In Defence of Soil

an Ontario Greenbelt Regeneration Strategy

by
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Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Abstract

Ontario's prime agricultural soils are in distress. Degraded by decades of intense conventional agricultural practices and threatened by the advancing footprint of suburban development, the once abundant layer of topsoil has been abused and exploited to produce ever higher yields of commodity crops intended for export overseas instead of for consumption by Ontario communities. As legislation lacks requirements for sustainable farming practices on government owned lands, farmers use harmful agriculture practices to yield the most results during their lease. Located within the Ontario Greenbelt, the Duffins Rouge Agricultural Preserve is an agricultural land area owned by the provincial government where farmers do exactly that. *In Defense of Soil* asks: how could the Duffins Rouge Agricultural Preserve support a repository of exemplary regenerative agricultural knowledge that is specific to Ontario's agricultural landscape, which orients the products of Ontario's farms towards local markets instead of global exports? This thesis realizes Ontario's only designated agricultural preserve has the potential to become a landscape mosaic of healthy, diverse, and aggrading ecosystems that provide energy and life to surrounding communities.

This thesis seeks to explore a series of landscape transformations that increase crop production in combination with practices that restore natural ecosystems. The regenerative strategies used in the design of the agricultural preserve aim to evoke a sense of place which challenges conventional notions of today's degraded rural landscapes—a place which upholds nourishing, ecological, and human-scale farming techniques.

Through drawings, illustrations, maps, and data visualization, this thesis will propose a design for the Duffins Rouge Agricultural Preserve to demonstrate the key regenerative impacts this work could have on the landscape above, the communities nearby, and the soil below. Working to address the needs of both the community and the environment, this vision for the Duffins Rouge Agricultural Preserve exemplifies regenerative agriculture practices for Ontario, advocating for the land itself and we who rely on it.

Acknowledgments

I began this thesis process amid a pandemic, during a time of global uncertainty, and was unsure whether I could start and achieve a master's degree online and in isolation. Yet, with the support from the Waterloo Architecture community, I was able to complete this work with pride and even enjoyment. I am grateful to have been able to carry out my undergraduate degree in the physical realm of the School of Architecture. To have experienced in person the beauty of the Waterloo Architecture community is an extraordinary gift. Although my master's degree was online, I still felt the presence and support of the architecture community, and I am thankful for all those at the school who have helped me in my education.

First and foremost, I would like to thank my supervisor, mentor and friend, Val Rynnimeri. Your online presence, overwhelming support, and expertise provided remarkable contributions to this work, and were valued throughout the duration of this thesis. Thank you for seeing the possibility of this thesis and continuing to propel me forward in the right direction, even when my own confidence wavered.

Thank you to my committee member, Jane Mah Hutton. Your TRD1 studio is where the bones of this thesis were formed, and your support and feedback fundamentally shaped the direction of this work. Although we have never met in person, our virtual meetings have had a profound impact on the way I think and process information. Thank you for your thoughtful suggestions, for asking the tough questions, and for encouraging me to look beyond my comfort zone.

Thank you to my internal reader Rick Andrighetti, for your time and insightful comments, which helped push this thesis over the finish line.

Most notably, thank you to my incredible friends and fellow master's students, Liga and Natalie. Our shared conversations, laughter, bubble tea dates, bike expeditions, and your company in both the physical and virtual realm truly mean the world to me. The success of this thesis would not be possible without you, and I am eternally grateful to have the support of you both.

To Amanda, Christy, Genna, and Tracey, thank you for always being here for me. You have all done your bit in keeping me sane, continuously inspiring me, and making me smile throughout the many years of our shared education experiences.

To the voices who shared their stories at the 2021 Living Soils Symposium virtual event, thank you for helping the global audience understand the transformative power of our hands in regenerating our agricultural lands. Every speaker at the event demonstrated how both individual and community actions can inspire change. This thesis is indebted to the physical labour of love you pour into your landscapes.

Last but not least, thank you to my family who have continuously believed in me and supported me from the beginning. To my parents, Alan and Anne, thank you for your unwavering love, support, and encouragement along the way. The hard work you both demonstrate every single day continues to inspire me, and I hope that the values you have instilled in me shine through in this thesis. To my siblings, Chloe and Thomas, I am very thankful to be able to call you both my best friends and to always be able to look to you for guidance. To my remarkable grandmothers, May and Violet, thank you for leading me towards creativity, and for demonstrating courage even when the path ahead seems difficult and uncertain.

Land Acknowledgment

As my thesis begins with the land, I'd first like to acknowledge the Indigenous lands, waters and peoples of the territory that the University of Waterloo occupies. The School of Architecture is situated on the Haldimand tract, stretching out to include 10 kilometres on each side of the Grand River, the land promised to the Haudenosaunee of the Six Nations of the Grand River and the traditional territories of the Neutral, Anishinaabe, and Haudenosaunee.

My research takes place on agriculture lands in Pickering, Ontario. Pickering resides on land within the Treaty and traditional territory of the Mississaugas of Scugog Island First Nation and Williams Treaties signatories of the Mississauga and Chippewa Nations.

This work focuses on the impact of settler agriculture and urbanization on the land and soil. Settler developments have caused harm and dispossession to Indigenous peoples who still occupy this land; and have resulted in polluted ecosystems, and mass deforestation, while exploiting the land, soil, and people who work with it.

This thesis recognizes that these extractive land practices are built on the oppression and exploitation of Indigenous, Black, and People of Colour's bodies by colonial practices and systems. I hope to engage these communities with my research, and I stand in solidarity with the ongoing Indigenous-led work to decolonize this land. In understanding that we need to dismantle the intersecting colonial systems which devalue land, we can work towards healing our landscapes.

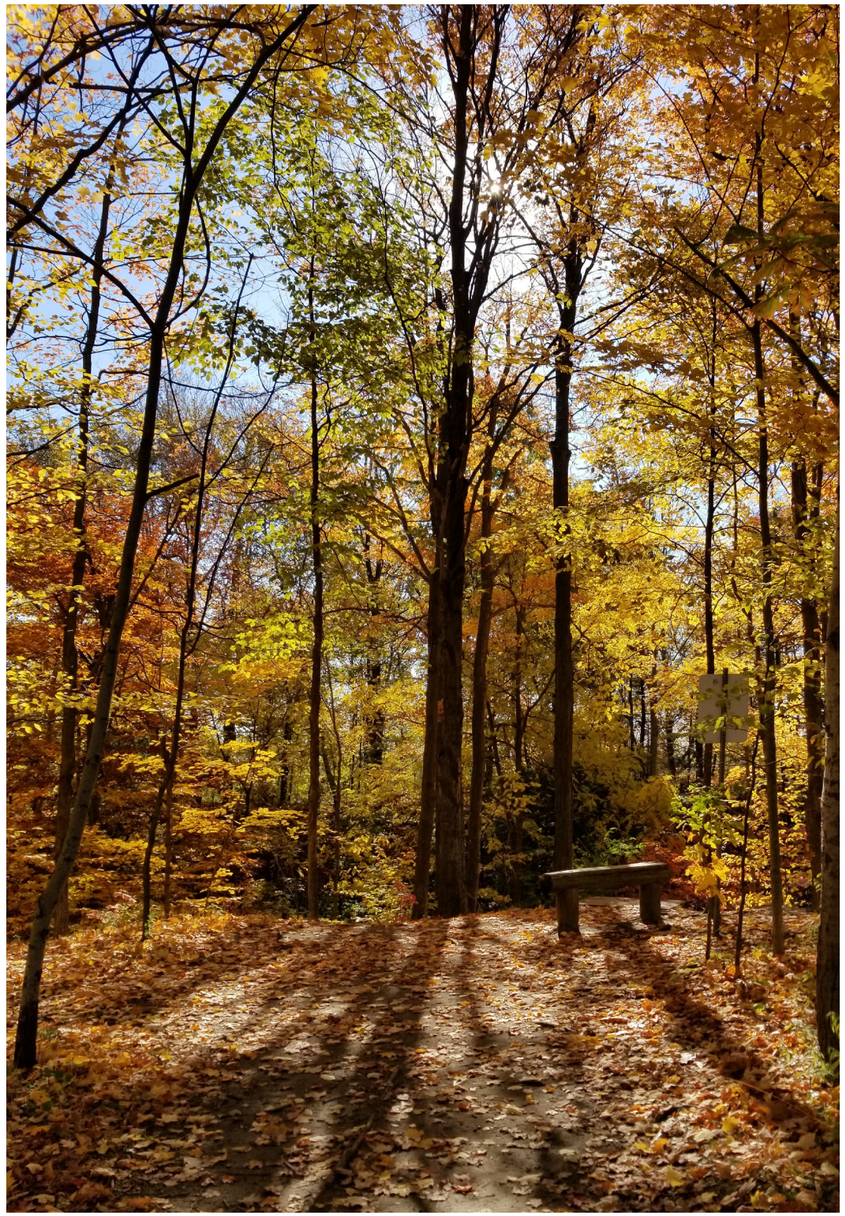

Figure i *Bench located along Seaton hiking trail, in Pickering, ON.*

Dedication

In dedication
to Mother Earth,
for all she provides.

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Introduction

In Defense of Soil presents a study of land use and farming methods that are practiced in the Southern Ontario rural landscape. It reveals the damaging impacts on environments, ecosystems, and soils from conventional agricultural practices and urban development. This thesis then proposes a design intervention to restore agricultural landscapes in Southern Ontario. It rejects the current practices used in modern agriculture, and instead explores how design can combine regenerative agriculture with landscape infrastructure to build resilient environments for future generations.

It uses the Duffins Rouge Agricultural Preserve as a demonstration site for such methods. Of the 5,200 provincially owned acres of land in the preserve, more than 75% is dominated by monoculture fields, which produce grains destined for animal feed, global exports, and ethanol use. Laden with toxic soil amendments and poisonous dust from denatured topsoil, the fields contaminate Ontario watersheds and destroy essential ecosystems. In the absence of any definitive provincial government policy in the last five decades, farmers in the agricultural preserve continue to use degrading agriculture practices to yield the most results during their lease.

Located within the Ontario Greenbelt, Ontario's only designated agricultural preserve has the potential to become a landscape mosaic of healthy, diverse, and aggrading ecosystems that provide energy and life to surrounding communities. The thesis asks, how could the Duffins Rouge Agricultural Preserve support a repository of exemplary regenerative agricultural knowledge that is specific to Ontario's agricultural landscape, which orients the products of Ontario's agriculture towards local markets instead of global exports? The design proposal addresses this question by combining a set of solutions that reduce the harsh environmental impact of conventional agriculture practices on the site and external regions. Instead, these solutions will restore and diversify the existing agricultural lands. It reveals how these methods generate ecological and community resilience in a changing climate. The agricultural preserve, as a site of collaborative practice, would involve leaders from government organizations, local Indigenous groups, farmers, community members, and researchers to weave together local knowledge of the land and address the damage caused by outmoded farming practices. By increasing public access and fostering community connection, this design aims to connect neighbouring communities with local farmland.

Bagged garden soil

Conventional farm soil

Organic orchard soil

Floodplain soil

Figure ii *Soil samples collected in Pickering, ON.*

This thesis is structured into five parts, first breaking down the research behind the design, then detailing the design itself. *Part One: Understanding Soil* provides the groundwork that supports the research and design. The thesis positions fertile soil conservation as the focus for the research. It highlights the importance of healthy soil preservation and examines the impact on soil health from human interactions with the landscape. This section explains, in depth, the impact soil has on food systems, ecosystems, and its role in the fight against the climate crisis. It then uncovers the impact humans have on soil health with our agriculture and development practices. The research covered in this section serves to justify the focal point of this thesis.

Part Two: The Southern Ontario Agricultural Landscape uncovers the significance of Southern Ontario's agricultural lands in relation to Canada's largest metropolitan area. This section delves into understanding the unique position of the Ontario Greenbelt. It compares the soils in the Greenbelt to other agricultural soils in Canada. It also reveals the demand for development into the Greenbelt and the resulting consequences should development be allowed. The objective is to understand the potential of the Ontario Greenbelt in providing for the Greater Toronto Hamilton Area (GTHA), and the need to protect the land for agricultural uses in perpetuity.

Part Three: A Site With Potential introduces the site chosen for the thesis design experiment and implementation. The Duffins Rouge Agricultural Preserve is a permanently protected agricultural land area located in Pickering, Ontario. The lands are identified as Prime Agricultural Lands and are protected under the Conservation Land Act for agricultural uses in perpetuity. This section reveals the history and the unique position of the site. It includes an elaborate site analysis, completed through a series of plans, maps, photographs, and illustrations. It exposes the conditions of the site that are contributing to land degradation and identifies potential areas for improvement. The findings in the site analysis support the thesis argument which calls for implementing policies that outline regenerative agriculture practices to restore soil health and support local communities.

Part Four: Design Development proposes new guidelines and policies for the Duffins Rouge Agricultural Preserve. Policies for the area will be informed by key actors who are knowledgeable in a variety of practices that repair landscapes and build community engagement. These policies will be advised by community members and will respond to their needs. A stewardship guide for the Agricultural Preserve will be created from

the amalgamation of knowledge from the key actors. It will put both the health of the environment and the heart of the community at the centre of its vision.

The proposal is site-specific, responding to the site's ecologies, and creates areas that allow communities to have direct interactions with the agricultural lands. It incorporates landscape design elements into the Agricultural Preserve, with spaces for people to interact more closely with their food systems. This will empower surrounding communities to invest in and engage with their productive landscapes. Hopefully, this inspires them to enforce protections of other agricultural lands and ask for changes in land practices.

Finally, in *Part Five: Design Implementation*, the practices outlined in the stewardship guide are put into practice. Drawings and visualizations imagine a system of land relationships and conditions that are reactive to the immediate landscape. These conditions will work to restore soil health and ecosystems, while producing food for local communities. This system design is responsive to natural conditions that exist across the site, and in similar agricultural lands that occur in the larger scale of the Ontario Greenbelt. Therefore, these regenerative methods can be scalable and applicable to areas outside of the Agricultural Preserve. The proposal also includes landscape installments and architectural elements such as trails, signs, pavilions, and buildings, to move people through the site, to provide spaces for gathering, and to allow people to engage with the land.

In analyzing the profound impacts humans have on soil health and ecosystems in the Ontario Greenbelt, *In Defense of Soil* reveals the immediate need to transition away from common agriculture methods used in the Southern Ontario rural landscape. The thesis focuses on the importance of community involvement when striving to transform food-based systems that harm the environment. It aims to establish practices that build resiliency in landscapes, to engage communities in the recovery of land, and to create a landscape that is inclusive of all living beings.

Lexicon

A few terms require definition, to clearly convey my meaning and intent to any reader. All definitions sourced from the Merriam-Webster dictionary unless otherwise cited.

Particular to Soil:

Aggradation (noun)

a modification of the earth's surface in the direction of uniformity of grade by deposition

Biodiversity (noun)

the degree of variation of life at all biological levels starting from cellular level up to plants and animals [1]

Carbon Sequestration (noun)

a process in which CO2 is removed from the atmosphere and stored in the soil carbon pool[2]

Degradation (noun)

the decline in the soil's productivity through adverse changes in nutrient status and soil organic matter, structural attributes, and concentrations of electrolytes and toxic chemicals[3]

Erosion (verb)

the removal of soil from the land's surface by water, wind, ice, or gravity[4]

Heavy Metals (noun)

1. *constitute an ill-defined group of inorganic chemical hazards*
2. *do not undergo microbial or chemical degradation, their total concentration in soils persists for a long time after their introduction*[5]

Microbiome (noun)

a community of microorganisms (such as bacteria, fungi, and viruses) that inhabit a particular environment

Phytoremediation

the treatment of pollutants or waste (as in contaminated soil or groundwater) by the use of green plants that remove, degrade, or stabilize the undesirable substances (such as toxic metals)

Soil Structure (noun)

the aggregation, or secondary shape, of soil particles which adhere together into structural units (peds) [6]

General terminology:

Community (noun)

2. *a unified body of individuals: such as the people with common interests living in a particular area broadly : the area itself*
2. *a social state or condition*

Cultivate (verb)

1. *to prepare and use (soil) for growing plants*
2. *to grow and care for (plants)*

Ecotone (noun)

a transition area between two adjacent ecological communities

Regenerate (adjective)

1. *formed or created again*
2. *restored to a better, higher, or more worthy state*

Resiliency (noun)

an ability to recover from or adjust easily to adversity or change

Stewardship (noun)

the careful and responsible management of something entrusted to one's care

Wetland (noun)

and or areas (such as marshes or swamps) that are covered often intermittently with shallow water or have soil saturated with moisture

Endnotes

1 Miroslav Kutílek and Donald R. Nielsen, *Soil : The Skin of the Planet Earth* (Dordrecht: Springer, 2015).

2 Todd A. Ontl and Lisa A. Schulte, "Soil Carbon Storage," *Nature Education Knowledge*, no. 3(10):35 (2012). https://www.nature.com/scitable/knowledge/library/soil-carbon-storage-84223790/.

3 B. A. Stewart and R. Lal, *Advances in Soil Science. Volume 11, Soil Degradation*, 1st ed. (New York: Springer-Verlag, 1990). doi:10.1007/978-1-4612-3322-0.

4 Sanjai J. Parikh and Bruce R. James, "Soil: The Foundation of Agriculture," *Nature Education Knowledge*, no. 3(10):2 (2012). https://www.nature.com/scitable/knowledge/library/soil-the-foundation-of-agriculture-84224268/#:~:text=soil%20organic%20matter%3A%20The%20organic,stable%20biomass%20fraction%20(humus).

5 Raymond A. Wuana and Felix E. Okieimen, "Heavy Metals in Contaminated Soils: A Review of Sources, Chemistry, Risks and Best Available Strategies for Remediation," *ISRN Ecology* 2011 (2011), 402647. doi:10.5402/2011/402647. https://doi.org/10.5402/2011/402647.

6 Parikh, "Soil: The Foundation of Agriculture."

01

Part One:

Understanding Soil

"We stand, in most places on earth, only six inches from desolation, for that is the thickness of the topsoil upon which the entire life of the planet depends"

- R. Neil Sampson

An Introduction to Soil

The focal point of this thesis revolves around the importance of Soil. Soil has been described in some cultures as the skin of the Earth, and in others as black gold.[1] These descriptions depict how valuable soil really is. Although it is a thin veil that covers the surface of land, "it has the power to shape our planet's destiny".[2] Earth's skin works to protect and ensure all forms of life on each continent of the planet.[3] Soils are "vast ecosystems that support all agriculture and every single terrestrial biome,"[4] by providing "plants with physical support, water, nutrients, and air for growth."[5] Soil has the ability to combat climate change and sequester carbon from the atmosphere. Soils that store large amounts of carbon are healthier and more fertile.

For soils to be healthy and fertile, the presence of two upper layers, also known as soil horizons, are crucial. The first soil horizon is Humus. It is considered a living substance and is the product of a healthy decomposition of plant and animal matter decay.[6] This dark layer contains necessary nutrients, fungi and organisms that plants need to survive – nitrogen being the most notable nutrient. Nitrogen is crucial to life, acting as the "key substance that limits the primary productivity of the plant kingdom".[7] Bacteria in the Humus layer "fix" nitrogen, transforming it from atmospheric nitrogen gas - which plants cannot take advantage of - into ammonia (NH_3). Only after this conversion is NH_3 able to be transported into plants.[8]

Topsoil is the next layer below Humus. It is the horizon where plants grow their roots to get the most nutrients. Ninety-five percent (95%) of the world's food is grown in this layer of soil, making topsoil one of the most important components of the planet's food system.[9]

Healthy soils also act as water storage systems. The healthier the soil, the higher the available water holding capacity.[10] This allows soil to retain large amounts of water during periods of high precipitation, helping to mitigate floods. Their holding systems also allow them to provide water to plants during times of drought.

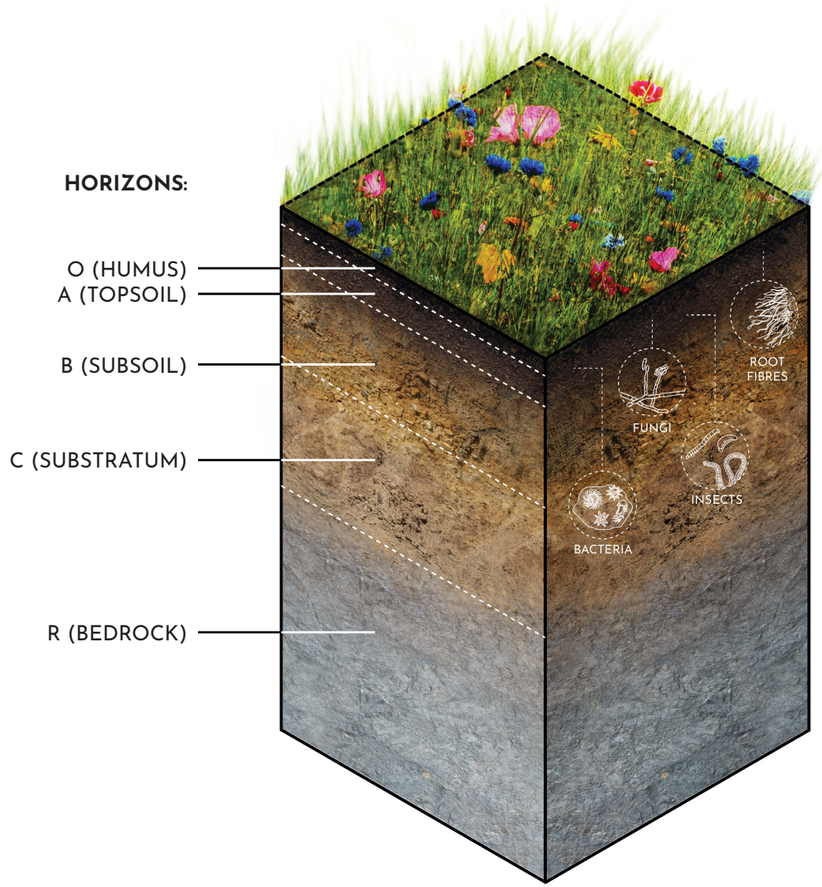


Figure 1.1 *Fertile soil isometric.*

As proven, preservation of soil health and maintenance of the fertile top layers are essential for the sustainable development of agriculture, however, a variety of human actions are having direct consequences on soil health, especially affecting the presence of topsoil. Two types of actions in particular are have the most impact on fertile soils: agriculture and development.

Agriculture's Impact on Soil

Healthy agricultural lands act as pillars to today's societies, yet conventional agricultural practices destroy productive landscapes by degrading healthy, fertile soils. In the book *Agroecology: The Ecology of Sustainable Food Systems, Second Edition*, author Stephen R. Gliessman states that

> "Conventional agriculture is built around two related goals: the maximization of production and the maximization of profit. In pursuit of these goals, a host of practices have been developed without regard for their unintended, long-term consequences and without consideration of the ecological dynamics of agroecosystems."[11]

Agriculture is asserted to be the most significant way humans have impacted the planet, primarily from six basic practices which act as the foundation for modern agriculture.[12] Intensive tillage, monoculture, irrigation, application of inorganic fertilizer, chemical pest control, and genetic manipulation of crop plants are "each used for its individual contribution to productivity, but as a whole the practices form a system in which each depends on the others and reinforces the necessity of using the others."[13]

To till the soil means to dig, stir, and overturn the soil.[14] It is a common practice in conventional agriculture. Tillage practices are done to prepare the soil for seeding, weed suppression, soil aeration, and to incorporate fertilizer deeper underground.[15] However, tillage actually fractures the soil. It disrupts or destroys the soil structure and opens up aggregates that were otherwise protected, resulting in topsoil erosion during surface runoff.[16] For the designers of the built environment that are not familiar with farming practices, author Zach Loeks describes in architectural terms how tillage impacts the soil. In his book *The Permaculture Market Garden – A visual guide to a profitable whole-systems farm business*, he describes the common practice of aggressive tillage is akin to taking a city and flipping it over, smashing it, raking it out and blending it, then asking the people, buildings, and infrastructure systems to function as usual for the communities that

Figure 1.2 *Agricultural fields in Pickering, ON.*

depend on them.[17] Here, he is comparing the people to soil organisms, the buildings to soil aggregates, and the infrastructure systems to the nutrients, water, and air cycles.[18] The dependent communities are analogous to the crops and plants grown from the soil. This analogy presents the disturbed soil as an extremely hostile and uninhabitable environment for the continuation of life. Soil disturbance from tillage is widely believed to "the primary cause of historical loss of soil organic carbon".[19]

Monoculture planting, a typical planting strategy used in conventional agriculture, also leads to soil degradation. Monoculture production farms grow one crop type at a time in specific fields. This type of planting method is used for its increased efficiency in planting and harvest. "Monocropping" refers to continuous monoculture, "where the same species is grown year after year, [and] can lead to unsustainable environments such as building up disease pressure and reducing particular nutrients in the soil."[20] This practice has been criticized for its environmental impacts, and "has been implicated in the loss of nutrients from the soil."[21]

Monoculture practices are often paired with fertilizers, manures, and pesticides to increase crop productivity.[22] The use of these soil amendments can contribute to the accumulation of heavy metals in soils.[23] For instance, using pesticides that contain arsenic can result in the accumulation of high arsenic levels in orchard soils. Arsenic in soils can persist for decades, and high amounts of arsenic exposure can be fatal.[24] Organic chemicals can also lead to serious soil contamination problems. They are introduced during the "agricultural application of herbicides, insecticides, and nematicides."[25] These organic chemicals will "resist decomposition in the environment and bioaccumulate as they move up the food chain," disrupting bodily systems once they enter the bodies of mammals and birds.[26]

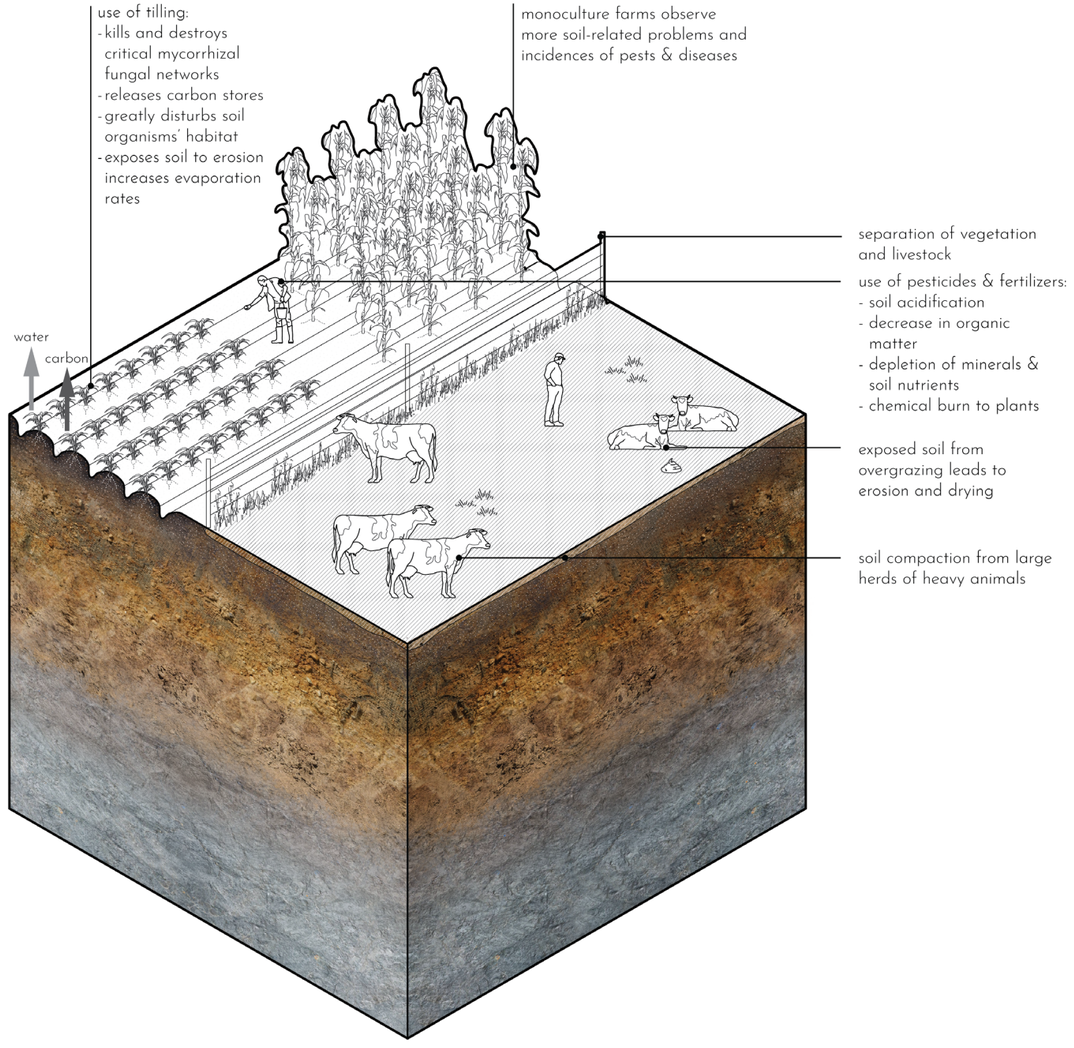


Figure 1.3 *Conventional agricultural isometric.*

Soil Degradation and Desertification

Agricultural lands have become places of exploitation. Monocultures, machinery, and soil amendments are introduced to increase the scale of food production. Soil starts to be viewed as a commodity, worked until no longer considered fertile and productive—ready to be paved over with development. The demand and strain on agricultural lands is a leading cause of degraded soils.

