uneven Development

Alongside a growing appreciation for natural heritage planning, governments are embracing forms of program implementation that incorporate public, private, not for profit and civil society in new ways. These mechanisms come with their own host of pros and cons, which range from, on one hand, the perceived ability to navigate and respond to local contexts more efficiency, to on the other, management challenges, equity issues and market failures (Savas, 2000). In addition, planning policies are inherently spatial, with their effects played out in variegated ways across the landscape; the impact of housing policy is no different. In grappling with the connection between policy and space, Bunting *et al* (2008) points to the changing patterns of housing affordability problems in major

[7] This is a US policy that doesn't exist in Canada. In addition the most recent federal tax act put limits on these deductions and also reduced their usefulness for moderate-income households due to the fact that the law increased the so-called standard deduction.

[8] In a Canadian context the use of tax exemptions has been problematized by the organization Citizens for Public Justice, which raise important questions concerning tax exemptions and their benefits. In their report they highlight that not only is there a lack of literature on this topic, there is a lack of transparency in terms of who is benefiting. In this regard they question whether in reality tax exemptions are really benefiting low-income households and the most vulnerable (CPJ, 2015).

cities in Canada. Using spatial methods to counter ingrained ideologies of a Chicago-school model of center-periphery analysis, the authors critique the prevalent ideology of housing affordability as just an inner-city issue. In their analysis, they reveal a variety of patterns of inner city, inner suburb as well as more dispersed patterns of affordability outside of dense agglomerations.[9]

In positioning forest property tax incentives as a form of housing subsidy, I aim to complicate their representation as tools for environmental conservation and sustainable forest management, and ask: what might be revealed by placing them in a different light? Within this expanded context, the following section of this chapter provides a policy overview that grounds these discussions, using a case study approach focused on the Region of Peel, Ontario. Key topics that are addressed in the following pages include: affordable housing preservation, the current issues experienced in Peel Region, and finally possible overlaps in policy and the politics of implementation.

Planning and Housing in Ontario

In Canada, the federal and provincial government fund housing initiatives and develop housing frameworks which are adhered to by municipalities. In particular, it is provincial legislation that governs municipalities who in turn are charged with its implementation through the use of local planning and financial tools such as community improvement plans, development charges and designation abilities to provide housing that is affordable (AMO, 2019). Due to the increase in the cost of housing since the 1970s in Ontario, escalating prices are impacting both low and moderate income households in the province (Gladki, 2007). In this context, planning for affordability has entailed the recognition of the diversity of households in a community and the provision of housing opportunities for a range of incomes.[10]

Case Study: Region of Peel

Within southern Ontario the focus of this chapter is on the Region of Peel. This region is comprised of three municipalities, Mississauga to the south, Brampton in the middle, and the Town of Caledon to the north. Due to the varied topography within each of these municipalities this transect was thought to provide a good overview of the variety of conditions ranging from the impervious built-up areas in the south, to the more pervious unbuilt areas in the north. Peel is governed by a regional municipality which coordinates

[9] While, most research on housing affordability in Canada is primarily focused on cities and suburbs, research on affordable housing in rural areas from the UK documents a range of housing situations, pointing to the lack of low-cost housing for low-income individuals, families, elderly and individuals with special needs (Satsangi and Dunmore, 2003). In their analysis of house prices for counties outside of Metropolitan Statistical Areas in the US, Hermann (2017) points to the fact that non-metro house prices generally follow national patterns and that rather than stagnating, home prices in these areas grew noticeably between 2000 and 2016. In addition the JCHS annual State of the Nation's Housing Report includes estimates of cost burden rates in rural areas as well in the US (JCHS, 2019).

[10] The recent publication by the Association of Municipalities Ontario (AMO, 2019) advocates for special attention to housing for both low income and for middle-income households. The term 'the missing middle' refers to both middle income earners as well as mid-density housing tied to PPS 2020 legislation which directs planning for complete communities. This includes a diversity of housing type, density and tenure (AMO, 2019; MMAH, 2020).

and sets strategic planning goals for the area as a whole. Within this structure, each municipality has its own semi-autonomy to set their own objectives that abide by the region's strategic plan and provincial planning legislation. Just under 1.5 million residents live in this area, and each municipality, due to their placement, navigates different forces in relation to land use change and development pressures. The Region of Peel is experiencing growth at a faster rate than other similar municipalities elsewhere within Ontario and the number of households with affordability issues are increasing. While most of this recent growth is situated in Brampton, population and household projection data indicate that in the future this trend will extend north to the Town of Caledon as well (Region of Peel, 2018b).[11] The town is projected to become the fastest growing municipality in the region with an expected growth rate of 135.6% between 2016 and 2041 (Region of Peel, 2018b).

Between 2011 and 2016 only one third of private housing for low- and mid-income households in Peel region were considered affordable to residents. Of those in lower income brackets (those earning less than $59,156 per year), 70% of these households were paying more than 30% of their income on shelter. Within the mid-income range 29% of these households (earning $59,156-$106,002) are in housing that is unaffordable (Region of Peel, 2018a). In addition, there is a significant gap between housing supply and demand in the region, especially for low income households. In addressing these disparities, the Region of Peel in their Housing and Homelessness Plan (2018) points to the need to address ingrained power structures in the current system that enable some to benefit at the expense of others, as well as for more flexibility in policy making to address housing issues; one that reflects principles of planning for complete communities as well as environmental impacts.

Housing Affordability: Town of Caledon

The Town of Caledon is the northernmost municipality in the Region of Peel and is comprise of both built up and more rural communities (Figure 2). According to the Region of Peel Housing Strategy (2018), the town has the highest average house price as of 2017 within the region ($951,501), which has increased since 2005 by 144.6%. As of 2016, there were 66,606 people residing in Caledon which was an increase of 31.4% from 2001 (Town of Caledon, 2017). This growth is projected to continue with an expected population increase of 62.4% over the next 15 years, as such Caledon is expected to grow more rapidly in comparison to Brampton and Mississauga (Town of Caledon, 2017).

For 2017 Caledon had the highest estimated average household income which was greater than both Mississauga and Brampton. This has been attributed as partly due to the low rate of renter households and likelihood of high income household types in the area (2018b). The Town also has an aging population with households typically comprised of 2-4 people (Town of Caledon, 2017). Most houses are single detached, and the majority of households are homeowners (91.9%), which is high in comparison with the rest of Peel (Region of Peel, 2018b). As house prices increase, homeownership

[11] In Peel, housing policy is coordinated with regional initiatives including the Peel Housing Strategy (2019) and the Peel Housing and Homelessness Plan (2018-2028).

