

REGREENING PROGRAM

5 Year Plan
2021-2025

May 2021





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Background

Since 1978, the City of Greater Sudbury has been engaged in the greening of Sudbury's landscape through liming, grassing and tree and shrub planting initiatives. From 1978 to 2020, over 3,400 hectares of land were limed and grassed and over 9.8 million trees and over 460,000 shrubs and understory trees have been planted.

During the first decade of the Program, greening activities focused mainly on high visibility sites along major road corridors and in urban neighborhoods. This approach offered easy access for workers and resulted in prominent aesthetic improvements.

In the 1990's, there was a shift toward watershed rehabilitation. After liming parts of the watersheds of Hannah and Robinson lakes, both land and water quality showed improvements. Several lakes were selected as focal areas over the first half of that decade as a means of both reclaiming barren lands and improving lake water quality. This trend continues to be a focal point of greening efforts.

A previous 5-year plan (1999 to 2003+) used Ministry of Natural Resources and Forestry (MNRF) Forest Resource Inventory maps that included areas classified as 'barren rock' and 'sparse vegetation cover' within the general zone to be greened. These areas were ground-truthed and prescriptions for their reclamation were determined. The areas selected varied from urban hilltops to watersheds to sites with difficult access. It was estimated that given the extent of areas outlined in the plan, greater than five years would be required to complete the plan. In fact, this previous 5-year plan was still being implemented up to 2008.

In 2009 the Sudbury Soils Study released the Ecological Risk Assessment (ERA) which evaluated the ecological risks associated with seven Chemicals of Concern (COCs): arsenic, cadmium, cobalt, copper, lead, nickel and selenium. The ERA found that terrestrial plant communities in large areas of Greater Sudbury have been and continue to be impacted by the COCs in soil. The study also found that local plant communities are affected by other factors, such as soil erosion, low nutrient levels, lack of soil organic matter, and soil acidity. This impact on vegetation was also concluded to be influencing wildlife populations indirectly by affecting habitat quality.

A Biodiversity Action Plan (BAP) was then developed as a comprehensive way to address the risks to plant communities and wildlife habitat identified by the ERA. The previous two 5-year plans (2011-2015 and 2016-2020) followed the general direction of the BAP. Increasing biodiversity continues to be a primary focus of the Greening Program and this current plan continues to use the BAP as a guiding document.

In May 2019, City Council declared a Climate Emergency and the Community Energy and Emissions Plan (CEEP) was developed to address climate change concerns and carbon sequestration target of net-zero emissions by 2050. On December 14, 2021, the Honourable Seamus O'Regan, Canada's Minister of Natural Resources, launched the Government of Canada's plan to plant two billion trees over 10 years to address climate change by reducing carbon pollution and achieve net-zero greenhouse gas emissions by 2050. A call for funding proposals was requested in a news release on February 19, 2021.

Although direction is still being developed for climate change mitigation, over the next 5 years, the 5-year plan 2021-2025 will follow the trends to plant more trees for carbon sequestration and explore funding potentials and operational alterations to best meet targets.

At the same time, operations will follow the guidance of the BAP and past research findings to ensure a sound and stable approach to Regreening in Greater Sudbury. As always, to safeguard efforts, areas within development zones will be avoided. In addition, there has always been a history of being quick to act on funding from government or other sources and accommodating changing community priorities. For this reason, the Regreening Program must remain flexible to take advantage of other funding opportunities, upcoming partnerships and changing community priorities.

Goals

Regreening Master Plan

The Community Energy and Emissions Plan (CEEP) is the long-term plan to reduce carbon emissions and pollution in Greater Sudbury. It responds to City Council's Climate Emergency declaration in May 2019, which included a commitment to achieve net-zero emissions by 2050. That means reducing greenhouse gas emissions (GHG) caused by human activity to as close to zero as possible, and removing remaining emissions from the atmosphere.

Goal 18 in the CEEP is to increase the reforestation efforts of the Regreening Program as a means to sequester carbon, addressed in Phase 1 of the Implementation Plan to develop a Regreening Master Plan over the next 3+/- years. The Primary Action is to increase the resources available to the Regreening Program for its reforestation efforts through operating budget assignment and coordination with businesses, institutions, and community groups.

Following the Federal Government's 2 Billion Trees Commitment announcement the Regreening Program will endeavor to pursue this avenue of funding which will align with local efforts to sequester carbon through tree planting efforts. Greater Sudbury's Regreening Program is a renowned success. Increasing its capacity will help sequester more carbon and engage the community in environmental protection and restoration efforts.

Any measurable energy or GHG reduction would be undertaken based on research currently underway at Laurentian University. Trees planted by the Regreening Program are estimated to have sequestered a cumulative total of 1 million tonnes of carbon dioxide equivalent since the start of the Program in 1978. VETAC has agreed to assist with the development of the Regreening Master Plan that will identify the areas remaining to be regreened and the interventions required in the individual management units. This should result in an improved overall strategy for accomplishing the remaining regreening work. This 5 Year Plan will be modified as necessary to align with the Regreening Master Plan.