Soil degradation occurs when soil experiences a decline in the physical, chemical, and biological qualities, which diminishes its capability to support life and growth. [27] This results in the loss of organic matter, the decline in soil fertility, and the deterioration of the structural condition.[28] Changes in soil's structural conditions can make soil impermeable to water, negatively affecting the growing conditions for plants, and resulting in mass flooding and/or drought.[29]

These forms of soil degradation result in soil erosion. In North America, "soil is lost to wind and water erosion at the rate of 5-10 tons per hectare per year".[30] In comparison, "soil is created at the rate of about 1 ton per hectare per year".[31] The soil lost during erosion "is rich in organic matter, the most valuable soil component."[32] As the supply of agricultural soil is finite, and because natural processes can't restore and build soil faster than the rate of degradation, "agriculture cannot be sustainable until it can reverse the process of soil degradation."[33] The UN projects that if current rates of degradation continue, the global supply of topsoil could be gone within 60 years.[34] When large areas of soil reach a permanent degraded state, the landscape experiences desertification. Desertification can severely reduce land productivity, causing degradation of the ecosystem, and its associated ecosystem services.[35]

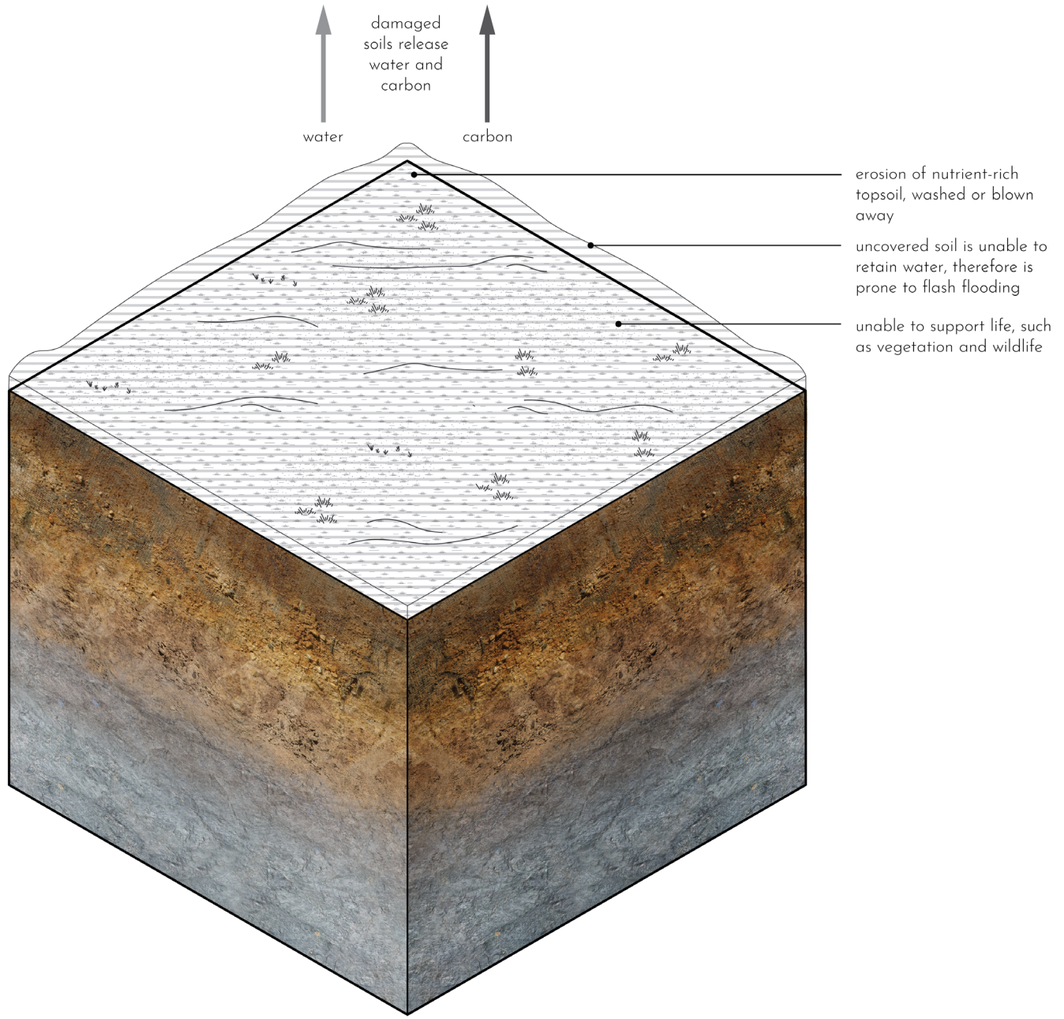


Figure 1.4 *Desertification isometric.*

Development on Fertile Soils

Additionally, development on fertile soils causes irreparable damage to the health of the soils and surrounding ecosystems. This is a result of conventional construction practices, starting with the stripping of a site's topsoil. Developers remove this first layer of soil to prepare for roadbeds, sewer lines and building footprints. After the topsoil is stripped from the ground, excavation occurs, creating pits for houses and their foundations. During the construction of these houses, the surrounding landscape gets severely compacted.[36] This is a consequence of the heavy machinery and trucks moving through the site. The resulting compacted ground has a deteriorated soil structure which inhibits the growth of plants after construction is completed. Developers try to alleviate this problem by re-covering the ground with topsoil, however plants struggle to survive as their roots are unable to dig and grow deep into the ground.[37]

The construction of these development sites results in the excavation of subsoils. These subsoils are used as back fill around buildings or to even out the ground condition for new roadways, but the majority of excavated soil is left as piles in the landscape, as shown in Figure 1.5.

These large piles become a nuisance to developers, requiring transportation to move soil piles from the site and disposed of elsewhere.[38] Legitimate sites exist for subsoil waste but are expensive for developers. Instead, developers will often look for a cheaper alternative. Regularly, they will pay cash to organized crime groups to move the soil from the site, creating a black market of soil.[39]

Figure 1.5 *Soil pile from excavation in the Seaton development lands.*

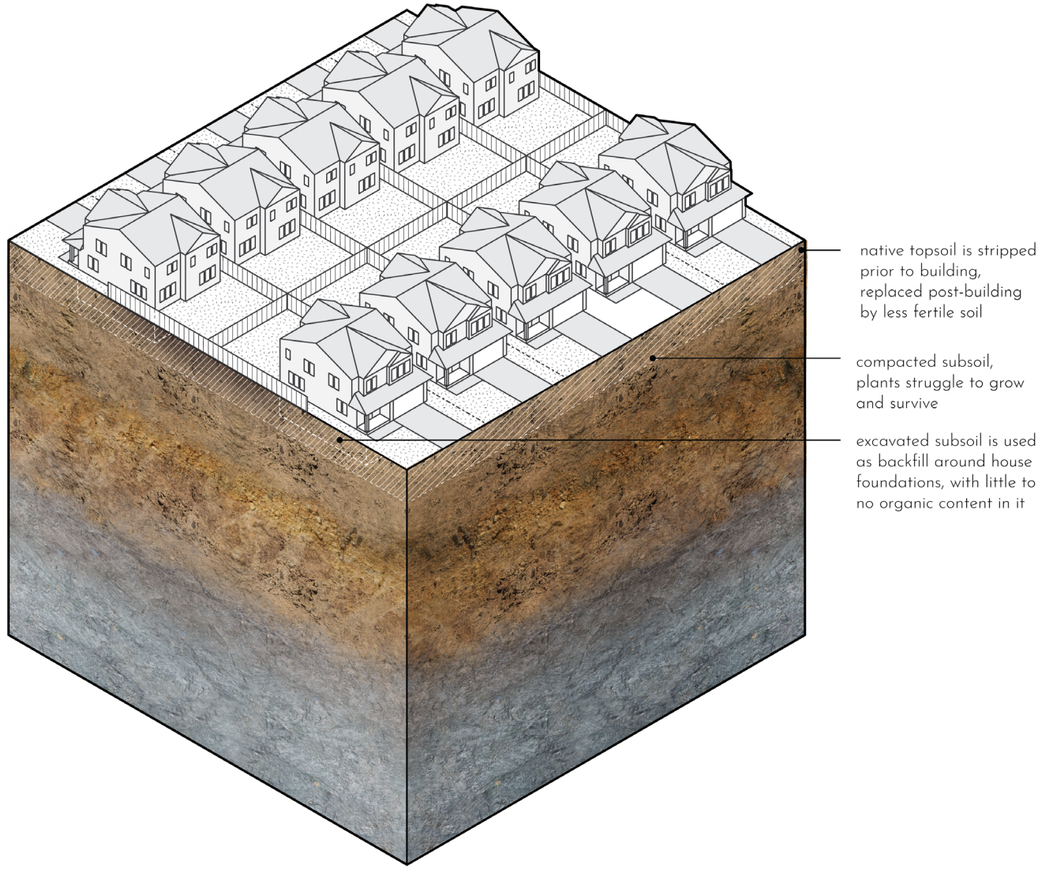
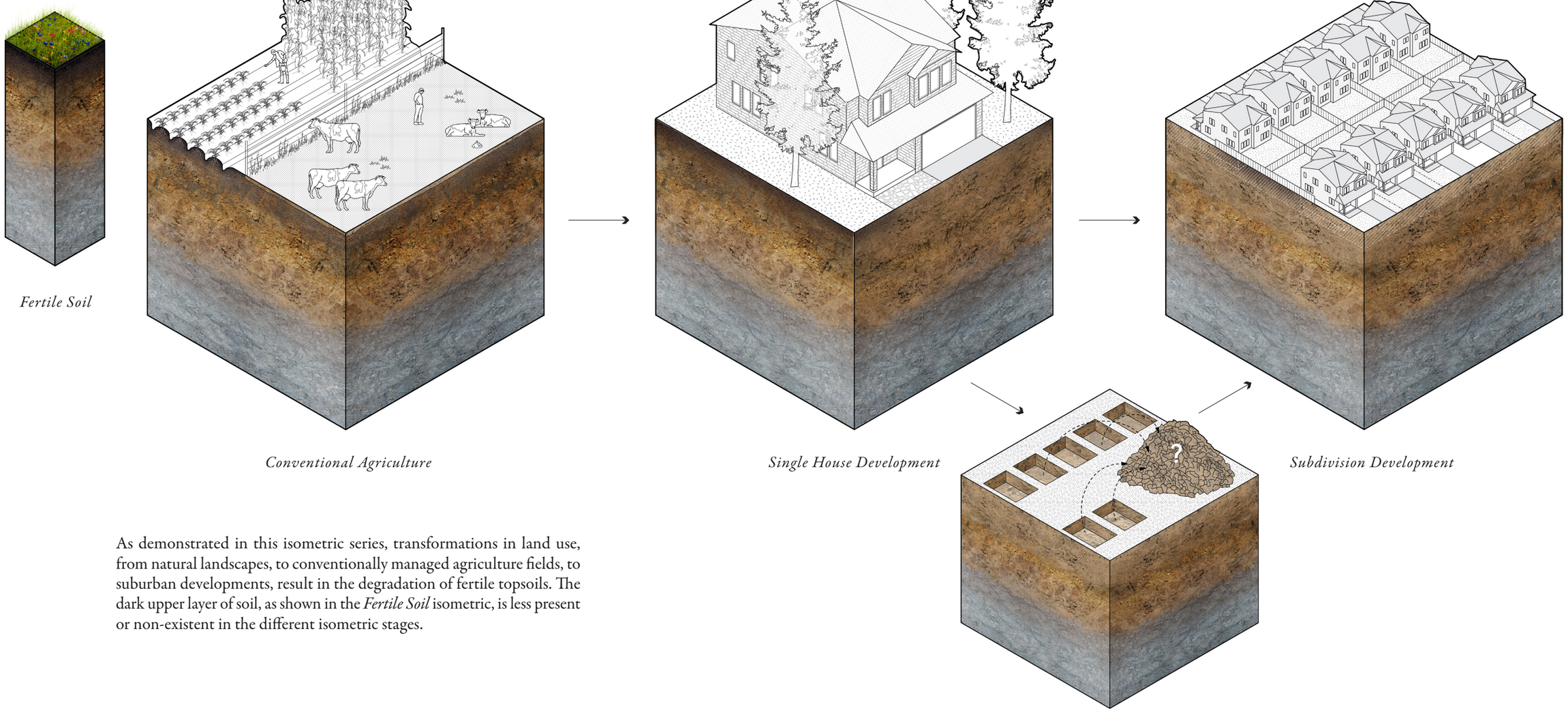


Figure 1.6 *Suburban development isometric.*



As demonstrated in this isometric series, transformations in land use, from natural landscapes, to conventionally managed agriculture fields, to suburban developments, result in the degradation of fertile topsoils. The dark upper layer of soil, as shown in the *Fertile Soil* isometric, is less present or non-existent in the different isometric stages.

Figure 1.7 *Isometric series of change in land use.*

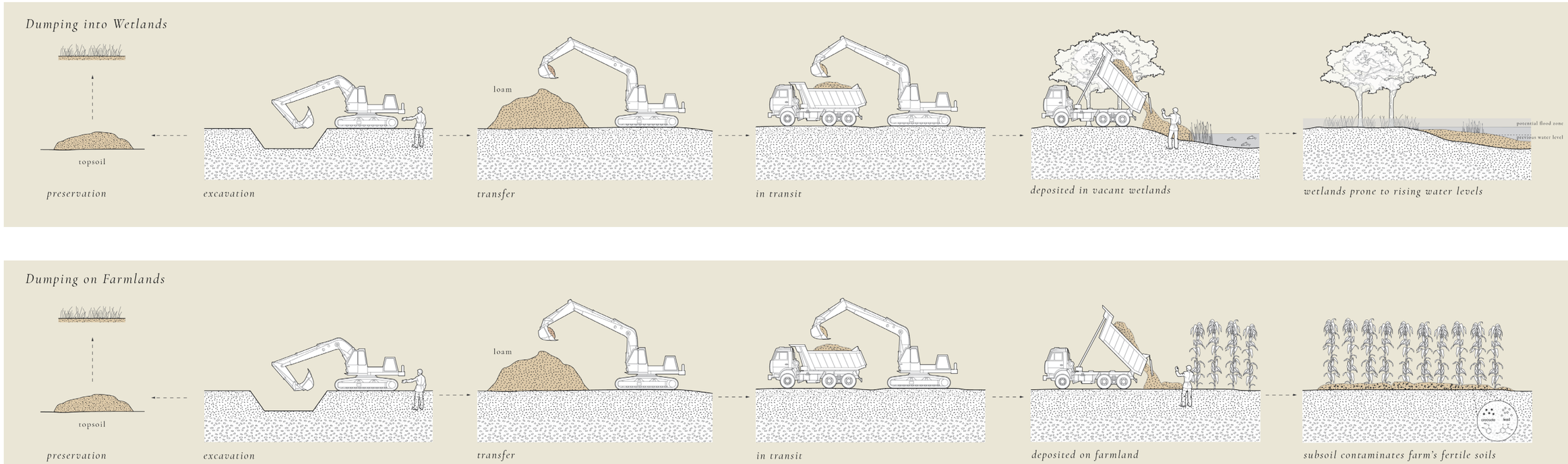


Figure 1.8 *Movement of excavated soil illustration.*

The excavated soils can be contaminated with heavy metals and pollutants. These groups will dump the soils into vacant wetlands or pay farmers and landowners to accept truckloads of soil (Figure 1.8). The dumping of excess subsoils into wetlands can destroy environmental conditions of the wetlands and watersheds, creating contamination problems, and increasing the risk of serious floods for the floodplain.[40] When dumped onto farmland, the soil risks contaminating the existing fertile soils, potentially jeopardizing the food supply grown from the land.[41]

Restoring Soils

There are a variety of methods that do not degrade soils and ecosystems, and instead restore them. This thesis focuses on regenerative agriculture practices—agriculture practices that are used with the intention to restore and build soils to a fertile state. There are a range of practices in regenerative agriculture, all which restore and build soils to fertile levels.

According to Gabe Brown, a regenerative farmer and pioneer for the soil health movement, there are five basic practices of regenerative agriculture that work to restore soil health.[42]

5 Practices of Regenerative Agriculture:

1. keep soil covered
2. limit soil disturbance
3. build crop diversity
4. maintain living roots in the ground year-round
5. integrate livestock

Regenerative agricultural practices follow nature's lead, increasing plant biodiversity, and use rotation and cover crops to protect the soil from erosion.[43] It is an ecological approach to farming that enables landscapes to renew themselves. Regenerative agriculture practices do not till and or use soil amendments that might disrupt the natural relationship in the microbiome. Regenerative agriculture enhances and sustains the health of the soil with the restoration of its carbon content which improves productivity—the opposite of conventional agriculture.[44] Improving soil health increases an agriculture field's resilience to the fluctuations to the fluctuations of a changing climate.[45]

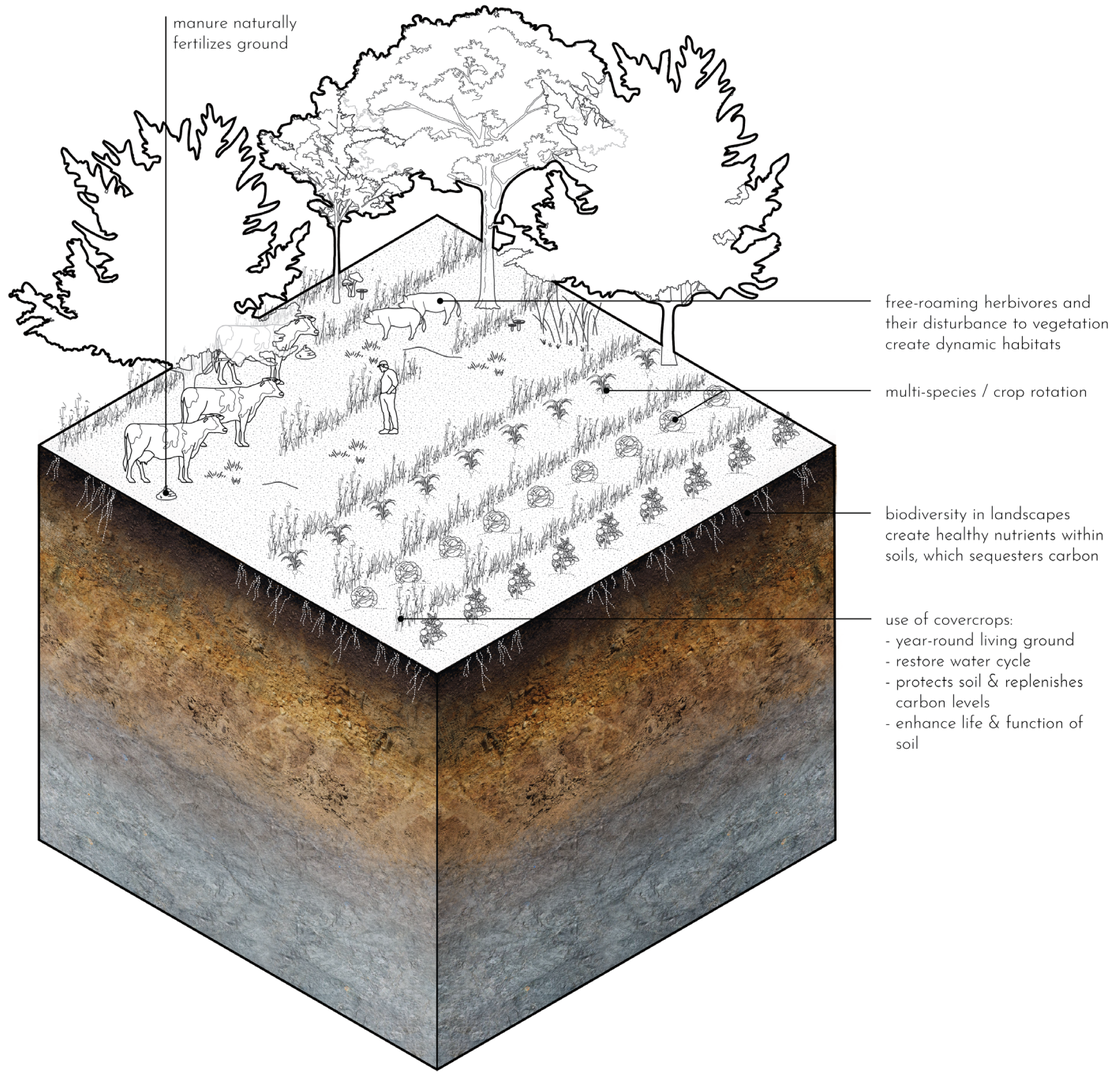


Figure 1.9 *Regenerative agriculture isometric.*

Proof of Practice

To demonstrate the restorative effects of regenerative agriculture, a Brazilian farmer conducted a trial on his farmland. For 40 years, he practiced conventional agriculture on his land. However, after discovering regenerative practices, he transitioned away from conventional practices. In 2008, he started intercropping, cover cropping, and limited the use of fertilizers. His crops were planted after harvest, without a break, so that a crop was always growing. After 4.5 years of these practices, Japanese researchers conduced a survey to evaluate the effects.[46] They compared his farm to the neighbouring farm (understood as the control group) which continued to practice conventional agriculture. Comparison images in Figure 1.10 show the difference in fertile soil growth and crop practices above ground. In 4.5 years, the fertile soil layer increased by 7cm, and the aggregates formed up to 29cm in thickness. Results concluded that his regenerative agriculture method "remediates soil degradation, and improves food production."[47]

In my personal journey to learn more about regenerative agriculture, I attended the week-long Living Soils Symposium hosted by Regeneration Canada in February of 2021. Hundreds of global attendees and speakers came together online to tell their regenerative stories. During this symposium, I learned that regenerative practices, such as composting, diversifying horticulture, cover cropping, and no till agriculture, have been ongoing for thousands of years, passed down through generations by Black and Indigenous farmers. Many speakers emphasized the fact that the term regenerative is a rebrand of Black and Indigenous people's practices. They repeated how important it is to remember that these practices should not be viewed as temporary trends, but as an intentional movement with the motive of the people as a solution to the oppressive industrial agriculture system that currently exists. They explained how regenerative agriculture that works within a productionist mindset still works to exploit the land.

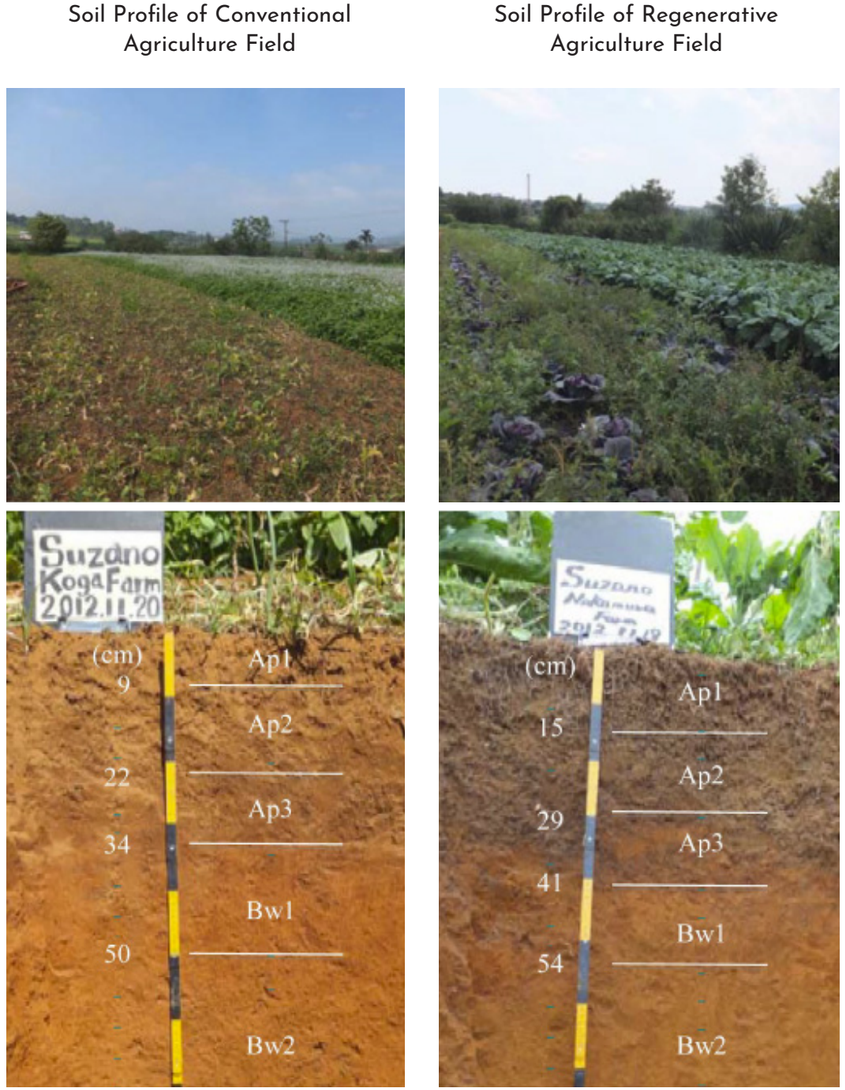


Figure 1.10 *Comparison of soil profiles from neighbouring Brazilian farms.*

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Part Two:

02 The Southern Ontario Agricultural Landscape

Southern Ontario Soils

Southern Ontario's agricultural lands are composed of some of the most fertile soils suitable for growth in Canada. The Government of Ontario follows the soil classification of the Canada Land Inventory (CLI). The CLI system distinguishes soils into seven capability classes, descending in quality from Class 1, the highest, to Class 7 soils, which have no agricultural capability for the common field crops.[1] Soil maps created for the Southern Ontario region identify the area surrounding the Greater Toronto Hamilton Region (GTHA) as almost exclusively Class 1 soil, with Southern Ontario having 50% of all of Canada's Class 1 soils.[2] The government recognizes Class 1 soils as having no significant limitations in use for crops and classify the lands as Prime Agricultural Lands.[3] When managed properly, they are "high in productivity for a wide range of common field crops."[4]

Two million acres of these Prime Agricultural Lands are protected within the boundary of the Greenbelt.[5] The Ontario Greenbelt is a permanently protected area, preventing urban development on environmentally sensitive land. It is the largest protected Greenbelt in the world and more productive than others in North America and Europe.[6] It encircles the built regions of the GTHA, home to Canada's largest population. The David Suzuki Foundation describes the Greenbelt as a world of wonder, "heavily populated by a diverse web of life made up of plants, animals and other life forms, each connecting and contributing to the function and health of the area."[7] The Greenbelt's soils work to purify water and air, provide food, and allow life to flourish in the GTHA.

Located within the Greenbelt is one of Ontario's most significant landforms that controls the water systems for Southern Ontario, the Oak Ridges Moraine. The Moraine is an irregular ridge that stretches 160 kilometres, running north of and parallel to Lake Ontario.[8] As described in the *Oak Ridges Moraine Conservation Plan (2017),*

> "The moraine divides the watersheds draining south into western Lake Ontario, from those draining north into Georgian Bay, Lake Simcoe and the Trent River System. The Moraine shapes the present and future form and structure of the Greater Toronto region (GTA), and its ecological functions are critical to the region's continuing health. The Moraine has a unique concentration of environmental, geological and hydrological features that make its ecosystem vital to south-central Ontario,

Figure 2.1 *Ontario Greenbelt with Toronto skyline.*

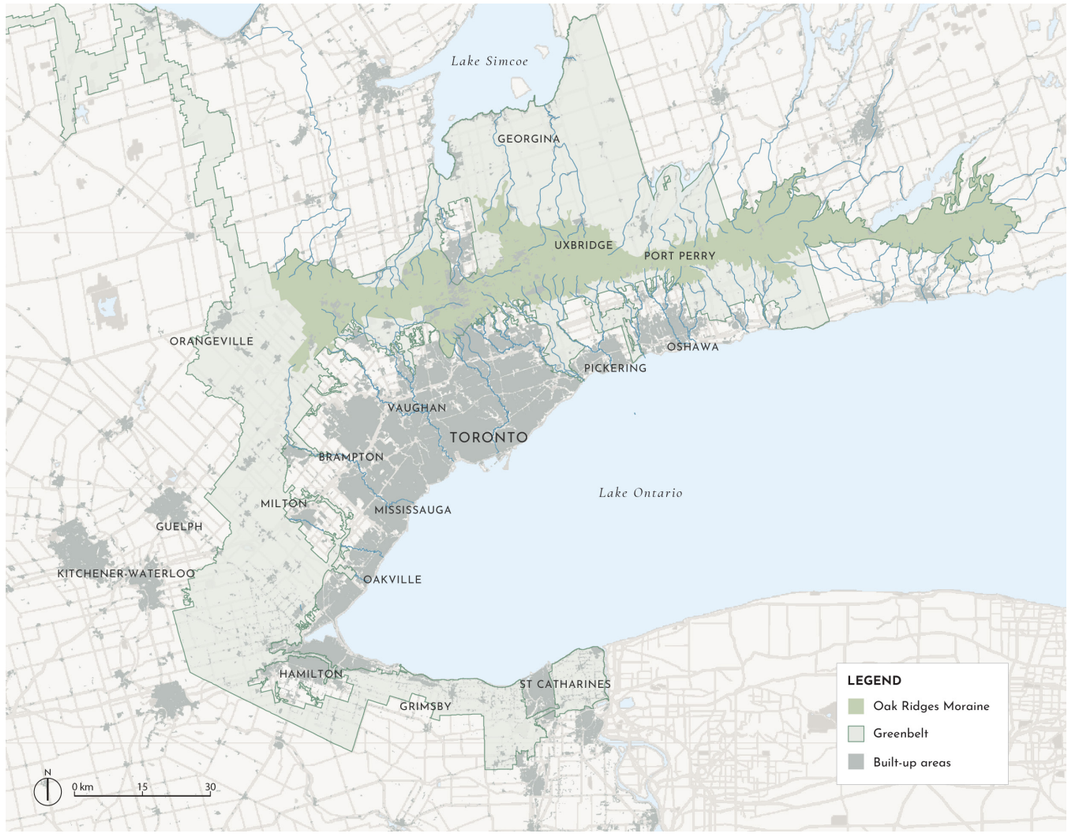

Figure 2.2 *Plan of Ontario Greenbelt with built area.*

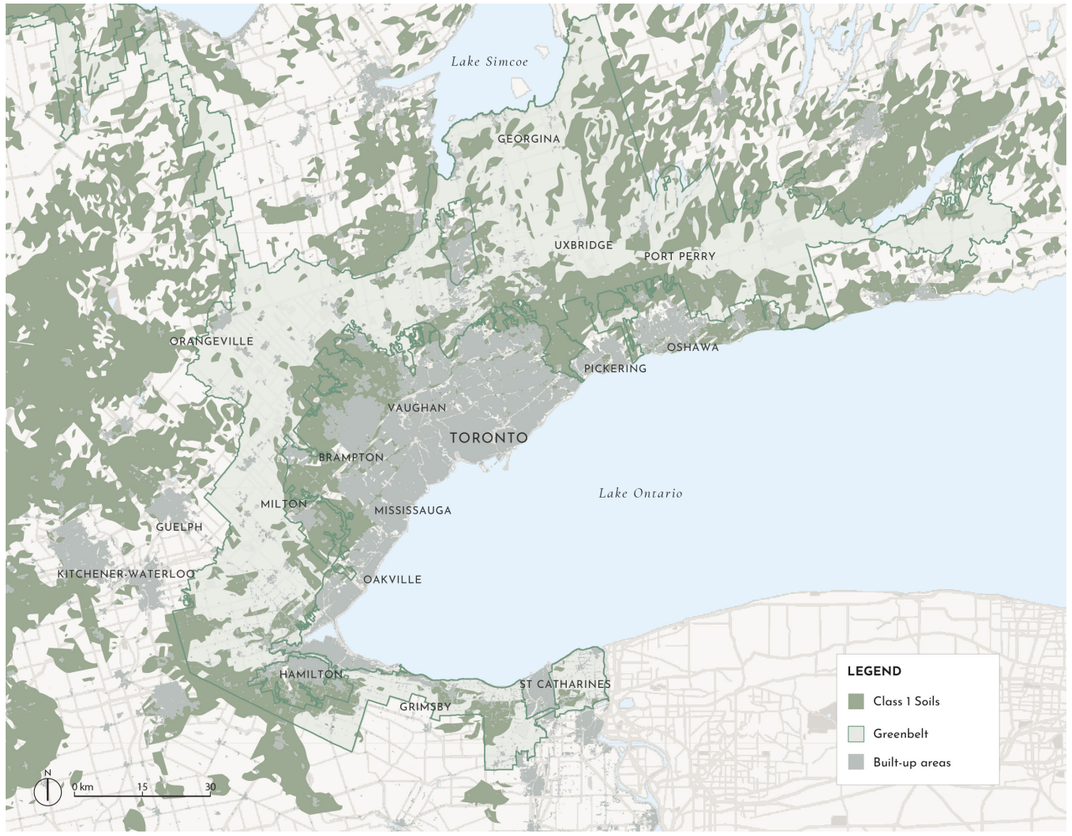

Figure 2.3 *Plan of Ontario Greenbelt with built area & Class 1 soils.*

> including: clean and abundant water resources, healthy and diverse plant and animal habitat,... prime agricultural areas, and sand and gravel resources close to market."[9]

However, the health of the Oak Ridges Moraine, and its associated wetlands and water systems, is impacted by the agricultural practices and developments that occur in and around the Greenbelt. Farming methods used in conventional agriculture can damage the Moraine and have devastating impacts on the regions water quality and biodiversity. Toxic soil amendments used on farmlands adjacent to the Moraine can contaminate watersheds and effect the health of the GTA. Therefore, agricultural lands in the Greenbelt that might impact the health of the Moraine need to be managed in ways that have little impact on their surrounding environments. There are approximately 6,200 farms in the Greenbelt.[10] Regeneration Canada is working to identify farms in Southern Ontario that use regenerative practices, however as of January 2022, there are only 19 regenerative farms.[11]

Therefore, almost all agricultural land in both the Greenbelt, and Southern Ontario, has been—and continues to be—degraded from conventional agricultural practices and soils need to be restored to healthy fertile levels. Additionally, the use of conventional methods might be affecting the health of the Moraine and its water systems, and therefore the agricultural practices need to change to maintain the health and function of the region.

