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Xtreme Makeover: Toronto

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Explicit Greenbelt/Implicit Whitebelt: *strategies for a transitional landscape*

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When the Ontario government defined the province's Greenbelt in 2005, a second belt, known as the *whitebelt*, was also implicitly created. For the explicitly defined Greenbelt, future planning is relatively clear as development within its boundaries is highly controlled as preserving natural areas and agricultural lands are paramount. The greenbelt effectively demarcates a zone, wrapping loosely around the Greater Golden Horseshoe in southwestern Ontario, where urban development *should not* occur. For the resultant whitebelt, understood as the residual buffer zone between the new greenbelt boundary to its north and the already developed or planned-for developments to its south, the future is less clear. The incredible potentials of the whitebelt, both its ties to the greenbelt and its capacity for new development, are brought to the fore when seen from a shifted planning and design perspective. The urges to view the whitebelt as either some lighter, less-rigid version of the Greenbelt or as a placeholder for some future, status quo, development should both be resisted. Instead of positioning the whitebelt as a passive buffer zone, it is interesting to speculate how it becomes a radically reimagined landscape: a landscape where its neighbours (Greenbelt to the north and urban metropolitan area to the south) are not pitted against one another but instead leveraged together in creating a synergistic territory were human-centered needs and ecosystem logics coexist to mutual benefit. While some versions of such a future may rely on utopian visions, emerging thinking and design work surrounding ideas of natural capital and ecosystem-services, suggest that market-driven, capitalistic metrics need not be left behind. In examining existing examples around the world of such redirected agency through design, we can begin to speculate on a new future for areas within the GTHA that resist singular categorizations as either urban or rural, white or green – but expose a new language for the emerging landscape potentials.

A hard-green legacy

The Greater Golden Horseshoe (GGH), named for its u-shaped cupping of the western edge of Lake Ontario, identifies a mega-metropolitan region spanning across most of southwestern Ontario in eastern Canada (Fig. 12). It includes major urban centres such as the Greater Toronto-Hamilton Area (GTHA) as well as natural features such as the Niagara Escarpment and its associated ecosystem. The Golden Horseshoe is one of the most populated metropolitan regions in North America as 8.1 million people live in the region's 33,500 km^2 area.[1] Aside from this noteworthy size and density, perhaps the most striking characteristic of the Golden Horseshoe is its dramatic rate of growth: in the period from 2001 to 2006 the population grew at a rate of 8.4% accounting for 84% and 39% of total provincial and national growth respectively.[2] This population growth, while bringing with it obvious economic benefits, exerts powerful land-use conversion forces by way of urban spread.[3] With notable growth projected through to 2031, when the population of the GGH is expected to surpass 11.5 million[4], the Ontario government has developed two sets

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[1] Statistics Canada. 2006. 2006 Census: Portrait of the Canadian Population in 2006: Subprovincial population dynamics. http://www12.statcan.ca/census-recensement/2006/as-sa/97-550/p14-eng.cfm (20/09/2013)
[2] Statistics Canada. 2006. 2006 Census: Portrait of the Canadian Population in 2006: Subprovincial population dynamics. http://www12.statcan.ca/census-recensement/2006/as-sa/97-550/p14-eng.cfm (20/09/2013)
[3] Statistics Canada provides an animated map of the outward growth of urbanized region in the Greater Golden Horseshoe from 1971 to 2006. http://www12.statcan.gc.ca/census-recensement/2006/as-sa/97-550/maps-cartes/animations/cmas/toronto.swf (20/09/2013)
[4] Hemson Consulting (January 2005). "The Growth Outlook for the Greater Golden Horseshoe". Greater Golden Horseshoe Forecast Committee. (20/09/2013)

of policies aimed at controlling the physical spread of the projected growth: the *Greenbelt Act* and the *Places to Grow Act*.
In 2005, the Government of Ontario designated the Ontario Greenbelt Area by passing the Greenbelt Act into law[5]. The primary purpose of the act is to protect over 720,000 hectares (1.8 million acres) of environmentally sensitive land and farmland in the Greater Golden Horseshoe from urban development and sprawl. Extending for over 325km as an arc-shaped ribbon along the northern edges of the GGH, the Greenbelt protects current land uses within its boundaries. While small-scale agricultural uses dominate the landscape, the Greenbelt also protects a natural heritage system which includes 216,500 hectares (535,000 acres) of lakes, wetlands, river valleys and forests as well as rural settlements. The Greenbelt Plan makes it very clear, through its planning policies, where development *should not* occur.

