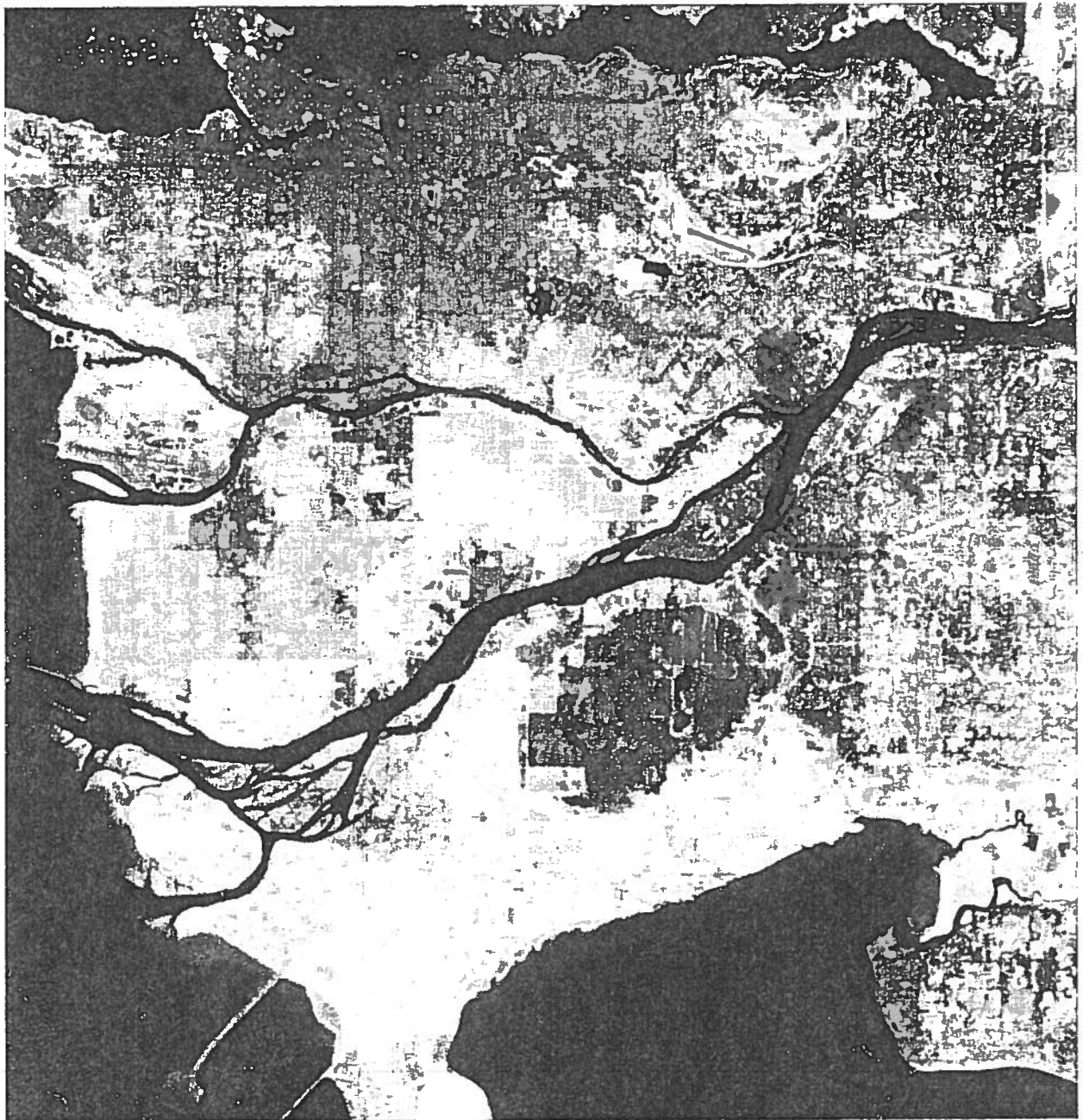




Ministry of Environment Lands & Parks



# BURNS BOG ANALYSIS

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Province of British Columbia

# EXECUTIVE SUMMARY

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## Introduction

Burns Bog is a 4000 hectare raised peat bog in north Delta. It is one of the largest tracts of undeveloped land in the Lower Mainland. It was studied here as one component of the Boundary Bay Area studies funded by the Province. The Burns Bog Analysis was guided by a study team including provincial, regional and local agencies, industry, First Nations, public interest group, and landowner representatives. The study team had input into all aspects of the work. The scope of the study was inventory and preliminary analysis. The process included information collection and review, preliminary analysis of existing and potential land uses and a public open house. Issues were identified early in the process. They relate to ecological significance; protected area, research, recreation and agricultural potential; waste management; land use; ownership; and First Nations concerns.

## Primary Natural Resources

The bog began to develop in the Fraser River Delta about 5000 years ago. The historical boundaries of the bog have been mapped. Bog-type soils are relatively consistent with the historical bog boundary, although some mapped soil types have been affected by drainage and harvesting in their conversion to agricultural use. The bog is a gentle dome. The height of land is just south of the centre and surface and subsurface water flows generally north and south from that area. Numerous ditches have been built to facilitate peat extraction and to provide water to adjacent agricultural lands.

Vegetation is primarily Sphagnum heathland in the central portion. South of this is a significant amount of pine woodland. The bog is generally ringed with mixed deciduous and coniferous forest. Much of the vegetation is more characteristic of a boreal realm and some uncommon species exist. Where harvesting of peat has occurred in the past, the natural vegetation has been altered and a patchwork of various vegetation types remains.

Detailed knowledge of the wildlife is unavailable. Based on existing information, the wildlife using the bog includes approximately 20 species of waterfowl, 18 species of raptors, 9 species of gulls, 9 species of shorebirds, 87 species of passerines and other birds, 24 species of mammals, and several species of amphibians and reptiles. The Sandhill crane, which is known to frequent the bog, is of specific interest because it is a relatively uncommon species in the Lower Mainland. Informal sightings indicate that Burns Bog may also be home to some rare species of insects.

Peatlands are composed of living Sphagnum moss and other plants growing at the bog surface which decompose into the peat which lies underneath. Bogs sequester carbon from the atmosphere and they also generate methane. Over time they become less effective in sequestering carbon but they continue to store it. When disturbed, bogs release carbon. It is possible that bogs also release methane to the atmosphere when disturbed, however the role of wetlands as sources and sinks for methane is imperfectly understood.

## Primary Human Activities

Knowledge of First Nations use of the bog is limited by a lack of archaeological surveys. The area has potential for archaeological remains. Peat harvesting has occurred in the area since the 1940's. Methods have included hand, mechanical and dredge-like machine harvesting processes. Ponds have developed in some locations which were dredged, and these areas attract waterfowl.

The majority of Burns Bog is owned by one private company, Western Delta Lands Inc. The City of Vancouver (Vancouver) owns 627 hectares for use as a sanitary landfill. The remainder of the bog is owned by various public and private interests.

There are no existing formal uses of the large central portion of the bog. A local hunting club has permission to use the area and unauthorized walking and nature viewing occur. A peat extraction lease exists though no peat extraction has taken place recently. The Vancouver landfill currently occupies 268 hectares in the south-west portion of the bog. Agriculture occurs around the margins of Burns Bog. Along the north boundary of the bog is an industrial area fronting on River Road.

The majority of the bog is zoned for peat extraction and processing. The surrounding zones are generally consistent with the pattern of existing use. The Agricultural Land Reserve parcels generally conform with the lands being used for agriculture. Various new regional arterials and local roads have been studied in and around the study area, but there are no confirmed plans for new roads.

## Preliminary Analysis

The preliminary analysis involved discussion of the primary land uses perceived as potential uses of the study area.