City Sprawl – A Threat to the Greenbelt

The city of Toronto was reported to be the second fastest growing city in North America in 2019.[12] However, the expansion of the built environment is restricted to the confines of the Greenbelt perimeter. As the city seeks development land for its growing population, it is increasingly requesting to build into the Greenbelt. Every year, there are hundreds of requests for development in the Greenbelt. In 2018, the Ontario government was reviewing more than 650 requests to transform the agricultural lands into areas of development.[13] As of December 2021, the provincial government is proposing to build Highway 413 through these sensitive agricultural lands and ecosystems, further degrading these crucial landscapes.[14]

The degraded state of the agricultural lands is a justified reason to halt the advance of suburbia on the Greenbelt's degraded soils. However, as urban dwellers continue to be disengaged from their productive landscapes, they depend heavily on commercial centres for access to food. As a result, they fail to recognize local agricultural lands as important, allowing development on the lands that could provide for them. Katsuyuki Minami writes about this disconnect in his article *Soil and Humanity: Culture, Civilization, Livelihood and Health,* admitting that "it is easy for people living in urban areas to forget that the soil provides the nutrition for life. A convenient and comfortable lifestyle provides no reason to adopt a more profound ethical attitude toward the soil and land."[15]

As a result of the dramatic transformation of the Southern Ontario Landscape from Carolinian forest, wetland and grassland to urban development and conventional agriculture, the landscape has and continues to experience a detrimental loss of biodiversity, soil erosion, and water contamination, among other degrading environmental conditions.[16] There is a need to transform the Southern Ontario landscape into healthier agricultural lands and ecosystems, to support community life and biodiversity for the area.

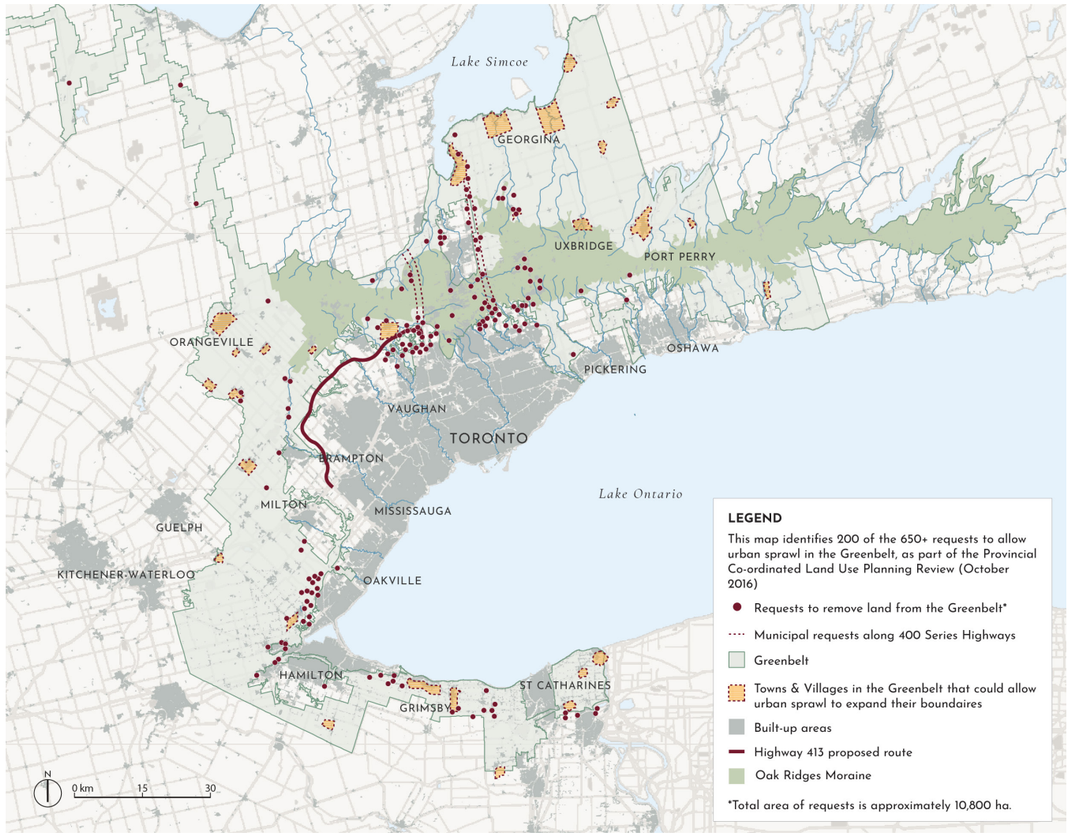

Figure 2.4 *Plan of Ontario Greenbelt with Development Requests.*

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03

Part Three:

A Site With Potential

Duffins Rouge Agricultural Preserve

One area in the Greenbelt stands out as a prospective site to use regenerative agriculture practices for land restoration and community engagement. The Duffins Rouge Agricultural Preserve, located in Pickering, Ontario, is a large parcel of land that was set aside to protect the agricultural lands in the 1970s. This occurred when the Government of Ontario was concerned with suburban sprawl and development into the province's fertile landscape. Their intention was to set aside multiple parcels of land as agricultural preserves, but with the change of government, the motive to create multiple preserves was lost. In 2005, the final Golden Horseshoe Greenbelt Plan was announced, and the Duffins Rouge Agricultural Preserve was included in the Greenbelt, with the provincial government continuing to own the lands. The legislation of a unified Greenbelt overrode the idea of individual preserves, and as a result, the Duffins Rouge became the only agricultural preserve in Ontario. When the lands were merged with the Greenbelt, the preserve lost its identity and direction.

The Duffins Rouge Agricultural Preserve is a meaningful land area to me. I grew up in Pickering, near the site, and would often play in the preserve with friends when I was younger. At the time, I did not realize the importance of this landscape. However, I reconnected with these lands while living at my family's house during the pandemic and discovered the opportunity for transformative processes.

Figure 3.1 *Duffins Rouge Agricultural Preserve location on plan.*

Figure 3.2 *Duffins Rouge Agricultural Preserve government sign.*

Site Context

The Duffins Rouge Agricultural Preserve has notable surroundings as it is bordered by three massive sites, each associated with a different type of land use and managed by the three different levels of government. The Rouge National Urban Park is located directly to the West of the agricultural preserve. This is the first National Urban Park in Canada, and protects 18,500 acres of land. The park has a large trail system, and protects essential ecosystems and agricultural parcels. Bordering the site to the East is the New Town Seaton development area, which is 7,400 acres large. To the North of the agricultural preserve is a site with 8,700 acres of land, reserved for the development of the federal airport. The motive to create an airport in Pickering is a source of conflict for people in Pickering and those who live near the airport site, as many oppose development on these sensitive agricultural lands.[1] The built urban area of the City of Pickering is to the South of the agricultural preserve. Located at the centre of these places, the 3 levels of government each have influence and interest in the agricultural preserve, which currently protects 5,200 acres of farmland.

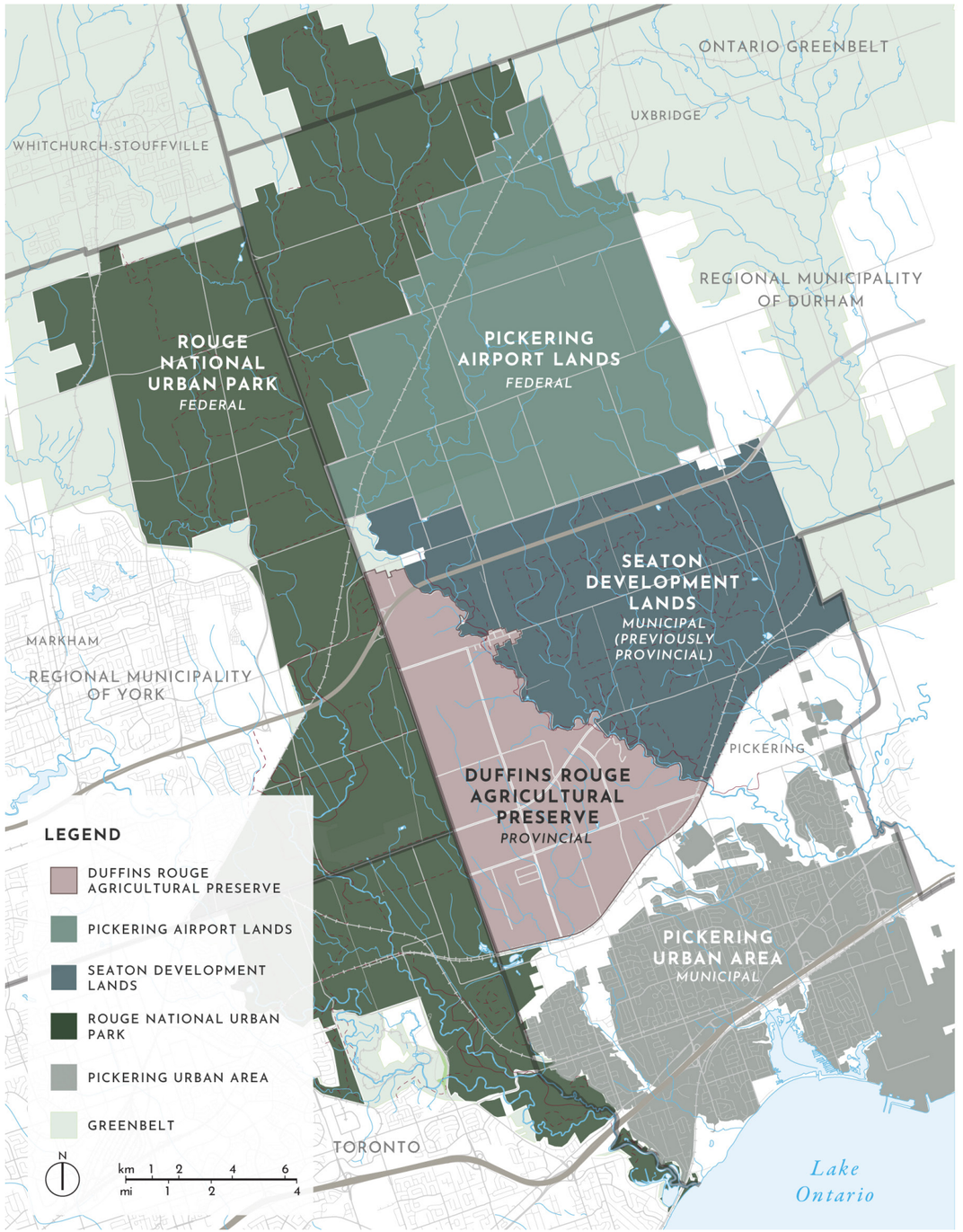


Figure 3.3 *Site Context Plan.*

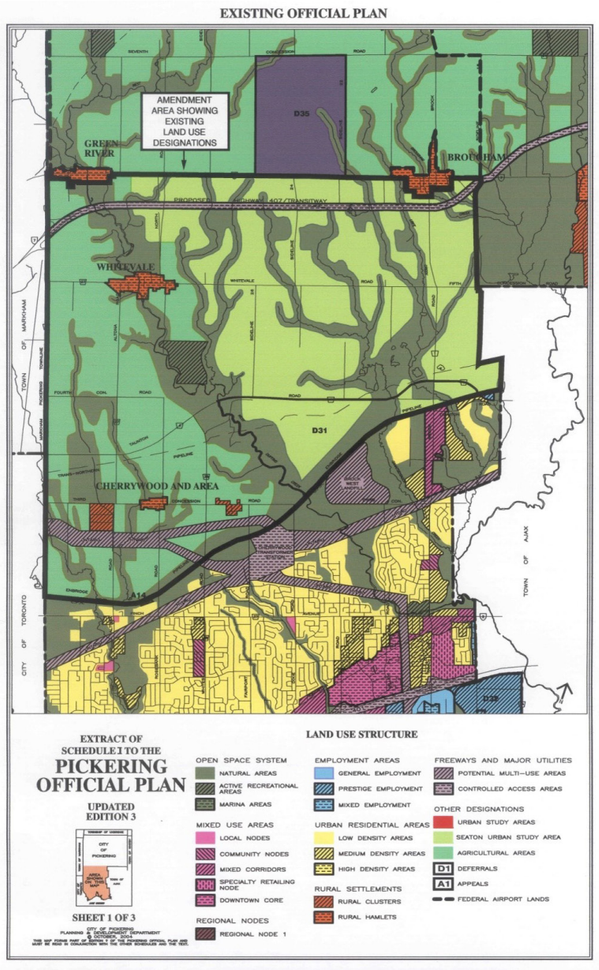


Figure 3.4 *Existing official plan for agricultural preserve.*

In the early 2000s, the agricultural preserve was a bone of contention. The City of Pickering put pressure on the provincial government to make it urban and allow development into the landscape. This coincided with plans to transform adjacent agriculture lands in North Pickering into the New Town Seaton development lands, which once completed will increase the population of Pickering by 70,000 within the next decade.

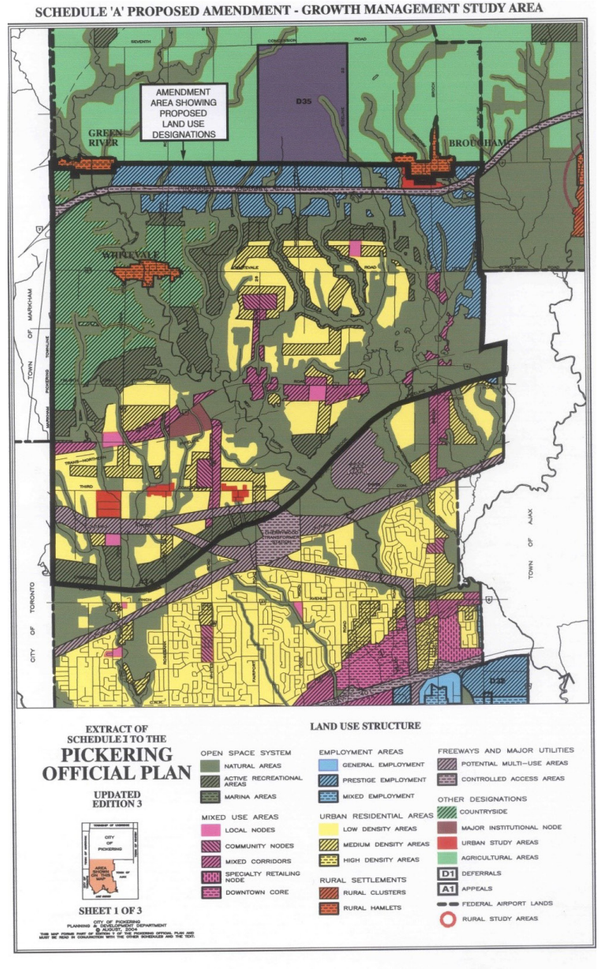


Figure 3.5 *Proposed amendment for agricultural preserve.*

Figure 3.4 shows the existing conditions of the Duffins Rouge Agricultural Preserve, located next to the Seaton development lands. Figure 3.5 shows the city of Pickering's 2004 proposed amendment to transform areas within the agricultural preserve into development lands. However, the province rejected the proposal and any consequent development, and instead reinstated conservation easements to protect, conserve and preserve the agricultural lands.[2]

Design Proposal

The design of this thesis proposes to give a role back to the Duffins Rouge Agricultural Preserve, marked by the white border in Figure 3.7's aerial image. The design imagines the preserve as agricultural lands that reject the exploitative narrative of commodity croplands. Instead, the design transforms the purpose of the landscape, such that it supports local food production with restorative agriculture practices. The Duffins Rouge Agricultural Preserve becomes a repository of exemplary regenerative agriculture practices that are specific to Ontario's agricultural landscape. The design reveals agricultural practices that focus on the preservation of soil health and the nurturing of connections between communities and the preserve. It aims the products of the agricultural preserve towards local markets, moving away from the globalized market production. The goal for the design is to combine a set of solutions that reduce the harsh environmental impact of conventional agriculture practices on the site and external regions. Instead, these solutions will restore and diversify the existing agricultural lands. It will reveal how these methods contribute to the creation of resilient landscapes and communities.

The design proposes the agricultural preserve to be similar in nature to the Ottawa Central Experimental Farm (CEF), an agricultural research facility and working farm in downtown Ottawa. Established in 1886, it was designed to demonstrate Canada's excellence in scientific and agricultural research. It is "home to a variety of agricultural landscapes... [and] although it remains a working scientific station, the Farm is open to the general public."[3] Although the preserve has similar motivations as the CEF, the proposal for the preserve differs as the Duffins Rouge Agricultural Preserve would have higher aspirations as a demonstrational landscape that restores vital ecosystems.

Figure 3.6 *View of Central Experimental Farm from water tank, August 1945.*

Figure 3.7 *Site Aerial.*

Site Analysis

Highlighted in yellow on the infrastructure plan in Figure 3.8 are the 4 existing hamlets in the agricultural preserve. These hamlets are privileged residential areas, surrounded by open fields, and are protected from suburban encroachment by the agricultural preserve's boundary. Essentially, this indicates that each residential area in the preserve is a version of a massive, gated community.

The hamlet of Whitevale and its residents are notable, as they are recognized for their strong voice in protecting the agricultural lands against the development of the federal airport. This vocal community could become key participants in supporting the transformation of the agricultural preserve into a regenerative site.

A series of site analysis plans reveals inconsistent data when accessed from the different levels of government's websites. For example, GIS mappings taken from the provincial geoportal for the wetlands and forest cover in the site is inconsistent with federal land use imagery and satellite data. The provincial GIS data shows a larger land area of natural ecosystems than what the federal government displays.