Climate Change Adaptation

Adapting to climate change can be like adapting to the unknown. We know climate will change but how exactly that presents itself is not certain. It is not just an increase or decrease in temperature, other factors like length of growing season, amount of precipitation and type of precipitation can play key roles in the sustainability of local ecosystems.

In 2020, the Ontario Government released its Ontario Tree Seed Transfer Policy, which replaces the Seed Zones of Ontario (2010), providing guidance for seed transfer in a changing climate. 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. Selecting quality seed that is adapted to planting site conditions is the foundation of forest renewal efforts.

Seed transfer is the movement of seed from where it is collected, referred to as a collection site, to a growing site. Based on Ontario ecodistricts, as opposed to the previous Seed Zones of Ontario, the Policy specifies where seed can be collected and used and the conditions under which seed may be transferred.

Sudbury falls in ecodistrict 5E.4 and based on Policy, the best place to obtain seed to grow seedlings in the future is from areas to the south. Along the shoreline of Lake Huron from Killarney Provincial Park south to Gravenhurst and east to west from Goderich on the shore of Lake Huron to the southern shore of Lac Saint-Pierre on the St. Lawrence River appear to be the best locations to obtain seed for seedlings to be planted in Sudbury. This area roughly follows the current Seed Zones 31 to 36. Moving forward, the new Policy states that seed collected locally is best deployed to areas east to west from Lake Superior Provincial Park to Temiskaming Shores and northwards.

The Regreening Program has already established several experimental plots to assess the survival of trees and shrubs that grow close to the south of the City, and seedlings obtained from more southern seed sources. These plots will continue to be monitored and expanded upon in the future as additional species are tested for suitability to the Sudbury area. This new Policy will help guide further seed sourcing for planting stock, and may present some challenges or new partnerships in obtaining and dispensing seeds.

‘Completion’

The Regreening Program has operated for over 40 years treating large tracks of land within the 82,000 ha of industrially impacted land. The need for different Regreening interventions varies across the landscape due to the spatially heterogeneous impacts of past industrial activities. The degree of intervention applied to date has also varied spatially. To better manage, plan and prioritize regreening efforts a systematic way to inventory all areas of impacted land was developed. The formation of 140 Regreening Management Units (RMUs) will assist in this process. These management units are based on watershed/ subwatershed boundaries defined at a geographical scale small enough to require several years of regreening work.

The development of RMUs allows for critical analysis of past interventions and the need for future interventions within these smaller areas. Several regreening interventions have been and may continue to be applied to management units. These include liming, fertilizing, seeding, initial tree seedlings planting, follow-up tree and shrub seedling planting to add diversity, transplanting of forest floor mats and transplanting of specialized forest floor plants.

At some point, however, the need for further interventions within a management unit should be assessed to determine if all that can be done has been done and nature should be left to finish the work. The development of a comprehensive set of criteria is necessary to conduct the assessment of ‘completion’ of regreening interventions within individual RMUs. These ‘completion criteria’ may include biological and physiological functions of an ecosystem, such as plant species presence/absence, abundance and health, soil microbial activity, and animal species presence/absence. Climate change will also be a consideration in the development of the ‘completion criteria’.

Full assessment of four to six RMUs will be conducted to identify the regreening interventions still required to be undertaken within the unit. The assessment will include desktop GIS work as well as field investigations. The end result will be a clear picture of what is still remaining to be reclaimed, what interventions are required and what areas can be left to natural recovery. RMUs may be revisited at a future time as new scientific evidence becomes available that would alter any previous assumptions and affect interventions identified for ‘completion’.

Research/Monitoring:

The municipal Regreening Program is a direct result of the findings of research conducted at Laurentian University in the early 1970s. Research continues to play an important role in improving the techniques used in regreening as well as their positive environmental influences. As well as undertaking its own research and monitoring initiatives, the Regreening Program has benefitted from and, at times, collaborated in research and studies undertaken at all three local post-secondary institutions: Laurentian University, Cambrian College and Collège Boréal.

Several established research/monitoring activities will continue this term but the main focus will be to assess RMUs for completion and assisting with the collection of base information for the Regreening Master Plan including carbon sequestration strategies.

Aside from studies conducted by the Regreening Program, numerous research projects are planned or underway by professors and students at local post-secondary institutions. The City's Regreening Program will assist in promoting/reporting the results from this research to the wider Greater Sudbury community through various means.

Outreach/Collaboration:

Many educational initiatives have and will be developed to share knowledge and experience of local Regreening with groups and individuals both locally and abroad. The UN Decade on Ecosystem Restoration will be officially launched on World Environment Day June 5, 2021, IMAX filming for Dr. Jane Goodall's Reasons for Hope will commence in 2021 with Regreening as a feature. The planting of the 10 millionth tree of the Regreening Program will be celebrated in the near future as will the 50th anniversary of VETAC (in 2023). Staff and VETAC members will continue with presentations, tours and conferences to spread the word abroad and locally efforts will continue with the Ugliest Schoolyard Contest and local biodiversity engagement through bookmarks featuring species of the month.