The *Places to Grow Act*, on the other hand, identifies a far-reaching set of policies describing where growth and development *should* occur in the GGH[6] and other regions of southwestern Ontario. While densification/intensification of areas already urbanized (40% of growth until 2030 is slated to be absorbed within the current urban footprint), is one strategy. The majority of future growth will be accommodated in some form of expanded boundaries of GGH municipalities. While allowing for the expansion of urbanized footprints into surrounding areas identified as Designated Greenfields Areas, the policy imposes constraints on such spread whereby newly urbanized areas need to achieve an average density of at least 50 people or jobs per hectare.[7] While these Designated Greenfield Areas offer a temporary urban growth boundary, it is predicted that over time these boundaries will push closer and closer to the Greenbelt. The current buffer zone, located between the southern boundary of the Greenbelt and northern edges of the Designated Greenfield Areas, is known as the *whitebelt.* (Fig. 2)

While urbanization in the mostly agricultural whitebelt is unlikely in the next few years, all of the upper-tier municipalities surrounding the Greenbelt are planning to eat away at this buffer zone in their development plans through to 2031 and beyond.[8] With an area of approximately of 58,000 hectares it is unlikely that the pressures exerted to push the growth boundaries into the whitebelt will breach the official Greenbelt boundary.[9]

Although the Greenbelt boundaries are unlikely to be contested, this does not mean that the long-term viability of the greenbelt is not threatened. Ecological systems, such as groundwater flows and animal migration, do not obey the hard boundary defining the Greenbelt. Such systems blur, bleed and poke through the legislated border. As development in the whitebelt increases, so does the likelihood that this urbanization will begin to indirectly, by way of interacting with systems operating with trans-boundary logics, affect the Greenbelt. Such indirect interactions could negatively affect the Greenbelt by increasing demand for groundwater supplies, infrastructural growth, and recreational capacities.[10] Thus, the challenges facing the Greenbelt's sustainability become apparent when we consider the greenbelt not as an isolated entity but instead as part of an ecology of land-based processes in southwestern Ontario. These ecological processes provide services that range from rain water run-off control to pollination services by forests or water filtration and carbon banking by wetlands.[11] These services are often dubbed as "ecosystem services" which include both *products* (such as clean water) and *processes* (such as pollination).[12] In turn these services have positively affected human-centered processes around municipal, industrial and agricultural activities, but whose roles can no longer be taken for granted in their increasingly fragile future.

Given that the frontier for development lies within the whitebelt, and that this future development is inextricably linked to the Greenbelt's well-being, the way in which this development occurs becomes critical. Although the GGH's Growth Plan attempts to curb some of the less desirable characteristics associated with urban sprawl by imposing controls to increase density and ensure mixed-use live-work neighbourhoods[13], the plan does not seem to recognize the true dynamics linking the whitebelt with the Greenbelt. Ontario's Greenbelt, like many other emerging greenbelts around the world, seems to pitch urbanism and nature on opposing sides. By placing such opposing agendas for land use conversion adjacent to one another the limitations of a line-based boundary become apparent.

