



AFFORESTATION PLAN

2020 - 2030

Prepared for Canada's National Capital Region



DIRECTORS' STATEMENT

Over the course of 2019 Phil McNeely, concerned with the state of affairs on climate change, became consumed with the idea that planting forests within vacant lands in Ottawa would be a good way to take action at a community level. He convened a handful of individuals to discuss the idea - Andrew Kenney, a retired forestry professor, Raymond Leury, a retired tech business leader, Shelley Lambert, an IT project leader by day and food forester by night, David Handelman, a long time TD Tree Days team lead, and Stephanie McNeely, a civil engineer.

Weekly evening meetings in the early days of the pandemic helped to sketch out a mission and vision. Partnerships were pursued and wheels set in motion. By summer we secured two forestry interns who laid some of the groundwork. We incorporated and our fledgling group became the Forêt Capitale Forest. We had become a team rooted in the mission.

Forêt Capitale Forest (FCF) is a reflection of what we hope to achieve; a collection of individuals that together are more than the sum of their parts. And like the roots of the trees in the first nursery order we placed, we will grow: in numbers, in strength, in knowledge. 2020 was just the beginning, and we have big plans. We have launched our first tree planting site at the Just Food Farm, we will learn, change, adapt, and scale-up. This Afforestation Master Plan allows us to plant with a plan, and like us, it will continue to evolve as we learn and adapt.

1 million trees in Ottawa by 2030

We hope you will use this document to guide afforestation efforts in the Ottawa region or wherever you may be. Together we are stronger. Together we can take action to be resilient in the face of our climate crisis.

- Board of Directors

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1.0 INTRODUCTION

1.1 LAND ACKNOWLEDGEMENT

Forêt Capitale Forest would like to begin by acknowledging that the land on which we operate is located on unceded Algonquin Anishinaabe territory. The peoples of the Algonquin Anishinaabe Nation have lived on this territory for millennia. Their culture and presence have nurtured and continue to nurture this land (City of Ottawa 2021).



1.2 BACKGROUND

Forêt Capitale Forest is a non-profit organization that aims to strengthen resilience to climate change by increasing biomass and carbon sequestration of lands, whether public or private, in Canada's Capital Region. We are a group of experienced forest experts and community leaders with an active adaptive afforestation management and stewardship plan in line with the National Capital Commission's Forestry Master Plan, Ottawa's Greenbelt vision of 2067, Ottawa's Urban Forest Management Plan, and Canada's goal to plant 2 billion trees by 2030. Our objective is to foster community empowerment through educational and applied research experience to have expanded, thriving forests, stewarded by the communities they are growing in.

1.3 HISTORY

1.3.1 CONTEXT

Forest distribution has varied globally at 4.06 billion hectares, with over half (54%) (FRA 2020) of the world's forests distributed across five countries of which Canada is one. At only 9% of the total global value, Canada is the third most forested area in the world at 347 million hectares (FRA 2020). Results have shown a global net forest loss of 178 million hectares since 1990 (FRA 2020), not including forested areas lost to increasing seasonal wildfires. While the world's forests are mostly publicly owned, privately owned forests have increased from 21% to 22% since 1990 (FRA 2020).

Afforestation is defined as the conversion of land with non-forested land use designation for a minimum of 50 years, into forested areas through tree planting (UNFCCC 2001). Canada has further characterized afforestation as having 1 hectare minimum area, with trees that reach a minimum 25% canopy cover and are able to reach 5 meters height at maturity (Ontario 2021). Ontario has used these criteria to map the extent of afforestation efforts over time, revealing challenges to procuring past afforestation records, especially on public lands (Ontario 2021).

Given these considerations, Forêt Capitale Forest will initiate afforestation efforts on lands with a minimum of 1 hectare in size, across all land tenures. This approach allows our activities to contribute to future global, national, and provincial afforestation and contribute to data collection and research efforts.

1.3.2 URBAN DEVELOPMENT IN OTTAWA

From 1969 to 2019, the population of Ottawa doubled in 50 years to over a million people, with a projected 1.4 million people in Ottawa and over 2 million in the Ottawa-Gatineau region by 2046 (Ottawa Official Plan 2021). The Official Plan projects growth of our city over the next 25 years, ensuring climate resilience, adaptation, as well as "supporting city neighbourhoods and rural communities as healthy, inclusive, and vibrant places" (Ottawa Official Plan 2021).

Six policy areas have been defined by transect type, with different policy and urban development goals identified for each: rural, suburban, greenbelt, outer urban, inner urban, and downtown transects (Ottawa Official Plan 2021). The City of Ottawa also is invested in the importance of identifying and conserving areas of cultural heritage value, managing built heritage resources, and promoting partnerships through community engagement and incentives (Ottawa Official Plan 2021). Forêt Capitale Forest recognizes the importance of our rural and greenbelt areas in particular, and is in agreement with major greenspace areas as having inherent cultural heritage. We advocate for these areas to be given proper designation and protection.

1.3.3 MAJOR GREEN SPACES IN OTTAWA

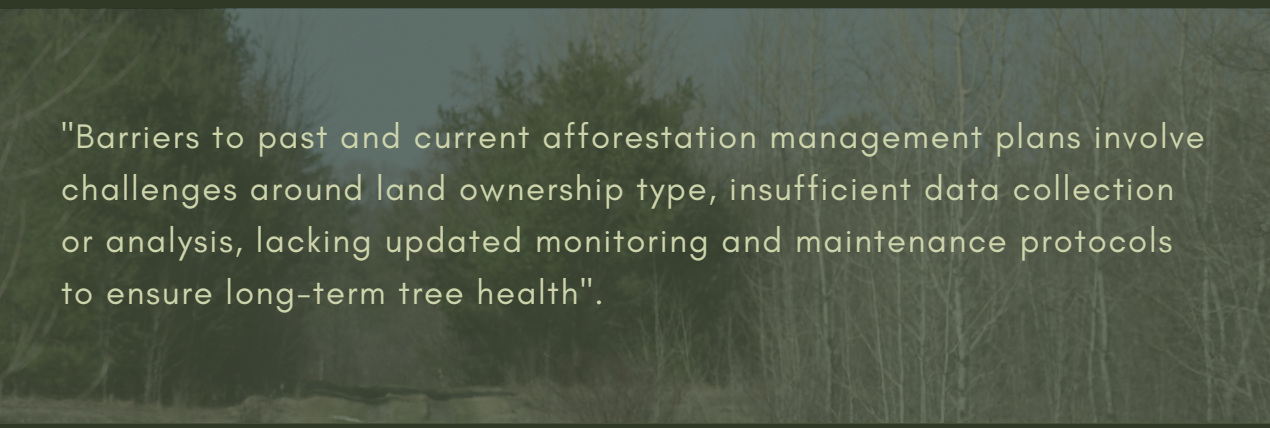
The City of Ottawa defines major greenspaces as larger than 3.2 hectares, which includes parks, open spaces, urban natural features, significant wetlands, natural environment areas, and conservation areas (Ottawa Official Plan 2021). While lot creation is not permitted within these greenspace designations, urban development still poses many threats to afforestation due to competing interests (Ottawa Official Plan 2021).