Operations:

Reflected in the BAP and the last 5 Year Plan, the Regreening Program benefitted from the multi-year TALER (Terrestrial Aquatic Linkages for Ecosystem Recovery) research program coordinated by the Vale Living with Lakes Centre at Laurentian University. This research shed light on the important role that revegetation of the watershed has on the contribution of high quality organic matter to the biological recovery in lakes and streams. As a result of these findings, the Regreening Program now sets priorities for revegetation and increases planting density within 100 metres of streams, lakes and wetlands. The TALER research also has lent support to the Program's use of lichens to revegetate barren rocks and to the need to continue to regreen remnant natural sites in urban areas.

Other research, such as that lead by Dr. Kabwe Nkongolo at Laurentian University, has highlighted the need for continued liming to promote ecological recovery in Greater Sudbury and the sustainability of local conifer and deciduous tree populations based on adequate genetic diversity. Dr. Nkongolo's research on soil micro-organism dynamics following regreening will also likely provide an important contribution to the development of completion discussed previously.

More recently, Landscape Carbon Accumulation through Reductions in Emissions (L-CARE) research program coordinated by the Vale Living With Lakes Centre at Laurentian University has produced data on carbon sequestration of Regreening sites over time. This research will be important to move forward with the Regreening Master Plan. So far findings show that carbon sequestration is greater in both planted pines and regenerated white birch after soil amendments are applied (lime, fertilizer, grass seed), reinforcing the need to first treat the soil. There is a need to create organic matter at all sites as the soil organic carbon (SOC) was the largest contributor to carbon sequestration despite reclamation technique. Restoration tree planting can sequester rates of carbon comparable to silvicultural plantations in similar climatic regions. These finding will help to drive the Regreening process forward.

Following the direction set out in the BAP and flexible to any up and coming research and development, the Regreening Program will continue to integrate best practices in its operations. At a minimum, there is a commitment to continue to plant 40,000 understory trees and shrubs to increase local diversity of species planted and 50,000 pine seedlings on more barren sites annually and remain flexible to plant additional trees as funding permits for carbon sequestration or other community priorities arise. Continue our partnership with Vale's aerial seeding program and manually lime 5 - 15 hectares of land per year, and spread fertilizer and grass seed. Continue with forest floor mat transplants as donor sites permit and collect native seeds/berries to maintain healthy local seed supply. A detailed work plan follows.

Operations

Aerial Seeding

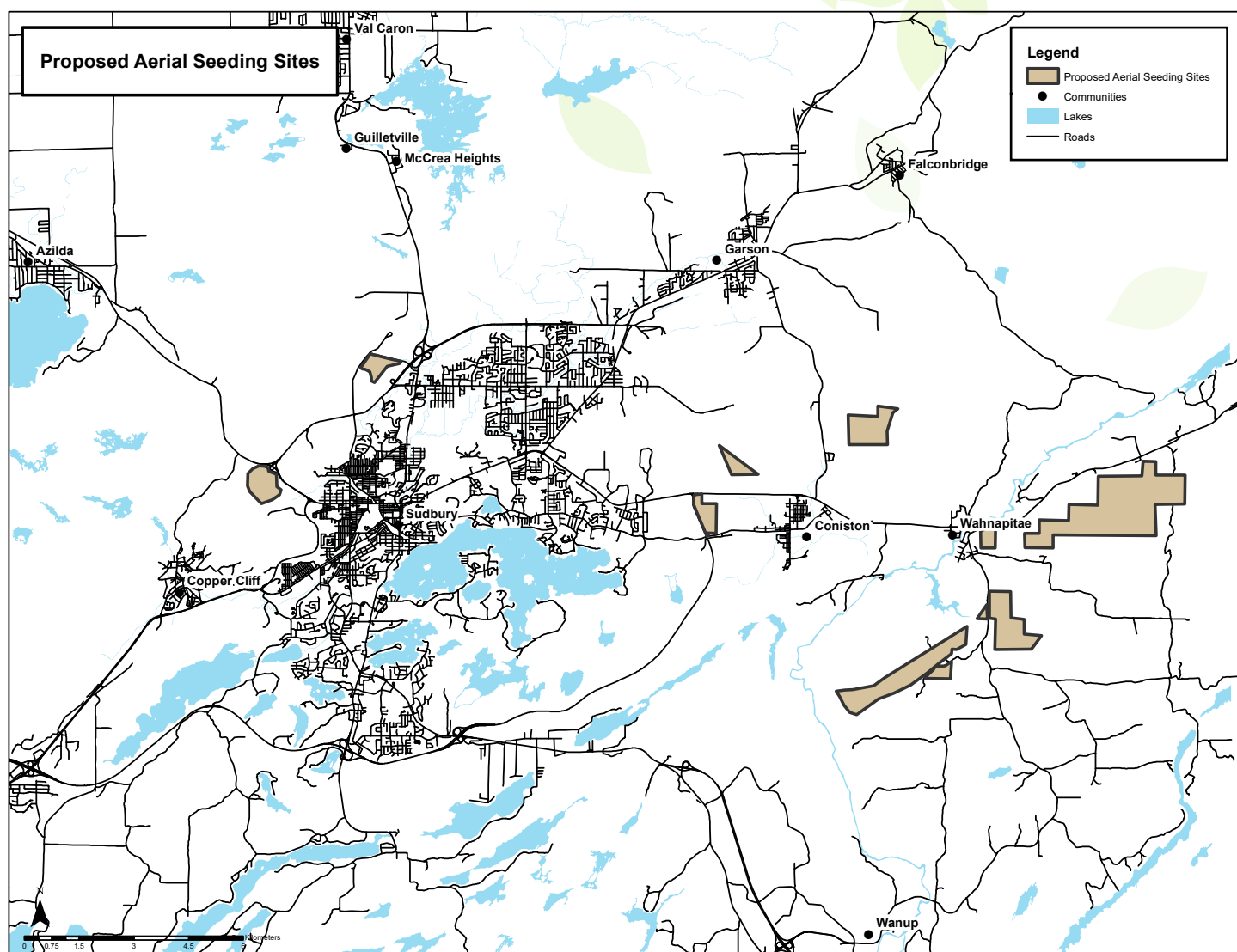
Vale has continued to partner with the City and VETAC in an effort to restore barren lands through aerial seeding, which entails spreading crushed limestone, fertilizer and a grass/legume mixture using modified crop duster airplanes and more recently with helicopters. Areas to be aerially seeded are selected by Vale in consultation with VETAC. Areas selected focus on large tracks of land that are not in close proximity to built environments and occur mainly within the barren rings, semi-barren areas that have little soil and watersheds that would benefit from reclamation activities. Partnership with Vale allows the City's Regreening Program crews to plant on the aerially seeded sites the following spring before the grass cover becomes too dense to allow the tree seedling roots to establish. Currently, Vale has been able to aerially seed approximately 100 hectares of land per year, on which 50,000 tree seedlings can then be planted. The prescription of seedlings for each of these areas is generally composed of 40% Jack Pine (Pj), 40% Red Pine (Pr), 10% White Pine (Pw) and 10% White Spruce (Sw) or 20,000 Pj, 20,000 Pr, 5,000 Pw, 5,000 Sw (Table 1). The number of pine trees may be increased to accommodate climate change targets. In addition, 10,000 Green Alder will be planted per year on these sites to increase nitrogen availability.

