Land Reclamation Program 1978 - 1984

Regional Municipality of Sudbury

Vegetation Enhancement Technical Advisory Committee

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To each of you, the program organizers wish to extend a sincere thank you and express their deep gratitude for assisting in helping make the Regional Municipality of Sudbury a better place.

Photo Credits

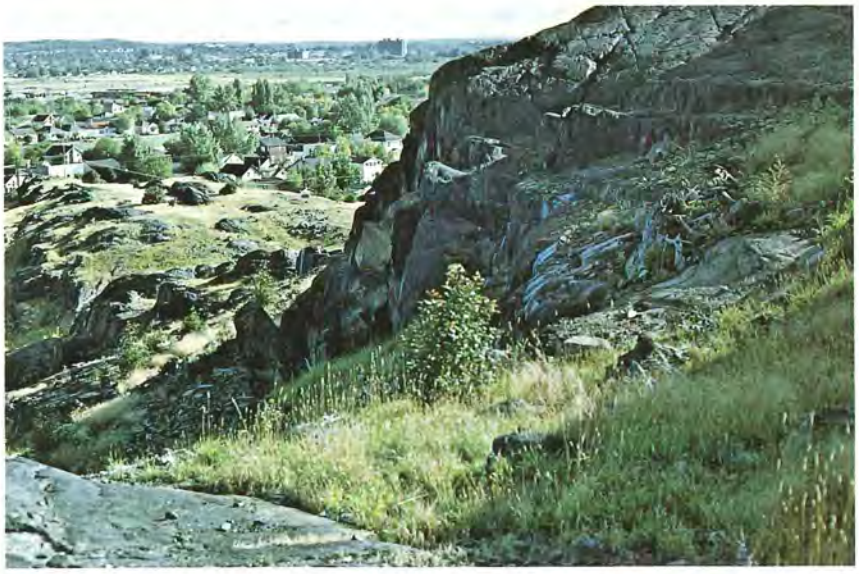
The following individuals and institutions are thanked for making available the photographs which appear within this report. These include: INCO p. 7; B. Michelutti p. 29; K. Winterhalder p. 10, 11, 28, 29, 42, 49; Sudbury Public Reference Library - Sudbury Collection p. 3; Ontario Ministry of Natural Resources p. 5; and the Regional Municipality of Sudbury p. 1, 5, 8, 11, 12, 14, 15, 23, 27, 28, 29, 30, 31, 32, 34, 35, 36, 38, 40, 42, 49.

Table Of Contents

1.0 Introduction

Since 1978, the Regional Municipality of Sudbury has been engaged in reclaiming large areas of environmentally damaged land within its administrative boundaries. By the end of 1984, over 2,636 hectares of land have been grassed and 387,580 trees planted. This report is a review of the unique process that has brought about this change.

As an overview, this report is intended to provide a historical perspective of events which have occurred in the evolution of the program over the last seven years. It also has amalgamated key facts from all previous annual reports into one public document for ease of program review and assessment.



Before and After - Kathleen Street Hill, City of Sudbury - 1982

2.0 Historical Background

2.1 Evolution Of The Sudbury Barrens

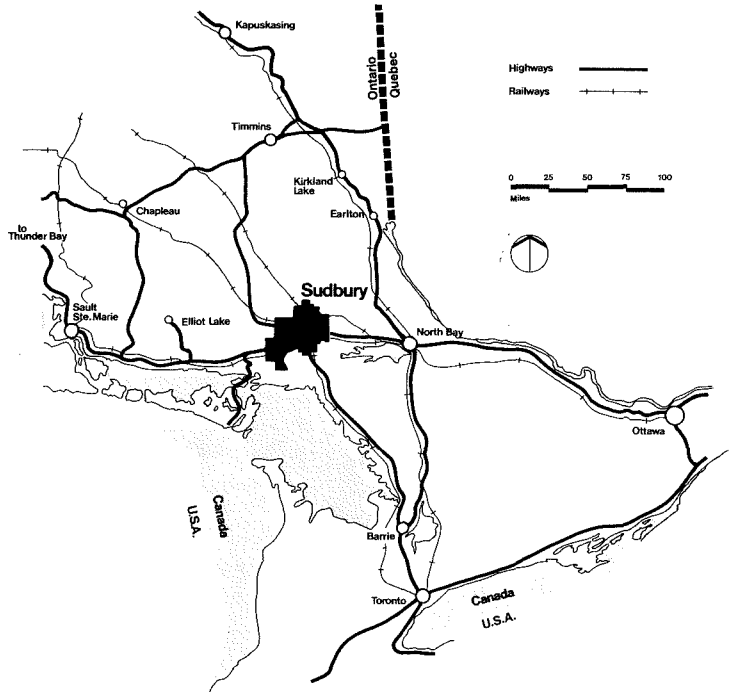
The Regional Municipality of Sudbury is located in Northeastern Ontario and covers a geographical area of 2,818 km² (Figure 1). It lies on the southern portion of the Precambrian Shield in the vegetation transition zone between the eastern deciduous forests of the south and the coniferous forests of the north. A significant portion of the Regional Municipality is comprised of industrially disturbed ecosystems.

Logging, bush fires, and smelting operations over the last 100 years have interacted to create a very different environment than the one originally present. Prior to disturbance, white pine, jack pine and red pine forest probably covered the sand plains and rocky ridges; while black spruce - tamarack, white cedar, or black ash - red maple communities were likely found on poorly-drained sites; with sugar maple and yellow birch communities likely found on the more mesic sites (Winterhalder, 1978). By the early nineteen seventies many of these same locations were altered by human impact and appeared similar to the photos on pages 5, 10 and 12. So significant was man's disturbance that dramatic vegetation alteration resulted along with large scale soil loss through erosion (Amiro and Courtin 1981). This in turn culminated in a highly disturbed landscape and a very negative national image of the Sudbury Area. By 1972, it was estimated that 64 square kilometres within the Sudbury Area were completely barren and approximately 225 square kilometres were semi-barren or moderately impacted (DeLestard, 1967).

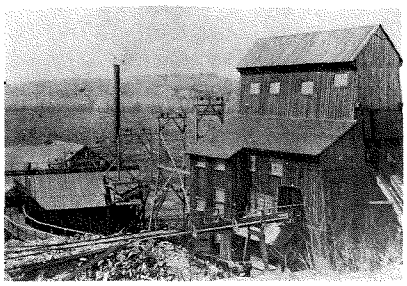
What historical events occurred to bring about such a monumental change of landscape? Research has shown that various human related activities interacted, beginning with the advent of lumbering in the Sudbury Area, to cause this deterioration. In the 1870's, loggers came into the region to supply sawlogs and timber for the United States markets. At first, red pine and white pine trees were exploited for the construction market, but later, large amounts of spruce, balsam fir and jack pine were being harvested for pulpwood,mining, and railroad timbers. After 1887, trees not suitable for lumber or pulpwood were used as roast bed fuel (Winterhalder, 1978).

With the removal of the trees came a greater incidence of fire. The open conditions initiated by logging and the large amounts of slash left by these operations created an ideal environment for frequent bush fires. Prospectors are also alleged to have burned-off a considerable amount of vegetation in an attempt to expose the underlying bedrock in their quest for minerals (Winterhalder, 1978; 1984).

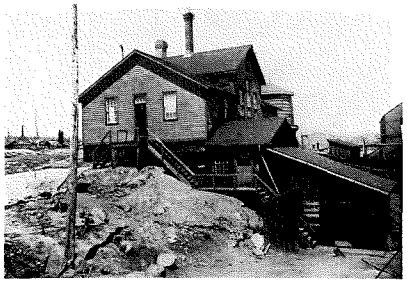
Figure 1
Regional Setting



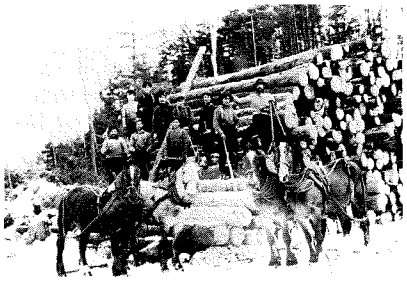
Historic Photos



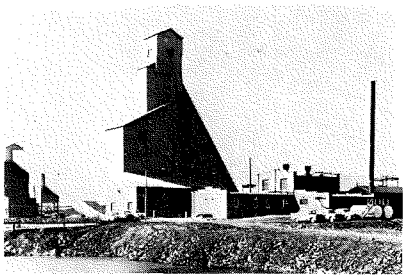
Copper Cliff Mine 1894
Collection: Sam Rothschild



East Smelter Laboratory
Copper Cliff

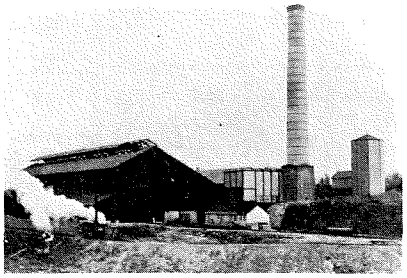


Men, Horses and Logs
Collection: Higgins



McKim Mine, Falconbridge Nickel Mines
Collection: Falco 50

O'Donnell Roastyards
Collection: I.N.C.O.



Coniston Smelter, 1912

With the start of mining activity in the Sudbury basin in 1886, two other factors, the roastbed and the smelter, came into play. From 1888 to 1929, eleven roast yards located in or near Copper Cliff, Coniston, and Creighton were in operation (Laroche, Sirois, McIlveen, 1979). During the roasting process, sulphur in the form of sulphur dioxide was removed from the ore. In a typical operation, crushed ore was piled on beds of wood several feet deep. These piles were covered with fine material to prevent open flames, and the wood ignited and left to burn for one to seven months until the ore was ready for furnace separation. In the process, clouds of sulphur dioxide from the roast yards rolled across the countryside killing or damaging surrounding vegetation, further adding to the impact created by lumbering and fire. In addition, large amounts of wood were harvested to operate the roast yards. For example, Mond Nickel Company removed most of the woody vegetation from Coniston between 1913 and 1916 to fuel its roast beds, while Canadian Copper Co. used 40,000 cords of wood per annum for its heap roasting processes (Winterhalder, 1978; 1984).

With the demise of heap roasting in 1929 and the institution of roasting furnaces and smokestacks, airborne emissions from Copper Cliff, Coniston and Falconbridge further contributed to the impairment of living vegetation which still remained nearby. Before 1970, sulphur dioxide emissions from INCO Limited and Falconbridge Limited were in the neighbourhood of 1,910,000 and 318,000 tonnes per year respectively. Not only were these emissions impairing the growth of vegetation, but they were also contaminating surrounding soil with copper, nickel and iron particulate matter.

Taken together, lumbering, fire and smelting processes resulted in a loss of vegetation. Subsequently, soil erosion became frequent and unchecked across the area. Humus rich soil horizons were washed away in many locations along with nutrients and colloid particles. Lack of an insulating litter layer led to enhanced frost activity and resulting soil instability (Sahi, 1983). Acidification of soil throughout this same area and increased metal toxicity in the soil further exacerbated the problem. As a result, a serious breakdown in plant-soil relationships occurred, increasingly creating more and more hostile environmental conditions which ultimately resulted in barren areas. Within these areas, the normal cycle of plant establishment was broken as most plants could no longer survive in such a deteriorated environment.

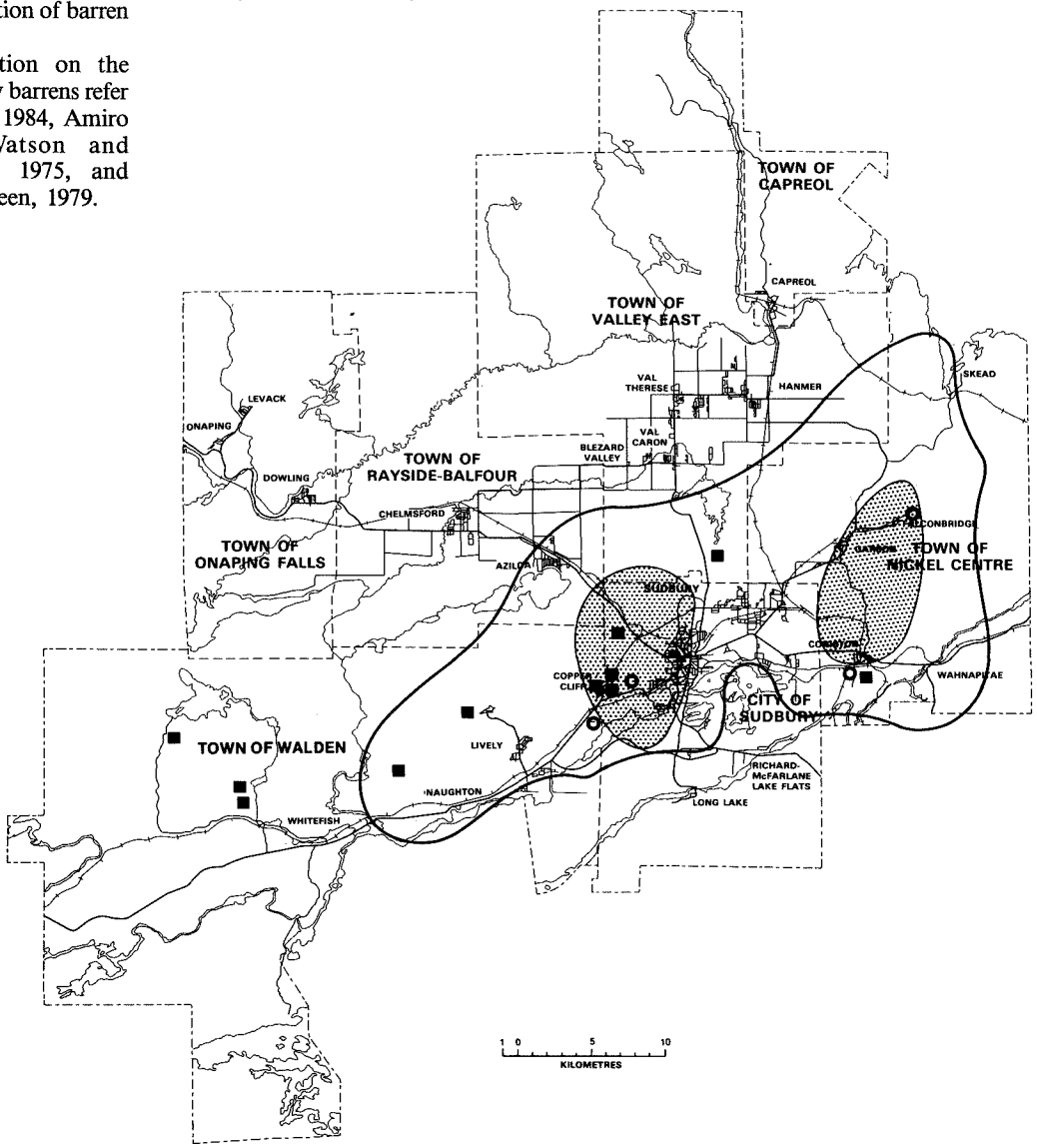
Figure 2 outlines the extent of barren areas as well as the semi-barren or moderately impacted zone. It also identifies the larger roastbed sites and smelter locations. Figure 3 graphically illustrates the complex interaction of factors involved in the evolution of barren lands in the area.

For further information on the development of the Sudbury barrens refer to Winterhalder 1978 and 1984, Amiro and Courtin 1981, Watson and Richardson 1972, Struik 1975, and Laroche, Sirois and McIlveen, 1979.

Figure 2

Extent of Barren and Semi-Barren Landscape Within the Regional Municipality of Sudbury

Adapted from: Amiro and Courtin, 1981
Laroche, Sirois and McIlveen, 1979



Semi-Barren Area

Barren Areas

Roastyard Site

Major Smelter Site

Figure 3

Major Interactions Which Led to the Formation of Barren Land

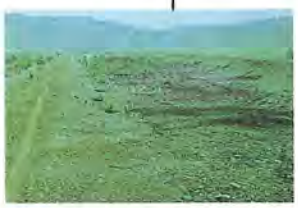
Prospecting

Open Conditions

Slash

Lumbering

Fire



Roastbeds

Smelters

Enhanced Frost Action

Sulphur Dioxide

Copper and Nickel

Erosion

Plant Death

Acid Soil

Loss of Whole Soil

Loss of Nitrogen and Phosphorus

Loss of Colloids

Loss of Seed Stock

Loss of Moisture

Loss of Nutrients

Denuded Land

Adapted from: Winterhalder, 1984

2.2 Steps Toward Environmental Improvement

On account of the landscape and environmental damage described, attempts began to emerge to counteract this process. These actions toward environmental improvement have fallen essentially into two broad categories: (1) reduction of air pollution and (2) land reclamation efforts.

2.2.1 Air Quality Improvements

With the erection of larger smelter stacks, the toxic ground level emissions of the roastbeds were shifted to a wider dispersal of sulphur dioxide emissions through atmospheric dilution. However, since dispersal was still localized, substantial improvement was not realized until the early seventies. In 1972, improvements of major proportions were achieved locally through company actions and legislated reductions under Ministerial Orders of the Ministry of the Environment.

These improvements consisted of emission reductions by closing INCO Limited's Coniston smelter, reducing emissions at INCO Limited's iron ore plant to 225 tonnes/day, commissioning INCO Limited's 381 metre 'superstack', and closing Falconbridge Limited's pyrrhotite plant. (Winterhalder, 1978; 1984). Other actions around this time period which also contributed to atmospheric improvement included: the construction of acid plants by INCO in 1967 and Falconbridge in 1978 for the purpose of manufacturing sulphuric acid from waste gases and the construction of a new smelter at Falconbridge in 1978.

During this same time period, Ministry of the Environment control orders progressively reduced allowable sulphur dioxide emissions for both INCO and Falconbridge Limited. In 1970, a control order required INCO to limit sulphur dioxide emissions from the Copper Cliff smelter to less than 4,720 tonnes/day. By 1983, this limit was reduced to 1,770 tonnes/day. A similar 1969 control order limited Falconbridge to 930 tonnes/day. By 1979, this limit was reduced to 420 tonnes/day (Government Task Force, 1982.)

As a result of these initiatives, particulate and gaseous emissions were significantly reduced and better dispersion of existing pollutants achieved (Winterhalder 1978, 1984). Reduced demand for metal products, company shutdowns, strikes, emission reductions and wider dispersal each have interacted to create noticeable improvement in local plant growth. These factors have also resulted in a marked reduction of air pollution fumigation occurrences within the Sudbury area.

2.2.2 Company Land Reclamation Endeavours

At the same time that efforts were being made to reduce environmental contaminants, reclamation efforts were already underway. Company efforts at first, focused primarily on importing soil and landscaping previously denuded sites in an attempt to improve site appearance and encourage settlement. Nickel Park in Copper Cliff, which was the site of early roast yard activity, was reclaimed by this method in 1917. Similarly, Centennial Park in Falconbridge, which originally was a tailings dump, was reclaimed in 1967. Extensive berming has also been undertaken by INCO along Highway 17 using imported soil and landscaping techniques.