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[5] Ontario Government. 2005. Protecting the Greenbelt: Greenbelt Act, 2005. http://www.mah.gov.on.ca/Page195.aspx (20/09/2013)
[6] The specific application for of the Places to Growth Act on the GGH is described in the Growth Plan document
[7] A Guide to the GGH Growth Plan- page 19
[8] Tomalty, Komorowski. 2011. "Inside and Out: Sustaining Ontario's Greenbelt". Friends of the Greenbelt Foundation. Page 15.
[9] Ibid. Page 15.
[10] Ibid. Page 3.
[11] David Suzuki Foundation. 2008.Ontario's Wealth, Canada's Future: Appreciating the Value of the Greenbelt's Eco-Services.2008. http://greenbelt.ca/sites/default/files/david_suzuki_foundation_-_value_of_greenbelt_eco-services_study_.pdf(20/09/2013)
[12] Millennium Ecosystem Assessment (MA). 2005. Ecosystems and Human Well-Being: Synthesis. Island Press, Washington. Page 155.
[13] Ministry of Infrastructural Renewal. 2006. "Places to Grow: Better Choices. Brighter Futures. A guide to The Growth Plan for the Greater Golden Horseshoe". Government of Ontario.

As things stand now, the development pattern for the whitebelt will likely be a continuation of the patterns currently playing out at its southern edge and elsewhere in North America. Characterized by a patchwork approach where discrete parcels of land are converted from one use to another, a developer-driven approach largely overlooks the opportunities found in a more holistic approach seeking to establish and maintain connections, both natural and constructed, across single sites' limits.

An alternative soft-white future

While the whitebelt's symbiotic connection to the green might initially be seen as yet another limitation to urban growth in the newly constrained GGH, it does provide the region with the opportunity to tap into and leverage those relationships at both the local and regional levels. The ecosystem services provided by the whitebelt and its connection to and within the greenbelt call into question existing methods of quantifying productivity and prompt a reconsideration of *how* the pattern of urban development might change in order to respond and react to those services.

One way to promote such reconsideration may lie in foregrounding the *natural capital* found in and around the Greenbelt.[14] Within a natural capital perspective, we recognize the earth's natural ecosystems as stocks, or assets, which, through the flow of services and material resources, provide us with quantifiable value. By adopting the dominant economic perspective of urban growth, planning dynamics surrounding land-use conversion can be pushed away from a binary tug-of-war between the *natural* and *developed*, towards a more fine grained set of relationships where preserving natural heritage moves beyond stewardship and becomes inextricably linked with agency – economic, social, and environmental all at once.

The power of the natural capital approach was proven when New York City was forced to confront the shortcomings of its public water filtration systems in the early 1990s.[15] At this time, the Environment Protection Agency (EPA) introduced new requirements for public water systems forcing water supplies to either be filtered or remain unfiltered but meet a set of new criteria. This new law had potentially costly results for New York City which had, since 1915, been drawing unfiltered water from the Catskill-Delaware Watershed. Two very different options presented themselves. The traditional capital model pointed to the building of a massive new *hard* filtration system which was estimated to cost over $6 billion USD to construct and over $300 million USD to operate annually. A *softer* approach based on natural capital assessments, which included the conservation of existing wetlands through government purchasing and pollution reduction, was estimated to cost between $1 and $1.5 billion USD. [16] To this day the complex network of wetlands found in the Catskill/Delaware Watershed provides New York City with over 1.3 billion gallons of pure, unfiltered drinking water each day.[17]

The natural capital argument enabled these two options to be compared using such metrics as cost, return on investment, payback period etc. The wetlands solution, by leveraging ecosystems as non-linear, self-organizing and complex feedback systems that are able to juggle various hierarchies and scales, points to a more flexible, sensitive, and sustainable template for the design of new urbanized zones within the whitebelt.[18] The argument also promotes the role of *soft design* approaches – prompting consideration for strategies that are adaptable, responsive, distributed; operating collectively across large territories towards a coordinated goal. Working within such a framework, the landscape is seen as a network of ecologies primed to address the pressure of development through a multi-lateral approach. Re-wiring current urban networks and patterns reduces dependencies on "hard" infrastructure, allowing the design to adapt to local conditions and adopt "soft" solutions.

In this light, the whitebelt's role at the regional scale is fundamentally changed from a passive "buffer-zone" clearly bordered to shield the greenbelt from development to a dynamic and functional "transition-area" that grows and shrinks over time. Further, as a transition-area, the whitebelt can extend beneficial services into the upper tier municipalities from the Greenbelt, thus charging the entire region with a dynamic ecosystem feedback through the whitebelt. Meanwhile, urban adaptation at the local level within future whitebelt development not only creates resilient soft infrastructure to support the new growth but also creates differentiation and distinct identities amongst the communities.

