

Land Reclamation

Réhabilitation des sols



Annual Report 2004

ENVIRONMENTAL INITIATIVES
- LAND RECLAMATION PROGRAM -
Economic Development and Planning Services

December 2004

Our work

Number of tree seedlings planted
since 1978: 8 million
in 2004: 269,096

Number of hectares treated with crushed limestone
since 1978: 3346
in 2004: 17.4

Our workers

Ontario Works Participants: 44
HRDC - JCP Participants 10
CGS Temporary Staff 5
CGS Summer Students 4
Volunteer Groups and Students 1,464

Our outreach

Towards a Greener Sudbury Show
Regional Heritage Historica Fair
Facilitate Group Planting Activities
Provided Guided tour to the Ambassador of the United States
Sudbury Star Articles
Featured in the EARTHCARE Supplement of the Northern Life
Participated in several phone interviews

Our partnerships



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Fondation communautaire de Sudbury
40 Elm Street Unit 218 Tel: (705) 573-7770
Sudbury, Ontario P3C 1S8 Fax: (705) 573-8727
www.cfs.sudbury.on.ca



Natural Resources
Canada



The Land Reclamation Program has been very active this year in continuing to improve the City's environment and image. This year the Land Reclamation Program met its goal of liming almost 20 hectares of barren land and planting over 250,000 tree seedlings.

Last year, the Land Reclamation Program committed to adopting two approaches to its planning and operations: 1) watershed improvement and 2) increasing diversity of the plantings. Several initiatives were carried out this year to accomplish these goals.

Watershed Improvement

A watershed is the land area that drains to a specific body of water, such as a lake, river, stream or wetland. Improving the conditions of the land in a watershed, such as increasing vegetation cover, will improve the quality of the receiving water body. In fulfilment of its commitment to improve watersheds, the Land Reclamation Program this year focussed on three objectives: 1) completing the reclamation of the watershed of Silver Lake, a highly acidic and degraded lake, 2) reclaiming the watershed of an important tributary of Junction Creek on City-owned land around the snow dump, and 3) improving tree canopy cover in several watersheds.

Silver Lake Watershed

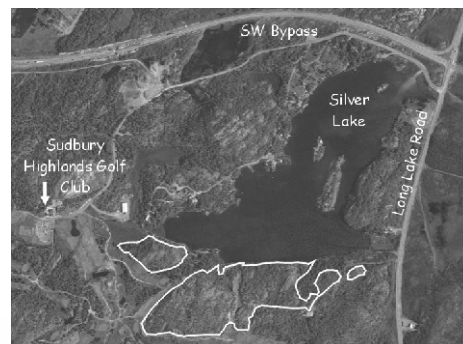
In 1995, Dr. John Gunn of Laurentian University referred to Silver Lake as one of the most metal-contaminated lakes in the world, considering lakes affected only by atmospheric deposition. In 1990, copper and nickel levels were 60 times and almost 24 times the Ontario Water Quality objective respectively. The pH, a measure of acidity, was at 4.32 during the same time, and it is known that lethal effects of acidity on aquatic life occurs at a pH level below 4.5.

Treatment of the Silver Lake watershed with lime, fertilizer and a grass/legume seed mixture was completed this year, following previous efforts in 1983, 1985, and 2000. This year, 11.8 ha of the watershed were treated for a total of 22.7 ha since 1983. In addition, a total of 8000 tree seedlings were planted in the watershed this year.

Treatment of the land in the watershed appears to have had dramatic effect on the quality of Silver Lake. A fish survey conducted this summer by the Cooperative Freshwater Ecology Unit found several fish species present in the lake whereas no fish were present in 1990. Likewise, acidity has also improved drastically from a pH of 4.32 in 1990 to over 6.35 in 2004.

Right: Liming and tree planting activities in the Silver Lake watershed.

Below: View of the barren rock outcrops in the Silver Lake watershed.



Junction Creek Watershed

The Land Reclamation crew also applied lime, fertilizer and seed to 5.6 hectares on the barren slopes near the City's snow dump off the Lasalle Blvd. Extension. The slopes drain into the Nolin Creek system that empties into Junction Creek. The slopes are partly covered with dwarf birch, an indicator species of elevated metals and low pH in soils. Our crews will plant trees on these slopes next spring.



Left: Lime site near the City snow dump off the Lasalle Blvd. Extension.

Below: View of barren rock outcrops near the City snow dump. Note the lime bags placed on the ground ready to be spread.



Tree Planting and Watershed Improvement

The spring planting season ran from May 3rd to June 22nd, with 164,620 trees planted. Keeping with the watershed approach to reclamation activities, sites selected for tree planting included the watershed areas of McFarlane Lake, Richard Lake and Crooked Lake. Sites aerial limed by INCO Ltd. in the fall of 2003 were also planted. As part of an ongoing commitment the crew planted 29,280 red pine seedlings for the Vermilion Forest Management Co. in the Falconbridge area.