For the period covering 2021-2025, eight sites have been selected for aerial seeding. Specific years are not attached to the list of sites to allow for greater flexibility. The total area exceeds Vale's current annual aerial seeding limit but allows for flexibility for various reasons (e.g., presence of wetlands, electrical right-of-ways, quarry sites, logistical issues, etc.). Given the site sizes, a total of over 300,000 seedlings could be planted in these areas.

Areas selected for aerial seeding include:

Location Name	Area
#8&22 Garson-Coniston Road	70 ha
#9 SE Bypass at Hwy 17 E	35 ha
#11 Clarabelle Hill	70 ha
#20 North of Hwy 17E West of Savannah	25 ha
#21 Wahnapiatae Expanse	450 ha
#31 Finni Road Ridge	75 ha
#36 Frood Road	25 ha
#40 Wahnapiatae Hwy 537	100 ha

Proposed Aerial Seeding Map



Manual Liming

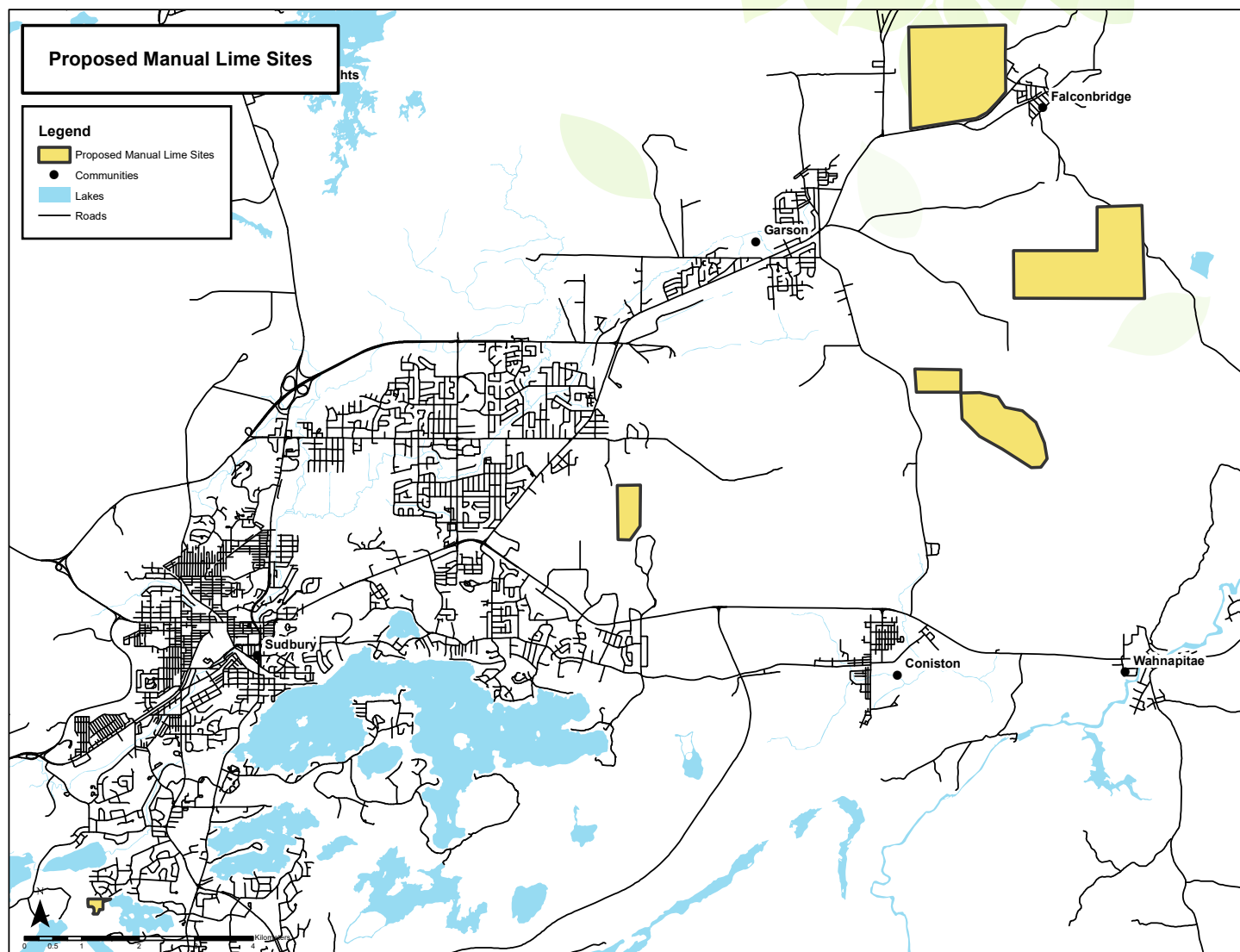
The current goal is to manually lime 5 to 15 ha of barren land per year depending on terrain. The application rate for the crushed dolomitic limestone will continue to be 10 tonnes per hectare.