### Protected Area

B.C. Parks and B.C. Environment have interest in Burns Bog as a potential Ecological Reserve, Provincial Park, Wildlife Management Area (WMA), or some combination of these. The primary characteristics of the bog that qualify it for consideration include the following:

- Ecological Reserve - The bog is suitable for scientific research and education, including study of the process of bog recovery from human modifications. It provides various opportunities for research on the plant and animal species. The bog contains relic plant species that are very unusual for the south coast of B.C. Burns Bog has been cited as being the finest example of a raised bog in the northwest of North America and there are currently no examples of raised bogs in the system of Ecological Reserves.
- Provincial Park - Burns Bog contains scientific, historic and scenic resources that are candidates for preservation and presentation to the public. Specific opportunities include wildlife viewing and plant interpretation of some unusual species.

- Wildlife Management Area - The bog provides habitat for Sandhill cranes which are threatened in the Lower Mainland. Burns Bog has high values to wildlife in general. The bog is unique regionally, provincially, nationally, and perhaps internationally from an ecosystem perspective.

Provincial protected area status requires control of the land by the provincial government. This would require action on the following issues: 1. The Province would need to purchase the land, and 2. The Province would need to acquire the mineral rights which are held by private companies.

Five concepts for the extent of a potential protected area were outlined solely as a presentation of a range of options. The purposes of the concepts are as follows:

- Concept A - to establish the entire original bog as a protected area,
- Concept B - to establish the entire original bog minus areas which are already intensely developed as a protected area,
- Concept C - to designate one large unharvested portion, some mixed coniferous forest, and some of the human-modified part of the bog as a protected area, maintaining the dome formation by including land on either side of the existing height of land.
- Concept D - to establish a large unharvested and undeveloped portion of the bog and a small portion of the harvested part as a protected area, including the existing height of land within the protected area.
- Concept E - to allow land use to develop in accordance with Delta planning and development controls, therefore outlining no specific protected area.

Considerations of each protected area concept are listed in the report. The primary recreational activities appropriate for a protected area on Burns Bog include walking, nature viewing and natural history education. If a protected area were established, surrounding land uses would need to be planned to provide a buffer.

### Recreation

Existing recreation use in the study area consists of day hiking, guided walks, nature viewing, natural history education, hunting, photography/painting, motorbike riding, horseback riding, and golf. Controversy exists over the appropriateness of motorbike riding, horseback riding and golf on Burns Bog. Minimal facilities have been provided for most of the existing uses, and some of the use is unauthorized. There is currently one golf course within the study area. An additional two golf courses have recently been proposed. Potential exists to provide facilities for the activities noted above and to provide opportunities for heritage interpretation. The primary existing constraints related to the development of recreational facilities include environmental sensitivity and private ownership. The realization of recreation potential will depend on the eventual ownership, designation, and environmental impact assessments.

## Agriculture

Physical conditions in the bog make it particularly suited to two crops: cranberries and blueberries. Cranberries can only be grown on lowland and bog-type soils and there is a limit to the available land of that type in B.C. Market forces are such that land on Burns Bog will unlikely be in demand for cranberry production in the near future. In addition to market forces, suitability for cranberry production is dependent upon a large supply of fresh water and on good road access, neither of which currently exists in the portions of the study area not already in development or in operation as cranberry bog. If the present economic and market conditions and limiting factors such as road and water development were to improve, expanded cranberry production in Burns Bog would be possible.

Although Burns Bog could be used for blueberry production, blueberries can be grown successfully on many different soil types and are currently being cultivated primarily on mineral soils. Areas of the bog which are suited to blueberry production but have not been cleared or drained may be too expensive to bring into production under current market conditions. Given the current market, economic and land conditions, it is unlikely that there will be a demand for increased blueberry production on the bog in the near future.

There is potential for impacts on adjacent existing or proposed land uses by practices on agricultural land. The installation of drainage works or water control structures on agricultural land can have impacts on the water balance of the bog and other adjacent lands, and careful management is required to minimize any negative effects. There is concern over the removal of existing vegetation and subsequent changes to wildlife habitat which occur as a result of agriculture.

## Peat Extraction

Peat is a valuable commodity as a soil amendment, but there are many new alternatives to peat. It has been estimated that 10 to 20 million tonnes of recoverable peat is available on private land in Burns Bog. These facts need to be considered when evaluating the land for other uses.

The extraction of peat has significant impacts on the vegetation since the existing vegetative cover is removed, and this in turn affects wildlife resources. In addition, removing peat can release stored carbon and possibly methane to the atmosphere.

## Waste Management

Waste management is an important factor affecting Burns Bog. Existing landfills can be grouped into three areas as follows: 1. City of Vancouver landfill, 2. River Road properties, and 3. 60th Avenue extension. There is a critical need for sites in which to dispose of the waste generated within the region. The biggest concern related to landfills on Burns Bog is that this use eliminates bog habitat and resources. There are also concerns about potential pollution and its effects on the surrounding area.

The Vancouver landfill operation has a statutory and legal obligation to dispose of municipal solid waste generated by five municipalities in the Lower Mainland. There is currently no indication from the monitoring program of the Vancouver landfill that any leachate from the landfill is leaving the site. A technical study of waste management options for the Lower Mainland has recently been

commissioned by the GVRD. This stage of GVRD's Solid Waste Management Plan Review will assess different methods for reducing and disposing of the region's solid waste and there is a risk that the region may need to utilize the Vancouver landfill site more intensively. Recognizing the size of the site and the condition of the bog vegetation, there is considerable interest from many sectors in maintaining the native vegetation located on the landfill site.

There are other landfill sites for demolition and land clearing wastes within the study area along River Road and near Highway 91. These landfill operations have waste management permits from B.C. Environment. B.C. Environment intends to investigate leachate containment and treatment systems in these landfills in the 1993/94 fiscal year. In addition to the permitted sites, unauthorized dumping occurs.

A road composed of special waste light-weight tar material (residue from the production of phenol and benzoic acid) on the 60th Avenue extension was found to have leachates which are acutely toxic to fish and aquatic life in the immediate area. Recommendations for remediation are being formulated at the present time.

#### Other Land Uses

Should portions of Burns Bog not be designated a protected area or be used for agriculture, peat extraction or landfill purposes, there are other uses which could be located there. Most of these could follow the extraction of peat. Two golf courses and a race track have been proposed within the study area. The development of any other land uses will need to be evaluated in relation to their potential impacts on natural resources and on other existing and potential uses, e.g. water supply to agriculture.

#### **Future Needs**

In order to further analyze options and develop land use plans for the area, additional information would be useful. The specific information needed and the timing of those needs will depend on decisions made and actions taken with respect to Burns Bog. Information needs with respect to establishment of a protected area include Sandhill crane population data and hydrological information, particularly related to effects of draining portions of the bog. For ongoing management, information is needed about various land use impacts on water quality, small landfill impacts, 60th Avenue extension road impacts, and future transportation requirements. General knowledge to be obtained over time includes detailed information on vegetation communities, wildlife use, hydrology, and water quality; and data on the role of the bog as a carbon sink, the rate of recovery of bog lands, impacts of various land uses on the bog, and private funding sources to acquire wetlands.

The primary next step at the provincial level will be the consideration of Burns Bog within the Protected Area Strategy for the region.