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[14] Hawken, A. Lovins and H. Lovins. 1999. "Natural Capitalism: Creating the Next Industrial Revolution". Little, Brown and Co, Boston.
[15] The example of New York's ecosystem based approach is described in detail in The David Suzuki Foundation's publication mentioned earlier in the text.
[16] Richmond, A., Kaufmann, R.K., and Myneni, R.B. 2007. "Valuing ecosystem services: A shadow price for net primary productivity." Ecological Economics. 64: 454-462.
[17] David Suzuki Foundation. page 16
[18] Przybylski, M., Bhatia, N. 2010. "Learning from Ecosystems" in Field Journal: Ecology. Vol. 4, Issue 1. Sheffield: University of Sheffield. Pages 109-121.

Soft intelligent bundles
As ecologically responsive planning is gaining popularity amongst researchers, planners, and politicians a wide range of strategies to include ecosystem services in future development is currently being explored. However, focus will be placed on three strategies that not only question current development patterns but also offer design opportunities beyond mere efficiency and raise the potential for development to create ways for inhabitants to interact with new ecologically symbiotic infrastructures. . Further, these three strategies also have the ability to be adapted in scale to address the macro (regional) to the micro (neighborhood block) level.

- Designing development patterns/systems to participate in ***symbiotic ecosystem-service bundles***
  - How might urban development be designed to complement groups of mutually beneficial ecosystem services?

- Designing ***soft flexible infrastructures***
  - How can we design urban development infrastructure to gain resiliency and flexibility by embracing more of our existing ecosystem services?

- Incorporating ***interactive eco-ambient intelligence***
  - Ecologically responsive designs in both their initial conception and future adaptation depend on the continuous gathering of data from landscapes.
  - Could this new network of technology be used as part of an interactive public infrastructure?

Symbiotic Ecosystem-Service Bundles

The concept of “ecosystem-service bundles” is an emerging framework to evaluate, account, and manage multiple ecosystem services across landscapes. As mentioned earlier, “ecosystem services” include both *products* (such as filtered water) and *processes* (such as pollination). With an increased interest to enhance the supply of some ecosystem services there is also an awareness that these efforts have led to the decline of others, the challenge is determining how to manage them collectively. The Millennium Ecosystem Assessment (MA), a major international assessment of the world’s ecosystem services concluded that addressing this challenge requires identifying tradeoffs and synergies that exist among ecosystem services at different scales.[19] “Tradeoffs” arise when the provision of one service reduces another, and “synergies” arise when multiple services are enhanced simultaneously.[20] Analyzing a landscape through bundles (sets of ecosystem services that repeatedly appear together across space or time) is a useful method to identify common ecosystem services that create tradeoffs and synergies across a landscape.

Identifying bundles provides planners with the ability to match complimentary development types with landscape ecosystem service bundles. In this light development is seen more systematically as a series of inputs and outputs that can be paired and matched in order to achieve greater degrees of ecosystem synergy. At the regional level designing with ecosystem service bundles implies creating new development that is organized around their surrounding ecosystem bundles where the pattern will react and respond more to ecological opportunity rather than on our current development drivers (such as suburban block layouts). Designing with bundles at the neighborhood scale provides new opportunities for designers to consider *how* specific development types will be paired with their ecosystem service bundle. This connection to the bundle has the potential to become an interface for the occupants with the paired ecosystem service. Imagine an elementary school with a wet-green vegetated wall that connects to a series of existing surrounding wetlands. The process of filtration, the role of vegetation, ground-water absorption, and awareness of other species becomes not only a functioning service but a rich experience for the students to see how these systems work.