Once limed, the area is fertilized and seeded. The following year, the site is ready to receive trees. The prescription of seedlings for each of these areas is the same as for aerial limed sites and includes 40% Jack Pine (Pj), 40% Red Pine (Pr), 10% White Pine (Pw) and 10% White Spruce (Sw), with the addition of 100 Green Alder (Ga) per hectare to increase nitrogen availability in the soil.

Manual liming sites include:

Location Name	Area
#5 Skead Road	50 ha
#10 End of Lapointe	130 ha
#23 Garson-Coniston Ridge	70 ha
#38 Falconbridge Area	200 ha
St. Charles Lake Area	4 ha

Proposed Manual Lime Sites



Fertilization and Seeding

For the Regreening Program, the liming phase has traditionally been followed by the application of fertilizer and a mixture of grass-legume seeds. Application rate for the 6-24-24 fertilizer has been 400 kg/ha. Grass-legume seed mixture applied at a rate of 40 kg/ha, has evolved over time as shown in the following table:

Grasses Common Name	Grasses Scientific Name	1979	1983,1988 & 1991	1995 to 2010	2011 to 2016	2017	2018 to 2020
Redtop	<i>Agrostis gigantea</i>	12%	20%	10%			
Timothy	<i>Phleum pratense</i>	15%	20%	20%			
Canada Bluegrass	<i>Poa compressa</i>		15%	15%			
Kentucky Bluegrass	<i>Poa pratensis</i>	10%	15%	15%			
Tall Fescue	<i>Festuca arundinacea</i>	20%					
Creeping red fescue	<i>Festuca rubra</i>	28%	10%	15%			
Fall Rye	<i>Secale cereale</i>				90%	40%	40%
Poverty Oatgrass	<i>Danthonia spicata</i>				<1%		<1%
Canada Wildrye	<i>Elymus canadensis</i>					10%	20%
Little bluestem	<i>Schizachyrium scoparium</i>					10%	20%
Slender wheatgrass	<i>Elymus trachycaulus</i>					30%	10%
Legumes Common Name	Legumes Scientific Name	1979	1983,1988 & 1991	1995 to 2010	2011 to 2016	2017	2018 to 2020
Alsike Clover	<i>Trifolium hybridum</i>	10%	10%	10%	10%	10%	10%
Birdsfoot Trefoil	<i>Lotus corniculatus</i>	5%	10%	15%			

The grass-legume seed mix was considered important as the resulting vegetation improves the ground-level microclimate so that tree seedlings can survive being planted on the bare, wind-swept black rock on the barrens. Rapid vegetation growth from the grass-legume mix also helped reduce ongoing erosion of the exposed soil and encouraged natural colonization of poplars, birches and willows.

Over the years, the grass-legume vegetation has aggressively colonized certain areas making it difficult or impossible to plant additional tree seedlings or to introduce native shrubs or forest floor herbaceous mats. As expected, the grass-legume vegetation thrives best in deeper, moister soils.

The conditions that necessitated the establishment of non-native agricultural grass-legume vegetation are no longer as acute as they once were in many areas. The spread and development of low-bush blueberry, white birch, various native grasses and sedges, and planted pines and spruces have brought much needed shading and reduction of the desiccating winds.

Starting in 2011, the Regreening Program together with Vale's aerial seeding program altered its traditional operation of broadcast seeding of the grass-legume seed mix and spreading of fertilizer.

