INVENTORY, ANALYSIS AND MANAGEMENT OF THE ASSINIBOINE FOREST URBAN NATURE AREA

By

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ABSTRACT

The Assiniboine Forest Natural History Area is located within the City of Winnipeg. Due to the proximity of the park to the city center which generates intense urban pressures, and given the ever-increasing demands for natural emphasis recreation, preservation and/or conservation of the natural resources of the park is vital. The management of this unique area is possible only through the application of specific guidelines based upon the area resources. The objectives of this practicum are to assess the existing data available on the Assiniboine Forest; update the information and fill existing data gaps; and through analysis, recommend appropriate action(s) to allow recreation and public enjoyment while maintaining the quality of the resource.

This report concludes that the Assiniboine Forest is a special feature and that the diversity of wildlife and resources presents Winnipeg residents with a most difficult challenge: effective management. Options to management include the introduction or re-introduction of native species, habitat enhancement through active measures such as burning and passive measures such as zoning to prevent over-use and the development of formalized public education/interpretation programming.

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CHAPTER I

INTRODUCTION

1.1 Preamble

Many changes have taken place since the settlement of the west by Eurasian cultures. The northern and eastern confines of the prairies were sections of grasslands interspersed with shrubs and trees in a biome known as 'aspen parkland' (Bird, 1961). This land was agriculturally fertile land and was consequently cleared and tilled to provide food for settlers. Soon, few natural areas remained, having given way to cities and farms. The Assiniboine Forest represents one of the few remaining areas of aspen parkland in western Canada.

The Assiniboine Forest also represents a new trend in recreation: urban nature parks. The forest area is one of the largest natural urban parks of its kind in Canada. The action of the City of Winnipeg in preserving the park has not only provided another park, but has preserved a habitat where city residents may view animals and plants no longer commonly seen. The move to preservation has allowed contact for many urban dwellers with nature close at hand. Such an interpretive experience of natural heritage is of national significance.

1.2 Background to the Problem

Located south of the Assiniboine Zoo and Park, the Assiniboine Forest is one of the largest urban nature areas in Canada, encompassing approximately 287 hectares of relatively undisturbed aspen parkland. Due to the proximity of the area to city centre, the Assiniboine Forest is subjected to intense urban pressures.

After the forest was established as an urban nature park in August, 1973, a multidisciplinary team known as the Assiniboine Forest Task Force was established (Richards, 1974). The Task Force was instrumental in identifying areas of management concern and possible remedies. The Task Force also established a general mandate, not only for the study area, but one that could be construed as a policy statement for future urban nature parks. The mandate of the forest is:

> The preservation within the urban environment of natural communities and conditions general to the vegetative region for the educational, recreational and moral benefits to be derived by people.

While the mandate was generalized to accommodate possible changes in long range planning, the Assiniboine Forest Task Force also stressed that goals for master planning include consideration of conservation, interpretation and year-round recreation without sacrificing the quality of the resource (Richards, 1974).

1.3 Problem Statement

Given the ever-increasing demand for outdoor recreation in Winnipeg, an in light of the need for preserving natural areas within the city, a comprehensive and complete resource inventory is necessary to produce a series of guidelines for management of the Assiniboine Forest study area. Such information is necessary as "...there is an illusion that the urban wilderness does not require maintenance. The management of hundreds of acres of parkland of this type requires skilled staff with a knowledge of the ecology in order to preserve the inventory of plants and animals, which are of ever-increasing interest to the park users." (Brampton, 1979: pers. comm.). This report is intended to serve as the basis for management and planning by providing a synthesis of resource information.

1.4 Description of the Study Area[1]

1.4.1 Assiniboine Forest Study Area Location

The Assiniboine Forest study area is located south of the Assiniboine River and contains portions of river lots 19 through 30. Thirteen kilometres from the center of Winnipeg, the Assiniboine Forest is easily accessible by Corydon Avenue on the north and Wilkes Avenue on the south: Grant Avenue bisects the study area into north and south sections. As well,

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[1] A detailed account of the acquisition and history of the Assiniboine Forest, as well as a detailed description of the physical features of the park is provided in Appendix A.

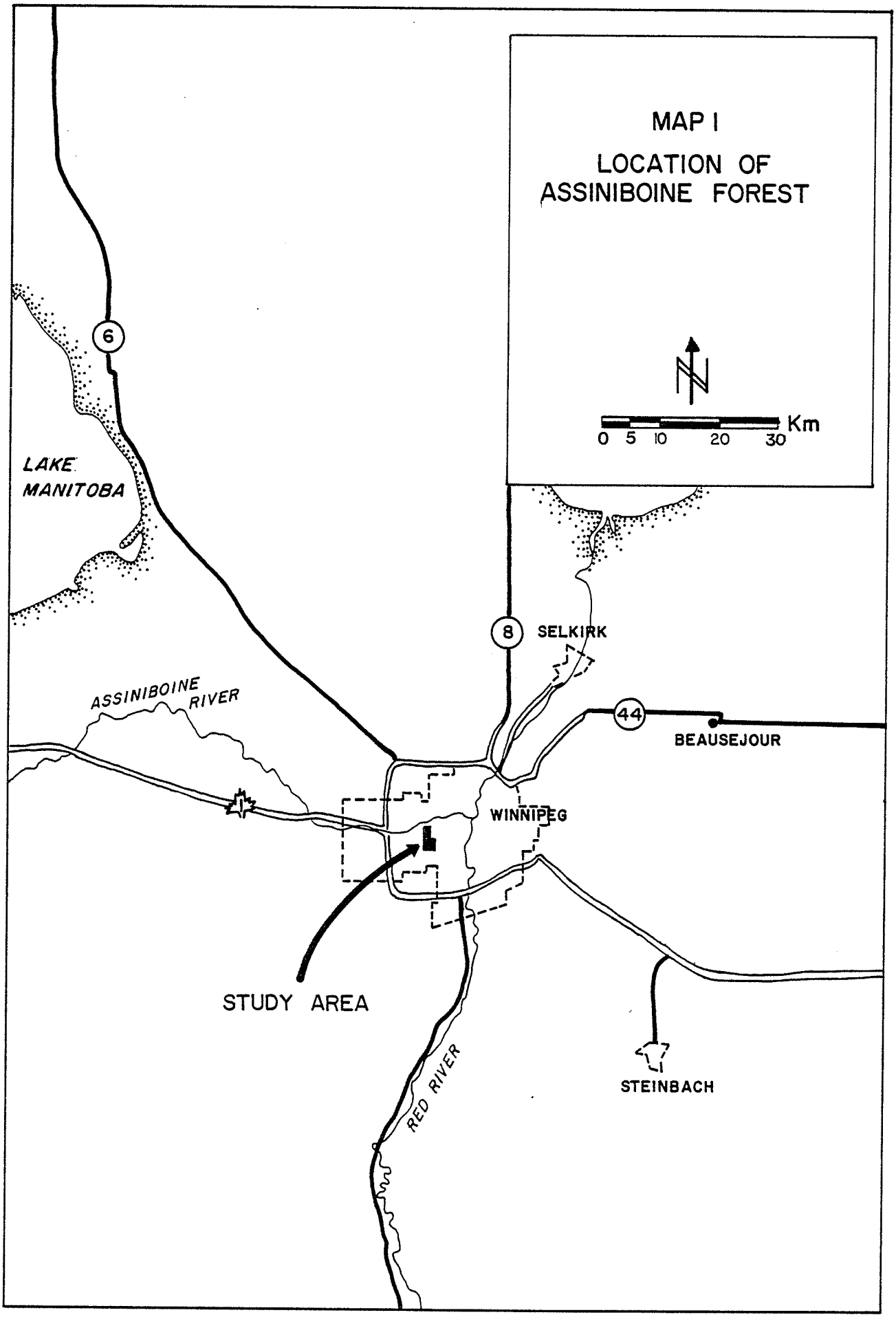
Chalfont Road and Shaftesbury Boulevard form the western and eastern boundaries, respectively (See Maps 1 and 2).

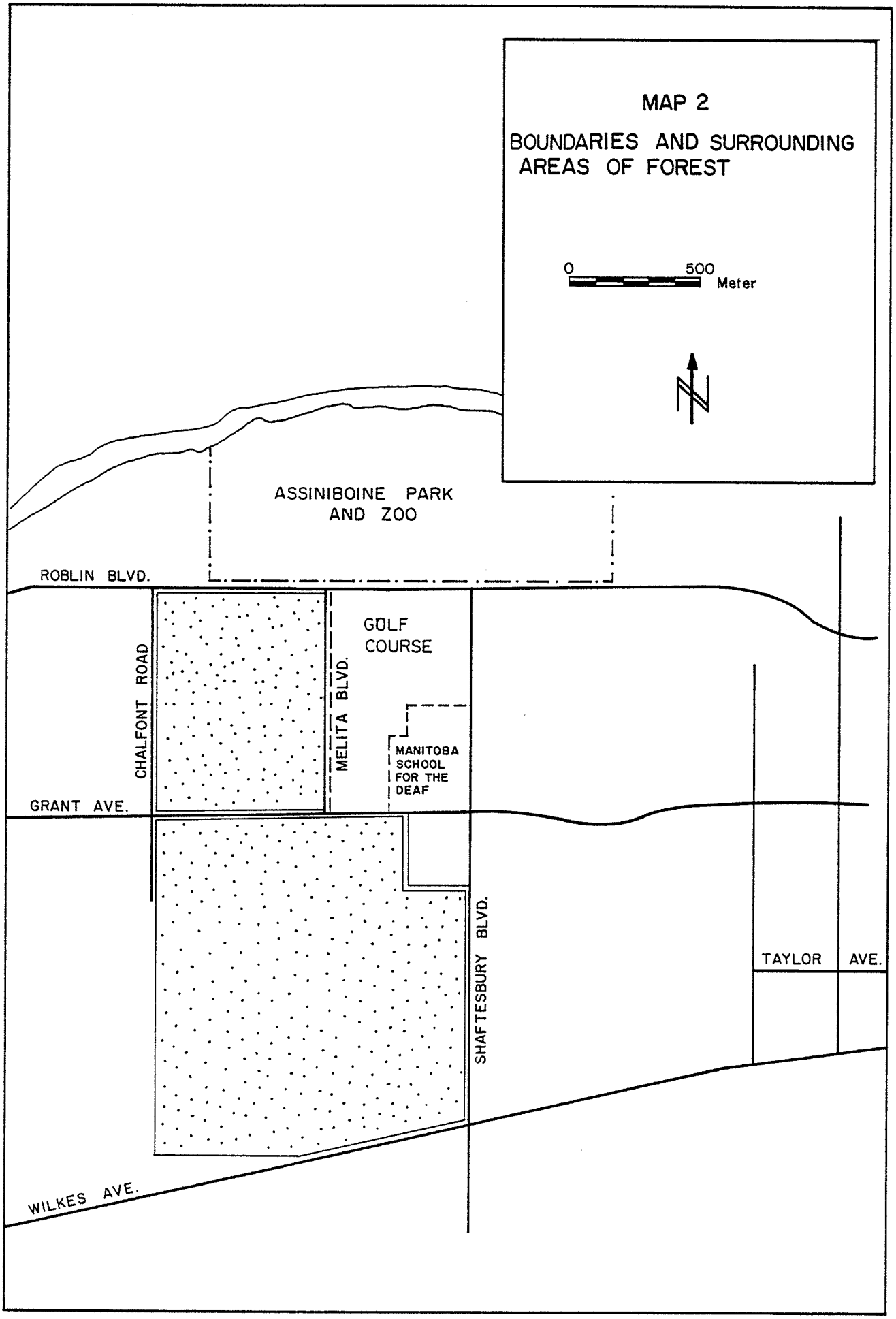
1.4.2 Physical Description of the Study Area

The climatic description of Winnipeg will be taken as being accurate for the study area. The climate has been described as being dominantly subhumid, cool continental, characterized by higher summer and lower winter temperatures than the world average for the same latitude (Michalyna, 1975:61). Precipitation for Winnipeg can be considered as representative for the study area. A climatic record of the time period pertaining to this study can be found in Appendix B.

The bedrock of the area consists of material formed during the Silurian Period. The bedrock is overlain by soils belonging to black earth soils developed on fine textured sediments. Two major soil series are present; St. Norbert clays (wooded association - lacustrine fine clays - Red River association) and Fort Garry clays. The latter series consists of clay over light grey to pale yellow sandy clay calcareous subsoils. The surface topography is manifested by the nature of the formation of these soils. The glacio-lacustrine action has resulted in a gentle micro-relief of approximately two to three metres (Ehrlich, *et al.*, 1957).

The combination of climate and soils has resulted in a mixed prairie and aspen forest known as 'aspen parkland' (Bird, 1961:3). Aspen parkland is characterized by an aspen


MAP I
LOCATION OF
ASSINIBOINE FOREST
0 5 10 20 30 Km
6
LAKE
MANITOBA
8
SELKIRK
ASSINIBOINE
RIVER
44
BEAUSEJOUR
WINNIPEG
STUDY AREA
RED RIVER
STEINBACH


MAP 2
BOUNDARIES AND SURROUNDING AREAS OF FOREST
0
500
Meter
N
ASSINIBOINE PARK AND ZOO
ROBLIN BLVD.
CHALFONT ROAD
MELITA BLVD.
GOLF COURSE
MANITOBA SCHOOL FOR THE DEAF
GRANT AVE.
SHAFTESBURY BLVD.
TAYLOR
AVE.
WILKES AVE.

forest grassland community leading to a more stable oak-aspen or oak climax community.

1.5 Study Objectives

The objectives of the study, with the overall goal of developing a technical supporting resource document to aid in the development of future management plans for the Assiniboine Forest, were:

1) To research gaps in existing information by providing an inventory of the vegetation, geomorphology and wildlife of Assiniboine Forest.

2) To identify and classify biotic communities within the study area and to present correlations between the physical and biological resources of the study area.

3) To develop guidelines for a recreation and management plan for the Assiniboine Forest based upon the biophysical resource inventory and cover-type mapping that will:

    a) preserve and protect wildlife species and habitats while permitting recreation and interpretation on a year-round basis;

    b) maintain a diversity of habitats to permit a varied program to interpret various habitat types and successional stages in an urban nature preserve.

1.6 Delimitations and Assumptions

This project assumes that data collected during the summer of 1979, although qualified according to conditions prevailing during that period, provide a reliable estimate of the Assiniboine Forest species, communities and conditions.

Conclusions and recommendations of this research project are based upon one summer of fieldwork.[2] Additional research done in earlier years (See Koonz, 1978; Richards, 1974; and Evans, 1975) has also been cited in appropriate sections. Research has been restricted to the area of Assiniboine Forest and does not attempt to quantify the effects of urban environmental influences. Subsequently, this document is not to be construed as a masterplanning document, but should be considered as a supporting document.

1.7 Research Methods

While the following section includes a summary of the study research methods in relation to study objectives, the reader is referred to Appendix C for a specific treatment of study techniques.

Objective 1: To research gaps in existing information by providing an inventory of the vegetation, geomorphology and wildlife of Assiniboine Forest.

The inventory goal of this objective was met by conducting comprehensive species lists based upon inventory methods and vegetation records (Appendices D and E). To

---

[2]Field investigation was hampered by a shortage of time, adverse weather conditions, a shortage of manpower and a lack of cooperation between agencies.

maintain a standard for comparison with previous works, the breeding bird census tracts were established according to Cuthbert and Koonz, 1975. Appendix F contains a complete record of bird censuses. Further inventory information of flora and fauna was added by a continuous record of sensitive areas and species lists for use in interpretation and education programs (See Appendix G). Information was further supplemented by a review of earlier studies, contact with habitat management specialists and communication with resource specialists. Appendices H and I, respectively, contain information on soil inventory in the form of soil-use ratings and limitations and soil profiles.

Objective 2: To identify and classify biotic communities within the study area and to present correlations between the physical and biological resources of the study area.

The combination of floral, faunal and physiographical information, in combination with a review of current knowledge in habitat analysis allowed for identification of sensitive areas and cover mapping. The cover mapping segment is especially useful in situations where fire and plant succession are constantly altering the vegetative structure.[3] An accurate cover map provides graphic display of areas where habitats may be extensively managed or developed in the future.

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[3]Although a fire occurred in the north sector of Assiniboine Forest in spring, 1980, this was not plotted and should be the focus of future study.

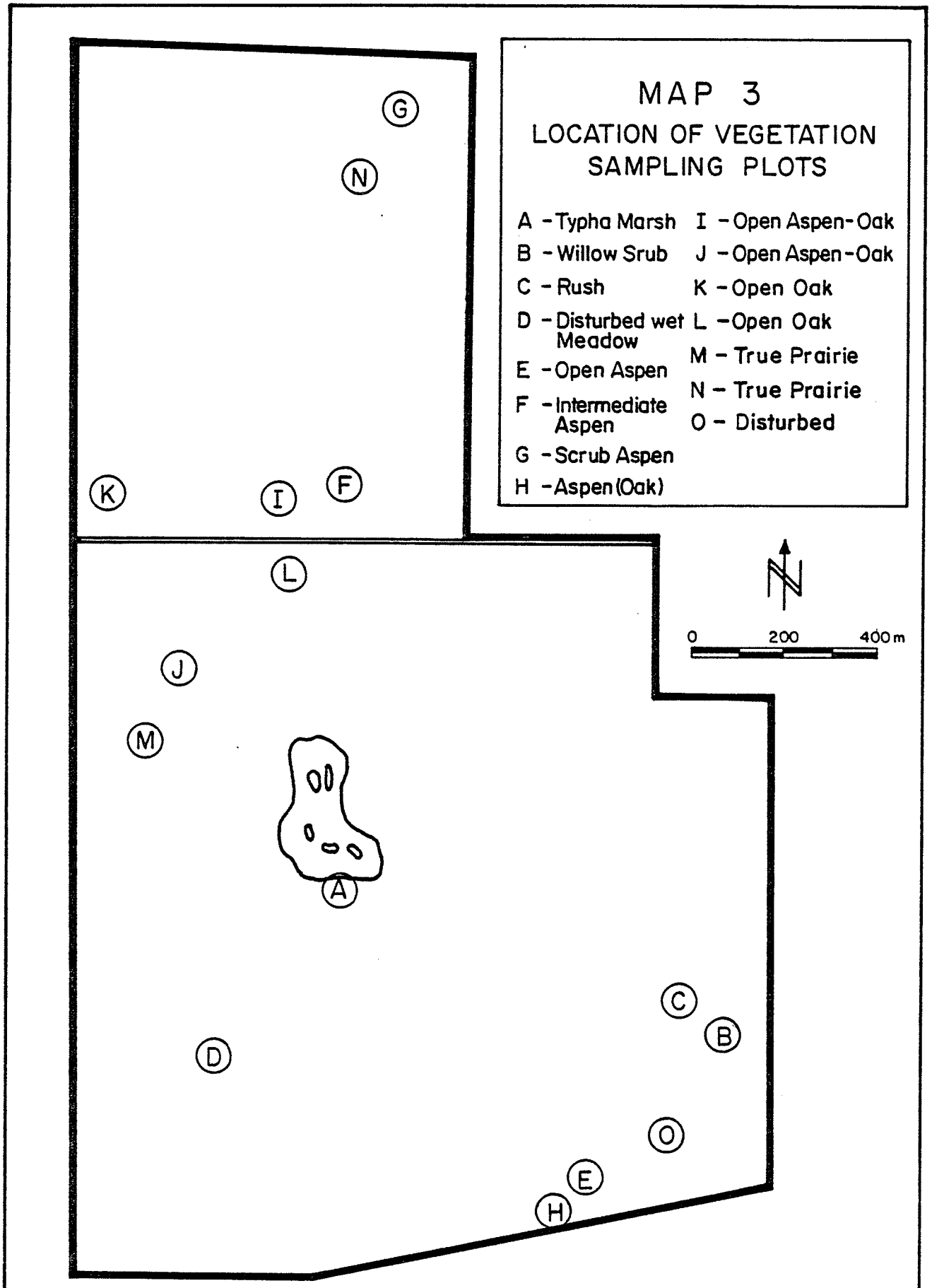

MAP 3
LOCATION OF VEGETATION SAMPLING PLOTS
A - Typha Marsh
B - Willow Srub
C - Rush
D - Disturbed wet Meadow
E - Open Aspen
F - Intermediate Aspen
G - Scrub Aspen
H - Aspen (Oak)
I - Open Aspen-Oak
J - Open Aspen-Oak
K - Open Oak
L - Open Oak
M - True Prairie
N - True Prairie
O - Disturbed
0
200
400 m

TABLE 1: GENERAL AREAS OF THE ASSINIBOINE FOREST CHOSEN FOR VEGETATION SAMPLING AND BREEDING BIRD CENSUS.

Typha Marsh	
Willow Scrub	
Wet Meadow	
Rush	
Disturbed	
Grass/Sedge	
Willow/Aspen	
Aspen Forest	
Open	*
Intermediate	
Dense	
Scrub	
Aspen (Oak) Forest	*
Aspen - Oak Forest	
Open	*
Intermediate	*
Dense	*
Oak - Aspen Forest	
Oak Forest	
Prairie	
True	
Disturbed	
Disturbed Ground	

*Indicates Breeding Bird Census Tract.