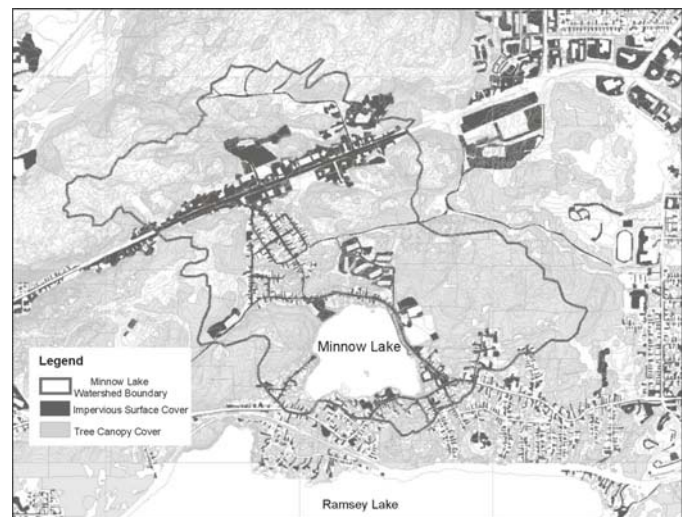
The fall plant saw the planting of 104,476 trees between August 31st and October 13th. Sites included the continuation of the spring sites, as well as the planting of the Silver Lake watershed area, and the site aerial limed by INCO Ltd. in 2002.

A total of 269,096 trees were planted at 30 strategic locations within the City of Greater Sudbury.



Mapping

Another important watershed project completed this year was the mapping of tree canopy cover and impervious surface cover for all urban areas within CGS. These covers serve as important indicators of watershed health and will serve, among other things, to direct future Land Reclamation activities on improving the most critically damaged watersheds. Detailed mapping of the watersheds and subwatersheds of Lake Ramsey and Lake Nepahwin have been prepared.



Above: Tree canopy and impervious surface cover of the Minnow Lake watershed.

Biodiversity

The Land Reclamation Program has effected profound and lasting change to our community's image and environment by establishing vegetation on barren, blackened hills. Yet, the vegetation growing on the hills is made up of very few species. Low plant diversity means less habitat diversity for wildlife and also makes the entire system more susceptible to major disruptions from pest and disease infestations and climate change. Greater plant and wildlife diversity is required to allow regionally representative, self-sustaining forests to develop. The Land Reclamation Program this year has undertaken a number of steps to achieve greater plant diversity.



Planting a Diversity of Tree Species

In an effort to increase the diversity of species planted through the Land Reclamation Program, four additional species were planted in 2004: sugar maple, American beech, green ash and bur oak. Test plots were set up at four different locations: the Frood Road trail, the Ramsey Lake Boat Launch, a site off Hwy 17E and the Jane Goodall Reclamation Trail. The success of these plantings will be monitored over the next few years to assess whether these species can be incorporated into the general mix of tree planting activities for the future.

Forest Floor Transplants

In fulfilment of the commitment made to increasing biodiversity, this year the Land Reclamation Program worked in partnership with FNX Mining to salvage plants from an area destined for site stripping prior to mineral exploration activities. Sections of forest floor were cut from an existing forest site north of Capreol and moved to biologically impoverished reclamation sites at the Frood Road trail and the Jane Goodall Reclamation Trail. Species included in the transplanted forest floor sections include star flower, wintergreen, bunchberry, goldthread, pipsissewa, bluebead lily and several others.

These small plots of relocated forest floor should serve as biologically diverse nodes from which

native species will eventually colonize surrounding areas. Monitoring of these transplants will continue over the next few years to assess survival and spread.



Above: Notice the dramatic difference between the existing forest floor (left) and the forest floor transplants (right).

Compost Plot

One of the limiting factors of diverse forest floor cover may be the lack of organic matter in which to grow. A small plot of municipal compost was established at the snow dump area and seeded with native seeds including; blueberry, choke cherry and mountain maple. It is known from past experimental plots that compost has a neutral pH and is sufficient in nutrients which eliminates the need for lime and fertilizer application. This site will be monitored for any growth of the species seeded.