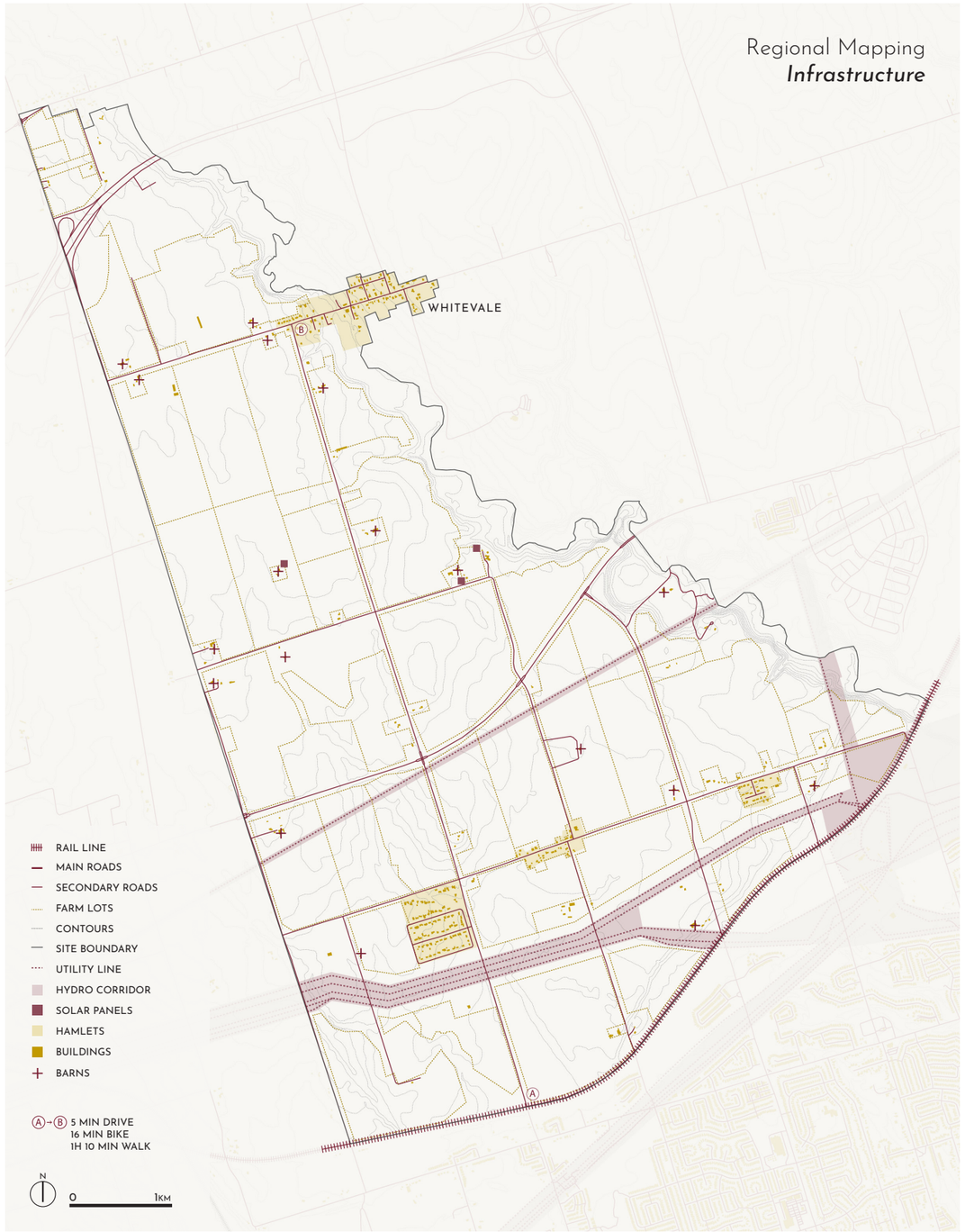


Figure 3.8 *Regional mapping of infrastructure.*

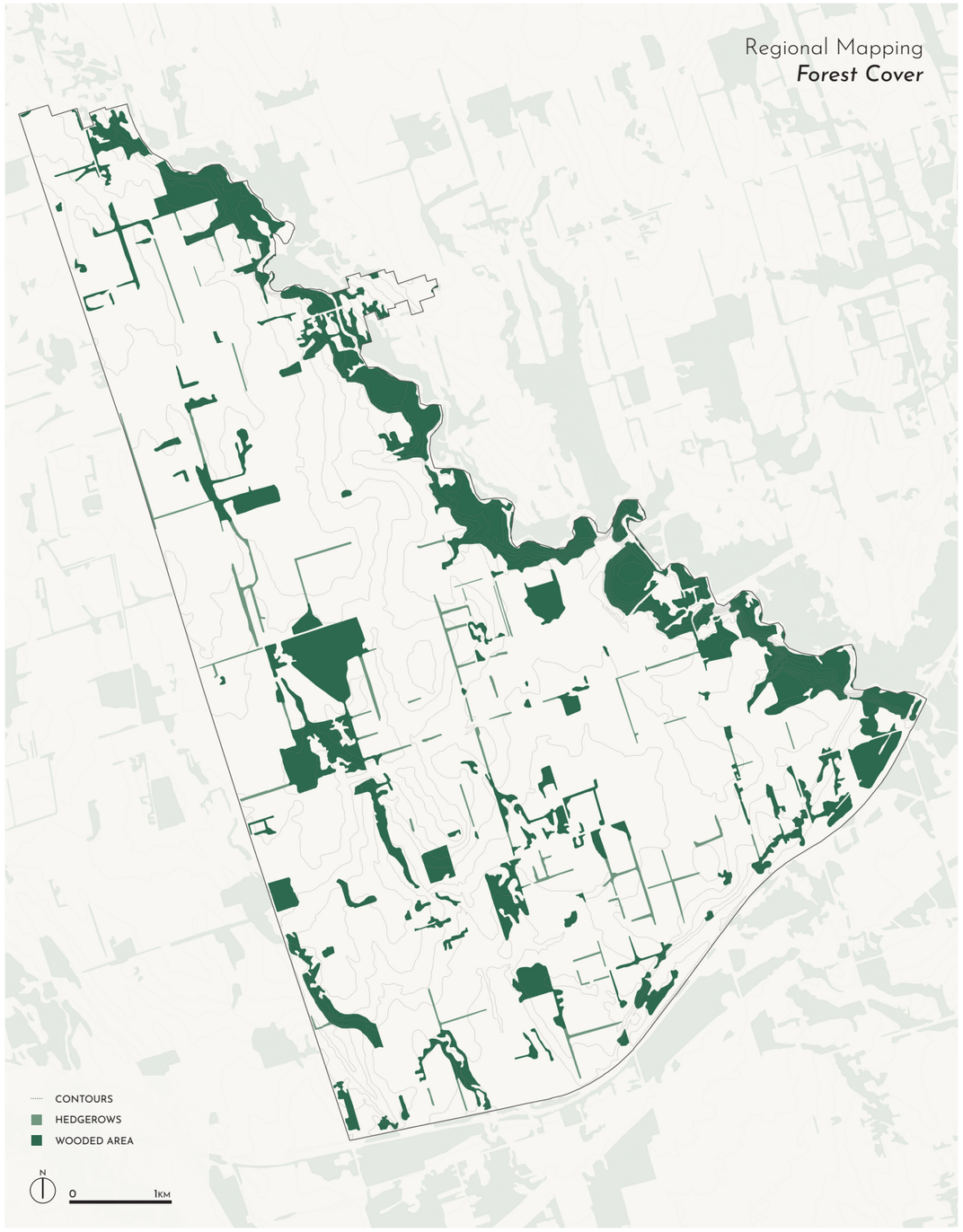


Figure 3.9 *Regional mapping of forest cover.*

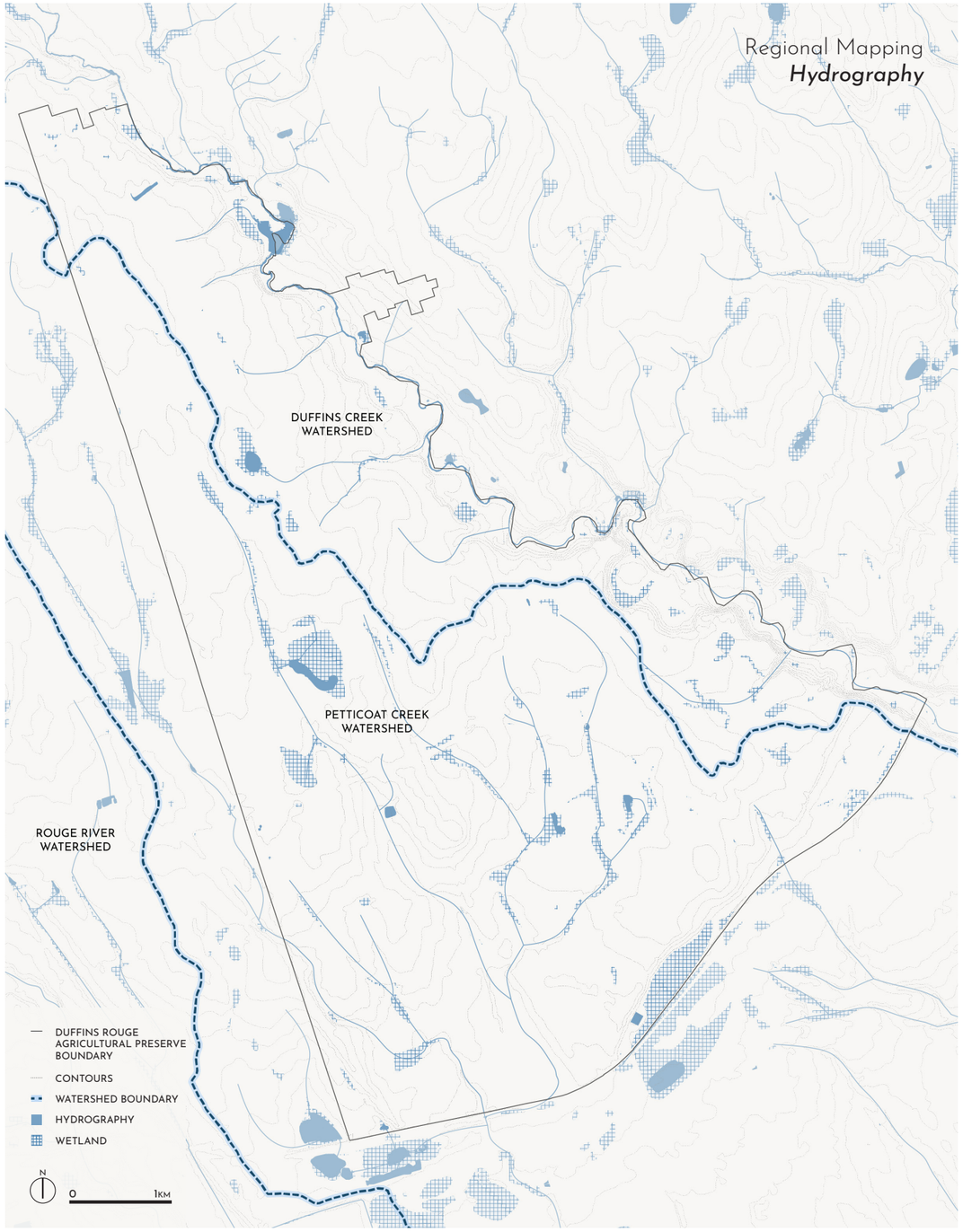


Figure 3.10 *Regional mapping of hydrography.*

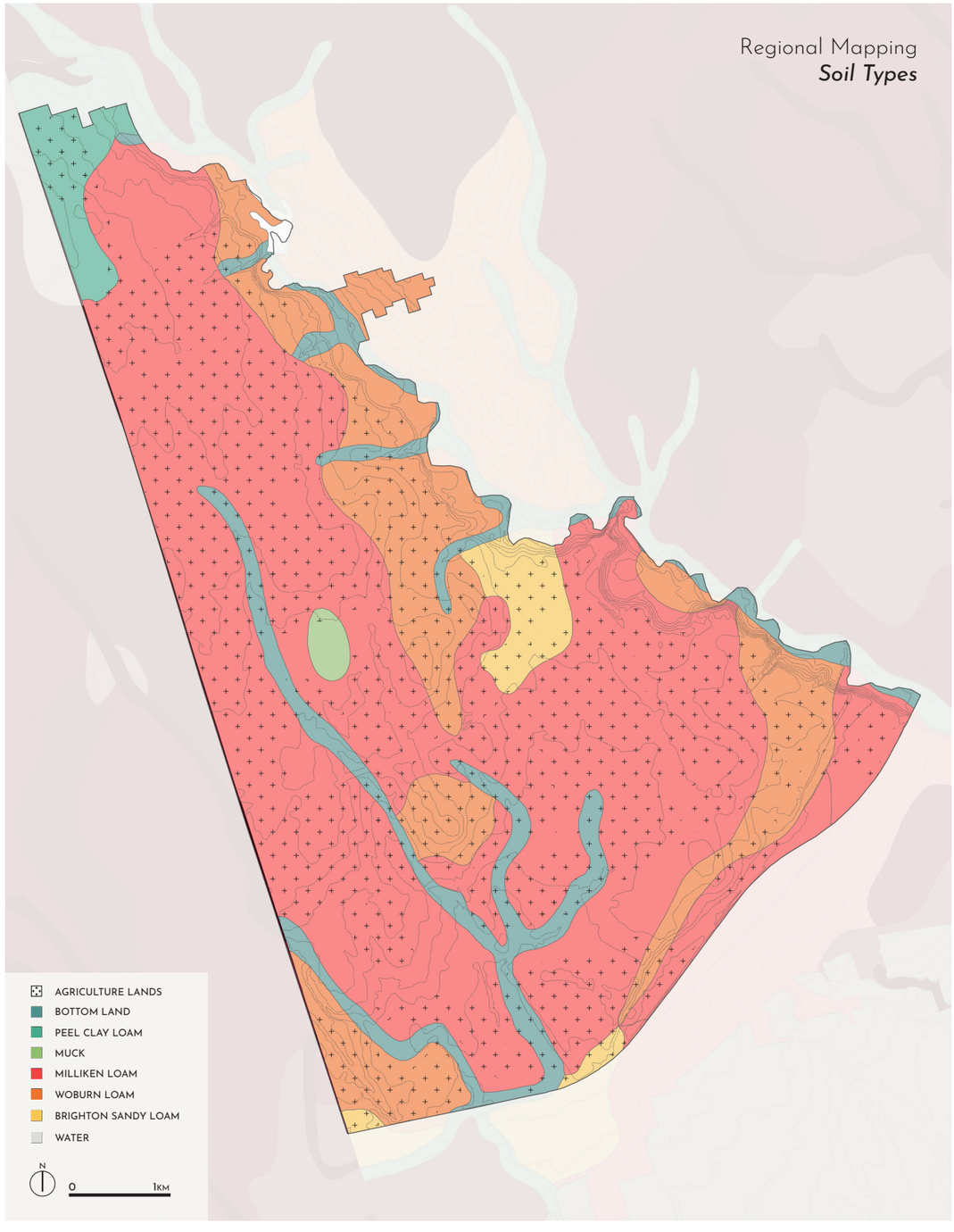


Figure 3.11 *Regional mapping of soil types.*

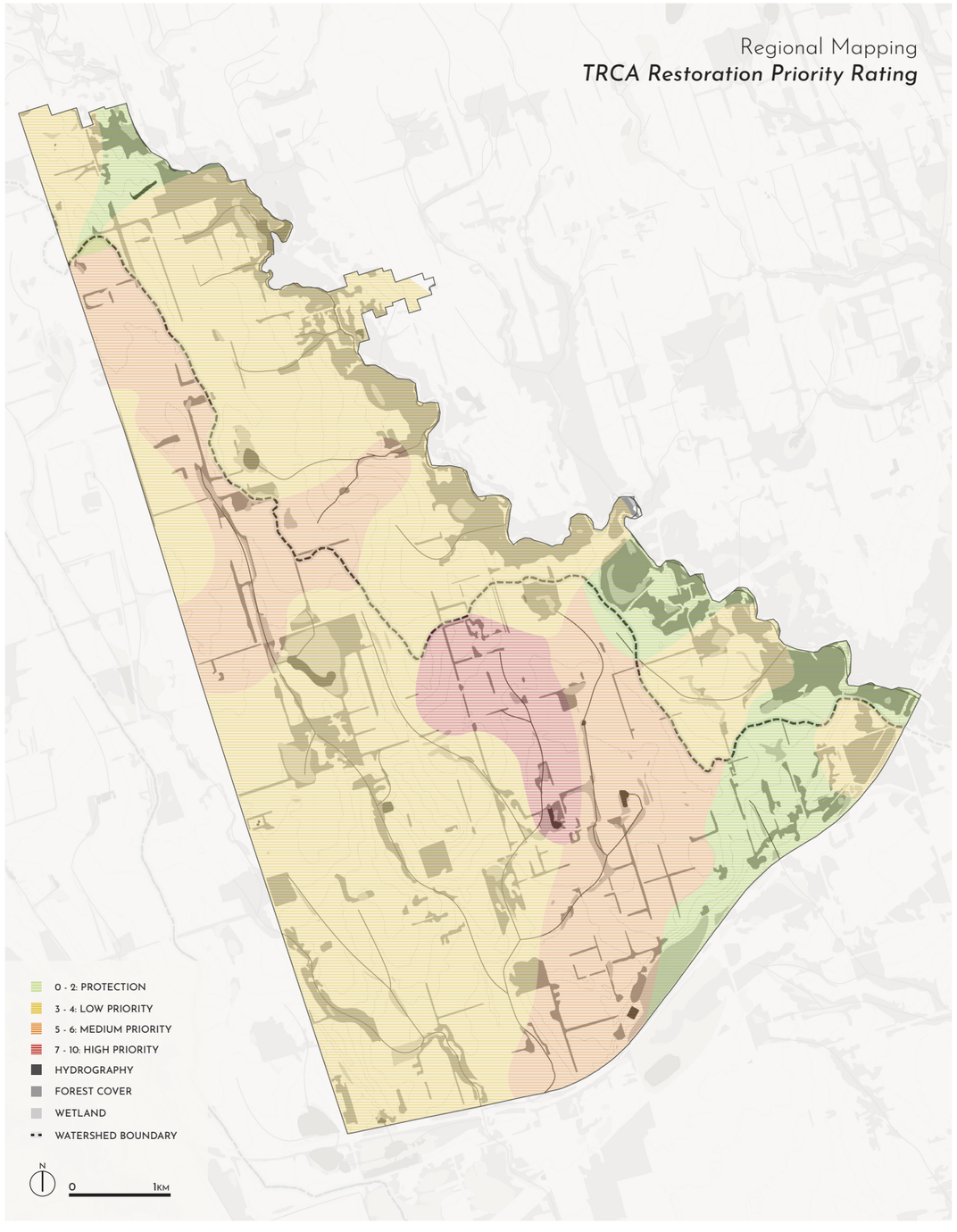


Figure 3.12 *Regional mapping of TRCA restoration priority rating.*

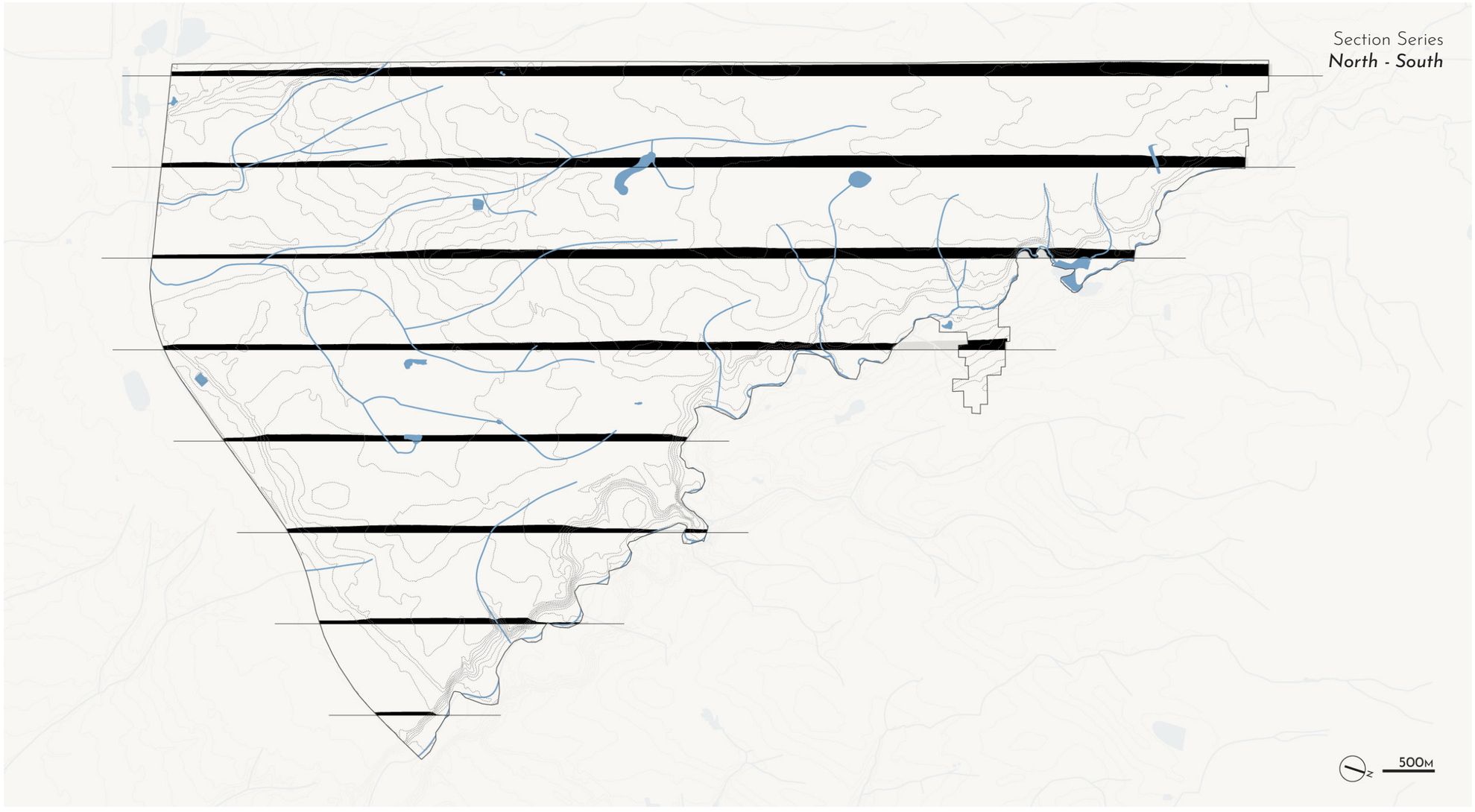


Figure 3.13 *North - South Section Series.*

The North-South section series in Figure 3.13 reveals the site is relatively flat, although it slopes and drains modestly to the South towards Lake Ontario.

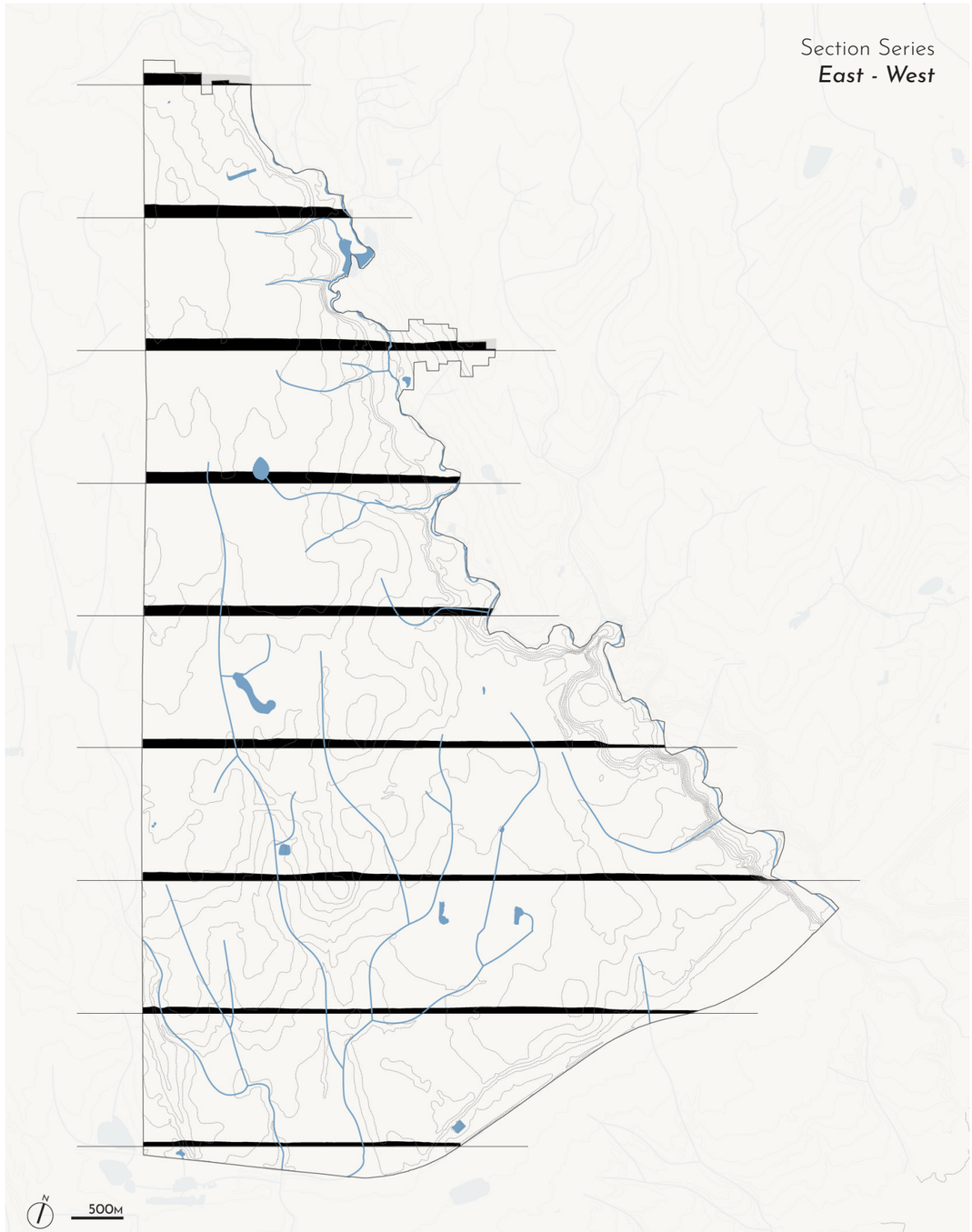


Figure 3.14 *East - West Section Series.*

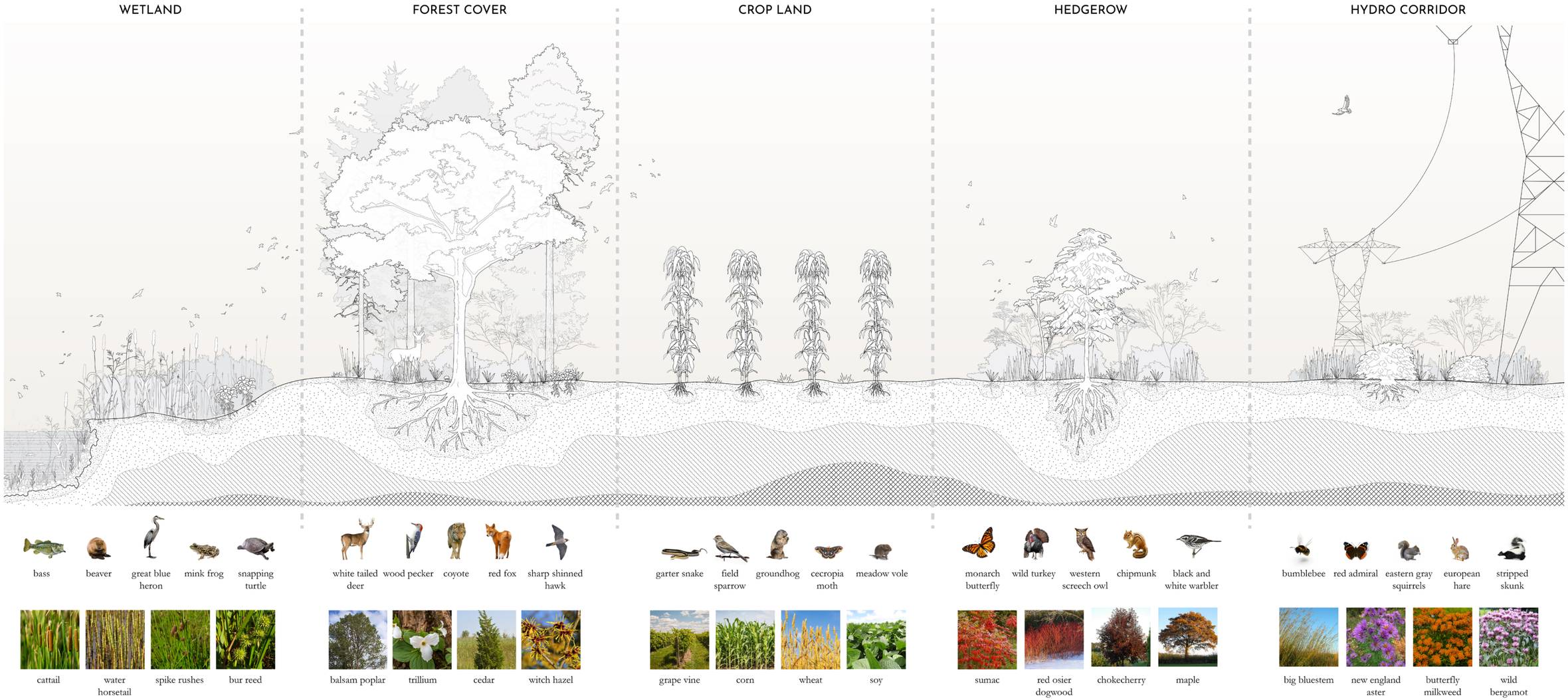


Figure 3.15 *Cross section of landscape conditions.*

Figure 3.15 illustrates the main landscape conditions and ecosystems found in the site. The drawing identifies the different types of vegetation and wildlife that call the preserve home.

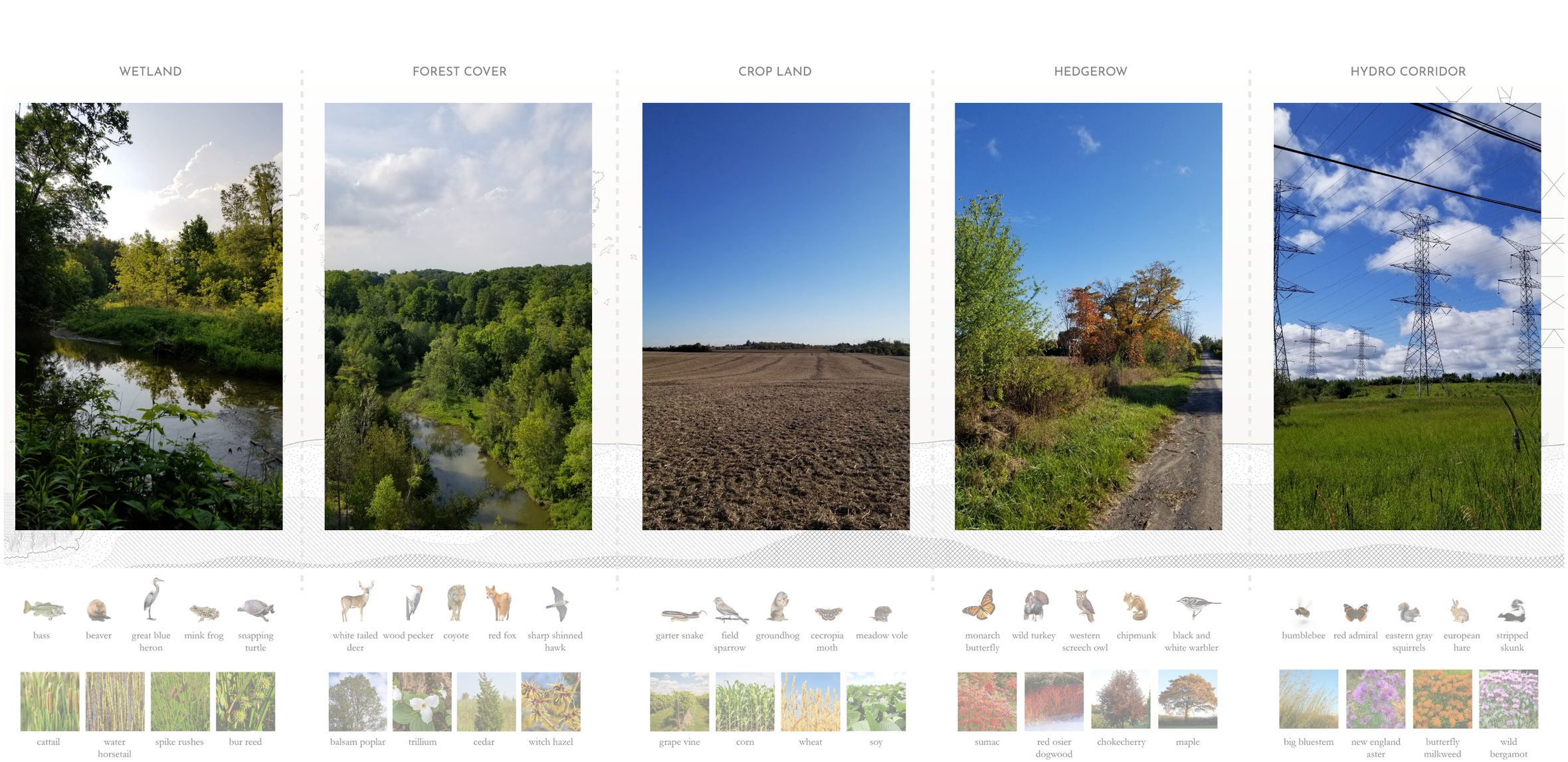


Figure 3.16 *Images of landscape conditions.*

However, images of the actual conditions reveal a state of degradation. This land degradation is identified in the image of the crop lands in Figure 3.16, which shows a field with exposed soils. Fields such as this are often barren after harvest and during the winter. When barren fields have exposed soils, the fertile soil layers become exposed to the elements, leading to erosion.








Figure 3.17 *A series of recently built and older residential buildings in the agricultural preserve.*






Figure 3.18 *A series of the century-old barns in the agricultural preserve.*

Images of the houses located in the agricultural preserve show older homes are often torn down and are rebuilt into luxury homes. This demonstrates that to live in the preserve is to live in a place of privilege. Images taken of the large barns located in the agricultural preserve show the majority of these built structures are in good condition. This creates an opportunity to make use of these large structures.

2020 Land Use Percentage

A compilation of data collected from Canada's satellite crop index recognizes crop types and land use. Data and imagery from the website is available from 2011 onwards. Figure 3.19 is an adapted representational land map created from the latest land use identification in 2020.[4] The data reveals that 10% of the land in the agricultural preserve is non-cultivable. This includes urban land use, however, over the past 5 years, there has been an increase in barren, exposed, or too wet agricultural land, meaning it is not suitable for growth, and is an intense state of degradation. Additionally, as shown in the top left of Figure 3.20, the agricultural preserve is losing its natural ecosystem areas, such as wetlands and forest cover, to agricultural uses and urbanization.

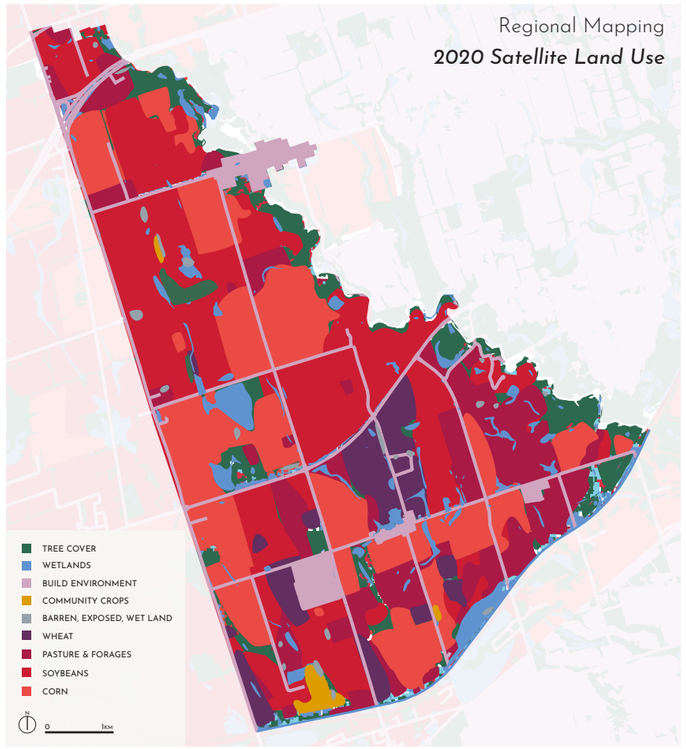


Figure 3.19 *Land use identification map.*

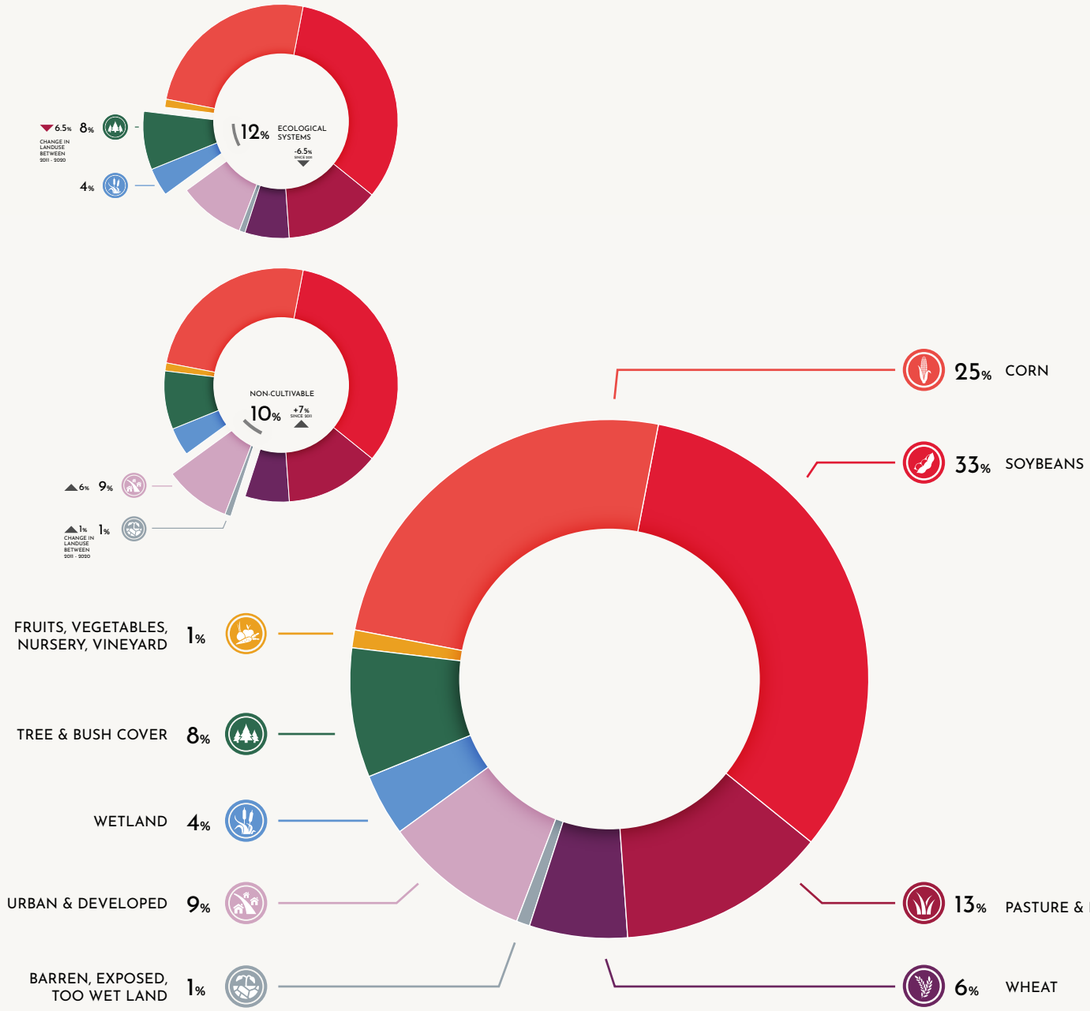


Figure 3.20 *2020 Crop types & land use percentages for agricultural preserve.*

The data also reveals that 77% of the land area of the preserve, and almost all of crop fields, are growing four main crops: corn, soy, pastures, and wheat. Figure 3.21 breaks down what Ontario uses these commodity crops for.[5] The data reveals that the majority of these crops are grown for ethanol and biofuels, animal feed, or exports. This is a result of the province renting out the agriculture lands for short term leases. With short term leases, farmers have no intimate connection to the landscape and "are only interested in practices that will results during the term of the lease."[6] These practices often result in soil degradation as "most soil conservation practices are a long-term investment."[7] Tenants will grow commodity crops for fast profit, which continues to deplete the landscape. The data reveals only a small percentage of commodity crops are directly consumed by humans.