The manually applied grass mixture was altered to 90% fall rye with 10% alsike clover with good success. Handpicked poverty oat grass trials were successful and will be added to the mixture as available, since the seed is not currently available commercially. Reduction in the fertilizer rate proved fair; the full application rate of 400 kg/ha had better results. The seed mixture alterations will continue to be reviewed annually.

In 2012, Vale's aerial seeding program adapted their seed mixture to include a large portion of native grasses and conducted large-scale trials. The results proved to be a robust and vigorous crop of less invasive native grass species. Alsike clover, although not native to North America, is an important nitrogen fixer so it remains in the manual and aerial seeding mixture. The aerial seed mixture Vale used and will continue to use (pending monitoring results) is listed on the next page. Securing seed for some of the native species is quite difficult, which is reflected in the range of values for percentage seed mix content.

Grasses Common Name	Grasses Scientific Name	Percentage of Seed Mixture
Fall Rye	<i>Secale cereale</i>	40%
Slender Wheatgrass	<i>Elymus trachycaulus</i>	10-20%
Canada Wild Rye	<i>Elymus canadensis</i>	20-30%
Little Blue Stem	<i>Schizachyrium scoparium</i>	0-20%
Legume Common Name	Legume Scientific Name	Percentage of Seed Mixture
Alsike Clover (non-native)	<i>Trifolium hybridum</i>	10%

Tree and Shrub Planting

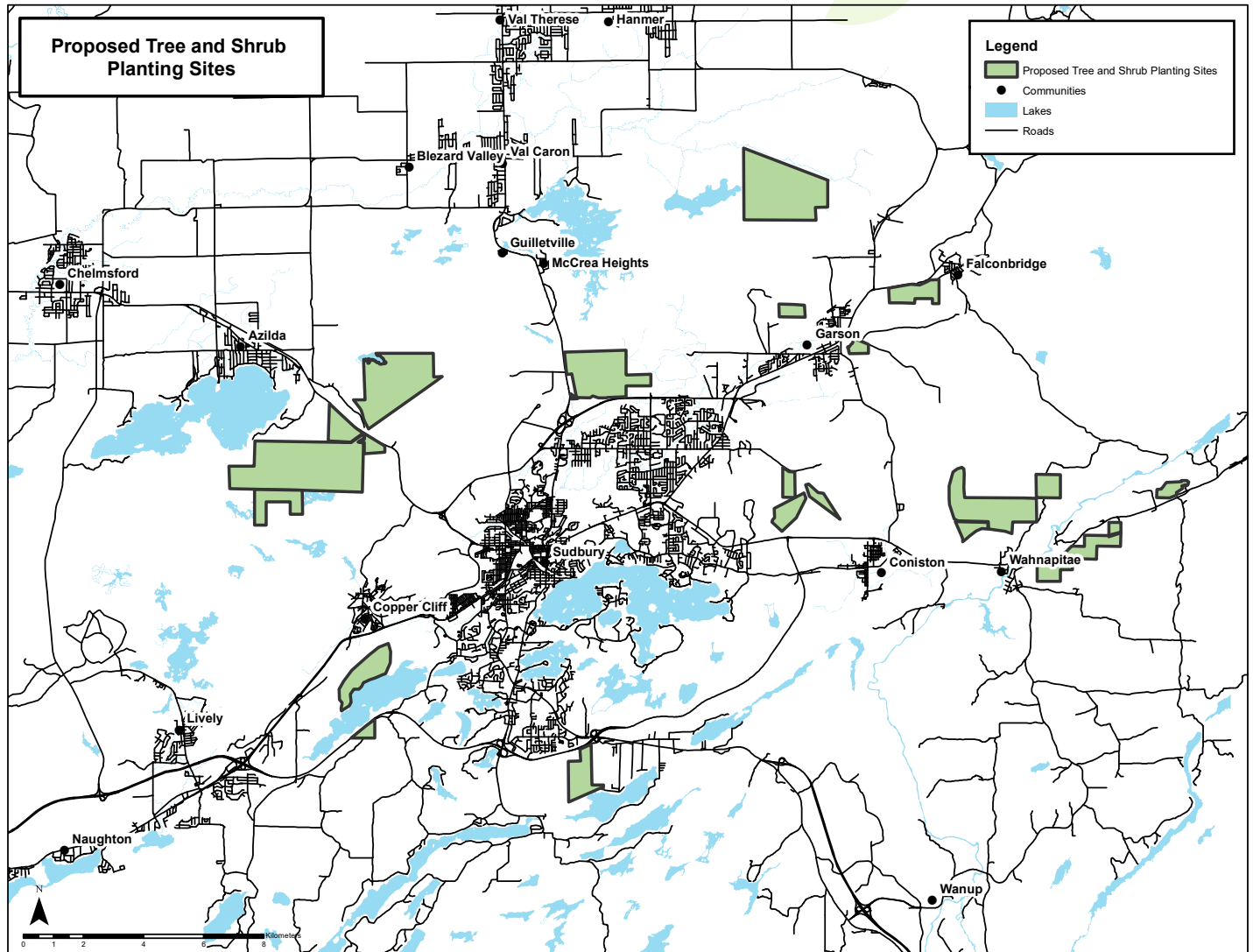
The Biodiversity Action Plan states that half a million conifer tree seedlings and 5,000 shrubs/ deciduous tree seedlings are to be planted annually; the latter are 8 to 10 times more costly than conifer seedlings. For flexibility in any given year, the Biodiversity Action Plan makes allowance for planting any combination of the above numbers (i.e., fewer conifer seedlings and more shrubs). For the last two 5-Year Plans, 2011-2015 and 2016-2020, VETAC recommended increasing the plant diversity of areas that have already been planted with conifers in the past rather than focusing primarily on planting conifer seedlings. On average, over 40,000 shrubs and deciduous tree seedlings and almost 70,000 coniferous seedlings were planted yearly over this period. VETAC maintains this recommendation for the 2021-2025 5-Year Plan.

