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FIELD TRIP GUIDEBOOK

INDUSTRIAL MINERALS OF SOUTHEAST MANITOBA

(FIELD TRIP B7)

by

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INDUSTRIAL MINERALS OF SOUTHEAST MANITOBA

Industrial minerals produced in southeast Manitoba include lithium, cesium, tantalum, sand, aggregate, dimension stone and peat. Lithium, cesium, and tantalum are produced for export from the Tanco mine in the Bernic Lake pegmatite. Sand and aggregate are quarried for use in local construction. Dimension stone and peat are quarried for local consumption and export. Two companies, SunGro Horticulture Canada Ltd., and Premier West Peat Moss Ltd. quarry horticultural quality sphagnum peat. The locations of the peat quarries are shown on Figure 1. Five companies, Cold Spring Granite (Canada) Ltd., Gillis Quarries Ltd., Groupe Polycor, Manex Ltd. and Canital Granite Ltd., quarry dimension stone. Gillis quarries a dolomitic limestone, the renowned "Tyndall Stone", and the other companies quarry granite. Locations of the stone quarries are shown on Figure 2.

Geological setting

The peat quarries (Fig.1) are located in areas of thick glacio-lacustrine sediments that overlie the Archaean Superior Province. Granite quarries (Fig. 2) in southeast Manitoba are located in late tectonic granitic batholiths on the western edge of the Archaean Superior Province.

Sphagnum Peat

Canada holds more than a third of the world's peat resources with 1,223,834 km^2 of peatlands, or 12 percent of the total land mass (Tarnocai *et al.*, 1995) Approximately 40% of Manitoba's surface is covered with peat deposits, many of which are inaccessible and/or of uneconomic thickness and quality to be quarried (Dixon and Stewart, 1988). Still, Manitoba holds vast reserves of peat suitable for horticultural or energy peat production. At present, only horticultural quality sphagnum peat is quarried in Manitoba.

Horticultural quality sphagnum is the fossilized but undecomposed remains of sphagnum moss plants. Sphagnum deposits accumulate in areas of poor drainage where the rate of atmospheric precipitation exceeds the rate of evapotranspiration, *i.e.* the low boreal forest climatic zone shown on Figure 1. The accumulation occurs above the level of the local watertable in an acidic nutrient poor environment. The characteristics of sphagnum that allow it to survive in this environment are the same characteristics that make it valuable to the horticultural industry as a growing medium and soil conditioner. These characteristics are:

1. the ability to absorb approximately 20 times its weight in water,

2. a high capacity for cation exchange,

3. a fibrous structure that introduces volume and pore space to a soil mix,

4. compressibility and,

5. the ability to resume its precompression volume after compression is released.

Sphagnum moss is composed largely of rigid walled hyaline cells. The function of these cells is to absorb and hold water. Since the sphagnum must get

all its nutrients from the nutrient poor atmospheric precipitation, it is able to absorb approximately 20 times its weight in water and has a high cation exchange capacity. These properties make it a valuable growing medium in places like Texas where the native soil is fine and does not retain moisture. The hyaline cells are compressible and will resume their shape even after being compressed to a 10:1 ratio. The sphagnum moss can be compressed into bales for efficient transport.

These properties are retained after the plant has died and even when it is slightly humified. Since the accumulation of sphagnum takes place in an acidic, oxygen poor environment, it is possible for several metres of relatively undecomposed sphagnum to develop. The high quality bogs in southeast Manitoba accumulated sphagnum to a maximum depth of approximately 2.5 m over a period of 4000 years.

Two companies, SunGro Horticulture and Premier West quarry (or harvest) 6 bogs in southeast Manitoba (Fig. 1). SunGro also holds leases in good standing in the Interlake for future development. In total there are almost 4000 hectares of leases in good standing in the Interlake and southeast Manitoba. In addition there are pending leases on approximately 5500 hectares of peat in the Interlake and southeast Manitoba. Peat production in Manitoba in both 1994 and 1995 was approximately 100 000 tonnes worth an estimated 12 million dollars.

A bog must be prepared for quarrying before peat extraction occurs. First the trees and roots are removed, ditches are dug, and the bog is drained. It may take two years to prepare a bog for quarrying.