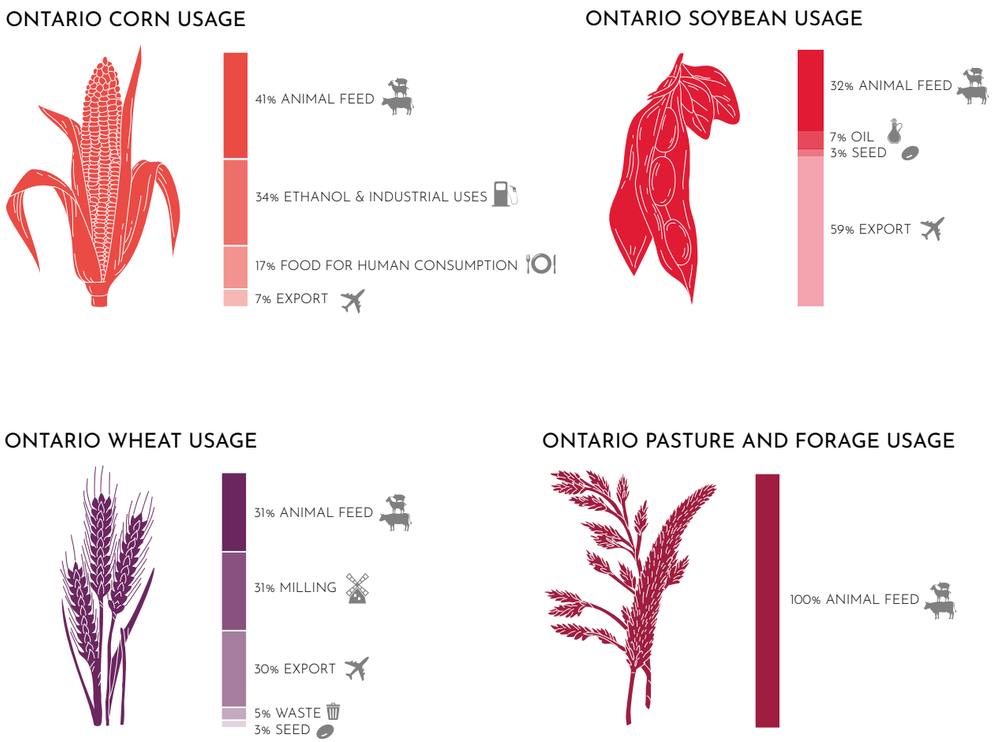


Figure 3.21 *Ontario's grain usage breakdown.*

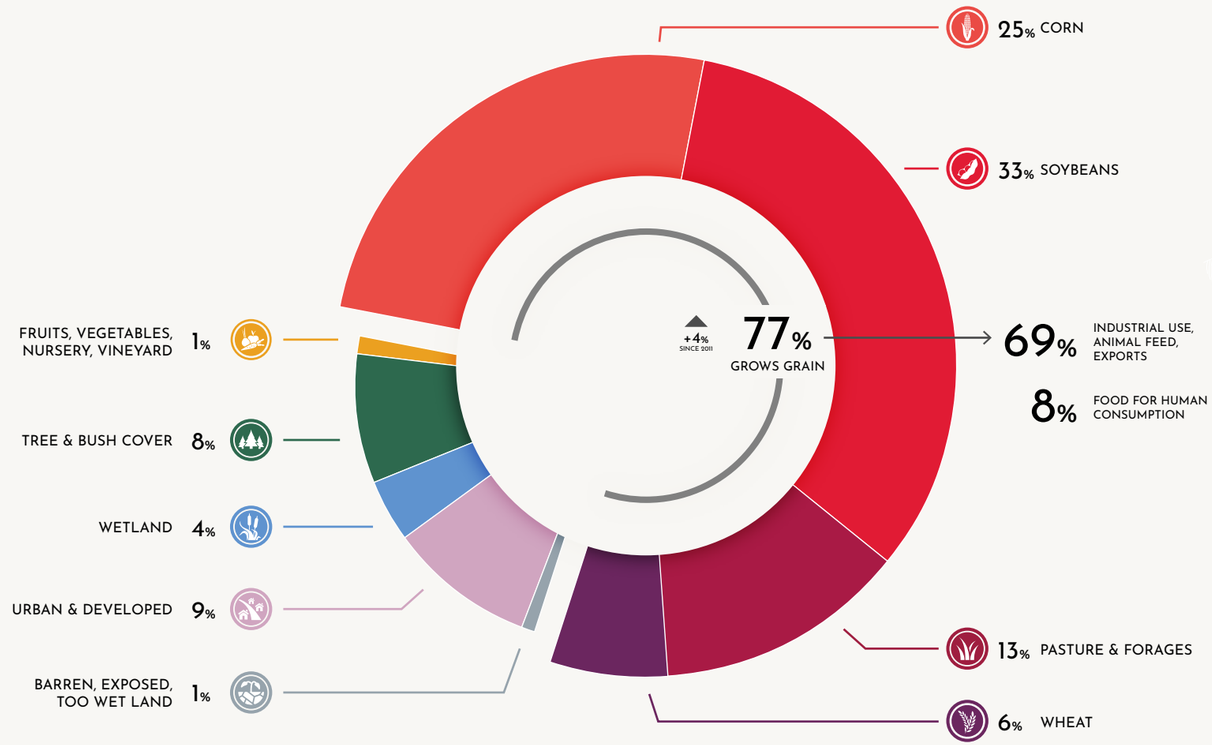


Figure 3.22 *2020 Percentage of area grown for commodity crops in agricultural preserve.*

When this is added to the remaining 1% of the land area in the agricultural preserve which is actually grown for the community, only 9% of the total area is grown for community use.

The compilation of this data reveals that the majority of the land and soil within the agricultural preserve is experiencing degradation from conventional agricultural practices from practices that do not provide for the community.

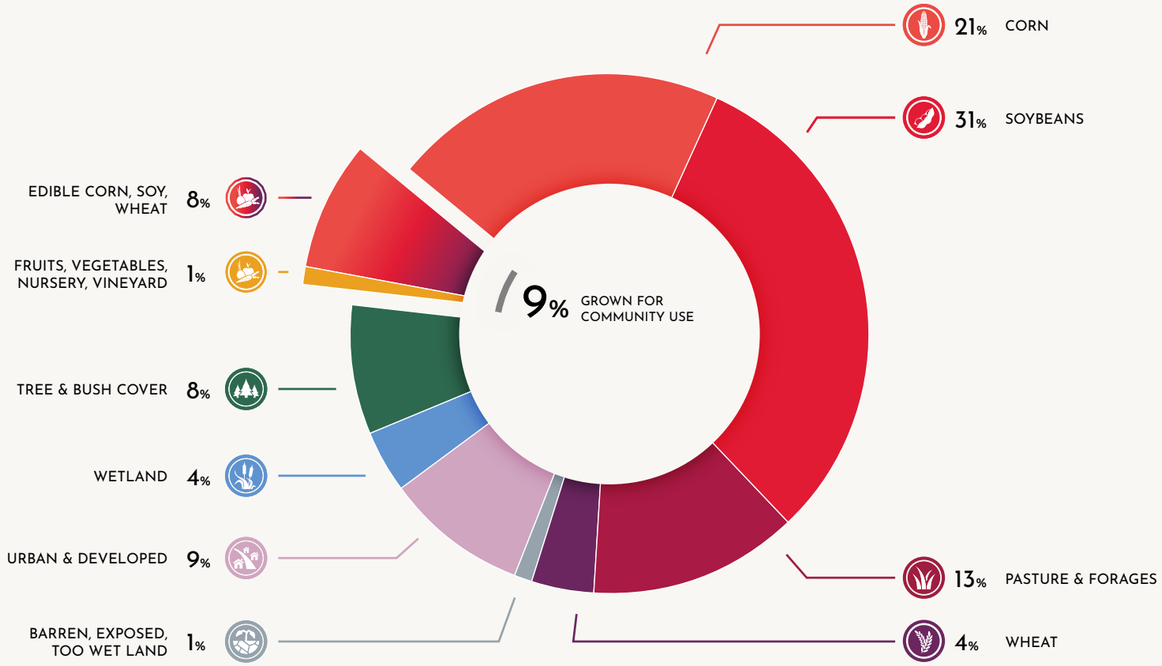


Figure 3.23 *2020 Percentage of area grown for community use in agricultural preserve.*

Endnotes

1 Michael Rowan, "On their Knees: Politics, Protest, and the Cancellation of the Pickering Airport, 1972–1975," *Urban History Review; Urban History Review* 45, no. 2 (2017), 46-56. doi:10.3138/uhr.45.02.03.

2 Government of Ontario, Ministry of Natural Resources. *Duffins Rouge Agricultural Preserve Act, 2005,* S.O. 2005, c. 30.

3 Peter Grant Anderson, "Comparing Nineteenth and Twenty-First Century Ecological Imaginaries at Ottawa's Central Experimental Farm," *Canadian Journal of Urban Research* 25, no. 1 (2016), 38-48.

4 Government of Canada. Agriculture and Agri-Food Canada, *Annual Crop Inventory*, (2020). https://agriculture.canada.ca/atlas/aci.

5 Grain Farmers of Ontario's Market Development department, *Market Utilization Overview* (Guelph, Ontario: Grain Farmers of Ontario,[2016]).

6 Ontario Ministry of Agriculture, Food and Rural Affairs, *Lease Agreements Flexible Cash Leases* (Guelph, Ontario: Queen's Printer for Ontario,[2014]).

7 Ontario Ministry of Agriculture, Food and Rural Affairs, *Lease Agreements Flexible Cash Leases.*

04

Part Four:

Design Development

Process Design

The data and analysis presented in *Part 3* exposes that the site is experiencing land degradation from the farming practices used in the agricultural preserve and reveals that there is an immediate need to restore the site. The diagrammatic process map in Figure 4.2 reveals the strategies and steps this thesis follows to transform the Duffins Rouge Agricultural Preserve into a regenerative agriculture site.

This transformative approach starts with the community. The community needs to be activated and introduced to the key actors that will allow the vision of a regenerative agricultural preserve to be realized. Key actors include the provincial government, community leaders, Indigenous leaders, regenerative farmers, and local education institutions. These groups need to be brought together, to build partnerships between them, allowing them to create policy and change that happens in an equitable and just way. These groups could use the preserve as a gathering hub, where they can share their knowledge, and can educate farmers and community members who work in the Duffins Rouge Agricultural Preserve and who call the site "home."

With guidance from involved partners, the agricultural preserve can be transformed from a site that contributes to Canada's global commodity production into a regenerative landscape mosaic of healthy, diverse, and aggrading ecosystems. These ecosystems will further work to provide energy and life for surrounding communities while supporting local economies.

These actions will aid in halting soil degradation. Phasing out conventional agriculture practices will lead to an avoidance of soil erosion. Instead, soils will start to be restored to healthy and fertile states. This will help to restore natural systems in the region and will increase biodiversity and water retention for the area.

By introducing these transformative landscape practices, the Duffins Rouge Agricultural Preserve will engage with surrounding communities. These practices will help to foster connection between people and the land. This connection can be furthered by building public infrastructure and incorporating landscape design to create public access. Providing the public with access across the entire site will build relationships between the community and the large preserve, leading to an increase of awareness of the state of these degraded agricultural lands. Awareness often sparks action, and interest from educated community members could initiate

Figure 4.1 *Hiking trail through fields in Pickering, ON.*

PROCESS DESIGN
FOR DUFFINS ROUGE AGRICULTURE PRESERVE

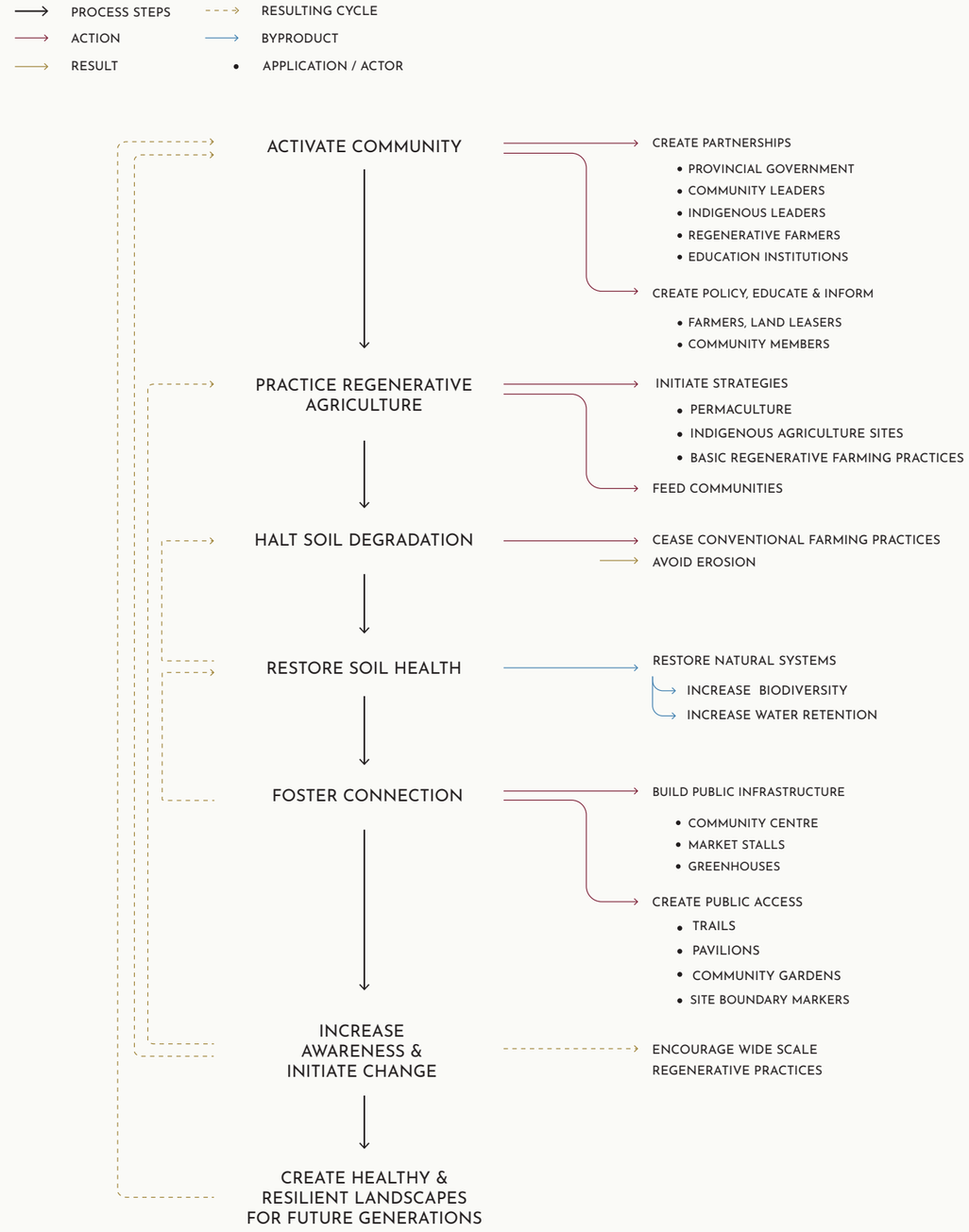


Figure 4.2 *Process design map.*

change of agricultural practices at a larger scale outside the agricultural preserve. Ultimately, the goal is to create healthy and resilient landscapes for future generations.

Once initiated, these steps will start to feed back into each other. This transformative process shifts from a series of linear phases, into a cycle that revolves around creating sustainable, healthy and resilient landscapes for generations to come.

Figure 4.3 *Process design cycle.*

Creating Policy

As the lands within the Duffins Rouge Agricultural Preserve are owned by the Ontario Government, the shift in landscape practices needs to be framed within government policy. Any new policy and governance implemented for the area will be guided by the key actors mentioned in the previous section. Their unification of applicable knowledge will create a stewardship guide for the agricultural preserve that puts both the health of the environment and the heart of the community at the centre of its vision. This document will guide practices on regenerative agriculture, agroforestry, wetland restoration, and community engagement. It will outline how to use these practices within existing farm parcel boundaries, to work with the tenants who farm these parcels and educate them on practices to be upheld in the agricultural preserve.

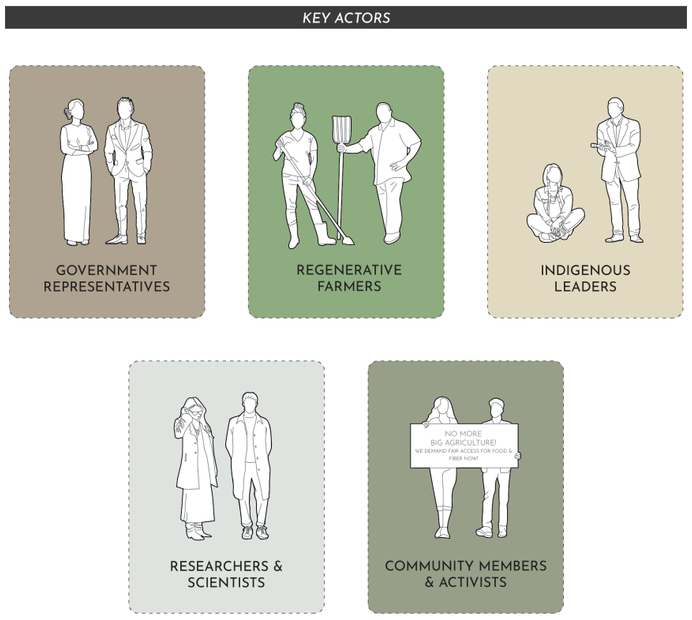


Figure 4.4 *Key actors illustration.*

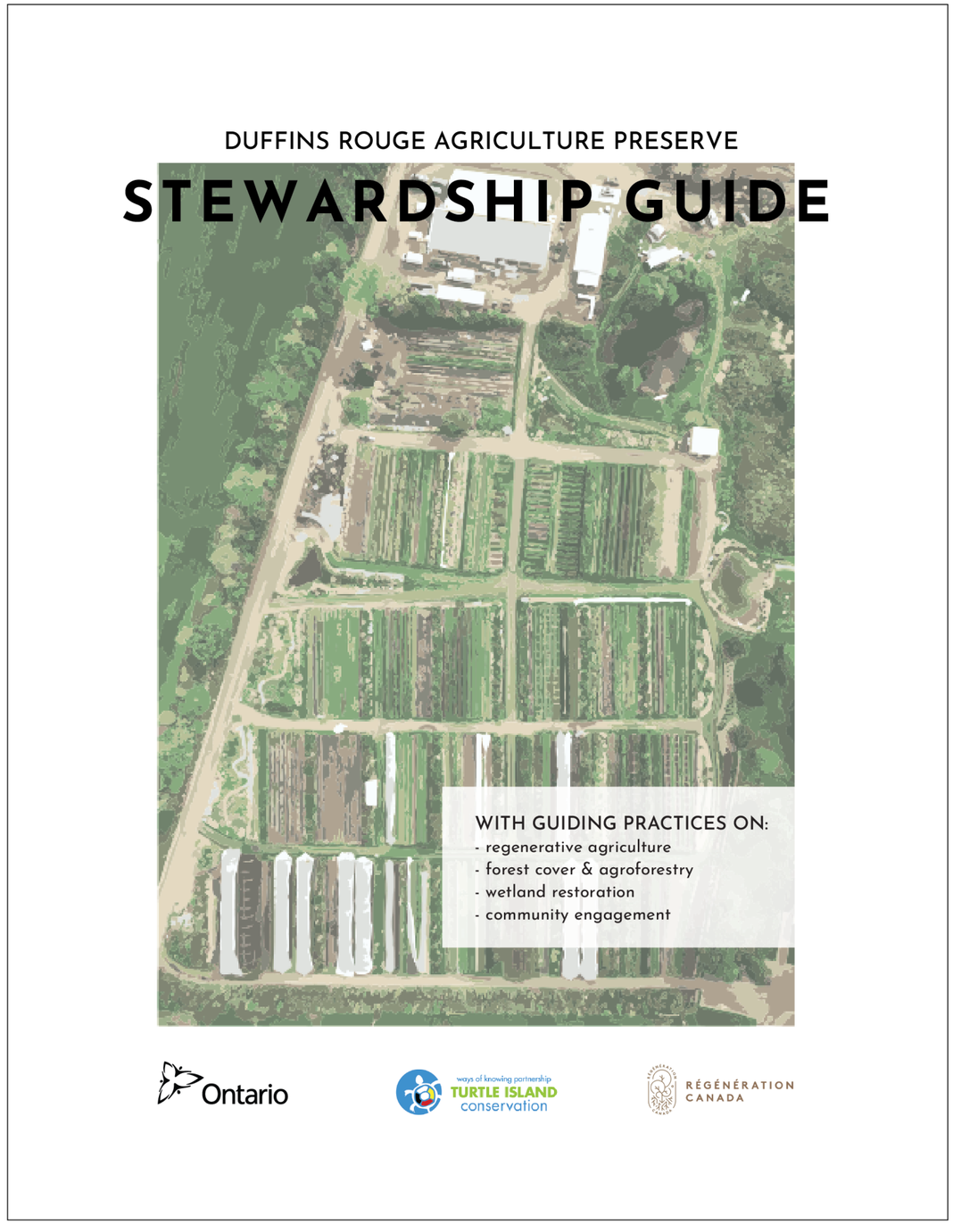


Figure 4.5 *Example of stewardship guide document.*

Influential Work: Orongo Station

Nelson Byrd Woltz Landscape Architects

The following design work was first inspired by the Orongo Station located in New Zealand. The site is culturally significant to the Indigenous Maori people. However, "subsequent colonization subjected the site to ongoing resource depletion as a result of unregulated sheep farming."[1] Nelson Byrd Wolts Landscape Architects restored wetlands, and planted over 600,000 trees to reforest the grazed land, which shields the coastline from the elements and erosion. Over the past 16 years, the landscape architects have continued to work closely with the local Maori tribe to implement a restoration agriculture system to repair ecological damage of the past 100 years. They integrated "cultural and ecological landscape restoration with active, profitable agricultural operations" to create a site that contributes to the local economy with job opportunities, while serving "as a national model for sustainable land management."[2]

Figure 4.6 *Reforested sheep-grazed costal land.*

Figure 4.7 *Orongo Station Conservation Masterplan.*

Influential Work: Fresh Kills Park

James Corner's Field Operations

The design proposal was also influenced by the masterplan and transformation of Fresh Kills Park, a former landfill in Staten Island. The landscape architecture firm, Field Operations, considered the various layers of the landscape, and instead of proposing a perfect masterplan, which might be unachievable, they strove to design a process for the landscape to grow over time. They call this a "lifescape", "an ecological process of environmental reclamation and renewal on a vast scale, recovering not only the health and biodiversity of ecosystems across the site, but also the spirit and imagination of people who will use the new park."[3] The design and realization of the project demonstrate how government bodies can respond to the needs of local communities, and proves that society can "tap into natural processes and help to restore the proper functioning of our landscape."[4]

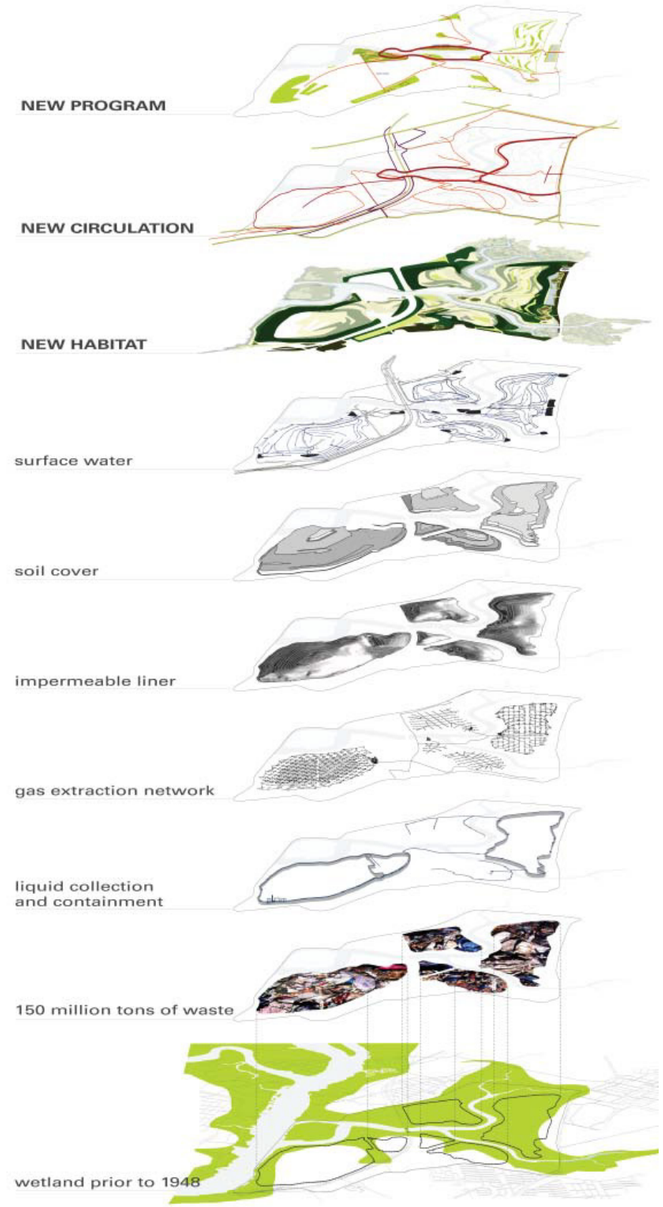


Figure 4.8 *Historical and infrastructural layers for the Fresh Kills site.*

Influential Literature

The research and design presented in this thesis are inspired by the books shown on the right. Projects and methodologies introduced by architects and designers in the *Architecture, Landscape, and Design* literature category each demonstrate the power of design to create landscape infrastructure that allows communities to become more resilient. They reveal the importance of engaging communities in the co-design of public spaces where communities engage with and invest in their landscapes, leading to intimate connections between the land and the people. In different ways, these authors and designers echo similar ideas. They encourage landscape designs that facilitate community connection to natural places, as to influence their behaviour towards their environments.

In *Toward an Urban Ecology,* landscape architect Kate Orff asserts that the design of landscape projects "must provide a framework for behavioral change."[5] This thesis' design proposal aims to do just that, working with the landscape to create a site that influences the visitor's appreciation of and behaviour towards the land.

Work created in this thesis was also inspired by the stories and illustrations in *Lo–Tek: Design by Radical Indigenism,* by author and architect Julia Watson. Her work demonstrates how designers do not need to respond to the climate crisis with hard infrastructures and high-tech solutions. By working with soft systems that have been used since time immemorial by Indigenous peoples who have evolved with the land, design can combine multigenerational knowledge with practices that create sustainable landscapes.[6] The design presented in this thesis was inspired by her drawings and documentation of Indigenous practices and incorporates soft system solutions to build landscape resiliency.

The literature under *Regenerative Agriculture Practices* explain in depth the practices farmers are using to regenerate their landscapes. In *The Permaculture Market Garden,* I found inspiration in the drawings on every page that demonstrate the various methods used in regenerative agriculture. The illustrations allowed me to easily understand how different farming practices affect the landscape and was inspired to create such illustrations for my own work.

While reading *Farming While Black,* I was moved by Leah Penniman's descriptions of her daily work to transform her farm into a healthy landscape, while honouring her ancestor's practices and healing from the

ARCHITECTURE, LANDSCAPE, & DESIGN

REGENERATIVE AGRICULTURE PRACTICES

FIRST PERSON STORIES

Figure 4.9 *Covers of literature which were influential in this thesis work.*

trauma of black slavery in the landscape.[7] Many farming books I came across are written with a white person's perspective and therefore do not reflect on the harm and trauma inflicted on persons of colour who were forced to work the land. Penniman's personal story influenced the design presented in this thesis, as it aims to create an inclusive landscape for everyone, welcoming their alternative farming and food knowledge to the overall large scale initiative.

In *Restoration Agriculture,* Mark Shepard lays out the history of conventional agriculture and how it not only affects soil health, but also the nutritional value of food and the impact on human health. He clearly demonstrates the need to shift towards regenerative agriculture and how it can be done.

In *Dirt to Soil,* author Gabe Brown—a regenerative farmer and a pioneer for the soil health movement—illustrates the various methods used in agriculture that can transform the soil into a healthier and more productive state.[8] Many of the illustrations created for this thesis were inspired and informed by the agriculture methods as described by the authors of these books.

The work in this thesis was also inspired by first person stories, by those who have firsthand experiences cultivating and stewarding the land, and who have forged connections with it. Their recollections of their personal experiences reveal different ways to bridge the gap between humans and nature, which is ultimately what this thesis attempts to do.