Later, the Agricultural Department of INCO pioneered direct land reclamation seeding techniques using agricultural methods and equipment to reclaim tailings areas in the early nineteen fifties (Peters, 1970; 1978; 1984). This technique was basically suitable for relatively level, accessible locations, although it could be applied to more rugged terrain if prior landscaping with heavy equipment was undertaken. More than 1,640 hectares of INCO tailings and sand pit areas have been reclaimed via these methods with additional efforts ongoing. Falconbridge too has utilized agricultural techniques to grass 400 hectares of denuded areas close to Falconbridge operations.

Major tree planting efforts were also undertaken in the late fifties by Falconbridge Limited. Planting trees without soil amendments resulted in sparse growth in 1958. However, it was discovered that adding loam to planting holes resulted in good tree growth. On this basis 10,000 trees per year (mostly Carolina poplars), were planted over the next twenty-three years for a total of approximately 250,000 trees. Recently, 5,000 evergreen trees have been planted each year without soil amendment on sites previously grassed (Michelutti, 1983, personal communication).

Today, active land reclamation efforts are being undertaken by both mining companies within their holdings. These efforts have dramatically improved the landscape in those locations. They have also significantly added to the local land reclamation knowledge base and contributed to the Regional Municipality of Sudbury's land reclamation efforts.

A summary of reclamation accomplishments at INCO Limited include:

(1) Revegetation of 625 hectares of tailings area.
(2) Reclamation of 1,015 hectares of stressed land in the Levack, Coniston, Garson, Creighton and Copper Cliff areas.
(3) Establishment of an annual tree planting program in the early 1960's with a total of 130,000 seedlings planted during the past five years.
(4) Establishment of a wildlife management area as part of the tailings reclamation effort near Copper Cliff (Peters, 1984, personal communication).

A summary of reclamation accomplishments at Falconbridge Limited include:

(1) Establishment of vegetation on 53 hectares of tailings and pyrrhotite deposits.
(2) Vegetative stabilization of 230 hectares of denuded sandy areas at Falconbridge with grasses and trees.
(3) Conversion of 120 hectares of dead bog at Falconbridge into marsh wetland by utilizing treated wastewater.
(4) Restoration of Red Pine Lake at Falconbridge which allowed fish stocking with speckled trout by the Ministry of Natural Resources (1978).

(Michelutti, 1983, personal communication)

For further information on company land reclamation activities, refer to Michelutti 1974, Michelutti 1978, Peters 1970, Peters 1978 and Peters 1984; or contact R.E. Michelutti, Falconbridge Ltd., Falconbridge, Ontario, P0M 1S0; or T.H. Peters, Agriculturalist, INCO Limited Ontario Division, Copper Cliff, Ontario P0M 1N0.

Conventional Methods

Most land reclamation programs today are highly mechanized, relying on established agronomic techniques. This series of photos illustrates mining company reclamation activity on tailings sites. It includes mechanical harrowing, lime spreading, fertilizing, seeding, hydro-seeding and mulching equipment. These methods are in direct contrast to the Regional effort on much stonier sites.

2.2.3 Other Early Land Reclamation Attempts

The problem of barren areas was not just limited to locations of company interest. A much wider area of land had been impacted. Because of this wider community impact, initial steps were undertaken between the Ontario Department of Lands and Forests' Timber Branch and Laurentian University's Biology Department in 1969 under the Sudbury Environmental Enhancement Programme (McHale et al..., 1974). As part of the program's mandate, the soil of denuded areas was assessed to determine its ability to support vegetation with or without soil amendments. In addition, tree planting experiments involving several thousand trees were undertaken in 1969 and 1970 on a barren site near Coniston and on a semi-barren site in Skead. The results at Coniston indicated that direct tree planting without soil amendment appeared destined to failure as only a few trees survived. Although good survival was achieved at Skead, tree growth was poor without soil amendment. Later, in 1975 and 1976, the Ministry of Natural Resources was able to successfully achieve both survival and tree growth at these same sites through experiments that amended the soil with lime and fertilizer (Negusanti, 1978; Winterhalder, 1978; 1984).

Because of the early failure with tree planting endeavours, an alternative approach was initiated by the Sudbury Environmental Enhancement Programme in 1971. This time the focus shifted to field trials and greenhouse experiments utilizing different herbaceous species and various soil amendments. The results of this research showed that the most significant factor limiting plant growth in this area was low pH combined with elevated copper and nickel values. A secondary limiting factor at Coniston was found to be phosphorus while in the Skead area nitrogen was limiting. Liming the metal contaminated soil to elevate pH was subsequently shown to positively affect not only the germination and growth of plants, but it also decreased the uptake of metals and increased the activity of soil microflora. (Winterhalder, 1978; Winterhalder, Beckett and Todd, 1984).

Based on these trials, two larger scale grassing operations were carried out with the assistance of agricultural machinery using lime, fertilizer and seed additives. At Coniston, 2.4 hectares of barren area was seeded in 1974 with Canada Blue Grass while at the Sudbury Airport, 5.8 hectares of outfield apron were seeded with Canada Blue Grass and Redtop in 1975 (Winterhalder, 1978; 1984).

For further information on these early initiatives refer to (Winterhalder, 1974; 1975; 1976; 1978; 1984; McHale et. al. 1974).

Research Test Plots

Test Plot Seeded Without Soil Amendment

Test Plot Treated With Lime and Seeded

Test Plot Treated With Lime and Fertilizer and Seeded

2.3 Regional Government Involvement

2.3.1 Early Efforts

Soon after the formation of Regional Government in 1973, the Ministry of Natural Resources approached the Regional Chairman based on the work of the Sudbury Environmental Enhancement Programme and suggested that a multidisciplinary group of individuals representing a number of different community interest groups be assembled under a regional government umbrella. Their purpose would be to try to change Sudbury's reputation of being a barren and inhospitable environment. This was to be accomplished by (1) vegetating barren areas around area communities and along highways and railways, (2) making available to residents, trees for planting on lots within the community, and (3) encouraging the revegetation of vacant land within communities. Acting on this suggestion, the Regional Municipality of Sudbury established a Technical Tree Planting Committee on October 3rd, 1973. Consisting of volunteer members from Laurentian University, INCO, Falconbridge, Ministry of Natural Resources, Nickel District Conservation Authority, Area Municipalities and the Region, this committee has expanded and remained active in community vegetation enhancement work since its inception (see footnotes 1 and 2).

One of the first actions undertaken by the Tree Planting Committee was to authorize a research team to further investigate the magnitude of reclamation work required. A group of individuals from Laurentian University's Biology Department was commissioned in 1974, for $7,000, to undertake a survey of the amount of barren and semi-barren land along regional highways and railroad lines. In addition, seventeen one metre wide experimental plots, widely scattered throughout the Region, were established to test a variety of seed and soil amendment applications. As there was some uncertainty as to whether some areas would support plant growth, these tests were oriented toward reclamation of relatively inaccessible sites such as steep stony slopes or barren bogs. Manual liming, fertilization and seeding was utilized without additional site preparation (Winterhalder et al, 1975; Winterhalder, 1976).

Results of this research indicated that a large percentage of regional highway corridors were barren of vegetation or severely impacted as illustrated in Figure 4. At the same time results of the experimental tests appeared promising enough in 1975 to suggest that semi-operational direct seeding trials be undertaken. In 1975, a 0.5 hectare grassing trial using the manual, direct-seeding approach was tried on a barren hillside opposite St. Hubert's School in the West End of Sudbury. In 1977, a similar 0.5 hectare site near St. Paul the Apostle School in Coniston was reclaimed. Here also, lime, fertilizer and seed were directly applied to the site without site preparation, allowing the stony surface to act as a mulch and seed trap. Once again, the results of these tests and subsequent monitoring work funded by the Tree Planting Committee were encouraging (Winterhalder 1976; 1983; Winterhalder et al.., 1975).

During this same time period (1976-1978), the Regional Municipality was in the process of developing a Regional Official Plan for the Sudbury Planning area. On January 11, 1978, Council adopted this Plan which established as one Regional objective the enhancement of the Region's visual quality and image by means of land reclamation efforts on disturbed lands (Sections 9.19-9.22 Appendix B). To accomplish this objective, Council committed itself to encourage research and support projects which aided in the land reclamation process. This commitment of Regional Council, aimed at finding a solution to Sudbury's denuded landscape, provided a further foundation for subsequent Regional initiatives. However, it was not until the summer of 1978 that the Regional Land Reclamation Program began as an operational program through the culmination of a number of events.

As has been outlined, a large amount of reclamation research and trial reclamation work had been undertaken throughout the Region by Laurentian University, INCO, Falconbridge and the Ministry of Natural Resources. This research established which techniques were successful or were unsuccessful on a trial basis. As well, the Technical Tree Planting Committee had brought together a working group of concerned agencies, company representatives and academia who were charged with enhancing the Region's image. An initial survey documenting land reclamation damage in the Region had also been undertaken. In addition Regional Council, through its Official Plan, took a stand in support of the cause of reclamation work, providing scope for further Regional involvement in this process. Yet in spite of all these positive steps, little was actually happening in the area to physically improve denuded lands outside of mining company efforts at their plants. The Technical Tree Planting Committee had published a tree planting brochure, undertaken an annual garden show to encourage landscaping, and continued to support monitoring and research efforts; however, it lacked funding to undertake any type of operational program. In fact, in 1976 and 1977 committee funds were non-existent or significantly reduced making it impractical to undertake operational land reclamation efforts.

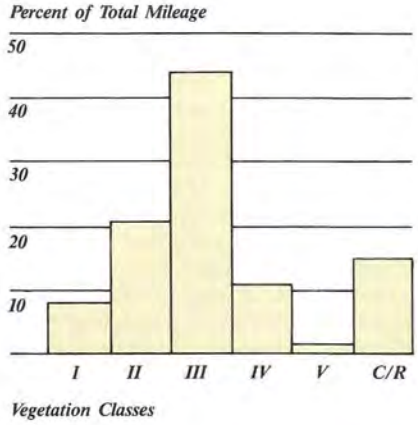
Then, in September of 1977 an event occurred which acted as the catalyst that tied all other previous efforts together. INCO announced that it was laying off 3,500 employees and that it would not be utilizing summer student labour as it had in the past. Following this announcement, the Region's Chief Administrative Officer organized a Regional task force to discuss means of reducing the impact of INCO's layoff. One of the ideas generated by the Regional Planning Department was that perhaps some of the lost student jobs might be recaptured through a land reclamation program. As a follow-up, Planning Department members met with the Technical Tree Planting Committee to see if a concerted approach would be possible. The Committee requested that B. Lautenbach of the Planning Department and K. Winterhalder of Laurentian University collaborate on a proposal which could be suitable for government funding.

In the days which followed, grant sources were examined and a project prepared and sent to S. Fevens of the Employment Development Branch, Employment and Immigration for potential funding under the Federal Young Canada Works program. At the same time, Regional Council in its 1978 budget deliberations was asked to set aside $53,000 for material and equipment cost in the event that employment monies would be forthcoming from the Federal Government. The Ontario Ministry of Northern Affairs was also approached and requested to match the Region's contribution. Both governments responded favorably to the proposal and the financial request. As a result, all necessary materials and supplies were financially underwritten making it possible for Young Canada Works to underwrite the labour component. In May 1978, the program officially started, beginning one of the largest community efforts in reclamation of industrially disturbed lands ever.

1. A complete listing of committee members is contained in Appendix A.
2. In 1978 the name of the Committee was changed to the Vegetation Enhancement Technical Advisory Committee (VETAC).

Figure 4 Extent of Vegetation Damage Along Regional Highway Corridors

Summary of Vegetation Classes Bordering Municipality Road Arteries in Percent of Total Mileage (80 Miles)-1974



I Denuded

II Severely Damaged

III Damaged

IV Slightly Damaged

V Natural

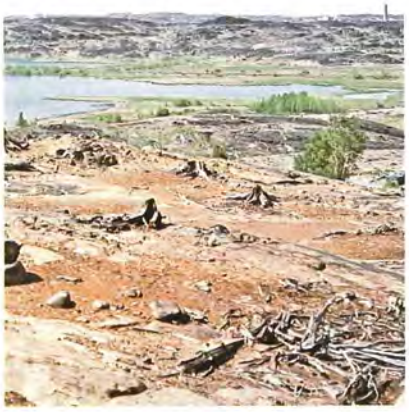
C/R Commercial/Residential

Land Reclamation Research Efforts

Experimental research test plots, scattered throughout the Region, helped to establish the type of treatment necessary for successful reintroduction of grasses, shrubs and trees.

Lime and fertilizer combinations and various varieties of plant species were tested and monitored to determine soil additive requirements and the most adaptable plant species for barren sites.

Typical Sudbury Landscape Scenes Prior to the Regional Land Reclamation Program



2.3.2 Land Reclamation Program 1978

Since large scale reclamation employment programs had not been undertaken previously in the Region, projects undertaken in 1978 included both operational and experimental programs. Two projects, grassing and greening of barren areas, and site improvement of damaged lands formed the operational core of the program and employed the majority of the students. Two other projects, pH and nutrient sampling and native seed collection, provided direct inputs to the grassing program. The remaining projects, transplanting and composting, were essentially experimental in nature. Together, these projects employed 174 students for a period of 7 to 16 weeks.

From the start it was decided to begin work along major transportation routes where successful results would be immediate and dramatically obvious even though barren and semi-barren areas existed in many locations throughout the area. In response to this criteria, Highway 541 from Highway 541A to the Sudbury Airport and Highway 17 East from Coniston to Wahnapitae were chosen. The Airport corridor was chosen because it desperately needed cleanup efforts to ameliorate the visual impression dead standing vegetation debris and semi-barren landscape had on visitors coming into Sudbury from the Airport. Highway 17 East on the other hand was chosen because it was particularly barren of vegetation and the Trans-Canada highway entrance into Sudbury. It was felt that if improvements could be achieved in these areas, the procedure for reclaiming slopes and rocky areas throughout the Region would clearly be demonstrated.

Results of the work undertaken during the first year were very encouraging. Approximately 115 hectares of barren area were grassed and 206 hectares of visually damaged landscape improved. In addition, 30,000 samples were taken in barren areas to determine pH and nutrient deficiencies and 365 kilograms of native seed collected. The experimental projects provided useful information regarding future land reclamation attempts, and the Regional Municipality demonstrated that it was capable of operating job creation programs of significant size. Perhaps the biggest achievement, however, was the fact that the program clearly demonstrated that dramatic landscape improvement was possible in the Region.

Table 1 summarizes the most significant parameters of the 1978 program. For further information on 1978 activities, refer to the Regional Municipality of Sudbury's 1978 land reclamation report, or Lautenbach and Winterhalder, 1979.

Table 1
1978 Land Reclamation Program Summary

Type of Project	Number of Persons Employed	Number of Work Weeks	Labor Cost	Capital Cost	Total Cost	Program Accomplishments
1. Grassing and Greening	82	624	81,498	57,272	138,770	114.8 hectares of barren or semi barren area reclaimed
2. Site Improvement	40	524	62,342	9,737	72,079	206.3 hectares of damaged area site improved
3. pH and Nutrient Sampling	15	192	24,218	1,827	26,045	Completed intensive sampling of proposed grassing areas, 30,000 samples taken
4. Native Seed Collection	20	141	18,602	1,897	20,499	Collected 365 kilograms of seed comprised of 15 native species
5. Transplanting	6	72	9,124	1,427	10,551	Transplanted 6,000 trees, shrubs and herbaceous plants to 3 test sites
6. Composting	8	105	11,399	1,993	13,392	Established 122 test plots at 3 locations
7. Office Support Staff/ Administration	3	48	5,429	6,731	12,160	Provided office support, eg. timecard records, payroll, equipment supply, etc.
TOTALS	174	1,706	212,612	80,884	293,496	

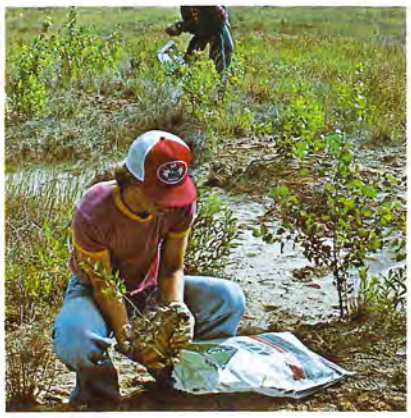
Source: Audited Financial Statements

[1] Minor discrepancies in figures occur between the year end reports and this summary. To the extent possible this report attempts to rectify previous errors and omissions and is the more accurate reference.

Land Reclamation Programs

Throughout the years, several different projects have been undertaken. Grassing and greening projects have been the primary emphasis. This program has included: pH and nutrient sampling, the movement and distribution of lime, and cyclone seeding of soil amended areas.

It also included major site clean-up efforts as illustrated by the photo of one of the slash debris piles. As well, a number of experimental projects were undertaken.
These included: composting a variety of compostible materials in pits, collecting native seed for sowing on barren sites, and transplanting tree seedlings, shrubs and grasses from well established sites to barren plots.



2.3.3 Land Reclamation Program 1979

Based on the success of the 1978 program, the Regional Municipality pursued an expanded program in 1979. Once again the Regional Municipality of Sudbury and the Ontario Ministry of Northern Affairs contributed $74,065 and $75,000 respectively to provide capital funding for the project. Canada Employment and Immigration Commission through its Young Canada Works Program supplied $424,121 to cover labour costs. Projects undertaken in 1979 consisted of: (1) grassing and greening barren areas (2) site improvement (3) pH and nutrient sampling (4) native seed collection (5) transplanting and (6) monitoring and assessment. As in 1978, only students were employed; however, the number of students employed was significantly expanded to 325.

Continuing with the primary objective of improving major transportation corridors, 1979 reclamation efforts focused on the LaSalle Extension, Highway 17 East between Coniston and the City of Sudbury, and Highway 144. In all 478 hectares of barren area were reclaimed and 296 hectares of roadway site improved. Approximately 20,000 trees, shrubs and herbaceous plants were transplanted and 425 kilograms of native seed collected. This seed was subsequently intermixed with commercial seed and planted at three different locations. Also in 1979, previously reclaimed areas were monitored to assess the impact of reclamation activity and to identify any areas where regression or negative results were occurring. As in 1978 the achievements of the program dramatically improved those road corridors where work was undertaken.

Table 2 summarizes the most significant parameters of the 1979 program. For further information on 1979 activities, refer to the Regional Municipality of Sudbury's 1979 land reclamation report and the 1979 Monitoring and Assessment Reports on Plants, Microbiology, Insects and Small Mammals.