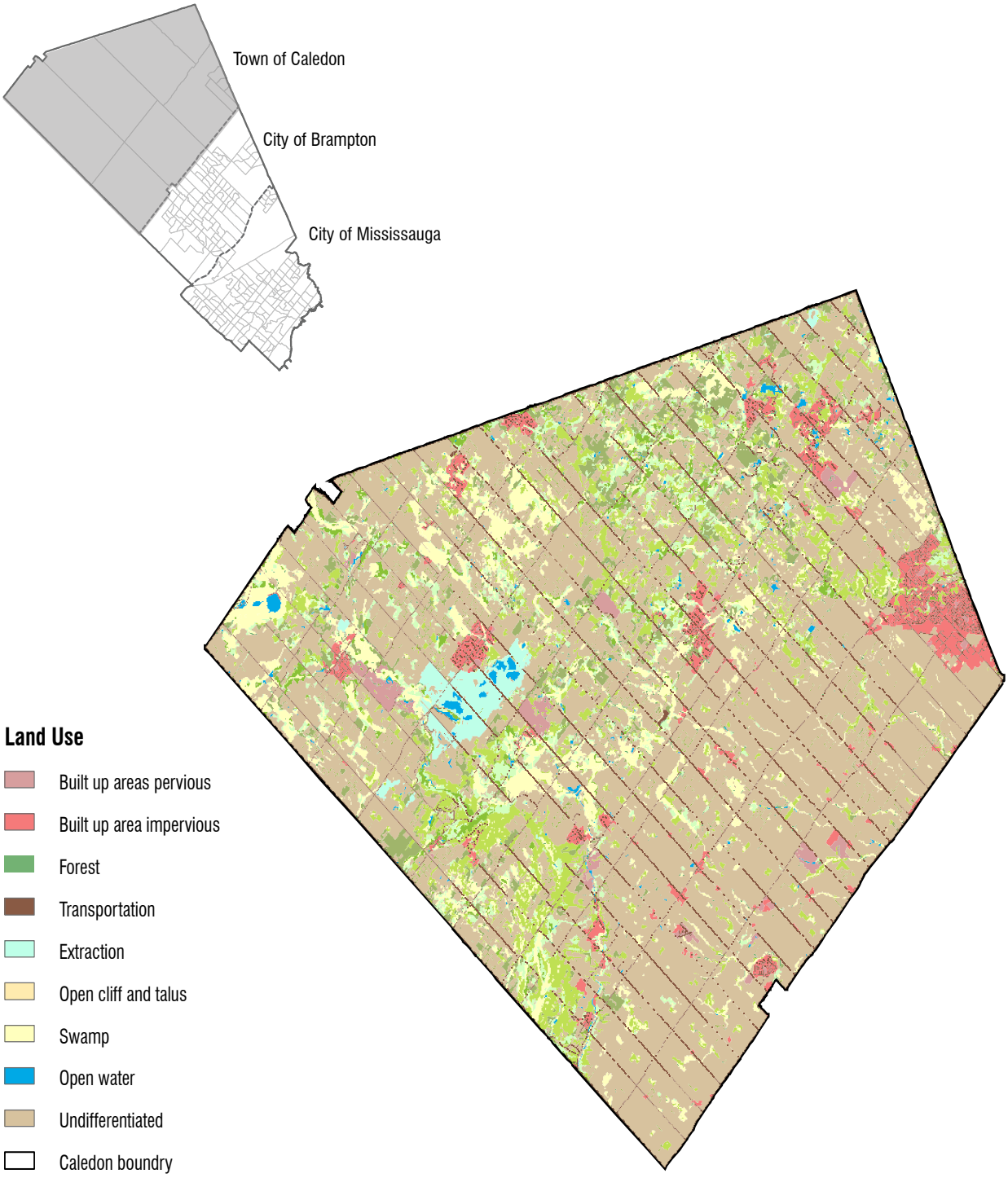


Figure 2: Town of Caledon Land Use (SOLARIS, 2008)

is becoming unattainable to low and moderate incomes households and there are few rental opportunities. In 2011, 21.3% of all households in Caledon were experiencing housing stress in that they were spending upwards of 30% or more of their income on housing costs, 9% of households were under severe stress (spending more than 50%). These percentages are better than those experienced by the rest of the region –but the municipality acknowledge that the issue of housing affordability in Caledon is increasing (Town of Caledon, 2017). See Figure 3.