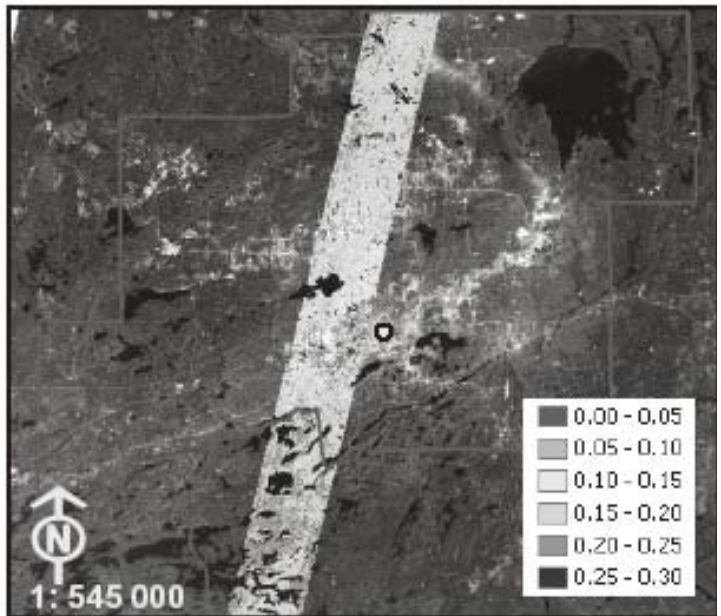
Longterm Monitoring

The City, through the Land Reclamation Program, established a partnership with the Canada Centre for Remote Sensing (CCRS) to develop tools for assessing changes in the forest canopy in the CGS impacted by mining activities and monitoring the progress of vegetation cover using satellite imagery. This research is supported by the Sustainable Development through Knowledge Integration program in Natural Resources Canada's Earth Sciences Sector. These investigations have lead to two preliminary findings: 1) thousands of hectares of land in CGS are still largely bare of vegetation and 2) forest canopies growing naturally in the zone impacted by past mining activities are not as healthy as those growing outside of that zone. Unhealthy forests are more susceptible to insect and disease infestations.

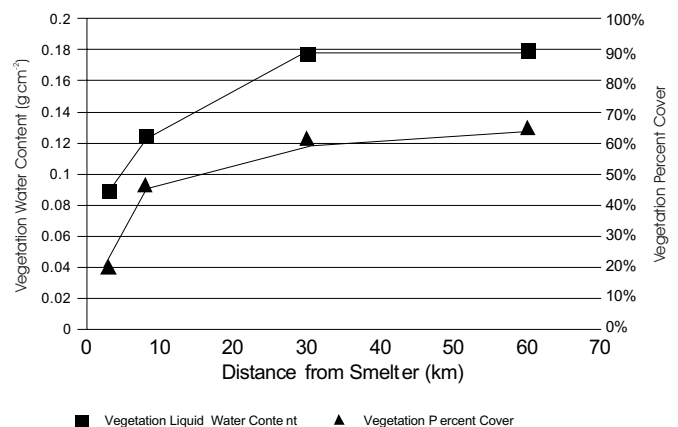
Based on these preliminary findings, it will be important for the Land Reclamation Program to continue reclaiming the thousands of hectares of damaged land to create productive forests that will in turn help improve the quality of our rivers and lakes and increase the biological diversity of our ecosystems.

The vegetation cover monitoring techniques being developed in collaboration with CCRS will be supplemented by monitoring techniques for determining changes in the plant species composition of the vegetation. This will allow the Land Reclamation Program to track changes in plant species and vegetation structure to determine the need for further intervention.

*Top, right: Classified image of vegetation liquid water content (LW) derived from Hyperion data (with Landsat false-colour image in background). LW values are in $\text{g}\cdot\text{cm}^{-2}$.



*Bottom, right: Average values of vegetation liquid water (LW) and vegetation percent cover within impact zones around the Copper Cliff smelter.



*Both figures from the article: *Champagne et al. 2004. Ecological Restoration from Space: The use of Remote Sensing for Monitoring Land Reclamation in Sudbury 16th Int'l Conference, Society for Ecological Restoration, August 24 – 26, 2004, Victoria, Canada.*

Labour

The Ontario Works program provided a total of 44 individuals for this year's Land Reclamation Program. These individuals participated 2 days a week over a 12 week period offered in two sessions: May 3rd to July 22nd and July 26th to October 14th. Since this partnership began in 1997, the Land Reclamation Program has provided 655 positions for participants through Ontario Works.

Funding from the YMCA Summer Job Service was obtained which provided wage subsidies for 4 summer students over a 12 week period.

HRDC funding for a Job Creation Partnership was received for 10 individuals to work on the Silver Lake Watershed Improvement Project over a 15 week period.

Labour Summary

Program	Number of Positions	Number of Weeks	Cost to City	Activity
City of Greater Sudbury Temporary/Summer Students	4	17	87%	Tree planting, liming
City of Greater Sudbury Temporary Employees	5	26 24 5	100%	Foreperson (2), Crew Foreperson (1), Land Reclamation Worker (2)
HRDC - JCP	10	15	Nil	Tree planting, liming
HRDC Youth Internship	1	33	15%	GIS Mapping
Ontario Works	25	24	Nil	Tree planting, liming

TOTAL 45

Volunteers



Above: Silver Lake Watershed Improvement Crew 2004.