Thus, sites can be monitored with the net result being that habitat manipulation programs for a wide variety of species may be more effective.

Objective 3: To develop guidelines for a recreation and management plan for the Assiniboine Forest based upon the biophysical resource inventory and cover-type mapping that will:

a) preserve and protect wildlife species and habitats while permitting recreation and interpretation on a year-round basis;

b) maintain a diversity of habitats to permit a varied program to interpret various habitat types and successional stages in an urban nature preserve.

Recommendations meeting this objective were made by formulating guidelines for urban nature area management and recreation within such areas, based upon a review of the inventory results, consultation with habitat biologists and a review of the principles of urban nature management. Recommendations are cognisant of the obligation of the City of Winnipeg to be accessible to all residents.

1.8 Definition of Terms

biophysical resource inventory - comprehensive record of flora, fauna and physical resources of a study area

conservation - protection and maintenance with the intention of maximum yield and current or future use through ecologically based, active management techniques

cover type - a concrete example of a plant community named after the visually dominant species

fauna - undomesticated animals, not including invertebrates found in the Assiniboine Forest

flora - undomesticated vascular plants indigenous to the Assiniboine Forest study area

habitat - typical biotic and abiotic surroundings presently capable of supporting an animal or a group of animals; native environment

interpretation - any process designed to reveal meanings and relationships of cultural and natural heritage to the general public through first hand involvement with an object, artifact or site

plant community - an aggregation of living plants including the natural relationships between themselves

preservation - protection without the intention of direct use other than for scientific observation such that the ecosystem is allowed to evolve naturally

quantitative vegetation analysis - an accurate measurement and precise record of the plants present at all levels of a plant community

recreation - any activity that is undertaken outside of work conditions for moral, aesthetic or health benefits

territory - the breeding area defended by a male of a species against other males of similar species

urban nature area - an area of relatively undisturbed wildland dedicated for the wildlife contained therein and located within city limits

1.9 Organization of the Study

The second chapter of this report contains a review of the relevant literature. Special emphasis is placed on the

Winnipeg situation with regard to urban nature.

While Chapter 3 contains a synopsis of the biophysical resource inventory, the appendices contain field data.

Conclusions and recommendations for managing the Assiniboine Forest as an urban nature park formulated as a function of the resource inventory analysis are presented in Chapter 4.

The appendices contain field results and a description of the cultural and physical history of the study area.

CHAPTER II

REVIEW OF RELATED URBAN NATURE LITERATURE

2.1 Introduction

Modern society is affected by technology with the result that additional leisure time has become available. Recreation, in the form of passive and active modes, plays an important role in leisure. Also, recent ecological awareness has generated a conservation ethic in many city dwellers. However, few people in the past have realized the potential of urban nature. Rublowsky (1967) suggests that:

> the city, for all its congestion,
> for all its soot and smoke,
> is not a barrier that can stop the
> stream of life. It may slow down
> the movement of the stream, may even
> reduce it to a trickle but life remains
> and those of us with eyes to see can
> seek out and find its myriad branches
> almost wherever we chance to look.

The recent interest in urban biology has resulted in a shift from game to non-game biology (See, for example, Thomas and DeGraaf, 1975). The shift is also reflected in the establishment of urban or near-urban nature preserves. Such areas serve society and, more importantly, serve nature by providing a welcome refuge from intense urban pressure.

2.2 Nature in an Urban Setting

Nature surrounds most urban dwellers, although some contention may be raised as to exactly that which constitutes

'nature'. In this section, a review of the more notable natural areas located within cities will be undertaken. Although the focus of this paper is intended to be consideration of the Assiniboine Forest, mention should be made of other areas to show that although the City of Winnipeg is not in a unique situation, it is in a most favorable one.

2.2.1 Survey of Natural Areas

2.2.1.1 International Scope

Worldwide, many cities possess not only urban wildlife, but natural areas. In many cases, preservation arose out of the principle of the 'commons'. In many developing cities, the commons was a resource centre where local residents could have obtained some of the necessities of life, such as wood or wild food-stuffs. (Johnson, 1974:4). In other cases, the natural areas are those regions which were considered to be inhospitable or unamenable to habitation. Doxiadis (1975) states that Athens, Greece is about 50 percent hillside or mountains and that the preservation of Athenian urban nature arises from the lack of development in these areas. Other cities in Europe, such as Zurich, Switzerland; Oslo, Norway; and Frankfurt, West Germany are famous for their forested tracts (Johnson, 1974:4).

In North America, the United States stands out with many examples of urban natural areas. The movement toward such natural areas stems from the work of pioneers like Olmstead. The United States is also of interest as little research has

been done into urban nature, (Gill and Bonnett, 1973:109) although there is evidence of a changing trend (See Geis , 1975:36-48).

Geis (1975:79) described the case of Washington, D.C. where a comprehensive approach was taken toward the goal of integrating urban planning and urban wildlife. Other cities in the United States have studied the wildlife resource within or around the city. Notably, the Los Angeles coyote (Gill and Bonnett, 1973:87), in conjunction with the surrounding natural area, has been studied. Burton (197:30) documents the Jamaica Bay Natural Park just outside New York. The author heralds the Jamaica Bay park as being a unique resource for such a megalopolis. The Jamica Bay project as it represents a new change: parks for urban dwellers. The U.S. News and World Report documents a shift in the United States National Park Service attitude to allow for the development of national parks for city dwellers. (U.S. News and World Report, 1970: 76). The U.S. News and World Report also documented the new national parks with natural emphasis in New York, San Francisco and St. Louis.

Although many urban or near-urban areas have been set aside as natural emphasis areas, some American centres have gone one step better: the establishment of natural parks. Johnson (1974:5) mentions the Kalamazoo, Michigan nature area which also has a million dollar interpretive centre. The area, and others like it such as the Madison Prairie or the

Konza Prairie in Kansas is part of a trend now seen in Canada (Leskiw, 1978).

2.2.1.2 National Scope

Canada, while having only a small section that has undergone development is, for the most part, sorely lacking in urban natural areas. Some Canadian cities have made a move toward the incorporation of urban nature, but most are still mired in bureaucracy that prevents intelligent planning for wildlife.

In Alberta, cities developed at a hectic pace with the end result that nature was given a back seat. In Medicine Hat, little exists in the way of large natural habitat. (Spalding, 1974:47). Spalding also states that Lethbridge is in a similar position with only the valley of the Oldman River. In Red Deer (Spalding, 1974:49) the Gaetz Lake Bird Sanctuary was preserved as a result of being threatened with gravel extraction and now possesses a city-run nature centre. The Edgeworthy and Fish Creek areas are relatively undisturbed and add to the list of urban natural areas. Provincial incentives were taken to turn Fish Creek into a provincial park, and another area, Pearce Estate, which is a small riparian site is the location of a provincial fish hatchery. In contrast, Edmonton, Spalding states, is a city with more available greenspace. Groat Ravine on the North Saskatchewan River and McKinnon Ravine are generally unspoiledand have had established within them trails for public use (Spalding, 1974:54).

In Saskatchewan, some movement has been made to retain natural areas; notably, Saskatoon and Regina have developed plans and areas for urbanites.

The province of Ontario has some natural habitat in or near urban areas. London, for example possesses Kettle lakes known as the Westminster Ponds (Hearn and Wake, 1974:63). At this location, White-tail deer (*Odocoileus virginianus*) are common visitors. Near the city of Guelph (MacKintosh, 1974:277), the Hanlon Creek watershed has been the site of ecologically based planning for wildlife. Nature centres within cities are exemplified by the Windsor Ojibway Nature Preserve (Brampton, 1979). The Ojibway Preserve is a large tract of essentially undeveloped aspen parkland and prairie.

Other cities across Canada do contain natural habitat although few are true natural undeveloped habitats. For example, the Morgan Arboretum is a woodlot not a natural area (Baird, 1977:60). One city, however, does possess natural areas: Winnipeg.

2.2.1.3 Winnipeg Nature Areas

Winnipeg is not unique, but spectacular in that it contains four areas, two of which might be considered true natural areas. Although no formal policy statement exists to this effect, Winnipeg areas are natural or natural emphasis. The former are undisturbed or relatively undisturbed tracts of land where the emphasis is on preservation and passive recreation, such as bird watching, and the latter integrates wild

lands and more emphasis on recreation and multiple use. The aquisition of park areas with natural emphasis has, for the most part, been accidental (Johnson, 1974). Winnipeg currently possesses a total of five areas (Ross, 1980, pers. comm.).

The first of two natural emphasis areas to be considered is La Barriere Park which is a 127 hectare park located south of the city along the La Salle River. In the La Barriere park, beaver and muskrat are commonly seen by recreationists. The second area is the Little Mountain Park which was originally the site of the town of Little Stony Mountain at the turn of the century. The Little Mountain site provides an opportunity for individuals to experience natural and human history. Interpretive programs, conducted by the Living Prairie Museum staff illustrate area history, geology, industry and nature.

Two natural areas are documented in the work of Johnson, 1974. Specifically, the areas are the Living Prairie Museum and the Assiniboine Forest. The Living Prairie Museum is a 19 hectare area of relatively undisturbed native tall grass prairie. The area was preserved through a quirk of fate that the proximity of the bedrock to the surface made the provision of services difficult. Set aside, over 160 species of prairie plants flourish on the prairie providing Winnipegers of all ages the opportunity to experience what was once the dominant landscape of the

prairie provinces. Even more outstanding in Winnipeg is the Assiniboine Forest (Richards, 1976). The forest is a 286 hectare area of aspen parkland, once Winnipeg's dominant vegetation. The park also contains a wide variety of plant species and boasts a resident white-tail deer herd (Richards, 1974 and 1976; and Johnson, 1974). This area is one of the most impressive urban nature areas due to the undisturbed nature and size of holdings.

As all of the urban nature areas, in Winnipeg and abroad, are subject to intense pressure, research is required to plan for the preservation.

2.3 Planning for Urban Nature

Urban nature has been neglected for many years, with the exception that some consideration has been given to past or deleterious species. For many years, research has been directed toward the management of game species only. This arose as a result of the monies derived through the sale of game licences (DeGraff and Thomas 1973). In recent years, there has been a subtle shift in the planning process to include non-game wildlife. This stems, in part, from public involvement in the conservation movement.

Although the conservation movement seeks to better the lot of wildlife, one might assume that man often attempts to control wildlife for his ends and not the betterment of the wildlife. The need to conserve wildlife and wildlife habitat was

first identified by Bennett in 1946 (page 513). Yet, little work was done for almost twenty years, with only scientific studies carried on by the academic world.

With the move toward urbanization and the realization of the need to promote wildlife in cities, some research has and is being conducted in urban areas. Research in urban nature, for the most part, has been carried out in three distinct areas: avifauna, mammals, and vegetation. Some of the research in the category of wildlife studies has been to investigate the effects of wildlife upon man (See Problems with urban wildlife by Smith, 1974 for an example).

The latest trend in urban planning seems to be the integration of wildlife into the planning process (Geis, 1975). Here the input of biologists is most important as they often are able to relate to the concept of managing human activity to fit wildlife characteristics. Some studies (Richards, 1974; Johnson, 1974; and Gill and Bonnett, 1973) have been directed toward a more comprehensive study of the nature of urban ecosystems.

2.3.1 Planning Problems

Planning for nature in urban environment is no easy task. The high cost of land acquisition is but one problem with urban nature areas (Richards, 1974). For the most part, this is due to the failure of urban planners to recognize the value of the wildlife resource (DeGraff and Thomas, 1973). The problem is further compounded by the reported problems accom-

panying urban nature and wildlife in particular. Smith (1974:113) lists a number of problems including disease transmission and property damage that arise as a result of man-nature conflicts. However, not only is man affected, but wildlife suffers as well from human influence. Koonz (1978: 13) lists problems associated with urban natural areas. Some of the problems that plants encounter are pollution, human disturbance, lack of natural distribution, drainage alteration, competition from urban exotic species and herbicides. Animals fare even worse, according to Koonz (1978) as the animals are subject to pressure in the form of public and political pressure, pollution and pesticides, escaped pets, lack of gene pools through restricted movement, human harassment and disease.

The greatest problem, however, is the lack of integrated planning in the urban planning process. The question is then raised (Smith, 1975): is urban wildlife wanted and/or needed?

2.3.2 Prospects

The recent trend to accumulate land for parks, in combination with the designation of more of these lands for natural and nonconsumptive uses, is providing more challenges for planners. Management problems will be partially ameliorated by the establishment of interpretation and public education programs will only help to increase public understanding and support for urban nature. The main thrust planning should be, as Wallace (1976:51) states:

> ... a system of serious management of natural areas to provide optimum quality and variety of habitats, combined with legislated protection for a core of key areas of the highest natural quality, may be a good start toward establishing an equilibrium between the natural and man-made in parks.

2.4 Summary

Research on urban wildlife and urban nature areas indicates that comprehensive planning is vital for successful parks. Smith (1975:351) states that wildlife studies should be expanded and that considerations for urban nature be incorporated into city planning processes. According to Hearn and Wake (1974:68), the following concept must be understood by all parties involved:

> In one respect, every natural area has a common uniqueness - it takes everyone forever to preserve it, but one person and one time to destroy it.

CHAPTER III

PROJECT RESULTS: SUMMARY AND ANALYSIS OF THE VEGETATION AND WILDLIFE INVENTORY AND MANAGEMENT RECOMMENDATIONS FOR THE ASSINIBOINE FOREST

3.1 Introduction

Chapter III is a synthesis of the biophysical resource inventory information and subsequent analysis of the resources of the Assiniboine Forest Study Area. The following sections outline the nature of the vegetative and faunal communities and provide the background substantiating information for the Management Recommendations and Guidelines contained later in the chapter. The reader is referred to the Appendices for additional information concerning the Assiniboine Forest.

3.2 Supporting Information

3.2.1 Introduction to Vegetation Analysis

The major vegetation types of the study area are Typha Marsh, Willow Community, Wet Meadow (Rush, Disturbed and Grass/Sedge Types), Willow/Aspen Community, Aspen (Open, Intermediate, Dense and Scrub)[1] Community, Aspen (Oak) Community,

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[1] Open areas of aspen have >30% open space; Intermediate areas range in open area from 15% to 30%; Dense areas have <15% while Scrub areas are characterized by small numerous aspen trees.

Aspen-Oak (Open, Intermediate and Dense) Community, Oak-Aspen Community, Oak Community, Prairie (True and Disturbed) Community, Disturbed Ground and Clover Community.[2]

The areas previously mentioned were sampled and certain areas were singled out for intensive vegetation study. Intensive studies are, according to Kuchler (1974), important in providing an accurate inventory through the presentation of the structure and floristic composition of a particular community. The areas chosen for intensive study were selected as per Evans (1975) and are listed in Table 1 and illustrated in Map 3.

3.2.2 Results of Individual Vegetative Community Analysis

3.2.2.1 Typha Marsh

The Typha Marsh community was determined to be one of the less common cover types in the Evans report of 1975. Originally, the Typha Marsh was located in the west-central south section of the forest. This area was a collection or recharge area for spring runoff (See Map 12 in Appendix A). With the establishment of the Eve Werier Memorial Pond in 1976, the natural moist marsh area was submerged. Since the development of the man-made pond and as a

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[2]The progression from Aspen Community to Oak Community is illustrated by the analysis of communities such as Aspen (Oak) where Oak vegetation plays a minor role and the importance increases as vegetation moves toward Oak community type.

result of reintroduction of extirpated and native species, the Typha Marsh area forms an important component of the Assiniboine Forest. This cover type is especially important in the overall provision of faunal habitat due to the utilization of such vegetation as food, cover and nesting sites.

The groundcover in the Typha Marsh is generally poorly diversified with a combination of aquatic emergent vegetation and parkland species. The most prevalent species is the broadleaf cattail (*Typha latifolia* L.) with cover values averaging 3.9 [3] with broadleaf waterplantain (*Alisma trivale* Pursh) as the second most prevalent plant. As well, other ground cover species include swamp thistle, rice cutgrass and sedges. Appendix E provides complete analysis on a per quadrat basis.

The presence of trembling aspen in small number indicates marsh dominance and aspen provides only marginal overstory. The Typha Marsh accounts for 1.9 hectares or .66% of the total study area.

3.2.2.2 Willow Community

In previous years, the Assiniboine Forest reportedly was a more damp site than at present but changes in drainage resulted in successional progression. The Willow

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[3] See Appendix C, Inventory Sampling Methods for a description of cover values according to the Braun-Blanquet system.

Community presently occupies 1.92% of the forest area (5.52 hectares).

The ground cover of the Willow Community is dominated, as would be expected, by members of the genus *Salix*. In particular, the Willow Community is dominated by gray willow (*Salix humilis* Marsh) and pussy willow (*Salix discolor* Muhl.). The cover estimates of ground cover in site B, as shown in Table E.2 (See Appendix E) also indicate high importance (cover) values for fowl-meadow grass (*Poa palustris* L.) and sedges (*Carex* spp.).

The overstory of the sample plot is almost non-existent with trembling aspen (*Populus tremuloides* Michx.) occurring in only one of 10 quadrats with an importance value (IV) of one (1).

3.2.2.3 Wet Meadow

Wet Meadow cover type is composed of three categories: Rush, Disturbed and Grass/Sedge. The Wet Meadow community occupies 9.97 hectares or a total of 3.48% of the study area. Wet Meadow is characterized by annual standing water which prevents the encroachment upon the area by the aspen forest.

3.2.2.3.1 Rush Community

Rush community, designated by Site C analysis, is a combination of hydrofilic grasses and rush

species. Particularly, *Juncus balticus* Willd. (rush), *Poa palustris* L. (fowl-meadow grass) and wheat grass or *Agropyron trachycaulum* (Link) Malte are found in all ten quadrats with an Importance Value = 5. Plants of the genus *Erigeron* are also abundant within the study site. One foreign specie, white sweet clover (*Melilotus alba* Desr.) exists in eight of ten quadrats with an average cover value of two. This may be the result of human influence upon the forest. The Rush site is notable in that it contains one wild licorice plant (*Glycyrrhiza lepidota* (Nutt.) Pursh). The Rush component of the Wet Meadow occupies 3.58 hectares (1.25%).

3.2.2.3.2 Disturbed

The Disturbed Wet Meadow is represented by site D and Table E.3.2· Approximately 4.74 hectares or 1.65% of the Assiniboine Forest is covered by the Disturbed Wet Meadow cover type. In this plot, the diversity is higher than that of the Rush Wet Meadow community as 18 species of plants were recorded in comparison to the Rush Community total of 15 species. Couch grass (*Agropyron repens* (L.) Beauv.) and Kentucky bluegrass (*Poa pratensis* L.) were found in all quadrats with IV = 4 and are the most common species in the plot. Smooth rose (*Rosa blanda* Ait.) was found to be common to all quadrats with an Importance Value of 3. Other species determined to be in notable quantities include Flodman's thistle (*Cirsium flodmanii* (Rydb.) Arthur),

snowberry (*Symphiocarpos occidentalis* Hook.) and Canada goldenrod (*Solidago canadensis* L.).

The over story within the plot is restricted to aspen with an average Importance Value of 1.6. The aspen were the only trees within the plot and thus calculations of mean cross-sectional area of 42.3 cm^2, 5,694.76 stems/hectare and a relative frequency of 100% were obtained. Tree health was 7.5% in good health, 75% in fair condition and 17.5% in poor health.

3.2.2.3.3 Grass/Sedge

The Grass/Sedge type was found to be similar in composition to the Rush community except that the rush specie was replaced by sedges (*Carex* spp.). Only .58% of the study area is covered by the Grass/Sedge Wet Meadow community for a total area of 1.65 hectares.

3.2.2.4 Willow/Aspen Community

Within the Assiniboine Forest, only .34% (.98 hectares) of the total area is covered by the Willow/Aspen vegetation complex. This vegetative association is representative of successional trends within the Assiniboine Forest. The ground cover of this region was found to be moist with evidence of clumped willow (*Salix* spp.) and invading aspen (*Populus tremuloides* Michx.). Additional species present include those found in the Disturbed Wet Meadow Community.

Although this plot contains visible willow plants, intensive study determined that aspen was most dominant with 2,415.46 trees/hectare with a mean cross-sectional area of 126.1 cm^2 and 100% relative dominance. Tree health estimates indicate that 70% of aspen trees listed in fair condition, 22.5% were in good condition and only the remaining 7.5% were in poor health.

3.2.2.5 Aspen Community

This community type was discovered to be the largest single vegetative cover in the study area with a total area of 98.36 hectares or 34.28%. Four categories were delineated as being of value to segregate the vegetative cover. The four categories are Open, Intermediate, Dense and Scrub. Respectively, the areas equal 52.80 ha. (18.40%), 33.10 ha. (11.54%), 7.38 ha. (2.57%) and 4.08 ha. (1.42%). Bird, 1961, noted that the aspen tree served as the primary source of overstory in the prairie landscape.