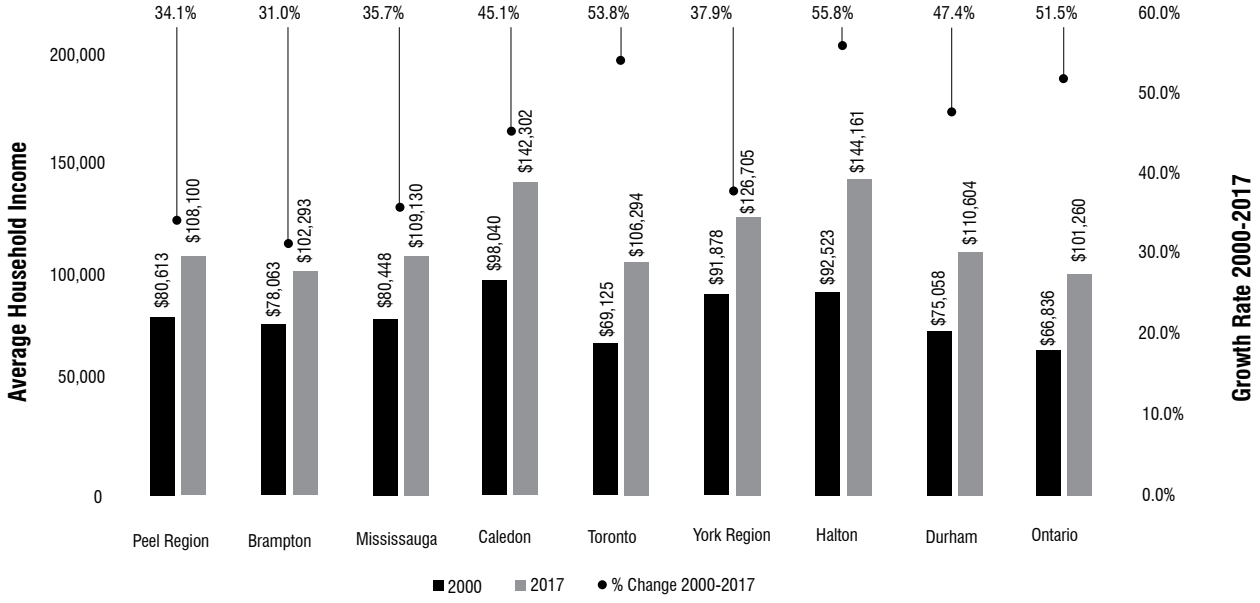


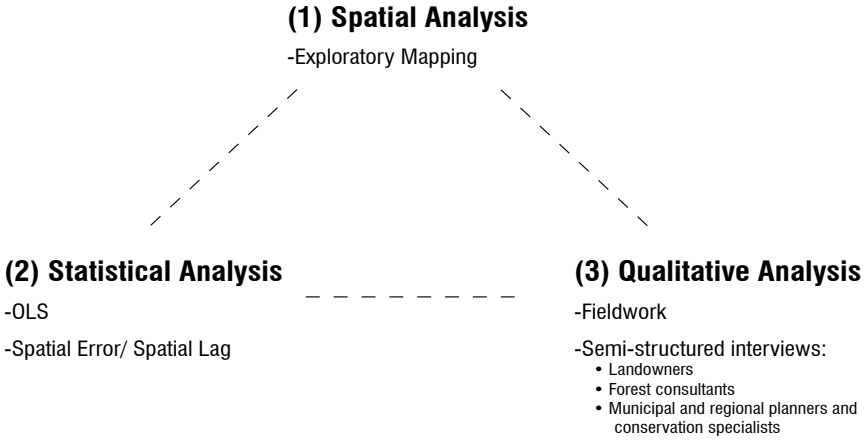
Figure 3: Average Household Income Growth and Income Growth Rate: Peel Region. Local Municipalities and Comparators 2000-2017 (Peel Region, 2018b, p. 54)

Methods

Scholarship on housing affordability has pointed methodologically to the productive capacities of pairing spatial analysis with non-spatial approaches (Ryan and Enderle, 2012; Pamuk 2006). This section uses a mixed-methods approach; combining interviews with spatial and statistical analysis. The following three part analysis draws from data collected from fieldwork in southern Ontario and integrates semi-structured interviews with landowners (14), forest consultants (10), municipal and regional planners (8), and conservation authorities (3). An effort was made to conduct in-person interviews, however in some instances where this was not viable interviews took place over Zoom or telephone. The names of all informants have been removed to respect confidentiality. The transcribed interviews were coded in relation to key themes which were then synthesized in relation to the research questions being investigated in this paper. Spatial and socio-economic data was obtained from the Municipal Property Assessment Corporation (MPAC, 2018), as well as from Statistics Canada (2016) respectively.

(1)Spatial Analysis

In their paper on housing assistance in New York City mentioned earlier, Wyly and DeFilippis 2010 question inherited categories by asking for a re-consideration of the geography of assisted housing beyond vouchers. In this paper I consider the MFTIP program as a form of subsidy and use the spatial analysis software GIS and GeoDa to help identify patterns through an analysis of clustering and dispersion to give insight into what variables are associated with the geographies of incentivized forests. In extending our definition of affordable housing to include environmental tax incentives on private land, what associations might we observe in relation to the spatial aggregation of properties and indicators of wealth?



Types of Properties

Using GIS the MFTIP properties were geocoded for the region and their classifications spatialized. These properties fall into 3 categories: (1) Managed forest property residence, (2) Managed forest property seasonal residence, and (3) Managed forest property vacant land. By far, the vast majority of properties have a primary residence on them, and very few are being used as secondary seasonal homes. When looking at Figure 4, the majority of MFTIP properties are located in the northern area of Peel Region in the Town of Caledon, in close proximity to forested land.

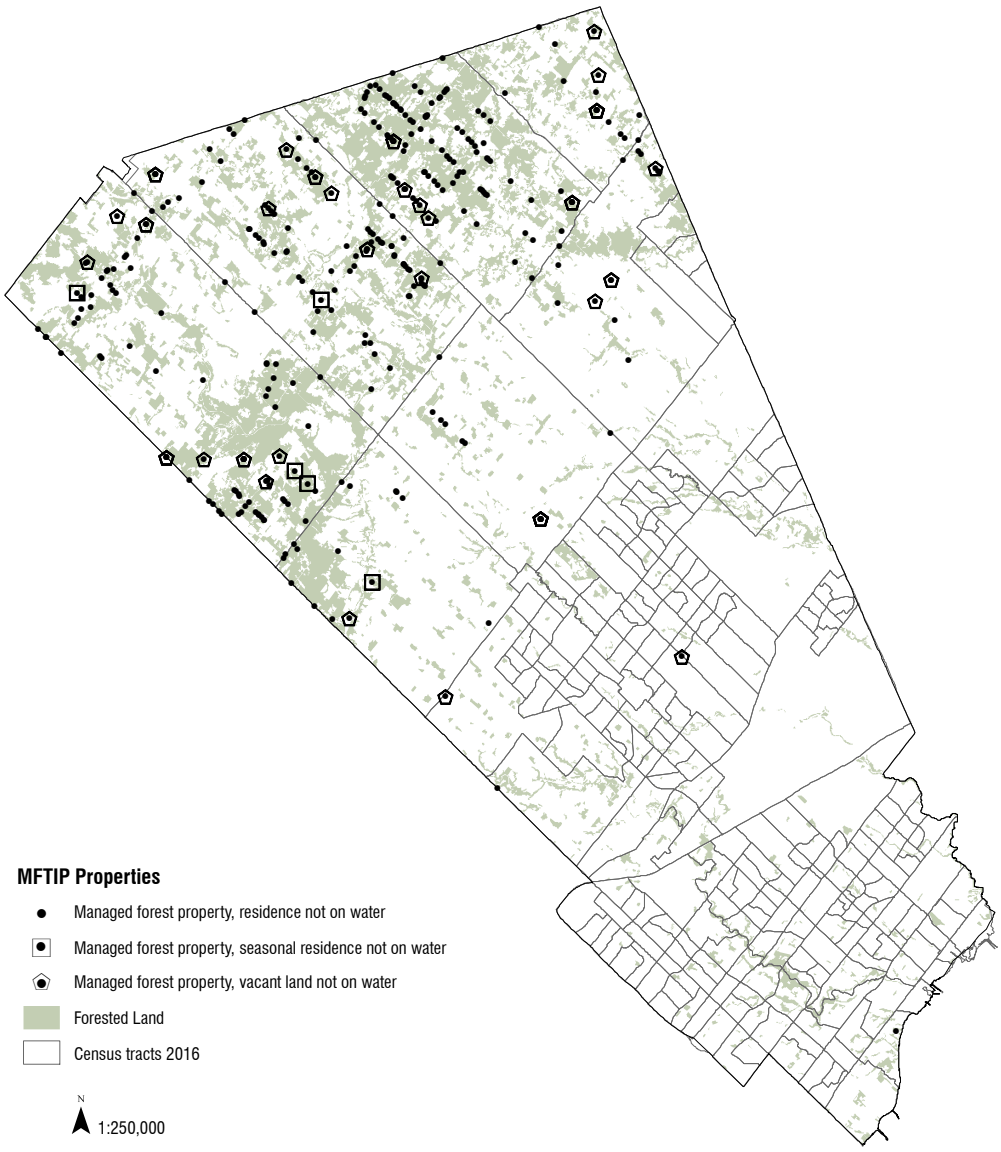
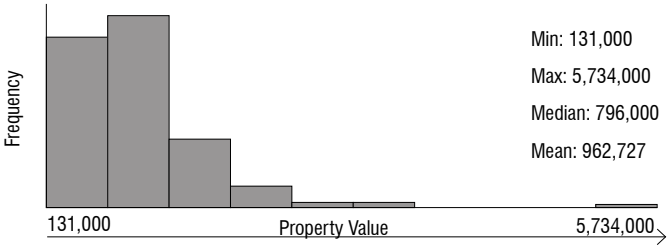