Table 2
1979 Land Reclamation Program
Summary

Type of Project	Number of Persons Employed	Number of Work Weeks	Labor Cost	Capital Cost	Total Cost	Program Accomplishments
1. Grassing and Greening	165	1,155	140,164	108,944	249,108	478.6 hectares of barren or semi barren area reclaimed
2. Site Improvement	86	1,118	146,448	21,394	167,842	295.9 hectares of damaged area site improved
3. pH and Nutrient Sampling	12	156	19,224	4,378	23,602	Sampled 420 hectares of barren or semi barren area for grassing
4. Native Seed Collection	29	203	34,603	2,946	37,549	Collected 425 kilograms of native seed comprised of 16 different species and seeded 8.9 hectares of barren land
5. Transplanting	18	234	28,803	2,036	30,839	Transplanted 20,000 trees, shrubs and herbaceous plants
6. Monitoring & Assessment	15	195	27,362	2,547	29,909	Undertook soil pH, soil microflora, plants, insects and small mammal monitoring & assessments of previous reclaimed sites
7. Office Support Staff/ Administration	—	—	12,854	21,483	34,337	Provided office support, eg. record keeping, payroll, equipment supply
TOTALS	325	3,061	409,458	163,728	573,186	

Source: Audited Financial Statements.

2.3.4 Land Reclamation Program 1980

Following the successful operation of land reclamation programs in 1978 and 1979, it was decided to develop a long term plan for reclamation in the Region which provided a five year strategy for local initiatives. Such a plan would also provide the program's funding agencies with some idea of the amount of work which remained to be completed if transportation corridors and neighborhood areas were to be restored. Therefore, in 1980, a major proposal for land reclamation activity was again submitted to the Federal government under its Summer Canada Program. It was proposed that a major grassing program be undertaken, along with monitoring and assessment of previous reclamation work, and a comprehensive planning program. The Canada Employment and Immigration Commission approved this proposal and committed $380,983 in funds to the program. The Regional Municipality of Sudbury and the Ontario Ministry of Northern Affairs again contributed $63,869 and $72,980 respectively. As a result 218 students were hired in 1980.

This year, grassing efforts were directed toward the Highway 17 West Corridor between Martindale and Fielding Road as well as along Highway 541A near Falconbridge. Planting and site improvement work also occurred on scattered pockets of property along Notre Dame Avenue and Paris Street. In all, 331 hectares of barren area were reclaimed and 259 hectares of land cleared of dead standing vegetation. Another achievement included the development of a five year planning document for Regional land reclamation activity. This project provided a longer term time horizon and broader scope to the reclamation program which had up until this point been largely incremental in nature.

Table 3 summarizes the most significant parameters of the 1980 program. For further information on 1980 activities, refer to the Regional Municipality of Sudbury's 1980 land reclamation reports.

Table 3
1980 Land Reclamation Program Summary

Type of Project	Number of Persons Employed	Number of Work Weeks	Labor Cost	Capital Cost	Total Cost	Program Accomplishments
1. Grassing & Greening	209	2,926	353,612	117,426	471,038	331.0 hectares of barren or semi barren area reclaimed 258.7 hectares of damaged area site improved 1300 trees planted
2. Information Processing and Analysis	3	42	6,439	2,418	8,857	Assembled and coded information and developed 100 computer programs for processing previous program data
3. Planning and Mapping/ Five Year Plan	6	84	14,373	1,192	15,565	5 Year Reclamation Plan and background study developed, 2,000 pH samples taken and field maps prepared
4. Office Support Staff/ Administration	—	—	—	24,372	24,372	Provided office support; eg. record keeping, payroll, equipment supply, supervision
TOTALS	218	3,052	374,424	145,408	519,832	

Source: Audited Financial Statements

2.3.5 Land Reclamation Program 1981

By 1981, the Regional Municipality of Sudbury's land reclamation efforts were well established. As in previous years, the Region applied to the Federal and Provincial government for funding for a student program. Again the Region put up $111,072 and the Ontario Ministry of Northern Affairs contributed $75,000. Funds from the Canada Employment and Immigration Commission under the Summer Canada program totalled $398,049. This enabled the Region to hire 207 students for five projects. Although ninety percent of the program again centered around grassing and greening, several other smaller projects - tree planting, reclamation treatment research, reclamation information processing and analysis, and planning and mapping - were also carried out.

As many of the major contiguous stretches of barren lands along highway corridors had been completed in previous years, smaller segments of barren area became the focus in 1981. Regent Street and Martindale, Terry Fox Sports Complex on the LaSalle Extension, Big Nickel Mine Drive around the Slag Dump, and Highway 17 East near the wind generator and Wahnapitae were the major areas of concentration. As in previous years, the results were highly satisfactory. In all, 208 hectares of barren land were reclaimed, and 10 hectares site improved. Approximately 4,600 trees were planted throughout the area and data, maps and plans updated. As well, 29 new experimental research sites were established where new or varied land reclamation treatments were tested for potential future application.

Table 4 summarizes the most significant parameters of the 1981 program. For further information on 1981 activities refer to the Regional Municipality of Sudbury 1981 land reclamation report.

Table 4
1981 Land Reclamation Program
Summary

Type of Project	Number of Persons Employed	Number of Work Weeks	Labor Cost	Capital Cost	Total Cost	Program Accomplishments
1. Grassing & Greening	191	2,674	366,702	142,140	508,842	208 hectares of barren or semi barren area reclaimed 9.8 hectares of damaged area site improved 4,600 trees planted
2. Planning and Mapping	6	84	13,585	2,423	16,008	Updated 5 year plan and provided field mapping requirements and pH sampling
3. Data Processing and Analysis	4	56	9,933	352	10,285	Provided data entry for monitoring and assessment records
4. Reclamation Treatment Research	6	84	12,441	712	13,153	Established 29 land reclamation experiments involving new procedures or treatments for future monitoring
5. Office Support Staff/ Administration	—	—	29,359	6,474	35,833	Provide office support eg. record keeping, payroll, equipment supply and supervision
TOTALS	207	2,898	432,020	152,101	584,121	

Source: Audited Financial Statements

2.3.6 Land Reclamation Program 1982

In January 1982, J. Miller was appointed Coordinator of the Regional Land Reclamation Program. Up until this time, the Region had successfully operated four summer land reclamation programs. However, leadership within the program had changed frequently, and continuity of effort was lost once the summer program closed in the fall. By having a co-ordinator involved throughout the year, the program could be wound down properly in the fall of the year and the necessary preparations could be made in the spring for the summer program. Administrative assistance could also be readily provided to the Region's VETAC Committee. Although this appointment was not initially seen as a full-time responsibility, changing circumstances in 1982 necessitated year-round involvement.

By now, most of the easily accessible land in close proximity to major road corridors had been reclaimed. However, there remained a number of highly visible properties along access routes where extremely steep slopes or lack of access prevented reclamation using conventional methods (eg. Kingsway Hills). As a result, the VETAC Committee examined the possibility of utilizing helicopters to undertake land reclamation work in these areas. Three alternatives for reclaiming steep slopes were examined. One reviewed reclamation utilizing only manual techniques, the second examined reclamation using only aerial application of lime, fertilizer and seed by helicopter, and the third reviewed a combination of these two methods. On the basis of this examination it was determined that if reclamation material could be airlifted to its distribution points, individuals could safely distribute the lime, fertilizer and seed by working down the hill in a labour intensive manner. On the basis of this cost analysis, a proposal for student funding was forwarded to the Federal Government for reclamation activity along the airport and Kingsway road corridors in preparation for Sudbury's 1983 Centennial year.

During this same time period, Canada slipped into a very serious recession. Sudbury, like other resource centres, was severely impacted by the downturn and resulting structural economic changes. As a result, INCO announced early in 1982 that it would be reducing its workforce by 850 individuals through early retirements, sabbaticals and layoffs. Following this announcement, the Region began looking at job creation actions which might assist in softening the impact that this reduction would have on the community. Land reclamation activity was one of the short term bridging programs identified as a possibility. However, since all previous activities had involved students, funding sources for unemployed individuals had to be identified. In April 1982, a Regional delegation of VETAC representatives was invited to Toronto to discuss with the Ministry of Natural Resources, a new Federal-Provincial job creation program geared to provide short-term employment opportunities for individuals unemployed in the mining sector. On the basis of these discussions and the land reclamation proposals previously developed, it became apparent that the Region would be eligible to create reclamation jobs for unemployed individuals if new proposals were put forward under Section 38 of the Unemployment Insurance Act.

Immediately following these discussions, the Region developed and submitted two reclamation proposals under the Federal-Provincial Section 38 Mining Sector Work Program. The first project was designed to employ 100 individuals for 26 weeks grassing and greening barren areas. The second project was designed to employ 50 individuals for 22 weeks visually improving major road corridors into Sudbury by removing dead standing debris. Several weeks later, both projects officially began, thereby launching Ontario's first Section 38 Mining Sector Program.[1]

Later, due to the compatability of Section 38 funding requirements to Regional land reclamation needs, two other projects were applied for and approved in 1982. One project employed another 100 individuals for nine weeks as an expansion of the grassing and greening program. The other project assisted INCO in reclaiming a portion of their tailings area for development as a wildlife sanctuary. On this project 21 individuals were employed for 26 weeks.

Together, these four Section 38 projects employed 271 individuals for 4,935 work weeks. Revenues received for this program amounted to $1,184,400 from the Canada Employment and Immigration Commission and $625,215 from the Ontario Ministry of Natural Resources. In all, 184 hectares of barren area was reclaimed and 170 hectares of damaged landscape cleared of dead standing vegetation. The major areas grassed included: Mountain Street and Kingsway Avenue hills, Kathleen Street hill, Coniston Townsite hills, Robinson-Kelly Lake Road hill, Southview Drive and the 69 Bypass area, and the Robinson Lake area. In addition Highway 17 East from the eastern edge of the Region to Falconbridge Road and Highway 69 North from Lasalle Boulevard to Valley East were cleared of dead standing vegetation. The program also provided the Region with experience in operating large scale adult job creation programs.

After initiating the Section 38 programs, the Region also applied for and received from the Canada Employment and Immigration Commission, a Canada Community Development Project grant for $54,241. This grant allowed the Region to undertake further liming work within the Settlement of Wahnapitae. A total of 20 individuals, were hired for 15 workweeks. In all 19.4 hectares of barren area were reclaimed.

In addition to embarking on non-student programs, the Region also successfully obtained funding for a summer student program. This year, the Canada Employment and Immigration Commission, through its Summer Canada Program, contributed $406,550 for labour cost with the Ontario Ministry of Northern Affairs and the Region each contributing $75,000 and $53,247 for capital cost respectively. This enabled the Region to hire 169 students for two separate projects. Again, most of the students were employed grassing and greening barren areas. However, as in previous years a planning, mapping, monitoring and data processing program was also carried out.

This year, remaining barren areas in the airport corridor were reclaimed in preparation for Sudbury's Centennial Year celebration. As well, major sites within the City of Sudbury, notably the Kingsway Corridor and Frood Road were also reclaimed. In all, 158 hectares of barren area were treated.

Table 5 summarizes the most significant parameters of the 1982 program. A total of 464 individuals were hired and 362 hectares of area reclaimed at a cost of $2,408,653. For further information on 1982 activities refer to the Regional Municipality of Sudbury's 1982 land reclamation report.

[1]Unlike previous job creation programs, Section 38 projects were funded partially from an individual's unemployment insurance entitlement. In each instance, unemployed mining sector individuals would volunteer for the program and contribute their current U.I.C. entitlement. In return, each individual's U.I.C. entitlement was increased to $240 per week by the Canada Employment and Immigration Commission. In addition, the Ontario Government, through its Ministry of Natural Resources, provided an additional wage supplement of $60 per work week, paid for the employee's benefits and all other expenses. For more information on this program refer to the Canada-Ontario Mining Sector Work Program. Program Guidelines to Project Sponsors, March 1982.

Table 5
1982 Land Reclamation Program
Summary

Type of Project	Number of Persons Employed	Number of Work Weeks	Labor Cost	Capital Cost	Total Cost	Program Accomplishments
1. Grassing & Greening Program (Students)	160	2,272	330,883	119,635	450,518	158.6 hectares of barren or semi barren area reclaimed 29.7 hectares of damaged area site improved
2. Planning, Mapping Data Processing Program (Students)	9	144	20,132	1,218	21,350	Undertook field mapping updates, pH sampling and provided data entry for monitoring and assessment record
3. Greening Program (CCDP)	20	231	43,848	10,393	54,241	Limed 19.4 hectares of barren area
4. Grassing Program (Section 38)	200	3,358	805,920* 237,299	229,250	1,272,469	184.4 hectares of barren or semi barren area reclaimed
5. Site Improvement Project (Section 38)	50	1,093	262,320* 72,219	3,667	338,206	Removed dead standing vegetation throughout Region along major road corridors 169.5 hectares of damaged area site improved
6. Tailings Reclamation[1]	21	484	116,160* 34,490	58,290	208,940	Reclamation improvements of future wildlife management area, dismantled and removed 2.4 km. of abandoned trestle and grassed 3.7 km. of pipeline corridor
7. Office Support Staff/ Administration (All Projects)	4	64	48,905*	14,024	62,929	Provided office support eg. record keeping, payroll, equipment supply, etc.
TOTALS	464	7,646	1,972,176	436,477	2,408,653	

[1]Includes portion of project completed in January 1983 including 63 workweeks and 5,864 for labour and 5,211 for capital cost.

*CEIC contribution includes individuals' normal UIC payment

Source: Audited Financial Statements, Section 38 Schedule F Reports

2.3.7 Land Reclamation Program 1983

In 1983, the Region undertook its most ambitious land reclamation program. For the first time, a major tree planting component was undertaken along with major grassing endeavours. Once again events outside the program precipitated new funding possibilities and allowed for program expansion.

For several years prior to 1983, VETAC had experimented with planting trees in reclaimed areas. During the first few years of the program, transplanting experimentation occurred. In 1979, small plantations of red and jack pine were established. In the following years, small numbers of Ontario Landscape stock were planted in several locations and all areas were monitored. By 1981, it was evident that trees could grow on reclaimed sites and the committee began exploring means of obtaining a greater number of trees for operational planting of reclaimed land.

However, unlike the grassing program which could optimally be run during the summer months with student programs, bareroot seedlings required spring planting. This necessitated a non-student work force. In addition, the large quantity of trees required for this type of planting had to either be grown by commercial nurseries for the Region in advance, or allocated to the Region by the Ministry of Natural Resources about 6 months to a year in advance. As normal granting sources are highly seasonal, the Region was left in a position where, unless it was able to guarantee the full cost of the program, it could not be sure that grants covering labour or capital would be forthcoming. Timing was also important. Bareroot stock is optimally planted in Northern Ontario during the brief period when the ground is no longer frozen in the spring and the onset of warm summer weather - usually a timeframe of only 6 weeks. These timing difficulties became most apparent in 1982 when 25,000 trees were allocated to the Region by the Ministry of Natural Resources. However, the committed funding for the program did not arrive in time resulting in both the trees and funding being returned.

In 1983, the Region was finally able to avoid these timing difficulties by tentatively reserving 242,000 trees with the Ministry of Natural Resources in September, 1982. At the same time, several new sources of funding were investigated. As a result, partial funding of $25,196 was secured through the Canada Community Development Program to hire 9 individuals. The rest of the revenue was received through the UI/IC Forestry Sector Program. This latter source was a Section 38 Canadian Forestry Service program under which the Canada Employment and Immigration Commission contributed $34,800 in Unemployment Insurance and supplementary

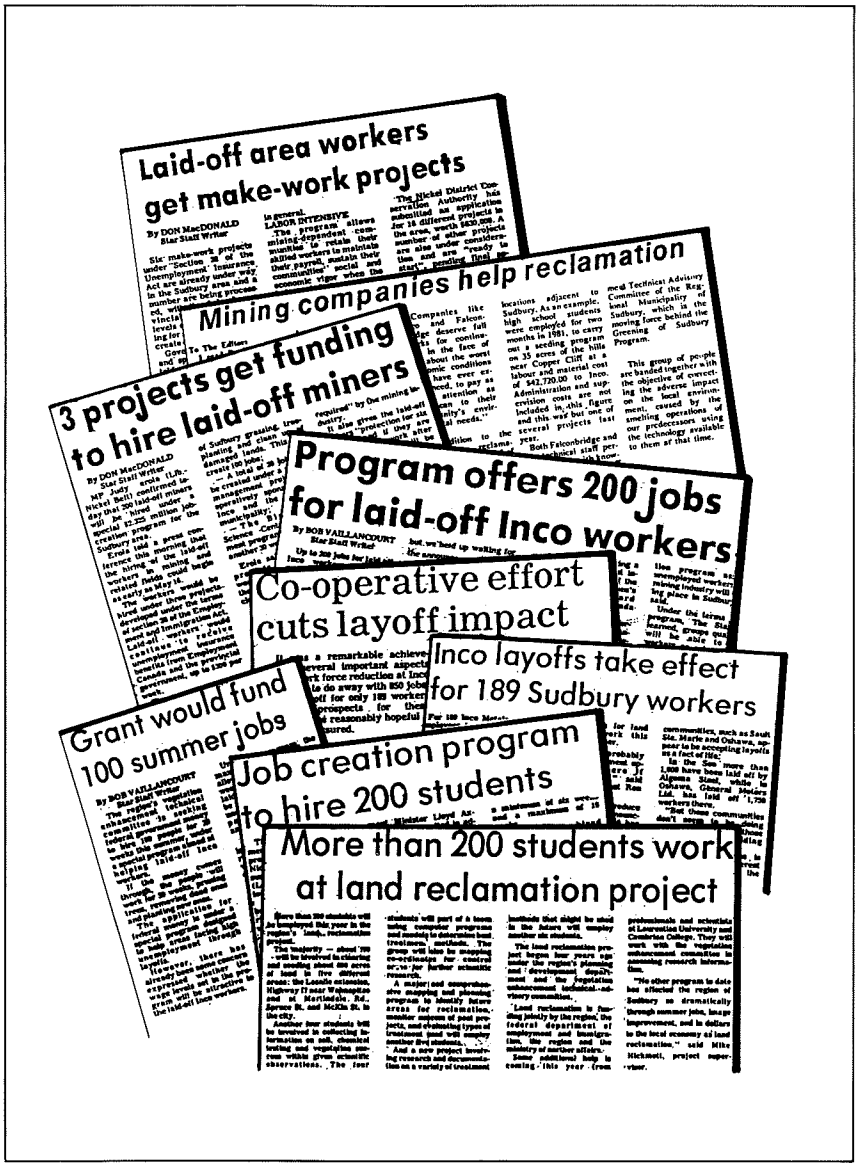
benefits and the Canadian Forestry Service contributed $25,130. Under this program, an additional 15 individuals were hired. Between May 2nd and June 17th, a total of 228,080 trees were planted at 16 different locations.