The speculative *Strategy for a Lost Landscape* project by Bas Smets in 2009 for the villages of Watou in Belgium explores the concept of taking a regional area outside of a major urban center (in this case Dunkirk) and reconsiders future development organized by grouped landscape features and functions. In the flat marshy context of Watou the architect was striving to develop a project that could provide new forms of resistance to standard development patterns. (Fig. 3) While the project and the approach may recall strategies from Ludwig Hibelseimer’s “The New Regional Pattern” or Frank Lloyd Wright’s “Broadacre City” the difference with the bundle approach is that development is not treated as a predetermined pattern but

[19] C. Raudsepp-Hearne, G.D. Peterson, and E.M. Bennett. Ecosystem service bundles for analyzing tradeoffs in diverse landscapes. Proc Natl Acad Sci U S A. Epub March 2010. Page 1.
[20] Ecosystems and Human Well-being: Synthesis. Washington, DC: Island Press, 2005. Page 7-25 (Summary)

rather a set of rules that react to their specific ecosystem service bundle creating a distinctive urban patchwork.

The development of the emergent Haerbin City in China around the *Qunli National Urban Wetland* (2010-2011) by Turenscape is a prime example of how ecosystem services can be incorporated at the urban and landscape level. Here the designers retained and enhanced the function of the existing salt flat marshes by organizing all development around a large central basin and using it as a water retention and storm water drain while becoming a key public park space for the city.[21] (Fig. 4,5)

However, while there is a lot of enthusiasm around ecosystem service bundles it should be noted that *how* the concept is applied is a major point of debate. Further development of integrating GIS information and complex Bayesian[22] relationship networks is still limited to the output of graphic pixel values.[23] The use of pixels is being challenged by researchers as an appropriate method for assessing ecosystem services or bundles, because of the information that might be missing. For example, Italian environmental and civil engineers revealed how relying on GIS information to yield a resolution of even 30m pixel values for the Italian freshwater ecosystems was not enough to capture integral information about networked wetlands and short-run ravines which obviously have a clear role in the health of their water filtration networks.[24]

Striving to create a symbiotic relationship with ecosystem service bundles provides a convenient first-tier level of planning that has the ability to tie services with development types and provide urban developments with a distinctive relationship to their landscape. However, because of the potential gaps in collected information the use of ecosystem services must be complimented by not only developing continuous landscape data monitoring but also to create soft and flexible infrastructures that can anticipate and adjust to future change.

Soft Flexible Infrastructures

The concept of soft and flexible infrastructures is systems that provide urban development with products and services (like water purification) that are resilient, respond to change, and do not rely on heavy-hard invasive components while providing those services. As in the water purification example from New York cited earlier, leveraging existing ecological services comes with many advantages such as reduced capital investment, landscape preservation, and inherent resiliency.

Another strong example that incorporates a soft-flexible design strategy from New York is the Oystertecture (Figs. 6, 7) proposal by Scape for the 2010 MoMA Rising Currents Exhibition. The design team explored a design strategy that:

> *…nurtures an active oyster culture that engages issues of water quality, rising tides, and community based development around Brooklyn's Red Hook and Gowanus Canal…This living reef is constructed from a field of piles and a woven web of 'fuzzy rope' that supports osier and mussel growth and builds a rich three dimensional landscape mosaic…The reef attenuates waves and cleans millions of gallons of Harbour water through the harnessing of the biotic processes of oysters, mussels, eelgrass, and neighbourhood fabrics that welcome the water to develop further inland.*[25]

The project is interesting on many levels, but a few points to highlight include its ability to create "ecosystem resiliency" through species redundancy, (cultivating a habitat with many species able to perform the same water filtering service) in this case oyster + mussel + eelgrass and its simple and adaptable construction method (poles and 'fuzzy rope') which can be easily adjusted over time to expand, contract, or shift.[26]
A final note on the Oystertecture project is its creation of a dispersed network of water quality sensors, through the observable health of the oysters. The oysters and other species can be easily observed by the public because the design team included a number of simple public access points onto the infrastructure (a

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[21] Turenscape. The Transformed Stormwater Park: Qunli National Urban Wetland http://www.turenscape.com/english/projects/project.php?id=435

[22] Bayesian networks (named after Thomas Bayes for his 18th Century work in probability) are graphical models that help structure 'probabilities' and 'dependencies' from one attribute in a system to another. The classical example of Bayesian networks explores symptoms and disease in a health/medical context.