Figure 4: MFTIP Property Classification

Value of Properties

To get a sense of the distribution of current property values tied to MFTIP properties in the Town of Caledon the data points were organized ranging from lowest ($131,000 to highest value $5,734,000). Most properties in the program were valued under one million Canadian dollars with a median value of $796,000. When looking at the histogram below showing the value of these properties, the distribution is unimodal and positively skewed, with by far the majority of properties residing in the lower value range (see Figure 5).



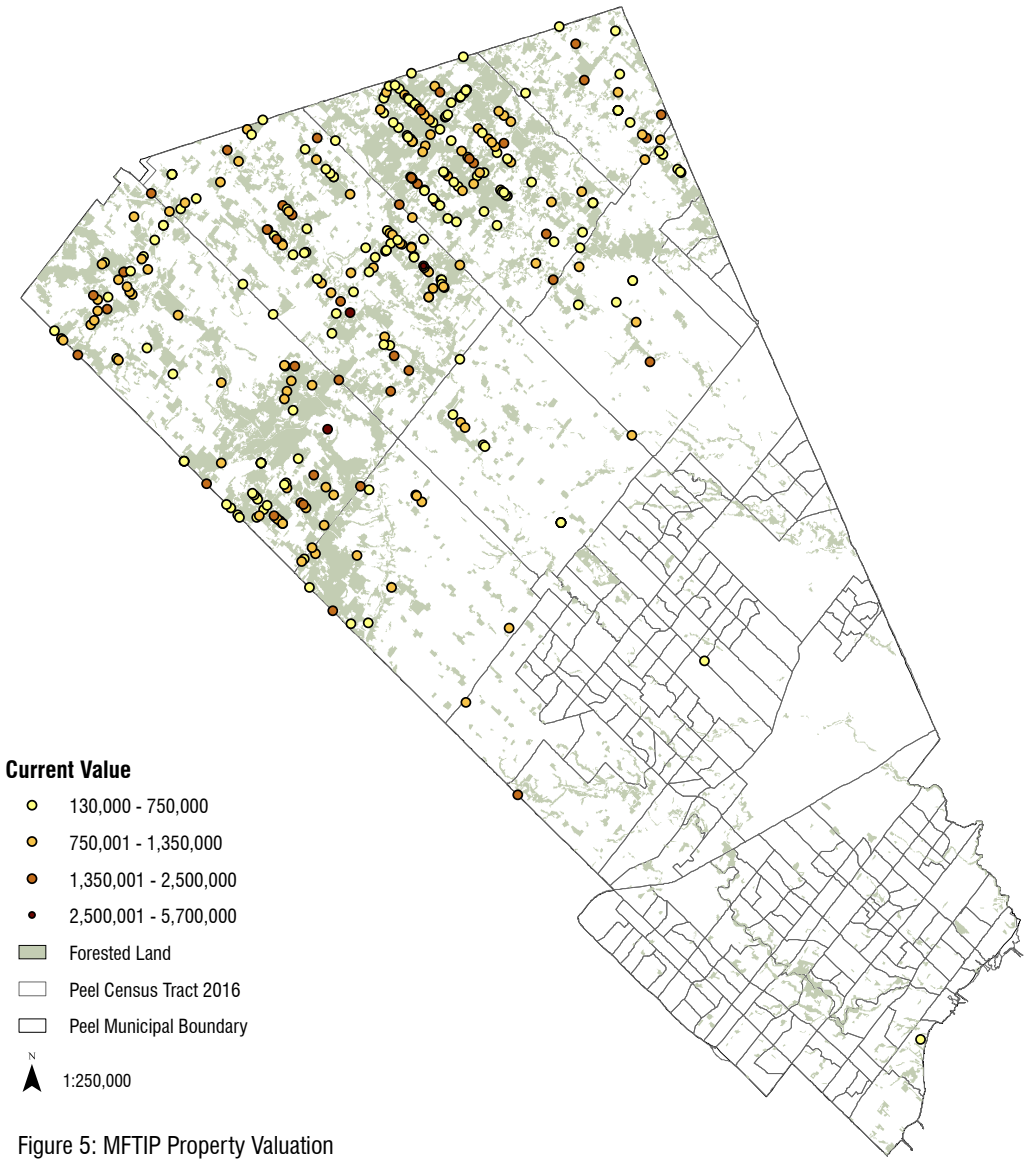


Figure 5: MFTIP Property Valuation

MFTIP Kernel Density

Are these properties clustering? From this preliminary analysis, clustering seems to be occurring in areas that have larger amounts of forest cover, which was expected. In order to explore the extent of the clustering several tools from ArcGIS were used. One ArcMap tool that gives a sense of locational clustering is the Kernel Density tool which calculates the density of features around each output raster cell. This map depicts a concentration of MFTIP properties at the central-northern extent of the municipality. As well as a couple of areas with slightly less concentrations of program uptake to the western central and northern edge of the municipality.