- Annacis - Lumbum - (Annacis) very poorly drained, deep well decomposed peat over deltaic soil
- Annacis - Blundell - (Blundell) underlying silty material
- Delta - Blundell - (Delta) poorly drained, high organic matter content in top soil, saline and very acidic subsoil
- Delta - Kitter -(Kitter) well drained, medium textured deltaic deposits
- Delta - Vinod (Vinod) poorly to very poorly drained, organic over deltaic
- Embree - poorly to very poorly drained, medium textured marine and fresh water deltaic deposits
- Embree - Sandel - (Sandel) poorly to very poorly drained, medium textured mixed marine and freshwater deltaic deposits over sand
- Embree - Spetifore - (Spetifore) poorly to very poorly drained, medium textured deltaic deposits over medium to fine sand
- Goudy - very poorly drained, organic over mixed marine and fresh water deltaic deposits
- Ladner - Delta - (Ladner) very poorly drained, dense subsoil may contain sand layers, extremely acidic subsoil
- Lulu - Richmond - (Richmond) poorly drained, underlying fine and medium textured deltaic deposits

The first three soils listed above are the primary bog soils. Bog soils are characteristically very poorly drained, acidic, and they are composed of moss, which slowly decomposes in layers forming peat. The configuration of the bog soils can be seen to be fairly consistent with the historical bog boundary.

### 2.1.3 Hydrology

The surface of Burns Bog is a gentle dome. The highest point is approximately 5.5 metres above mean sea level and the surface slopes gently (at about .0007 % slope) down to an elevation of about 3 metres above sea level at the perimeter of the bog. The height of land runs in an east-west direction slightly south of the centre (see Map 3). One theory holds that the high point may have shifted south as a result of harvesting and drainage activities (Hebda, pers. comm. 1993).

The mean annual precipitation in the vicinity of the bog is 100 cm. (Wright 1966). There is more precipitation in the north than in the south part of the bog.

The general surface and subsurface flows are determined by the surface slope. Water generally flows north and south from the height of land. Construction of the new Highway 91 and related ditches likely intercepted much of the runoff which previously would have flowed westward from the

eastern upland area into the bog (Dakin, pers. comm 1993). There are a number of large areas of standing water, which exist as a result of human activities in the past. In addition, there are smaller areas of standing water, and large areas which flood seasonally.

Numerous ditches have been constructed to facilitate peat extraction and to provide water to adjacent agricultural lands. The primary ditches and their direction of flow are indicated on Map 3. There are extensive ditches in the north portion of the bog, and some near the south. A central area along the height of land is relatively free of drainage ditches.

The primary source for the hydrology mapping was Piteau (1983). Ditch locations and flow were updated based on information provided by Delta. It is commonly recognized that the hydrology of the bog is not fully understood.

#### **2.1.4 Vegetative Cover**

Map 4 provides a summary of the vegetative cover of Burns Bog. Vegetation mapping has not been completed for areas which have been developed for agricultural, industrial or landfill uses.

The general pattern of vegetation in Burns Bog is as follows: Sphagnum heathland occurs in the central portion. Immediately south of the core area, there is a significant amount of pine woodland, where pine trees have grown taller amid the Sphagnum. Mixed deciduous and coniferous forest rings most of the bog. There is evidence of repeated fires within the bog, the most recent of which burned approximately 50 hectares in 1990.

In general, Burns Bog is a repository for plants which are characteristic of the muskeg portions of a Boreal realm. These bog plants are otherwise uncommon or absent in south-west B.C. One unique plant is the cloudberry (Taylor 1990). The bog rosemary is one of two local populations, the other being at the Richmond Nature Park where it may be threatened. Burns Bog may be the only Lower Mainland bog with crowberry, another boreal and oceanic species. A sub-alpine species of blueberry also exists in Burns Bog (A. Grass 1993). These plants most commonly occur in the pine woodland and wet sphagnum heathland areas of the bog.

Where harvesting activities have occurred in the past, the natural vegetation has been significantly altered. In these areas, a patchwork of various vegetation types exists. Areas which were harvested have a particular combination of species and the original vegetative cover type occurs in strips or clumps. In addition regeneration of bog species is occurring but there is no scientific data available on rates or patterns of regeneration. In some cases, the low portions of harvested areas appear identical to low unharvested areas (D. DeMill, pers. comm. 1993). These harvested areas are therefore difficult to describe.

It is known that bog vegetation regenerates. Hebda and Biggs (1981) note that conditions created by peat extraction do not appear to cause irreversible damage to the generative capacity of the bog. From determining the regeneration of two sites which had been harvested, Biggs (1976) found that the rate of sphagnum peat accumulation and productivity varies considerably. He measured regeneration at 168 g/m<sup>2</sup>/year on sphagnum hummocks and at 71 g/m<sup>2</sup>/year in wet depressions. Informal observations vary from full recovery in 40 years (DeMill, pers. comm. 1993) to hundreds of years for recovery (Rouse, pers. comm. 1993). It is important here to define "recovery". To some recovery may entail complete cover of live vegetation, while to others recovery means regeneration to sphagnum heathland in its original condition. The latter figure above is based on



the time of formation for the peat layer to attain the original two metre depth in the existing unharvested areas. In a study of a bog in southern Ontario, regrowth of vegetation after peat harvesting was measured (Jonsson-Ninniss and Middleton 1991). Disturbed areas were found to regenerate quickly, however the plots with regenerating vegetation have more woody vegetation and less diversity of vegetation than undisturbed plots.

The sources for vegetation mapping included aerial photography over numerous years, base mapping by McElhanney Engineering Services Ltd. for Western Delta Lands Inc. (1988), previous studies on the vegetation of the bog (Hebda and Biggs 1981), (Rouse 1992), and recent field observations (DeMill 1993).

Because of controversy over early drafts of the vegetative cover map, the consultants coordinated a special meeting with people particularly familiar with the bog: Richard Hebda, ecologist with the Royal British Columbia Museum who conducted extensive mapping of the bog as part of his Ph.D dissertation; Glenn Rouse, UBC professor in botany and plant paleontology and consultant to Western Delta Lands Inc.; Al Grass, naturalist with B.C. Parks; Judy Millar, resource officer with B.C. Parks; and Don DeMill, biologist associated with the Burns Bog Conservation Society. That group came to general agreement on vegetation boundaries and general descriptions for most of the study area. It was determined that more detailed mapping was required to develop descriptions for three of the map areas. Fieldwork was conducted and these areas were described by Hans Romer, ecologist with B.C. Parks. It should be noted that this fieldwork was conducted at the least desirable time of year, late February, when there are no deciduous leaves and few herbaceous plants.

The following are descriptions of the areas identified on Map 4. For a complete list of all plant species in the bog, see Hebda and Biggs (1981).

#### Mixed Deciduous Forest (Photograph 1)

- mixed deciduous forest including *Betula papyrifera* (Paper birch), *Salix lasiandra* and *Salix hookeriana* (Willows), *Rhamnus purshiana* (Cascara), *Malus fusca* (Pacific crabapple), *Alnus rubra* (Red alder), and *Acer circinatum* (Vine maple)
- some coniferous species including *Pinus contorta* (Shore pine), *Thuja plicata* (Western red cedar), and *Picea sitchensis* (Sitka spruce)
- shrubs include large areas of *Spiraea douglasii* (Hardhack), as well as *Rubus spectabilis* (Salmonberry), *Pteridium aquilinum* (Bracken), *Gaultheria shallon* (Salal), and *Ledum groenlandicum* (Labrador tea)
- the herb layer includes scattered patches of the mosses *Polytrichum commune* and *P. juniperinum*, local occurrences of Sphagnum species (*Sphagnum capillaceum* and *S. fuscum*, typ.), and scattered sedges (*Carex rostrata* and *C. lenticularis*)

#### Mixed Coniferous Forest

- mixed coniferous forest including *Tsuga heterophylla* (Western hemlock), Sitka spruce, Shore pine and Western red cedar
- includes spruce trees up to 525 years old and pines up to 135 years old
- some deciduous trees including primarily Paper birch and Red alder
- shrub layer is dominated by Salal, with lesser numbers of *Menziesia ferruginea* (False azalea), Salmonberry, Hardhack, Blueberry, Labrador tea, and Sphagnum species