The other major circumstance affecting Sudbury and the Region's 1983 land reclamation program was the continued downturn in the local economy. Since the initial mining layoffs at INCO in the spring of 1982, the demand for metals continued to drop along with the price of nickel and copper. As a result INCO and Falconbridge were forced to reduce losses through lengthy shutdowns and further layoffs. In December 1982, INCO laid off a further 1,185 individuals and in January 1983, Falconbridge Limited laid off 1,300. These events along with the shutdowns and the contracting local and national labour force resulted in a large segment of Sudbury's workforce being unemployed. A growing number of these individuals had also been unemployed during 1982 and were now beginning to exhaust unemployment insurance benefits without new job prospects. Where individuals continued to remain without employment once UIC benefits were exhausted, welfare assistance became the only realistic alternative.

While the Sudbury welfare caseload began to grow in 1982 and 1983 on account of unemployment, this same situation was occurring in many other cities across the country. In an effort to provide some assistance to communities hard hit by unemployment, the Federal and Ontario governments initiated the Canada/Ontario Employment Development Program (COED). This new program was designed to provide short term employment for individuals who had exhausted their UIC benefits or were currently in receipt of social assistance. It was designed to assist those most in need of employment opportunities, help reduce welfare caseloads, and allow communities to undertake projects of community benefit.

Prior to the announcement of this program, a number of municipal meetings were held at which time the anticipated welfare projections were reviewed based on the number of individuals presently exhausting UIC benefits. At that time, it was forecast that a welfare caseload increase of several thousand individuals was a real possibility within Sudbury over the next one or two years if new employment opportunities were not found. As the Regional Municipality of Sudbury pays 20 per cent of welfare payment cost, it was also concerned over the impact such an increase would have on local budgets. The Region, therefore, was determined that all possible job creation endeavours of a short or long term nature would be pursued in an effort to reduce welfare costs and diversify the local economy.

Community News Reports on Program Developments



Because the land reclamation program had proved successful over the years, and because the Region had successfully operated reclamation projects for unemployed individuals in 1982, it was again looked to for a major short term job creation contribution in 1983. In addition, land reclamation work generally did not require special employment skills unlike other projects. It was therefore capable of covering the widest spectrum of community unemployment needs, and was particularly suited for those individuals who were unskilled. Due to this focus, two identical grassing proposals were submitted to the Province in March. While covering different locations and time periods, each proposal was designed to provide 16 weeks of employment for 600 individuals at a cost of $3,816,450.

In April 1983, the first of two COED land reclamation grassing projects was approved. Because of the large size of the program, temporary office space outside of Civic Square was rented at 174 Douglas Street for project administration. In all, 600 individuals were employed for 10,048 workweeks reclaiming 503 hectares of barren land. Again this year, most of the grassing effort focussed on highly visible areas which were difficult to reclaim because of steep slopes or accessibility problems. In many

of these locations helicopter transport was again utilized to move materials. Major areas reclaimed included the north shore of Kelly Lake, hills along LaSalle Extension, hills throughout the Minnow Lake area, hills on the west end of the City of Sudbury and hills surrounding Coniston and Wahnapitae. A project amendment in September allowed the Region to extend Phase I until mid-December in order to utilize accumulated lost time work weeks due to absenteeism or rained out days. This also allowed a number of individuals who required more workweeks, enough time to re-qualify for U.I.C. benefits.

In July 1983, the second COED application for land reclamation funding was approved. Subsequent amendments to the program resulted in 556 individuals being employed for 8,820 workweeks between July and December for the grassing program, 7 individuals being employed between December 1983 and June 1984 for a reclamation and forestry assessment program, and 77 individuals being employed for 9 weeks in May and June 1984 in order to plant 149,350 trees. Again these variations from the original proposal were created to utilize unused workweeks which had accumulated over the duration of the program. In all, 465 hectares were limed, fertilized and seeded. Primary areas reclaimed included hills in the Robinson Lake area, hills near Highway 144 and LaSalle II, and hills around the Settlements of Coniston and Wahnapitae. Together the Canada Employment and Immigration Commission and the Ontario Ministry of Labour each contributed $2,982,929 to these COED programs.

In addition to the COED grassing programs, the Region again applied for and received funding for a student program. Once again, the Canada Employment and Immigration Commission through its Summer Canada Program contributed $258,084 for labour costs while the Ontario Ministry of Northern Affairs and the Region each contributed $57,779 and $57,779 for capital cost respectively. These funds enabled the hiring of 97 students for a grassing and greening program and a planning and mapping program. A total of 119 hectares of barren or semi-barren area were reclaimed. The majority of this work focused on reclaiming Public and Separate School sites throughout the City of Sudbury, small scattered parcels of barren land in various locations throughout the Region, and several larger areas along the Southwest Bypass and Long Lake Road and near Burton-Bruce-Snowdon Avenues. In addition, the students undertook site preparation work and planting of 3.6 hectares of wildflowers at 10 different experimental test sites.

Table 6 summarizes the most significant parameters of the 1983 program. In all, 1,277 individuals were hired, 1,084 hectares of land reclaimed and 228,080 trees planted. Total cost of these programs amounted to $7,197,916.

Table 6
1983 Land Reclamation Program Summary

Type of Project	Number of Persons Employed	Number of Work Weeks	Labor Cost	Capital Cost	Total Cost	Program Accomplishments
1. Tree Planting (CCDP Section 38)	24	252	34,800* 26,828	23,498	85,126	Planted 228,080 bare root tree seedlings and 56 potted trees Limed 3.2 hectares of semi barren area
2. Grassing and Greening (Students)	88	1,198	198,253	84,607	282,860	119.1 hectares of barren or semi barren area reclaimed including 3.6 hectares of wildflower seeding
3. Planning and Mapping	5	73	11,379	4,462	15,841	Undertook field mapping updates, public relation activities and pH sampling
4. COED Grassing Phase I	600	10,048	2,775,848	925,658	3,701,506	503.5 hectares of barren or semi barren area were reclaimed (968.3 x 52%)
5. COED Grassing[1] Phase II	556	8,820	2,400,156	697,945	3,098,101	464.8 hectares of barren or semi barren area were reclaimed (968.3 x 48%)
6. Office Support Staff/[2] Administration	4	70	11,070	3,412	14,482	Provided office support eg. record keeping, payroll, equipment supply, etc.
TOTALS	1,277	20,461	5,458,334	1,739,581	7,197,916	

Source: Audited Financial Statement, Project Reports, Section 38 Final Report

[1]As of Dec. 31, 1983
[2]In addition nineteen office staff were incorporated from COED Phase I and II numbers.

*CEIC contribution includes individuals' normal UIC payment

2.3.8 Land Reclamation Program 1984

The Region's reclamation program in 1984 was significantly smaller than its 1982 and 1983 counterparts due to a reduction in available grants. Although reduced in size, substantial contributions were made in the area of tree planting, grassing and greening, program planning and forestry assessment.

Through an amendment to the 1983 COED grassing project (Phase II), monies were carried over to undertake two significant 1984 program elements. Beginning in December 1983, 7 individuals were hired through June of 1984 to undertake a forest assessment of municipal lands, update program records, close up 1983 accounts, and prepare for the 1984 tree planting program. Under the forest assessment portion of this program, 3,213 hectares of municipal land were timber cruised to assess their forestry potential. Under the record update component, all lands reclaimed over the last 6 years were recorded and compiled by year on 1:20,000 mylar base maps for historical record purposes. Under the 1984 tree planting preparation component, planting sites were investigated, planting maps compiled, quality control sheets constructed, and the tree planting strategy for 1984 finalized.

The second significant project funded under the COED program in 1984 was the tree planting program. This project employed 77 individuals for 707 work weeks in May and June. A total of 149,355 bareroot tree seedlings and 500 shrubs were planted throughout the area at 19 previously reclaimed sites. In addition, 400 red and jack pine trees, 4 to 7 feet in height, were transplanted from a crown land plantation to higher profile sites along the airport corridor. The Canada Employment and Immigration Commission and the Ontario Ministry of Labour each contributed $132,803 to these 1984 COED projects.

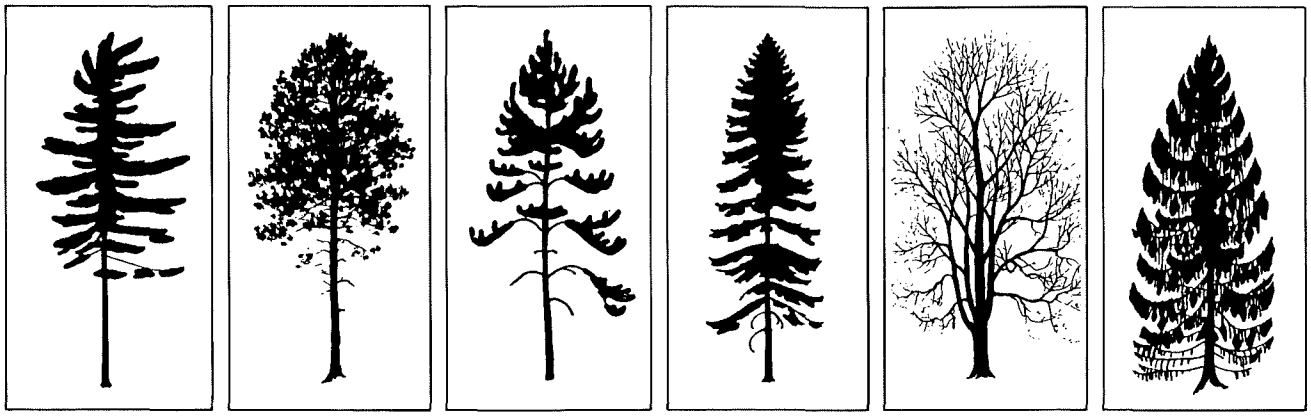
In addition to the COED programs, the Region applied for and received funding under the Industry and Labour Adjustment Program (ILAP). A total of $182,835 was received from the Canada Employment and Immigration Commission for additional grassing work. This enabled the hiring of 27 individuals for 460 work weeks. Due to the nature of this grant, two groups of 23 individuals were actually employed in the project with individual turnover occurring as soon as eligibility for collecting unemployment insurance was achieved. A total of 37 hectares were limed, 144 hectares fertilized and 172 hectares seeded. The major portion of this effort involved reclaiming land in Coniston and Falconbridge and along old Skead Road. As well, lands previously limed in 1983 were fertilized and seeded in the Wahnapitae, Coniston and Frood Road areas.

As in the past six years, a student program was also undertaken, although on a much reduced scale. This year the Canada Employment and Immigration Commission through its Summer Canada Program contributed $135,759 for labour cost with the Ontario Ministry of Northern Affairs and the Region each contributing $75,000 and $46,658 respectively. This enabled the Region to hire 55 students for grassing and planning and mapping work. In all 21 hectares of barren area were limed and 44 hectares fertilized and seeded. The majority of this work took place along Cambrian Heights Drive and at other scattered, smaller sites within the City of Sudbury. As well, several sites along the Garson-Coniston Road and near Hannah Lake, which were limed in 1983, were fertilized and seeded.

A final project undertaken in 1984 was a planning and review program supported under the Canada Works Program. This project employed 5 individuals for six months and was totally funded by the Canada Employment and Immigration Commission at a cost of $37,469. The major thrusts of this project included: the preparation of an updated five year grassing plan for the years 1985 to 1989; the preparation of 1985 tree planting maps; and the preparation of display and report graphics related to the program.

Table 7 summarizes the most significant parameters of the 1984 program. In all, 171 individuals were hired, 58 hectares reclaimed, 149,355 trees planted, program records significantly updated and long range planning undertaken. Total cost of these programs amounted to $743,327.

Treeplanting



Eastern White Pine *Red Pine* *Jack Pine* *White Spruce* *Silver Maple* *Eastern White Cedar*

Table 7
1984 Land Reclamation Program
Summary

Type of Project	Number of Persons Employed	Number of Work Weeks	Labor Cost	Capital Cost	Total Cost	Program Accomplishments
1. Tree Planting (COED)	77	707	208,935	109,687	318,622	Planted 149,355 bare root tree seedlings, 310 shrubs and 200 potted shrubs; Transplanted 400 trees
2. Grassing and Greening (Students)	42	574	116,043	62,534	178,577	Limed 20.7 hectares, fertilized 43.8 hectares, and seeded 43.8 hectares of barren or semi-barren area
3. Planning and Mapping (Students)	8	101	16,955	—	16,955	Prepared site plans for vegetation enhancement of vacant city property
4. Grassing and Greening (I.L.A.P.)	23	460	152,584	39,120	191,704	Limed 36.9 hectares, fertilized 144.5 hectares, and seeded 172.0 hectares of barren or semi-barren area
5. Timber Cruising (COED)	2	40	*	*	*	Timber cruised for inventory purposes 3,213 hectares of municipal land
6. Planning and Review (Canada Works)	5	108	33,993	3,476	37,469	Monitored 1984 program. Updated report and display graphics. Compiled 1985-1989 grassing plan. Prepared 1985 tree planting maps. Prepared tree planting guide for Sudbury Region
7. Office Support Staff/ Administration (Students, COED and I.L.A.P.)	14	272	†	†	†	Provided office support eg. record keeping, and payroll, equipment supply, mapping, cruise line layout, etc.
TOTALS	171	2,262	528,510	214,817	743,327	

SOURCE: Regional Financial Statements

*Dollar contributions are reflected in costs listed for item 1.
†Dollar contributions are reflected in costs listed for items 1, 2 and 4.

3.0 Major Land Reclamation Programs

3.1 Grassing And Greening Program

To a very large degree land reclamation in the Sudbury area has become synonymous with the grassing and greening of barren areas. By far, the largest accomplishments have occurred through this aspect of the program. Through 1984, 2,464 hectares of barren area have been restored to vegetative cover. Also this component has involved the largest numbers of individuals providing employment to 2,313 people over the past 7 years.

Although usually listed together, grassing and greening are really two distinct types of treatment. In the greening operation, work is usually carried out in areas where some vegetation already exist yet soil pH or nutrients are low. In these locations, lime, or fertilizer, or both lime and fertilizer are applied depending on the site requirements, however, seed is not sown. Grassing on the other hand involves the application of lime, fertilizer and seed.

In order to determine the amount of lime which was required at each site soil pH readings were necessary. During 1978, extensive soil and nutrient sampling occurred with the help of Cambrian College. Approximately 30,000 soil samples were collected from the major work areas at intervals along sampling grid lines and placed in styrofoam cups. Each sample was then brought back to the lab for pH testing and analysis. The resulting data was mapped, recorded and stored for future monitoring to enable time series analysis.

In subsequent years, it was determined that fewer samples were necessary as the pH was fairly consistent over short distances and the operative liming procedures of the program were not that refined to handle small or spot differences. After 1979, pH sampling was integrated into the planning and mapping program and sampling significantly reduced. Only 10 to 20 pH samples per hectare are now taken prior to liming any area.

Throughout the barren areas, pH readings prior to land reclamation efforts ranged from 3.0 to 5.0. The average reading was approximately 4.0.

To counteract the high acidity in the soil, agricultural limestone (calcium carbonate, $CaC0_3$) or granular dolomitic limestone (calcium and magnesium carbonate, $MgC0_3$) can be used. It is known that calcium reduces toxicity of metals such as nickel, copper, and aluminum while controlling the movement of nutrients and toxic materials into the root cells. The carbonate on the other hand, neutralizes the soil and maintains plant available metals in less toxic quantities (Winterhalder 1983b; 1983c).

Because of the low pH values found throughout the Sudbury barrens, large quantities of limestone were required. To reclaim one hectare of barren land an average of 10 metric tonnes of lime was required. To meet this requirement, limestone was shipped into the Region from Spragge and La Cloche Island in 25 to 40 tonne truck loads and delivered to staging areas near the sites being reclaimed. At these lime dumps, the bulk lime is manually shovelled into bags. Approximately 4.5 kilograms of lime is placed in each bag to facilitate later hauling and distribution at the site.

After bagging, the lime is moved onto the area being reclaimed by the most efficient means. Wherever feasible, the bags are moved by pickup or 5 ton trucks as close as possible to the area being worked. In 1980, locomotives and flatbed railcars donated by INCO and C.P. Rail were used to help move bagged lime into areas crossed by their rail lines. In 1982 and 1983, helicopters (Bell Jet Rangers, and Hughes 300 and 500 D's) were used to ferry bagged lime into steeper inaccessible areas. Between 80 and 140 bags per load were airlifted in this way.

Once transported to the site, the bagged lime is carried manually by work crews to areas being reclaimed for distribution. Here the bagged lime is placed in a grid pattern at 1 to 2 metre spacing intervals in order to ensure that the entire area will be uniformly treated. When all the bags are laid out, the lime is then spread by emptying the bag evenly across the grid. Depending on the pH value and colloid content of the soil, between 4.5 and 11 metric tonnes of lime are applied in this manner at each site. Because of the large amounts of lime required, this part of the operation is the most labour intensive. Roughly 80% of all the reclamation effort involves bagging and distributing lime.

After a few weeks of allowing the limestone to react with the soil, the limed areas are fertilized. This was usually done later in the summer to coincide with the seeding operation. Fertilizer was purchased in 50 kilogram bags and transported to the site where it is emptied into pails and hand spread at a rate of about 390 kilograms of fertilizer per hectare. Although the fertilizers used have varied, generally a fertilizer with a higher concentration of phosphorus is utilized to ensure adequate amounts of this limiting nutrient for grass development (Table 8).

Table 8
Land Reclamation Fertilizer Mixtures Used

Year	Type (N-P-K)
1978	5 - 20 - 20
1979	6 - 24 - 24
1980	5 - 20 - 20
1981	6 - 24 - 24
	16 - 25 - 6
1982	6 - 24 - 24
1983	6 - 24 - 24
1984	6 - 24 - 24

After fertilizing, workers return to treated sites requiring seeding in late August and September. With the help of cyclone seeders, the seed is spread at a rate of 30 to 45 kilograms per hectare. A blended mixture of several grass species and two legumes have been found to be best suited for this purpose based on previous test work by INCO, Falconbridge and Laurentian University (Table 9). Modification of the mixture has taken place over the years based on monitoring findings.

Seeding occurs later in the summer in order to take advantage of the Region's cooler temperatures and wetter fall conditions which are favorable for germination. Usually, within three weeks, lush green shoots of grass plants can be seen prior to the onset of winter. By spring, this initial planting has become well established as once again the soil warms and moisture content in the soil is sufficient for good growth.

Since 1978, significant progress has been made through the grassing program. Each year those sites most in need of improvement have been targeted for restoration. From the beginning, the major focus has been to reclaim barren areas along major transportation corridors; however, in the later years, a great deal of attention has also been given to improving area neighbourhoods. Appendix C indicates in Tables C1-C7, the scope of the work completed each year. It lists the areas reclaimed, type of treatment provided and amount of area reclaimed. Map A illustrates the extent of grassing program by indicating the locations of all the work undertaken and the year in which it was done. The photographs throughout this report further illustrate the grassing operation and the significant impact this process has had on the Sudbury environment.