Drawing from this observation, the subsequent section of this paper focuses on the area identified in the kernel density mapping above as having the greater proportion of MFTIP properties, the Town of Caledon.

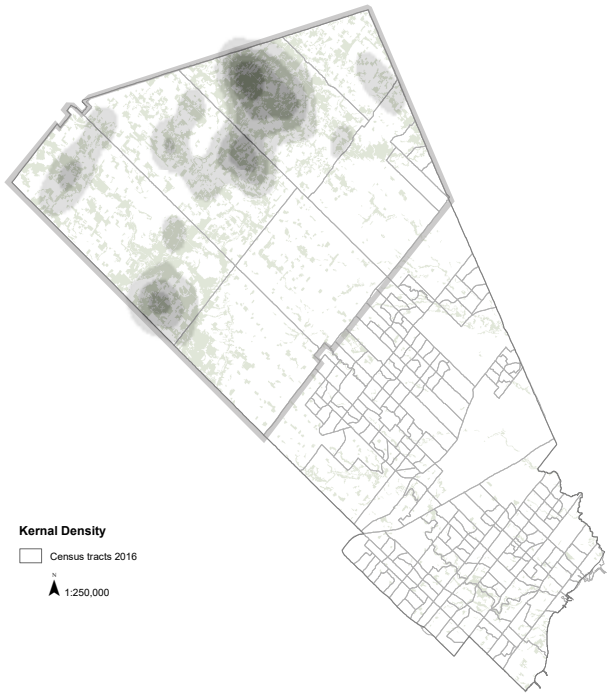


Figure 6: MFTIP Kernal Density

MFTIP Dissemination Area Distribution

Due to the availability of data, the smallest unit of analysis going forward is at the Dissemination Area level.[12] When we look at the distribution of properties at this scales we can see that some areas have higher rates of program uptake than others. The highest rate of uptake at the DA level is in the northern region of the town as opposed to the southern area.

Figure 7: MFTIP Distribution per Dissemination Area

[12] A Dissemination Area (DA): is the smallest standard geographic area for which all census data are made available. Each DA is approx 25 km2 which is around 10 miles 2, with around 500 people per unit (Statistics Canada, 2016).

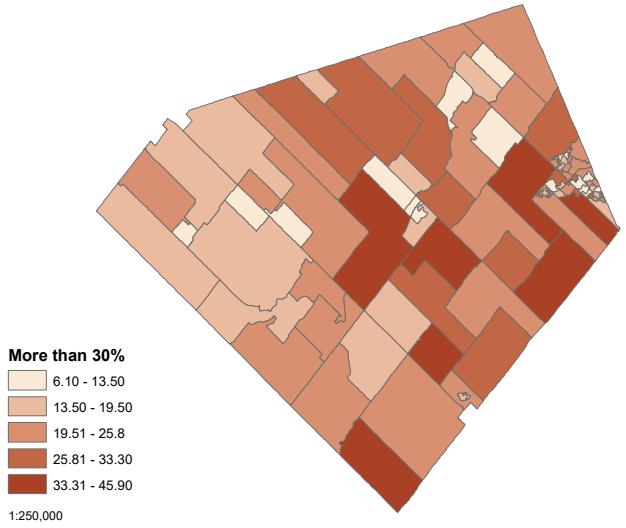


Figure 8: Town of Caledon Housing Affordability

Housing Affordability

In exploring the association between MFTIP and housing affordability I was interested in the relationship between the location of these programs and the Dissemination Areas where landowners are paying 30% or more of their income on shelter.

The spatial distribution of the rates of those spending 30% or more of income on shelter costs can be seen in Figure 8, where it appears that the highest rates are located along the southern border of the municipality. However there are some areas that seem quite high around the mid-northern portion, and central portion of the municipality.

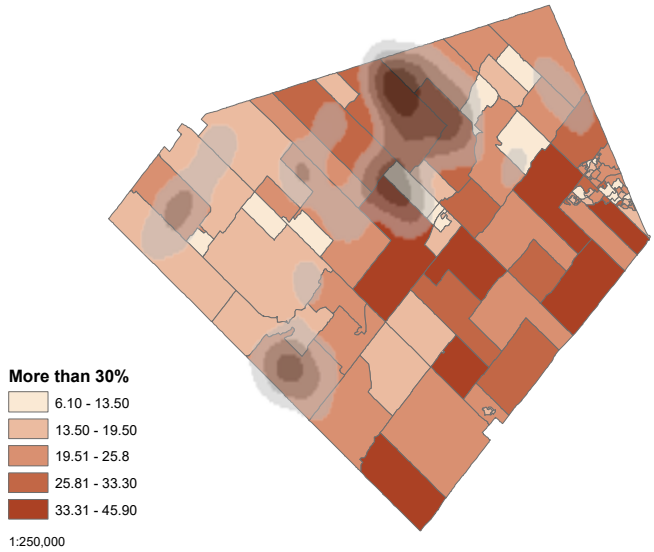


Figure 9: Town of Caledon Housing Affordability + MFTIP Kernal Density

Overlap of MFTIP Property + Affordability

What might happen when we look at affordability and MFTIP together? When looking at the resulting map, of interest is the area in the northern part of the municipality where the MFTIP properties are concentrated and where they overlap with lower rates of affordable housing.

The spatial distribution of the MFTIP program overlaid with affordability data pointed to a possible connection between housing affordability and incentivized environmental stewardship. From the results of this initial exploratory mapping, I became further interested in the social, environmental or economic factors that might impact the uptake of the program.

(2) Statistical Analysis

Building from the initial exploratory spatial analysis that indicated clustering in certain areas of the town, the next stage involved an analysis of socio-ecological variables and their association with the number of MFTIP properties at the Dissemination Area level. Here I investigated which variables might help to explain the amount of properties per DA and their distribution. The most important outcomes of the statistical analysis included: (1) results from the correlation matrix, as well as (2) those from the linear and spatial regression models.