### Pine Woodland (Photograph 2)

- Shore pine is the dominant tree
- some additional trees including primarily Paper birch
- extensive coverage of *Sphagnum* mosses especially in the transition to wet heathland
- shrub layer dominated by Labrador tea and Salal, additional shrubs include *Kalmia macrophylla* (Bog laurel), Blueberry, *Vaccinium oxycoccos* (Bog cranberry), and *Andromeda polifolia* (Bog rosemary)

### Sphagnum Heathland (Photograph 3)

- open aspect with scrub or small Shore pine
- wetter areas are dominated by Sphagnum mosses, and include sedges, Bog rosemary, and Bog cranberry and ponds
- drier areas are dominated by Labrador tea with mats and hummocks of Sphagnum species
- shrub layer is dominated by Labrador tea, other shrubs include Bog laurel, Blueberry, and Bog cranberry, Bog rosemary, lichens also exist

### Water - Sphagnum Heathland (Photograph 4)

- primarily year-round ponds with *Nuphar polysepalum* (Yellow waterlily) and other water plants
- some small areas of standing water, year-round with some water level fluctuation, with sedges, rushes, Sphagnum, Labrador tea, Bog rosemary, *Drosera rotundifolia* and *D. anglica* (Sundew)
- Sphagnum and other original vegetation from wet sphagnum heathland exists along access routes, edges of ponds and in various patches
- roots and stumps left from harvesting activities have been and are being recolonized by vegetation similar to the original vegetation of Sphagnum heathland, but in a humpy pattern
- exposed brown heath peat with protruding roots and stumps, commonly called "porridge peat", exists in places

### Ridge and Groove Pattern (Photograph 5)

- ridges (varying from 3 to 20 m) and grooves (varying from 3 to 20 m) as a remnant of peat harvesting (the peat was harvested from the grooves); pattern includes wide grooves with narrow ridges and wide ridges with narrow grooves
- significant amounts of Labrador tea
- mixed tree species including Shore pine, Western hemlock and Paper birch
- higher areas tend to have Salal, taller birches and mosses
- lower areas tend to have wetter sphagnum heathland vegetation
- water in ditches and between striations

### Sphagnum Heathland - Water (Photograph 6)

- areas of wet Sphagnum heathland vegetation, plus roots, stumps and brown heath peat
- some year-round ponds with Yellow waterlily and other water plants
- some temporary standing water with sedges and other herbaceous plants
- exposed brown heath peat with protruding roots and stumps, commonly called "porridge peat", exists in places

### Narrow Trench Pattern (Photograph 7)

- areas where narrow trenches exist as a remnant of peat harvesting
- Labrador tea and Shore pine on higher areas
- sedges and Sphagnum in lower areas as well as Bog rosemary, Bog Laurel and other Sphagnum heathland species
- water in trenches generally year-round with some fluctuation in water levels

### Root Hump Pattern (Photograph 8)

- areas where during peat harvesting the roots from the former bog forest were pushed together to form humps
- areas with vegetation cover around 80 percent have mosses and *Rhynchospora alba* (Beakrush sedge) dominating in the low areas, other sedges in higher areas, shrubs and small trees only on root humps
- areas with vegetation cover of 5 percent or less have sedge-type shrub vegetation only on the humps

### Longitudinal Field Pattern (Photograph 9)

- areas with varying amounts and types of vegetation as a remnant of peat harvesting, appears as large fields with a channelized pattern, shallow water exists in places
- vegetation cover variations are as described below - vegetation cover is defined as land areas covered by vegetation and deep water where there is plant material, remainder is either bare peat or temporary water areas with no vegetation
- areas with vegetation cover less than 10 percent contain mostly Beakrush sedge
- areas with vegetation cover from 10 to 40 percent include Beakrush sedge, occasional mosses, and a variety of scattered shrubs
- areas with vegetation cover from 40 to 70 percent include Beakrush sedge, other sedges, moss and shrub cover (e.g. Labrador tea and Sweet gale), and small birches
- areas with vegetation cover over 70 percent include Beakrush sedge, occasional other sedges and reeds, Sphagnum and other mosses, shrubs including Labrador tea, blueberries, Bog laurel, Bog rosemary, and Crowberry; some lichens in places

## **2.2 Primary Human Activities**

### **2.2.1 Historic Use**

Knowledge about the use of Burns Bog by First Nations is limited by a lack of archaeological surveys. The area has been noted as having archaeological potential (S. Acheson, pers. comm. 1993), and it is within the traditional use areas of various First Nations peoples. The area was used historically for hunting and gathering. Summer village sites have been documented north of Burns Bog along the Fraser River. One archaeological site, St. Mungo's, exists under the Alex Fraser Bridge just north-east of the bog. Apparently a pestle was found on a farm at the west edge of the bog (W. Nottingham, pers. comm. 1993).

In 1917 a ditch was dug along the Burlington Rail spur. In the 1940's, peat extraction of the area began. One remnant of this period is a narrow gauge railway which was used to carry the peat from the site. Map 5 shows the location of the former railway.

### **2.2.2 Harvesting Activities**

Map 6 shows a summary of the peat harvesting activities which have occurred in Burns Bog. Various methods of harvesting have been used over time, and each leaves a distinct pattern of land cover. Old harvesting equipment also remains (see Photograph 13).

The early harvesting of the 1940's was undertaken by hand. Peat plugs approximately 1.5 metres long by 30 to 40 cm wide were cut in lines, then they were stacked beside the trenches to dry before they were taken to the peat plant for shredding and bagging. This harvesting method has left linear striations. The lower portions of the striated areas are wetter and have vegetation more like dry sphagnum heathland, and the higher areas which were never harvested have some trees.

During primarily the 1950's and 1960's, machines were used to harvest the peat. These machines mechanically removed the top layer of sphagnum. The resulting pattern is large areas like fields, with undisturbed areas which appear as hedgerows around the harvested "fields". Regrowth of beakrush, other sedges, occasional mosses including Sphagnum and various shrubs is occurring.

From the 1950's to 1980's, dredge-like machines were used to hydraulically harvest the peat. Hoses under high pressure were used to dislodge the upper layers of peat, and the material was piped to the peat plant for drying and bagging. This harvesting method left an irregular pattern on the land. Ponds have developed in some locations which were dredged, sphagnum and other bog plants have grown on root humps which were piled within the area, and the original vegetation remains in strips and patches.