3.2.2.5.1 Open

This vegetative class, the largest component of the Assiniboine Forest, occupies 52.80 hectares which translates to 18.40% of the study area. With an approximate ground cover of less than 70%, the Open Aspen stands of the study area illustrate the continuing successional changes in the parkland region.

The ground cover of the Open Aspen plot was found to be highly influenced by the grasses; specifically the high incidence and cover value of couch (*Agropyron repens* (L.) Beauv.) and Kentucky blue grass (*Poa pratensis* L.). Other plant species include northern bedstraw, snowberry and raspberry. Of considerable importance to the low strata is the high cover value (3) for poison ivy (*Rhus radicans* L.). Poison ivy occurred in all ten quadrats and should be noted due to the dermatic qualities the plant possesses. The ground cover species total 31 in number and indicate the overall increased diversity that accompanies higher seral stages.

Overstory in the cover is notable as there exists a large number of shrub species such as hawthorn (*Crataegus* spp.). One specie in the shrub layer that indicates succession is green ash (*Fraxinus* spp.). The larger components of overstory include bur oak, trembling aspen and balsam poplar. Trees within the plot are generally fair to poor in health.

3.2.2.5.2 Intermediate

Intermediate Aspen areas of the study area total 11.54% of the forest and this may be equated to 33.10 hectares. Within the study plot (Site F), 16 species have been recorded.

Ground cover in Site F is dominated by Kentucky blue-

grass and couch grass as was the case with Open Aspen; both herbaceous species have an Importance Value of 5 in each of ten quadrats. Shrub species include snowberry, northern gooseberry, smooth rose and downy arrowwood. One species that is notable is the presence of Carrion-flower (*Smilax harbacea* L.).

As in previously mentioned plots, trembling aspen remains the dominant tree in the Assiniboine Forest. Oak also occurs within the plot, but only to a minor extent. Willow species provide approximately 10% of the tree species. Tree health is fair to poor.

3.2.2.5.3 Dense

Dense Aspen stands account for 2.57% of the area by occupying 7.38 hectares. Dense stands of aspen are not very common and although the groundcover is similar to that of Open and Intermediate stands, species diversity is somewhat lower due to dense aspen growth.

3.2.2.5.4 Scrub

Within the study area, only 4.08 ha. (1.42%) are Scrub Aspen. Scrub vegetation is characterized by the presence of a large number of small, closely spaced trees. Such growth is characteristic of aspen due to the nature of growth through 'suckering'. The Scrub Aspen stand analysed contained a total of 25 species ranging from violets

to trembling aspen.

Plant species of importance in the Scrub community are sedges (*Carex* spp.), strawberry (*Fragaria virginiana* Duch.) and poison ivy (*Rhus radicans* L.). Other species exist, but most occur only in limited quadrats and importance. Notice should be taken of the large importance value (5) for the sedges. Sedges are moisture-loving plants and their presence suggests periodic inundation. Shrubs present include members of the genus *Viburnum* such as nannyberry and downy arrowwood, red osier dogwood and American hazelnut.

The tree cover in this plot is dominated by trembling aspen, although oak was recorded in four quadrats. The increasing presence of oak in the sites is indicative of progressing succession toward the ultimate seral hardwood stage. Health of trees within the plot ranges with the majority of individuals in the fair to good range: few individuals were judged to be in poor condition.

3.2.2.6 Aspen (Oak) Community

The Aspen (Oak) component of the Assiniboine Forest covers an area of 36.78 ha. representing 12.82%. The Aspen (Oak) plot was found to tend toward a higher presence of oak. The presence of oak suggests that the area is proceeding toward a higher seral stage. As one would expect, the procession toward a higher seral stage is accompanied by an increased diversity of plant species. Site H contains 30

different species, with an increasing segment being woody-stemmed shrubs.

The ground cover of the Aspen (Oak) vegetative type is dominated by couch grass and Kentucky bluegrass, sedges, wild lily-of-the-valley and northern bedstraw. Shrub species in the study plot were identified as red osier dogwood and pincherry which both were most common of the shrubs discovered.

The forest canopy is, as the community name suggests, Aspen (Oak). In this instance, the plot was found to have a preponderance of aspen but with the addition of oak in larger quantity than in the Aspen stands.

3.2.2.7 Aspen-Oak Community

Aspen-oak forest stands are the second greatest area of vegetative cover in the Assiniboine Forest. Approximately 25.51% or 73.2 hectares of the area is covered by this community. Within the classification, three categories were delineated: Open, Intermediate and Dense. As in the consideration of Aspen Community stands, the labels refer to the percentage ground cvoer: Open stands accounted for approximately one third of the Aspen community with an area of 27.36 ha. (9.54%); Intermediate areas equalled 31.13 ha. (10.85%) and Dense cover type occupied 14.71 ha. (5.13%).

3.2.2.7.1 Open

Open Aspen-Oak plots in the Assiniboine Forest were calculated to cover 9.54% of the forest study area.

The dominant species of aspen was found to be found to be decreasing in relation to oak as a function of increased parkland succession. The most common species[4] in the ground cover are couch grass, sedges and Kentucky bluegrass. Other important species contained within the study sites included alumroot, carrion flower and orache (*Atriplex patula* L.). The sites also recorded the presence of two non-indigenous species: dandelion (*Taraxacum officinale* Weber) and white clover (*Trifolium repens* L.). Both species represent human influences. Of interest is the fact that poison ivy, an important species in human use consideration, is less prevalent.

Forest canopy in the Open Aspen-Oak region is a mixture of bur oak and trembling aspen. Tree health is fair to good.

3.2.2.7.2 Intermediate

Intermediate density Aspen-Oak communities exist on 31.13 hectares (10.85%) of the study region. Plant species are similar to those described above.

3.2.2.7.3 Dense

Just over five percent (5.13%) of the forest area is covered by Dense Aspen Oak vegetation. The

[4]Two sites were selected in the Open Aspen-Oak areas to allow for more complete anlysis of this important area and to maintain continuity with the Evans (1975) study.

areal dimension of the cover type is equal to 14.71 hectares. Vegetative structure and composition is similar to the Open Aspen-Oak type, except tree densities are higher.

3.2.2.8 Oak-Aspen Community

Oak-Aspen cover type extends over 6.45 hectares (2.25% of the study area) with vegetation that illustrates a trend toward the higher seral stage of oak forest. Understory and ground cover was determined to be similar to the Aspen-Oak forest; canopy is increasingly dominated by oak trees.

3.2.2.9 Oak Community

This community is found in 25.74 hectares of the Assiniboine Forest and as only 8.97% is thus forested, the overall impact of the vegetation type would not be expected to exercise a large influence upon the area. Morover, the dominant type in the oak forest is representative of the near climax forest common to aspen parkland (Bird, 1961).

Sites K and L were analysed to ascertain the species composition and consequent floristic structure of the Oak area. Ground cover is dominated by couch grass, Kentucky bluegrass, poison ivy and arrow-leaved colt's foot (*Petasites sagittatus* (Pursh) Gray). An important species is the wild sarsaparilla (*Aralia nudicalis* L.) which is characteristic of a more successionally mature forest (Evans, 1975).

Shrub species are less dominant than those same species found in aspen dominated plots although Saskatoon, hawthorn, red osier dogwood, hazelnut and pincherry are present.

The overstory remains dominated on a cover value system by the aspen but oak trees, while fewer in number are very evident. Aspen tends to smaller importance in the study plots.

3.2.2.10 Prairie Community

Two divisions of prairie were delineated by Evans (1975) although no concrete information is available to ascertain the validity of the 'true' prairie claimed. True and Disturbed Prairie were selected for vegetative analysis and quantification. True prairie (predominately the section at the corner of Grant Avenue and Chalfont Road) occupies 6.44 hectares and covers 2.24% of the study area while Disturbed Prairie covers .09% for a total acreage of .26 hectares.

3.2.2.10.1 True

The major component of the prairie vegetation system has been classified as True Prairie by Evans, 1975. Site M provides a breakdown and listing of species encountered during field testing. Ground cover occurs as herbs and forbs with one exception only: in Site M one quadrat contained aspen with an Importance Value of 1.

True prairie species existing within the plot are listed in the table for site M and N and include three-flowered avens, Canada anemone, blazing star and aster. Grasses are restricted to couch grass (*Agropyron repens* (L.) Beauv.), switchgrass (*Panicum virgatum* L.), and Kentucky bluegrass. Plants worthy of note within the True Prairie area include the Canada thistle as an example of human influence and the yellow lady slipper as an example of a species no longer common within the city of Winnipeg.

3.2.2.10.2 Disturbed

Disturbed Prairie is similar in structure to the above-mentioned cover zone with the exception that human influence has introduced weed species that have reduced the natural diversity.

3.2.2.11 Disturbed Ground

Site O analyzed the structure and composition of the Disturbed Prairie. This cover type exists over only .48 hectares (.17%) of the area covered by the study. Plant species common to this area reflect the disturbed nature of the vegetation as total number of species is restricted to 9 and many, such as sowthistle and dandelion are often termed 'weeds'. The plot was dominated by couch grass (IV = 5), Canada thistle (IV = 2.6) and white sweet clover (IV = 2.5). *Hordeum jubatum* and *Aster* species were also recorded within

the vicinity of the sample plot.

3.2.2.12 Clover Community

Clover communities occur in only .48 hectares (.17%) of the Assiniboine Forest. Although the actual area is small, dispersion of the clover is widespread as a function of horses which spread clover through feces deposited on the roadcuts. These communities are basically monocultures with limited additional weed species interspersed. Clover appears associated with most riding trails, road cuts and is only found in quantity in the south east sector of the forest.

3.2.3 Summary of Vegetation Analysis

The Assiniboine Forest contains a total of 12 cover types. Table 2 lists the cover types and the areal and percentage cover breakdown of each. As indicated by Table 2, the Aspen vegetation community is the most prevalent community type with an area approximately one-third of the total forest area. Aspen-Oak Community is the second-most common vegetation type and is followed by Aspen(Oak) and Oak cover types. The dominance of aspen is evident as one would expect in aspen parkland (Bird, 1961).

TABLE 2

NUMBER	VEGETATION	AREA (HECTARES)		PERCENTAGE	
1	Typha	1.90		.66	
2	Willow	5.52		1.92	
3	Wet Meadow	9.97		3.48	
3a	Rush		3.58		1.25
3b	Disturbed		4.74		1.65
3c	Grass/Sedge		1.65		.58
4	Willow/Aspen	.98		.34	
5	Aspen	98.36		34.28	
5a	Open		52.80		18.40
5b	Intermediate		33.10		11.54
5c	Dense		7.38		2.57
5d	Scrub		4.08		1.42
6	Aspen (Oak)	36.78		12.82	
7	Aspen - Oak	73.20		25.51	
7a	Open		27.36		9.54
7b	Intermediate		31.13		10.85
7c	Dense		14.71		5.13
8	Oak - Aspen	6.45		2.25	
9	Oak	25.74		8.97	
10	Prairie	6.70		2.34	
10a	True		6.44		2.24
10b	Disturbed		.26		.09
11	Disturbed	15.47		5.39	
12	Clover	.48		.17	
	Water	5.35		1.87	
		286.90		100.00	

The total land area was determined to be 283.99 ha. with a pond area of 5.35 ha.[5] The location of the vegetation types is illustrated in Map 4.

3.2.4 Wildlife Resources

3.2.4.1 Introduction

One of the most significant resources integral to the Assiniboine Forest Urban Nature Area is the presence of a variety of wildlife species. Although this section contains a summary of the significant wildlife species contained within the study area, the reader is referred to the Appendices for species lists and additional substantiating data.

3.2.4.2 Birds

As of September 1979, a total of 102 species of birds representing a total of 31 families has been observed within the Assiniboine Forest.[6] Those species that constitute the majority of species observed are either summer residents or winter migrants. The inclusion of waterfowl and other unusual species is probably due to the habitat diversity of

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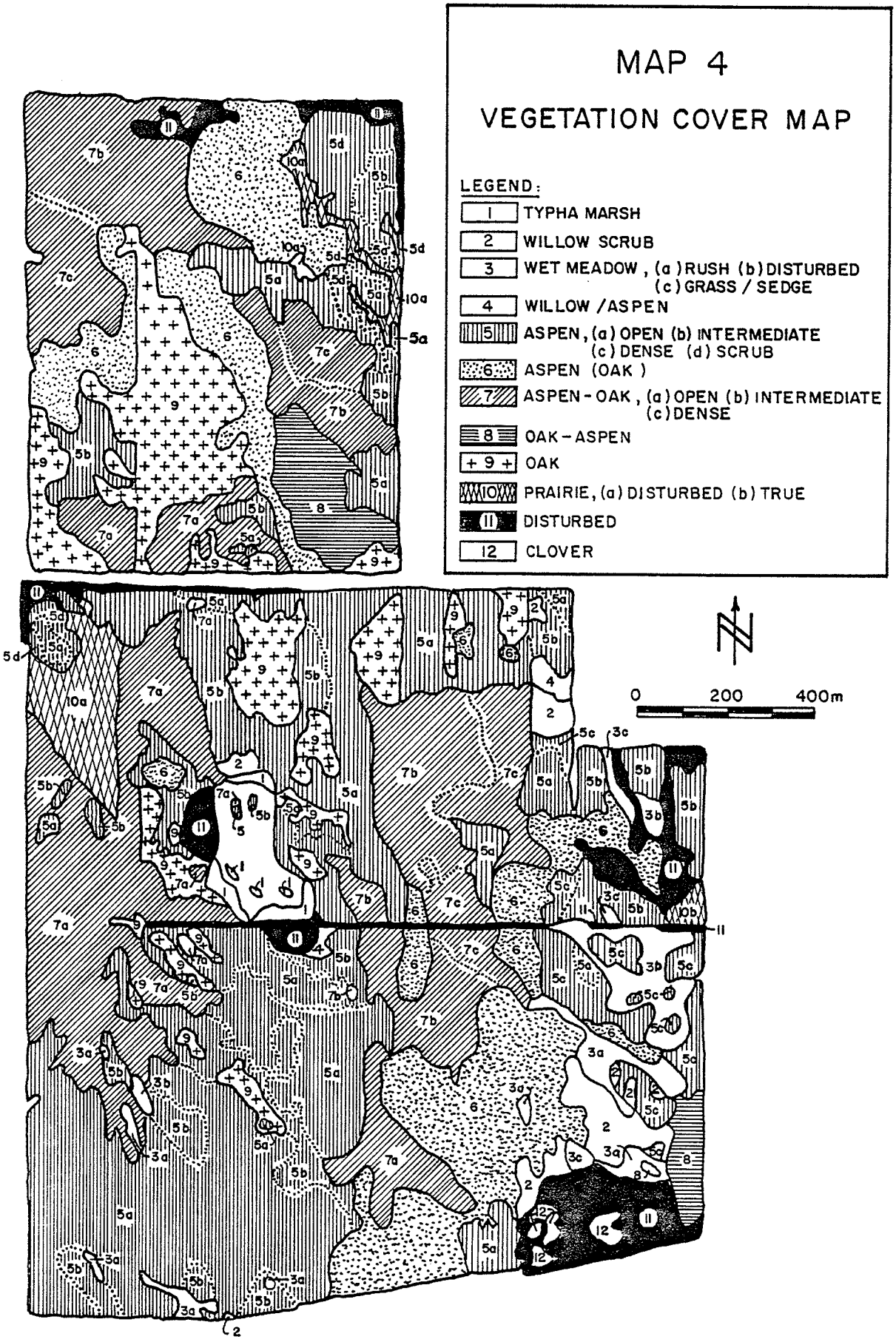
[5]Note that water level fluctuation in the pond may result in changing areal values for Typha Marsh and water area.

[6]These totals were obtained from inventories expedited by this study and previous studies. Due to the location of study area on a major flyway (Peterson, 1967) the probability of other species existing is high.

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MAP 4

VEGETATION COVER MAP



SOURCE : After Evans, 1975

the Assiniboine Forest. Appendix D.3 lists bird families and Appendix D.4 lists species present.

Within the areas selected for breeding bird census study, the highest number of confirmed breeding species was located in the stands of vegetation exhibiting the greatest diversity in overstory, understory and ground cover. In site 7A, the Open Aspen - Oak vegetation type, 11 territorial males of nine species were recorded. Northern orioles, Tennessee warblers and wood peewees were the most prevalent species. In the Intermediate Aspen-Oak community type (site 7B), northern orioles and least flycatchers were the most common examples of the 14 territorial males of eight species. The third most populated area was determined to be the Aspen (Oak) Community where nine species were represented by 12 territorial males such as northern orioles, Tennessee warblers and warbling vireos. The site is also notable as it contained a confirmed breeding black-billed cuckoo. Six species, including blue jays, eastern wood peewees, northern orioles, ovenbirds and mourning doves for a total of 11 territorial males, were found in site 5A, the Open Aspen Community Type. The Dense Aspen-Oak vegetation provided breeding habitat for the following species: northern oriole, clay-colored sparrow, Tennessee warbler, great crested flycatcher, tree swallow, mourning dove and eastern phoebe. A total of 10 territorial males of seven species was recorded. The Assiniboine Forest, as a result of the Eve Werier Memorial Pond also supports breeding popu-

lations of wood ducks and mallards. Many species of avifauna occur in the vicinity of the pond.

3.2.4.3 Mammals

The inventory of mammals was conducted on a much less rigorous basis than other inventory stages. The small mammal populations cycle and large mammals, such as white-tail deer require extensive aerial surveys therefore, the inventory process consisted of a collection of previously obtained data and personal sightings. The results of the mammal inventory are given in Appendix D.

A total of nine families of mammals are known to exist within the study area as of September, 1979. At least 31 species have been recorded in the forest and additional species have been reported but not confirmed. Many mammal species, such as lynx and coyote, are also occasional visitors to the forest (Richards, 1974:5). Small mammals known to occur in the Assiniboine Forst (Cuthbert and Koonz, 1975) include species not normally found in urban areas, such as the arctic shrew (*Sorex arcticus*). The most noticeable mammal in the forest has been the white-tail deer. The deer population in the city of Winnipeg is one of the most notable wildlife-man relationships in urban America (Shoesmith, 1979). White-tail deer were seen on several occasions during the field studies of 1979. Deer were sighted in all areas of the forest except for areas exhibiting poor drainage. A surprising number of

these animals were seen in the north section of the forest, near high human traffic areas thus indicating the tolerance levels of the animals to human impact. A study conducted on February 8, 1980 by Koonz and Ross (Koonz, 1980: pers. comm.) revealed the fact that 41 deer were present in the Assiniboine Forest. Koonz (1980:1) states that past tagging studies indicate a sedentary population with the majority of movement restricted to travel between the forest and the Fort Whyte cement plant area to the south. Studies in the past have shown the Assiniboine Forest region population to be active in crossing Wilkes Avenue although the 1980 study indicates that movement has been limited due to the removal of sugar beet fields. The white-tail deer herd is an important component of the fauna of the Assiniboine Forest.

3.2.4.4 Other Animals

Other animals in the Assiniboine Forest include reptiles, amphibians and fish. Insects, particularly wood ticks and mosquitoes are present but have not been investigated. Lists of amphibians, fish and reptiles are given in Appendices D.7, D.8 and D.9, respectively.

Reptiles in the forest are limited to the snapping turtle (introduced) and garter snake while the amphibians are represented by at least nine species. The only fish species known to be present is the fathead minnow, introduced into the Eve Werier Memorial Pond to control mosquito populations

(Richards, 1980: pers. comm.).