Sun dries the surface of the bog, which is then raked using a harrower (or cultivator) to loosen the surface peat. This loose, dry peat is lifted from the surface with a "vacuum harvester". The harvesters empty the quarried peat into stock piles, or winrows. The stockpiled peat is either moved into the plant for processing or is stored in plastic "silage" tubes for future processing when unfavourable weather prohibits harvesting. (Peat can't be quarried if the weather is too wet or too dry, because quarrying equipment can't operate on a bog that has been saturated by rain or meltwater, and sparks from equipment can ignite peat dust in hot, dry weather). Once in the plant, the peat is dried (if necessary). Popped perlite is added as a volumizer. The peat is treated with surfactants, which increase absorptive capacity, and fertilizers. The type and quantity of the chemicals added to the peat are dependent on the intended end use. Specialized mixes are available for several applications, *i.e.* soil mix for violet plants. The peat is baled, shrink wrapped on pallets and stored in the warehouse before being loaded onto semitrailers. Some of the peat is sold in local markets, but most goes to nurseries and greenhouses in the southern United States. The peat companies take advantage of backhaul rates by shipping the peat south in trucks that bring produce to Manitoba from the southern United States. Ninety percent of the peat from SunGro's Manitoba quarries is exported to Texas. If the SunGro quarries in Alberta or New Brunswick are unable to produce because of bad weather or labour problems, Manitoba peat is diverted to markets west or east of Texas to cover the shortfall. Both SunGro and Premier West operate quarries across Canada.

SunGro presently holds 29 leases for a total of 3785 hectares in good standing in southeast Manitoba and the Manitoba Interlake. The company plans to open a plant near Riverton, in the Interlake, by the year 2007.