The goals stated in the Official Plan are to provide convenient, inclusive access to a variety of greenspaces across the city; design and animate certain types of publicly owned greenspace to enhance their contributions to healthy, active communities; and protect the ecosystem services of natural features and recognize their role in building resilience to future climate conditions" (Ottawa Official Plan 2021).

1.3.4 CALL TO ACTION

Expansion of Ottawa's urban areas has significant implications for the long-term availability of land for afforestation. Barriers to past and current afforestation management plans involve challenges around land ownership type, insufficient data collection or analysis, lacking updated monitoring and maintenance protocols to ensure long-term tree health. Too often tree planting initiatives have management and longevity issues due to insufficient experience and applied research that prioritizes tree survival and growth at a long-term scale.

Our 'Call to Action' is to adopt an active adaptive strategy that encompasses the interdisciplinary applied research to provide the most current approach to afforestation in the country. Forêt Capitale Forest will work with both private and public land owners when developing afforestation management strategies for a given site. Management factors for 2030 include a multi-year plan occurring at the same timeline as natural stages of tree growth, to develop our strategy around best practices that address fragmented landscape as a result of socio-political boundaries, with the goal of creating linkages between existing forest stands and other ecological features to enhance biodiversity and ecosystem function in Ottawa's Greenbelt region.



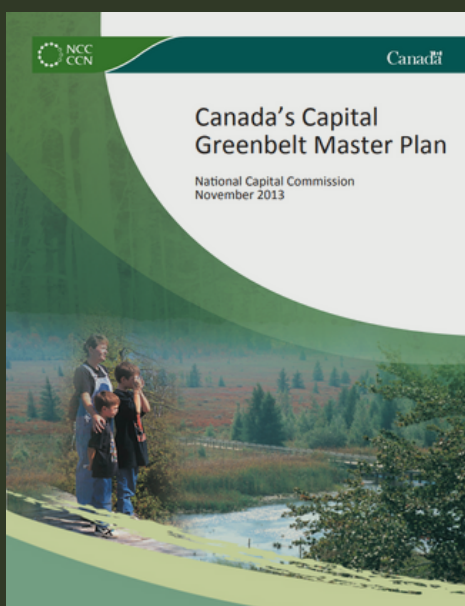
"Barriers to past and current afforestation management plans involve challenges around land ownership type, insufficient data collection or analysis, lacking updated monitoring and maintenance protocols to ensure long-term tree health".

1.4 EXISTING AFFORESTATION POLICY IN OTTAWA

1.4.1 NATIONAL CAPITAL COMMISSION'S FOREST STRATEGY

The 2021–2026 Forest Strategy by the National Capital Commission (NCC) outlines a thirty-year plan, with an action plan that is reviewed every five years. They have identified the benefits of forested lands as providing “essential ecosystem services, heritage and cultural landscapes, and promoting health and well-being equitably for residents and visitors” (NCC Forest Strategy 2021).

The NCC has identified five overarching goals for the Forest Strategy: Understand our trees and forests, protect existing canopy cover, plant the right trees in the right place, manage for resilience, safety and efficiency, and engage with partners and the community (NCC Forest Strategy 2021). Their long-term vision is for trees and forests on federal lands in Canada’s Capital Region that are diverse, connected and resilient (NCC Forest Strategy 2021).



1.4.2 OTTAWA GREENBELT MASTER PLAN

The Greenbelt Master Plan includes a vision for 2067 that ensures the “protection of Ottawa’s greenbelt, natural heritage systems, agricultural areas, as well as create opportunities for outdoor recreation and education that inspires Canadians to contribute to the sustainability and quality of life in Canada’s Capital Region” (OGMP 2013). The plan is set to be reviewed by the National Capital Commission at 10-year intervals (OGMP 2013).

Protecting outdoor spaces while strengthening “outdoor learning and recreation featuring the rich natural and cultural history of Canada” is integral to the sustainable growth of our city (OGMP 2013). Forêt Capitale Forest seeks to expand upon the NCC’s greenbelt master plan initiative, increasing visitor interpretation, recreational pathway systems, and sustainable farming and forestry initiatives.

1.4.3 OTTAWA OFFICIAL PLAN



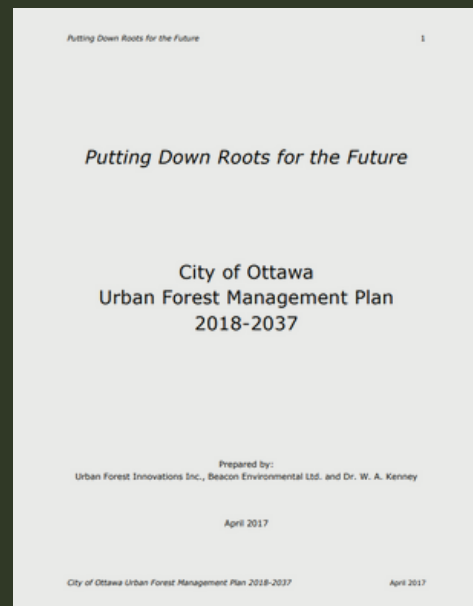
The City of Ottawa Official Plan provides municipal policy framework for 2021 to 2031, projecting a future growth and development strategy for urban, rural, and natural heritage systems (Ottawa Official Plan 2021). Of particular importance are provisions for providing residents with equitable accessibility to urban forests through increased forest cover, from which greenspace covered by the natural heritage system connects urban to rural areas of vegetation. The city has committed to a “no net loss” approach to forest cover outside urban areas regardless of ownership, and intends to manage city-owned forests and natural lands “to maximize carbon storage and sequestration in vegetation and soils” (Ottawa Official Plan 2021).

Ensuring that rural and urban communities have access to forested areas connected to a larger vegetative framework can be achieved through planned afforestation on lands identified as adjacent to larger significant environmental areas like Mer Bleue-Larose Corridor. There is a benefit to focusing on areas of natural heritage systems, which offer many opportunities to connect afforestation sites.

1.4.4 CITY OF OTTAWA URBAN FOREST MANAGEMENT PLAN

The Urban Forest Management Plan addresses program structure, administration, planning, and maintenance of our urban forests, ensuring urban forest outreach, education, and stewardship (UFMP 2017). They have identified a 20-year plan from 2018 to 2037 that is divided into 4-year management cycles. The document “is intended to provide the strategic and technical guidance required to achieve urban forest sustainability in Ottawa” (UFMP 2017).