3.2.5 Physical Resources

3.2.5.1 Introduction

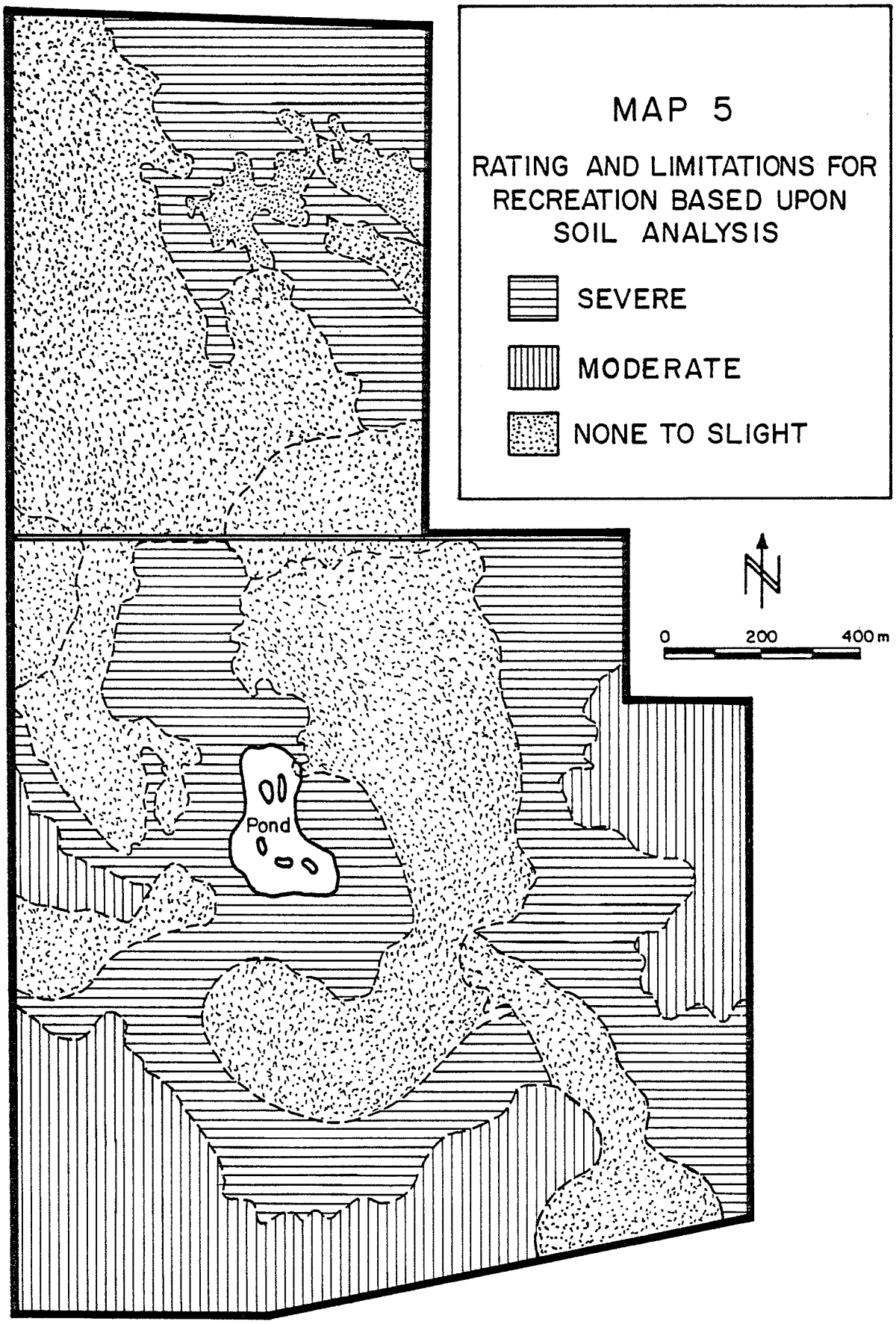
The physical resources of the Assiniboine Forest were examined through a field research program that involved soil sampling and laboratory analysis. Surficial materials were examined according to the procedure outlined in Appendix C.

3.2.5.2 Surficial Materials[7]

Given the soil testing and analysis, four soil series were found in the Assiniboine Forest; Dencross, St. Norbert, Fort Garry and Osborne. The soil series present were mapped (See Appendix A - Map 9) and then further grouped to provide information concerning suitability for recreational use. Based upon Michalyna, et al, the St. Norbert and Ft. Garry series were found to be the most common soil and also had the least effect upon intensive recreational development. Osborne soils were severely constraining while the Dencross soil series was shown to be of moderate consideration in planning. Map 5 illustrates the areas of

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[7] Additional information concerning the genesis of soils is given in Appendix A.


MAP 5
RATING AND LIMITATIONS FOR RECREATION BASED UPON SOIL ANALYSIS
SEVERE
MODERATE
NONE TO SLIGHT
0
200
400 m
Pond

Assiniboine Forest that have particular constraint parameters.

The Dencross series soils areas are generally poorly drained and subject to ponding. Such factors render the soils not useless, but requiring attention if trails or structures are to be constructed. Ft. Garry and St. Norbert clay soils are characterized by few constraints due to good drainage characteristics. The Osborne series is generally very poorly drained and subject to ponding. Notice should be taken that while each particular series has constraints, all could be used if proper precautions, such as ensuring proper drainage, are taken. Appendix H contains a breakdown of each soil type and the corresponding constraints.

3.3 Management Recommendations and Guidelines

3.3.1 Introduction

The management of the Assiniboine Forest Urban Nature Area presents difficult problems for City of Winnipeg resource managers. Problems arise as a result of two major factors. Firstly, the proximity of the forest to the centre of a city of approximately 600,000 people presents problems of human impact, both directly through high use and indirectly through urban environmental influences such as residential development. Secondly, the dynamic nature of aspen parkland embodied in successional and faunal activities presents challenges in conventional habitat and wildlife management.

Management of the Assiniboine Forest requires a thorough inventory and analysis of the biophysical resources of the area in question. This study includes the results of a biophysical resource inventory conducted during the summer of 1979 and as well is supplemented by data obtained from previous studies. Recommendations and guidelines for management presented were formulated on the basis of inventory analysis.

The following section lists the recommendations and the guidelines suggested to achieve the recommendations. Additionally, recommendation guideline measures are suggested and the rationale for both the measures and the initial recommendations is given. Recommendations and associated guidelines are not fixed and should be reviewed to ensure

that they remain effective.

3.3.2 Management Recommendations

Based upon the analysis of the biophysical resources of the Assiniboine Forest, the following recommendations are made.

1) An external zoning system and land use zoning system should be applied external to and within the Assiniboine Forest to protect its wildlife and resources.

2) Individual habitat areas should be improved and/or maintained and where necessary, inadequate habitat areas should be developed and efforts taken to rehabilitate where potential exists.

3) Species extirpated from the Assiniboine Forest should be reintroduced where possible, given sufficient habitat and low probability of the species becoming a nuisance exists.

4) An interpretive program should be developed for the study area.

Recommendation 1; An external zoning system and land use zone system should be applied both external to and within the Assiniboine Forest to protect its wildlife and resources.

Guidelines:

1) A system of buffer zoning surrounding the Assiniboine Forest should be developed and applied to protect the wildlife resource, in particular the white-tail deer herd, and other resources of the study area. Buffer zoning for the Assiniboine Forest should include provision for:

   a) Wildlife movement corridors to facilitate movement by white-tail deer who move between the forest and Fort Whyte. Wildlife corridor(s) should be supplemented with fencing and speed restriction on Wilkes and Grant Avenues. Additionally, a program of vegetation management(ie. planting) may encourage deer to remain within corridor confines.

   b) A system of land development control. Specific measures that must be recognized to provide for an effective development control system include an analysis of the effects of residential development (vis à vis the housing development west of the forest), a program to ensure that at least 10% of land dedicated as recreational land with

a residential development is arranged to provide for adequate wildlife movement corridors and a program whereby all new development would be approved only with measures to protect the integrity of the natural park concept.

2) An internal zoning system, in the form of land use zones, should be applied toward park planning. Specific zoning of the Assiniboine Forest will assist in minimization of human impact arising from use and development. These land use zones are proposed for the forest:

   1) Sanctuary

      Sanctuary area is parkland designated for minimal human use to allow wildlife and vegetation to co-exist without human interference. As far as possible, human access should not be encouraged.

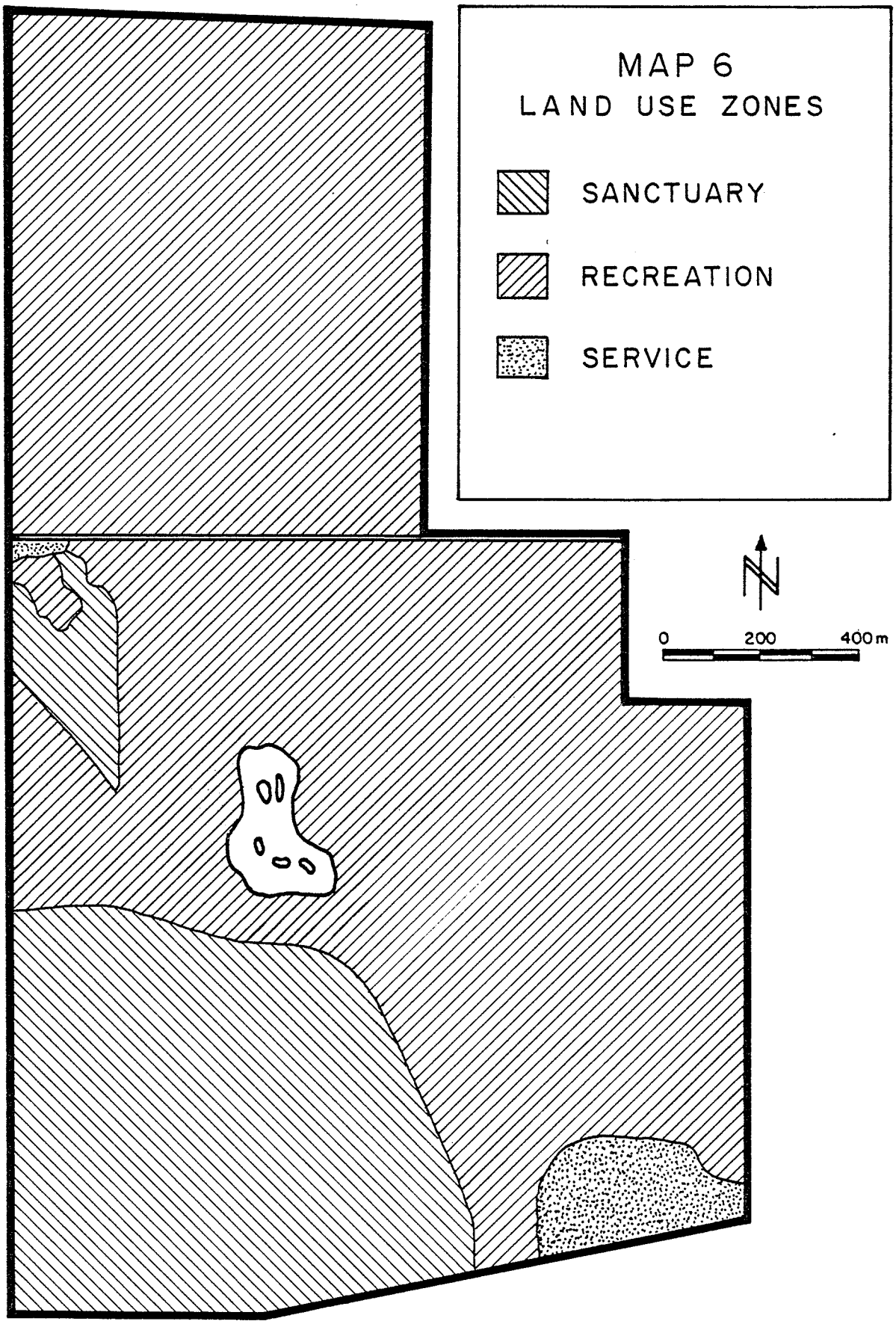
   2) Recreation

      As the park is used by Winnipeg residents, areas designated for general, non-consumptive recreation will allow park managers to plan trails and interpretive programs in a manner so as to control use. Recreation in this zone should be restricted to non-motorized traffic, yet be accessible to the physically disabled.

   3) Service

      Access to trails and other use areas should be made through nodal service area development. Controlled service areas should be developed along exterior points. Features in service areas include washroom and parking facilities.

Map 6 illustrates the relative placement of land use zones for Assiniboine Forest.


MAP 6
LAND USE ZONES
SANCTUARY
RECREATION
SERVICE
N
0
200
400m

Rationale:

The proximity of the Assiniboine Forest to city center gives rise to intense urban pressures that can have deleterious effects on area resources. The major objective of Recommendation 1: Zoning, is to ameliorate urban influences through land-use planning/control. The zoning system may be considered a passive management system in that the process is not material intensive, in comparison to active guidelines and measures stated in Recommendation 2; however, passive systems require a concerted effort by resource managers to be effective.

The external zoning system (Guideline 1), should provide protection from ambient urban influences if properly administered and monitored. Areas of concern addressed by an external zoning system are movements of white-tail deer and changes in drainage patterns effected by local developments. The study area possesses a deer herd that exhibits movements to the Fort Whyte cement plant area, approximately two kilometres to the south. Movement has traditionally been between the forest and the cement plant. As deer were one major reason for the establishment of the forest, deer represent a vital resource.[8] Wildlife movement corridors are necessary to keep the herd active and present in the park. As development increases to the south of the study area specific measures may control deer movement in the corridor.

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[8]See Appendix A for a review of the historical development of Assiniboine Forest.

Measures include deer-proof fencing (up to 2.5 metres high), natural vegetation to induce movement in restricted regions and a deer underpass to allow movement under traffic arteries. While white-tail deer do not travel in sharply delineated patterns which would facilitate the success of an underpass, further research is required to ascertain the probability of deer travel through an underpass connecting the Assiniboine Forest with Fort Whyte. Another possible measure to control wildlife movement at peak periods is the use of mirrors (See Arnold, 1978). According to Arnold (1978:101), only fewer vehicles moving at slower speeds will reduce mortality.

Development control, the second guideline measure, requires not only cooperation between city planning departments, but also rigid development agreements. The objective of development control is the reduction or prevention from proximal industrial and residential development. One example of such damage is change in ground water levels and drainage arising from residential development west of the study area. Historically, the area west served as a natural surface drain and landfill used to increase the ground level has seemingly reversed water flow. Consequently, the south-west sector remains damp into the summer. External development control should attempt to prevent such problems.

The objective of land use zoning within Assiniboine Forest is the regulation of activity to safeguard area resources.

The categorization of the forest will provide for minimization of human impact within the study area.

Three land use zones have been delineated for the study area. As the area under study is relatively small, in comparison to national or provincial parks; therefore, a site-specific zoning system was devised. Map 6 illustrates the location of each zone within the forest. The zones are as follows:

1) Sanctuary

   The sanctuary zone was instituted to provide an area for wildlife that would have minimal human interference. The south-west sector of the forest was chosen as this is the least accessible area for people and also shelters white-tail deer year-round.

2) Recreation

   As the park is used year-round, a recreation zone is vital. Recreation should be restricted to non-motorized traffic, while allowing access for physically disabled individuals. Features of the recreation zone include pedestrian trails and interpretive signs. As far as possible, trails in the recreation should utilize existing road cuts and any additional trails should be cut within labour-intensive methods (rather than machines such as tractors). The recreation zone is currently used by horse riders. The potential for conflict between riders

pedestrians (or skiers in the winter) exists and has been noted on several occasions (Ross, 1980, pers. comm.). One method of avoiding conflict would be the establishment of separate trail systems. However, one question remains: will the riders continue to use the forest area. As the extended use over time may have created an easement (legal right of travel over land), legal experts may have to be consulted.

2) Service

To allow access while controlling the points of entrance, designated areas have been assigned the Service Zone classification. Service areas that assist in access are parking lots and gates. Such features should be addressed in the masterplan.

The three zones were delineated on the basis of current use, vegetation and soil suitability. For zoning to be successful specific actions should be taken to educate the general public as to the use and restrictions inherent in zones. Public education may be assisted through the provision of interpretive services as outlined in Recommendation 4.

Recommendation 2: Individual habitat areas should be improved and/or maintained and where necessary, inadequate habitat areas should be developed and efforts taken to rehabilitate where potential exists.

Guidelines:

1) Individual habitat areas identified for improvement (Map 7) should be improved through an active vegetation management program including:
   a) planting of normally indigenous species to supplement typha marsh cover type;
   b) controlled mowing and/or burning to control aspen encroachment upon prairie areas;
   c) revegetation and plant control in areas of disturbed ground, such as the observation mound in the pond area.

2) A program of habitat creation for areas that would provide a more accurate representation of the aspen parkland biome, provided that suitable opportunity exists.

3) Rehabilitation should be instituted in areas of the forest where non-natural changes have occurred and are deemed to contrary to the philosophy of an urban nature park. One example of rehabilitation is removal of

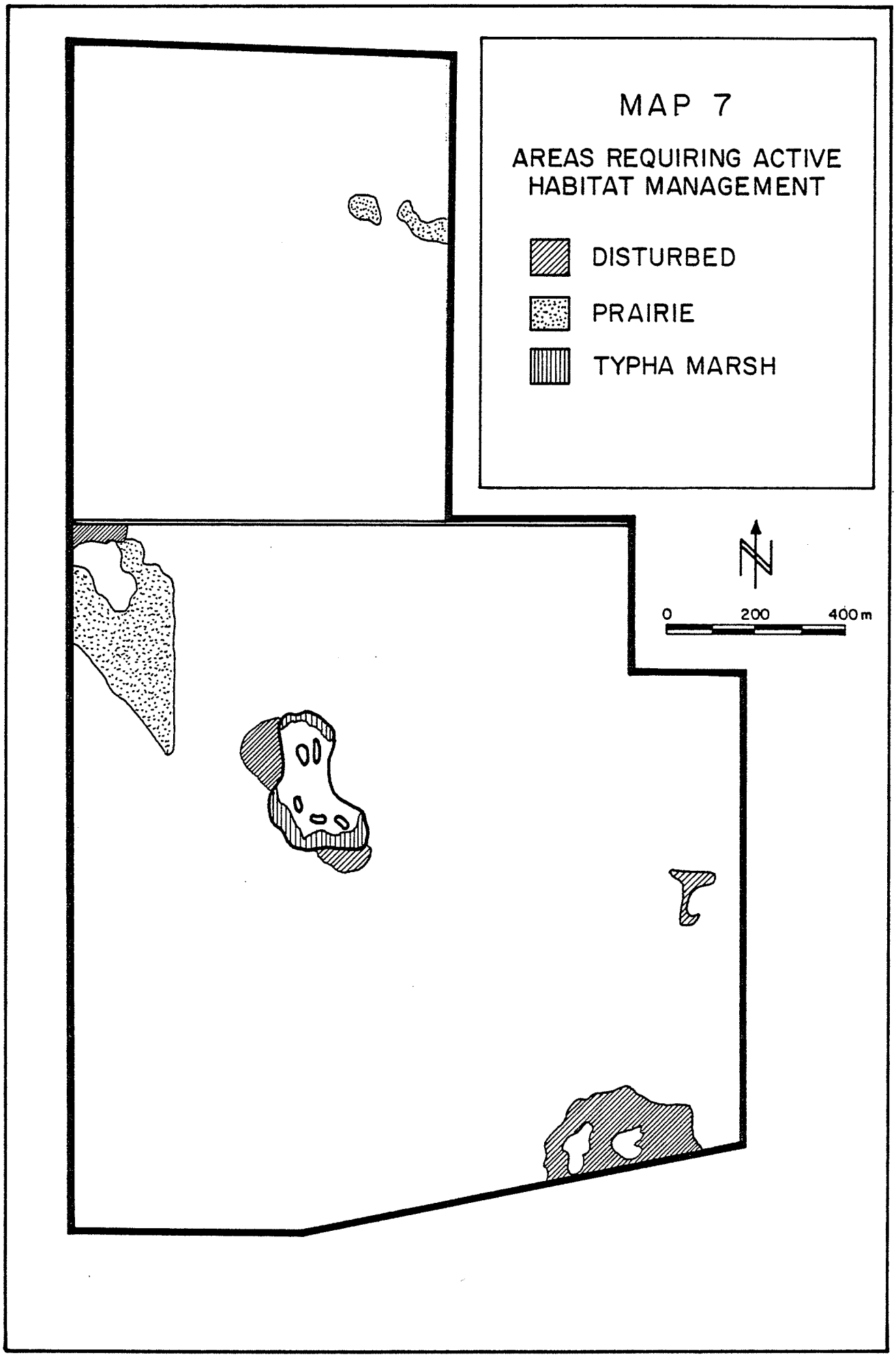
garbage that accumulated during the period when the Assiniboine Forest was used as the site of a dump by the Town of Tuxedo.

4) Whenever possible, management programs should utilize natural processes unless non-natural techniques lead to a more accurate representation of the biome or are safer (eg. fire can control prairie growth).

Rationale:

The objectives of Recommendation 2 are to provide an accurate representation of aspen parkland and to ensure that the Assiniboine Forest is managed to preserve and conserve species that would normally be found in such an area. Active management techniques as suggested in the guidelines for this section are necessary due to the dynamic nature of aspen parkland and the urban environmental influences exerted upon the nature park.

Areas that have been identified as requiring active vegetation management have been illustrated on Map 7. Three types of areas have been delineated; typha marsh, prairie and disturbed ground. Typha marsh resulting from development of the Eve Werier Memorial Pond serves as nesting areas for a variety of waterfowl and other birds. The marsh community might be improved by planting of additional species such as marsh marigold which would also serve to increase the inter-


MAP 7
AREAS REQUIRING ACTIVE HABITAT MANAGEMENT
DISTURBED
PRAIRIE
TYPHA MARSH
0
200
400 m

pretive experience of park visitors (See Recommendation 4). The prairie areas, specifically the prairie section of the corner of Chalfont and Grant Avenues, are being encroached upon by the aspen and dogwood of the aspen forest. The preservation of the prairie is an essential component of the aspen parkland (Bird, 1961) and as such a system of controlled burning and/or mowing should be instituted to preserve the prairie from successional processes. Leskiw (1978) lists the probable courses of action in prairie vegetation management. Additionally, controlled burning has proven successful at the Living Prairie Museum. Disturbed ground areas possess the characteristic of being heavily populated with non-indigenous or weed species. The observation mound overlooking the pond, the three islands in the pond, the old dump site and the area at the corner of Wilkes Avenue and Shaftesbury Boulevard are regions where vegetation management control is essential. In the case of all sites, except the old dump site, efforts should be taken to remove large areas of thistle and replace the weeds with natural aspen parkland-type vegetation. The old dump site and old road cuts that serve currently as trails represent human influence and a decision to rehabilitate areas should consider leaving the old dump as an example of natural succession in a disturbed area and incorporating the road cuts into an interpretive trail system where possible and replanting the cutover areas to present a natural appearance.