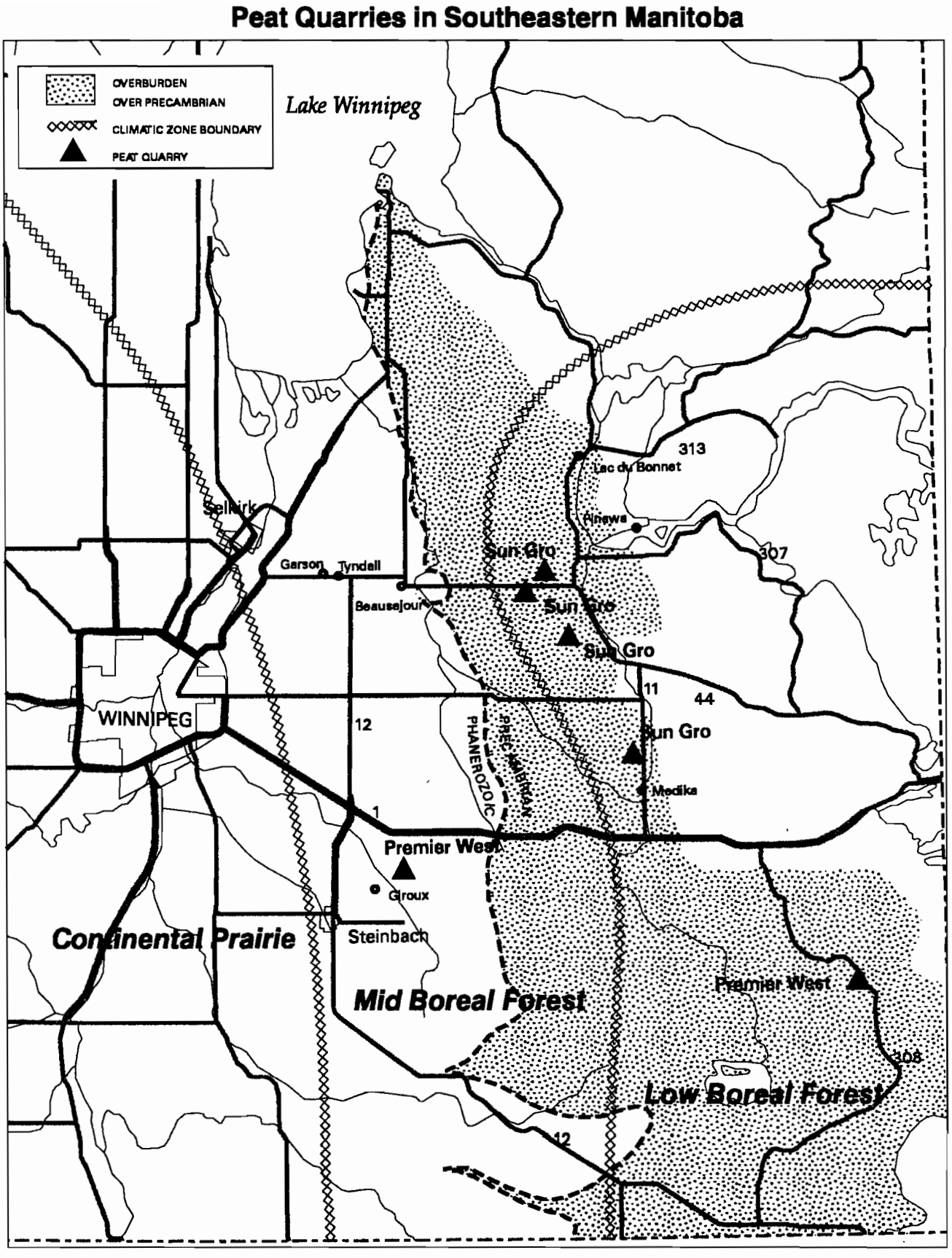

Figure 1: Locations of sphagnum peat quarries in southeast Manitoba

Elma Bog

The Elma bog, which is quarried by SunGro Horticulture Products Ltd., is approximately 3000 acres (12.14 km^2) in area and has been in production since 1969. The on site plant was completed in 1972. Peat is quarried using the vacuum harvesting method described above. The bales are loaded at the plant into semitrailers and shipped to the southern United States. A small percentage of the peat is sold for local consumption at retail stores in Manitoba. Reserve estimates have not been published by the company.

Granitic dimension stone

Few granitic outcrops display the physical features required in a dimension stone deposit. These features are listed in Schmidtke (1993) as:

1. widely spaced, preferably orthogonal fractures that will allow removal of blocks with a minimum trimmed size of 2.0 by 1.25 by 1.25m;

2. widely spaced, or preferably the absence of, veins;

3. homogeneous, attractive and fashionable colours and textures;

4. the absence of minerals that pluck when polished, or oxidize and cause unsightly rust spots when exposed to the elements;

5. road access,

6. proximity to transportation routes, finishing facilities and markets and,

7. acceptable strength values that meet ASTM standards (as per Annual Book of ASTM Standards).

The geology of the Lac du Bonnet Batholith (LDBB) has been the subject of intensive study by Atomic Energy of Canada Ltd. (AECL) as a research site for geological, geotechnical and hydrogeological studies to determine the potential for storing nuclear waste at depth in granite. The regional geology has been described by Tammemagi *et al.* (1980) and McCrank (1985).

The LDBB (outlined on Figure 2) is the youngest intrusion in the Winnipeg River area (Tammemagi et al., 1980). The batholith is a predominantly pink granite that extends over approximately 1000 km^2 from Pointe du Bois southwestward beneath Paleozoic cover. The largest exposures of the batholith occur east of the town of Lac du Bonnet, but isolated outcrops are found as far west as the farmlands directly north of Beausejour. Many of the outcrops of Lac du Bonnet granite have widely spaced fractures, which makes them potential sources of dimension stone (Schmidtke, 1993).