The independent variables employed in this model include the Area of the Dissemination Area, Income, Population Density, Minority Individuals, Age, the Amount of Forested Land as well as Housing Affordability. The dependent variable in this case is the logged count of the number of MFTIP properties per DA. The unit of analysis is the Dissemination Area.

A series of models were run to get a sense of how the number of MFTIP properties per DA, conceptualized here as a form of housing subsidy, might be concentrated spatially with income and housing affordability, among other socio-economic variables, that would explain the clustering seen in the previous spatial analysis. As a form of tax easement, particular interest was given to both income levels as well as those households who are paying more than 30% of their shelter costs on housing.

Correlation Matrix

A correlation matrix was used as a diagnostic tool for the later regression analysis to assess how closely pairs of variables are related to each other and the strength of their association. The below correlation matrix shows the correlation coefficients between logged Join Count and the socio-economic variables: Area, Income Before Tax, Population Density, Minority, Age,

Dependent Variables

Number of MFTIP Properties (Join Count): The number of MFTIP properties per Dissemination Area (DA) in Caledon.

Logged Number of MFTIP Properties (Log_JC): Log of the Join Count.[13]

Independent Variables

Area: (Area_m2) Area of DA

Income Before Tax (Income) Median total income in 2015 among recipients ($).[14]

Population Density: (PopDen_m2) The count of the number of people per DA divided by the area of the DA.

Minority: (Minority) Total visible minority population.

Age: (Age) The average of age of the population per DA in Caledon.

Forested Land: (Percent Forested) The amount of forested land per DA divided by the area of the DA

[13] Due to the non-normal distribution of the variable join_count I took the log of these values (Log Join Count) which follows a precedent set in other studies when dealing with non-normal distributed variables (MPAC, 2018).

[14] Income statistics in 2015 for the population aged 15 years and over in private households - 100% data (Statistics Canada, 2016).

[15] Total - Owner and tenant households with household total income greater than zero, in non-farm, non-reserve private dwellings by shelter-cost-to-income ratio 25% sample data (Statistics Canada, 2016). In addition the term 'shelter costs' as defined by Statistics Canada for "owner households include, where applicable, mortgage payments, property taxes and condominium fees, along with the costs of electricity, heat, water and other municipal services. For renter households, shelter costs include, where applicable, the rent and the costs of electricity, heat, water and other municipal services" (Statistics Canada, 2016).

Forested Land and Housing Affordability. The results of this calculation are summarized below and indicate statistically significant associations between the number of MFTIP properties per DA and the independent variables: Area of the DA, Population Density, Age and the Percent Forested Land (see Figure 10).

In more substantive terms, for the variable *Area*, there is a strong positive association. Thus DAs that have larger areas have higher counts of the MFTIP program. *Population Density* has a negative moderate association, with areas that have lower population densities having lower counts of the program. *Age* had a strong positive association, where areas that have more older adults had more counts that those with younger populations. Lastly, the association with *Percent Forested Area* was positive with DAs that have more forested land also having more instances of the MFTIP program. Of particular relevance is the fact that there does not seem to be a statistical connection between the number of MFTIP properties and areas where households are spending more than 30% of their income on shelter costs or with income. The implication of these findings points to the fact that the program doesn't provide the property tax relief that allows people to stay in their homes. Looking at these results from a different angle, the correlation matrix doesn't point to a connection between more affluent DAs and the number of properties in the MFTIP program. Thus those DAs with higher incomes are not significantly befitting from these programs. Here, the original hypothesis that there might be an association between Dissemination Areas with households experiencing affordability stress and an increase of program uptake has been proven false.

	Log_JC	Area_m2	Income	PopDen	Minority	Age	MT30_Rate
Log_JC	1.0000						
Area_m2	0.7535 0.0000	1.0000					
Income		-0.2532 0.0155	1.0000				
PopDen	-0.4816 0.0000	-0.6047 0.0000		1.0000			
Minority		0.2745 0.0085	-0.4329 0.0000		1.0000		
Age	0.6132 0.0000	0.5160 0.0000	-0.2656 0.0109	-0.6443 0.0000		1.0000	
MT30_Rate		0.3538 0.0006	-0.5419 0.0000		0.4029 0.0001		1.0000
Percent Forested	0.2535 0.0153		0.2683 0.0101	-0.2711 0.0093			

Figure 10: Correlation Matrix

Regression Analysis

Generally a correlation matrix is used as an indicator for more advanced analysis. The next stage of this study ran a series of regression analyses to obtain further insight into how the dependent variable (Join_Count) might be associated with other socio-economic and environmental variables that might hint to the reasons for spatial clustering in the northern section of Caledon. Furthermore, this section aims to provide additional insight on a possible association between the level of income and the rate of households who are paying more than 30% of their shelter costs on housing. In terms of how well the model fits the data, the variables included in the OLS regression explained about 40% of the outcome variable. Most importantly for the research question being asked, the results indicate that the count of MFTIP properties per Dissemination Area is not statistically associated with the rate of households paying 30% or more of their income on shelter or with income. There is however a statistically significant relationship between MFTIP and the average age of people in the DA ($p > 0.001$). This indicates an association where DAs with a greater number of older adults are most likely to have more properties within the MFTIP program.

When checking for assumptions, I ran a Variance Inflation Index which indicates if the model has multicollinearity. I have a Mean VIF of 1.70 which is below 3 which indicates that these variables are not experiencing high levels of multi-collinearity. In addition, it's important to note that due to a small sample size due to the difficulty of obtaining data, some variables might actually be significant even though they don't appear so in this regression model. In this case, it is important to note that the correlation matrix might actually be more indicative of which variables actually matter.

Variable	Coefficient	Std.Error	t-Statistic	Probability
CONSTANT	-18.4775	9.55231	-1.93435	0.05644
Inc_Log	1.24243	0.841977	1.47561	0.14379
VisMinor	-0.00331266	0.00822759	-0.402628	0.68824
Age	0.139191	0.0305667	4.55369	0.00002
MT30_rate	0.0193919	0.0136679	1.41879	0.15966
Forest_per	0.00229858	0.00288832	0.795819	0.42838
PopDen_m2	-65.7769	64.6576	-1.01731	0.31193

Figure 11: OLS Regression Model

Spatial Regression – Model Estimation

After running the first regression model which didn't take into consideration the possible effects of auto-correlation the following two models: (1) Spatial Error Model, and (2) Spatial Lag Model were run which incorporate spatial effects to address the possible impact of clustering indicated through the exploratory analysis above.