### **2.2.3 Ownership**

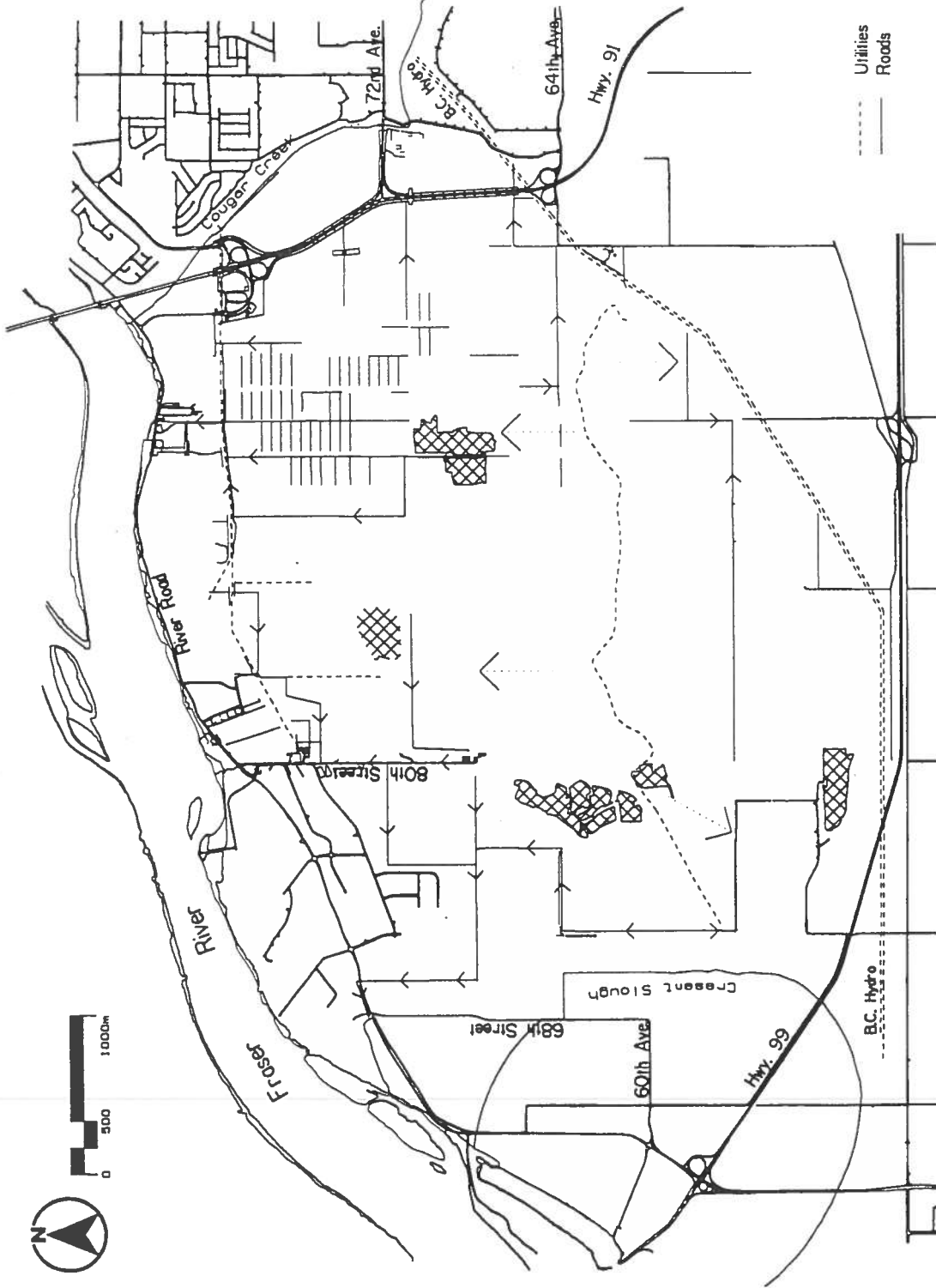
Map 7 identifies the ownership of lands in the study area. The majority of Burns Bog, approximately 2283 hectares, is owned by one private company, Western Delta Lands Inc. The City of Vancouver owns a total of 627 hectares.

Delta owns a number of land parcels. The most significant of these is the Delta Nature Reserve along Highway 91. The other sites include "Sherwood Forest", a name used to describe a dense

Map 3  
HYDROLOGY

- Permanent Ponds
- Height of Land
- General Surface and Subsurface Flow
- Ditch/Flow Direction

Note: Numerous other areas of permanent and temporary water not mapped.