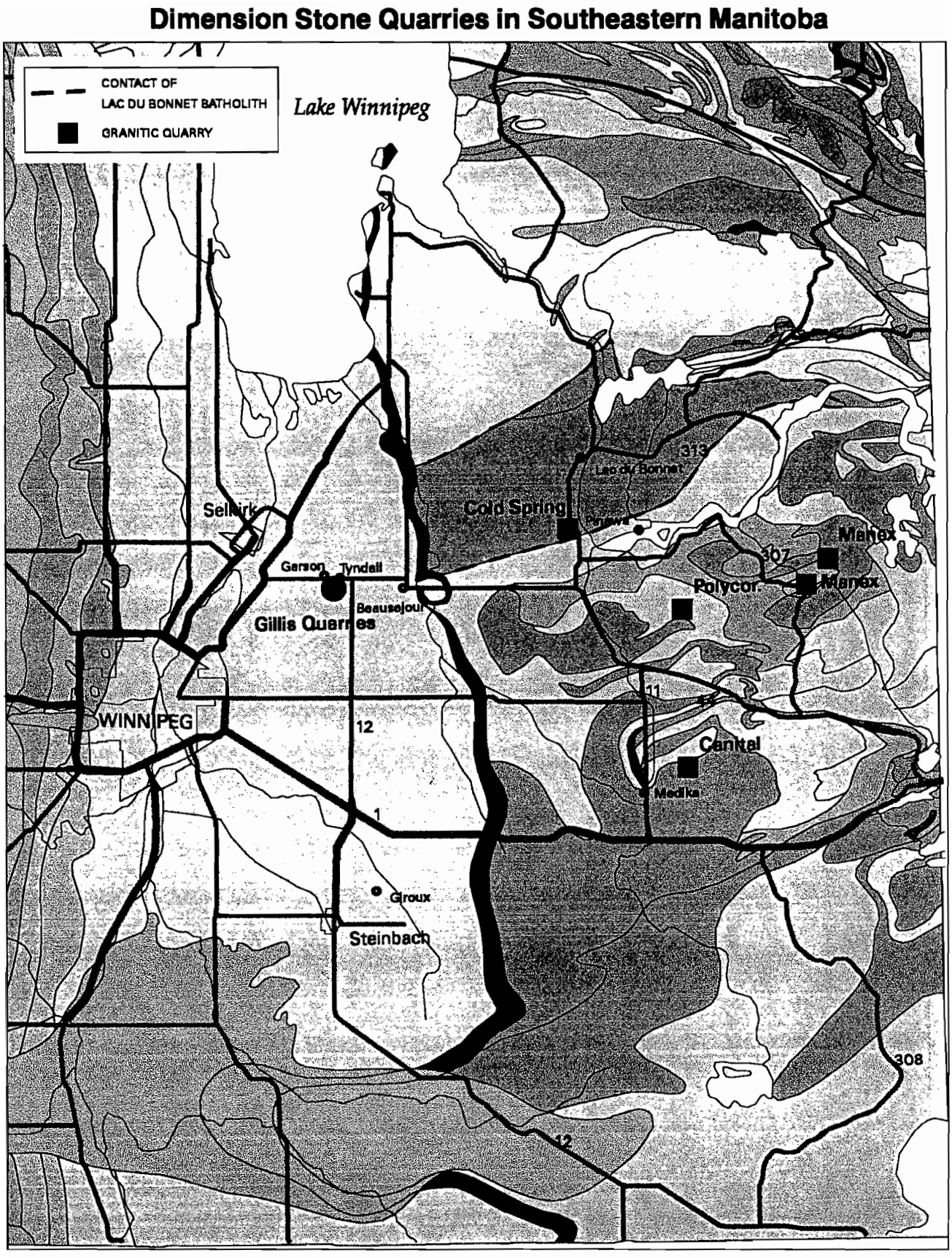

Figure 2: Locations of dimension stone quarries in southeast Manitoba

Cold Spring Granite quarry

The Cold Spring Granite is located in the south central area of the LDBB on a 1220 m long 6 to 8 m high ridge approximately 10 km south of the Town of Lac du Bonnet (Fig. 2). The quarry is accessed via Highway 11.

The rock was first quarried from 1933 to 1949 by a local resident, Ivor Peterson, for tombstones. An American company, Cold Spring Granite Ltd., reopened the quarry in 1959 and has produced stone from the ridge to the present time.

The product is a fine grained pale rose granite sold under a variety of trade names including Lac du Bonnet, Canyon Rose, Colonial Rose and Canadian Mist. Even-grained rock is used for monuments and building stone, textured or variegated rock is used for tiles and countertops. The plant at Lac du Bonnet is equipped to make grave markers, countertops, paving and landscaping material, and structural panels. Blocks are shipped to the Minnesota plant for finishing into headstones, mausoleums, monuments, columbariums, structural panels, tiles, custom design industrial work, paving and landscaping material. Fine grained, even textured Lac du Bonnet granite is prized for grave markers, monuments and headstones, because sandblasted letters and designs stand out well. It is also a preferred rock for precision industrial applications because it takes a very tight smooth polish, *i.e.* precision milling surfaces. Rock is sold locally from the Lac du Bonnet quarry, and internationally through Cold Spring Granite's office in Cold Spring, Minnesota.

Prior to 1987, rock was removed from the quarry with wire saws. Since 1987, blocks have been removed by drilling and blasting. Sections of the outcrop are drilled off with portable, track-mounted, hydraulic drills. The drilled sections are then separated from the outcrop by blasting. The blast must move the section of rock without shattering it or inducing microfractures. The sections of rock are then drilled and wedged into smaller blocks that are moved to the plant with a 988 Cat loader. The plant has a 10 wire slab saw, a Salvatore 16 head polishing machine, a JB 110 granite milling machine, a 24" diamond saw and 6', 2', and 1' hydraulic splitters. Blocks are cut into slabs with the wire saw. The slabs are cut and polished with the diamond saw and the polishing machine for use as structural stone. Polished slabs are also manufactured into paving stone and grave markers with the hydraulic splitters and into countertops and furniture with the milling machine. Raw blocks are shipped to plants in Montreal for manufacture into granite tile and to the plant in Cold Spring, Minnesota to be processed for all other applications.

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