Above: Crew preparing lime bags for spreading on barren land.

Over 8,000 tree seedlings were planted by almost 1,500 volunteers who assisted the Program this year. Volunteer participation in the Land Reclamation Program helps to spread the message of the need for healthy forest ecosystems.

Most of the volunteers this year were students involved in Destination Conservation, an innovative school-based conservation program where students, staff, school district staff and utility companies interact to initiate environmental education and conservation activities aimed at conserving energy and resources in schools. In Sudbury, 50 schools participated in the event and students learned how trees can reduce energy costs by providing shade in the summer and act as wind blocks in the winter months. Each school received 50 trees to plant around their school yards and students' homes.

Events

Towards a Greener Sudbury Show Tree Giveaway

Land Reclamation's annual 'Towards a Greener Sudbury' show was held at the New Sudbury Shopping Centre on Saturday, May 29th. Over 5,000 seedlings were distributed to the public to plant on their property. Tree species included red pine, white pine, white spruce, red oak and white cedar. Financial contributions to the Program by the public at this event were very generous.



Above: Trees were distributed to the community free of charge.

Falconbridge Limited once again generously provided free pH testing for anyone bringing soil samples. Of the 71 garden and yard soil

samples analysed, the lowest pH value was 5.4 and the highest was 8.2 (7 is neutral) with an overall average of 6.8 which is almost neutral.

Right:
Falconbridge
Ltd. provided
free pH
testing.



Gardening and landscaping advice was offered by Greater Sudbury's Master Gardeners. Representatives of the Sudbury Soils Study were available to answer any questions regarding the Study. The City's Lake Water Quality Program provided information on community monitoring programs and healthy lakefront living.

Communications

Regional Heritage Historica Fair

Over 100 local students gathered at the Jane Goodall Reclamation Trail to experience some of Sudbury's reclamation history as a part of this year's Regional Heritage Historica Fair held on Friday, May 7th. First, the students were given a presentation on the Land Reclamation Program and the vegetative history of the Sudbury area. Later, along the trail, students were able to see how the devastation had come through century old logging and mining operations, but more importantly, how this community came together to remedy the situation. Students were offered a variety of learning opportunities: 1) identification of native tree species planted by

the Program, 2) important tree facts, and 3) understanding about the various stages of land reclamation. Tour guides included Program staff, VETAC members, and Laurentian University staff and graduate students.

Right: Guided tour
of the Jane Goodall
Reclamation Trail.



Visit of the Ambassador of the United States

On Friday, November 5th, His Excellency Paul Cellucci, Ambassador of the United States to Canada, and Ms. Jessica LeCroy, Consul General of the United States of America, were given an informative tour on the decades of land reclamation accomplishments in the City of Greater Sudbury. The tour was led by Bill Lautenbach, Director of Planning Services, with the assistance of Stephen Monet, Coordinator of Environmental Initiatives. In a follow-up letter to Bill Lautenbach, Ambassador Cellucci stated that "It was a true eye opener to get a glimpse first-hand all that you and your team have accomplished in the way of land reclamation over the past decades - you have, in the best sense of the word, transformed the city and helped make it what it is today."



Above: Tour provided for the Ambassador of the United States. From left to right; Bill Lautenbach, Director of Planning Services, Ms. Jessica LeCroy, Consul General of the United States of America, His Excellency Paul Cellucci, Ambassador of the United States to Canada, Doug Nadorozny, General Manager of Economic Development and Planning Services and Stephen Monet, Coordinator of Environmental Initiatives.

"Sudbury In Bloom"

On Sunday, August 22nd at the Carmichael Arena, the Sudbury Horticultural Society hosted its "Sudbury In Bloom" show. The Land Reclamation display board was available for viewing by interested visitors to the show.



Above: Land Reclamation Display.

Media

Stephen Monet, Coordinator of Environmental Initiatives, was interviewed and provided a brief tour of the Land Reclamation accomplishments for the French-language television documentary show 'Panorama', which aired on September 27, 2004 on TFO (TVOntario).

Stephen was also interviewed by the *Sudbury Star* for an article that appeared in that newspaper on March 25, 2004 entitled "7,960,000 trees and counting..."

He was also a coauthor of a scientific paper presented at the 16th International Conference of the Society for Ecological Restoration by Catherine Champagne of Natural Resources Canada. The paper's citation is as follows:

Champagne, C.M., A. Abuelgasim, K. Staentz, S. Monet, and H. P. White. 2004. Ecological restoration from space: the use of remote sensing for monitoring land reclamation in Sudbury. Presented at the 16th International Conference of the Society for Ecological Restoration, August 24-26, 2004, Victoria, British Columbia.