The benefit of doing a regression analysis in Geoda is that in addition to a regular multi-variable regression model, the software can take measures of spatial autocorrelation into consideration. The concern with accounting for the presence of spatial auto-correlation in a regression model is driven by the fact that the analysis is based on spatial data for which the unit of observation is largely arbitrary such as an administrative unit. For instance in this study the Dissemination Areas in Caledon (Geoda, 2020). This analysis in GeoDa uses a Weighted Spatial Analysis which performs a geographically weighted regression (GWR), a local form of linear regression used to model spatially varying relationships. This form of analysis relies upon the creation of a weights matrix. In this instance a Queen's Weight Matrix was used which takes into consideration all neighbors surrounding the property of interest. Using this software a (1) Spatial Error Model, and (2) Spatial Lag Model were run that both incorporated spatial effects.

Spatial Error Model + Spatial Lag Model

With a Spatial Error Model the results represent the difference between the observed and predicted dependent variable where residuals are spatially filtered. In addition a Spatial Lag Model removes the potentially confounding effect of spatial autocorrelation for the variable under consideration.[16]

Variable	Coefficient	Std.Error	z-value	Probability
CONSTANT	-1.70965	9.62017	-0.177716	0.85895
Inc_Log	-0.312668	0.851925	-0.367013	0.71361
VisMinor	0.00200865	0.00874352	0.22973	0.81830
Age	0.131048	0.0288026	4.54988	0.00001
MT30_rate	0.0118727	0.0115652	1.02659	0.30462
Forest_per	0.00257188	0.00265814	0.967548	0.33327
PopDen_m2	20.1692	56.9518	0.354145	0.72323
LAMBDA	0.573524	0.106815	5.36931	0.00000

Figure 12: Spatial Error Model

Variable	Coefficient	Std.Error	z-value	Probability
W_JC_log	0.423274	0.116218	3.64206	0.00027
CONSTANT	-9.17974	8.50667	-1.07912	0.28053
Inc_Log	0.417934	0.74865	0.55825	0.57667
VisMinor	-0.0021306	0.00725675	-0.293602	0.76906
Age	0.11572	0.0277102	4.17608	0.00003
MT30_rate	0.017536	0.0120502	1.45524	0.14560
Forest_per	0.00208584	0.00254957	0.818115	0.41329
PopDen_m2	19.3477	58.9081	0.328439	0.74258

Figure 13: Spatial Lag Model

[16] It essentially averages the neighboring values of a location and can be used to compare the neighboring values with those of the location itself (the value of each neighboring location is multiplied by the spatial weight and then the products are summed).

In terms of how well both models fit the data, these variables explained about 50% of the outcome variable and there is no change in the significance of the variables from the OLS model. It's worth noting that in both of these models, the results still indicate that the logged Join_Count is not significantly associated with the rate of households paying 30% or more of their income on shelter or income. Age remains the only statistically significant variable.

To recap, thus far this paper has combined descriptive statistics, linear and spatial regression models, as well as a mapping analysis of MFTIP properties. Ultimately, within the above statistical analysis, the correlation matrix was the most illuminating in pointing to associations between the number of MFTIP properties and the socio-economic variables of: Area of the DA, Age, Population Density, Percent Forested Area. When this data was used in the OLS and Spatial Regressions, in the end only the independent variable 'Age' was statistically significant. To present some possible explanations for why this variable is most strongly associated with the number of MFTIP properties per Dissemination Area the interviews below are intended to provide additional scope to these dynamics both at a broader land use level and more specifically in considering the relationship between MFTIP and housing.

(3) Interviews

This next section complements the spatial and statistical analysis above through the use of semi-structured interviews which offer further depth on how provincial programs interact with federal and local government policies, as well as the inherited geographies of this region. This section incorporates interviews conducted with landowners, foresters, and conservation authorities across southern Ontario, as well as conversations with urban and environmental planners in Peel Region to give additional specificity to the case study. Questions focused on approaches to environmental planning, the use of incentive programs, and housing affordability in the region. In addressing the political geography of these subsidies, several themes emerged that are outlined in more detail below. These include: (1)The connection between forested lands, land use change and future housing development, (2), the connection between environmental incentives and housing affordability, and (3) the potential use and abuse of incentive programs.

(1) Land Use Change: Forest and Development Dynamics

From a land use change perspective one outcome of the MFTIP program is that it rewards landowners for keeping their lands forested rather than selling them to be developed. In this case many forest consultants interviewed saw MFTIP as a means through which to encourage landowners, primarily in the southern half of the province to keep their property in a forested state rather than sever the property, and develop it. The retention of forested land was seen to be especially important in areas that are experiencing development pressure (particularly around dense urban areas) as the reduction of woodlands will affect water management capabilities due to an increase in impervious land cover. Other land use pressures in the region as a whole that impact forested lands include their conversion into farmland which can be economically beneficial to landowners, especially due to new

tile draining technology. This has been a particular issue in the eastern part of southern Ontario. In light of trends toward land conversion and fragmentation within the region, many interviewees saw the program as compensating landowners for the wider ecological benefits that their forested property had on the surrounding landscape.

The dynamics of forested land, municipal revenue and real estate development in southern Ontario were mentioned by several interviewees where they pointed to the fact that MFTIP can impact a municipality financially through the loss of tax revenue. Here, property tax that would have original gone to municipal programming is lowered due to the reclassification of land and reduced property tax payments to the local authority which can impact their ability to provide services. However, while this concern was recognized as a possible issue, along with the shift in tax burden from participants to non-participants, in the end interviewees pointed to a valuation study showed the amount to be negligible (Trim, 2013).

In regard to real estate dynamics, respondents pointed to the fact that home buyers are often more interested in properties that are bordering forested lands, and are willing to pay premiums for close proximity, where rural lands near to forest amenity areas are bringing in higher value. Possible equity issues were flagged in terms of the distribution of urban green space, however in regard to the connection to the affordability crises in the region interviewees pointed to the increasing complexity of these issues as a multidimensional planning concern. Lastly, due to future growth projections in Caledon, tensions between expanding urban development and the retention of natural heritage in designated growth areas was identified as a concern. In particular, one interviewee pointed to the increasing prevalence of land speculation in future development areas in the town of Caledon which will directly impact affordability.