[23] Van der Biest, K., et al., EBI: An index for delivery of ecosystem service bundles. Ecol. Indicat. (2013), http://dx.doi.org/10.1016/j.ecolind.2013.04.006. Page 11.

[24] A. Di Sabatino, L. Coscieme, P. Vignini, B. Cicolani. Scale and ecological dependence of ecosystem services evaluation: Spatial extension and economic value of freshwater ecosystems in Italy. Ecol. Indicat. (2013), http://dx.doi.org/10.1016/j.ecolind.2013.03.034. Page 3.

[25] SCAPE/LANDSCSAPE ARCHITECTURE PLLC. http://www.scapestudio.com/projects/oyster-tecture/

[26] "Redundancy and Resiliency Activity." Welcome to Ecoplexity. Accessed November 03, 2013. http://ecoplexity.org/node/869.

“watery regional park” as described by SCAPE). This inadvertent sensor network provides the designers/maintainers of the soft-infrastructure with information about how to adapt the system in the future.

Interactive Eco-Ambient Intelligence

As described in the previous two strategies, continuously collected data from the landscape not only provides planners and designers with the information to create an initial ecosystem service based development but provides the opportunity to update and adapt the design over time. This data collected from the landscape would need to come from a number of difference sources to fill in the gaps that current ecosystem service bundle analysis is lacking and could include digital sensors and/or indicator species (as seen in the Oystertecture proposal). This array of “sensors” would comprise an “eco-ambient network” that will enhance the awareness of both designers and occupants of their environment. It could be argued that the methods and technology to build the eco-ambient network itself is an opportunity for design. The incorporation of complimentary methods of collecting landscape information to the existing base of GIS mapping can be treated as an active part of the design and seen as part of a public infrastructure to read and register change in the landscape. Marc Böhlen’s “second order ambient intelligence” (2009) describes a near future where ambient intelligence is designed to accommodate other species – “Imagine a geothermal installation that generates warm water for a house. Imagine that the sensors in the ground would also listen to the insects and worms working their way in the soil. Imagine how we might think differently about the dirt if we only had some decent transmission from the underground”.[27]

Engaging with eco-ambient technologies provides designers a number of opportunities (and on multiple scales) to create interfaces for local inhabitants to gain insight into their surroundings. How an array of sensors gets deployed and whether or not they are designed to be interacted with becomes a design challenge; what shall design our systems to listen to? will they give us a sense of our neighbourhood’s health in relation to the rest of the greenbelt?

Given the fertile territory that ecologically responsive planning represents for design-researchers, the aforementioned suite of strategies is set only to expand in both breadth and depth.[28] As this work continues, a new language describing landscape potentials emerges. Instead of singular categorizations of land against binary notions such as rural or urban, natural or artificial, developed or undeveloped, a shifted perspective is proposed; a perspective in which human-centered needs and ecosystem logics coexist to mutual benefit. The built environment is not considered in isolation. Instead, a systemic viewpoint is foregrounded where emphasis is place on the complex weave of interconnections and interdependencies that comprise the environment – both built and unbuilt. In the context of Ontario’s explicitly defined Greenbelt and its implicitly resultant whitebelt, such a shift in perspective is especially timely.

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[27] Böhlen, Marc. Second order ambient intelligence. Journal of Ambient Intelligence and Smart Environments. IOS Press. 2009. Page 4.
[28] Recent publications such as “Performance-oriented Architecture - Rethinking Architecture and the Built Environment” (Hensel, M. 2013. London: AD Wiley) and “Bracket [goes soft]” (Bhatia, Sheppard (eds).2013. Barcelona: Actar) are indications that the research territory is rich and active.