Forêt Capitale Forest intends to further their work by providing the same level of detail and rigor for long-term afforestation efforts in Ottawa, that can be used as a guidance document for members of the community, other organizations, the city, and provincial policy-makers.

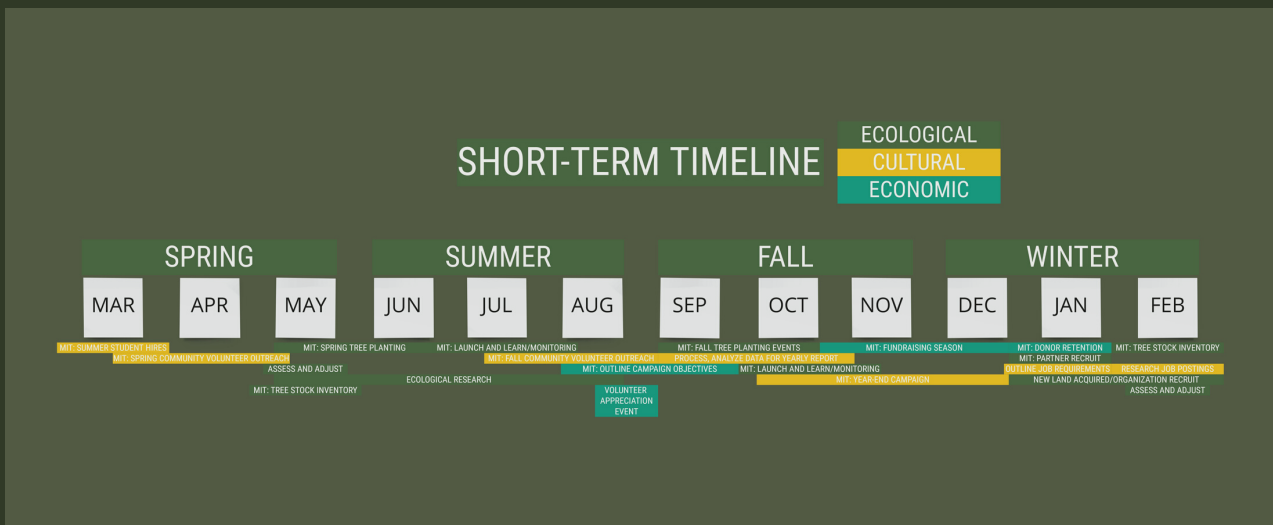


1.5 VISION

1.5.1 FCF MISSION STATEMENT

Forêt Capitale Forest has established a strong network required to carry out large afforestation initiatives in Canada’s Capital Region. The objective is to have a diverse and enhanced ecological structure of our afforestation landscapes, engaged with local community and service groups where newly established trees will thrive and be monitored and maintained. We came to be because we understand problems with current afforestation efforts that arise from management and planting strategies over too short a timeline. We would like to emphasize that our work is ongoing, we will grow and learn alongside our community partners and afforestation sites that, without our initiative, will be lost to other, less impactful uses.

1.5.2 FCF GOALS



SHORT-TERM

Community outreach combined with applied research are the basis of our initial efforts., We begin with collaboration with communities and organizations wanting to be involved in the process. With planting events occurring in early spring and late fall, Forêt Capitale Forest will rely on research from our forest team to prepare a series of documents ahead of time outlining the planting plan, process, tools, meeting area, and planting timeline. Creating strong relationships that link existing grassroots organizations acting alongside government agencies who are landowners, but have insufficient time or resources to connect with volunteer community groups.



LONG-TERM

Our afforestation framework consists of four stages centered around active adaptive management: Launch and Learn, Surviving and Thriving, Free-to-Grow, and Assess and Adjust.

While our initial strategy for organizing afforestation efforts is the same for each site, planting and distribution will change depending on context and site characteristics. As we gain access to new land, we begin with the Launch and Learn phase. Our model of applied research into planting the right species in the best location is supported by a long-term maintenance and stewardship plan, connecting existing forest stands and other ecological features in the region. It is through this partnership approach between Forêt Capitale Forest and existing community organizations and agencies, that we intend to assure the long-term health and sustainability of our afforestation projects. Over time, our documentation of afforestation success rates and strategies will contribute to the larger body of knowledge and understanding of the effects of climate change on afforestation approaches, which will be made available for all members of the community.

1.5.2 GUIDING PRINCIPLES

FCF’s operations will be guided by the following principles:

- Activities will be carried out in a manner that will minimize carbon emissions
- FCF operations will support multiple benefits in mind
- Risk management and emergency response plan
- Long-term stewardship and engagement
- Community empowerment
- Community engagement
- Providing information to support other groups
- Equal Opportunity Employer

1.6 POSITIVE IMPACTS OF AFFORESTATION IN OTTAWA

1.6.1 ECOLOGICAL

Forêt Capitale Forest’s primary objective is to create large carbon sinks by establishing 1 million trees. Successful afforestation carried out strategically can have the added benefits of enhancing the ecological structure and function of the existing landscape without compromising the carbon sequestration opportunities. We commit to carrying out operations that minimize embodied carbon and waste from planting activities examining the types of planting containers and plastics used and how we organize our planting activities and deliveries.

Forêt Capitale Forest adopts an afforestation implementation strategy that takes into consideration forest growth stages, canopy closure, natural and artificial thinning, and maturity. This results in the potential to reshape potential interior habitats and forest edge conditions, as well as to create linkages with existing forests, woodlands, wetlands, Environmentally Sensitive Areas (ESA), and Areas of Natural and Scientific Interest’s (NSI).



AFFORESTATION TIMELINE

OBJECTIVE MILESTONES	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
OPTION 1	LAUNCH AND LEARN	5,000 TREES 5 HECTARES	30,000 TREES 30 HECTARES	100,000 TREES 100 HECTARES	200,000 TREES 200 HECTARES	250,000 TREES 250 HECTARES							
OPTION 2	LAUNCH AND LEARN	5,000 TREES 5 HECTARES	10,000 TREES 10 HECTARES	25,000 TREES 25 HECTARES	50,000 TREES 50 HECTARES	100,000 TREES 100 HECTARES	125,000 TREES 125 HECTARES	150,000 TREES 150 HECTARES	175,000 TREES 175 HECTARES	175,000 TREES 175 HECTARES	175,000 TREES 175 HECTARES	185,000 TREES 185 HECTARES	185,000 TREES 185 HECTARES