As suggested in Guideline 4, management of the Assiniboine Forest should be restricted to methods duplicating, as close as possible, natural processes. Only in exceptional circumstances, such as human safety or where human influenced techniques lead to a more accurate representation of the forest, should non-natural programs should be used (Richards, 1979). The concept of natural processes should be extended to include pest control as has been illustrated by the stocking of the Eve Werier pond with fathead minnows for mosquito control.

Recommendation 3: Species extirpated from the Assiniboine Forest should be reintroduced where possible, given sufficient habitat and low probability of the species becoming a nuisance exists.

Guidelines:

1) Species that provide a more realistic representation of the aspen parkland biome should be introduced.

2) A systematic study should be undertaken to evaluate the habitat resources of the forest study area and determine the potential for species reintroduction. Scientific study should also examine the effects and suitability of the introduction of species with respect to nuisance factors such as garden crop depredation in neighbouring residential yards.

Rationale:

The major objectives of species introduction is to increase the diversity of the Assiniboine Forest while providing a more realistic view of aspen parkland. Species introduced might include plant species such as onion and showy lady-slipper and such animal species as ruffed grouse. In general, increased floral diversity leads to increased faunal diversity (through provision of additional components in ecological chains) and ecosystem stability. Concomitantly, the faunal diversity leads to an enriched outdoor experience for visitors through an increase in human/wildlife contacts. Interpretive programs (see Recommendation 4) are enhanced by such natural contacts. However, contacts should not be increased at the expense of possible long term effects generated by the introduction of a specie without proper scientific study. Guideline 2 states that studies should carefully examine possible deleterious effects.

Recommendation 4: <u>An interpretive program should be developed for the study area</u>.

Guidelines:

1) Interpretive services should be more fully developed to include all segments of society.

2) A system of trails and a corresponding interpretive information system should be devised to permit

information dissemination.

Rationale:

In recent years, urban interpretation has been an increasing component of recreational expenditures by the City of Winnipeg (Harburn, 1978). The objectives of an interpretive program are (Sharpe, 1976):

1) The encouragement of thoughtful use of the recreational resource via reinforcement of the idea that parks, being special places, require special behaviour.

2) The minimization of human impact by guiding visitors away from sensitive areas.

3) The development of visitor awareness, understanding and appreciation of the area visited.

4) The promotion of public understanding of an agency and its programs.

As well as providing information concerning the Assiniboine Forest, interpretation also serves as an important management tool. Interpretation creates an awareness of the environment and reduces vandalism. Garrison (1974) suggests that human impact may be reduced by spreading visitor load over seasons and time. Night programs are one example of visitor load spreading. Interpretive tools such as trails and viewing

towers will assist in the interpretive experience while reducing the visitor load by ensuring that access and movement will be restricted in the Assiniboine Forest. Interpretive programs for the Assiniboine Forest must be made available to all segments of the population, including the aged and the mentally and physically handicapped. Access to the handicapped is vital in City operated areas.

The results of this study, as given in Appendices G and D, some floral and faunal features of significance for interpretation in the Assiniboine Forest and plant, bird and animal lists, respectively, should be included in an interpretive unit plan for the Assiniboine Forest Urban Nature Area.

CHAPTER IV

CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

A summary of the inventory results and subsequent analysis of the Assiniboine Forest Urban Nature Area has indicated the following conclusions:

1) The Assiniboine Forest Study Area possesses a great diversity of plants and animals. The inventory phase of the study indicates that at least 202 species of plants in 43 families and 102 species of birds in 30 families are present within the area covered by the study. As well, the Assiniboine Forest supports other animal species on an irregular basis. Species present include many not commonly seen within or even near urban areas including the white-tail deer (*Odocoileus virginianus*), black-billed cuckoo (*Coccyzus erythrophthalamus*), yellow lady slipper (*Cypripedium calceolus* L.) and fringed gentian (*Gentiana crinita* Froel).

2) The diversity of the floral and faunal species present within the study area is representative of the large number of cover types. The cover types are delineated and shown on Map 4.

Further analysis of the forest area indicates that the study zone has contained within it a number of factors of importance in development. Land use zones are shown on Map 6 and indicate the suitability of areas for recreation. Habitat areas requiring enhancement include the prairie section near Chalfont and Grant Avenue and the Eve Werier Memorial Pond.

3) The study concludes that the following recommendations may have an important role in the management of the Assiniboine Forest.

   1) An external zoning system and land use zoning system should be applied external to and within the Assiniboine Forest to protect its wildlife and resources.

      Guidelines to achieve external zoning are;

      a) A buffer zoning system that provides for wildlife movement corridors;

      b) And a system of development control for new development.

      Land use zones are proposed and include sanctuary, recreation and service areas.

   2) Individual habitat areas should be improved and/or maintained and where necessary, inadequate habitat areas should be developed and efforts taken to rehabilitate where potential exists.

      Four guidelines for habitat management are;

a) Areas should be improved through planting, controlled burning/mowing and revegetation and weed control;

b) Habitat areas may be developed to provide a more accurate representation of the aspen parkland biome;

c) Areas that have degraded as a result of non-natural influences should be re-habilitated;

d) Management techniques used should be natural processes, except where safety is a factor.

3) Species extirpated from the Assiniboine Forest should be reintroduced where possible, given sufficient habitat and low probability of the species becoming a nuisance exists. Guidelines to meet this recommendation are:

a) Species that result in a more accurate representation of the biome be intro-duced;

b) Studies be undertaken to evaluate the forest and potential for species intro-duction.

4) An interpretive program should be developed for the study area;

a) Interpretive services should be more fully developed to be accessible to all segments of society;

b) A system of trails and corresponding interpretive system should be devised.

Rationale for the above recommendations is given in Chapter III.

4.2 Recommendations

Recommendations for the management of the Assiniboine Forest Urban Nature Area, arising as a result of the analysis in this report are:

1) The classification of the study area through application of the zoning system should be incorporated into the park development plan. Additionally, data and recommendations contained herein should be used in conjunction with a program of development phasing to produce a masterplanning document for the Assiniboine Forest. The final document should be especially congnizant of the requirements of the wildlife resource, in particular the white-tail deer, in planning.

2) An interpretive plan incorporating features of significance (Appendix G) and the historical and physical history of the area as outlined in Appendix A should be completed as soon as practical.

3) This report should serve as the basis for an on-going inventory program to assess natural changes in the character of the Assiniboine Forest on a three-to-five year basis. As well, additional studies might assess the effects of proposed development both within and surrounding the Assiniboine Forest Urban Nature Area.

4.3 Areas of Further Research

The following section lists areas of further scientific research which may have effects upon the long-term management of the Assinibione Forest.

1) Further to assisting in the conservation of the white-tail deer resource, a year-round study to determine the movements should be conducted. Consequently, studies should also examine the feasibility of wildlife corridors and movement protection structures.

2) The Eve Werier Memorial Pond should be studied to ascertain the hydrologic nature of the water body with respect to drainage patterns within the forest area.

3) The feasibility and potential of establishing interpretive services for the Assiniboine Forest should be examined in a future study.

4) Re-introduction of extirpated species should be researched to assess the capability of the study area to support such species while protecting the surrounding environs from possible deleterious effects. This research should also examine the potential for wildlife - people conflicts arising as a result of species re-introduction. Studies should also examine sites that identify areas for species reintroduction.

5) Horse trails and the associated problems should be examined in regard to their effects upon the forest area.

6) A scientific research policy should be formulated for not only the Assiniboine Forest, but for other urban nature/natural emphasis areas so as to exclude research, unless the area of research is urban-related.

7) Research concerned with the utilization of the park during the entire year should be conducted. A specific area of importance is the determination of carrying capacity and methods of ameliorating user pressure.

8) Research should examine the effects of the 1980 fire in the north sector to ascertain the effect upon the vegetation and wildlife resources.

9) Vegetation changes over time should be studied to determine the effects of natural and anthropogenic changes.

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APPENDIX A

A. HISTORICAL AND PHYSICAL DESCRIPTION OF THE ASSINIBOINE FOREST

A.1 History of Assiniboine Forest Land Acquisition

A.1.1 Background

The preservation of natural areas within cities has been a difficult process due to conflicting demands of industry, developers and the general public. Winnipeg historically has had more opportunity than most Canadian centres to preserve nature within city limits. The Assiniboine Forest represents the rapidly disappearing biome known as 'aspen parkland' (Bird, 1961). Presently, the Assiniboine Forest Urban Nature area remains as one of the last vestiges of relatively undisturbed parkland allowing Winnipeg citizens and visitors alike to view unusual floral and faunal features, many of which are no longer seen near urban centres. As well, the Assiniboine Forest forms an essential component of the Assiniboine Park complex. Specifically, the Assiniboine Park, Assiniboine Zoo and Assiniboine Forest form a triad that allows the park user general recreation (Assiniboine Park), an opportunity to view wild animals (Assiniboine Zoo), and an opportunity to experience indigenous nature first-hand (Assiniboine Forest) (Ross, 1980: pers. comm.).

A.1.2 History of Assiniboine Forest Inception[1]

The Assiniboine Forest remained an untouched area from approximately the mid 1920's until the early years of the 1960's. The original awareness for the park concept was generated by city councillor B.R. Wolfe. Councillor Wolfe proposed the creation of a park in the area now recognized as the Assiniboine Forest. Originally, the interest arose as a result of citizen complaints concerning collisions between automobiles and deer. When first notified, in September of 1964 by the Tuxedo and Royal Canadian Mounted police, the city councillor attended the posting of 'Deer Crossing' signs and was suitably impressed to pursue the issue.

Further investigation and subsequent negotiation with the Town of Tuxedo proved fruitless. In November of 1964, Andrew Currie, then Director of Parks stated that the Metropolitan Corporation of Winnipeg would assume responsibility for the Assiniboine Forest park only if the Tuxedo officials were willing to transfer the lands in question to the metropolitan corporation as the purchase cost was prohibitive.

Councillor B. Wolfe continued efforts, as the chairman of the Committee on Parks, to preserve the Assiniboine Forest and presented a brief stressing the need for additional urban parkland during a council meeting in January, 1965. During

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[1] The majority of information contained within this section is based upon research conducted by B.W. Richards (1974).

the same city council meeting, the councillors were informed that the Town of Tuxedo had prepared development plans for the urban nature preserve and the loss of revenue generated by taxation of the development made the transfer of title impractical. Apparently undaunted, Councillor Wolfe suggested a trilateral cost sharing of the Assiniboine Forest. As the City of Winnipeg, Manitoba provincial government and Town of Tuxedo were all involved, a report outlining the park feasibility was to be prepared.

The report presented to the Executive Director on October 25, 1965 was not to the advantage of those persons who wished to develop the nature preserve. Under the typical urban park standard of what Garrison (1964:35) has since termed "mature woodland - bluegrass - asphalt climax", the report suggested the Assiniboine Forest was unsuitable for development as the site had "no natural feature (*sic*) such as hills, and waterways, and no tree growth of substantial size" and that the area was "damp, even in mid-summer".

The matter remained inactive until December of 1966 when Wolfe communicated to the Town of Tuxedo Secretary-Treasurer A.W. Vincent the desire to reopen consideration of the park concept. The Tuxedo government was again against the park and cited several reasons including; considerable public (Tuxedo) and private land-holdings, development plans were prepared, and the local government was unwilling to provide ancilliary services such as police and fire protec-

tection or even basic park facilities. No further action was taken until the beginning of the next decade.

The turning point for the Assiniboine Forest came on the first of January, 1972 when the Unicity concept came into effect. With the amalgamation of the separate communities came revenue and service-cost sharing. Thus, the former town of Tuxedo no longer would directly benefit from the Assiniboine Forest development area revenue nor would the town be responsible for costly provision of park services. The urban park was placed under the auspices of the Assiniboine Park Community.

The meeting of the Community of Assiniboine Park held on January 8, 1973 considered two motions. Firstly, the Assiniboine Forest was posted to restrict access to the region by snowmobiles and more importantly the Community Committee adopted a motion calling for the establishment of a "Natural History Study Area to be known as the Assiniboine Forest". From the initial meeting, progress was made rapidly.

The Committee on Environment met on January 29, 1973 to consider the communication from the Assiniboine Park Community and made the following recommendations to the Committee on Finance on August 7, 1973 (City of Winnipeg, 1973: 1219)

> "Assiniboine Forest Park" -
> Expropriation. File PR-7.
>
> 1065 - 1. Your Committee has considered the following letter received from the Chief Commissioner, dated February 15th, 1973, namely:

> "At its meeting of February 1st, 1973, your Committee received the following communication, 'In Camera' from the Committee on Environment.
>
> 'Advising that at its meeting held on January 29th, 1973, the Committee on Environment considered a communication from the Assiniboine Park Community Committee recommending that an area be set aside in the former Town of Tuxedo as a Wildlife and Natural History Reserve.
>
> Further advising that after considering this matter, the Committee on Environment has recommended that an area bounded by Shaftesbury Boulevard, Chalfont Road, Grant Avenue and the C.N.R. Mainline excepting the property owned by the Mennonite College and from the west boundary of the Tuxedo Golf Course across to Chalfont Road and between Grant and Corydon Avenues be acquired by expropriation if necessary, for this purpose.
>
> Also advising that the Committee on Environment also recommends that a sum of money be added to the estimates of the Committee on Environment for the acquisition of those parcels of land not under public ownership and that all steps necessary be taken to have this property rezoned to "PR" Parks and Recreational District category.'
>
> Council instructed me to provide it with an estimate of consolidating the City's holdings, in the area referred to, by acquisition of those parcels of land under private ownership.
>
> The total area of land involved is approximately 703 acres, with approximately 35 acres in private holdings (*sic*).

The Committee on Finance then recommended the following course of action to the City of Winnipeg Executive Policy Committee (City of Winnipeg, 1973:1220).

Report of the Committee on Finance, dated August 7th, 1973.

> In view of the rapid escalation of land costs taking place in this area, early action for acquisition is recommended.
>
> In this connection, I would like to point out that the City also has substantial holdings to the east of this area in the former Tuxedo area and where development pressures are imminent. Consideration should be given to the consolidation of City ownership in this area for better control of development."
>
> Your Committee has been advised that the Assiniboine Park Community Committee has approved of the establishment of the area bounded by Shaftesbury Boulevard, Chalfont Road, Grant Avenue and Wilkes Avenue, as a natural history study area to be known as "Assiniboine Forest".
>
> Your Committee recommends approval of the acquisition of the non-publicly owned land in this natural history study area bounded by Shaftesbury Boulevard, Chalfont Road, Grant Avenue and Wilkes Avenue, and the area bounded by the west boundary of the Tuxedo Golf Course and Chalfont Road, between Corydon and Grant Avenues, so that the area can be officially dedicated in total as a public park in 1973, to be known as "Assiniboine Forest", and submits herewith for favourable consideration draft by-law to acquire by expropriation land required in this connection.

The Executive Policy Committee concurred and the motion was approved by City Council by a vote of thirty-two to four against on August 15, 1973. Consequently, the Council had approved the establishment of the Assiniboine Forest and allocated monies for obtaining the remaining land held in private control and that the land be rezoned from A1 - Agricultural to PR - Parks and Recreational District category.

The negotiations under the City of Winnipeg and Expropriation Acts obtained the privately held land involving

192 individual holdings with an area of approximately 14.18 hectares.[2] The Assiniboine Forest acquisitions encompassed 286.90 hectares, in total. The process that culminated with City Council approval on August 15, 1973 required, as Richards (1974:8) stated "... almost nine years...".

Although the land was secured, the Parks and Recreation developed a feasibility study (See Richards, 1974) for the park. The feasibility study was followed by the formation of the Assiniboine Forest Task Force; a multidisciplinary research team was established to formulate guidelines and objectives for park masterplanning.

The last major development in the Assiniboine Forest was the development of the Eve Werier Wildlife Pond. Named after the late wife of former Winnipeg Tribune columnist Val Werier who was instrumental in preserving the forest, the pond was originally conceived by the Task Force and executed by Councillor Wolfe by motion on September 15, 1976 (City of Winnipeg, 1976:1558).

> Moved by Councillor Wolfe,
> Seconded by Councillor Mercier,
> 1496 - WHEREAS early in 1976 Council approved the construction of a $50,000.00 Wildlife Pond in the 1976 Capital Works Program, and under this proposal the City provided the funds amounting to $30,000.00, with Ducks Unlimited and the Provincial Department of Renewable Resources and Transportation Services, each contributing the sum of $10,000.00;

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[2]The total area of the Assiniboine Forest is shown on Roll 50,000, Plan Number 13649 and the titles are registered on certificate numbers E 75948 and E 75949.

AND WHEREAS the Minister for Lands, Forests and Wildlife Resources of the Province has confirmed by letter dated April 29th, 1976, that the Province will make payment for development up to $10,000.00 for the Nature Pond in the Assiniboine Forest;

AND WHEREAS Ducks Unlimited (Canada) is a body corporate one of whose objects is the restoration and maintenance of water areas for the breeding and nesting of migratory waterfowl;

AND WHEREAS The City of Winnipeg proposes to construct in the area known as the Assiniboine Forest Nature Park certain works with the object of creating a natural marsh area, to be known as the Eve Werier Wildlife Pond, on land belonging to the City;

AND WHEREAS Ducks Unlimited (Canada) has recognized the value of such a project for the benefit of migratory waterfowl and has offered to share in the cost of the construction of this pond;

AND WHEREAS an agreement between The City of Winnipeg and Ducks Unlimited (Canada) has been drafted to provide for the above;

NOW THEREFORE BE IT RESOLVED that the Proper Officers of the City be authorized to execute the agreement between the City and Ducks Unlimited.

Carried.

Following the passing of this motion, and soil testing, the pond was completed by the summer of 1977.

The Assiniboine Forest was officially opened on September 25, 1980 with the unveiling of an official plaque in Assiniboine Park.

A.2 A Review of Assiniboine Forest Historical Setting

On June 12, 1811, the Hudson's Bay Company granted a large tract of Land called Assiniboia to Lord Selkirk. The land was later surveyed and divided into lots according to

the river lot system which produced lots extending two miles inland. A further extension of lots in 1880 created river lots four miles in length and also created the first Municipal Division under Provincial Act.

Use of the land for other than pure agricultural use is not sufficiently documented although Morton (1976:83) suggests the area may have been on the trail of the cart brigades.[3]

One of the 31 municipalities created was the Rural Municipality of Assiniboia which contained the Headingly, St. Charles, St. Boniface west and St. James parishes. The Assiniboine Forest is comprised of portions of original river lots 18 through 29 of the Parish of St. Charles. The riparian sections of lots 18 through 29 and some additional lots were purchased by the City of Winnipeg in 1905 for the 114.62 hectare city park.

The remaining lands were purchased in 1908 by a large consortium of mostly British investors operating under the name Tuxedo Rock Co. Ltd. and further divided a portion which became Tuxedo. The Town of Tuxedo was incorporated in 1911 and shortly thereafter a development plan was registered for the Assiniboine Forest area. The plan, registered during the early years of the 1920's is illustrated on Figure 1. The

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[3]Further research is required to ascertain the use of the Assiniboine Forest by the cart brigades as Morton does not delineate the exact path.