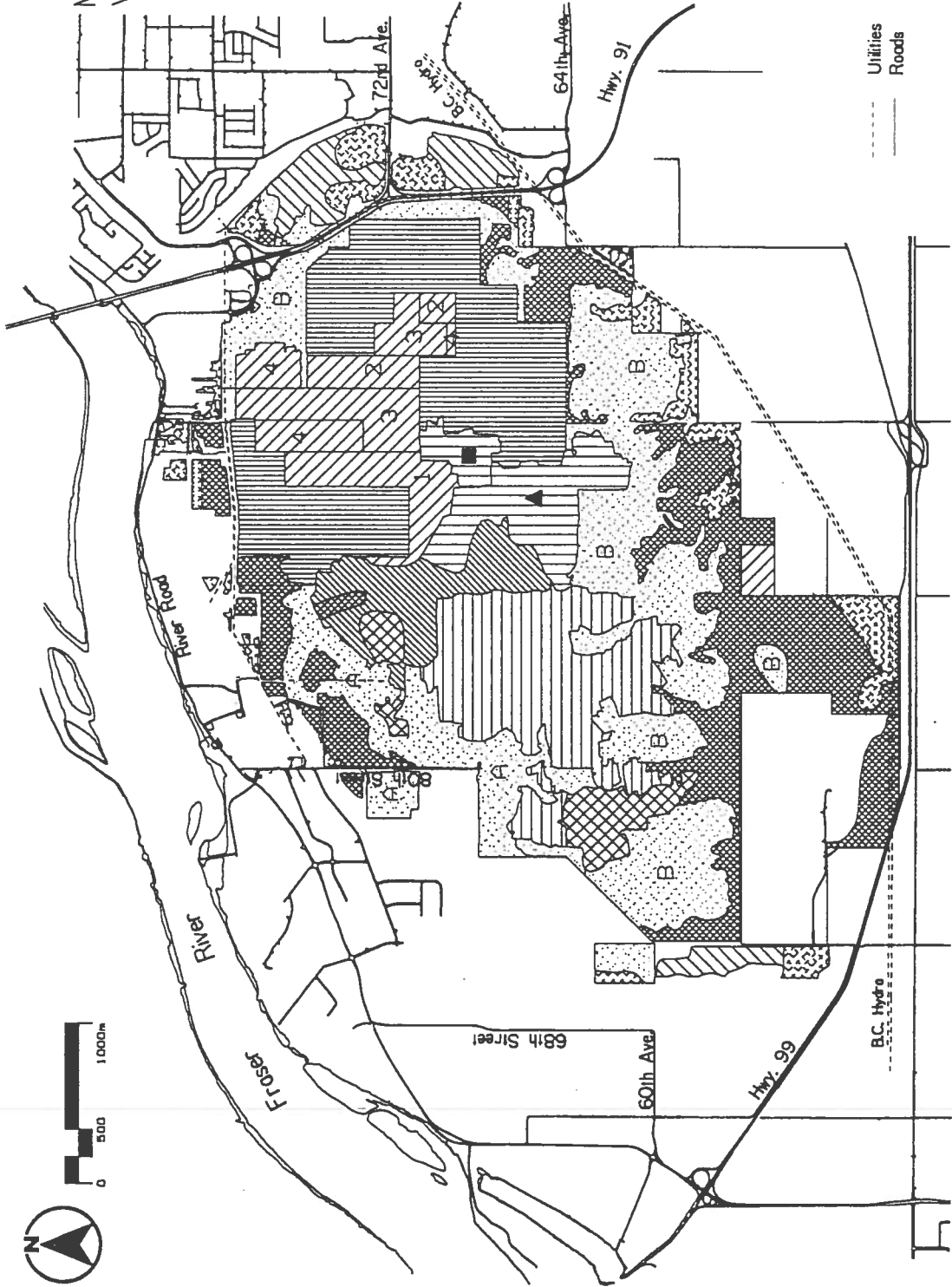
July 6, 1993

BURNS BOG ANALYSIS

Map 4

VEGETATIVE COVER

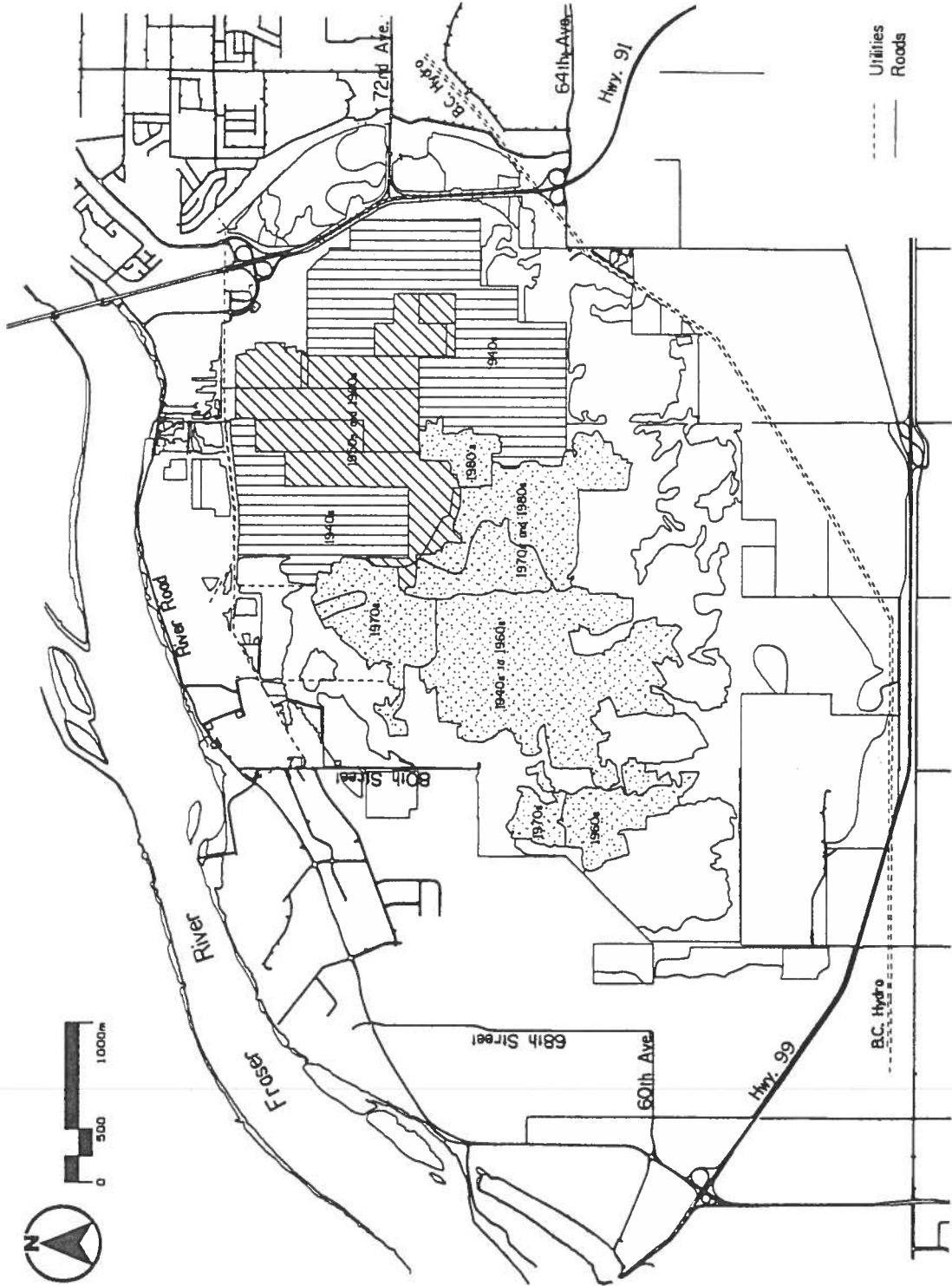
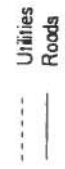
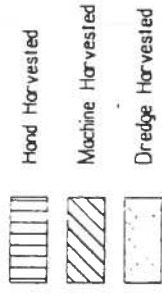
- Mixed deciduous forest
- Mixed coniferous forest
- Pine Woodland
- Sphagnum Heathland
- A-Drier
- B-Wetter
- Water-Sphagnum Heathland
- Ridge and Groove Pattern
- Sphagnum Heathland-Water
- Narrow Trench Pattern
- Root-Hump Pattern
- ▲ -Vegetation Cover +/- 80%
- -Vegetation Cover < 5%
- Longitudinal Field Pattern
- 1-Vegetation Cover < 10%
- 2-Vegetation Cover 10%-40%
- 3-Vegetation Cover >40% <70%
- 4-Vegetation Cover > 70%



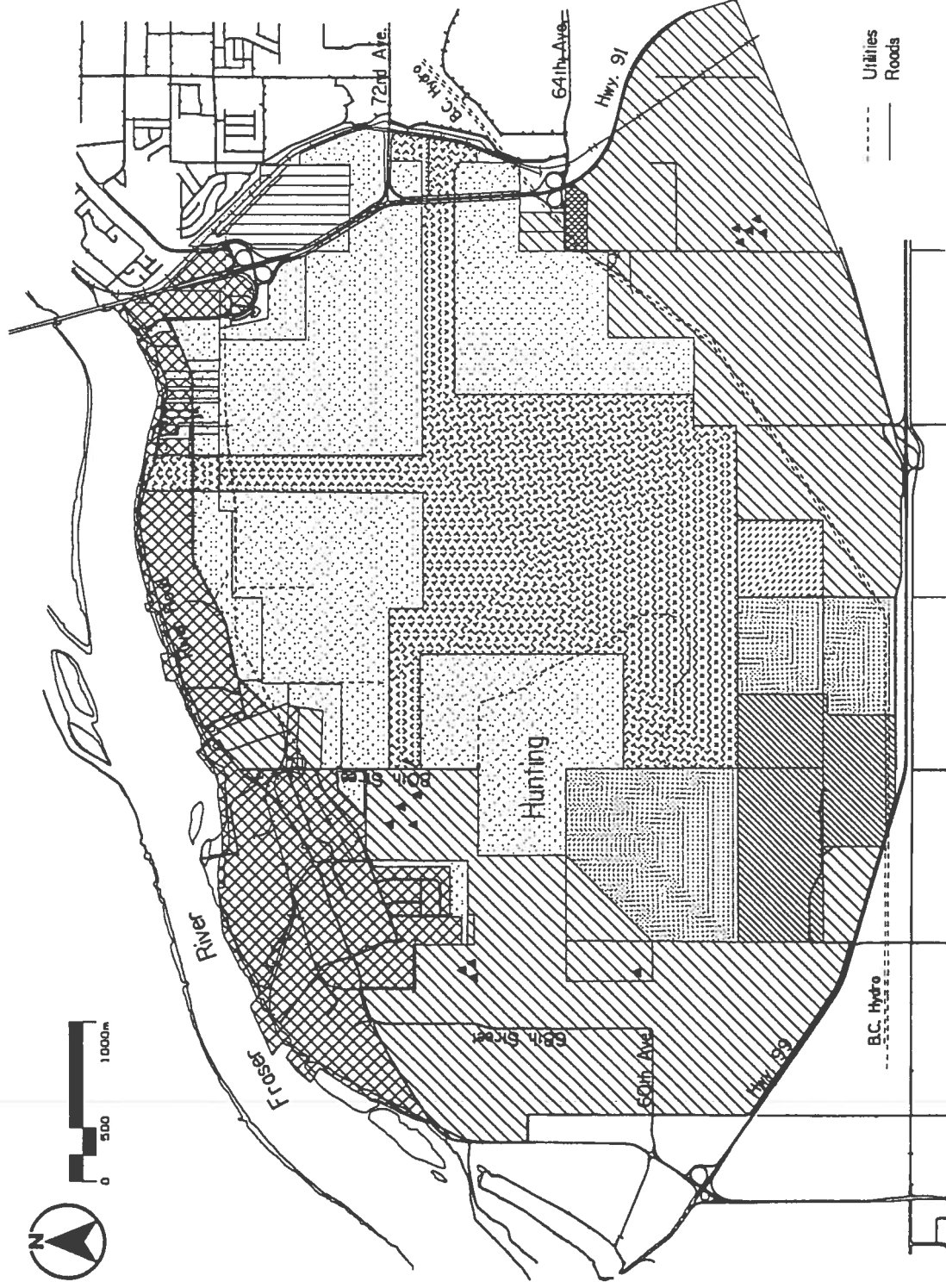
BURNS BOG ANALYSIS



Map 6  
HARVESTING



# BURNS BOG ANALYSIS



Map 8  
EXISTING USE

- Agriculture
- Commercial
- Industry
- Landfill
- Peat Extraction (Lease)
- Peat Extraction
- Residential
- Nature Reserve
- Recreation
- No Existing Use
- No Existing Use Proposed Landfill
- Radio Tower