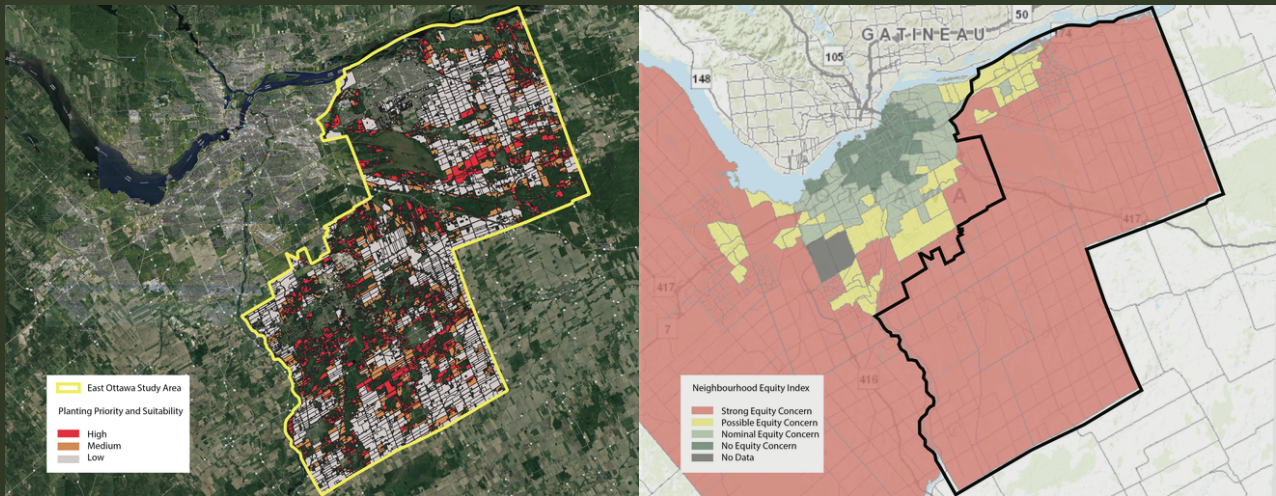


Figure 1: FCF study area, of which has been designated as having a strong equity concern for usable greenspace and community meeting space (NEI 2019).

1.6.2 CULTURAL

Cultural benefits to afforestation are identified through the spaces that hold value in our society, activities the afforestation and stewardship model create, and opportunities for connection within communities that occur long after planting takes place. A strong sense of community has been related to many health benefits that are integral to living a high quality of life. Indigenous cultures founded on a strong connection with nature and ecological mindfulness experience numerous community benefits. Afforestation efforts should support indigenous teachings, educating others on becoming stewards of the land where we live (NEI 2019).

Ottawa's Neighbourhood Equity Index shows a strong equity concern for usable greenspace and community meeting spaces across the city's suburban to rural regions (NEI 2019). Afforestation has further potential to occur on lands in a manner that increases recreation and leisure opportunities, which in turn could support educational and tourism activities. Our afforestation phasing timeline ensures that Forêt Capitale Forest addresses afforestation in areas with a strong equity concern, connecting existing patches of forested and ecologically significant areas, and providing the opportunity for continuous engagement.



2.0 AFFORESTATION FRAMEWORK



2.1 AFFORESTATION CONCEPTS

Afforestation concepts have been developed mimicking ecological processes that occur naturally. Through an active adaptive approach rooted in best management practices and applied research, we have developed four stages of afforestation to ensure tree health, monitoring, and maintenance considerations at a long-term scale. To manage multiple sites at once, we have developed a series of performance indicators and goals (found later on in the report or add hyperlink to lower in the document) that needs to be satisfied prior to moving into the next phase. This ensures that we are keeping an updated record and collecting data for each site that can later be analyzed to inform our progress as a whole and identify areas of concern. This information will be stored within a database, with results summarized in our yearly reports.

This master plan provides a framework for our operations, and is integrated within the development of a series of FCF Factsheets, which will provide greater technical detail as needed. They are used as a dynamic resource for Forêt Capitale Forest, developed through collaboration with communities and organizations, undergoing a peer-reviewed process.

2.1.1 LAUNCH AND LEARN

Forêt Capitale Forest recognizes that each new site acquired comes with in-depth site-specific conditions, which will impact all aspects of afforestation differently. Our Launch and Learn phase will last up to a year after planting to allow for data capture on site conditions, and make adjustments to our plan early on in the afforestation planting, monitoring, and maintenance process. With each site, we take this time to learn from all our initial planting efforts, which help us to address site specific needs of a given project, so that community members and landowners are given the most up-to-date information.



2.1.2 SURVIVING AND THRIVING

Our Surviving and Thriving stage begins one year after tree planting, and lasts until all performance and optimal goals/indicators have been met, usually between years 5 and 7. Monitoring and maintenance considerations are identified as the most important factors within this stage, albeit occurring at less frequent intervals than during the launch and learn phase.



2.1.3 FREE TO GROW

Free-To-Grow refers to the point when tree growth exceeds the height of surrounding competing vegetation (Ontario Forest Regeneration 2021). At this stage, monitoring and maintenance will be greatly reduced, with the opportunity for infill planting when required.



2.1.4 ASSESS AND ADJUST

At Forêt Capitale Forest, our learning does not stop at our Launch and Learn phase. To prioritize long-term tree health, we will implement our Assess and Adjust concept throughout each afforestation phase. This phase will operate frequently on a short-term scale at the beginning, during, and at the end of the other phases, and will occur on a less frequent yearly basis once a given site has reached the Free-to-Grow phase. These Assess and Adjust periods will give us the opportunity to evaluate our performance indicators as well as make changes based on any updated literature or research that may arise. It is through this process that Forêt Capitale Forest moves beyond traditional planting initiatives, towards a dynamic and successful afforestation and stewardship framework.



2.2 IDENTIFICATION AND RANKING OF POTENTIAL AFFORESTATION SITES

2.2.1 OBJECTIVES

The objectives are to identify and classify sites within the study area for afforestation for their relative suitability based on existing land-use and their potential to enhance landscape ecological structure and function. The latter will be achieved by ranking sites by their relative proximity to existing ecological features such as woodlands and wetlands, their association with the City's Natural Heritage System and the current land use.