Author’s Biography

Maya Przybylski is a Toronto based designer and educator. She is Assistant Professor at the School of Architecture at the University of Waterloo. Through her teaching and research, Maya is exploring the role of computation in developing ecologically informed design strategies. Maya is a graduate of the Faculty of Architecture, Landscape and Design at the University of Toronto where she was awarded the Royal Architectural Institute Medal for her thesis work on post-oil opportunities for the Caspian Sea. Maya previously earned a degree with a specialization in Software Engineering at the Department of Computer Science at the University of Toronto. Maya has also taught at the University of Toronto and Ryerson University. Through her own practice Maya has collaborated with a range of design practices including: RVTR, Lateral Office, WilliamsonWilliamson, and Bruce Mau Design. In 2008, Maya became a director of InfraNet Lab, a non-profit research collective probing the spatial byproducts of contemporary resource logistics. The Lab’s research into urban infrastructures is published in *Pamphlet Architecture 30* (2010). Maya is co-editor of *On Farming, Bracket 1* (Actar, 2010) and *At Extremes, Bracket 3* (Actar, 2014).

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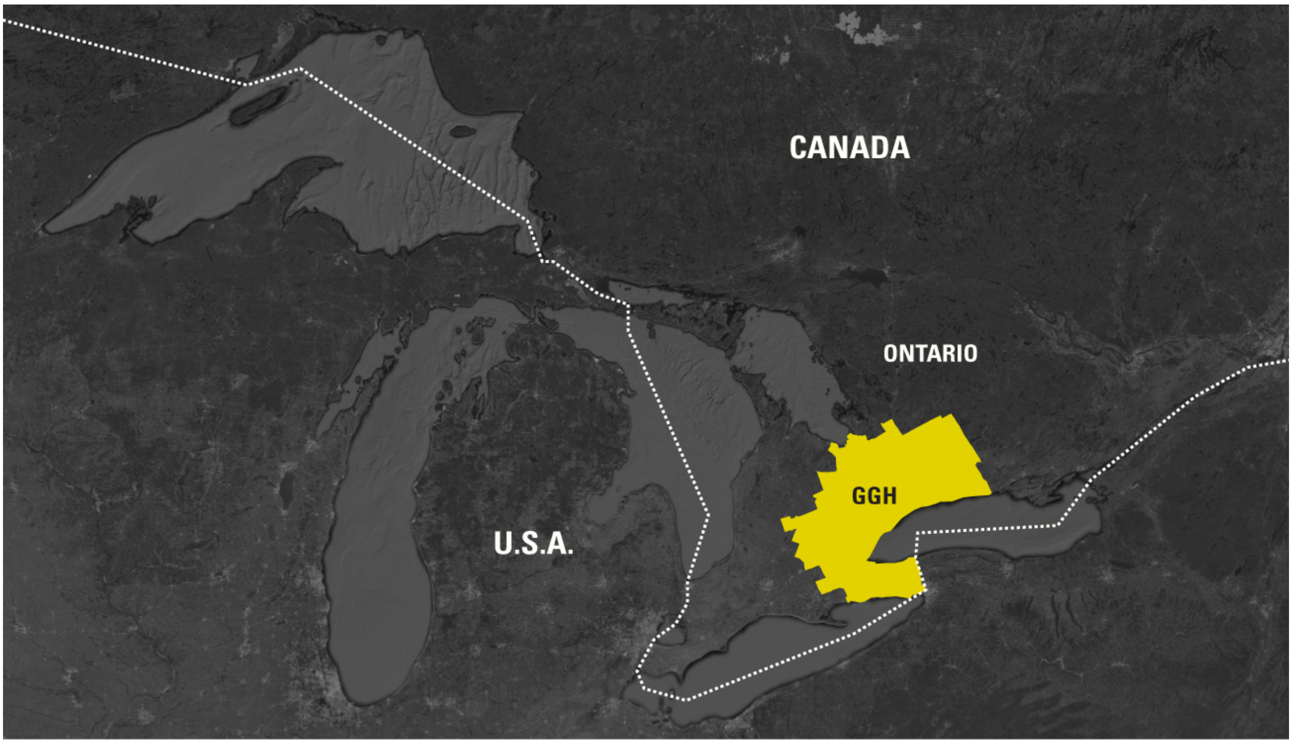

Figure 1: **Greater Golden Horseshoe:** a mega-metropolitan region spanning across most of southwestern Ontario in eastern Canada. The region includes major urban centres such as Toronto and natural features such as the Niagara Escarpment.