Finally, an article was prepared for the EARTHCARE feature in the November 19 issue of *Northern Life*.



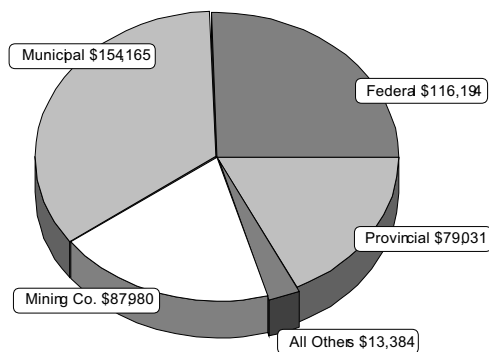
Financial Summary

The Land Reclamation Program owes much of its success to the many partnerships developed, which has resulted in the contributions of funds, materials and labour for the operation of the Program. The Program cost over \$450,000 this year, with the City contributing 34% of the total cost. The remaining 66% of the funding was provided by other contributors.

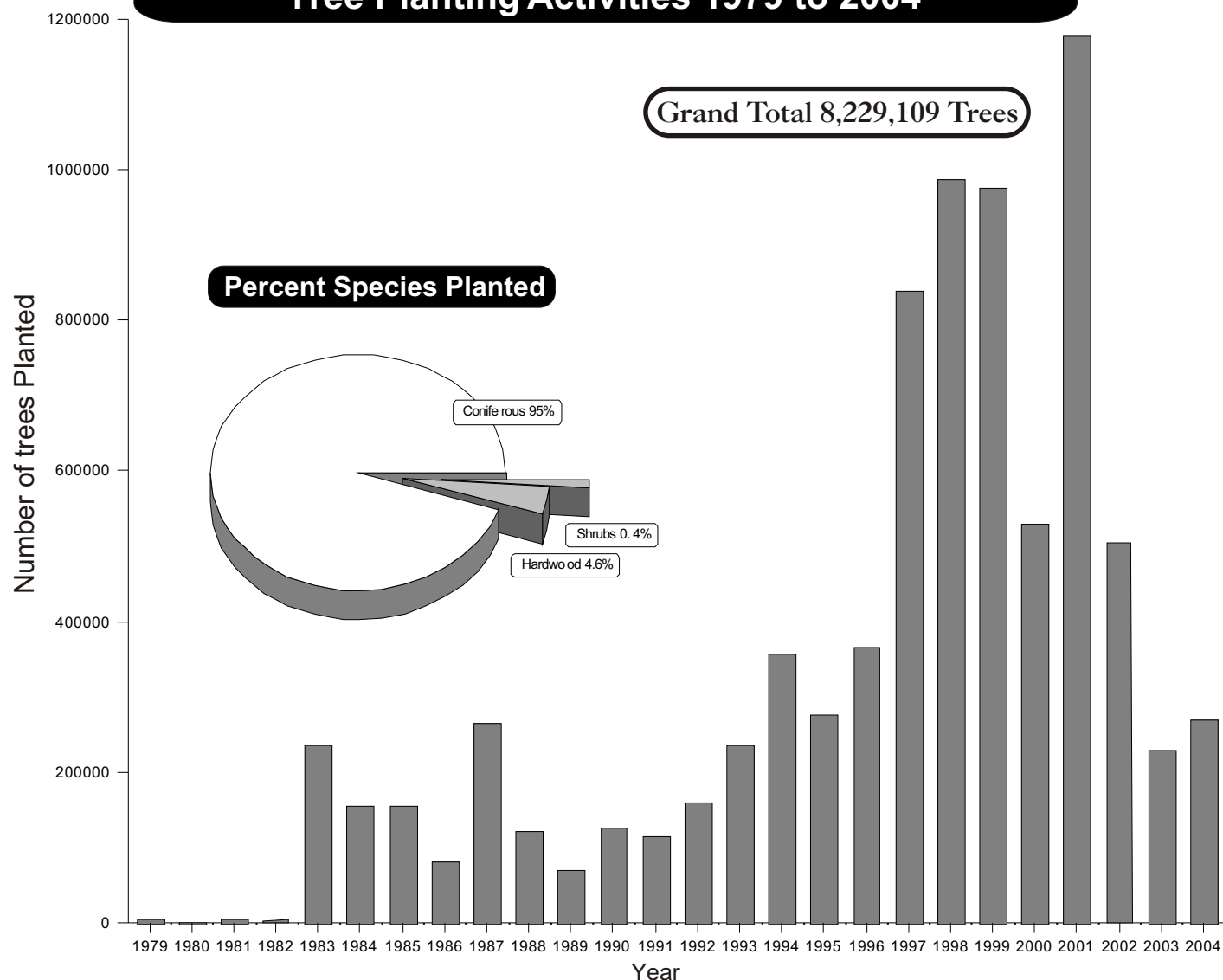
Funding Contributions 2004

Program Contributors	Number	Source	Amount
LABOUR			
Ontario Works	44	Provincial	\$50,671.48
Summer Job Service YMCA	4	Provincial	\$3,360.00
HRDC - JCP	10	Federal	\$52,464.00
HRDC Youth Internship	1	Federal	\$13,730.00