Table 9

Land Reclamation Grass Seed Mixture Used (% Composition by Weight)

Species	1978	1979	1980	1981	1982	1983	1984
Canada Blue Grass (Poa compressa L.)	40%	-	-	15%	-	15%	15%
Tall Fescue (Festuca arundinacea Schreber)	20%	20%	25%	15%	15%	-	-
Kentucky Blue Grass (Poa pratensis L.)	15%	10%	10%	-	15%	15%	15%
Timothy (Phleum pratense L.)	15%	15%	15%	15%	15%	20%	20%
Red Top (Agrostis gigantea Roth)	10%	12%	12%	20%	20%	20%	20%
Creeping Red Fescue (Festuca rubra L.)	-	28%	28%	20%	20%	10%	10%
Alsike Clover (Trifolium hybridum L.)	-	10%	10%	10%	10%	10%	10%
Birdsfoot Trefoil (Lotus corniculatus L.)	-	5%	-	5%	5%	10%	10%
TOTAL	100%	100%	100%	100%	100%	100%	100%

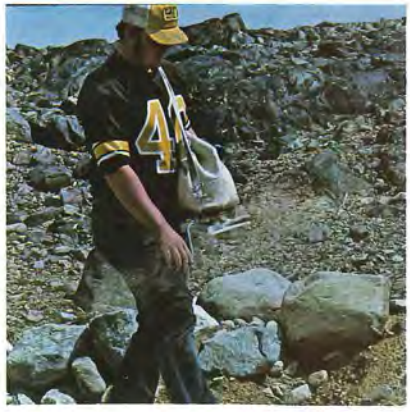

inco

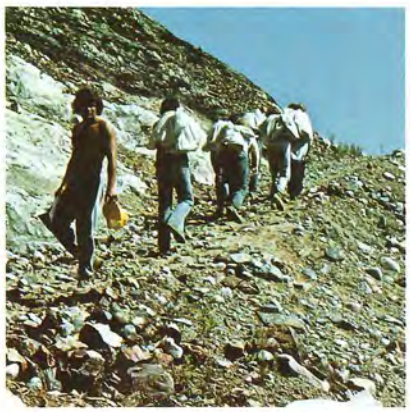
Greening and Grassing Process

A great deal of time and energy centered around the lime pile. For every hectare of land reclaimed, approximately 11 tonnes of agricultural lime was required. Work involved bagging bulk lime into allotments which could be physically carried. Once bagged, three to five bags are shouldered and carried to the site where the bags are laid out in a grid pattern to ensure even distribution. Following layout, the lime is evenly spread.

In the late summer, fertilizer is hand spread across previously limed areas. This is followed by cyclone seeding a mixture of grasses and legumes.

By the following summer, the sites reclaimed usually supported good grass cover. The before and after photos at the bottom of the page illustrate the degree of change possible in just one year's time.





3.2 Tree Planting Program

Even before the Region's land reclamation program began, it was the aspiration of many individuals to once again reforest some of the denuded area by planting trees. Early efforts, described in the historical section, pointed out the limitations of tree planting without proper site preparation (Sections 2.2.2 and 2.2.3). On the basis of this evidence, the Vegetation Enhancement Technical Advisory Committee advocated the establishment of herbaceous material, as well as proper soil treatment prior to full-scale, tree planting operations in order to provide the best opportunity for survival. As a consequence major tree planting programs were not included in 1978 when the land reclamation program began. Instead, the program focused on site preparation and grassing to "pave the way" for future tree planting endeavours. However, an experimental transplanting project was undertaken to provide further information for future tree planting endeavours. Approximately 1,000 small seedlings including birch, poplar and willow, were transplanted.

In 1979, another small tree planting project was undertaken in the Wahnapitae area. Approximately 2,500 bareroot red pine and jack pine seedlings were planted in areas grassed in 1978. These trees were planted in rows, with and without peat supplement. The Ministry of Natural Resources assisted the program by planting another 1,500 paper-potted red pine and jack pine stock in the same area that year. Within a few years of planting, a large number of both species had grown significantly. Further, monitoring of this project indicated a 70% survival rate with no difference between trees planted with or without peat. Little difference was noted between the bareroot and paper- pot stock; however, this conclusion appeared only to hold where bareroot stock was planted early in the spring.

In addition to this project, the Region continued to plant small numbers of selected species each year at various locations for future monitoring. Species planted include: red pine, jack pine, white pine, white spruce, white cedar, Austrian pine, Mugho pine, European larch, silver maple and American mountain ash, and included both bareroot seedlings and Ontario landscape stock. Besides its own planting, VETAC, through the Nickel District Conservation Authority and the Boy Scout Organization, also provides assistance in selecting tree planting areas and monitoring the annual Scout planting under the Trees for Canada Program.

Table 1, Appendix D, summarizes the results of these early tree planting efforts. It indicates the tree species selected, numbers planted, locations planted and groups who did the planting. As a result of each of these projects and subsequent monitoring, the time appeared appropriate for larger operational tree planting projects.

In 1983, the first major operational tree planting project occurred as described in Section 2.3.7. In that year 228,080 trees were planted at 16 locations throughout the area. Planting areas were initially selected by the Tree Planting Sub-Committee of VETAC from areas which had been previously reclaimed. Each area was visually inspected prior to planting in order to determine the species suitable for the site and the number of trees to be planted. Areas selected and species allocated to those areas were then delineated on 1:2000 field maps for use by the planting crews.

In each instance, the planning team attempted to select indigenous species which were suited to the location and ecosystem in which they were planted. The general philosophy governing most of the tree planting was that the end product should resemble to the extent possible a natural environment appropriate to the Sudbury area. Effort was also made to improve the visual environment and provide tree seed sources for subsequent natural propagation. With these objectives in mind, densities per hectare were kept relatively low, plantation appearance was avoided and small group clustering encouraged. In certain areas, colorful hardwoods such as sugar maple and red oak were introduced to provide greater species variety and fall color contrast. In many other locations, evergreen species were introduced or intermixed to provide year-round greenery. In a few instances, non-native species such as black locust were also utilized because of their ability to do well on ecologically disturbed sites.

Tree planting work crews.

Tree seedling transport and storage.

Tree Planting

Small bareroot seedlings, including silver maple, white ash and white spruce give rise to young forest groupings in just a few years time.

Once the planning work was completed, logistical operations and planting began. Bareroot seedlings were purchased and supplied through the Ontario Ministry of Natural Resources' Midhurst and Swastika tree nurseries. Trees were transported and stored in a refrigerated reefer van at a temperature of about 3°C from the time they left the nurseries until the time they were planted. All planting occurred between May 2nd and June 17th, 1983. Hardwood species were planted first to prevent bud flushing in storage. Each day, trees were taken from cold storage in the quantities required and stored in the shade or soaked in water until planted. Planting holes were dug manually with shovels and the appropriate bareroot species placed in each hole and lightly packed. At a few locations, bone meal was added. Because of the rockiness and variability of many of the sites planted, as well as the objectives desired, planting was slower than normal reforestation operations.

In 1984, another major tree planting project was undertaken along the operational lines used in 1983. Additional emphasis was given to planting procedure to ensure better quality control. A total of 149,355 trees were planted at 19 locations.

The tree species planted, number of trees planted and the areas in which they were planted are identified in Tables 2 and 3, Appendix D, and on Map B. Photographs illustrating the tree planting operation are found on pages 29 and 30.

3.3 Site Improvement Program

One of the first major projects of the land reclamation program was the reduction of unsightly, dead standing vegetation debris. Along a number of major road corridors, dead stumps left by lumbering activity or forest fires littered the area. Dead standing shoots of bushy second growth, which had been extensively fumigated in earlier days, also remained in numerous locations. In addition, a large number of birch and maple trees were partially alive and in need of pruning dead or dying parts. Taken together, this dead standing material contributed a great deal to the unsightliness of the area and to the overall visual impression people received of the Sudbury area.

In order to rectify this problem, clearing of damaged sites began. This involved removing dead stumps, pruning dead limbs and removal of other debris by whatever means practical. Backhoes and chainsaws were used to remove stumps, while chainsaws, saws and axes were used to cut down standing debris. In 1978 and 1979, all dead material was gathered into large wood piles for subsequent burning on site. By the end of the summer, hundreds of woodpiles dotted the landscape awaiting favourable burning conditions. Although remaining wood ash was left at the site to return to the soil, it was decided that more of the unnoticeable wood debris should be left at the site to aid in erosion control, contribute to soil humus through natural decomposition, or serve as wildlife habitat. Therefore, in subsequent years burning was discontinued. Only noticeable dead standing debris in the immediate view corridor was broken down to ground level, trucked from the site, or moved out of view.

In 1978, a crew of 50 individuals worked the entire summer on the Airport Road and along Highway 17 East reducing debris. In later years, site improvement efforts were integrated into the grassing and greening program. Prior to grassing of a site, all damaged vegetation debris was removed by the crew. By the end of 1981, most of the major problem locations had been improved, however; removal of dead isolated trees and pruning work on individual live trees containing some dead or dying parts still remained in a number of areas. In 1982, most of these trees along Highway 17 East, 69 South and 69 North were identified, flagged, and subsequently removed or pruned through a Section 38 program.

To date approximately 980 hectares of damaged landscape have been visually improved. Areas improved are indicated in Appendix C and on Map A.

Site Improvement

Dead standing debris as illustrated above occurred in many locations. The project reduced this visual impact by breaking down the dead material and gathering it into piles for burning or removal.

3.4 Planning And Mapping Program

An important part of each year's program has been the planning and mapping work which has taken place. The primary emphasis of this project has involved the development of a five year reclamation plan, preparation of maps for field crews and pH testing of sites to be reclaimed, as well as publicity, project photography, historical record keeping and mapping.

In 1980, this component developed a five-year comprehensive reclamation plan for the Sudbury area. This plan identified sites which required reclamation, established a priority for undertaking this work, and proposed recommendations for program improvement including the establishment of a land reclamation coordinator position. Over the years, many of the recommendations contained in this report have been implemented and most of the sites identified for improvement have now been reclaimed.

In addition, this program element attempted to keep all mapping up-to-date. Each year, 1:2000 field maps have been prepared for work crews to identify areas for grassing or tree planting. Subsequently, field progress was monitored each week. A 1:20,000 map of each year's reclamation work and a composite map showing all work undertaken in grassing or tree planting over the years has also been prepared (Maps A and B).

This group also was involved in program communications. This has included: photography of work in progress, before and after photographs, the establishment of static displays, the development of slide shows, the publication of program brochures, the organization of site tours, and the maintenance of a media clippings file on the program. As well, this component has worked on future reclamation planning efforts such as proposals for new projects directly related to vegetation enhancement in the Region. These have included a new five-year plan for grassing and greening, the identification of reclamation test sites, future tree planting locations and landscape improvement proposals.

Monitoring and Assessment

3.5 Monitoring And Assessment Program

Since 1979, an active program of monitoring and assessment of barren areas previously reclaimed has taken place. The purpose of this activity is to assess through time each experimental site or area reclaimed to see what has occurred on those sites. Results of these assessments are then used to determine the effectiveness of present reclamation treatments and to suggest necessary changes which will ensure long term success. This program has also involved collecting data which will add to the scientific knowledge base of reclamation processes in the Sudbury Area.

In addition, this program attempts to monitor biological parameters of areas seeded to determine whether or not reclamation efforts are capable of producing functioning stable ecosystems once again. To assist in this determination, soil, soil microbiology, vegetation, insects and larger fauna are examined along permanent monitoring transects. Table 10 indicates the type of information monitored and the techniques used. As well, the survival and growth of planted trees has also been monitored since 1980.

Throughout the past five years, responsibility for this program component has been shared between the Region and Laurentian University's Biology Department. Since 1980 most of the monitoring and assessment work has been completed by students hired through the University. As the expertise, supervision, lab facilities and supplies necessary to carry out this project are located there, the Vegetation Enhancement Technical Advisory Committee felt that to the extent possible the Biology Department should be responsible for this portion of the program.

The Region has also been directly involved in the monitoring process, particularly in 1979 and to a lesser degree in subsequent years. Its major role has been in the data assembly, coding, entry and processing stages of the program. During 1980, 1981 and 1982, data collected was assembled and coded for storage and entry in computer data files on Regional computing facilities. During these same years, numerous computer programs were formulated to handle and summarize the data being collected. This work included recording soil pH and chemical analysis records, filing monitoring data from land reclamation and RTR sites, and correlating data to mapping coordinates, and developing or using suitable statistical analysis programs to summarize the data. A users guide related to information processing and analysis of the data was also developed.

Results of the monitoring and assessment have yet to be written up in an overview report. Such a report is currently in preparation. However, five years of monitoring have yielded a number of significant findings (Beckett, Winterhalder and McIlveen, 1984). These include:

a. Vegetation cover in limed areas has remained in the range of 10 to 25%;
b. There has been rapid, spontaneous colonization of treated sites by herbaceous and woody species;
c. There has been a tendency for percent cover by grasses to decrease and percent cover of woody species to increase over time;
d. There has been an increase in the cover and vigour of legumes relative to grasses;
e. Surface soil pH has increased from 3.5 to 4.5 before treatment, to 4.0 to 5.5 following treatment and remained that way;
f. Vegetation in reclaimed areas contains significantly elevated aluminum levels in grasses and trees relative to "normal sites" but contains very little elevation of copper or nickel levels; and
g. There has been an increase in the number of insects, birds, and some small mammals in reclaimed areas.

For further information regarding procedures used, refer to The 1979 Land Reclamation Monitoring and Assessment Manual.

Table 10
Monitoring And Assessment Procedures

Features Examined	Information recorded and monitored	Technique Employed
Vegetation	an estimation of the total mean percent vegetation	sampling along a randomly placed transect using 1 m^2 quadrats
	an estimation of total mean percent cover of individual plant species	selective sampling of 1 m^2 quadrats along the same transects
	signs of nutrient deficiency and metal toxicity	visual observation of plants & chemical analysis of vegetation
	annual net biomass production	dry weight of clipped sample from 0.25 m^2 quadrats
Fauna	qualitative and semi-qualitative estimate of species present	for small mammals:live trapping using mark and recapture method; for large mammals and birds: direct observation; for insects: sweeping and pit fall trapping
	metal analysis of body organs of small mammals	laboratory analysis
Soil	soil pH	glass electrode, soil paste
	presence of carbonate	effervescence with HCl
	total Cu, Ni and P	nitric-perchloric-sulfuric and extract followed by atomic absorption spectrophotometer determination
	available Cu, Ni, Al and P	dilute acid extract followed by atomic absorption spectrophotometer determination
	organic and NH_4 Nitrogen	Kjeldahl procedure
	organic content of soil	chromic acid reduction
Soil Microbiology	total bacterial counts	dilution plate technique
	counts of cellulose decomposing micro-organisms	most probable number technique
SOURCE:	K. Winterhalder, Laurentian University	

3.6 Other Programs

In addition to the major program elements described in Sections 3.1 to 3.5, a number of additional projects have been carried out as part of the Region's reclamation program. These projects tended to be more experimental in nature, thereby contributing to the Region's reclamation knowledge base. Unlike the previous projects described, none of these programs have become part of the ongoing basic reclamation operation although useful findings have been incorporated.

3.6.1 Native Seed Collection

In 1978 and 1979, efforts were made to collect native seed for subsequent use in the programs seeding operation. These projects were undertaken on the premise that the use of native seed is more ecologically sound and may be better adapted to the barren areas than available commercial seed varieties. Because of the difficult growing environments into which seeds were to be sown, it was felt that species already growing in or near these environments may have developed a higher degree of tolerance to site conditions and be better able to successfully colonize the area.

To test this premise, native seed was collected. The procedure for collection first involved locating extensive stands of suitable species on public lands. Once located, the tops of plants were cut off at the time of seed maturity and placed in burlap bags for transport to City parks and recreation buildings for drying. Seed heads were allowed to dry for three to four days before manual threshing occurred. Following threshing the seed was placed in shallow wooden boxes for seven to ten days to complete the drying process. After drying was complete, seeds were winnowed screened, bagged, weighed and tagged. A total of sixteen different species were collected (Table 11).

In 1978, over 360 kilograms of native seed were collected and a 4.9 hectare hill was seeded with only native species. In 1979, 425 kilograms of native seed were collected and 8.9 hectares of land were seeded with a mixture of both native and commercial seed.

Following collection and planting in 1979, it was decided to discontinue this element. This was largely due to the fact that the cost of seed collection was high (approximately $50 per kilogram of seed collected) in comparison to the cost of commercial varieties used. It was also found that many native species will colonize the grassed areas if conditions are right without the necessity of including native seeds in the mixture.

Table 11
Native Seeds Collected

Scientific Name	Common Name
Agropyron repens	Quack Grass
Epilobium angustifolium	Fireweed
Agrostis scabra	Tickle Grass
Hordeum jubatum	Foxtail Barley
Betula papyrifera	White Birch
Melilotus alba	White Sweet Clover
Calamagrostis canadensis	Bluejoint
Myrica asplenifolia	Sweet Fern
Carex scoparia	Sedge
Quercus borealis	Red Oak
Chrysanthemum leucanthemum	Oxeye Daisy
Rumex acetosella	Sheep Sorrel
Deschampsia caespitosa	Tufted Hair Grass
Rumex spp.	Dock
Deschampsia flexuosa	Wavy Hair Grass
Vicia cracca	Cow Vetch

3.6.2 Experimental Composting

Undertaken only in 1978, this project was designed to examine the feasibility of on-site composting using various material. Based on earlier small scale reclamation research, this project was a pilot program to determine if larger scale composting operations could be successfully utilized in Regional land reclamation.

The procedure used in this component was to install composting pits at three testing sites. Once dug, the pits were filled with a variety of compostable material including: shredded newspaper, pulverized garbage, vegetable waste, saw dust, sewage sludge, and peat. These materials were composted separately and in various combinations. Each pit was covered with plastic and monitored for temperature on a regular basis. At the end of the summer each pit was covered with soil and seeded. A total of 122 test pits were installed.

Although results were positive at most of the pits tested, this program was terminated due to high cost with respect to the area actually reclaimed and the lack of widespread application. A successful grassing reclamation program that same year made further work on this approach unnecessary.

Composting Site

3.6.3 Transplanting

Transplanting of trees, shrubs, wild berries, wildflowers and grasses occurred during 1978 and 1979. The purpose of this project was to identify resilient plant species which could be transplanted into barren areas with minimum preparation or maintenance and which were particularly suited to the treated areas into which they were introduced. Hopefully those species thus identified could be further used to stabilize selected barren sites and provide a seed source for further colonization.

Various methods of planting were used depending on the species, quality of the soil and planting location. Experimental test areas on barren sites were selected, and control, limed, fertilized, and limed and fertilized plots established. Plants were excavated manually and transferred from areas of abundant growth onto barren sites. Watering of plants occurred after the first week of planting when necessary. Subsequent monitoring occurred to ascertain survival rates, suitability and growth.

In 1984, in an attempt to further beautify the airport road corridor at several strategic locations, 400 red pine and jack pine trees were transplanted from a crown land forest plantation just north of Hanmer. Trees four to seven feet in height were taken from the Hanmer site with the assistance of a tractor mounted tree spade on loan to the project from INCO. Whenever possible, trees requiring future thinning were taken.