Tree and shrub planting areas are shown on page 18. The areas were selected based on a number of criteria, including: 1) site accessibility, 2) years since receiving lime and conifer seedlings and 3) general site suitability. Due to varying site conditions in the overall areas, only portions of the areas shown will likely be planted. Excessively rocky sites receive 350 trees per hectare whereas less rocky areas receive up to 500 trees per hectare.

Tree/shrub planting sites include the following:

Location Name	Area
#1. Azilda Trails East	150 ha
#2. Garson Lake	480 ha
#3. Garson Cemetery	25 ha
#4. CKSO Ski Hill	100 ha
#6. Hwy 144 Azilda	1,000 ha
#7. Stinson Dam	35 ha
#14-15. WWTP	35 ha
#16. Hwy 69 N	300 ha
#17-18. Colonization Road	300 ha
#21. Wahnapiatae	200 ha
#25-29. North Savannah	100 ha
#30. Kirkwood Mine	50 ha
#33. Kelly Lake North Shore	130 ha
#34. Southview Drive	15 ha
#39. Garson	100 ha

Proposed Tree and Shrub Planting Map



Numerous species were selected based on increasing biodiversity of species planted, suitability to the Sudbury area and, for some, ongoing influences of climate change. Species available for planting in any given year will be dependent on seed availability. The expected delivery of species over the term of this 5-year plan is listed in the table below.

Common Name	Scientific Name	Moisture Use	Shade Tolerance	5-Year Total
Balsam Fir	<i>Abies balsamea</i>	Medium	Tolerant	10,000
Striped Maple	<i>Acer pensylvanicum</i>	Low	Tolerant	5,000
Mountain Maple	<i>Acer spicatum</i>	Medium	Tolerant	10,000
Green Alder	<i>Alnus viridis ssp. crispa</i>	Medium	Intermediate	50,000
Smooth Serviceberry	<i>Amelanchier laevis</i>	Medium	Tolerant	10,000
Red-twigged Serviceberry	<i>Amelanchier sanguinea</i>	Medium	Tolerant	15,000
Running Serviceberry	<i>Amelanchier stolonifera</i>	Medium	Intermediate	10,000
Bearberry	<i>Arctostaphylos uva-ursi</i>	Low	Intermediate	2,500
Black Chokeberry	<i>Aronia melanocarpa</i>	Medium	Tolerant	5,000
Yellow Birch	<i>Betula alleghaniensis</i>	Medium	Intermediate	25,000
Alternate-leaf Dogwood	<i>Cornus alternifolia</i>	Medium	Tolerant	5,000
Round-leaf Dogwood	<i>Cornus rugosa</i>	Low	Tolerant	5,000
Red-osier Dogwood	<i>Cornus stolonifera</i>	High	Intolerant	2,500
Mountain-holly	<i>Ilex mucronata</i>	High	Intermediate	2,500
Winterberry Holly	<i>Ilex verticillata</i>	High	Intermediate	2,500
Common Juniper	<i>Juniperus communis</i>	Low	Intolerant	2,500
Ironwood	<i>Ostrya virginiana</i>	Low	Tolerant	1,000
Red Oak	<i>Quercus rubra</i>	Low	Intolerant	50,000
Staghorn Sumac	<i>Rhus typhina</i>	Low	Intermediate	2,500
Prickly Wild Rose	<i>Rosa acicularis</i>	High	Tolerant	1,000
Smooth Wild Rose	<i>Rosa blanda</i>	Medium	Intolerant	1,000
Swamp Rose	<i>Rosa palustris</i>	Medium	Tolerant	500
Common Elderberry	<i>Sambucus canadensis</i>	Medium	Intolerant	1,000
Red Elderberry	<i>Sambucus pubens</i>	High	Intermediate	2,000
Buffalo Berry	<i>Shepherdia canadensis</i>	Medium	Intermediate	2,000
American Mountain-ash	<i>Sorbus americana</i>	Medium	Intermediate	5,000
Showy Mountain-ash	<i>Sorbus decora</i>	Medium	Intermediate	5,000
Hardhack	<i>Spiraea tomentosa</i>	Low	Intolerant	5,000
Snowberry	<i>Symphoricarpos albus</i>	Medium	Intolerant	2,500
Canada Yew	<i>Taxus canadensis</i>	Medium	Tolerant	500
Eastern Hemlock	<i>Tsuga canadensis</i>	Medium	Tolerant	1,000
Wild Raisin	<i>Viburnum nudum var. cassinoides</i>	Medium	Tolerant	10,000
			Total	252,500

In addition to the shrubs and deciduous tree seedlings, 50,000 conifer tree seedlings per year will be planted by the City's Regreening crews in the Vale aerially seeded sites as discussed earlier. These seedlings will likely be supplied from Vale's greenhouses but, as a back-up, can be purchased from a forestry nursery, including Collège Boréal.