Braiding Sweetgrass inspired much of the work in this thesis, as the design proposal aims to create a landscape where western science and indigenous knowledge unite.[9] It intends to establish a site of reciprocity and gratitude towards the land, as inspired by the stories of Robin Wall Kimmerer.

Many articles in various issues of *Beside Magazine* helped move this work forward, as they demonstrate the power of the individual in restoring connections between communities and the natural world. This thesis was inspired by the many contributing authors and their stories of care and reconciliation with nature.

In *All We Can Save*, a section of the book is dedicated to describing the incredible power of soil, and how important our relationship is to it.[10] Words in this book shaped the outcome of this thesis, as it demonstrated the many ways we can collectively work with the earth and the soil to help it heal. This book of essays presents the many ways women are taking climate action and shows the importance of community involvement when building resiliency against the climate crisis.

Endnotes

1 Warren T. Byrd and Thomas L. Woltz, *Nelson Byrd Woltz : Garden, Park, Community, Farm* (New York: Princeton Architectural Press, 2013).

2 Byrd, *Nelson Byrd Woltz : Garden, Park, Community, Farm*

3 James Corner, *Fresh Kills Park: Lifescape Draft Masterplan*Field Operations,[2006]).

4 Corner, *Fresh Kills Park: Lifescape Draft Masterplan*

5 Kate Orff, *Toward an Urban Ecology* (New York, NY: Monacelli Press, 2016).

6 Julia Watson and Wade Davis, *Lo-TEK : Design by Radical Indigenism* (Cologne: Taschen, 2019).

7 Karen Washington and Leah Penniman, *Farming while Black : Soul Fire Farm's Practical Guide to Liberation on the Land* (White River Junction, Vermont: Chelsea Green Publishing, 2018).

8 Gabe Brown, *Dirt to Soil : One Family's Journey into Regenerative Agriculture* (White River Junction, Vermont: Chelsea Green Publishing, 2018).

9 Robin Wall Kimmerer, *Braiding Sweetgrass : Indigenous Wisdom, Scientific Knowledge, and the Teachings of Plants* (Minneapolis, Minnesota: Milkweed Editions, 2020).

10 Ayana Elizabeth Johnson and Katharine K. Wilkinson, *All we can Save* (New York: Penguin Random House LLC, 2020).

05

Part Five:

Design Implementation

Regenerative Agriculture

As mentioned in *Part One: Understanding Soil,* regenerative agriculture practices can transform degraded agriculture lands into fertile landscapes. The proposal for the agricultural preserve incorporates the regenerative practices into the stewardship guide. Guidance from local and knowledgeable regenerative and indigenous farmers will allow farmers and tenants of the agricultural preserve to learn the steps necessary to transform the soils from a state of degradation to a healthy, fertile, and productive state.

The section in Figure 5.2 illustrates the typical monoculture field found in the preserve today, shown with pesticides and compacted soils. The fields are often divided by hedgerows, which help avoid soil erosion from wind and rain, and provide habitat corridors for wildlife.[1]

The series of landscape sections demonstrate how to transform the fields and soil conditions. To start, the compacted fields are softened with a subsoiler, to soften them and prep them for new growth. To follow, by planting and engaging in the 5 regenerative agriculture practices, soil health can be restored. This will help grow food for local communities. These practices protect soils from erosion, restore nutrients, fungi and soil organisms. Figure 5.4 shows examples of crops that can be planted.

Figure 5.1 *La Ferme des Quatre-Temps regenerative agriculture farm.*

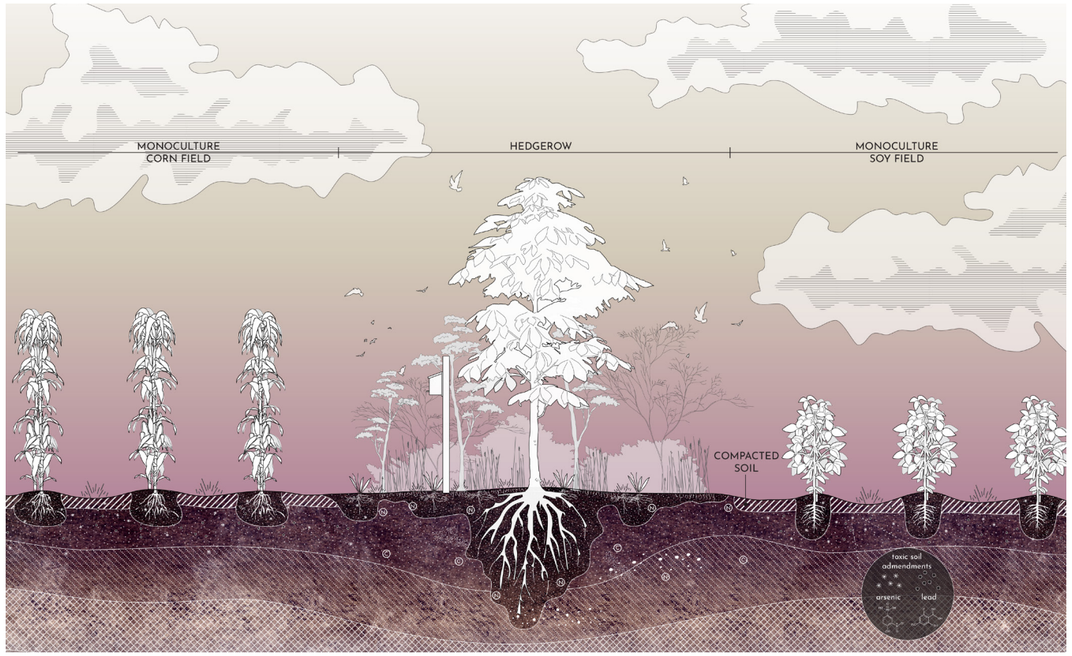


Figure 5.2 *Phase 1: Section demonstrating existing conventional agriculture field.*

Figure 5.3 *Phase 2: Section demonstrating soil preparation for field.*

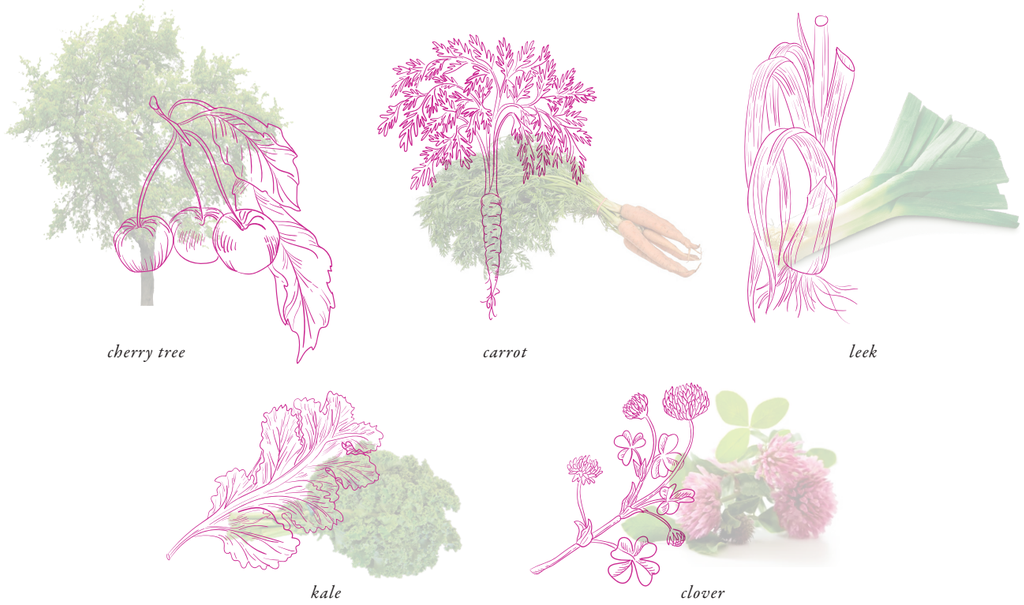


Figure 5.4 *Illustrations of crops grown for community use.*

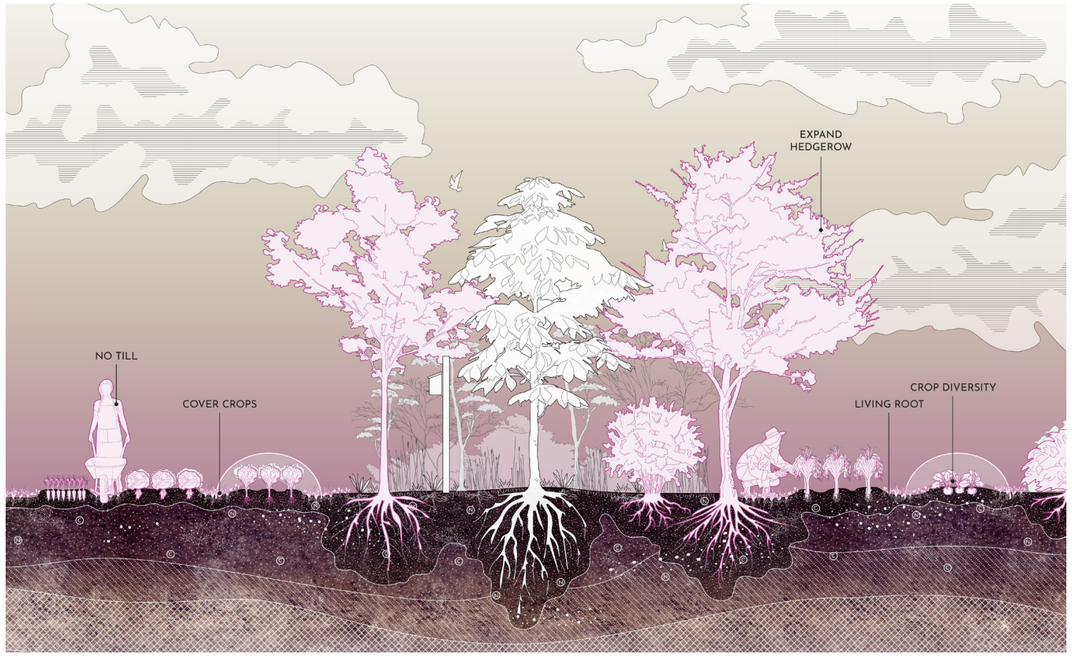


Figure 5.5 *Phase 3: Section demonstrating proposed regenerative agriculture field.*

"There are more life forms in a handful of forest soil than there are people on the planet ... These work the soil, transform it, and make it so valuable for the trees. "

- Peter Wohlleben

Restoring Forest Cover

After transforming conventional agriculture fields into regenerative lands, this section reveals the importance of tree and bush cover with respect to agriculture. Prior to European colonization, and settlement in the 18th and 19th centuries, Southern Ontario had over 80% forest cover.[2] Development of settler agriculture and urbanization removed 70% of tree cover of the entire landscape in under three hundred years.[3] However, trees and forest cover play an important role in their ecosystems and agricultural lands. They store large amounts of water in the soil, and contribute to soil health with decay and litter, while providing shade and protecting agricultural lands from erosion and the elements. Therefore, it is important to protect and grow the tree cover for the area. This can be done with agroforestry practices.

Agroforestry is a sustainable land management approach which combines trees, crops, and livestock at a field scale, and has "shown solid evidence of its role in improving soil quality and health based on at least four decades of data gathered from the world over."[4] It has the ability to "(1) enrich soil organic carbon better than monocropping systems, (2) improve soil nutrient availability and soil fertility due to the presence of trees in the system, and (3) enhance soil microbial dynamics, which would positively influence soil health."[5] There are a variety of agroforestry practices, but the design proposal for the agricultural preserve will focus on implementing a specific type of agroforestry—the growth of food forests.

Food forests are food system designs traditionally used by Indigenous communities "who evolved in forest ecosystems all over the world".[6] They are "described as a diverse group of plants, mostly perennial, which provide multiple services to help humans meet their needs locally for food, medicine, shelter, recreation, fibers, dyes, fodder for animals, fuel, and more".[7] Indigenous peoples cared for and maintained these forests, using sustainable agricultural practices that supported soil fertility.

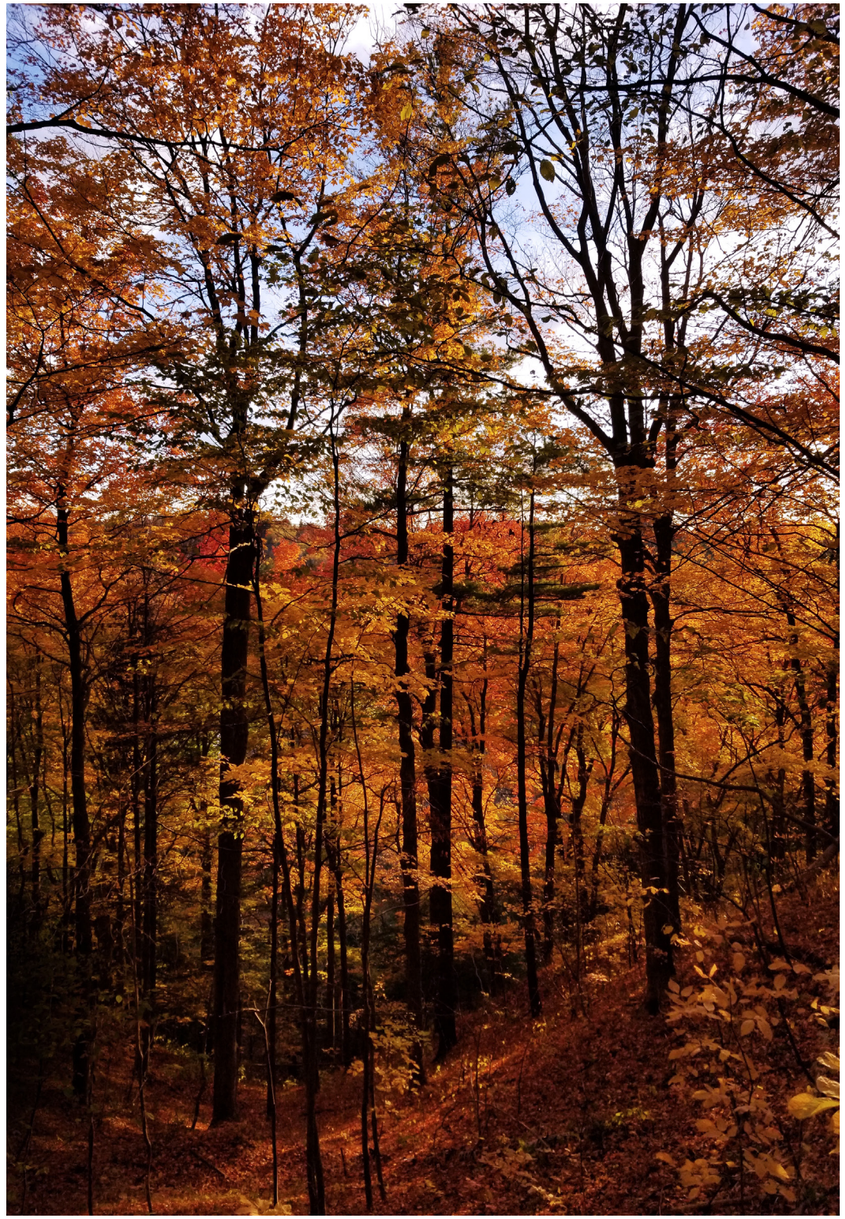


Figure 5.6 *Forest in the Rouge National Urban Park.*

Food Forest Design

The design proposes to grow food forests in the agricultural preserve as a way to acknowledge the history of the land in Southern Ontario that was once primarily forests and return the agricultural preserve's land to a forest-based ecosystem which provides for human needs.[8] Anishinaabeg Elder, Duke Redbird, explains how the 7 unique canopies found in the food forest are imparted from the Indigenous Seven Ancestral Teachings.[9] These have been guided and practiced by Indigenous peoples since time immemorial."[10]

First Nations leaders who know these practices can guide and collaborate with government officials to implement these in policy, as a way to grow the area's tree cover. By using policy, leaders can guide where and how to plant food forests on farmlands. Food forests can be grown in farm parcels along the perimeter of existing tree lines. In time, any agriculture fields or "rooms" which are bounded by food forests can be filled in, as shown in Figure 5.9. Ultimately, this will expand the tree cover for the entire area. Food forests are made up of 7 layers including nut trees, fruit trees, shrubs and perennial vegetables. Diverse in vegetation, these layers are planted in a way that mimics the growth process and ecological succession of nature. These are planted by order of their mature growth size, from largest to smallest, to provide protection to the layers below. The 7 layers of the food forest area listed below with their paired Ancestral Teaching, in their planting order.

7 Ancestral Teachings		7 Forest Layers
Wisdom	1	*Fruit & Nut Canopy*
Courage	2	*Understory & Fruit*
Respect	3	*Shrub & Berry*
Truth	4	*Herbaceous*
Honesty	5	*Ground*
Love	6	*Vertical/Climbing*
Humility	7	*Root*

The design for the agricultural preserve is inspired by these teachings and aims to evoke their meaning in the landscape. The following cross-sections demonstrate the transformation of the ecotone between existing tree lines and agricultural fields with the growth of these food forests.

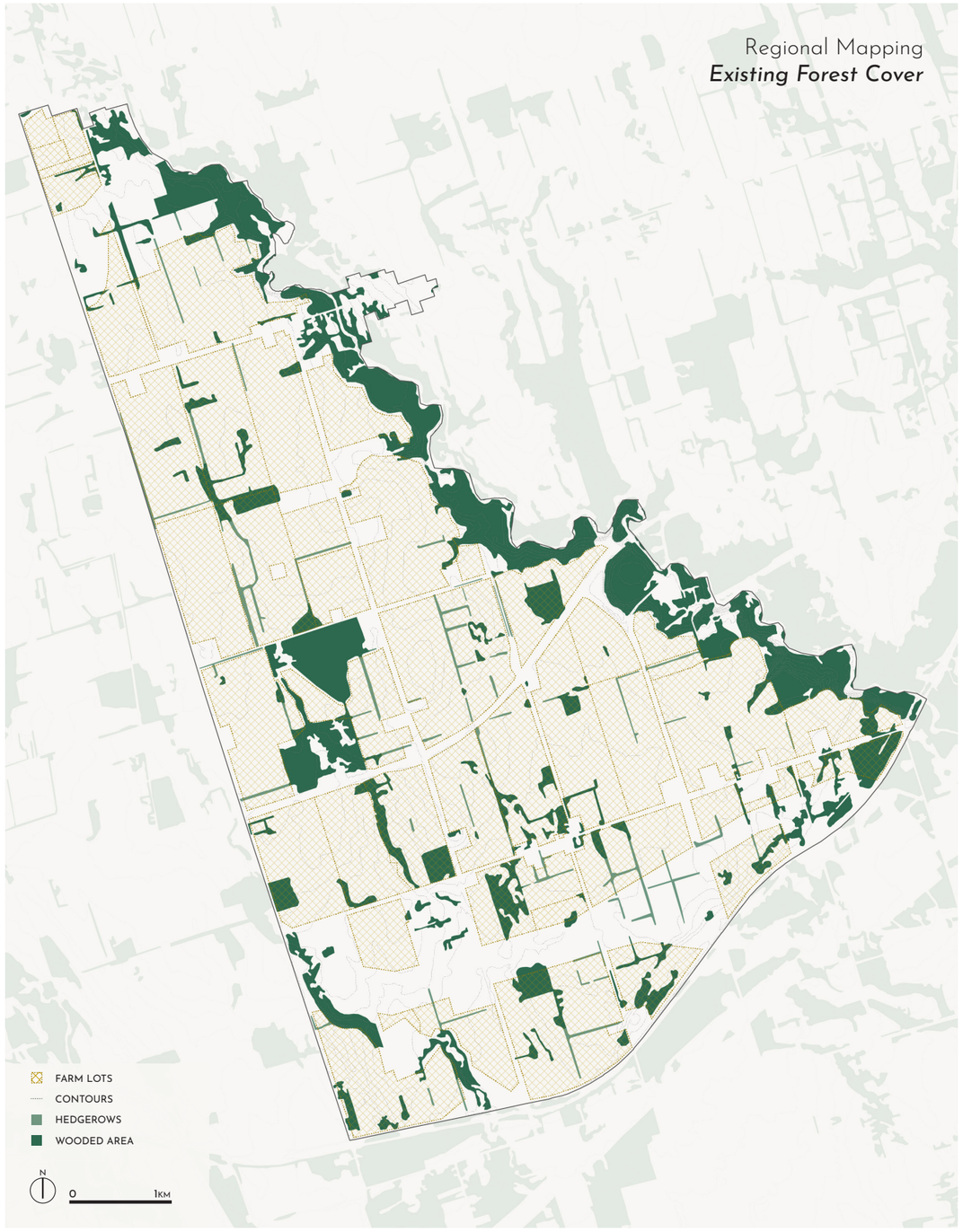


Figure 5.7 *Plan of existing forest cover conditions with farm parcels.*

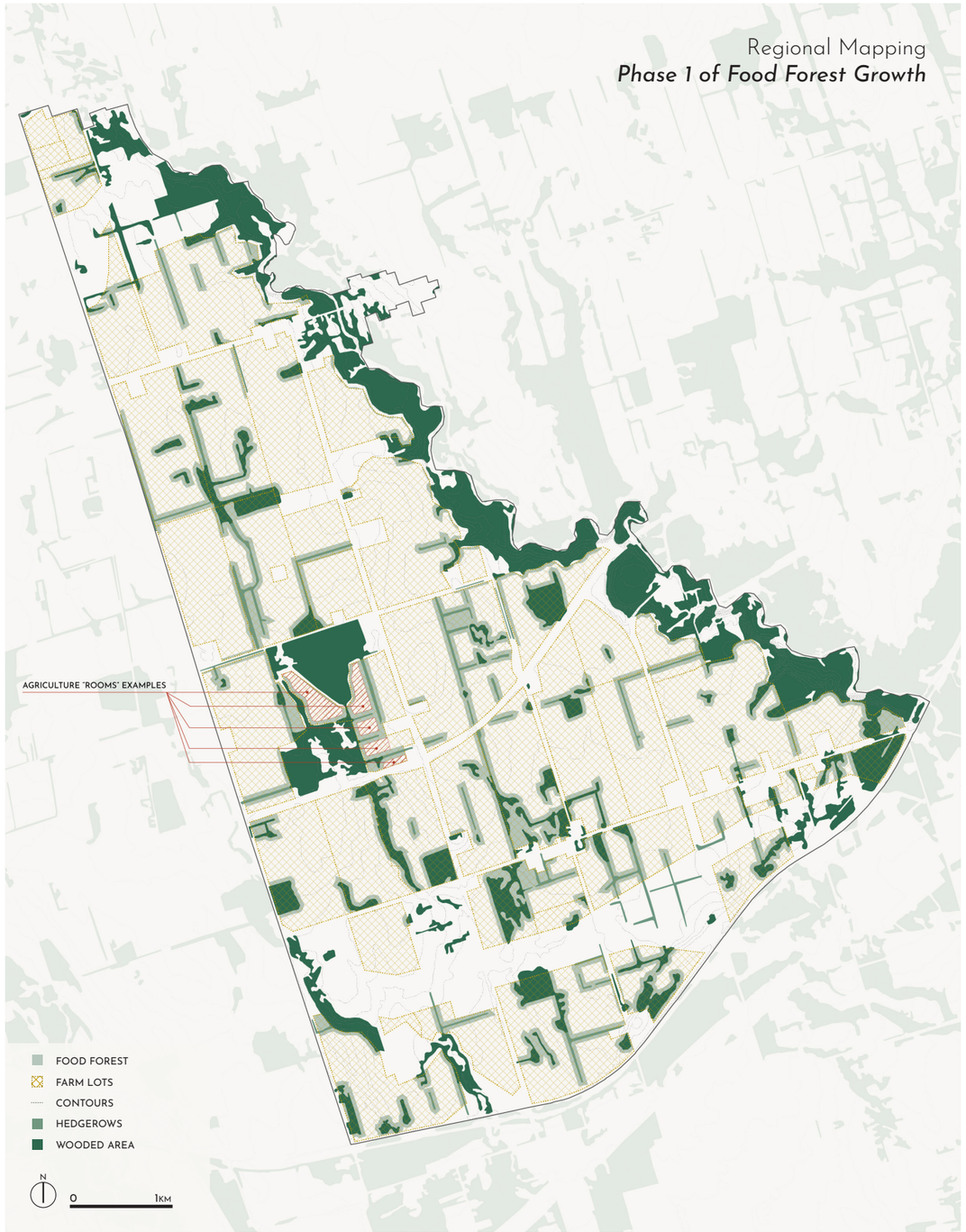


Figure 5.8 *Proposed plan of phase 1: growth of food forests.*

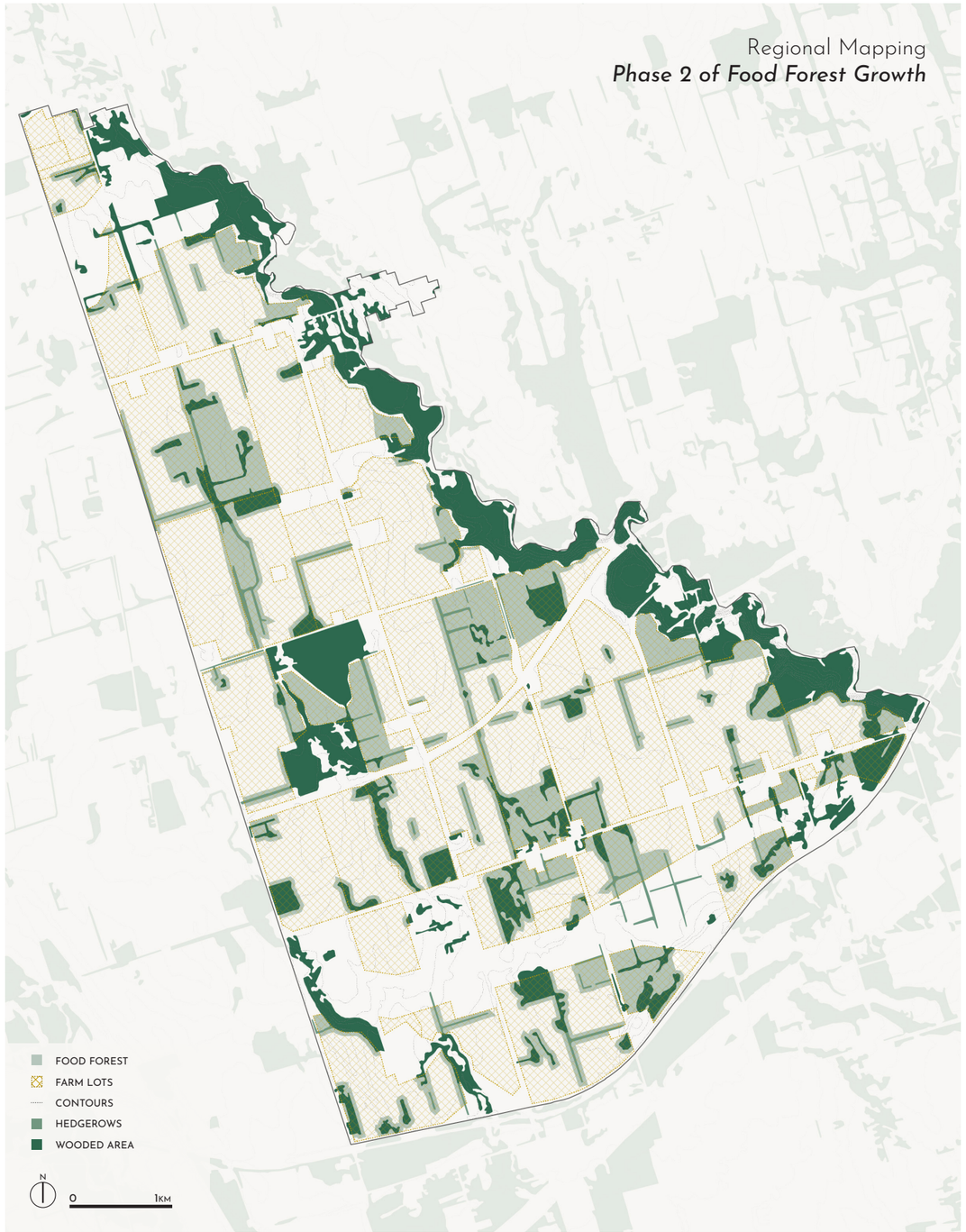


Figure 5.9 *Proposed plan of phase 2: growth of food forests.*

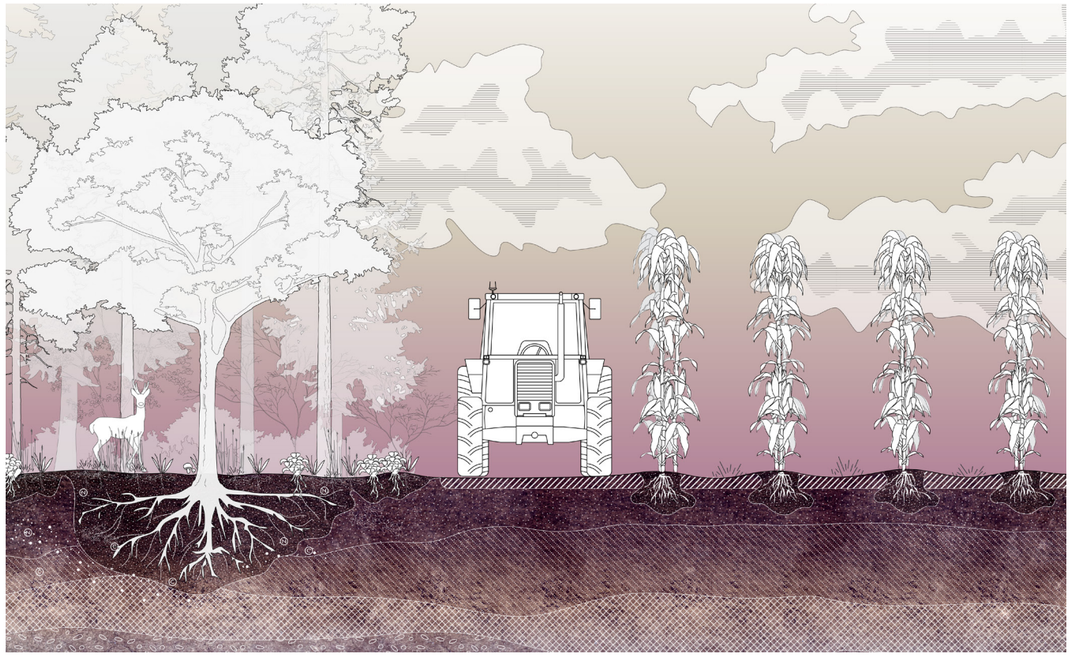


Figure 5.10 *Section illustrating existing ecotone conditions between agriculture field and forest cover.*