2.2.2 APPROACH

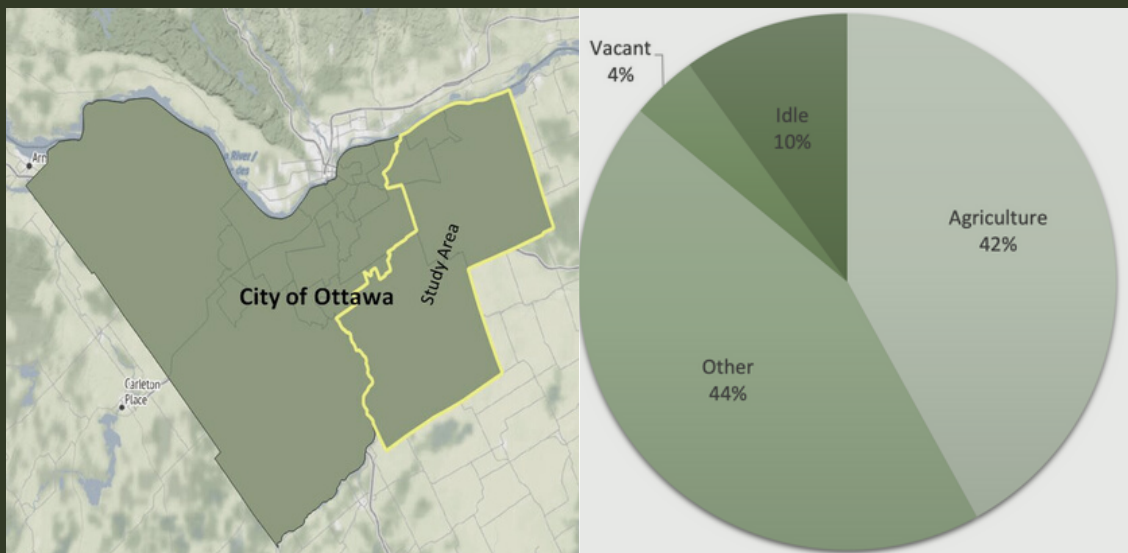


Figure 2: FCF study area, with identified land-use designation.

A detailed description of the approach used in the study can be made available to other groups to serve as a starting point for similar analysis of afforestation potential in their area. All GIS procedures were carried out using QGIS, an open-source geographic information system (QGIS 2021). The necessary GIS layers were obtained from the City of Ottawa. In some cases, additional data were obtained from the Ontario GeoHub (Ontario GeoHub 2021).

It should be noted that maps and data generated by this project are only as valid as the data obtained from the City of Ottawa. For example, the land-use layer (LU2015exOtt) was dated 2015, so any changes in actual land use in the five years between 2015 and the time of writing are not reflected in the results provided here, including changes stemming from a new Official Plan adopted by the City in 2021.

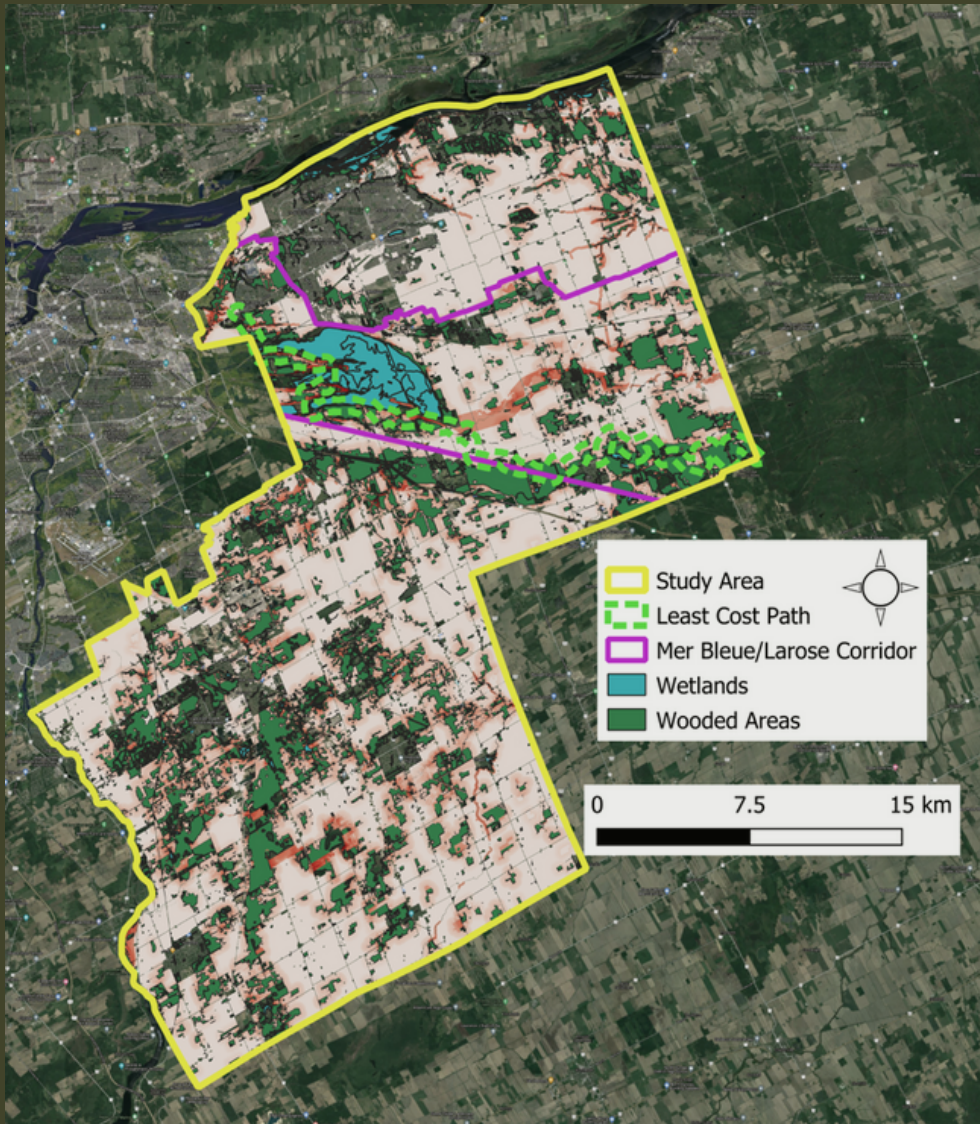


Figure 3: FCF study area, with identified Mer Bleue–Larose Corridor.

Table 1: Land use type and size within the FCF study area.

Land Use	Hectares (Ha.)
Agriculture	38
Idle	8,988
Vacant	3,440
Other	40,200
Total	90,800



The study area for this project included Ward 1 (Orleans), Ward 2 (Innes), Ward 19 (Cumberland) and Ward 20 (Osgoode) with a combined area of approximately 90,920 hectares. (Figures 1). The relative areas of the individual wards is shown in Figure 2. The ownership of properties in the study area is distributed across 67,434 parcels.

A GIS layer was needed to identify land within the study area that is theoretically available for afforestation. The land use layer provided by the City of Ottawa was the most consistent and direct means of developing such a layer. Land use types considered to be "theoretically available" were those designated as agricultural, idle or vacant as indicated in the City's land use layer. All other land-use types were considered unavailable or unsuitable for afforestation for the purposes of this study. Some smaller areas are undoubtedly suitable within other land-use types, for example, around schools or other institutions. However, this study focused on larger blocks to meet the aspirational goal of Forêt Capitale Forest to afforest 1,000 hectares.