CASH			
Ontario Works		Provincial	\$25,000.00
INCO Ltd.		Mining Co	\$25,000.00
Falconbridge Ltd.		Mining Co	\$40,000.00
Sudbury earthdancers		Private	\$1,600.00
MATERIALS (trees)			
INCO Ltd.	76,600	Mining Co	\$22,980.00
Vermillion Forest Management Co.	29,280	NGO	\$8,784.00
NDCA	10,000	Private	\$3,000.00
IN-KIND			
Canadian Centre for Remote Sensing		Federal	\$50,000.00
Sub-Total			\$269,589.48
City of Greater Sudbury Contribution			\$154,165.00
GRAND TOTAL			\$450,754.48

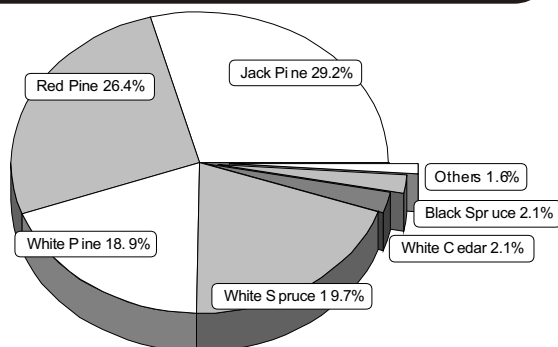
Funding Contributions 2004:



Tree Planting Activities 1979 to 2004

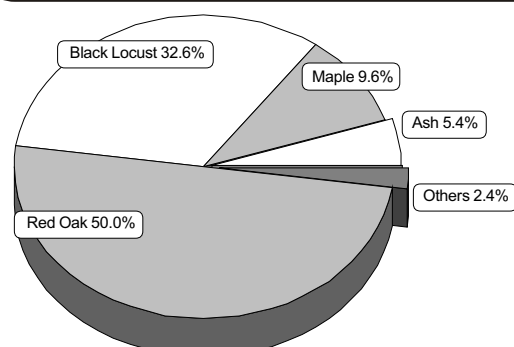


Percent Coniferous Species Planted 1979 to 2004



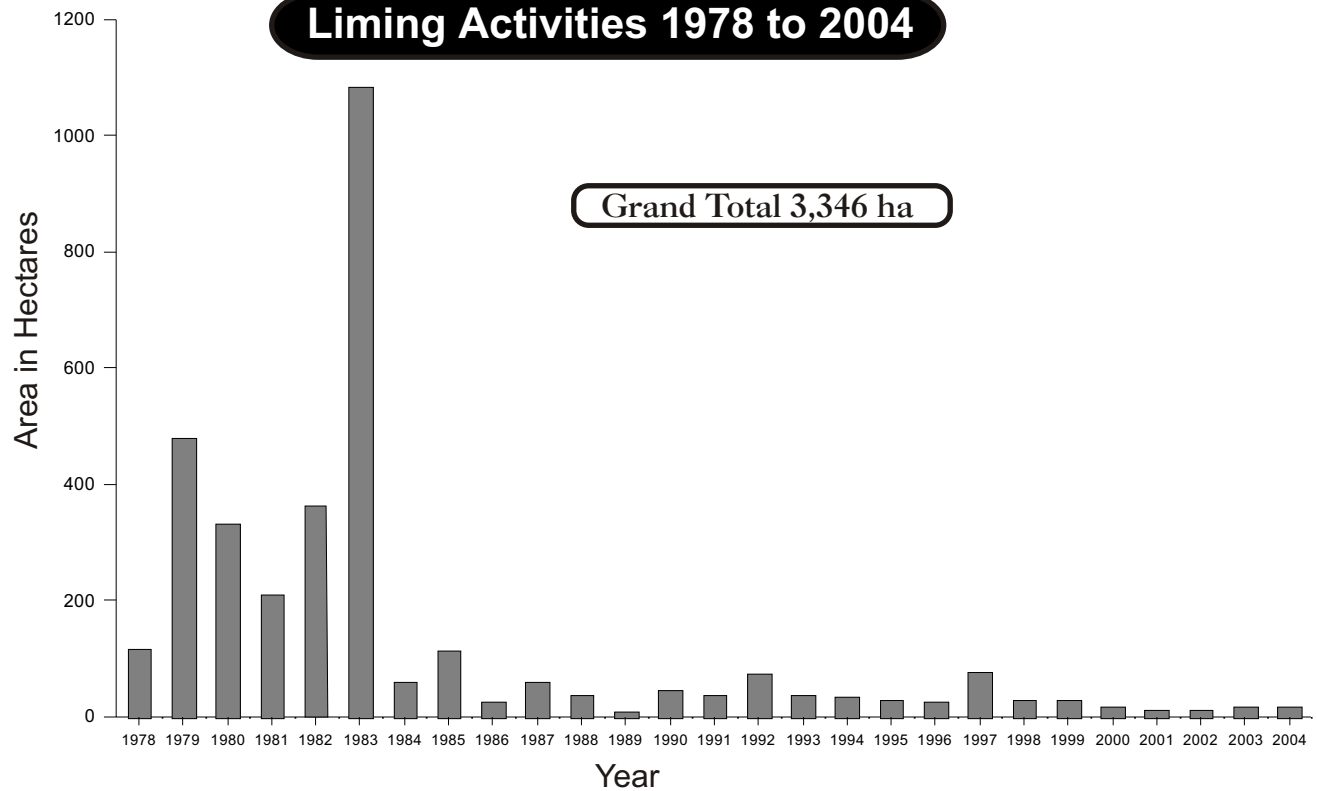
Others include: Tamarack 1.0%, Norway Spruce 0.3%, Larch 0.2% and Hemlock <0.1%