Once lifted, the trees were loaded onto a covered truck and transferred to selected locations. At these sites, holes were dug according to prepared landscape drawings. Peat and bone meal were added to the holes, and each transplanted tree was staked to help prevent wind damage. Over the course of the summer, an attempt was made to water the transplants during dry periods. As well, several shrubs including honeysuckle, red osier dogwood, and Mugho pine were planted at these sites to create the desired landscape effect.

Transplanting Operation

3.6.4 Reclamation Treatment Research

This project was designed to research and document new procedures and techniques which might be beneficial to land reclamation efforts in the future. Twenty-nine experiments were set up in 1981 to test the effectiveness of different types of lime, seed, fertilizer, transplant mixtures and methods of application. Records of each experiment were kept and the sites monitored to check their progress. Results of this project may lead to changes in certain reclamation procedures used in the area in future years.

3.6.5 Wildflower Planting

In 1983, the Region experimentally planted commercial "wildflower" mixtures at a number of sites requiring reclamation treatment. This operation was undertaken to explore the potential of introducing wildflowers into highly visible barren areas in an effort to further beautify the Region. It was postulated that if successful colonization occurred, wider use of wildflower planting would be undertaken in the future.

To initiate this program, ten different representative sites were chosen where soil conditions, aspect and moisture regimes were similar to barren sites found throughout the area. These sites ranged between 0.1 and 0.8 hectares in size. At each site the area was limed and fertilized and several wildflower mixtures sown. A watering schedule was also instituted as planting occurred during the summer months.

Three different commercially available mixtures were used at each site. Each mixture contained a variety of self-seeding annuals and perennials. Each mixture also contained a wide mix of wildflower colours and a variation in flowering periods designed for maximum visual impact.

While some wildflowers bloomed very nicely the first summer, none have yet been monitored over several years. This monitoring is presently underway. Initial results indicate that for the Region's purpose this type of seeding may be useful at some highly visible sites. However, for the majority of the area wildflower efforts were very expensive and did not produce the desired results.

3.6.6 Forest Assessment

In 1984, as part of the program's tree planting effort, forestry potential of large rural municipal lands were examined in order to determine: their potential for forest harvest, their need for forest management, and their potential for tree planting projects. As a first step in this process 3,213 hectares of municipal land were timber cruised during February, March and April. A total of 1,321 sampling stations were established along cruise lines established on aerial photos for forest stands. At each station, tree species were inventoried according to standard cruising procedures. Inventory data was then compiled on tally sheets and delivered to the Ministry of Natural Resources for computer analysis. Results of this analysis are now available but are awaiting further interpretation by trained professionals. It is hoped that this can be undertaken in 1985 and prescriptions made.

Other Programs

Illustrated on this page are tree transplanting, landscaping, wildflower planting, and grass transplanting projects.

4.0 Program Administration

4.1 Adminintrative Organization

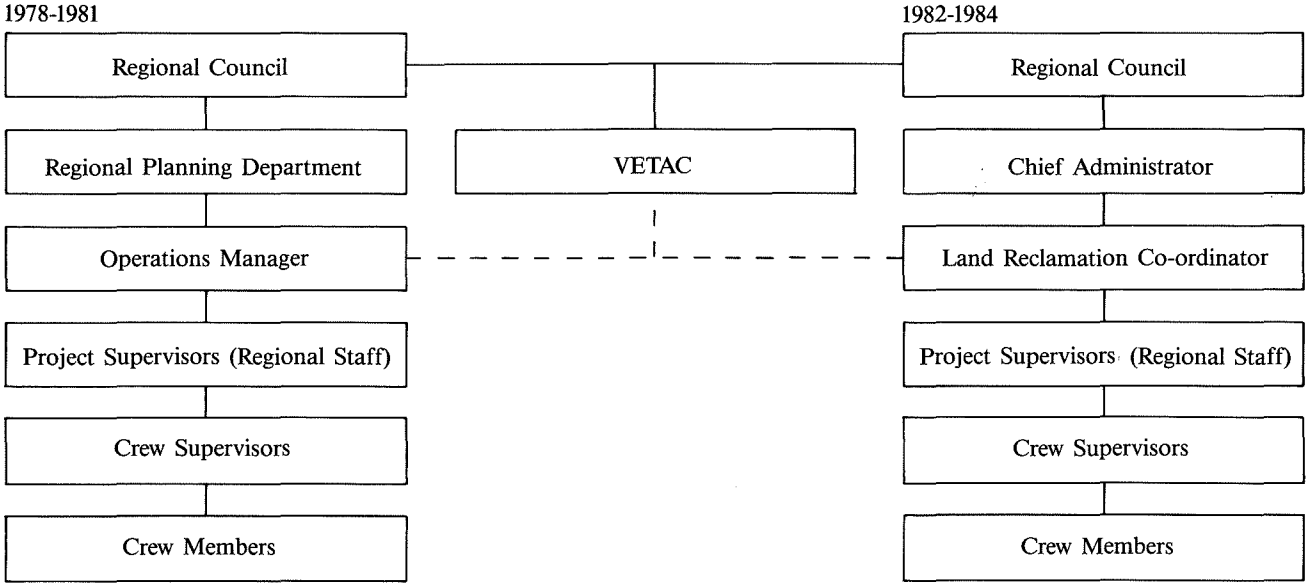
In order for a program of this magnitude to be sponsored successfully, an organizational commitment and structure is required. Since 1978, the Regional Municipality of Sudbury has filled this role by providing the organization through which resources and projects were channelled. This has been no small task, as the Region has had to submit proposals, provide supervision and provide support services such as payroll, accounting, personnel and purchasing services for numerous projects and hundreds of new employees. The key components of this operation are outlined below providing both an historical context and the organizational framework within which the program has operated. Flexible arrangements and creative response has been the key throughout this process.

4.1.1 Program Supervision

Between 1978 and 1981, the Regional Planning and Development Department was charged with the direct operation and administration of the program. This involvement began as a result of the key role the Department played in initiating the program in 1978 and the project planning expertise it possessed. However, as the program continued to operate yearly, and as it involved numerous Regional Departments, it was decided in the Fall of 1981 to shift the entire program under the Office of the Chief Administrator (Figure 5). To facilitate this change and to provide operational continuity, a Land Reclamation Coordinator was appointed. Basically, the role of the Coordinator is to facilitate all aspects of the land reclamation program with respect to its administration and operation. Although originally foreseen as a part-year position, the 1982, 1983 and 1984 land reclamation programs demanded year round involvement.

To further assist in the supervision and operation of the program, the Region also provided additional regional staff to act as field supervisors. Regional personnel were allowed to bid for these jobs as programs became available. Not only did this assist the land reclamation effort but it also provided regional staff with opportunities for job enrichment and management experience. Each year, three to six individuals were selected to assist in a supervisory role. Individuals who served in this capacity are indicated in Appendix E.

Figure 5
Program Organization



4.1.2 Technical Support Services

Technical expertise, advice and support for the program was supplied by the Regional Planning Department and the Vegetation Enhancement Technical Advisory Committee. As indicated in Section 2.3, the Vegetation Enhancement Technical Advisory Committee is an advisory committee of Regional Council and is, therefore, directly linked to the political system. From the very beginning this Committee has provided technical advice, guidance and some on site supervision for the land reclamation program. This has allowed the Region to obtain a wide range of consulting expertise and a diverse range of viewpoints concerning proposed projects. This Committee has also provided the Region with key contacts, research capability, specialized skills, and additional sources of equipment, supplies, storage facilities and lab facilities.

The Committee has also contributed a considerable amount of input to the program through subcommittees established from time to time on key issues. The tree planting subcommittee, site selection subcommittee and wildflower research subcommittee have each contributed a considerable amount of time during project development and monitoring stages.

A listing of all those individuals who have served on the Committee and the agencies they represent is detailed in Appendix A. A summary of various types of outside support provided to the program is outlined in Appendix F. The contributions of each of these individuals and agencies was and continues to be very much appreciated.

4.1.3 Administrative Support Services

In addition to the field supervision and technical input, a great deal of administrative support service was required. In each instance the Regional Municipality provided these services utilizing departments already in place. Support services required and the role they played are listed as follows:

a. Personnel Services documented all employees hired, handled more serious personnel problems which arose during the program such as Workmen's Compensation claims or dismissals and assisted in all employee termination documentation.
b. Safety Officer provided safety instruction to all employees, first aid training, accident investigation and spot inspections.
c. Payroll Services provided each employee with bi-weekly cheques and their earnings statements.
d. Accounting Services provided expenditure statements on each project, all final project accounting, and submitted required financial reports for project revenues.
e. Purchasing Services provided purchase orders, checked suppliers' prices on required items and ordered large items.
f. Regional Stores secured required leased equipment and furnished some supplies on hand.
g. Legal Services undertook all contract review and processing.

Without these required services in place, the program would have been much more difficult to operate. Even these services were heavily taxed at times due to the size of the program in 1982 and 1983. In order to meet program needs and assist the operating departments during those years, many of the personnel, payroll, accounting and safety tasks were undertaken by land reclamation office staff. As well, several individuals from the program were loaned to operation departments to help them provide these program functions.

Administrative Support

Besides the field operation, the program required an internal organizational support network to carry out office support services such as accounting, payroll, personnel, planning, purchasing and record-keeping and day to day supervision. Technical expertise and support was supplied by the Vegetation Enhancement Technical Advisory Committee and the Regional Planning Department.

4.1.4 Union Support

From the very beginning of the program, union support has been excellent. Because the land reclamation program did not infringe on work which was normally undertaken by union members and because a great deal of community benefit was realized from the program both in terms of employment and vegetation improvement, the Canadian Union of Public Employees has been very supportive. The program has also provided opportunities for some of their members to act in a supervisory capacity providing these individuals with a wider range of work experience and training.

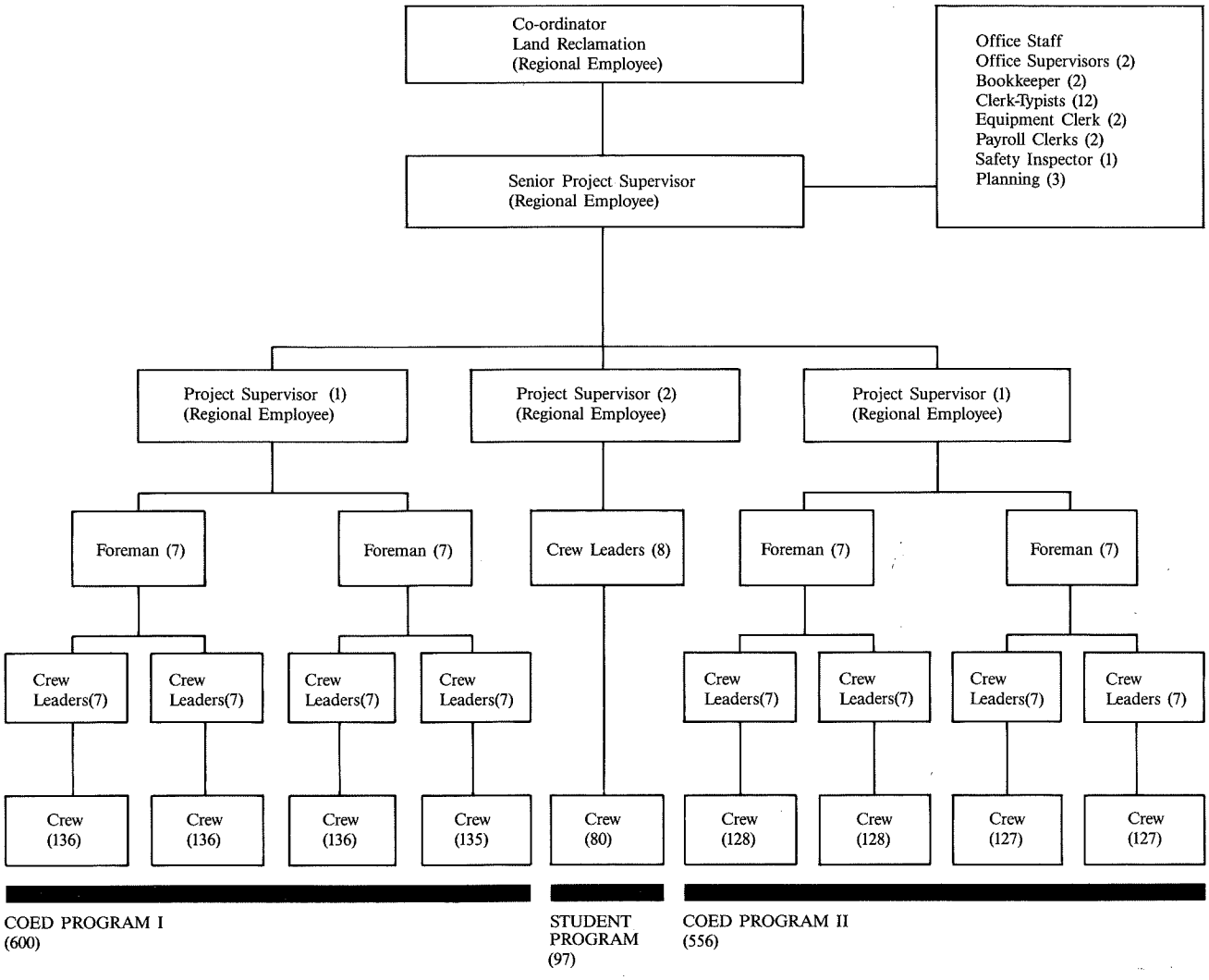
4.2 Workforce Structure

All individuals hired at the crew supervisor or labourer level have become temporary employees of the Region hired from student or unemployed labour pools.

Workforce organization has varied from year to year depending on the nature and the size of program. Generally supervisor to crew member ratios were maintained around 1 to 10 except for smaller or specialized projects. To help visualize this, an organizational chart of the 1983 grassing program is outlined in Figure 6.

Figure 6

1983 Land Reclamation Organizational Structure



Familiar scenes from various land reclamation work sites illustrating typical activities and program logistics.

5.0 Summary Of The Program

5.1 Conclusion

To this point, the report has provided an overview of the historical perspective, individual program elements, and the administrative context of the land reclamation program. This final chapter attempts to summarize the entire program by presenting six tables which provide an overview of the entire operation over the last seven years. In a very real sense, these tables along with the two report maps and illustrating photographs summarize the scope of the Region's program.

Tables 12 and 13 attempt to show the range of land reclamation projects initiated each year and their accomplishments. Tables 14 and 15 summarize the number of individuals employed in the program by project as well as the number of workweeks of employment. Lastly, Tables 16 and 17 provide a summary of the revenue sources and expenditure levels of the program.

In all, 2,636 hectares of barren area were reclaimed, 980 hectares of damaged area visually improved, and 387,580 trees planted. On the labour side 1,249 students and 1,587 unemployed adults were employed for 41,086 workweeks. Total cost of all projects was $12,320,531.

Area
Appearance
Before and After
Land Reclamation
Work

McKim Street Hillside West End City of Sudbury

Highway 17 East Between Coniston and Wahnapitae

Highway 17 East at Wahnapitae

Table 12

List Of Land Reclamation Projects Initiated And Years In Which Each Was Operational

Projects	1978	1979	1980	1981	1982	1983	1984
Grassing and Greening	X	X	X	X	X	X	X
Site Improvement (1)	X	X					
pH & Nutrient Sampling (2)	X	X					
Transplanting (3)	X	X					
Native Seed Collection (4)	X	X					
Experimental Composting (5)	X						
Monitoring and Assessment (6)		X					
Data Processing and Analysis (7)				X	X		
INCO Tailings Improvement					X		
Reclamation Treatment Research				X			
Tree Planting						X	X
Planning and Mapping (8)			X	X	X	X	X
Wildflower Experimentation (9)						X	
Forest Assessment							X
Administration (10)	X	X	X	X	X	X	X
Borgia Park Improvements(11)	X						
Biological Lagoon (11)			X				

(1) In 1980, 1981 and 1982, Damaged Site Improvement was carried out by the grassing and greening project.
(2) These activities were undertaken by the Planning and Mapping group in 1980 - 1983
(3) In 1980 and 1981 transplanting activities were undertaken by grassing and greening crews.
(4) Native Seed Collection was discontinued after 1979 as the cost of collection was too high.
(5) Composting activities were not continued after 1978 because practical application of the project at an operational scale within the Region seemed limited in comparison to grassing methods.
(6) After 1979 most Monitoring and Assessment has been carried out through Laurentian University's Biology Department.
(7) Data Processing and Analysis is closely linked with the monitoring and assessment project and was incorporated with it in 1982.
(8) Planning and Mapping activities are a subset of project administration and comprise progress updates, publicity, pH sampling and project mapping.
(9) Wildflower experimentation was undertaken as part of the grassing and greening program.
(10) Administration comprised all office support personnel as well as regional employees assigned to the project.
(11) Borgia Park Improvements and the Biological Lagoon were projects undertaken under the supervision of land reclamation personnel, however, for purposes of this report they are not considered as land reclamation activities.

Table 13

Land Reclamation Program
Achievements
1978 - 1984

Year	Amount Limed in Hectares	Amount Fertilized in Hectares	Amount Seeded in Hectares	Amount Site Improved in Hectares	Number of Trees Planted	Other Achievements As Specified
1978	114.8	114.8	114.8	206.3	-	30,000 pH and nutrient samples 365 kilograms of native seed collected 11000 trees, shrubs and plants transplanted 122 composting test plots
1979	478.6	466.6	420.2	295.9	4,250	420 hectares sampled for pH 425 kilograms of native seed collected 20,000 trees, shrubs and plants transplanted Monitoring and assessment begun.
1980	331.0	299.3	299.3	258.7	1,300	Land reclamation data assembled and computer coded. 2,000 pH samples taken 5 Year Land Reclamation Plan Developed
1981	208.0	173.4	173.4	9.8	4,600	5 Year Plan updated Monitoring and assessment records processed 29 research plots established
1982	362.4	342.4	305.2	199.2	-	Dismantled 2.4 km of abandoned trestle and improved tailings wildlife area
1983	1,084.0	934.6	935.4	-	228,080	Established l0 wildflower experimental test plots.
1984	57.7	188.4	215.9	7.5	149,350	Timber cruised 3,213 hectares Transplanted 400 trees Updated all mapping records Compiled 5 year grassing program
TOTALS	2,636.5	2,519.5	2,464.2	977.4	387,580	

NOTE: All area listed above reflects flat mapping area figures as recorded from 1:20,000 or 1:2000 scale maps.
As most of the locations reclaimed were not flat but quite hilly, a larger area was actually reclaimed than recorded on maps due to elevational changes. In some steep areas up to 50% more area was reclaimed than indicated. If an average 25% slope factor is added to the flat area totals, area limed would total 3,295 hectares, area fertilized 3,150 hectares and area seeded 3,080 hectares.