We say "theoretically" available since the availability of lands for afforestation will involve many factors beyond the scope of this project. For example, the landowner may not wish to commit their land to afforestation. One of the impacts of the 2021 Official Plan is that Ottawa City Council voted to extend the urban area for the City which could have significant implications for the long-term availability of land for afforestation. The current analysis does not account for loss of suitable land resulting from this extension. The collection of lands identified for afforestation in this project should be considered a first approximation intended to give FCF some indication of where to focus their efforts.

A Vacant Land layer (VL) was first created by selecting only those features classified as VI in the City's land-use layer. Since "vacant land" included wooded areas, a VLNoWoods layer was created and the wetlands also in the VL were removed. Next, a new layer was created consisting of lands from the land use layer designated as Agriculture (AG), Idle and Shrub Land (IS) and the vacant lands with no woodlands or wetlands as derived above. This layer was called AGISVL. All other land uses were considered unavailable for afforestation for the purposes of this project. While some areas may, in fact, be suitable they were less practical for larger-scale afforestation based on the definitions provided in the legend of the City's land use layer.

Several secondary plans were in effect in the study area, these areas were removed from the AGISVL layer which, at this point represented all agricultural lands, all idle/shrub lands, and all vacant lands NOT currently within secondary plans or, in other words, all lands "theoretically available for afforestation". This vector layer with a 10m x 10m pixel size was generated from this layer and a weight of 1 was added to all pixels.



Association with the City's designated natural heritage system (NHS) must be recognized in the prioritization of sites. While most of the NHS is currently comprised of existing woodland and wetlands, some areas within the NHS are currently shown as agriculture or idle lands. Such lands should be high priority for afforestation since there is potential to strengthen the NHS by expanding the boundaries of existing features by afforestation or by closing gaps in the "system". The City's Natural Heritage layer was first clipped by using the AGISVLNS layer as the overlay and a weight field was added with a weight of 10 assigned to every feature. Please note that areas within the NHS that are "available" carry the highest weight for the priority of planting. Buffers were NOT applied to the NHS as was done for other feature types since this would be covered by the woodland and wetland buffers and including them with the other buffers would constitute double counting. As before, this layer was rasterized with a 10m x 10m pixel size and a weight of 10.

A new Planting Priority raster layer was created by summing weights from the various layers as indicated by the following relationship:

$$\text{Priority Weight} = (\text{AGISVLNS} + \text{NHSW} + \text{NonSigWoodModBuf100} + \text{NonSigWoodModBuf200} + \text{NonSigWoodModBuf300} + \text{SigWoodBuff200} + \text{SigWoodBuff300} + \text{SigWoodlandsBuff100} + \text{WetlandNoSWampBuff100} + \text{WetlandNoSWampBuff300} + \text{WetlandNoSwampBuff200}) * \text{AGISVLNS}$$

Note that the sum of the weights from the various layers is finally multiplied by the weight of the pixels from the AGISVLNS layer. This is a binary layer in which pixels that are either in the Agriculture, Idle/Shrub, or Vacant Land category in the land use layer (excluding areas within secondary plans - NS) have a value of 1, otherwise (all other land-use types) they have a value of 0. This results in the accumulated weight already calculated becoming 0 if the pixel is NOT available for planting (AG, IS, VL or NS) or the accumulated weight remains as calculated.

2.2.3 RESULTS

Some general observations for the study area are provided below. The GIS which forms the basis of this report can be used to obtain answers to more detailed and site-specific queries. The study area (Figure 1) was 90,920 hectares in extent. Of this 49,091 ha (54%) was considered "theoretically available for afforestation". By available, we mean land that is within the agriculture, idle or vacant (VL) land use categories and is not currently forested, in wetland or within a secondary plan. In this sense, "available" does NOT take into consideration the many other factors that will dictate if the land could actually be afforested. This analysis is intended as a coarse filter to identify properties that have the potential to contribute to forest cover and contribute to the structure and function of the landscape of the study area. This coarse filter should be considered the first step in identifying potential afforestation sites. Figure 3 illustrates the results of the planting priority analysis for the entire study area (the Planting Priority layer). The high and medium priority areas (dark red and pink) areas are distributed across the study area, but a few areas of concentration are apparent.

Table 1. Distribution of land area (Ha.) by ownership and priority for afforestation in the study area.

Ownership	Priority			Total
	High	Medium	Low	
Conservation Authority	48		6	54
Federal	23	51	295	369
NCC	688	272	830	1,791
Ontario	4	11	5	20
Ottawa	146	165	382	693
Private	8,740	9,226	28,191	46,156
Unknown	8		2	10
Total	9,656	9,726	29,710	49,092

General observations can be made about the land "theoretically available for afforestation". Table 1 summarizes the distribution of the area (Ha.) by ownership and priority. As might be expected, the majority (94%) of the study area is in private ownership and is distributed over 8,066 parcels. The areas considered to be high and medium priority represent 19,381 ha or 40% of the area "theoretically available" with the two priority classes almost equally represented. The second largest (4%) single "landowner" in the study area is the National Capital Commission (NCC) with 54 parcels totaling 1,790 Ha all clustered around the Mer Bleue. Of the high and medium priority area under NCC jurisdiction, 688 Ha are in the high category and 272 Ha are in the medium for a total of 960 Ha. These 43 NCC parcels range in size from less than a hectare to 135 Ha.

Table 2. Distribution of land area (Ha.) by agricultural capability class and priority for afforestation in the study area.

Capability Class	Priority			Total
	High	Medium	Low	
1		145	363	507
2	2,357	2,902	10,005	15,264
3	3,563	4,510	16,923	24,996
4	847	593	1,010	2,451
<i>Subtotal</i>	6,768	8,149	28,301	43,218
5	951	571	750	2,272
6	1,107	755	304	2,165
7	201	17	16	235
<i>Subtotal</i>	2,259	1,343	1,070	4,672
Organic	507	99	190	795
n/a	122	135	150	407
Total	9,656	9,726	29,710	49,092

The suitability of land for agricultural production will likely have an impact on its availability for afforestation. Agricultural suitability was not taken into consideration in the GIS planting priority analysis, but suitability is included in the GIS attribute table for consideration as the process of site selection becomes more refined. Table 2 summarizes the area distribution of agricultural capability by planting priority. If we consider capability classes 5, 6, and 7 as being the most likely to be available for afforestation (lower suitability for agriculture) a total of 4,672 Ha (in 1,017 parcels) are "available" with 48%, 29% and 23% in the High, Medium and Low priorities respectively. The NCC parcels in capability class 5 and 7 (no NCC parcels were in class 6) totaled 40 Ha.

Table 3. Distribution of land area (Ha.) by ownership and priority for afforestation in the Mer Bleue-Larose Corridor.