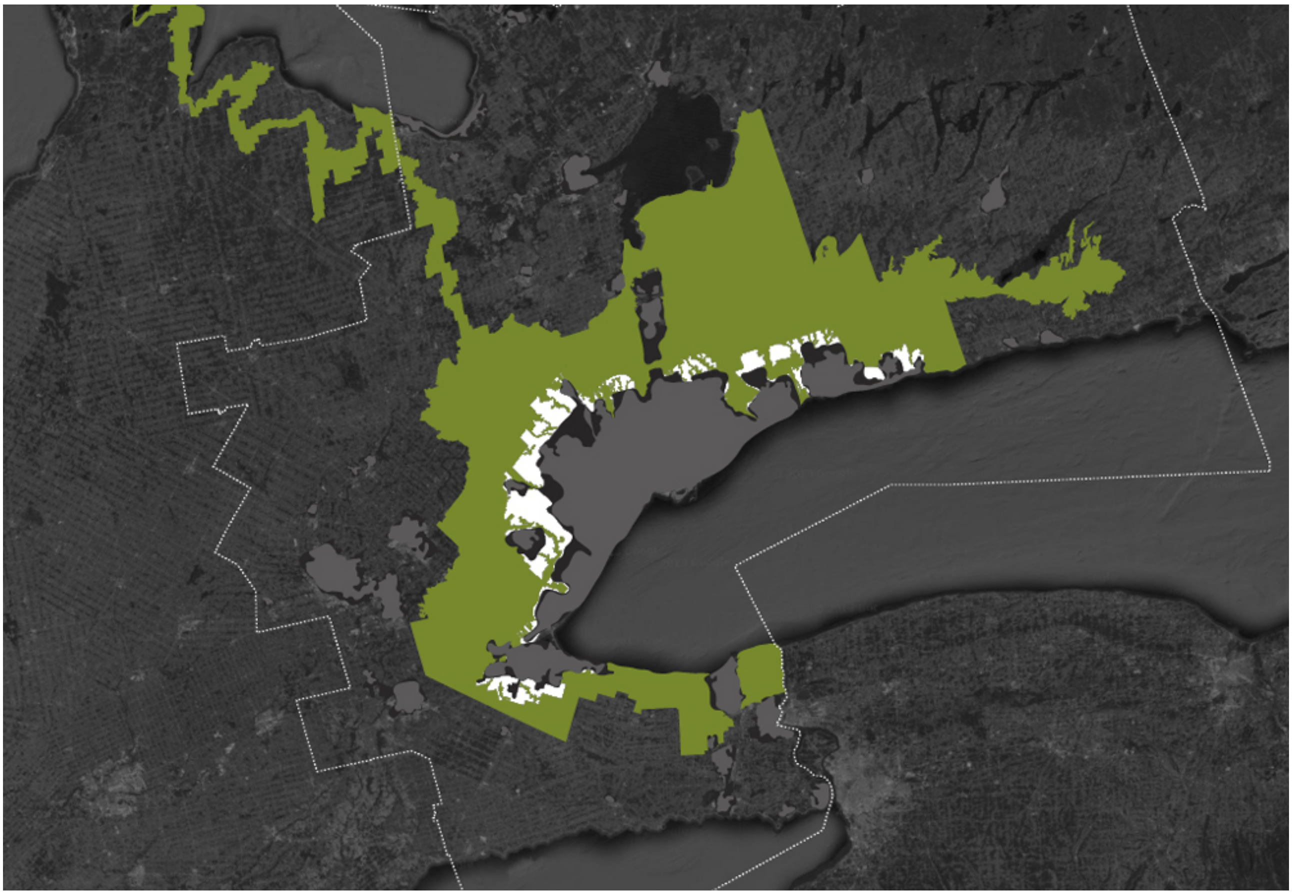

Figure 2: **The whitebelt:** located between the southern boundary of the Greenbelt and northern edges of planned development.