Figure 5.11 *Section illustrating proposed food forests expanding existing forest cover.*

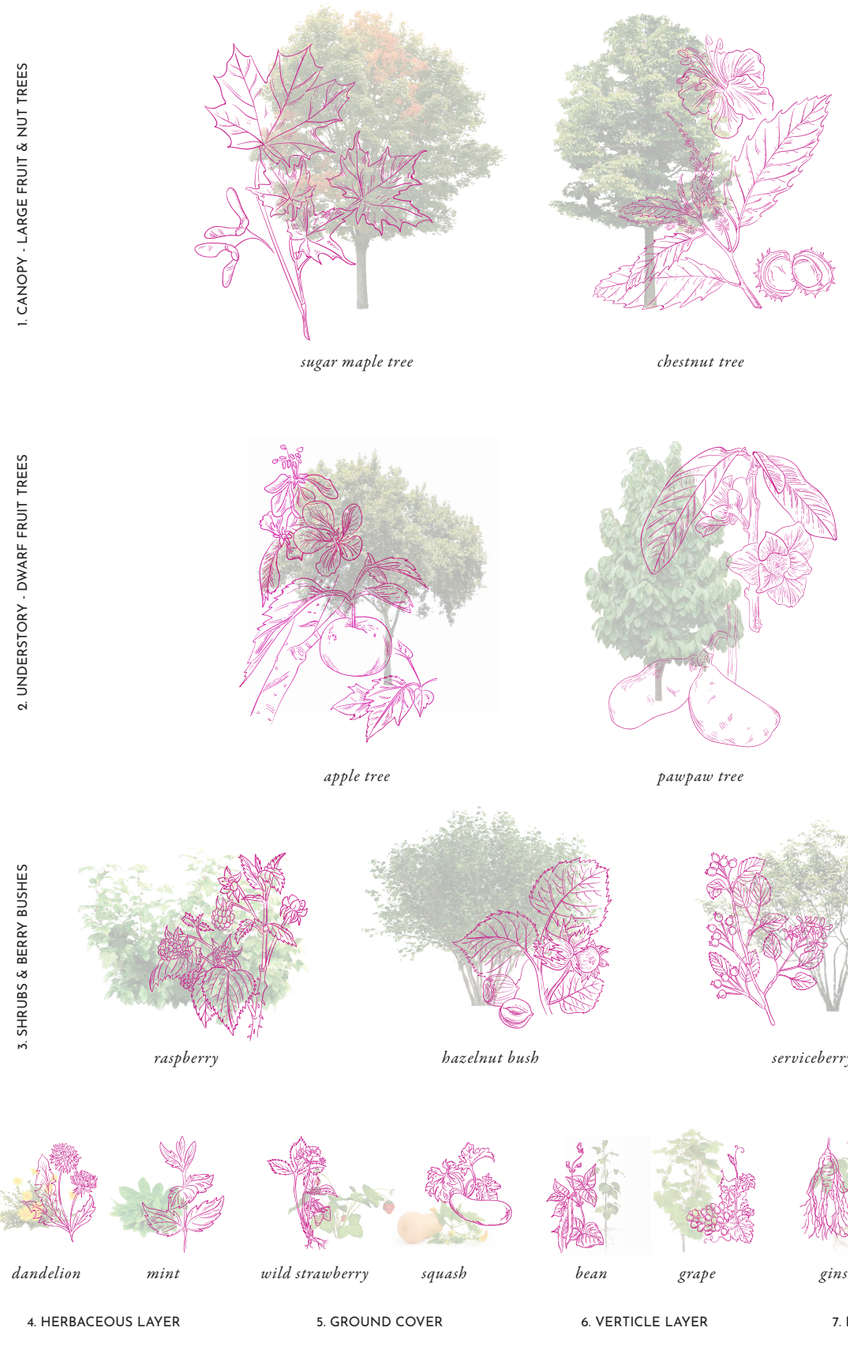


Figure 5.12 *Illustrations of crop examples for food forests.*

Restoring Wetlands

With land transformative processes in place, this section shifts the focus towards water health and conservation in wetlands and watersheds. Wetlands are crucial and remarkable ecosystems, and "scientific research has shown that wetlands are known to provide flood control, improve water quality, and enhance carbon sequestration."[11] Wetlands are essential ecosystems for the agriculture sector. They provide agricultural resilience against drought and play an essential part in the conservation of both water quality and quantity.[12] They also reduce greenhouse gases by building and storing soil carbon.[13] However, conventional agriculture processes negatively affect the health and function of wetlands. In Ontario, 68% of wetlands have been drained and converted to agricultural lands.[14] Essentially, this means that the reservoirs that supply ground water for underground irrigation are being exhausted. Wetlands are also severely affected by the pesticides used in farming practices and become clogged by soil erosion.[15]

The design for the Duffins Rouge Agricultural Preserve aims to restore and expand wetlands in response to the crucial role they play for the agriculture lands. This thesis uses policies guided by scientists and researchers to orchestrate wetland restoration. The design proposal follows the Toronto & Region Conservation Authority's (TRCA) suggestion of using 30m buffer zones surrounding the wetlands.[16] These buffer zones will help to reduce soil erosion and contaminants from entering the water course. When waterways and wetlands overlap into farm parcels, policies will direct how to use a combination of flood-resistant crops and phytoremediation vegetation to maintain the health of these water systems. These can be integrated to protect waterways while continuing to be economically advantageous.

Figure 5.13 *View of West Duffins Creek captured from the Seaton hiking trail.*

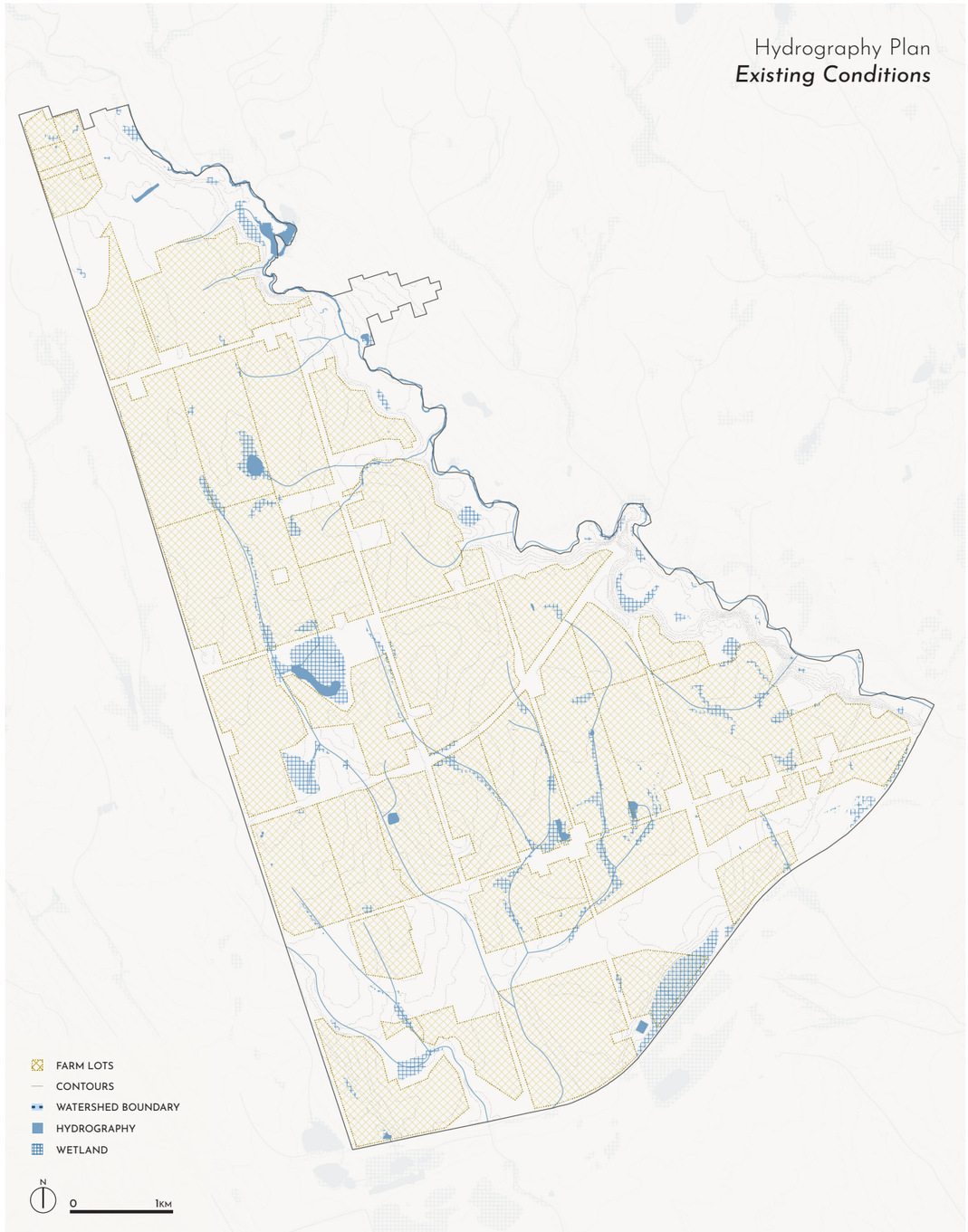


Figure 5.14 *Plan of existing hydrography conditions with farm parcels.*

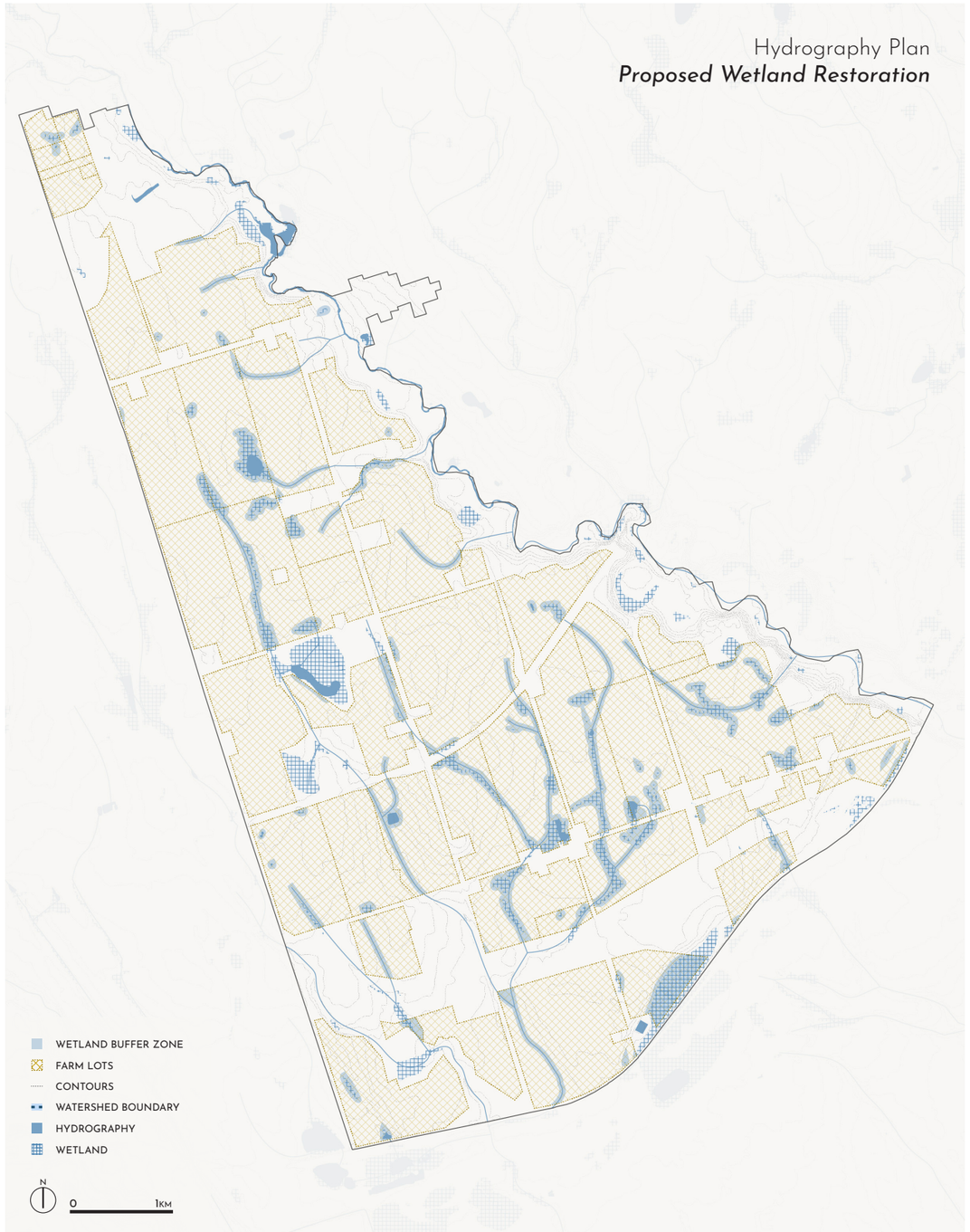


Figure 5.15 *Plan of proposed hydrography growth areas.*

Phytoremediation Design

Phytoremediation is the remediation of a degraded habitat with the use of plants.[17] It is done by growing plants that remove contaminants from soils and water, such as heavy metals and unwanted chemicals.[18] Common phytoremediation plants include Willow trees, Poplar trees, Indian Mustard, and Sunflowers. These plants, such as Willow trees, can then be harvested for economical by-products such as biomass for biofuels, pharmaceuticals, and other products.[19] Using phytoremediation strategies to remove toxic soil contaminants allows groundwater to flow through soils into nearby wetlands without the addition of harmful chemicals or metals. This protective ecosystem strategy benefits the water, soil, and habitats in the agricultural preserve, as well as life and biodiversity in the wetland's watershed. Phytoremediation plants that are suitable for growth in the agricultural preserve are often vibrant in colour, such as Sunflowers and Indian Mustard which both bloom in bright yellows, and their addition will increase the landscape's aesthetic.

Healthy wetlands provide a range of valuable ecosystem services to agriculture lands. By keeping wetlands healthy with phytoremediation strategies, they can continue to support fertile soils and store large amounts of water—critical services for agriculture lands. In fields adjacent to wetlands that are prone to flooding, planting flood-resistant crops such as wheat and barley will be beneficial, as they are not susceptible to flooding events.[20] Use of these crops can help "mitigate the devasting social and economic impact of extreme weather events on food production"[21] and will allow the agricultural preserve to be resilient to a changing climate.

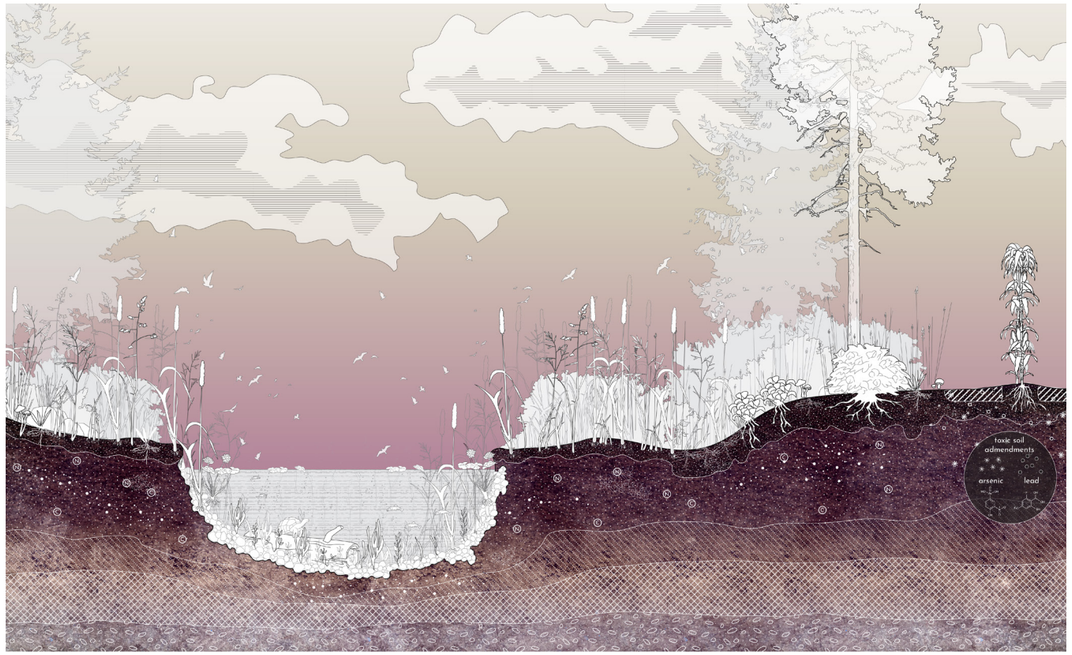


Figure 5.16 *Section of existing wetland conditions with adjacent agricultural field.*

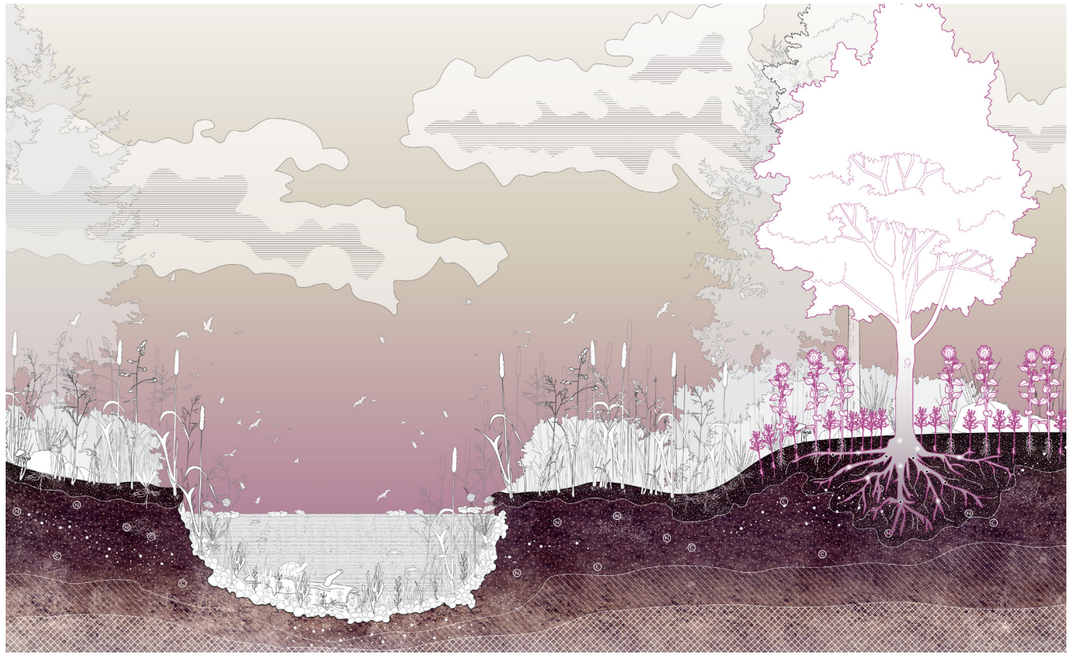


Figure 5.17 *Section of wetland conditions with phytoremediation strategies.*

Figure 5.18 *Illustrations of phytoremediation vegetation.*

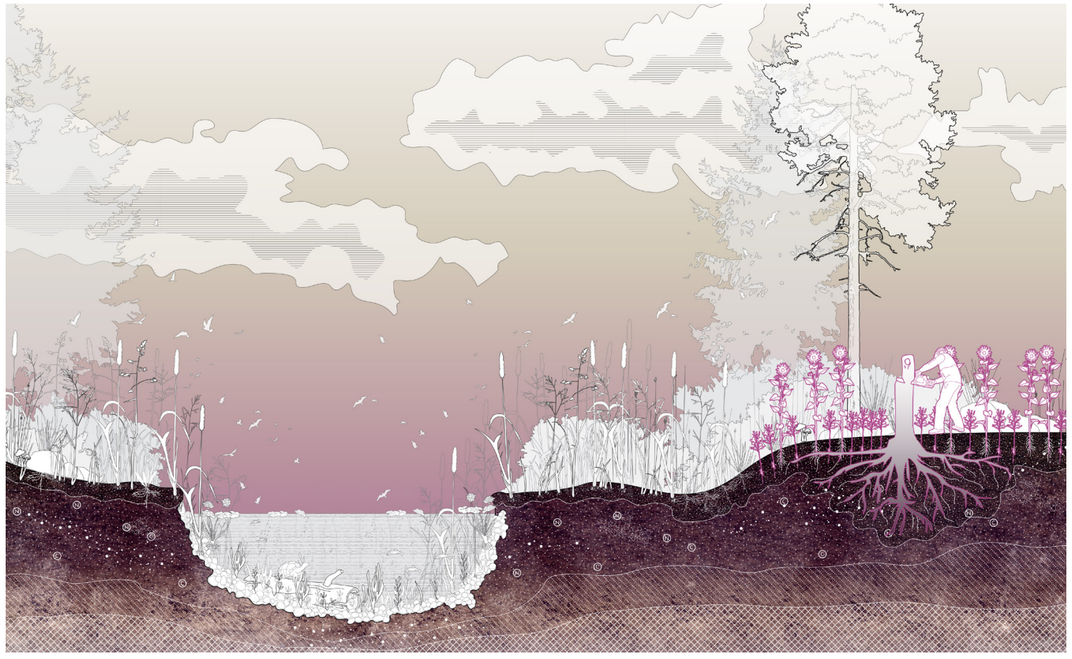


Figure 5.19 *Section of wetland conditions with the harvest of phytoremediation crops.*

Operating the Agricultural Preserve

After addressing the need for transformative land processes, this section of the thesis identifies the methods of operation for the agricultural preserve. With respect to finance and resources, the proposal for the agricultural preserve will be financially supported by the sale of produce, as well as government incentives, and partnerships with philanthropists.

Incentives from the Government of Canada will be necessary at the beginning of this project to help kick start the transformation of the agricultural preserve. In 2021, the Government of Canada announced a $185 million, 10-year program called Agricultural Climate Solutions (ACS), "that will help develop and implement farming practices to tackle climate change."[22] ACS is supporting projects that work to sequester carbon, conserve soil health, conserve clean water, protect biodiversity for sustainable farms, and reduce the effects of climate change.[23] ACS also supports projects which transfer "knowledge to other farmers so that they can deploy solutions that are tailored to their region and promote environmental sustainability and resiliency in the agriculture sector."[24] The design proposal for the Duffins Rouge Agricultural Preserve makes this project a perfect candidate for funding support by Canada's ACS.

The agricultural preserve also draws inspiration from La Ferme des Quatre-Temps. It is 160 acres of land, with an experimental farm that was "founded by wealthy philanthropists ... in Québec with the goal of demonstrating what the farm of the future could be."[25] The farm's intention is to provide an environment conducive to research, development and content creation.[26] Although the scale of La Ferme des Quatre-Temps is much smaller to the agricultural preserve, it demonstrates the possibility of financial support and donations from philanthropists who have similar values to the agricultural preserve.

Farms in the agricultural preserve can partner with restaurants and major institutions in the GTA to support the expansion of the farm-to-table movement, while securing guaranteed costumers. Additionally, a Community-Supported Agriculture (CSA) model will be implemented for the agricultural preserve. The CSA model "seeks to create a direct relationship between farmers and those who eat their food—farm members or shareholders."[27] Members of the CSA purchase a "share" at the beginning of the season, which allows farmers to plan production for a guaranteed market.[28] In this farming model, "members know other members of the farm, forming a community of eaters who have a long-term interest in working

Figure 5.20 *Produce trays at farmers market.*

with their farmer to assist in the success of the farm ... [and support] the nurturer of community ties of responsibility and celebration."[29]

Additionally, products grown in the agricultural preserve, which are sold in markets exterior to the site, will have a regenerative price premium. This will be similar to the premium price of organic crops. The agricultural preserve will advocate for market recognition of regeneratively grown products. It will use certifications or labels, such as the Regenerative Organic Certification (ROC). This certification "requires three additional pillars of product quality: soil health, animal welfare, and social and labor fairness."[30] There has been an argument that "price premiums for regenerative products would help convince more farmers to adopt regenerative practices, the upshot is that high prices may prevent lower-income consumers from affording this food."[31] To combat this inequity, the agricultural preserve will partner with hunger relief and food sovereignty organizations, donating products to those in need or who cannot afford the price premiums.

For phase one of the project, the agricultural preserve will use funding to transform one farm parcel into the first demonstration plot. This parcel will be selected based on a variety of elements in the landscape that the Board of Directors believes to be important. If the tenant of the chosen agricultural parcel supports the transformation of their land, then the project will be given the green light. This tenant will be financially supported in the first few years. Phase one will transform the farm parcel using the five main regenerative practices. Once the first farm parcel's transformation has been completed, it will act as a regenerative agriculture example, showcasing what is possible for the whole site. It will become a place for education, where community members can learn about the processes that are restoring the soils and ecosystems in the agricultural preserve. Also, during phase one, allotment gardens will be created, to immediately initiate community engagement with the agricultural preserve. This will help draw awareness and support for the transformation of the entire site.

Public spaces will be co-designed with community members, using their feedback to create sites of engagement that community members feel will positively impact their lives. Figure 5.21 calls out the roles of those who actively engage and work in the agricultural preserve. Those who are involved in ensuring the agricultural preserve runs smoothly include decision makers, organizers, producers and distributers. It proposes an inclusive and diverse Board of Directors for the agricultural preserve. The provincial government, local aboriginal groups, community members, researchers, environmentalists, and regenerative farmers would each have a representative, who would advocate for their needs.

Figure 5.22 identifies the land stewards from Figure 5.21, those who work intimately with the land and imagines what their practices are when caring for the land. These are the people who feel the need to spend their days outdoors, with their hands and feet in the dirt, working with forces of nature to make a tangible contribution to the wellbeing of their communities. People who work in the agricultural preserve might include students from local institutions, new residents in the adjacent New Town Seaton Area who are looking for work, and community volunteers. The diagram envisions their livelihoods connected to the recovery of land. The livelihoods of individuals working in the agricultural preserve will be supported with the financial initiatives previously mentioned.

To involve interested groups of people who might otherwise be excluded, the agricultural preserve will offer community programming and food-distribution projects. Events will be hosted to offer hands-on training and learning experiences. The agricultural preserve will partner with land stewardship organizations and educational programs, such Foodshare, as to initiate social change through food. This will help engage marginalized groups who can then contribute their alternative farming and food knowledge to the overall large-scale initiative.