Finally, up to 5,000 tree seedlings will be obtained yearly to accommodate organized group planting activities and the annual tree giveaway to residents during the Sudbury Gardening Festival at the end of May.

Transplanting of Forest Floor 'Mats'

The Regreening Program has determined that digging out and transplanting forest floor vegetation mats is a viable and practical method for increasing plant diversity on damaged sites undergoing ecological recovery. This method has the added benefit of introducing other organisms besides plants, including soil bacteria, microorganisms, fungi, and insects, as well as needed organic matter to reclamation sites. In 2010, VETAC partnered with the Ontario Ministry of Transportation to salvage vegetation mats along the Hwy 69S four-lane construction corridor which lasted until 2012. Since then, partnership with KGHM International Ltd was established and the opportunity for vegetation salvage continued from 2012 to 2018 at three different mine properties. Since 2019 Crown land north of Capreol along Moose Mountain Mine Road was used as the main donor site and starting in 2018, private properties were used to supplement collections from main sites and included Ronka Road, McCharles Lake Road (City land), Chelmsford and St. Charles area. Receptor sites for this vegetation will be within the same general areas as those selected in the past. Efforts will be made to secure additional opportunities for transplanting forest floor mats.

Seed Collection

Collecting and propagating seeds from local sources is an effective strategy for obtaining viable plants for use in the Regreening Program. The subsequent planting and re-introduction of these native plants contributes to species diversity and helps maintain a healthy local seed supply.

Productive seed sites for mountain maple (*Acer spicatum*), green alder (*Alnus viridis*), bearberry (*Arctostaphylos uva-ursi*), black chokeberry (*Aronia melanocarpa*), alternate-leaf dogwood (*Cornus alternifolia*), mountain-holly (*Ilex mucronata*) (formerly known as *Nemopanthus mucronatus*), winterberry holly (*Ilex verticillata*), common juniper (*Juniperus communis*), staghorn sumac (*Rhus typhina*), native mountain-ash (*Sorbus* sp.), Canada yew (*Taxus canadensis*), and wild raisin (*Viburnum nudum* var. *cassinoides*) were located and harvested over the past several years. Efforts will be made to continue to locate sites for collecting seeds or vegetative cuttings for a long-term supply of local stock for various other shrub and tree species. Multiple seed collection sites still need to be identified and recorded for each target species to avoid potential issues associated with overharvesting.

Collected seeds and cuttings will be sent to the City's contracted propagator for processing and storage. Seed and cutting collection sites are recorded on a Google map accessible to VETAC members for collaboration purposes to assist in future planning.

Mapping Records

In 2015, with the assistance of Sudbury INO funding, a mapping exercise was conducted to compile all historical Regreening Program mapping for tree planting and liming activities. All hard copy maps and records of municipal activity from 1978 to 2015 in liming, grassing and planting were verified and updated into a digital geographical information system (GIS). Also included in the GIS are the records of regreening work accomplished by Vale on lands outside of their gated boundaries and Vermilion Forest Management Company on lands within the semi-barren zone. Other regreening areas completed by both Vale and Sudbury Integrated Nickel Operations, a Glencore Company, (Sudbury INO) situated within their gated boundaries were not included in the mapping as these areas are outside the scope of the Regreening Program and are subject to regreening/rehabilitation requirements through site closure plans.

Barren and semi-barren rings were included on working maps since barren areas generally require lime first before any tree planting and the semi-barren limit generally outlines the outer extent of regreening operations. Given that the ERA determined that COCs are still limiting plant growth, many semi-barren areas may also require liming prior to any additional interventions (tree or shrub planting, forest floor mats, or compost).

This mapping assignment was completed in 2016 and the data have been uploaded using ESRI software. In early 2017, the interactive map became available to the public through the City's website and receives annual updates. This "Regreening App" can be found at greatersudbury.ca/maps. In this format, the general public is able to access up-to-date and historical tree planting and liming data. This has also proven to be a useful tool for staff at the City and the VETAC partners during the planning stages of regreening activities.

Management units were developed to assist in geographically partitioning the regreening work to be accomplished. Based on watershed mapping, 140 regreening management units (RMUs) were created and added to the map in 2018. These units will help in narrowing down what areas are still in need of some form of Regreening efforts.

In 2019, forest floor mat information was added to the app and is updated annually. This information includes all understory and exposed mat transplants from 2010 to present.

Areas limed, planted and location of forest floor mats are available at greatersudbury.ca/regreening as well as the watershed based RMUs and barren and semi-barren rings. By incorporating all maps in one location, a better understanding of what areas have not yet received reclamation treatment can be determined.

Records of regreening work will continue to be updated annually over the period of this 5-year plan.

For further information please contact:

Regreening Program

Environmental Planning Initiatives

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