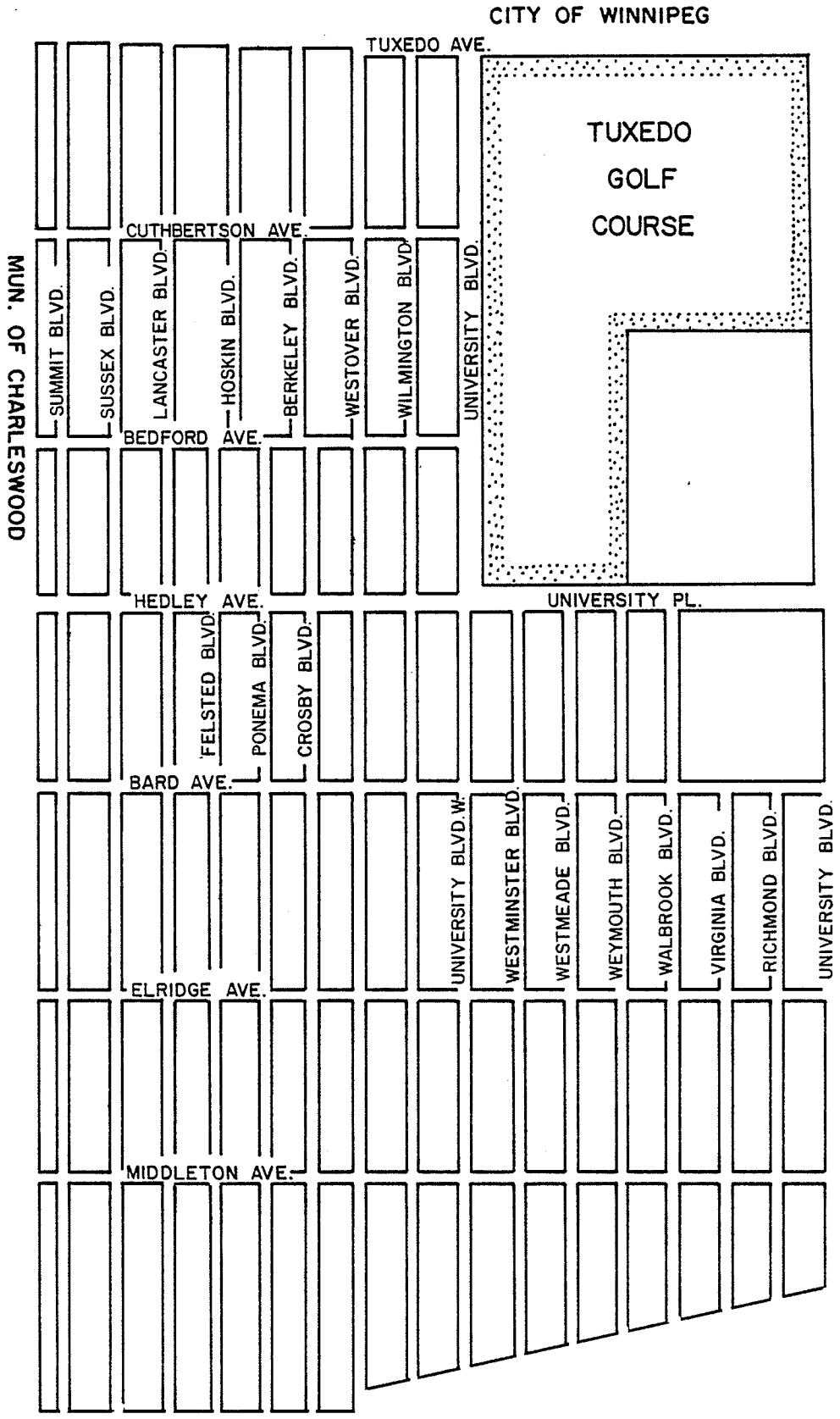


FIGURE I

STREETS PLAN FOR THE ASSINIBOINE FOREST AREA

SOURCE : Richards , 1980 pers. comm.

establishment of road cuts for O'Grady, Melita and Weymouth Boulevards, and for Bard, Mountbatten and Cuthbertson Avenues remains today as evidence of the early involvement of man. The Great Stock Market Crash and the subsequent Depression spelled the end for large scale developement in the forest. A reminder of human influence remaining is the old dump of the Town of Tuxedo.

The Assiniboine Forest remained virtually untouched and unnoticed until the early 1960's although the unique nature of the area was well known to nature enthusiasts.

A.3 Physiographic Location

The Assiniboine Forest is located in the Central Lowland Area which is a flat expanse in the central low-lying portion of the Agassiz Basin. This area generally lies at or below the 260 meter contour. This flat lowland area can be divided into four sub-units: the study area is contained within the Red River Plain sub-area of the Central Lowland Area.

The Red River Plain sub-area is a clay basin with local flood plains and river levees. The plain was covered, for a long period of time, by glacial Lake Agassiz. The major constituent of the basin is lacustrine clays and alluvial deposits which range from one or two meters in thickness to more than 20 metres. These fine-grained materials are manifested in a generally flat plain, but micro-relief appears as low clay ridges that impart a slightly undulating appearance

to much of this area. In some sites, deltaic and outwash sediments have been deposited over the lacustrine clays. As well, certain areas have had the deltaic deposits subsequently covered with fine-textured alluvium. Stratified deposits occur locally, but most notably along streams in the western and northern portions of the parkland region (Erlich, *et al.*, 1953:5).

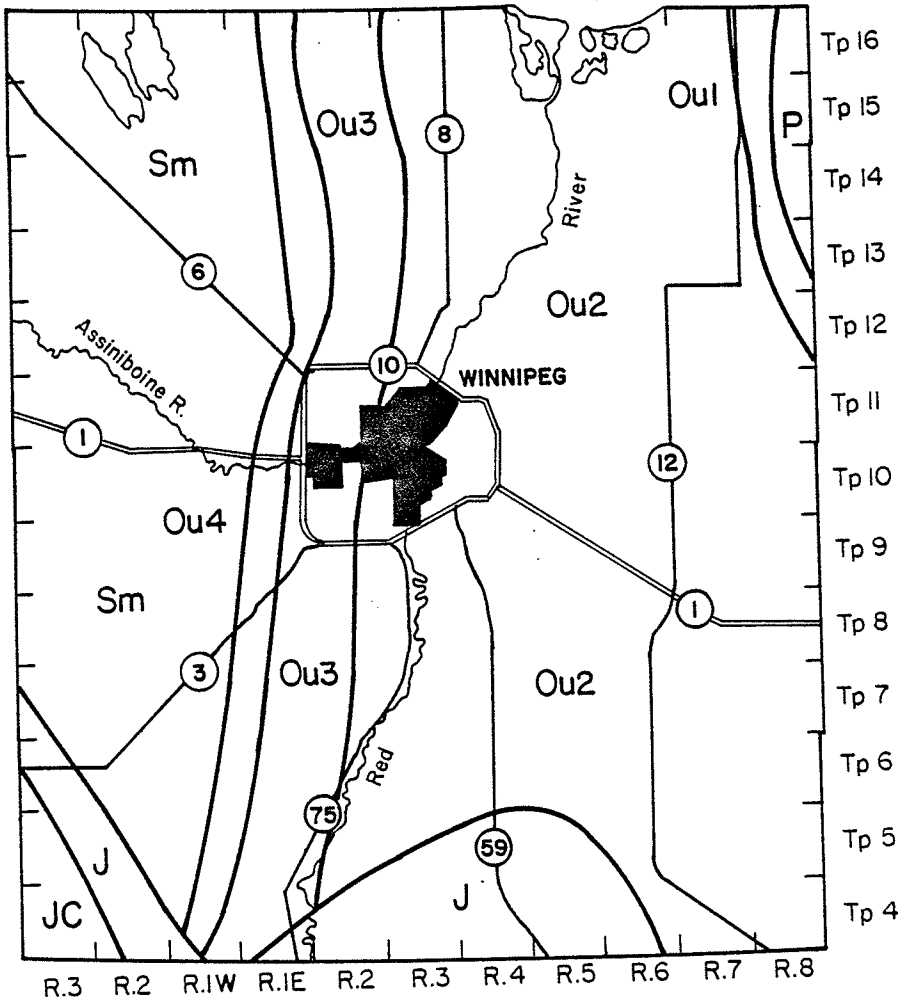
The outstanding feature of the Red River plain is the characteristic broad, flat expanse of terrain which slopes almost imperceptibly toward the Red River and from South to North. This section is dominated by Blackearth soils and by well-drained soils on the various parent materials. Blackearth-Meadow, Alkalinized, Solinized and Meadow Soils also occur extensively as associates in the intermediately drained and hydromorphic or locally humid sites (Erlich, *et al.*, 1953:5-6).

A.4 Bedrock Geology

The Assiniboine Forest study area is underlain by rock of Paleozoic and Mesozoic origin. Although Figure 2 indicates the general nature of the formations, an inspection of Figure 3 indicates that the area is at the conflux of several geologic regions.

Upper Ordovician Stony Mountain Formation

The study area is underlain by the Gunton member which is basically Upper Ordovician dolomite.



MESOZOIC

Jurassic and Cretaceous (Lower Cretaceous and Earlier)

JC — Sand, sandstone, glauconitic sand, shale, clay. Includes Swan River Formation of Lower Cretaceous age

Jurassic or Earlier

Amaranth Formation: Shale, calcareous sandstone, siltstone, argillaceous limestone, dolomite, anhydrite, gypsum

PALAEOZOIC

Silurian (Middle)

Sm — Middle Silurian Interlake Group: Includes Cedar Lake, Atikameg, Moose Lake, Inwood, and Fisher Branch Formations; dolomite

Ordovician (Upper)

Ou4 — Stonewall Formation: Dolomite, dolomite conglomerite

Ou3 — Stony Mountain Formation: Calcareous shale, dolomite

Ou2 — Red River Formation: Dolomitic limestone and dolomite

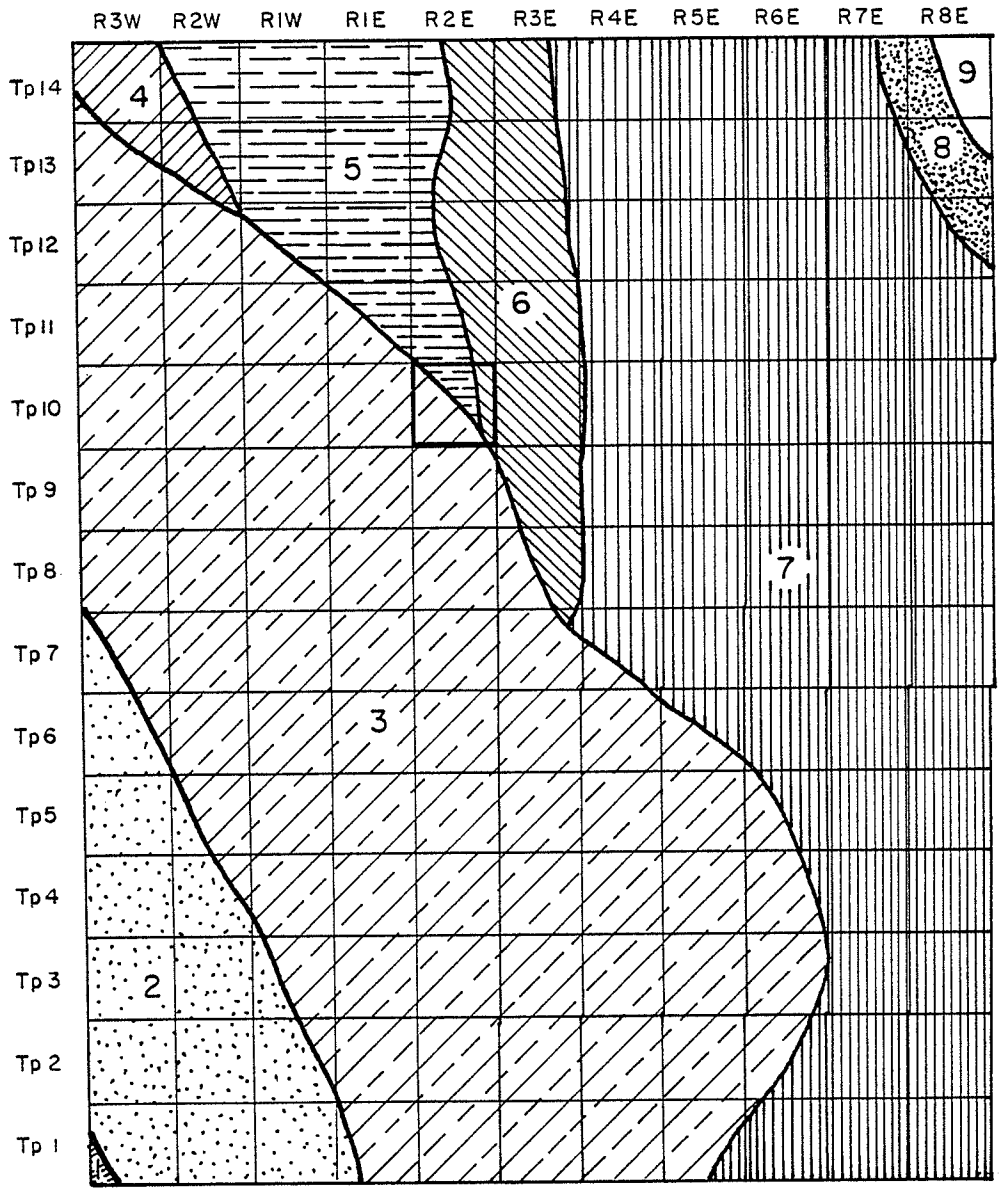
Ou1 — Winnipeg Formation: Sandstone, shale

PROTEROZOIC OR ARCHEAN

P — Granite, granodiorite, quartzdiorite, gneiss, schist undivided

FIGURE 2

BEDROCK GEOLOGY OF THE WINNIPEG REGION
SOURCE: Michalyna, *et al.*, 1975:6



MESOZOIC

LOWER AND UPPER CRETACEOUS

1 ASHVILLE FORMATION DARK GRAY SHALE, MINOR SILT AND SAND, LIMESTONE, BENTONITE

LOWER CRETACEOUS AND EARLIER

2 SWAN RIVER GROUP SAND, SANDSTONE, GLAUCONITIC SAND, GREY RED & VARIEGATED SHALE, CLAY

JURASSIC AND EARLIER

3 DOLOMITIC LIMESTONE, RED SHALE, GYPSUM, ANHYDRITE

PALAEOZOIC

DEVONIAN

4 LIMESTONE AND DOLOMITE

SILURIAN

5 STONEWALL FORMATION DOLOMITE

ORDOVICIAN

6 STONY MOUNTAIN FORMATION LIMESTONE AND DOLOMITE, RED SHALE

7 RED RIVER FORMATION LIMESTONE AND DOLOMITE

8 WINNIPEG FORMATION SANDSTONE, MINOR SHALE

ARCHEAN OR PROTEROZOIC

9 CHIEFLY ACIDIC INTRUSIVE ROCKS

FIGURE 3

GEOLOGIC PLAN VIEW OF THE STUDY REGION

Source: Ehrlich *et al* 1953:3

The Gunn member, in turn, underlies the Gunton Member and contains calcareous shale.

Upper Ordovician Red River Formation

The Stony Mountain formation is underlain by a dolomite layer known as the Fort Garry Member.

The Fort Garry Member is underlain by the Selkirk Member: a bed of high calcium limestone forms the uppermost layer.

The Selkirk Member is underlain by the Cathead Member which is composed of material ranging from Dolomistic Limestone to calcareous dolomite.

Beneath the Cathead Member lies a strata, which varies from magnesium-laden limestone to dolomitic limestone, known as the Doghead Member.

Upper Ordovician Winnipeg Formation

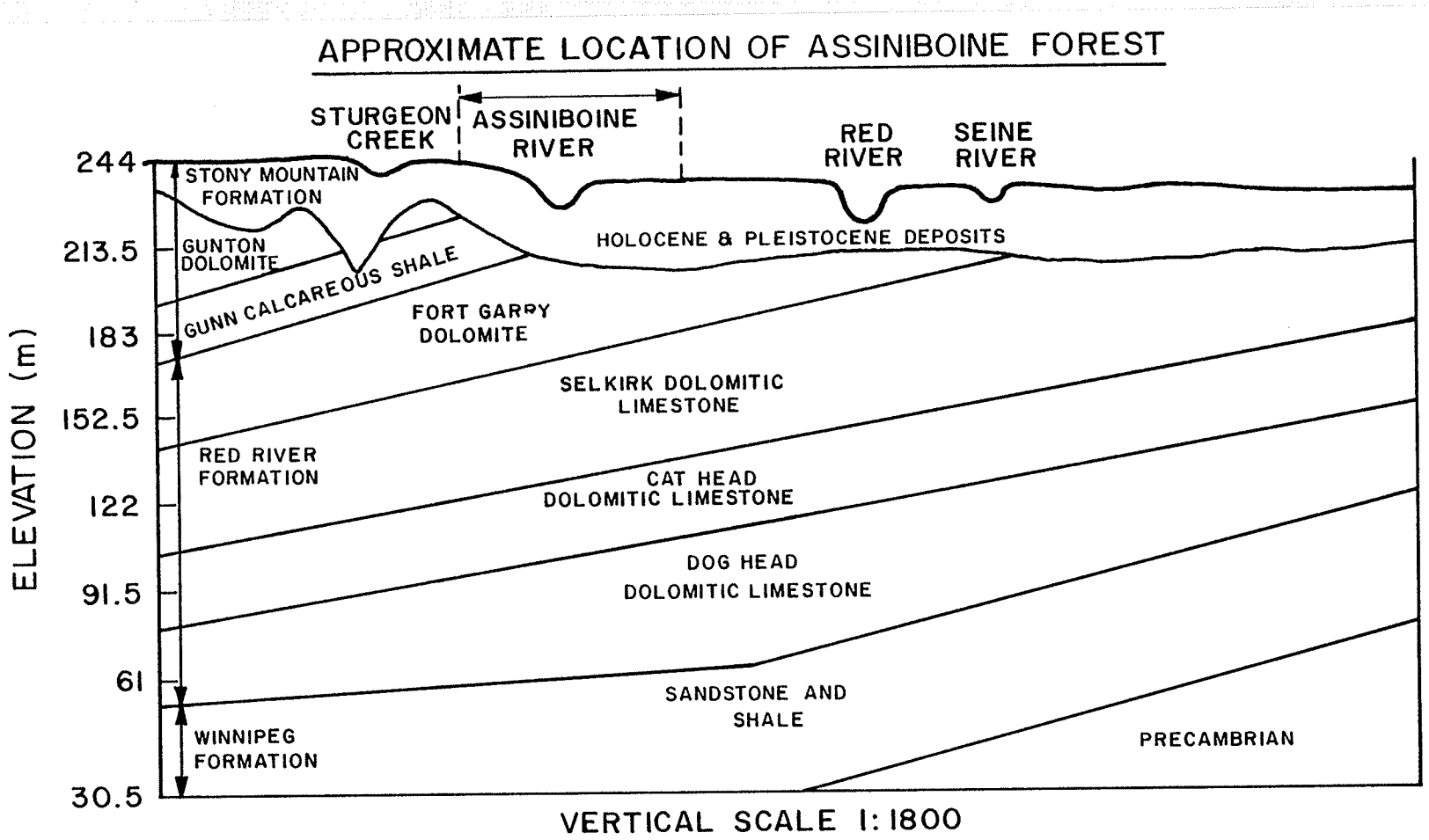
This is the basal formation in the Paleozoic sequence to the south and west of the Precambrian Shield and contains quartzose sand stone, shale with imbedded sand and shale beds. Minor amounts of pyrite and iron-oxide nodules and phosphate pellets are present. Shale deposits vary in color from green through blue-green, olive brown to dark brown and may be pyritic and sand-laden. Pure shale deposits tend to be plastic when found.

Precambrian Formation

Pre-cambrian basement rock is found at a depth of 150 to 215 metres. Rocks of this type (either Archean or Proterozoic) are chiefly acidic intrusive rocks. Such rocks, along with their contemporaries dip westward and form the base upon which all other formations rest (Bannatyne, 1973:6). Figure 4 illustrates the relative distribution of geologic formations.

A.5 Surficial Geology

The depth of surficial deposits over bedrock varies within the confines of the study area from 15 to 40 metres. Surface deposits vary considerably throughout the Manitoba Lowlands due to the effects of dynamic geological processes that occurred during glaciation and subsequent inundation. The deposits associated with glaciation are predominantly unconsolidated rock material derived from the rock formations through the action of the continental ice-sheets and glacial meltwater which covered the area of southern Manitoba during the Pleistocene epoch. The ice sheets plucked and transported large quantities of material from the bedrock which was mostly limestone and dolomite. The deposits are of Pleistocene and Holocene origin (Bannatyne, 1973).



STONY MOUNTAIN, RED RIVER AND WINNIPEG FORMATIONS BELONG TO THE UPPER ORDOVICIAN

SOURCE : BANNATYNE, 1973

FIG. 4 .

GEOLOGIC CROSS SECTION OF ASSINIBOINE FOREST AND AREA.

Pleistocene Deposits

Bannatyne (1973) described the nature of the deposits as follows: a glacial till layer consisting generally of carbonate pebbles with some Precambrian pebbles distributed through buff calcareous clay, overlying the bedrock and being approximately three to six metres thick. Under the study area, the upper segment of the till consists of a soft, wet uncemented zone that varies in thickness up to 3.7 metres and averages one metre. The underlying till is usually highly cemented with calcium carbonate and is referred to as 'hardpan'.

Glacial sediments overlie the till layer and are comprised of an upper layer of clay, silt and sand overlying clay materials. Several periods of low water and exposure of the lacustrine sediments occurred during the existence of glacial Lake Agassiz.

The lower clay unit previously mentioned is a laminated, highly colloidial clay of fairly uniform composition and ranges in thickness from six to twelve metres. The clay unit may be divided into a brown, slightly calcareous and thinly laminated varved upper layer and a lower layer of softer and siltier calcareous grey or blue-grey clay. The clay is very sticky when wet and is generally known as 'gumbo'. The blue-grey clay is predominantly composed of the clay minerals illite and montmorillonite with the illite: montmorillonite ratio of 1:1. Dolomite is the most prevalent non-clay mineral.

Minor amounts of calcite, quartz and feldspar and trace amounts of gypsum, limonite and pyrite exist. The non-clay minerals decrease in content from 40 percent at the base of the bed to 25 percent at the top. The other segment, brown varved clay, has an essentially similar composition with the addition of minor amounts of kaolinite. Non-clay minerals are found in the range of 10 to 25 percent.