Ownership	Priority			Total
	High	Medium	Low	
Conservation Authority	8		4	11
Federal	23	51		74
NCC	687	96	483	1,266
Ontario	0			0
Ottawa	34	11	22	67
Private	2,135	2,012	4,758	8,904
Unknown	3		0	3
Total	2,889	2,170	5,267	10,325

Table 3 summarizes the area of land in each of the priorities by ownership. As was the case in the entire study area, private ownership dominates (86%). The NCC is still the largest single landowner in the corridor, but in this case they have jurisdiction over 12% of the area of the corridor with over 78 Ha in the High and Medium priority categories. Table 4 summarizes the land area in each of the priorities by agricultural land capability class. If we assume that capability classes 1 through 4 are less likely to become available for afforestation because of their potential for food production, and we ignore the organic and unclassified soils, then 616 ha (6%) remain available in classes 5 through 7. Of these classes, 72%, 15% and 13% are in classes 5, 6 and 7 respectively.

Table 4. Distribution of land area (Ha.) by agricultural capability class and priority for afforestation in the Mer Bleue-Larose Corridor.

Capability Class	Priority			Total
	High	Medium	Low	
1		100	93	193
2	140	370	308	817
3	1,974	4,534	1,406	7,915
4	337	39	131	506
<i>Subtotal</i>	2,451	5,042	1,937	9,430
5	218	79	146	443
6	71	2	19	91
7	67	11	4	81
<i>Subtotal</i>	356	91	169	616
Organic	66	1	63	130
n/a	16	132		148
Total	2,889	5,267	2,170	10,325

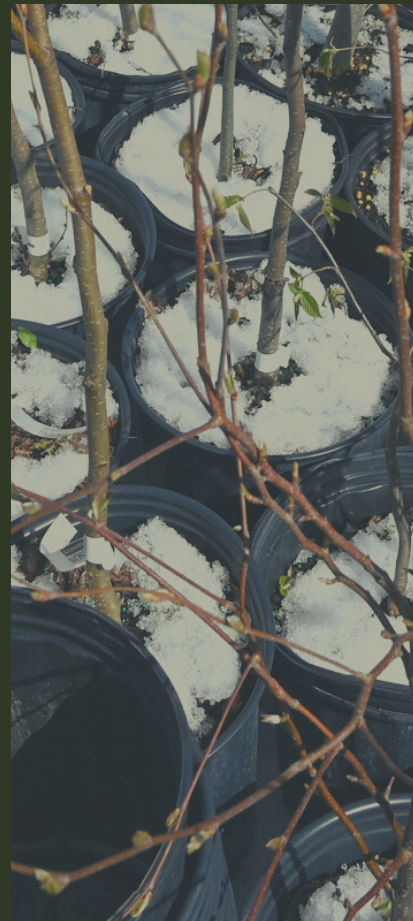
As a further refinement of the analysis for the Mer Bleue/Larose Corridor, a least cost path analysis was carried out. This procedure attempts to identify a path between two chosen points over a surface with various barriers or resistances to travel. In our case, for instance, a woodland would have 0 resistance, agricultural land would have moderate resistance (2) but urban land uses would have high resistance (5). Resistances ranging from 0 to 5 were applied to all 33 land use types used by the City. The GIS was then used to calculate the path between the chosen points that would minimize the resistance to travel. A least cost path was determined between the Just Food farm in Blackburn Hamlet and the edge of the Larose Forest where it abuts the southeast corner of the study area. A 300m buffer was applied to the path and is shown in Figure 2 as a dashed green line. This further analysis suggests that greater enhancement of the ecological structure and function of the corridor between the Bog and the Forest could be achieved by concentrating afforestation efforts along the southern edge of the very general outline of the corridor presented here. Since we are not considering any specific species, this should be considered as a general approach.

2.2.4 DISCUSSION

The analysis indicates that the various levels of planting priority are dispersed across the study area with a few notable areas of concentration of the High and Medium priority areas (Figures 2). One of the most interesting areas of concentration (from an afforestation perspective) appears between the Mer Bleue Bog and the Larose Forest. While the forest is outside the study area, this large woodland is a major ecological feature in the region. The potential to improve the linkage between the Mer Bleue, another very important ecological feature, with the Larose Forest presents an excellent area of focus for the initial afforestation efforts in the study area. For the purposes of this analysis, the proposed linkage area will be referred to as the Mer Bleue/Larose Corridor. Preliminary boundaries for the potential corridor were manually drawn to include easily identifiable features on the ground which enclose the concentrations of parcels designated as High and Medium priority and which are located within the general vicinity of the proposed corridor (Figure 2).

2.3 PRE-PLANTING ASSESSMENT AND SPECIES SELECTION

Once a planting site has been identified, some level of on-the-ground assessment is essential. The cost of afforestation goes beyond the purchase of the planting stock and site preparation. Hidden but real costs include volunteer time and the costs of delayed success if a planting project fails or is sub-optimal. Consequently, the time and dollars spent in assessing a site before the planting begins and tracking the early progress are a wise investment. A pre-planting assessment will be carried out on each site to determine planting stock needs (species mix, type, quantity, etc.) and identify any specific challenges that may come up during planting and beyond.



2.3.1 SURVEY DETAILS

A survey conducted before planting can provide critical information about the condition of the site. Pre-planting assessment will include the following categories to be recorded throughout the Launch and Learn phase:

- Overall suitability for planting;
- Access and staging for planting events and maintenance;
- Soil characteristics such as depth, texture, and drainage;
- Site preparation needs;
- Post-planting vegetation control;
- Presence of potential pests including browsing and girdling by animals; and
- Number, size, and species of acceptable advanced regeneration.

More information can be found within the FCF Factsheets.

2.3.2 SPECIES SELECTION, PROVENANCE, AND STOCK TYPE

Different tree species have different requirements to successfully establish at a planting site. The Ontario Tree Atlas provides a brief description of the tree species native to each Ecodistrict and their light requirements, growth rate and soil conditions. Ottawa is in Ecodistrict 6E-12. Looking beyond “native species”, genetic diversity is another important aspect to consider during planting stock procurement. One of the main components of genetic diversity in tree species is adaptive variation which refers to the genetic differences between different populations that result in local evolutionary adaptations to the local environment. In essence, it is crucial to ensure that the tree stock procured is adapted to local conditions. The Ontario Tree Seed Transfer Policy “...ensures that seed used to regenerate forests has a reasonable probability of producing trees that are adapted to their growing environment now and in the future. It specifies where seed can be collected and used and the conditions under which seed may be transferred.” (Ontario Tree Seed Transfer Policy 2020). The movement of seed between ecodistricts is only acceptable if the environment of the seed origin is similar to the restoration site, and movement between the ecodistricts is well-documented. Every effort will be made to procure planting stock grown from seed certified to have originated in Ecodistrict 6E-12 (Kemptville).