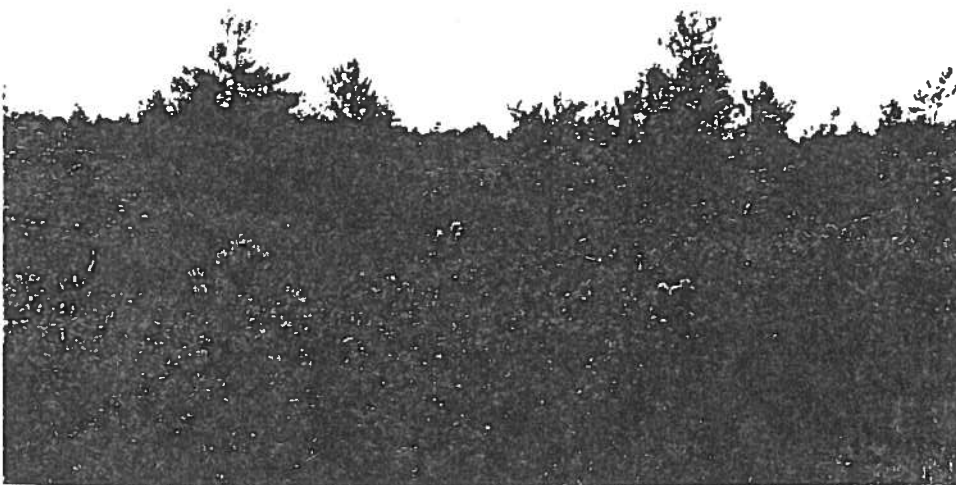




Photograph 1:  
Mixed Deciduous



Photograph 2:  
Pine Woodland



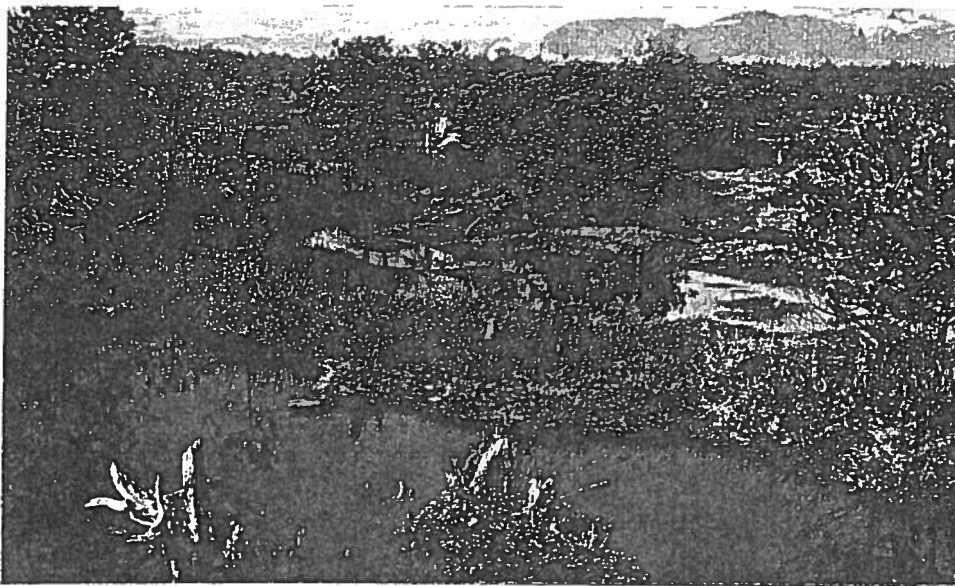
Photograph 3:  
Sphagnum Heathland



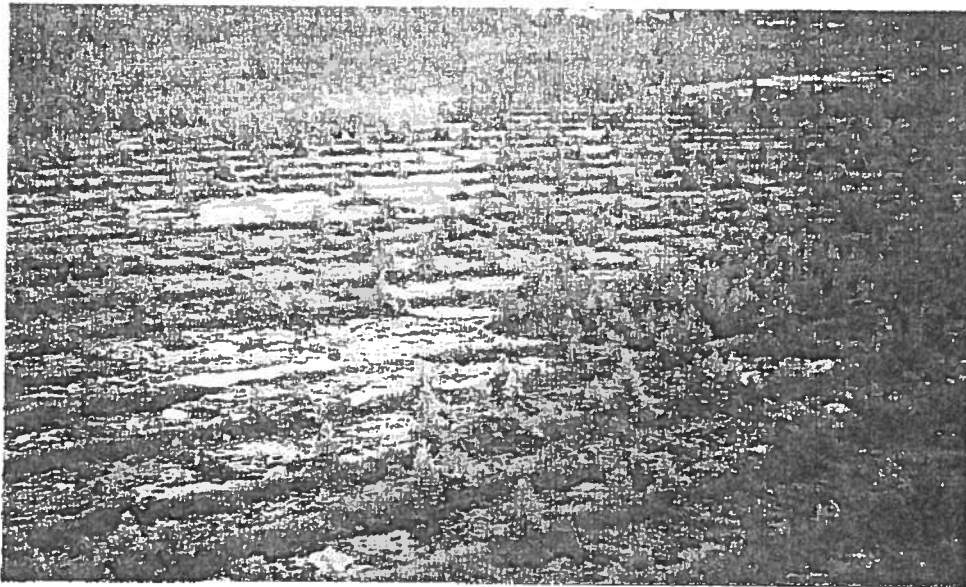
Photograph 4:  
Water-Sphagnum  
Heathland



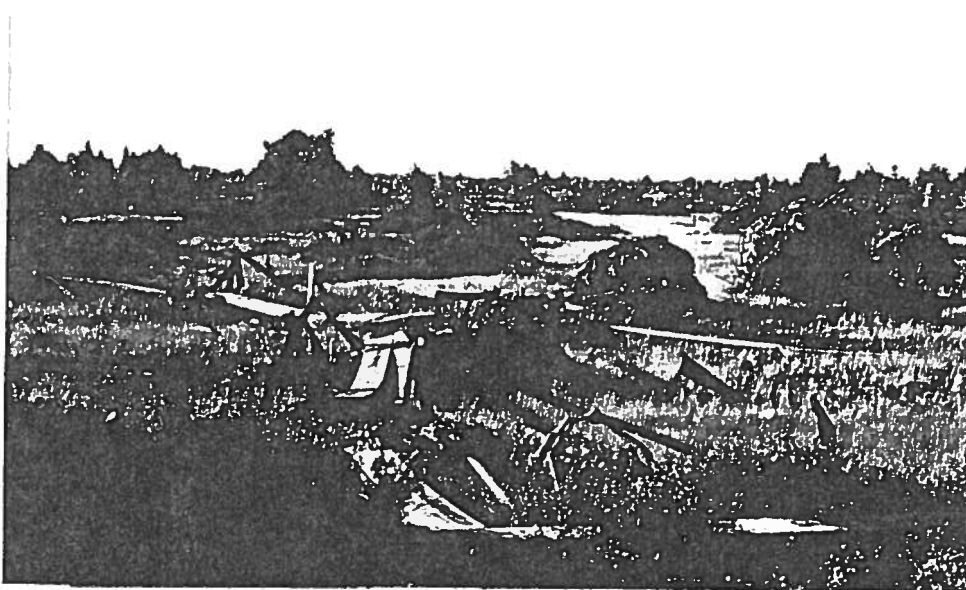
Photograph 5:  
Ridge and Groove  
Pattern