The upper silt, clay and sand unit of the Lake Agassiz deposits has a more diverse composition. A one-third metre interbedded layer of medium brown clay and slightly brownish yellow silt rests at the foot of the bed. Mineralogically, the lower part of the bed is less than 50 percent illite-montmorillonite with some kaolinite. Non-clay minerals present are quartz and feldspar with amounts of dolomite, calcite and limonite. The overlying one to three metre layer of greenish-brown varved clay is only slightly calcareous with a fine silt/clay composition of mainly dolomite with some calcite, quartz, feldspar and traces of pyrite, limonite and gypsum.

The uppermost sand layer is fine-grained yellow sand with crude bedding. Again, illite-montmorillonite is the major constituent (Bannatyne, 1973).

Holocene Deposits

Clays of Holocene origin occur in the study area as alluvial fillings in abandoned stream channels, river bank

clays and floodplain deposits. Bannatyne lists an average depth of 3.4 metres. Figure 5 illustrates the arrangement of deposits. The surficial deposits of the Assiniboine Forest study area appear to fall within the Black earth soils category developed on fine textured sediments.[4]

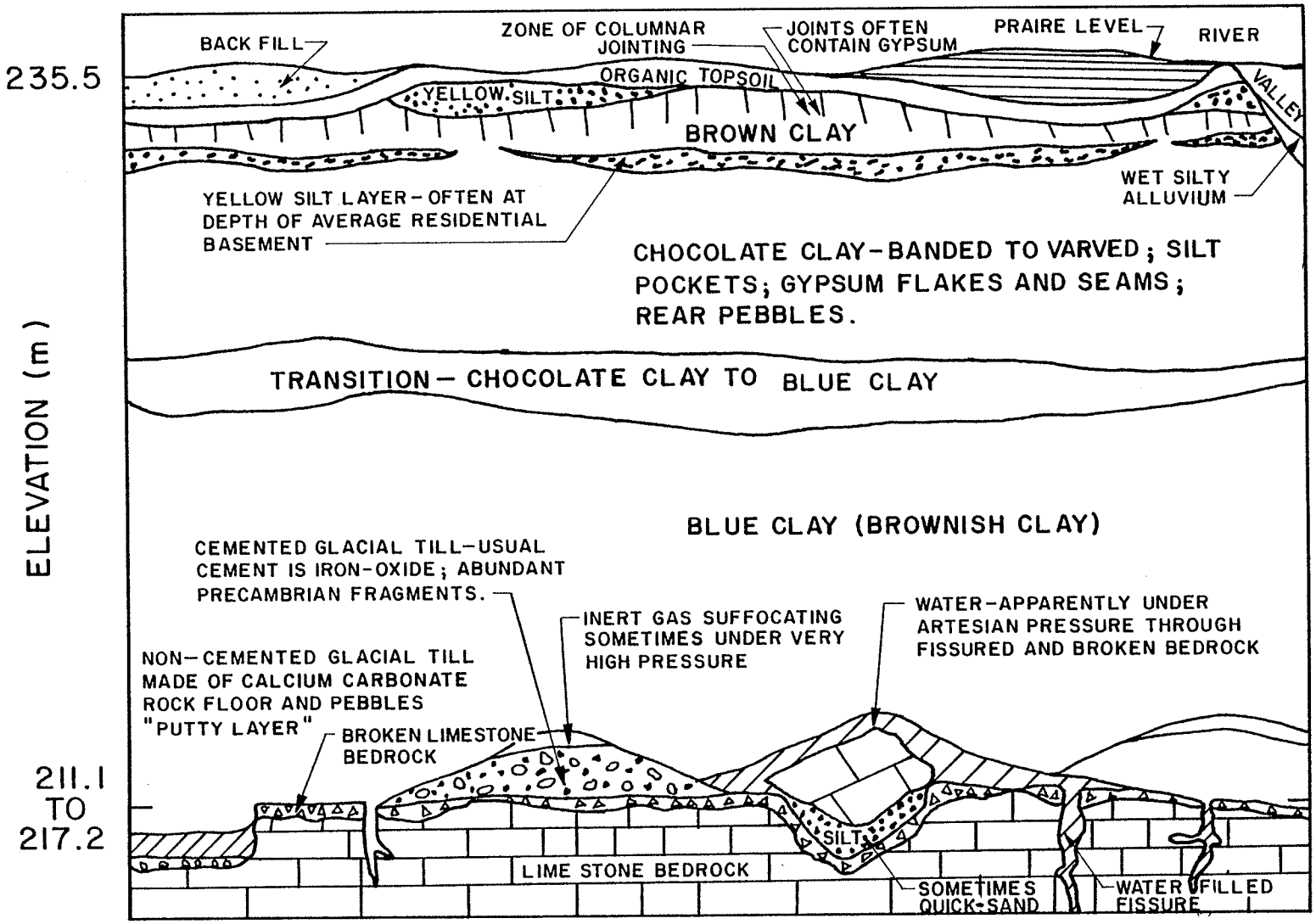
A.6 Relief and Drainage

As a function of the glacio-lacustrine surficial deposits, the topography of the Red River Plain is level to gently sloping with a total gradient of .57 metres to .95 metres per kilometre (Erlich, *et al.*, 1953). In addition, the Assiniboine Forest is located on the Red River Plain which is located in a mid-continent low and is drained by the Red and Assiniboine Rivers. A topographical map of the study area prepared from 1974 aerial photography by the Northway Survey Corporation illustrates the relief (See Map 8).

The total relief of the Assiniboine Forest is approximately 2.2 metres. Average elevation of the forest is ±235.31 metres above sea level (ASL). Generally, areas below 235 metres are considered low where water collects intermittently. The collection of water is one factor controlling vegetation. The general drainage pattern and low-lying areas

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[4]Refer to Section A.8 for a more detailed examination on the nature of the soils contained within the Assiniboine Forest.



SOURCE : (After) PROF. G. RUSSEL 1979.

FIG. 5.

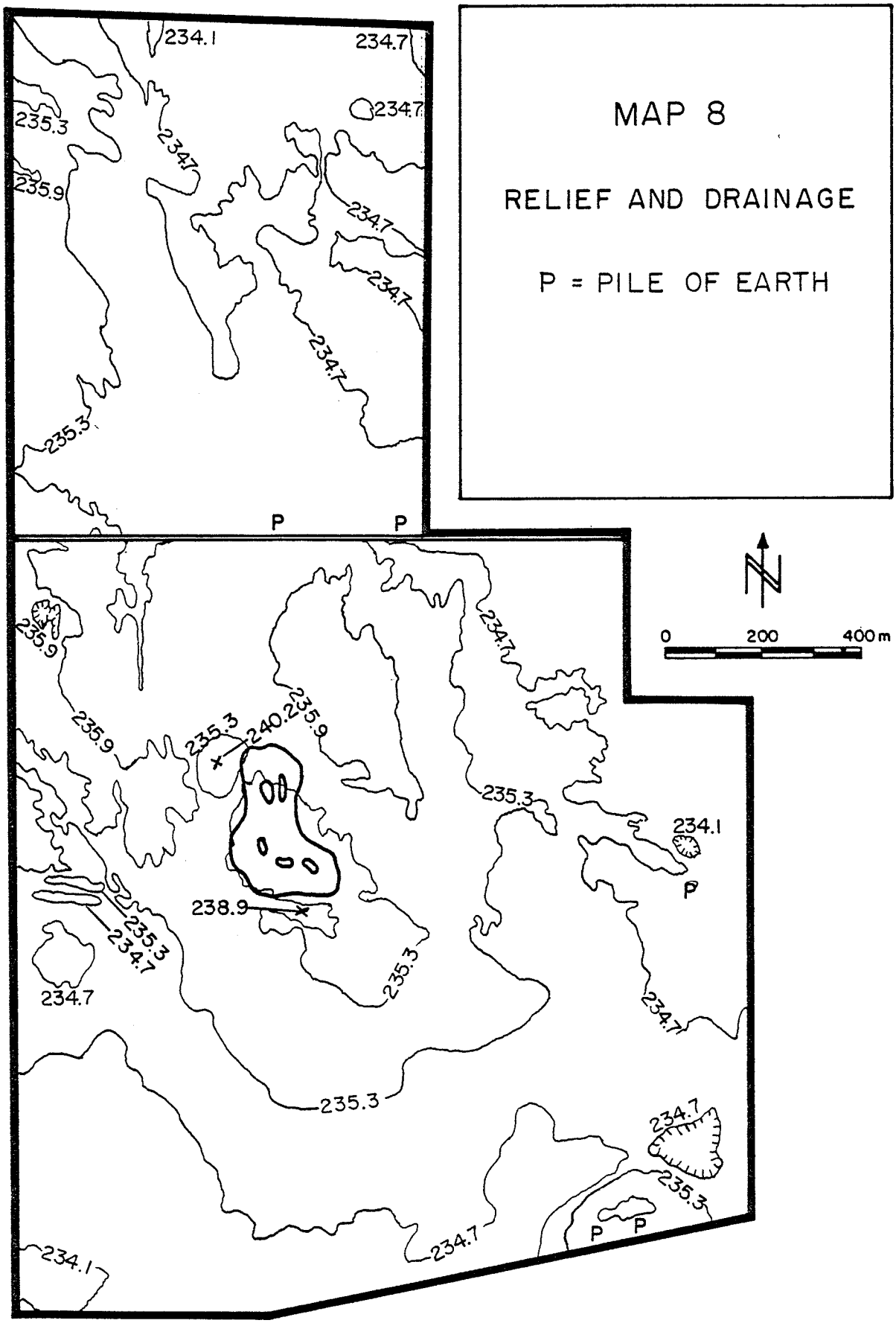
GENERALIZED CROSS SECTION OF THE WINNIPEG AREA FROM GROUND LEVEL TO THE BEDROCK.

where water collection occurs is illustrated on Map 12. As well, the Eve Werier Memorial Pond provides the immediate area with an artificial drainage basin. The pond itself was sealed by lining the bottom and sides with a clay mixture to protect the surrounding vegetation from subsurface water level changes (Braun, 1976:2). Table 3 indicates the materials that were found during testing at the pond site.

The natural drainage of the Assiniboine Forest is via the Red and Assiniboine Rivers (Weir, 1960). However, certain areas appear to be poorly drained (See Map 8) although drainage ditches exist on the north and south sections of the forest area. The drainage to the west (toward Chalfont Road) has been altered by a housing development where the additional fill has caused water retention. As well, the natural drainage to the south (toward Wilkes Avenue) appears to have been modified by the beds for the Canadian National Railway line and Wilkes Avenue. Ponding is subject to climatic variations on a yearly basis and may also be unduly influenced by the previously mentioned changes.

A.7 Hydrology

An extensive carbonate rock aquifer which yields 1.36×10^{10} litres (three billion gallons) of water per year lies under the Winnipeg region. The majority of this water is used for industrial purposes. This major aquifer, known as the Upper Carbonate aquifer, occurs in the Paleozoic



SOURCE : City of Winnipeg , 1974

TABLE 3

SOIL MATERIALS
Eve Werier Pond

Test Hole Number	Layer Depths (cm)	Texture
1	0 - 30.5	Organic Material
	30.5 - 76.3	Dark Brown Clay (42% Clay/42% Silt/16% Sand)
	76.3 - 106.75	Light Brown Silty Clay
	106.75 - 213.5	Medium Brown Varved Clay
2	0 - 15.25	Organic Material
	15.25 - 91.5	Medium Grey Clay
	91.5 - 122.0	Light Brown Clay (66% Clay/34% Silt)
	122.0 - 320.25	Medium Brown Varved Clay
3	0 - 15.25	Organic Material
	15.25 - 91.5	Medium Grey Clay
	91.5 - 122.0	Light Brown Silty Clay
	122.0 - 244.0	Medium Brown Varved Clay
4	0 - 15.25	Organic Material
	15.25 - 61.0	Medium Grey Clay
	61.0 - 106.75	Light Grey Silty Clay
	106.75 - 167.75	Light Brown and Grey Varved Clay (92% Clay/8% Coarse Silt)
5	0 - 15.25	Organic Material
	15.25 - 76.25	Dark Grey Clay (84% Clay/3% Fine Silt/8% Coarse Silt/5% Sand)
	76.25 - 106.75	Light Brown Silty Clay (68% Clay/23% Fine Silt/9% Coarse Silt)
	106.75 - 213.5	Medium Brown Varved Clay (93% Clay/4% Fine Silt/3% Coarse Silt)

TABLE 3 Continued

Test Hole Number	Layer Depths (cm)	Texture
6	0 - 61.0	Medium Brown Clay
	61.0 - 122.0	Medium Brown Silty Clay
	122.0 - 228.75	Medium Brown and Grey Varved Clay
7	0 - 30.5	Organic Material
	30.5 - 76.25	Light Brown Silt (Very Dry and Powdery) (46% Clay/40% Silt/14% Silt)
	76.25 - 152.5	Medium Brown Clay with Thin Silt Layer
	152.5 - 213.5	Medium Brown Varved Clay
8	0 - 15.25	Organic Material
	15.25 - 91.5	Dark Grey Dry Clay
	91.5 - 137.25	Medium Brown Silty Clay (87% Clay/6% Fine Silt/7% Coarse Silt)
	137.25 - 244.0	Medium Brown Varved Clay

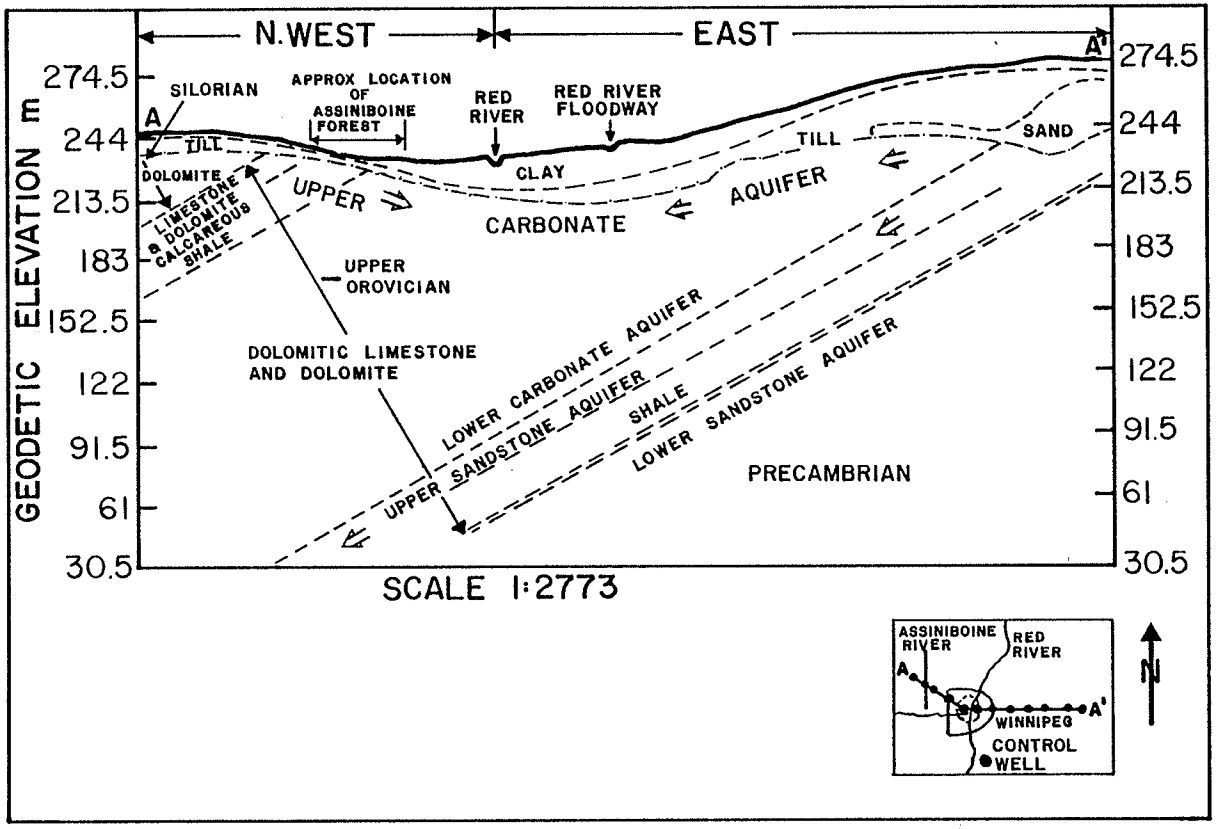
SOURCE: Braun, 1976: 3-10

limestone layer (Render, 1970). The Upper Carbonate layer lies over top of, in order, the Lower Carbonate, Upper Sandstone and Lower Sandstone aquifers (See Figure 6).

The Upper Carbonate aquifer is most active in groundwater movement in the region of the study. Recharge of the aquifer is accomplished by the percolation of precipitation through regions of glacial till (Render, 1970). Less active, but still important is the Lower Carbonate aquifer.

In the Winnipeg area, the groundwater in the deeper aquifers is found near the base of glacial deposits. The water is confined and pressurized, while the water in upper aquifers is unconfined. The static water levels for wells in the deep, confined aquifers are representative of the piezometric surface while the near surface levels are representative of the water table. In the Assiniboine Forest, the static water level ranges from 224.37 metres ASL to 228.79 metres ASL with little evidence of salinity (See Table 4 and Figures 7 through 9 for graphical display of the water levels).

The knowledge of static and piezometric is important for the Assiniboine Forest as the water table being higher than the piezometric surface indicates that the forest acts as an important area for aquifer recharge. Seasonal fluctuations due to temperature and precipitation can effect changes in vegetation. As well, Michalyna, *et al.* (1975) suggest that rainfall occurring during early summer will



⟹ GROUNDWATER FLOW

PIEZOMETRIC SURFACE OF THE UPPER CARBONATE AQUIFER

APPROXIMATE POSITION OF GEOLOGIC CONTACT

FIGURE 6
Hydrogeologic Cross Section of the Red River Valley Encompassing Assiniboine Forest

SOURCE: (After) Render, 1970

TABLE 4

Drill Well Data of Surrounding Areas of Assiniboine Forest

Date and Site No.	Layer Depth (m)	Material	Static Water Level (m)	Salinity
1	235.5 - 223.3	Clay	225.13	None
Lot 38	223.3 - 211.1	Hard pan		
3818 Wilkes	211.1 - 207.44	Unconsolidated Till		
(1973)	207.44 - 199.81	Limestone		
2	235.5 - 223	Dark Clay	225.44	Yes
Lot 30	223 - 215.37	Un. Till		
Lot 53 & 4	215.37 - 212.93	Clay & Sand		
London	212.93 - 204.69	Sand		
St.	204.69 - 202.6	Sand & Gravel		
31/3/69	202.6 - 195.8	Limestone		
3	235.5 - 221.77	Un. Ti-l	223.3	None
Lot 18	221.77 - 215.67	Hard pan		
Lot 63	215.67 - 213.54	Limestone		
1782 McCreary				
20/3/73				
4	235.5 - 223.3	Clay	225.74	None
849	223.3 - 214.15	Sand & Gravel		
Shaftsbury	214.15 - 211.1	Sand & Gravel		
Lot 18	211.1 - 203.47	Limestone		
12/7/72				
5	235.5 - 223.3	Clay	224.52	Yes
Lot 38	223.3 - 217.8	Hard pan		
Four mile	217.8 - 206.22	Un. Till		
Road	206.22 - 200.73	Limestone		
18/9/67	200.73 - 200.12	Limestone		
6	235.5 - 224.82	Clay	224.37	Slight
Lot 32	224.82 - 223	Un. Till		
Lot 12	223 - 215.67	Hard pan		
23/8/65	215.67 - 213.84	Gravel		
	213.84 - 202.6	Hardpan		
	202.6 - 188.22	Limestone		

TABLE 4 Continued

Date and Site No.	Layer Depth (m)	Material	Static Water Level (m)	Salinity
7	235.5 - 223.91	Clay	225.28	None
909	223.91 - 214.76	Hard pan		
University	214.76 - 212.32	Sand & Gravel		
Blvd.	212.32 - 203.78	Limestone		
10/10/63				
8	235.5 - 224.82	Clay	226.66	None
Lot 24	224.82 - 221.47	Limestone		
1821	221.47 - 214.76	Hard pan		
London	214.76 - 212.62	Un. Till		
St.	212.62 - 209.88	Un. Till		
2/01/75	209.88 - 199.81	Limestone		
9	235.5 - 234.89	Clay	225.74	None
Lot 16	234.89 - 231.84	Clay		
14/6/73	231.84 - 226.35	Hard pan		
	226.35 - 214.15	Hard pan		
	214.15 - 204.39	Gravel		
	204.39 - 190.97	Limestone		
10	235.5 - 231.84	Un. Till	224.83	None
Lot 18	231.84 - 221.47	Clay		
1880	221.47 - 218.42	Hard pan		
McCreary	218.42 - 214.15	Limestone		
18/7/74				
11	235.5 - 222.69	Clay	225.44	Yes
Lots 26 & 27	222.69 - 217.8	Hard pan		
2790	217.8 - 197.38	Un. Till		
Wilkes Ave.	197.38 - 189.14	Limestone		
28/03/69				
12	235.5 - 220.55	Clay	226.05	Yes
Lot 18	220.55 - 219.33	Clay & Sand		
1356	219.33 - 207.74	Hard pan		
McCreary	207.74 - 207.59	Sand		
27/03/71	207.59 - 205.3	Limestone		
13	235.5 - 231.84	Un. Till	224.83	None
Lot 18	231.84 - 221.47	Clay		
1850	221.47 - 218.42	Hard pan		
McCreary	218.42 - 212.62	Limestone		
18/07/74				