(2) Incentives and Affordability

Building from these conversations concerning broader land use change dynamics in southern Ontario this next section is concerned with associations between the use of incentive programs, environmental planning, and development in the context of housing affordability. In terms of affordability for homeowners, interviewees mentioned the tax break as the number one reason for landowner involvement in the program. In addition, one consultant mentioned that they could think of scenarios where younger people who are looking to buy, and who would like to live outside the city but can't afford the tax rate on a larger property could benefit. When asked about the possible relationship between the MFTIP program and housing one interviewees saw how they could contribute to keeping taxes low. With the right property, they mentioned that the property tax reduction certainly could have a positive impact for landowners in terms of the taxes owed.

At the same time, questions of who is participating in this program were also raised, where in southern Ontario those landowners that have 4 hectares of land or more were seen as *"most likely doing ok."* However, there was also the recognition that this was

not always the case. A number of interviewees pointed to the fact that there are a variety of landowners who take part in the MFTIP program, especially those who have been on their property for some time and in many cases are older adults who may be experiencing financial stress. Larger forested properties, especially in central Ontario can get quite expensive for landowners. While there is the perception that landowners who own these lands are well off, in many cases they have come into these properties through other means such as inheritance. In this case, many would not be able to afford these forested lands without the property tax reduction.

In terms of the geography of property tax in the region, interviewees mentioned a general trend where a greater tax benefit for program participants is linked to the location the property. In particular, the farther south and closer to dense urban areas the greater the property tax reduction for landowners. When talking with the forest consultants concerning the MFTIP property tax reduction there was a mix of responses that pointed to the program as being essential for some older adults, while others expressed that it had allowed landowners the ability to retire in the country while maintaining a house in the city. These conversations point toward the possible use and misuse of this incentive program which is the topic of the next section. Ultimately, what these conversations reveal are the variety of contexts in which conservation takes place and the means through which it is managed. At the moment, the role for private land forest management is still nascent in its connection to environmental planning in regard to its intersection with housing provision in policy and practice in the region.

(3) Program Impacts

In navigating the intersection of environmental planning and conservation with housing, it is vital to consider questions of who benefits. On one hand, the property tax reduction for the MFTIP program compensates landowners for their management work. This exists along a spectrum of involvement and involves time, labor and monetary costs. In areas where there are rising property taxes in more southern areas of the province, might there be a possible connection for people who are older and/or who are retired to benefit from this program? Referring back to the spatial analysis and OLS model, age was found to be the only statistically significant variable which points to an association between older homeowners and their likelihood to participate in the MFTIP program. Might this program benefit the retired community and build the capacities of this age group as environmental stewards? On the opposite age spectrum, some interviewees raised provocative questions concerning the cross-over between environmental incentive programs and housing, where these tax incentives could also serve younger households who have been priced out of the market elsewhere. Lastly, in many cases, landowners and forest consultants mentioned in interviews the multi-generational and long-term future planning goals for these properties. Here the program, through the development of landowners' connection to their land, has encouraged property owners to donate their property to conservation authorities or pass on their property to future generations allowing for the perpetual conservation of these forests, and effectively removing it from the market.[17]

[17] Of note is that landowner protection of their forested land in perpetuity was mentioned in interviews however due to a lack of data availability this is outside the scope of this research.

However, the spatial analysis and interview responses from this study also point to a number of possible negative externalities. The reduction of property taxes impacts the municipal tax base. In this case, while there is a gain in terms of natural capital where maintaining forested lands play a role in soil health and water quality, there is also the reduction of the financial resources for local municipalities, which can impact their ability to provide other services for the community. Many forest consultants also mentioned that the majority of people in the program are more interested in the tax break than in the active management portion of the program. There is therefore the potential that households could take advantage of this tax break to accumulate more property, sitting on these lands until there is the opportunity to clear the land of forest and sell to developers, or in some cases transition the property into farmland. However this was mentioned as a rare occurrence by those interviewed. The location of forested land in the region and the availability of properties that meet the 4 hectare minimum to qualify for this program also prohibits access for many who do not have the financial resources or mobility to benefit from these lands.

Conclusion

This study has placed the discussion of forest incentive programs within a broader context concerning the intersection of environmental protection and housing affordability, and the need to keep both issues in mind when developing policy. Using a mixed-methods approach, the paper has explored the broader social and environmental transformations that are connected to more abstract policy directions from different levels of government, while also grounding itself in the place-specific implementation of these policies. In the end, what this analysis shows is that the MFTIP is conserving forested land, but while it appears that older, long-time owners are more likely to make use of the program it's not clear that this means it's helping people who might not otherwise be able to afford property taxes on their holdings. In terms of my findings about the effects on costs for potential new residents seeking housing in Caledon, this analysis suggests these programs are not making a significant reduction in housing affordability overall. Ultimately this underscores my broader point about the need to take both housing and environmental planning goals into account in thinking about these policies.

This paper is also an attempt to illustrate the possible synergies that exist between the two sets of planning and policy goals, of environmental management and the conservation of housing affordability in the region and investigated how incentives might be one of many tools that planners and policy makers might mobilize to incorporate environmental concerns with that of public and private sector housing. What might be the potential for future ecological planning that attempts to reduce fragmentation while also addressing the need for housing assistance? Thus perhaps rather than answer the questions posed at the beginning, this paper points to a set of intersecting factors that illustrate the diversity of conditions that exist when considering overlap between the provision of housing and that of environmental conservation. In this sense, what emerges is that there is no clear division between winners and losers and this paper makes clear that the kinds of

environmental and housing related issues experienced throughout the region and in the Town of Caledon in particular, vary considerably given the context and the landowners involved. In the end, what this paper suggests is that the program has done a decent job of preserving forested land (at least for awhile) but the data are, at best, inconclusive about whether the program is addressing issues of affordability to current homeowners of modest means; and it's not clear how tax incentive programs will affect affordability for future residents. What is apparent is that we are dealing with both a climate crisis and a housing crisis. This paper is an attempt to illustrate the synergies that exist between these two sets of planning and policy goals, and investigate how incentives might be one of a host of integrated tools that planners and policy makers might mobilize that incorporate environmental concerns in the retention and development of additional affordable housing options.

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