Table 14

Land Reclamation Employment
1978 - 1984
Number Of Employees[1]

Project	1978	1979	1980	1981	1982	1983	1984	Total Employed
Administration								
- Office Staff	3				4(S) 4(U)	4(S) 19(U)	5(S) 14(U)	53
- Mapping and Planning			6	6	9(S)	5(S)	8(S)	34
Grassing & Greening	82	165	209	191	160(S) 196(U) 20(U)	88(S) 1,137(U)	42(S) 23(U)	2,313
Damaged Site Improvement	40	86			50(U)			176
Transplanting	6	18						24
Native Seed Collection	20	29						49
Monitoring and Assessment		15	3	4				22
pH and Nutrient Sampling	15	12						27
Experimental Composting	8							8
Tailings Area Improvement					21(U)			21
Tree Planting						24(U)	77(U)	101
Reclamation Treatment Research				6				6
Timber Cruising							2	2
TOTAL	174	325	218	207	464	1,277	171	2,836

[1]Only employee positions approved are indicated. The number of individuals who worked in the program is actually higher than the numbers indicated due to employee turnover and replacement. In 1982, 1983, the student (S) and unemployed (U) labour force components are indicated. Prior to 1982, only students were employed.

Table 15

Land Reclamation Employment
1978 - 1984
Number Of Work Weeks

Project	1978	1979	1980	1981	1982	1983	1984	Total Work Weeks
Administration								
- Office Staff	48	-	-	-	64	70(S) 348(U)	82(S) 298(U)	910
- Mapping and Planning			84	84	144	73	101(S)	486
Grassing & Greening	624	1,155	2,926	2,674	2,272(S) 3,358(U) 231(U)	1,198(S) 18,520(U)	574(S) 460(U)	33,992
Damaged Site Improvement	524	1,118			1,093(U)			2,735
Transplanting	72	234						306
Native Seed Collection	141	203						344
Monitoring and Assessment		195	42	56				293
pH and Nutrient Sampling	192	156						348
Experimental Composting	105							105
Tailings Area Improvements					484(U)			484
Tree Planting						252(U)	707(U)	959
Reclamation Treatment Research				84				84
Timber Cruising							40	40
TOTAL	1,706	3,061	3,052	2,898	7,646	20,461	2,262	41,086

Table 16

Land Reclamation Revenue Sources 1978-1984

Revenue Source	1978	1979	1980	1981	1982	1983	1984	Total To Date
Summer Canada (Young Canada Works Program) Canada Employment & Immigration Commission	191,960*	424,121*	380,983*	398,049*	406,550*	258,084*	135,759	2,195,506
Ontario Ministry of Northern Affairs	55,000*	75,000*	72,980*	75,000*	75,000*	57,779*	75,000	485,759
Regional Municipality of Sudbury	46,536*	74,065*	63,869*	111,072	53,247*	57,779* 763,290(8)	46,658	453,226 763,290
INCO Limited[1]					10,000*	10,000		20,000
Private Donations[2]			2,000*					2,000
Canada Community Development Program Canada Employment & Immigration Commission					54,241*	25,196*	37,469	116,906
ILAP/Canada Works							182,835	182,835
UI/IC Forestry Sector Program								
Canada Employment & Immigration Commission						34,800[6]		34,800
Canadian Forestry Service						25,130*		25,130
Mining Sector Work Program								
Canada Employment & Immigration Commission					1,184,400[6]			1,184,400
Ontario Ministry of Natural Resources					625,215[7]			625,215
Canada Ontario Employment Development Program								
Canada Employment & Immigration Commission						2,982,929	132,803	3,115,732
Ontario Ministry of Labour						2,982,929	132,803	3,115,732
TOTAL REVENUES	293,496[3]	573,186[4]	519,832[5]	584,121	2,408,653	7,197,916	743,327	12,320,531

Source: Audited Regional Financial Statement 1978, 1979, 1980, 1981, 1982 - R.M.S. Accounting Department
Land Reclamation Annual Reports 1978 - 1982

* Audited Financial Statements

1. Inco Limited donated $7,675, $2,830, $10,500 $10,000 and $10,000 in 1978, 1979, 1980, 1981 and 1984 respectively in material which was purchased by them and supplied directly to the program
2. Falconbridge Limited donated $500, $540, $4,000, $5,000, $4,500 and $2,550 in 1978, 1979, 1980, 1981, 1983 and 1984 respectively in material which was purchased by them and supplied directly to the program.
3. Figure excludes $8,175 for the Borgia Park Project
4. Figure excludes $88,049 for the Biological Lagoon Project
5. Figure excludes $6,091 for the Biological Lagoon Project
6. Figure includes individuals normal UIC entitlement as well as CEIC Supplement
7. Figure includes $11,074.94 from 1983
8. This figure was originally committed by the Regional Municipality of Sudbury but subsequently covered by a grant from the Ontario Ministry of Municipal Affairs & Housing

Table 17

Land Reclamation Program
Expenditures 1978 - 1984

Expenditure Categories	1978	1979	1980	1981	1982	1983	1984	Total To Date
Salaries and Benefits (1)	212,612*	409,458*	374,424*	402,661*	1,972,176*	5,458,334*	528,510	9,358,175
Office Expense (2)	3,145*	3,192*	3,279*	5,602*	7,287*	33,641*	11,510	67,656
Equipment (3)	6,931*	10,069*	26,478*	11,822*	22,825*	309,633*	19,719	407,477
Vehicle Rental and Maintenance (4)	21,019*	41,011*	31,981*	41,681*	94,777*	24,263	8,443	263,175
Fuel	3,845*	5,910*	5,542*	4,116*	4,625*	16,361*	7,174	47,573
Transportation (5)				2,376*	53,609*	322,108*	47,056	425,149
Materials (6)	45,944*	2,764*	3,813*	889*	42,289*	3,966	5,920	102,585
Lime		27,110*	25,315*	34,512*	71,982*	215,242*	17,629	391,790
Fertilizer		22,418*	20,373*	19,875*	47,945*	141,857*	32,106	284,574
Seed		47,563*	25,428*	26,586*	27,019*	84,493*	17,286	228,375
Trees						6,430*		6,430
Purchased Services (7)				29,359	53,880*	578,824*	46,658	708,721
Miscellaneous		3,691*	6,199*	4,642*	10,239*	2,764*	1,316	28,851
TOTAL	293,496*[8]	573,186*[9]	519,832*[10]	584,121*	2,408,653*[12]	7,197,916*	743,327	12,320,531

Source: Audited Regional Financial Statements 1978, 1979, 1980, 1981, 1982, 1983, 1984
*Audited Financial Statements

1. Category includes Salary, Vacation Pay, Workmen's Compensation, Ontario Health Insurance Plan and/or Canada Pension Plan
2. Category includes Office Rental, Telephone and Office Expenses
3. Category includes rental equipment items such as 5 ton trucks, front end loaders, tool trailers, porta-johns and pagers
4. Category includes vehicle rental and vehicle maintenance. In 1978 - 1981 this rental also included all transportation costs eg. buses, vans. Other items listed in this grouping include: pick-up trucks
5. Transportation costs for 1978 - 1981 were primarily incorporated into vehicle rental entries
6. Category includes such items as bags for lime, shovels, chain saws, cyclone seeders, first aid equipment, and gloves.
7. Purchased services include contractors fee for supervision of a project and equipment.
8. Figure excludes $8,175 for the Borgia Park Project
9. Figure excludes $88,052 for the Biological Lagoon Project
10. Figure excludes $6,091 for the Biological Lagoon Project
11. Figure includes individuals normal UIC entitlement as well as CEIC Supplement
12. Figure includes $11,075 from 1983 Tailing Project
13. Inco and Falconbridge also had expenditures which were directly attributed to this program but which are not reflected in this Table.

Land Reclamation Efforts Within Neighbourhoods

All the sites portrayed in these photos have now been reclaimed. The pictures illustrate: Victoria St. hill, City of Sudbury; a Wahnapitae subdivision before work began; a reclaimed hillside in the centre of Coniston; and before and after photos of Spruce Street area, City of Sudbury.

5.2 Postscript

As in previous years, the Land Reclamation Program is again operating in 1985. It is anticipated that the program will also continue to operate in subsequent years. To this end, a new 5 year plan has been drafted. Although the Region has come a very long distance in only seven years, more work still remains in order to restore barren sites remaining within neighborhoods or roadway corridors.

While the primary focus was and continues to be centred around the restoration of the local landscape, several other major stories of Regional concern are integrated within the land reclamation endeavour. Although not fully described in this report they are woven into, or lie beneath the land reclamation process. These issues include the desire of the Sudbury community to actively combat the negative image many Canadians have of Sudbury and the steps that have been taken in this regard, including landscape improvement. They also involve the use of short term job creation programs, including land reclamation as a partial community response to the hardship of layoffs and high unemployment that the community has faced since 1977. Land reclamation has been used as a bridging program to provide jobs and needed income to many individuals and to assist this community in other ways through the economic multiplier effect large scale programs provide. This program also has a story about the need to conserve some areas where land reclamation should not occur in order that important gene pools of metal tolerant species can be preserved and individuals can view the degree of impact man has had on his environment. Finally, this venture is a major story about community cooperation and partnership for the purpose of achieving common objectives.

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Appendix A

Vegetation Enhancement Technical Advisory Committee Membership 1973 - 1984

	Name	Agency	Period Active
1.	D. Balsillie	Ontario Ministry of Environment	1978-1979
2.	N. Barnett	Planning & Development Dept., R.M.S.	1973-1980
3.	P. Barry	Sudbury District Fish & Game Protective Assoc.	1973-1979
4.	P. Beckett	Biology Dept., Laurentian University	1978-1984
5.	D. Beirnes	Planning & Development Dept., R.M.S.	1978-1979
6.	L. Bigger	Parks & Development Dept., City of Sudbury	1978;1984
7.	A. Bonnis	Nickel District Conservation Authority	1978-1979
8.	C. Brankley	Sudbury 2001	1978-1980
9.	D. Burke	Landscape Architect	1984
10.	J. Carruthers	Planning & Development Dept., R.M.S.	1978
11.	J.H. Christiansen	Industrial Waste, Falconbridge Nickel Mines Limited	1973-1976
12.	G.M. Courtin	Biology Dept., Laurentian University	1973-1976
13.	D. Crawford	Ontario Hydro	1984
14.	R. Demore	Operations & Maintenance, R.M.S.	1974-1975
15.	R. Dutrisac	Engineer, Town of Valley East	1980-1984
16.	T. Fasciano	Planning & Development Dept., R.M.S.	1977-1984
17.	D. Faubert	Building Controls Dept., R.M.S.	1978-1979
18.	N. Fawcett	Councillor, Town of Capreol	1980
19.	A. Fex	Regional Councillor, R.M.S.	1978
20.	G. Fievoli	Regional Councillor, R.M.S.	1983
21.	G. Foley	Regional Councillor, R.M.S.	1981-1982
22.	R. Frank	Drafting Dept., R.M.S.	1978-1982
23.	B. Fryer	Parks & Recreation Dept., City of Sudbury	1973-1975
24.	J. Gardner	Parks & Recreation Dept., City of Sudbury	1974-1975
25.	D. Gougeon	Public Affairs Dept., INCO	1973-1975
26.	S. Grillanda	Chemistry Dept., Cambrian College	1983
27.	B. Hett	Parks & Recreation Dept., City of Sudbury	1978-1982
28.	M. Hickmott	Planning & Development Dept., R.M.S.	1978-1981
29.	P. Hobbs	Canada Employment Development Branch	1978-1979
30.	J. Hone	Ontario Ministry of Northern Affairs	1978-1984
31.	D. Hughes	Planning & Development Dept., R.M.S.	1981
32.	J. Hughes	Planning & Development Dept., R.M.S.	1980
33.	W. Kienapple	Town of Valley East	1974-1975
34.	S. Korpela	Regional Councillor, R.M.S.	1979-1980
35.	E. Kraker	Forester, Ontario Ministry of Natural Resources	1973-1974
36.	D. Lake	Chemistry Dept., Cambrian College	1978-1979
37.	T. Latreille	Sudbury Horticultural Society	1975
38.	B. Lautenbach	Planning & Development Dept., R.M.S.	1978 1982-1984
39.	D. Liske	Marchland Holdings, City Centre	1975-1977
40.	T. Lloyd	Manager, Poupore Lumber Limited	1973-1974
41.	M. Luoma	Metro Centre Management Board	1978-1980
42.	P. Martin	Martin's Potatoes INC.	1976-1978
43.	J. McCready	Forester, Ontario Ministry of Natural Resources	1977-1978
44.	J. McDonald	Regional Councillor, R.M.S.	1984
45.	D.E. McHale	District Manager, Ont. Ministry of Natural Resources	1973-1975
46.	W.D. McIlveen	Sudbury Horticultural Society, Ministry of Environ.	1978-1984
47.	G.J. Michalak	Parks & Recreation Dept., Town of Rayside-Balfour	1975
48.	R. Michelutti	Falconbridge Limited	1978-1984
49.	J. Miller	Land Reclamation Coordinator, R.M.S.	1981-1984
50.	J. Negusanti	Ontario Ministries Natural Resources & Environment	1978-1984
51.	S. O'Brien	Nickel District Conservation Authority	1976-1978
52.	T. Peters	Agriculture Dept., INCO	1973-1984
53.	H. Poulin	Town of Rayside-Balfour	1973
54.	H. Proudley	Engineering Dept., City of Sudbury	1978
55.	M. Racine	Canada Employment Development Branch	1979-1980
56.	N. Roberge	Rayside-Balfour Beautification Committee	1974-1975
57.	P. Sajatovic	Nickel District Conservation Authority	1981-1984
58.	J. Savage	Agricultural Dept., INCO	1977-1984
59.	S. Schillemore	Nickel District Conservation Authority	1979-1981
60.	B. Squirrell	Town of Walden	1973 1980-1981
61.	A. St. Onge	Town of Rayside-Balfour	1981
62.	J. Vining	Forester, Ontario Ministry of Natural Resources	1978-1984
63.	D. Welsh	Canada Employment Development Branch	1979
64.	K. Winterhalder	Biology Dept., Laurentian University	1973-1984
65.	D. Young	Agricultural Dept., INCO	1974-1975
66.	J.D. Yuill	Nickel District Conservation Authority	1973-1974

This listing acknowledges all those individuals who served on the Regional Municipality of Sudbury Technical Tree Planting Committee 1973-1978 and the subsequent Vegetation Enhancement Technical Advisory Committee 1978-1984.

Appendix B

Land Reclamation Sections — Official Plan For The Sudbury Planning Area

Derelict Land Reclamation

9.19 Derelict lands are those land and water areas which have been disturbed by man and his activities through past misuse or unwise conservation practices. Items covered under this heading include: a) abandoned mining activities which have not been rehabilitated; b) areas denuded of vegetation by air pollution, burning, timber harvest, or erosion which have not been revegetated; and c) polluted waterbodies or groundwater environments which have not recovered to former conditions.

A considerable amount of land and water within the Regional Municipality of Sudbury has been affected to varying degrees by past misuse. This misuse has resulted in a number of environmental consequences, including deterioration of soil conditions, increased erosion, lack of vegetation in some areas, visual degradation, water pollution, destruction of wildlife habitat and a negative image of the Region. The Ministry of Natural Resources, Ministry of the Environment, Laurentian University, the Technical Tree Planting Committee and the mining companies are all investing time, money and energies into finding solutions to reclaiming these lands. New legislation such as the Conservation Authorities Act, Pits and Quarries Act, Environmental Protection Act, and the Water Resources Act are designed to prevent similar misuse in the future.

Objectives

9.20 It shall be the objective of Council to:

a. Enhance the visual quality and image of the Sudbury area by encouraging the reclamation of derelict land areas:

b. Prevent the future creation of derelict lands.

Policies Continued Support

9.21 It shall be the policy of Council to:

a. Continue to encourage research and support projects which aid in stabilizing or revegetating burned-over, cut-over, barren or other derelict lands within the Region. This encouragement and support may occur through a variety of methods including: cooperation with responsible agencies and groups, financial commitment, supporting resolutions, and by-law enactment.

Reclamation Priority

b. Give priority initially to reclamation projects in those areas where the results would be immediate, dramatically obvious and economically feasible. This includes areas which are the most visible to the public, such as major transportation corridors and locations surrounding public facilities.

c. Continue to work with the mining companies and higher levels of government in supporting efforts which prevent unwise land use practices and solve problems regarding derelict land;

Examination of Potential Problem Areas

Carefully examine all land use practices, which have the potential for creating or aggravating derelict land problems, to ensure that adequate mitigation procedures are being included and rehabilitation methods are provided for. Where such procedures are not being taken into account, the Region will pursue any methods available to force compliance.

Program: Reclamation Studies

9.22 Council, in conjunction with other interested or affected agencies, shall coordinate efforts aimed at assessing derelict areas of the Region and examining methods of reclaiming them. Based upon the findings of these studies, Council may adopt a program for the reclamation of these areas.