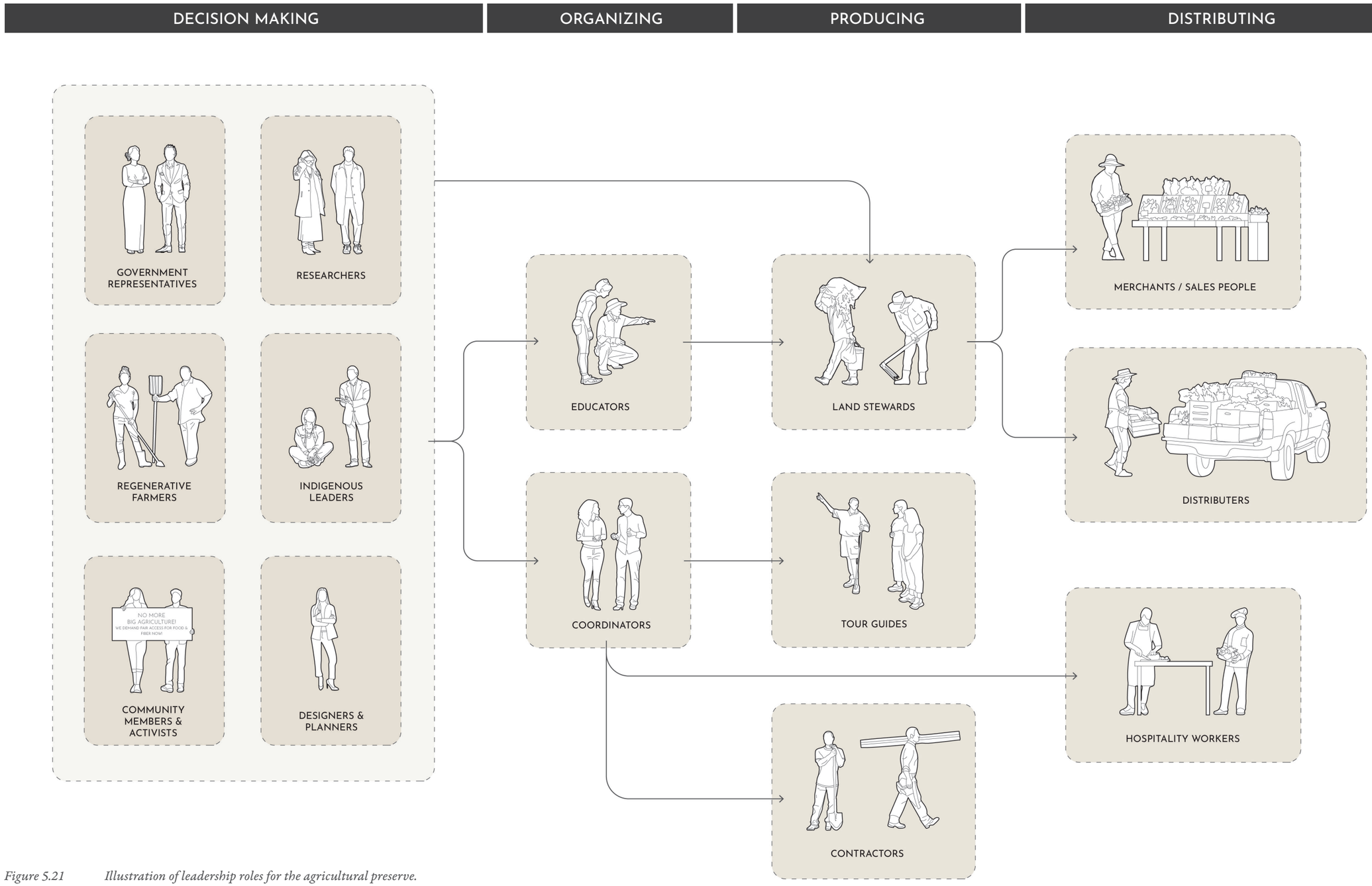


Figure 5.21 *Illustration of leadership roles for the agricultural preserve.*

LAND STEWARD ROLES

FOREST PRACTICES

TREE MANAGEMENT

SYRUP HARVESTING

CONTROLLED BURNING

FOREST HARVESTING

CROP PRACTICES

SEEDING

HARVESTING

MANUAL WEEDING

MULCHING

APPLYING COMPOST

GARDENING PRACTICES

PLANTING

IRRIGATION

HARVESTING

MULCHING

COMPOSTING

PEST CONTROL

BEEKEEPING

INTERCROPPING

PROTECTION BAGS

INFRASTRUCTURE MANAGEMENT

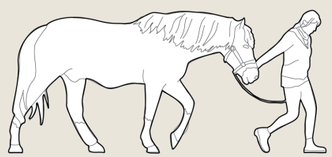
BUILDING MAINTENANCE

WASTE MANAGEMENT

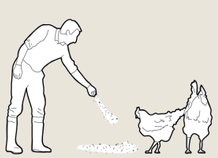
TRAIL MAINTENANCE

LIVESTOCK MANAGEMENT

CARING



LEADING / HERDING



FEEDING

MILKING

Figure 5.22 *Illustration of land stewardship roles.*

Providing Community Gardens

Community engagement starts with involving the public in the stewardship of the land. The creation of public greenhouses, allotment gardens, and food bank gardens are small-scale interventions that lead to intimate interactions between community members and their landscapes, while helping feed families in need. These gardens could be located in the lands under the hydro corridors. Typically, the high-voltage transmission lines hang over areas of unused fields. The design proposal will utilize these lands, drawing inspiration from urban agriculture projects located under similar hydro corridors around Toronto, such as The Meadoway design project by the architecture firm Perkins and Will. These corridors have the potential to become destination areas in the agricultural preserve and will create opportunities for people to get their hands dirty. Many new immigrants moving to Canada come from farming backgrounds and are willing to use their cultivation skills to dig into the ground.[32] However, when these immigrants arrive in the GTHA, they are unable to put their skills to use as it is too expensive to acquire farmland in the lands surrounding Toronto.[33] There is no shortage of people willing to farm and grow their own food, but their access to land is limited. Instead, land should be set aside and secured for their use. Allotment gardens gives community members and immigrants the ability to connect to the land by growing their own culture's food.[34] Growing familiar food that is connected to home and childhood unifies community members and is a way of continuing a family's legacy in a new and unfamiliar landscape, while establishing new roots and connecting to local soils.[35]

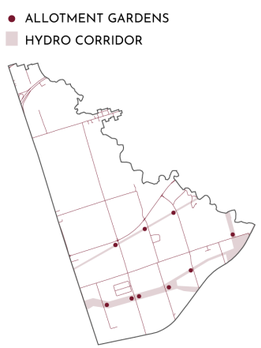


Figure 5.23 *Key diagram with community garden locations.*

Figure 5.24 *Author's niece picking berries at Whittamore's farm.*

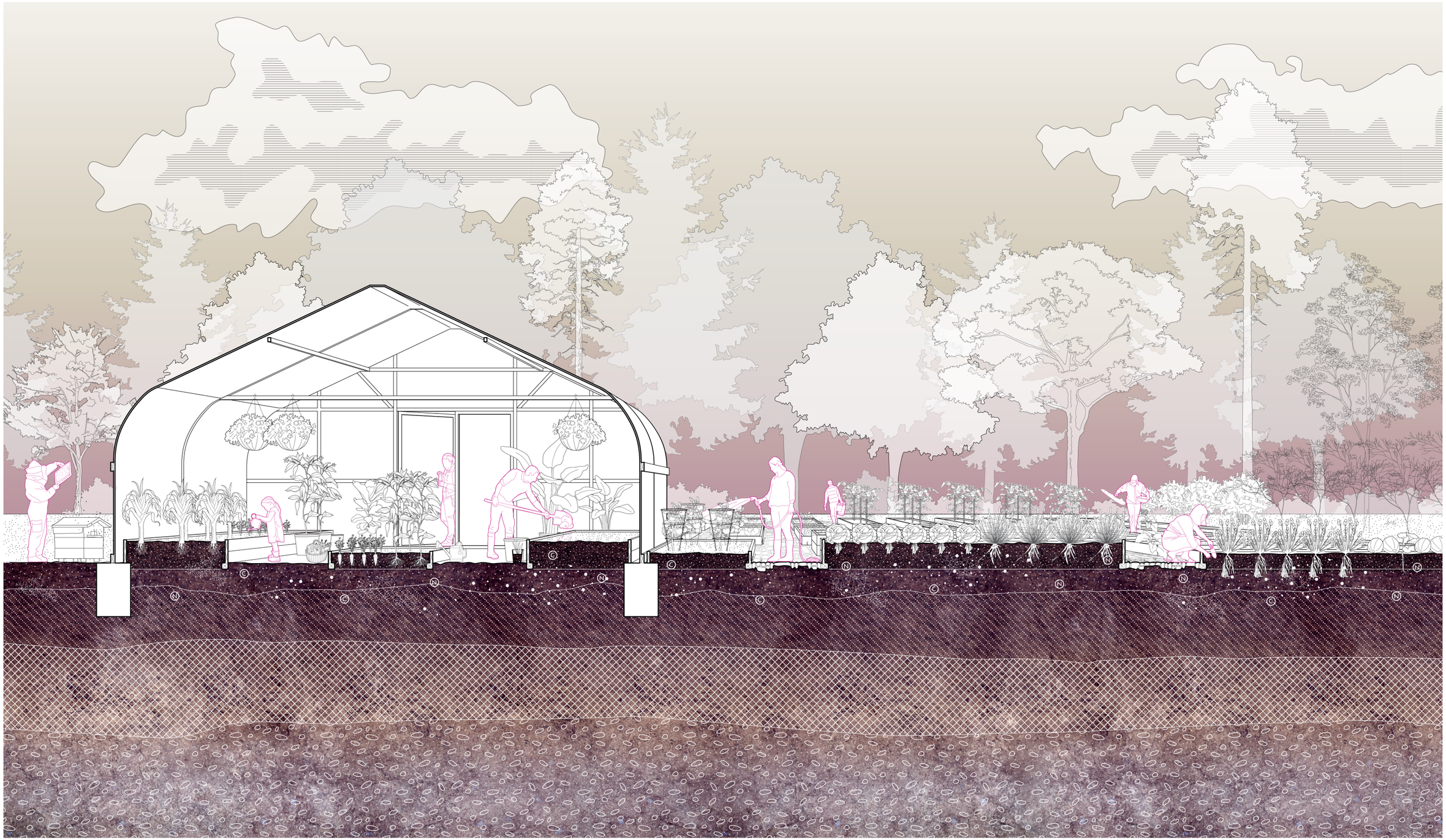


Figure 5.25 *Section of community greenhouse and garden.*

The Role of Indigenous Gardens

As work unfolds towards developing sustainable solutions to chronic issues in Southern Ontario's food systems, it is crucial to make space for local First Nations and Aboriginal groups. These groups have the longest relationships with local ecosystems, but also have the longest relationship with societal patterns that maintain the issues of imperialism, capitalism, white privilege, and patriarchy.[36] It is important to not only work with them throughout the landscape transformation of the Duffins Rouge Agricultural Preserve, but to give land back to celebrate their practices. The drawing of the Indigenous Garden in Figure 5.28 drew inspiration from the constructed corn spiral food garden located in the Springbank Food Bank Gardens by Rare Charitable Research Reserve. This corn spiral food garden was planned and completed by Dr. Andrew Judge, an Anishinaabeg leader who teaches at the University of Waterloo, among other education institutions, and educates communities on Anishinaabeg traditional land practices. His corn spiral food gardens are fine grain demonstration plots for local Indigenous practices. This thesis imagines one or more of these gardens to be constructed in the agricultural preserve, as a place for community members to learn from the First Nations who have stewarded the land for centuries. These Indigenous gardens would allow involved community members to work in respectful collaboration, where settler and Indigenous science systems can support the growth of skills to work with perennial plants and to share the principles necessary to create a food system that is centred upon a culture which cares about people and recognizes its inextricable connection to the land and the water.[37]

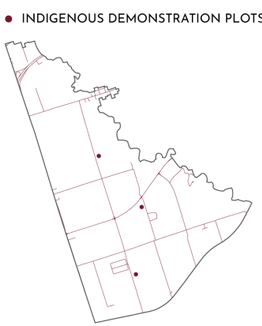


Figure 5.26 *Key diagram with Indigenous garden locations.*

Figure 5.27 *Anishinaabeg Harvesting Ceremony Totem at Rare Charitable Research Reserve.*

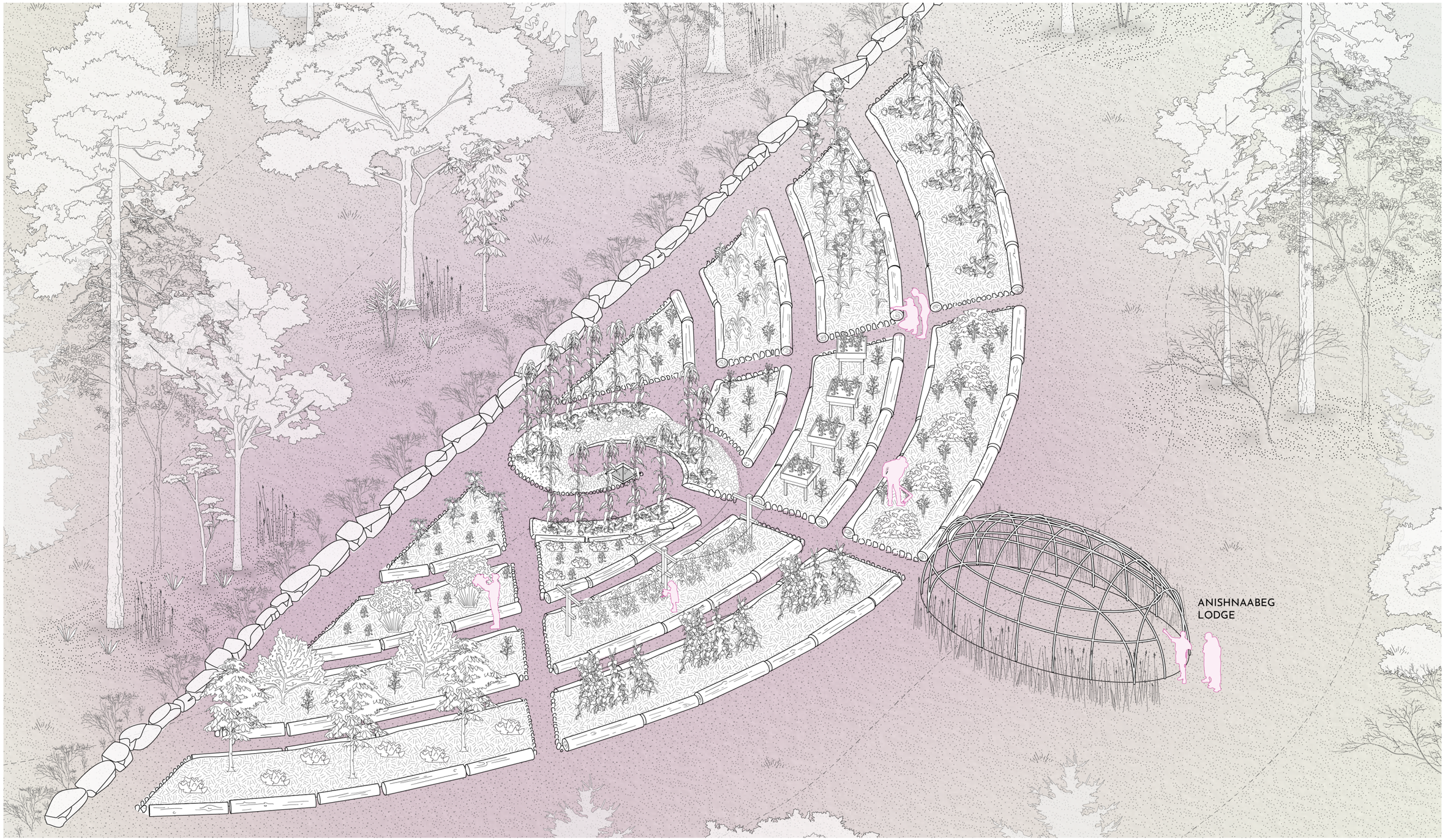


Figure 5.28 *Illustration of Anishnaabeg corn spiral food garden.*

Utilizing the Century Old Barns

As more people visit the agricultural preserve and with an increase in community interactions, there will be an increasing need for structures to act as gathering and event hubs. Marked by the crosses on the infrastructure plan in Figure 3.8 are the many century-old barns which stand in relatively good condition. One existing barn in the agricultural preserve already acts as a community hub. The Herongate Barn Theatre is a large barn located off Altona Road, a main transit artery through the site. It was transformed into a theatre, restaurant, and wedding venue and offers surrounding communities a place for enjoyment. The proposed design for the Duffins Rouge Agricultural Preserve draws inspiration from Herongate Barn Theatre. Instead of building new, the plan chooses to utilize these existing barn structures. These existing buildings represent embodied carbon, and by retrofitting them for new uses, act as a way to provide for the community while reducing carbon emissions.[38] They are reimagined as places for events, such as farmers markets, or used as research spaces. If re-utilized as research buildings, researchers from the government can work with academic institutions in these spaces, to build partnerships between colleges and the agricultural preserve. Academic institutions that have access to tools, information, funding, and processes can work with farmers who prioritize local communities. Together they can support the creation of long-term trials. Academics working in the agricultural preserve can also build relationships with local Indigenous groups to encourage practices in our food systems are guided by principles that care for people and the land.

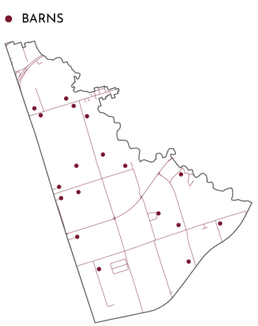


Figure 5.29 *Key diagram with barn locations.*

Figure 5.30 *Leahy's farmers market barn in Lakefield, ON.*

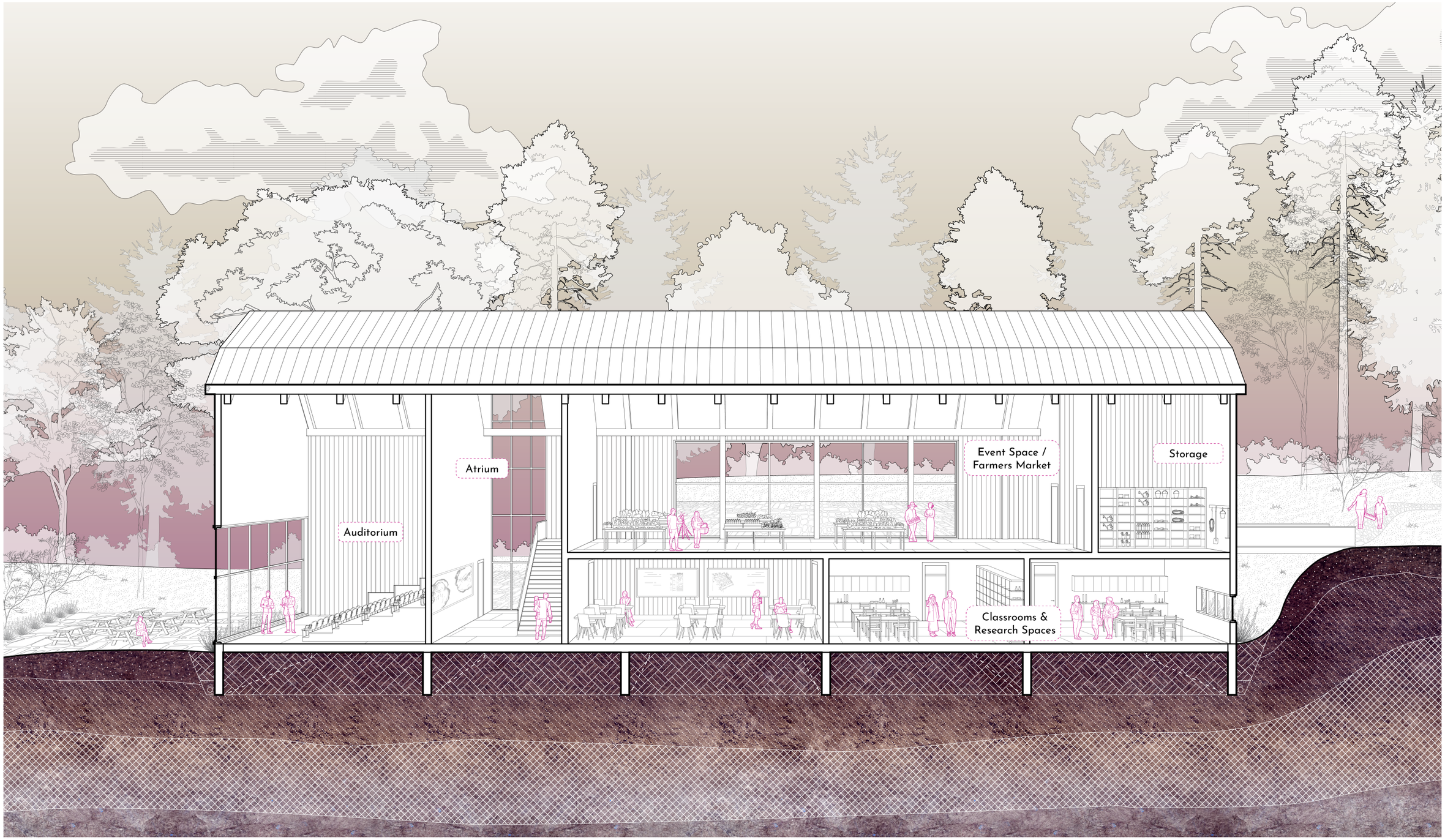


Figure 5.31 *Sectional perspective of barns re-imagined.*

Connecting the Landscape

This thesis imagines the Duffins Rouge Agricultural Preserve to become a point of interest for purposes other than agriculture. It proposes a system of trails and bike paths throughout the site, creating opportunities for hiking and commuting. These would connect to trails in the surrounding areas, such as those in the Rouge National Urban Park and the Seaton Natural Heritage System.

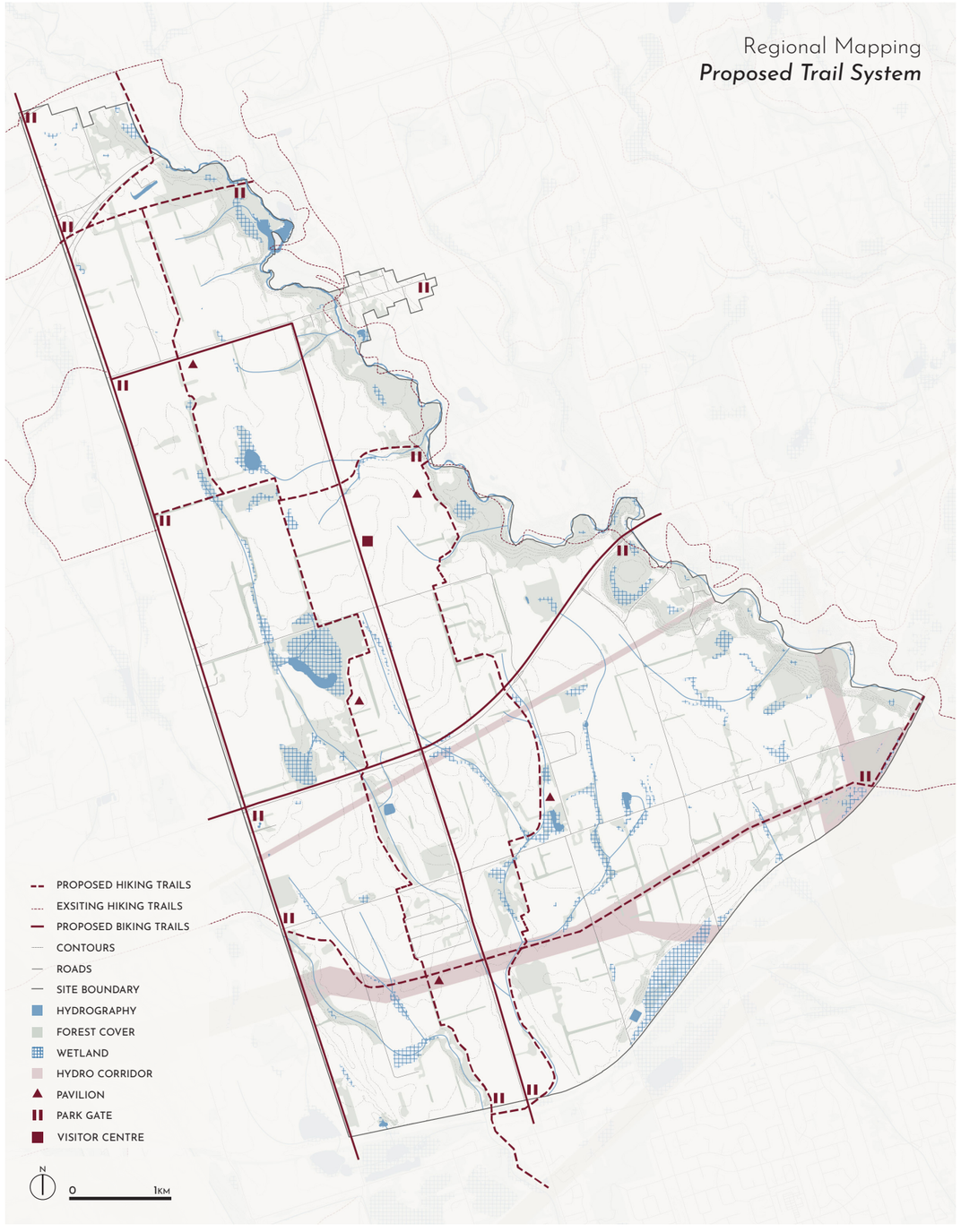


Figure 5.32 *Proposed trail system in plan.*

Entry into the Agricultural Preserve

Designed entrance signs are proposed at points of intersection between roads or trails and the site boundary. These are intended as more than typical government signs that currently announce the boundary of the site, as seen in the photograph in Figure 3.1. Entrance signs create the initial impression that visitors have and help set the tone of their experience. These signs would announce that the agricultural preserve is a special and intentional landscape, worthy of continuous protection.

Figure 5.33 *Rendering of proposed entrance signage at trail heads.*

Building Pavilions

Additionally, the thesis proposes multiple pavilions to be dotted throughout the site, as visualized in Figure 5.34. These pavilions are imagined as structures that complement their setting, offering a variety of purposes. These could create opportunities for design/build projects led by student design groups. They might also be introduced as curated installations by architects and artists, or can act as education huts, and bird viewing platforms for visitors.

In an op-ed for the ArchitypeReview, Susan M. Hatchell, president of the American Society of Landscape Architects, emphasizes the important role of pavilions in landscape design. She explains how designers use these "shelters to entice people to walk to them, and they are often sited to afford wonderful views to the landscape beyond. Pavilions provide a place to rest along the way, as well as shade to shield us from too much exposure to the sun. They are designed to be accessible, so that all ages and abilities can enjoy a wonderful outdoor setting."[39] The flexible nature of the pavilions will ultimately lead visitors throughout the site, as points of interest to reach and explore.

Figure 5.34 *Rendering of proposed pavilion and pedestrian trail.*

Imagining a Visitor Centre

In the future, when the agricultural preserve has become a celebratory landscape of these regenerative practices, *In Defence of Soil* imagines a visitor centre to be built on the footprint of a previous building, thereby not impacting undisturbed fertile soils. The design of this centre would be an inspiring place for visitors from around the world to come to the unexpected agriculture lands in Pickering, Ontario. The centre becomes a space for education and collaboration, where visitors could learn and understand the processes in place that restore healthy ecosystems, while connecting to and feeding local communities. The renderings in this thesis highlight the opportunity for architectural design in the agricultural preserve.

Figure 5.35 *Rendering of proposed Duffins Rouge Agricultural Preserve visitor centre.*

Figure 5.36 *Rendering of proposed visitor centre with regenerative fields and community barn in background.*

Conclusion

The design of this thesis imagines a future landscape that unifies local knowledge with regenerative practices to cultivate social connections with land restoration. The agricultural preserve is envisioned as a place to escape to from the bustling city streets, where visitors can find refuge in the serenity of a healthy and diverse agriculture landscape. A community landscape that honours the natural systems, with policies in place to protect, restore and expand them.

The ultimate vision for the agricultural preserve is to return to the previous aspirations of the site, dating back to when the land was set aside in the 1970s. This thesis aspires to give the agricultural preserve back an identity, transforming the site from one that has lost its purpose, into a demonstrational landscape, that proves agricultural processes can work to conserve and rebuild soil health. The agricultural preserve will act as an educational model, where guests will come to gain information. Visiting farmers can return to their own lands and apply their newfound knowledge to regenerate their farm fields.

Finally, the goal of this thesis is to create a project that reflects my love and respect for my local landscape, and my desire to share the stories and knowledge that I have learned throughout my master's degree, as I worked towards envisioning a hopeful future for the agricultural preserve and its surrounding communities. Envisioning a place where land relationships are restored, a place to celebrate in the joy of life and growth, and an inclusive, diverse, and opportunistic landscape that creates space and a sense of place for everyone to love and enjoy. A place where the power of our unified efforts can generate care in the landscape, and where knowledge from generations before can be passed down to the generations to come.

The thesis recognizes that the proposal for the agricultural preserve may not be a perfect design solution, however, its aim is to move in the right direction, towards restoring community connection with the natural world through care and stewardship and a little bit of dirt on our hands.

Figure 5.37 *Author's grandmother's hand, holding berries picked from her garden.*

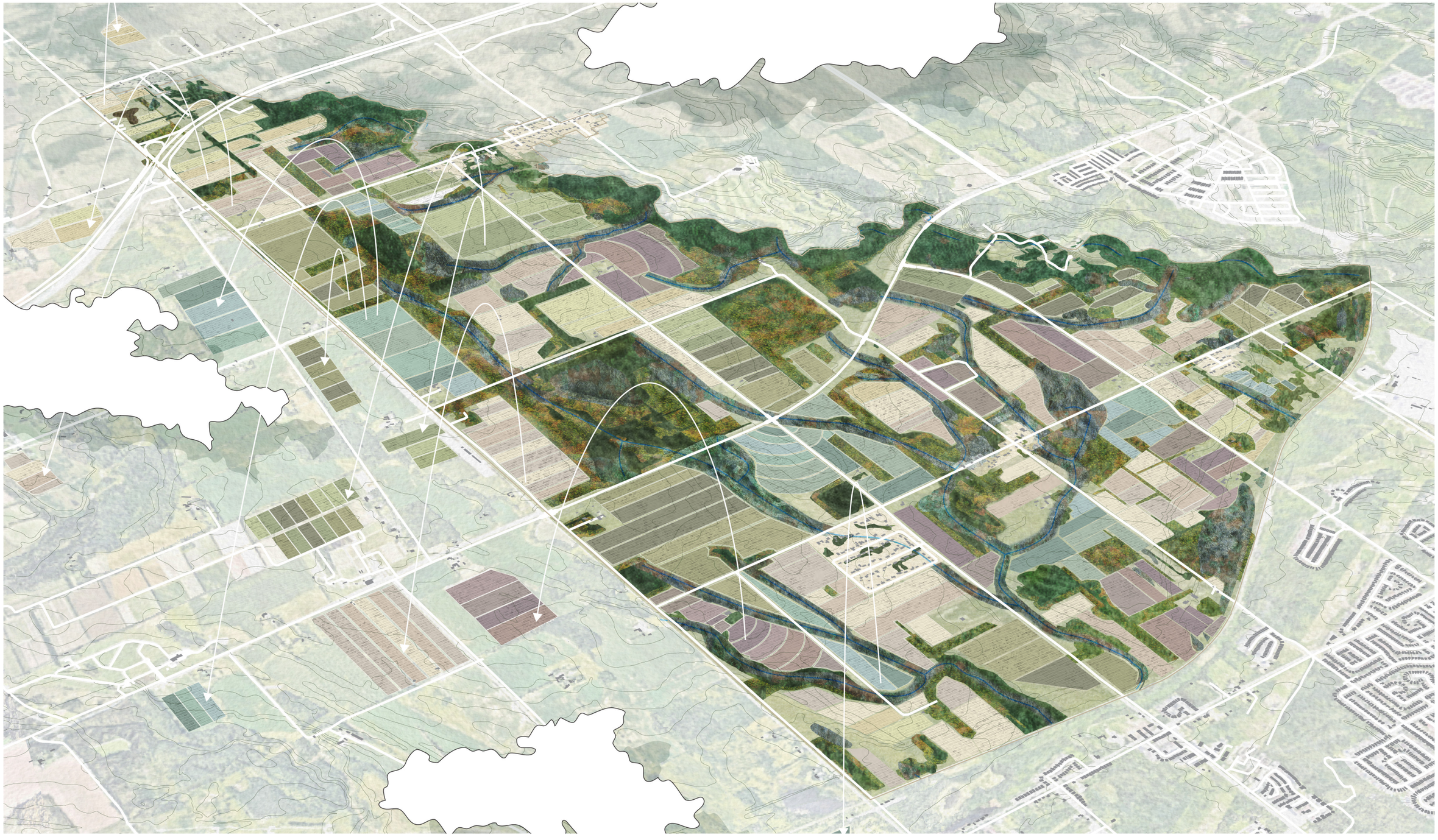


Figure 5.38 *Aerial illustration of agricultural preserve sharing knowledge to surrounding farms.*

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