Percent Hardwood Species Planted 1979 to 2004

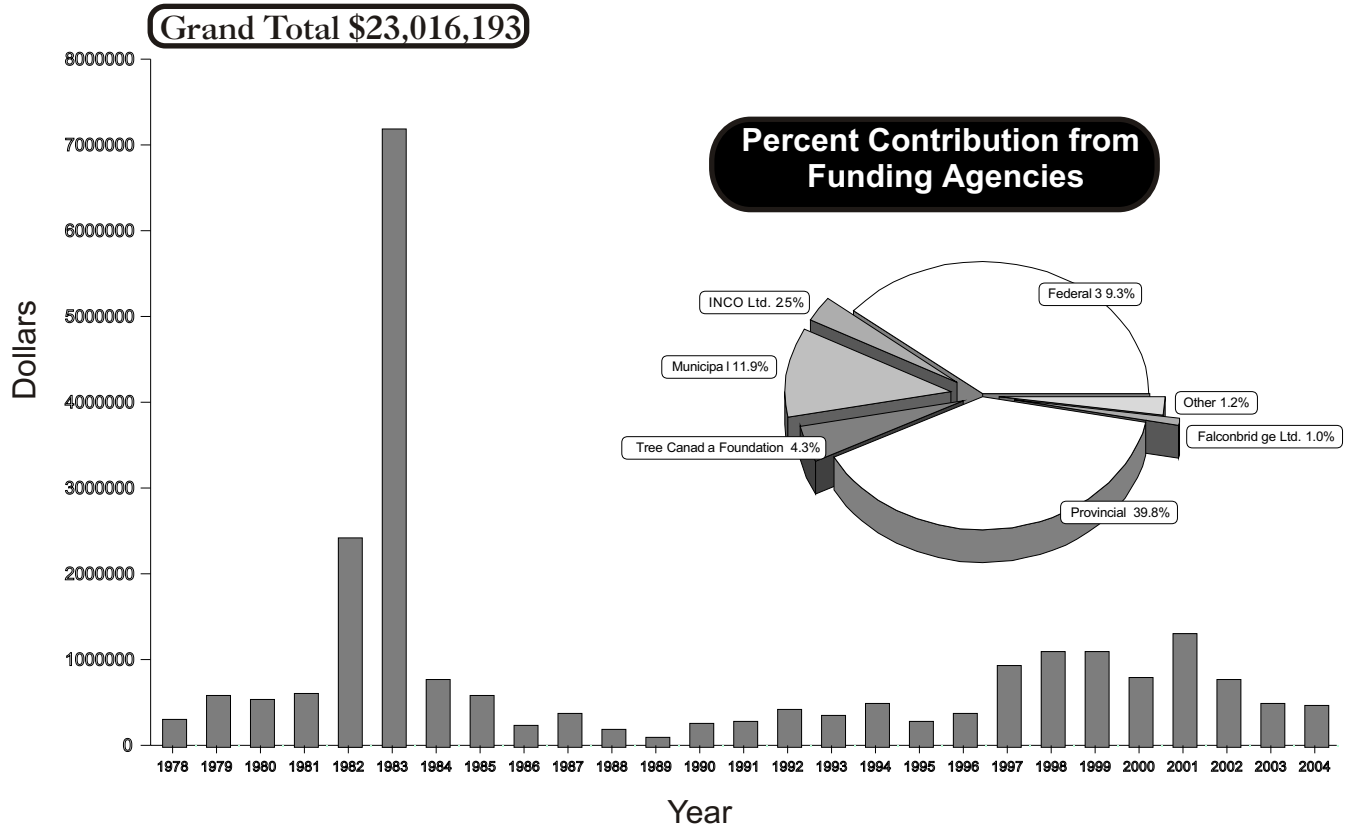


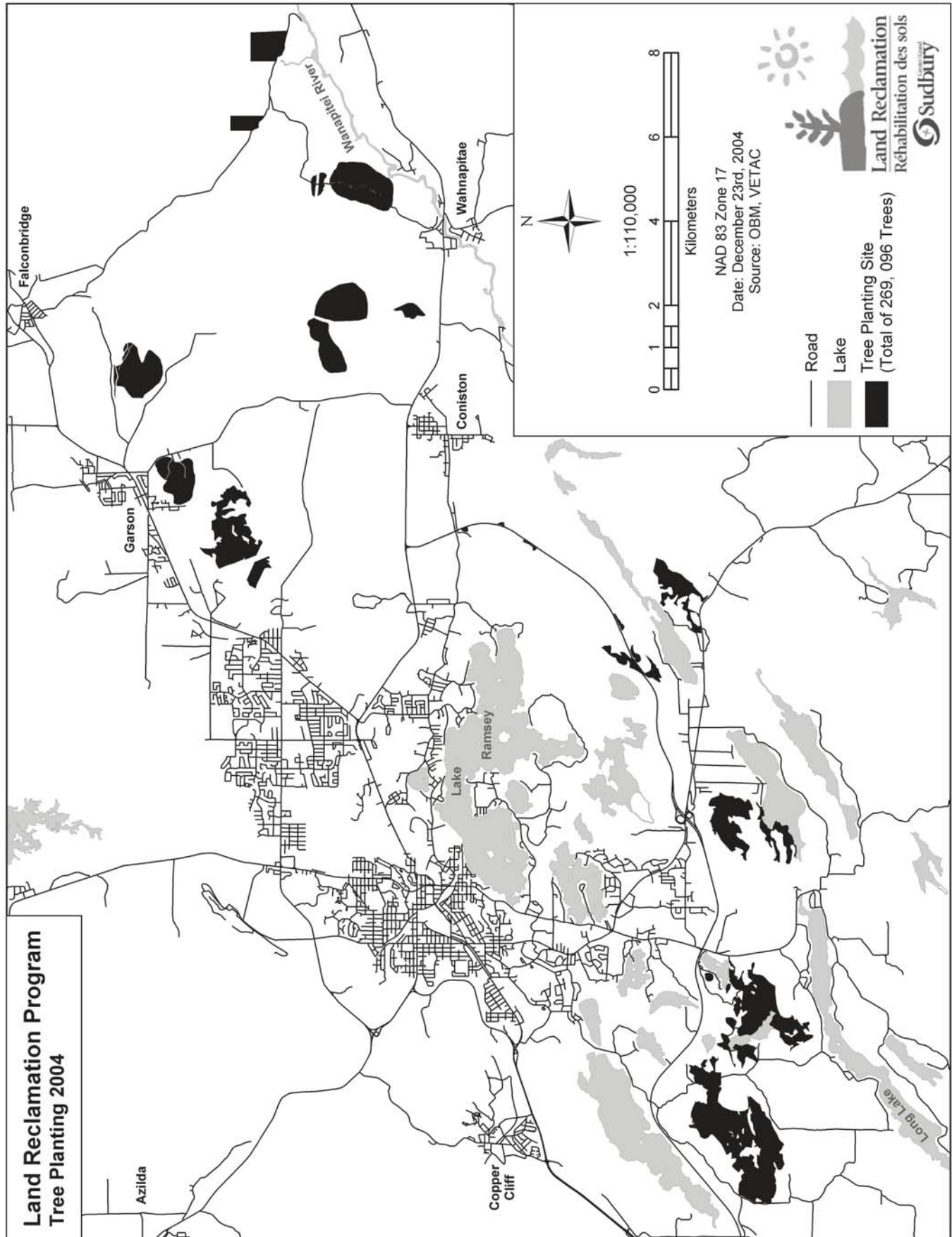
Others include: Russian Olive 1.4%, Yellow Birch 0.9%, Bur Oak 0.1% and American Beech <0.1%

Liming Activities 1978 to 2004



Financial Contributions to Date: 1978 to 2004





For further Information Please Contact:

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