When selecting species, it is also imperative to consider risk susceptibility to pests. For example, although the Ontario Tree Atlas shows Green/Red, White and Black Ash as native to Ecodistrict 6E-12, these species are at risk from Emerald Ash Borer (EAB) which is present in the region. Similarly, American Beech, Butternut and Elm species are affected by Beech Bark Disease, Butternut Canker and Dutch Elm Disease, respectively. While these and other pests represent significant challenges, it would be inappropriate to abandon completely any species or genus because of these potential risks. The limited use of such vulnerable species or genera will be considered only in conjunction with accompanying monitoring protocols. Where applicable, FCF afforestation projects will consider partnering with species recovery programs.



Stock types include bare root, containerized and balled and burlapped (ISA Arborists' Certification Study Guide). Availability and cost of stock varies widely depending on tree size and species. Planting seedlings is less expensive per tree, but generally requires the skilled labour of journeymen tree planters. Larger trees, which are more expensive, are more impressive to plant and can be a great draw for volunteers and members of the community. Larger stock types are also preferable on sites where competition from other vegetation is expected to be significant.

2.5 MONITORING AND SUSTAINABLE ADAPTIVE MANAGEMENT

2.5.1 MONITORING AND STEWARDSHIP

Development of a set of performance, optimal, and key indicators to rate afforestation success is integral to ensuring that goals are being met. Performance indicators include growth rate of newly planted trees, percentage of survivorship by species, and the successful achievement of 'Free-To-Grow' status. These performance indicators are to be rated based on optimal performance indicators suggestive of a healthy, thriving community at all stages post-planting. These optimal indicators contribute to an overall series of key objectives for a site, that is determined throughout the 'Launch and Learn' phase of a given project. Over time, our indicators will build and contribute to a larger body of knowledge that will be necessary in a changing climate in Ottawa's National Capital Region.

This collective process of Best Management Practices (BMP's) provides our organization the opportunity to update maintenance protocols in response to these indicators. These indicators are also used to determine whether a site meets the requirements to move from our 'Surviving and Thriving' phase to our 'Free-to-Grow' phase.

Active management principles and criteria for performance indicators can be found within the development of FCF Factsheets, but include and are not limited to:

- Roots (presence of girdling roots, roots near surface);
- Trunk (DBH, damage);
- Canopy (Size, even distribution, foliage quality, percent canopy cover);
- Dripline (Soil quality, presence of vegetation or pests, saturation);
- Succession stage (Primary or secondary succession); and
- Survival rate.

Conservation and maintenance begins after tree planting has occurred, with a detailed schedule following our 'Surviving and Thriving' and 'Free-to-Grow' phase, of which operations may be scaled up and adjusted based on results from our BMP's and our 'Assess and Adjust' phase.



3.0 COMMUNITY ENGAGEMENT AND STEWARDSHIP



3.1 COLLABORATION

While our main objectives center around our afforestation efforts, community engagement will be a significant component of all our activities. Forêt Capitale Forest commits to sharing our knowledge, growing alongside our community partners and afforestation sites. We will share our applied research methodologies with others so that anyone can use our model to initiate their own planting project.

Our main partner is Just Food, a well-established charitable social enterprise with a history of successful partnerships and execution of sustainable food system initiatives across the City of Ottawa and Western Quebec. Forêt Capitale Forest base their operations at the Just Food Farm, where we have 2 ha of land situated within the 'Mer Bleue-Larose Forest Corridor' (Figure 3 Section 2.2.2). To foster collaboration and partnership, we are open to working with individuals, students, organizations, and levels of government whose mission align with our work and encourage those wanting to be involved to reach out to someone on our team.

Our goal is to identify skills needed at each of our afforestation phases, as well as our long-term scaling of overall operations. To minimize bottlenecking of our volunteers, these Actionable Items will be identified as tasks, and agreed upon by each individual prior to commencing volunteer work. This also provides volunteers with the opportunity to identify learning and education goals for themselves, which will increase empowerment for creating and maintaining equitable opportunities over time. Volunteer output will be recorded, to be used later for metrics and evaluation in our Assess and Adjust periods. Forêt Capitale Forest will recognize our volunteers by holding Volunteer Appreciation Events that coincide with our Annual General Meetings to increase inclusion and engagement between community members.

3.3 DOCUMENTING STORIES

Future use of a digital platform to consolidate our monitoring and maintenance objectives will also be used as a tool to foster community stewardship through its ability to offer a two-way communication platform between our organization, volunteers, and educational users around tasks and events hosted by Forêt Capitale Forest that occur at a given location and time. The use of a mobile application allows for digital crowdsourced asset mapping that results in a collection of community stories bringing people together, consolidation the implementation of a grassroots, bottom-up approach to large scale tree planting, monitoring, management, and community engagement efforts. Various technologies will be used to capture details such as planning and volunteer booking, task management, identification and, in some cases, geo-location for every tree planted, monitoring, maintenance, and data capture through photography and videography.



Our “Seed to Tree” program is where Forêt Capitale Forest sends volunteers and families home with seed and seedlings to care for until they are ready to be planted on one of our planting sites. In this scenario, volunteers can safely sign up for activities at home, with limited exposure to other individuals. In a post-pandemic scenario, the tool can connect volunteers to our organization and seamlessly transition from one activity to another, using what we’ve learned to provide the tools required to continue community-based monitoring efforts after the pandemic.



3.4 EVENTS

Forêt Capitale Forest implements an ‘FCF Workback Plan’ for all events, that takes into consideration all necessary steps needed to ensure a successful event takes place. These plans are initiated in preparation for tree planting days, end-of-year update meetings with stakeholders and organizations, as well as our volunteer appreciation and Annual General Meetings. Steps include preparing and sending out Invitation emails, posts on social media and our website, a volunteer assessment period, confirmation of tools and supplies needed for the event, as well as a post-event appreciation email.

3.5 APPLIED RESEARCH

While our long-term afforestation framework and sustainable management practices work towards furthering our vision and goals as an organization, we recognize the benefit of forging opportunities for applied research that may arise in the future. We are open and willing to support initiatives that may align with our objectives to further benefit overall afforestation in Ottawa’s Capital Region. When possible, we aim to offer opportunities for employment, volunteering, and applied research for students at elementary, secondary, and post-secondary institutions, and encourage those wanting to know more information to reach out to a member of our team. Where feasible, the efforts of species recovery programs will be considered for incorporation into our afforestation projects.



3.0 CONCLUSION



To recap our mission, vision, goals:

- Our team of forest experts and community leaders.
- Strengthen resilience to climate change through our active adaptive afforestation management and stewardship plan.
- Our guiding principles and our four stages in our afforestation framework are developed alongside supporting factsheets that offer long-term stewardship security that are unique to other organizations.
- We look forward to growing alongside our communities, and are grateful that we get to play a role in improving our National Capital Region.

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