Appendix C

Table 1 Area Reclaimed - 1978

Area Location	Limed	Fertilized	Seeded (Area completed in Hectares)	Site Improvement	Workforce
1. Airport Corridor - Airport	1.0	1.0	1.0	29.7	Students
2. Airport Corridor - Regional Depot	16.0	16.0	16.0	77.5	Students
3. Highway 541 - Skead Road	7.2	7.2	7.2	31.5	Students
4. Hwy 17 E. Wahnapitae -Hydro Road South Side	34.0	34.0	34.0	36.8	Students
5. Hwy 17 E. Wahnapitae - CPR Tracks North Side	24.7	24.7	24.7	30.8	Students
6. Hwy 17 E. Regional Water Treatment Plant to Garson Road	29.1	29.1	29.1		Students
7. Hwy 17 E. - Native Seed Site	2.8	2.8	2.8		Students
TOTAL	114.8	114.8	114.8	206.3	

Appendix C

Table 2 Area Reclaimed - 1979

Area Location	Limed	Fertilized	Seeded (Area completed in Hectares)	Site Improvement	Workforce
1. Garson Coniston Road	15.2	15.2	12.6		Students
2. Coniston Townsite	17.6	17.6	14.3	6.9	Students
3. Hwy 17 E. Coniston to Moonlight Ave. South Side	32.5	53.1	23.6		Students
4. Hwy 17 E. Coniston to Moonlight Ave. North Side	83.3	83.3	72.3	83.3	Students
5. Hwy 17 E. Coniston to Wahnapitae North Side	15.6	2.9	2.9		Students
6. Hwy 17 E. Coniston to Wahnapitae South Side	4.5	0.2	0.2		Students
7. LaSalle Ext. - CPR Tracks to Frood Road	102.0	102.0	102.0	102.0	Students
8. LaSalle Ext. - Frood Road to Notre Dame	9.8	9.8	9.8	9.8	Students
9. Hwy 144 - Elm Extension to Cloverleaf	104.2	88.6	88.6		Students
10. Hwy 144 - Cloverleaf to Murray Mine	93.9	93.9	93.9	93.9	Students
TOTAL	478.6	466.6	420.2	295.9	

Appendix C

Table 3 Area Reclaimed - 1980

Area Location	Limed	Fertilized	Seeded (Area completed in Hectares)	Site Improvement	Workforce
1. Hwy 541 A/Falconbridge	50.1	50.1	50.1		Students
2. Notre Dame Avenue	7.2	7.2	7.2	0.5	Students
3. Kathleen Street	1.9	1.9	1.9		Students
4. Paris Street Corridor	8.8	8.8	8.8	23.2	Students
5. Memorial Hospital	6.7	6.7	6.7		Students
6. Robinson/Martindale/ Cooper Street Hill	20.5	20.5	20.5	20.5	Students
7. Elm Ext./Big Nickel Mine Dr.	21.2	6.0	6.0	15.2	Students
8. Hwy 17 W/Big Nickel Mine Dr.	39.0	39.0	39.0	39.0	Students
9. Hwy 17 W - Alexander Centres Ind. to Dump Road	39.7	39.7	39.7		Students
10. Hwy 17 W - Copper Cliff Area Balsam - Power St.	38.9	38.9	38.9		Students
11. Hwy 17 W - Copper Refinery Iron Ore Plant	30.7	30.7	30.7	30.7	Students
12. Hwy 17 W - Tailings Area	49.9	49.9	49.9	54.1	Students
13. Hwy 17 E - Falconbridge Hwy to Moonlight Ave. North Side	4.8			56.5	Students
14. Hwy 17 E - Falconbridge Hwy to Moonlight Ave. South Side	11.7			19.0	Students
TOTAL	331.0	299.3	299.3	258.7	

Appendix C

Table 4 Area Reclaimed - 1981

Area Location	Limed	Fertilized	Seeded	Site Improvement	Workforce
	(Area completed in Hectares)				
1. Memorial Hospital	8.4	8.4	8.4		Students
2. Regent St. South - Glad Tidings	6.4	6.4	6.4	6.4	Students
3. Robinson/Martindale/Copper St. Hill	11.6	11.6	11.6		Students
4. Big Nickel Mine Dr. - Hwy 17 W to Elm Extension	27.8	27.8	27.8		Students
5. Spruce Street	3.6				Students
6. McKim Street	27.9	27.9	27.9		Students
7. LaSalle/CPR	8.4				Students
8. Terry Fox Sports Complex	31.6	31.6	31.6		Students
9. Hwy 17 E - Falconbridge Hwy to Moonlight Ave. North Side	18.6				Students
10. Hwy 17 E - Falconbridge Hwy to Moonlight Ave. South Side	3.4	3.4	3.4	3.4	Students
11. Pearl Street Water Tower	1.6	1.6	1.6		Students
12. Barrydowne Rd./Kingsway Ave.	4.0				Students
13. Gatchell Pool	0.4	0.4	0.4		Students
14. Wahnapitae Townsite	6.1	6.1	6.1		Students
15. Water Treatment Plant -Hwy 17 E	9.3	9.3	9.3		Students
16. Wind Generator - Hwy 17 E	38.9	38.9	38.9		Students
TOTAL	208.0	173.4	173.4	9.8	

Appendix C

Table 5 Area Reclaimed - 1982

Area Location	Limed	Fertilized	Seeded	Site Improvement	Workforce
			(Area completed in Hectares)		
1. Kingsway Ave. - North Side	64.3	67.5	30.3		Students
2. Kingsway Ave. - South Side	9.4	3.6	3.6		Students Section 38
3. Mountain St./Kingsway Ave.	38.0	38.0	38.0		Section 38
4. Beatrice St. Ski Hill	11.5				Section 38
5. Kathleen St. and Tedman Ave.	10.4	10.4	10.4		Section 38
6. Coniston (Caruso Street)	11.2	11.2	11.2		Section 38
7. Coniston (George Street)	12.0	12.0	12.0		Section 38
8. Robinson/Kelly Lake Road	40.7	40.7	40.7		Section 38
9. Southview Drive and Bypass	16.6	16.6	16.6	16.6	Section 38
10. Janmar Crescent/Southview Dr.	15.8	15.8	15.8		Section 38
11. Robinson Lake	11.3	11.3	11.3	11.3	Section 38
12. Frood Road/Dupont Street	21.8	21.8	21.8		Students
13. Wahnapitae	19.4				CCDP
14. Kelly Lake (North Shore)	6.5				Section 38
15. Spruce Street		3.6	3.6		Students
16. Camp Sudaca	2.6	2.6	2.6		Students
17. Baikie Street/Hillcrest Cr.	6.5	6.5	6.5		Section 38
18. Burton Avenue/Selkirk Street	1.9	1.9	1.9		Section 38
19. Big Nickel Mine Dr./Hwy 144		15.2	15.2		Students
20. Ramsey Lake Road	1.2	1.2	1.2		Students
21. Stewart Drive	0.4	0.4	0.4		Students
22. Sandra Blvd. Berm		1.2	1.2		Students
23. Park Street Copper Cliff	0.6	0.6	0.6		Students
24. Godfrey Drive	0.2	0.2	0.2		Students
25. Bancroft Drive	0.4	0.4	0.4		Section 38
26. Hwy 541 - Skead Road	36.8	36.8	36.8	23.6	Students
27. Airport Corridor - Regional Depot	6.1	6.1	6.1	6.1	Students
28. Airport Corridor - Airport	15.2	15.2	15.2		Students
29. Sudbury Algoma Hospital	1.6	1.6	1.6		Section 38
30. Site Improvements of Major Highways (Hwy. 17E and Hwy. 69N)				141.6	Section 38
TOTAL	362.4	342.4	305.2	199.2	

Appendix C

Table 6 Area Reclaimed - 1983

Area Location	Limed	Fertilized	Seeded	Site Improvement	Workforce
			(Area completed in Hectares)		
1. LaSalle Ext. - Terry Fox Complex	87.0	87.0	87.0		COED
2. LaSalle Ext. Hwy 144 to Frood Rd.	245.0	245.0	245.0		COED
3. Frood Road to Dupont St.	71.6	55.4	55.4		COED
4. McKim St. to Hwy 144	57.9	57.9	57.9		COED
5. Burton-Bruce-Snowdon Ave.	12.4	12.4	12.4		Students
6. White Ave. - Ethelbert St.	3.4	3.4	3.4		Students
7. Spruce St.	4.9	4.9	4.9		Students
8. Princess Anne P.S.		1.8	1.8		Students
9. Slag Pour Overlook	1.0	1.0	1.0		Students
10. Lorne St. Hills/Gatchell P.S.	3.6	4.3	4.3		Students
11. North Shore Kelly Lake	90.2	90.2	90.2		COED
12. Robinson Lake - Hannah Lake Rd.	36.5	30.8	30.8		COED
13. South-West Bypass - Long Lake Rd.	28.5	26.9	26.9		Students
14. Sunnyside Rd.		0.8	0.8		COED
15. Arthur Robinson P.S. - Corpus Christi S.S.	1.9	1.9	1.9		Students
16. Lockerby P.S.- St. Theresa S.S. MacLeod - Laval P.S.	6.2	6.2	6.2		Students
17. St. Michael S.S.	4.3	4.3	4.3		Students
18. VanHorne Ave.	7.0	7.0	7.0		Students
19. Sudbury Curling Club	17.5	17.5	17.5		Students
20. CPR Lake Ramsey	15.1	15.1	15.1		COED
21. Lonsdale Area North & South	46.7	46.7	46.7		COED
22. Bancroft Dr. - Bellevue Ave.			0.8		Students
23. Frobisher Street		3.2	3.2		Section 38
24. Kingsway Hills South	33.9	33.9	33.9		COED
25. Kingsway Hills North	68.6	68.6	68.6		COED
26. St. Conrad S.S.	1.4	1.4	1.4		Students
27. Estelle St.	9.5	9.5	9.5		Students
28. Camp Sudaca	2.4	2.4	2.4		Students
29. Coniston Townsite	19.2				COED
30. Coniston CPR Line	11.3				COED
31. Sudbury Waterworks	0.9	0.9	0.9		Students
32. Wahnapitae Townsite	168.7	82.6	82.6		COED
33. Garson Coniston Rd.	15.8				COED
34. Hwy 541 - 541A	9.0	9.0	9.0		Students
35. Bailey's Corners Airport Rd.	1.1	1.1	1.1		Students
36. Wildflower Test Sites	1.5	1.5	1.5		Students
TOTAL	1,084	934.6	935.4		

Appendix C

Table 7 Area Reclaimed - 1984

Area Location	Limed	Fertilized	Seeded (Area completed in Hectares)	Site Improvement	Workforce
1. Frood Snow Dump				7.5	Students
2. Frood Road		25.5	25.5		ILAP
3. Demorest Street	0.2	0.2	0.2		Students
4. Palladino Motors	0.7	0.7	0.7		Students
5. Regent Street South	2.0	2.0	2.0		Students
6. Hannah Lake		5.7	5.7		Students
7. Carleton Street		0.4	0.4		Students
8. City Centre/Ste. Annes Road	1.2	1.2	1.2		Students
9. Knights of Columbus		1.2	1.2		Students
10. Cambrian Heights	11.9	11.9	11.9		Students
11. Adanac Ski Hill	1.8	1.8	1.8		Students
12. Cambrian College	2.9	2.9	2.9		Students
13. Coniston Townsite South Hills (2)	15.0	22.7	22.7		Students
14. Coniston CPR Line		11.3	11.3		ILAP
15. Wahnapitae Townsite North			27.5		ILAP
16. Wahnapitae Townsite South		63.1	63.1		ILAP
17. Garson Coniston Road South		9.3	9.3		Students
18. Garson Coniston Road North		6.5	6.5		Students
19. Falconbridge Townsite	7.3	7.3	7.3		ILAP
20. Old Skead Road Hills (S)	14.7	14.7	14.7		ILAP
TOTAL	57.7	188.4	215.9	7.5	

Appendix D

Table 1
Trees Planted By Land Reclamation Crews Prior To 1983

Area Location	No. of Trees	Species Planted					Year	*OLA Site Nos.
		Red Pine	Red/ Jack	Jack Pine	White Spruce	Other		
Hwy. 144 - Murray Mine Area	OLA						1981	8, 9, & 10
Hwy. 144 - Between Traffic Circle and Murray Mine	800 + OLA	500		300			1981	3, 4, 5, 6, & 7
Traffic Circle Area	3,200 + OLA		3,000				1981	2
Hwy. 144, Lasalle Extension				100	100			
Hwy. 17 East	800 + OLA		500				1980	
Austin Area		200		100			1981	11 & 12
Hwy. 17 East			1,500				1979[1]	
Hydro Road	4,500	250		2,250			1979	
Wahnapitae Area		150		350			1980	
Test Sites	390							
Hydro Road						250 OR	1979	
Hwy. 17 East						40 PW 100 MS	1981	
TOTAL	9,690+(450) OLA	1,100	5,000	3,100	100	390		

*OLA is Ontario Landscape Stock. Species include American Mountain Ash, Red Pine, Mugho Pine.

[1]Trees planted by Ministry of Natural Resources as paper pot stock.

Appendix D

Table 2
Tree Planting Program 1983
Tree Distribution By Area, Number, And Species

Area Location	Total No. Of Trees	Red Pine	Jack Pine	White Spruce	White Cedar	Black Spruce	Silver Maple	Hard Maple	Red Oak	White Ash	Black Locust
1. Lockerby/Robinson	18,975	3,950	1,000	4,000	2,400	500	4,975	1,000	100	1,050	
2. Terry Fox Complex	24,750	10,000	8,000	4,000	800		950		1,000		
3. Coniston NW/Savanah	9,300	2,200	1,000	800			1,000	2,000		2,300	
4. Coniston	38,900	10,700	4,000	7,500	2,750	500	13,000			450	
5. Coniston/Wahnapitae South	9,150	3,000	4,150	400			200				1,400
6. Coniston/Wahnapitae North	19,650	7,550	7,050	3,800			350			700	200
7. Elm Extension/McKim	13,450	4,300	3,350	300	350		2,750	1,250	500	550	100
8. Lasalle Extension	14,400	1,300	7,050	500			1,100		1,300		3,150
9. Highway 144/Godfrey	25,300	8,500	10,000	1,000	800		2,500				2,500
10. Murray Mine	800						700		100		
11. Falconbridge N.	14,400	800	12,000	800			800				
12. Falconbridge S.	12,525	2,525	10,000								
13. Skead Road Hill	9,600	4,000	4,000								1,600
14. Walden Industrial Park	2,980	1,360			800		250			470	100
15. INCO - Hwy. 17W	9,900	5,500									4,400
16. Airport Corridor	4,000	150			2,000		400	400		400	650
TOTAL	228,080	65,835	71,600	23,100	9,900	1,000	28,975	4,650	3,000	5,920	14,100

Appendix D

Table 3
Tree Planting Program 1984
Tree Distribution By Area, Number, And Species

Area Location	Total No. Of Trees	Red Pine	Jack Pine	White Pine	Black Locust	Japanese Larch	Red Oak
1. Southview Drive/Bypass	8,200	6,200	1,500	500			
2. Southview Drive/Robinson	1,250			1,250			
3. INCO Dump/Alexander Ind.							
West Area	35,800	6,700	6,200		2,650		
East Area		8,000	8,500		3,750		
4. Junction Creek Floodplain	3,000					3,000	
5. Frood Road	4,050	2,000	1,000			550	500
6. Kingsway Hills	27,895	13,900		11,725			2,270
7. Coniston Savannah	1,000		1,000				
8. Swamp/Savannah - 17E	5,000				5,000		
9. Hwy. 17E - Dump to Mid-North	12,025	6,025		6,000			
10. Hwy. 17E Hydro Road	1,250	300	300		350		300
11. Walden Industrial Park	800	170	200		200	230	
12. Curling Club	3,000			3,000			
13. Lonsdale South	8,500	4,000	4,000	500			
14. Lonsdale North	10,780	4,000	4,000	920			1,860
15. Hwy. 69 North	7,995		5,425		2,570		
16. Airport to Bailey's Corner	5,500	2,425	2,525		50	500	
17. Bailey's Corner to Hwy. 541A	9,310	4,600	4,400		10	300	
18. Hwy.541A to Garson-Coniston Road	3,600	1,500	1,500		300	300	
19. Burton-Selkirk	400	200	200				
TOTAL	149,355	60,020	39,750	24,895	9,880	9,880	4,930

Appendix D

Table 4
Trees Planted By The Boy Scout Organization

Area Location	No. of Trees	Species Planted				Year	*OLA Site Nos.
		Red Pine	White Spruce	White Cedar	Silver Maple		
Hwy. 144 - Murray	2,750	600		250		1982	20
Mine Area		1,300	400		200	1983	20
Martindale -Gino St.	800	550		250		1982	23
Martindale -	2,900	1,400	400			1983	26
Memorial Hospital Area		1,000			100	1984	33
Terry Fox Complex	2,850	600		250		1982	22
		800	1,050			1983	25
Reg. Rd. 80 -Little Stobie Road	1,900	1,800			100	1984	32
Sudbury Curling Club	1,600	1,400			200	1984	30
Falconbridge/Skead Rd.	4,210	560		250		1982	21
541/541A		2,000				1983	26
		1,200			200	1984	31
TOTAL	16,860 + 500 OLA	13,210	1,850	1,000	800		

*Species include Red Pine, Austrian Pine, Mugho Pine, European Larch, White Spruce, White Pine, Norway Spruce, Tamarack, Juniper, White Cedar, Silver Maple.

OLA is Ontario Landscape Stock.

Appendix E

Regional Supervisory Staff
Land Reclamation Program

Year	Name	Position on Program
1978	B. Lautenbach	Technical Director
	D. Beirnes	Operations Manager
	R. Frank	Field Supervisor
	D. Faubert	Field Supervisor
	G. Chretien	Field Supervisor
1979	M. Hickmott	Project Manager
	D. Beirnes	Assistant Project Manager
	R. Frank	Field Supervisor
	G. Chretien	Field Supervisor
	J. Brault	Field Supervisor
	G. Martin	Field Supervisor
	R. Hotti	Field Supervisor
1980	M. Hickmott	Project Manager
	J. Hughes	Assistant Project Manager
	R. Frank	Operations Manager
	J. Miller	Field Supervisor
	R. Brisson	Field Supervisor
	G. Chretien	Field Supervisor
1981	M. Hickmott	Project Manager
	T. Fasciano	Assistant Project Manager
	J. Miller	Field Supervisor
	S. Lohnes	Field Supervisor
	K. Anderson	Field Supervisor
	G. Serafini	Field Supervisor
1982	J. Miller	Land Reclamation Co-ordinator
	B. Lautenbach	Technical Support
	G. Serafini	Field Supervisor
	J. Wilkin	Field Supervisor
	V. DeLuca	Field Supervisor
1983	J. Miller	Land Reclamation Co-ordinator
	B. Lautenbach	Technical Support
	G. Serafini	Senior Project Supervisor
	N. Benkovich	Field Supervisor
	L. Moulaison	Field Supervisor
	V. DeLuca	Field Supervisor
	J. Brault	Field Supervisor
1984	J. Miller	Land Reclamation Co-ordinator
	B. Lautenbach	Technical Support
	J. Brault	Field Supervisor
	B. Renwick	Field Supervisor

Appendix F

Non-Monetary Program Support

1.	Alexander Centre Industries:	numerous tonnes of slag for access road building, storage area for lime, use of a loader to move lime;
2.	Cambrian College:	use of science laboratory facilities for soil testing and analysis;
3.	Canadian Pacific Railroad:	CPR locomotive and flatbed to move lime (1980); passenger car for committee tour;
4.	Cecchetto and Sons Ltd:	use of loader and loader/backhoe;
5.	Falconbridge Ltd.:	supplied stake truck for moving lime, loader, fertilizer, seed and commercial wildflower seed;
6.	INCO Ltd. Agricultural Department:	supplied haywagon for moving lime, tractor mounted tree spade for tree transplanting, hydro seeder for special project locations, hay and straw mulch for hydro seeding, and use of storage sheds for seed and fertilizer storage;
7.	INCO Ltd.:	INCO locomotive and flatbed for moving lime;
8.	Laurentian University:	science laboratory facilities for monitoring activity;
9.	Ministry of Transportation & Communications:	use of storage compound in Wahnapitae for fertilizer storage;
10.	Regional Municipality of Sudbury Operations Department:	use of storage depots at Airport Depot and Garson No. 4 well for storage of seed and fertilizer and all equipment; use of equipment pool and periodic loan of heavy equipment;
11.	Sudbury Parks and Recreation Department:	use of fieldhouse for threshing and storing native seed collected in 1978-1979; use of office tables and chairs;
12.	Town of Nickel Centre:	use of truck, loader, equipment and storage area for seed and fertilizer:
13.	William Day Construction:	use of loader and grader.