Photograph 6:  
Sphagnum  
Heathland-Water



Photograph 7:  
Narrow Trench  
Pattern

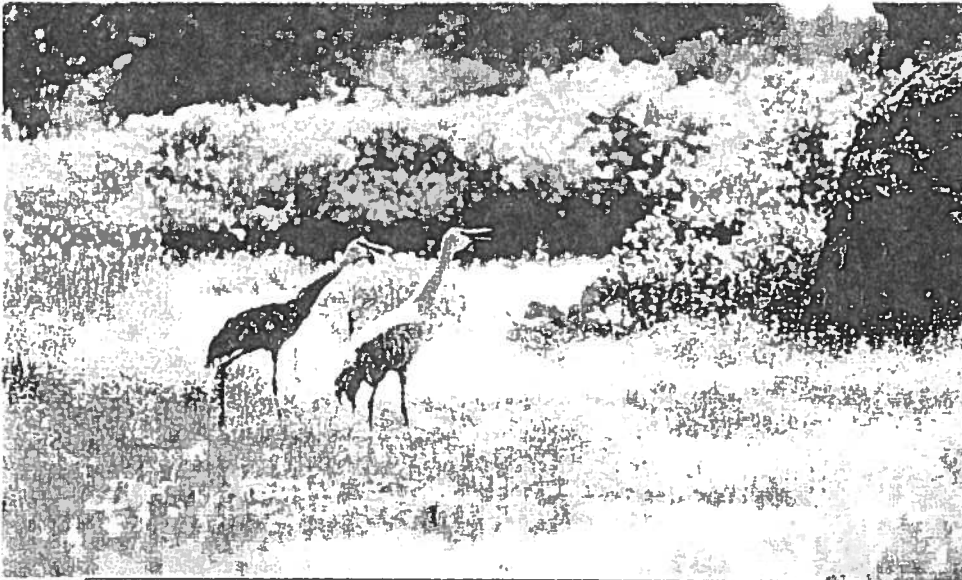


Photograph 8:  
Root Hump  
Pattern



Photograph 9:  
Longitudinal  
Field Pattern

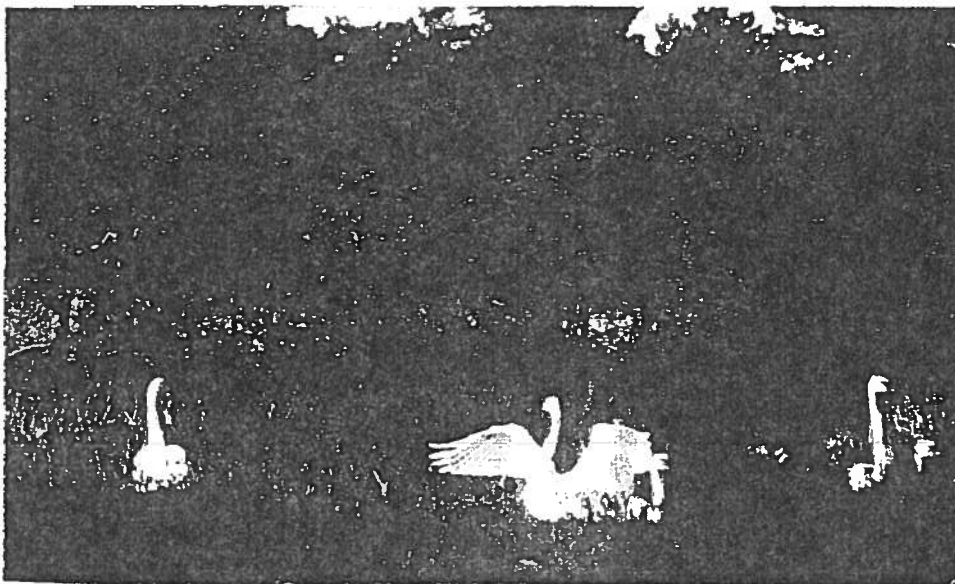




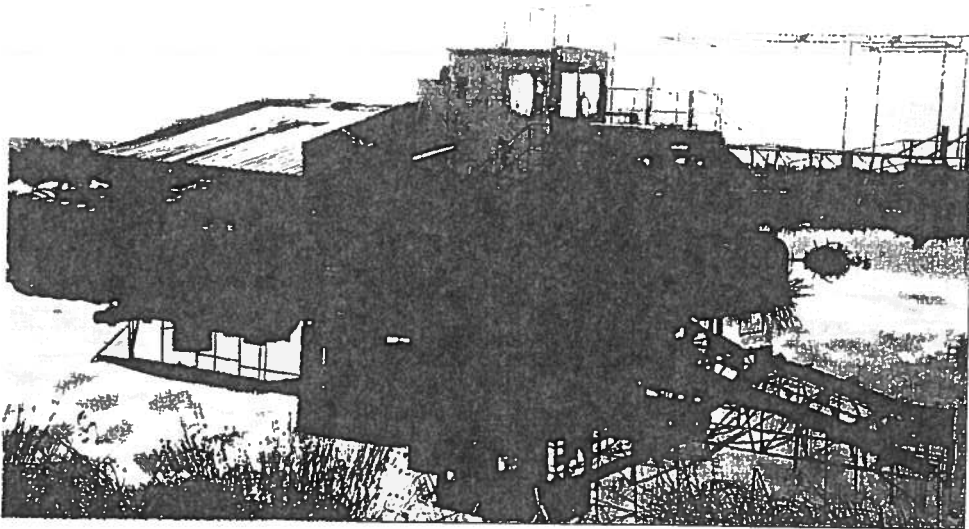
Photograph 10:  
Greater sandhill  
crane



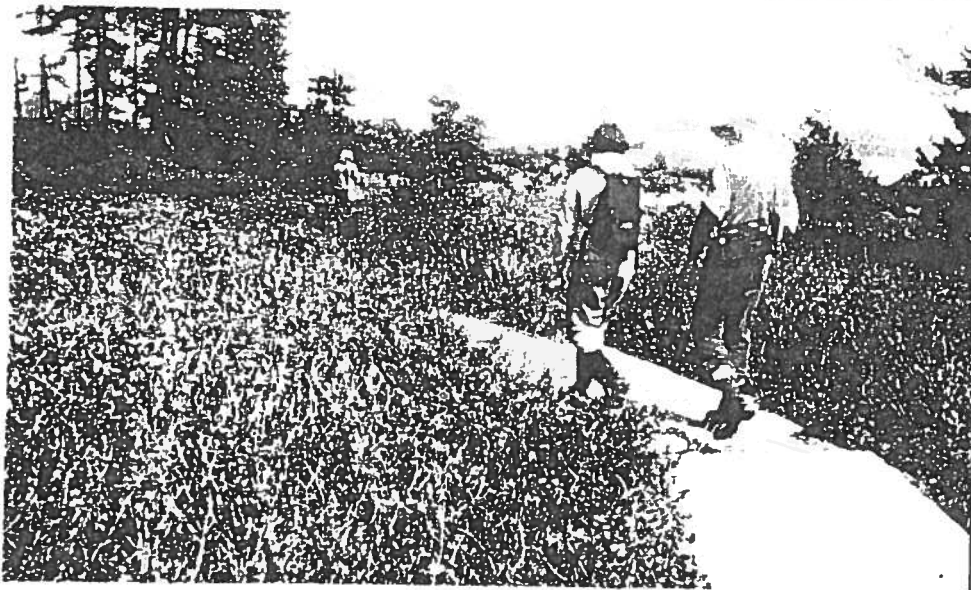
Photograph 11:  
Coyote



Photograph 12:  
Trumpeter  
swans



Photograph 13:  
Old Peat Harvest-  
ing equipment



Photograph 14:  
Existing trails

### Photograph Credits

All photographs were taken by Don DeMill, with the exception of numbers 3 and 9 which were taken by Brian Pearson.