TABLE 4 Continued

Date and Site No.	Layer Depth (m)	Material	Static Water Level (m)	Salinity
14 Lot 18 1652 McCreary 28/11/69	235.5 - 223.6 223.6 - 215.06 215.06 - 214.45 214.45 - 209.27	Clay Hard pan Sand Limestone	225.13	Yes
15 Lot 17 1662 McCreary 2/10/73	235.5 - 233.97 233.97 - 220.55 220.55 - 217.81 217.81 - 196.76	Clay & Sand Clay Hard pan Limestone	226.35	None
16 13 London 27/6/64	235.5 - 228.18 228.18 - 219.64 219.64 - 212.01	Clay Hard pan	228.79	None
17 Lot 18 1400 McCreary 17/07/69	235.5 - 222.7 222.7 - 219.6 219.6 - 208.74 208.74 - 206.9 206.9 - 204.22	Clay Clay & Sand Hard pan Sand Limestone	225.75	Yes

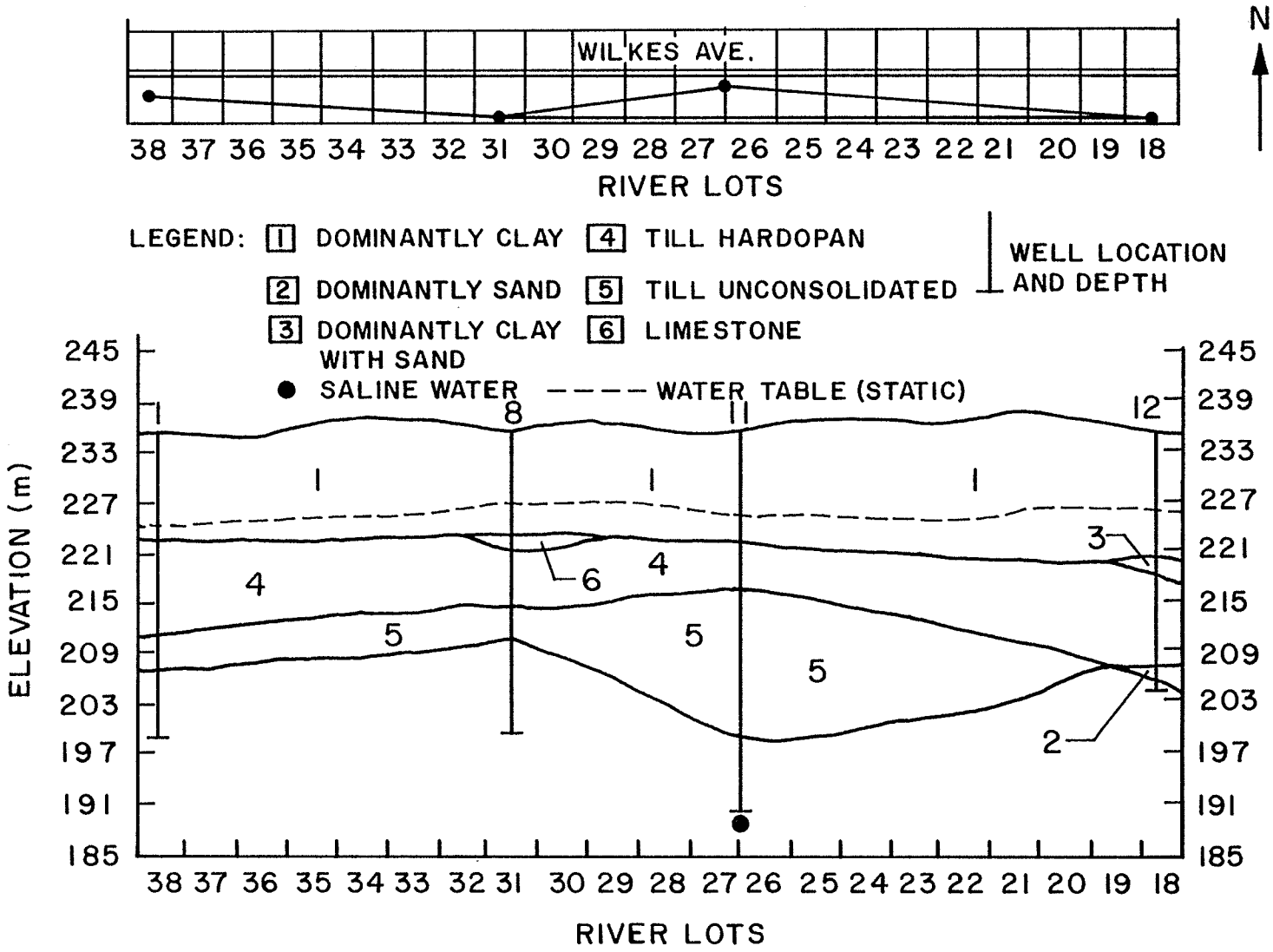


FIG. 7.

STRATIGRAPHIC CROSS SECTION – SOUTH END OF ASSINIBOINE FOREST RIVER LOTS 18–38 ALONG WILKES AVENUE.

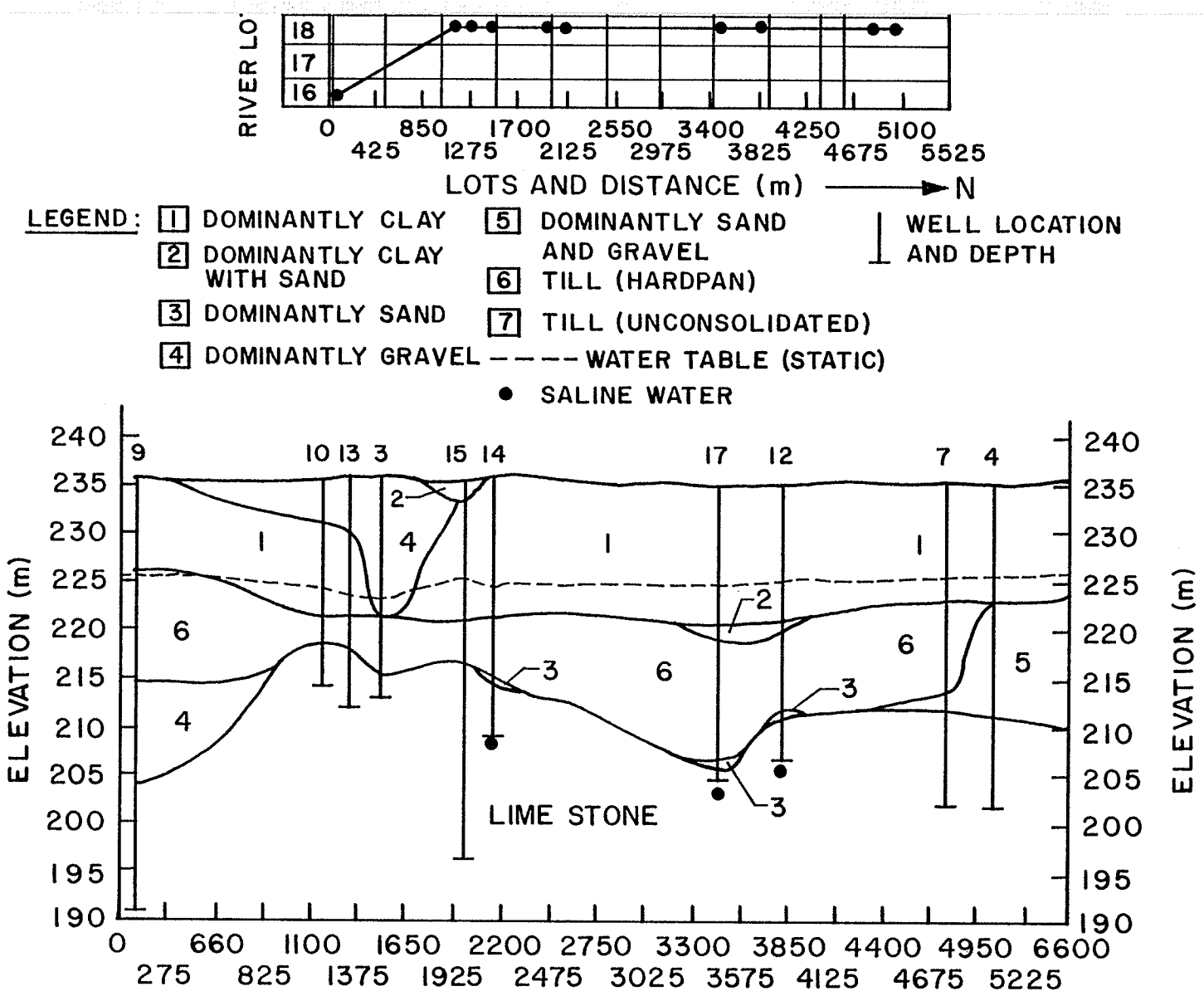


FIG. 8.

STRATIGRAPHIC CROSS SECTION – EAST EDGE OF ASSINIBOINE FOREST RIVER LOTS 16–18.

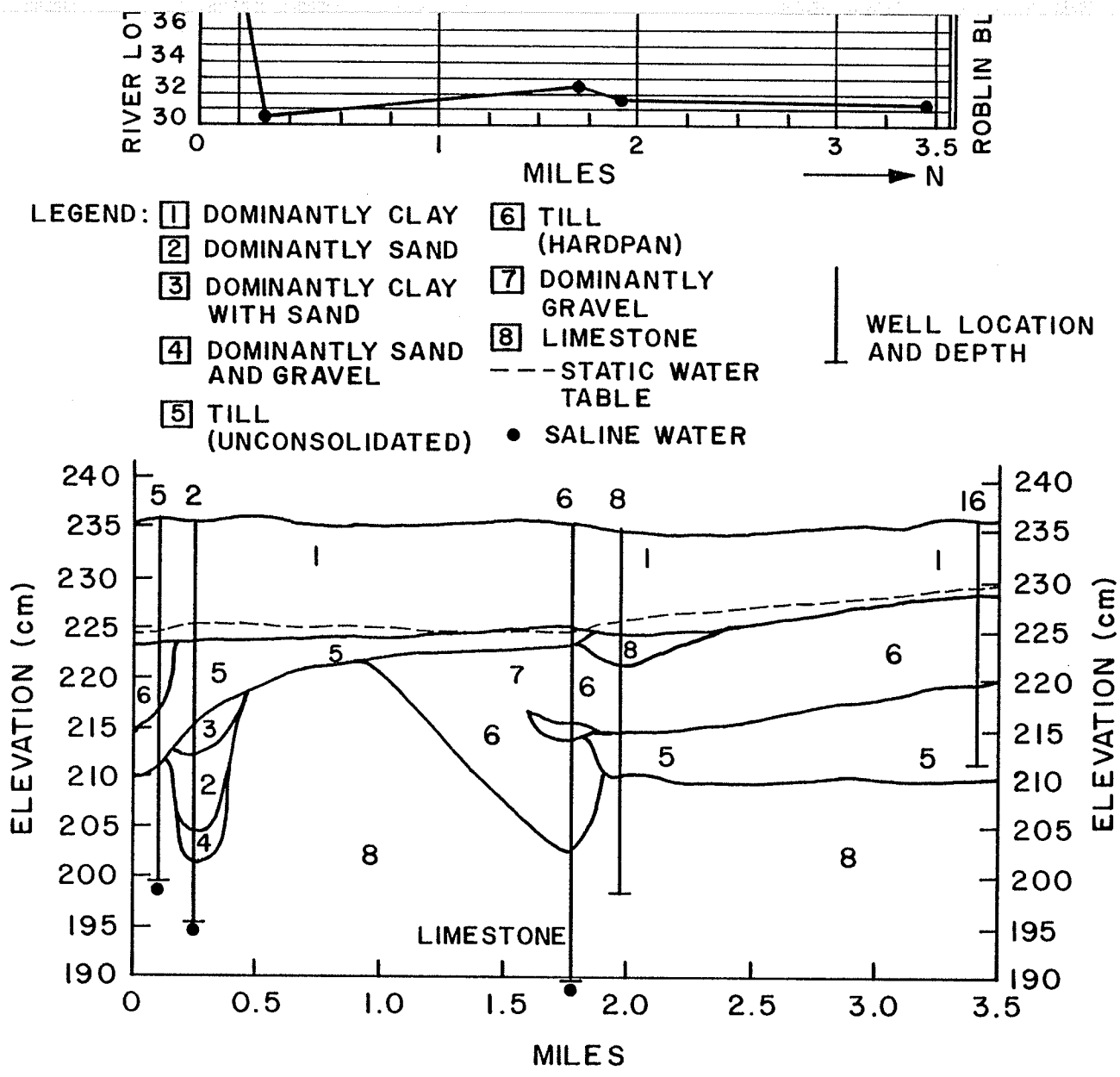


FIG. 9.

STRATIGRAPHIC CROSS SECTION – WEST EDGE OF ASSINIBOINE FOREST – RIVER LOTS 30 – 38 .

cause a rise in the water table which may favor moisture tolerant plants.

A.8 Soils

The soils of the Assiniboine Forest, like all soils, are the result of complicated interactions between the physical and mineralogical composition of the parent material, climate, the biota in or about the area, the topography and resultant drainage, human activity and the length of time over which the factors have interacted. The soils of the study area have been mapped according to the soil testing results and topography.[5]

Four soil series[6] were identified within the study area: Fort Garry, Dencross, St. Norbert and Osborne (Michalyna, *et al.*, 1975 and Erlich, *et al.*, 1953). The classification of these series is given in Table 5. The key to the soils of the Assiniboine Forest is given in Table 6 and the results are illustrated on Map 9 . Further information regarding the genetic profiles and limitations for recreational purposes is given in Appendices I and H, respectively. Michalyna, *et al.*, 1975 provides the following general descriptions for the soils found in the study area.

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[5]The reader is referred to Appendix sections C.5 and C.6 for discussion on soil mapping and sampling techniques.

[6]Michalyna *et al.*, (1975) defines a series as a naturally occurring body such that the material within the profile is similar, within a narrow range, with respect to color, texture, consistence, structure, reaction, thickness and composition.

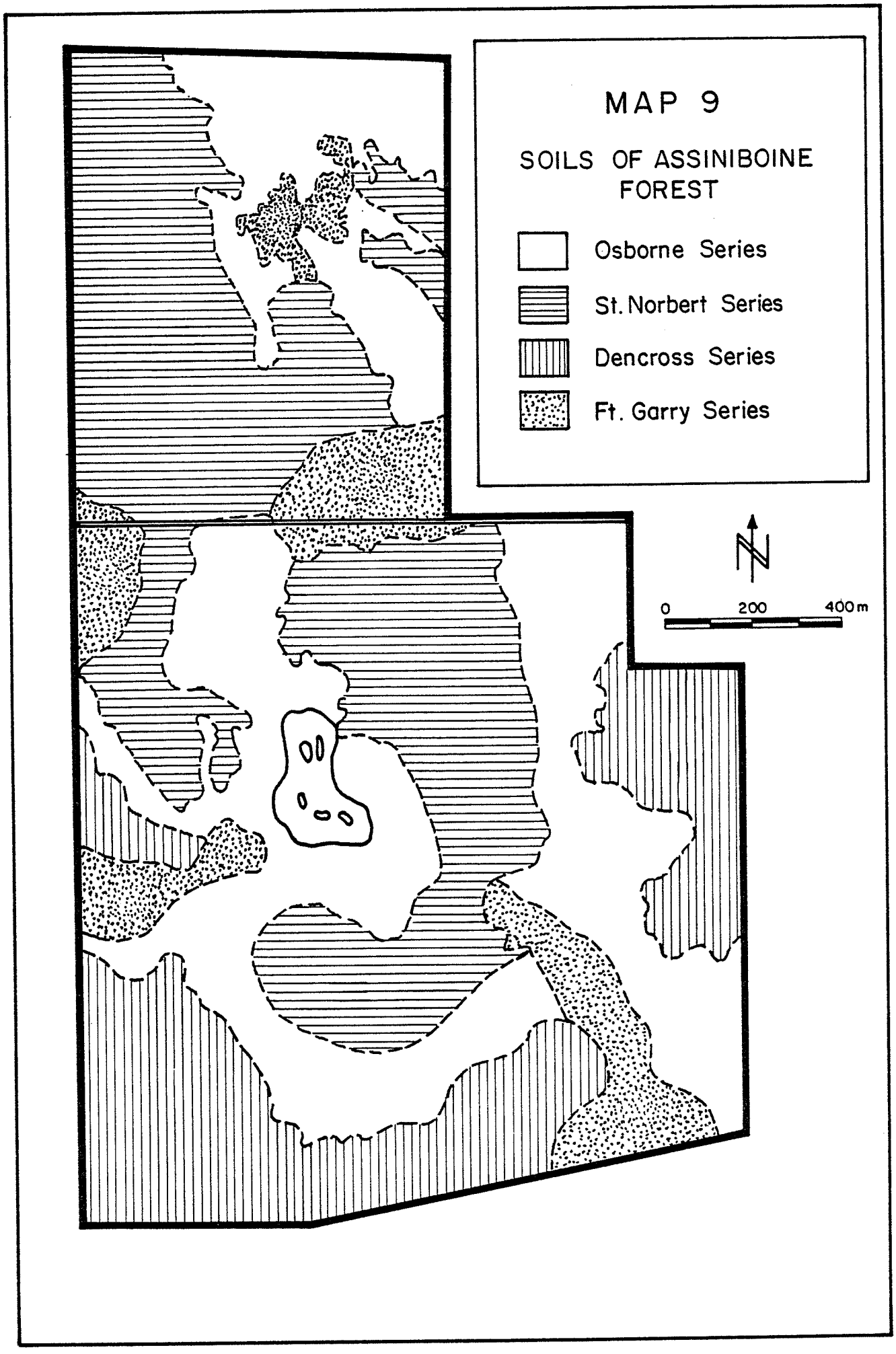

MAP 9
SOILS OF ASSINIBOINE FOREST
Osborne Series
St. Norbert Series
Dencross Series
Ft. Garry Series
N
0
200
400m

TABLE 5. Classification of the Soils of the Assiniboine Forest Study Area According to the Soil Classification System for Canada

Order	Great Group	Sub-group	Series
Chernozemic	Black	Orthic Black	Fort Garry
		Gleyed Carbonate Rego Black	Dencross
	Dark Grey	Orthic Dark Grey	St. Norbert
Gleysolic	Humic Gleysol	Carbonated Rego Humic Gleysol	Osborne

SOURCE: Michalyna *et al.*, 1975

TABLE 6. KEY TO THE SOILS OF THE ASSINIBOINE FOREST

I Soils developed on moderately calcareous lacustrine clay deposits

a. Well to moderately-well drained

St. Norbert series
(Orthic Dark Grey)

Soils developed on fine textured, slightly stratified, moderately to strongly calcareous alluvial and lacustrine clay

b. Poorly drained

Osborne series
(Rego Humic Gleysol)

II Soils developed on a thin mantle of lacustrine clay over strongly calcareous sediments. Silty sediments are variable in thickness and are underlain by lacustrine clay within four feet of the surface

a. Well to moderately-well drained

Fort Garry series
(Calcareous Black)

b. Imperfectly drained

Dencross series
(Gleyed Rego Black)

SOURCE: Michalyna *et al.*, 1975:25-28.

Dencross Series

Developed on a thin mantle overlying strongly calcareous lacustrine silty sediments and under imperfectly drained conditions, the Dencross series soils have a generally slow permeability. Water run-off tends to be slow. These soils support tall grass prairie and some aspen.

St. Norbert Series

The St. Norbert soils developed on moderately calcareous, fine textured lacustrine and alluvial deposits. As permeability is moderately slow to slow, the run-off is moderate. The St. Norbert soils tend to be found in the moderately well to well drained sections and support oak and oak-dogwood/ saskatoon vegetation.

Osborne Series

The Osborne series has a similar formative history as the St. Norbert Series, as these soils also developed on moderately to strongly calcareous lacustrine clay deposits along with some stratification. These soils, however, are poorly drained and tend to support moisture - tolerant vegetation such as willows.

Fort Garry Series

These moderately well drained soils developed on moderately calcareous, thin, fine textured sediments. Silty

sediments are also present and may vary to depths greater than 1.5 metres. Permeability is variable and run-off is moderate; both are a function of the amount and depth of silt and clays present. Vegetation is grasses and isolated clumps of aspen or bur oak.

APPENDIX B

RECORD OF DAILY MAXIMUM AND MINIMUM TEMPERATURES AND RAINFALL (SUMMER, 1979)

	May			June			July			August			Precipitation			
Date	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean	May	June	July	August
1	8.0	1.2	4.6	15.0	5.9	10.5	27.2	16.7	22.0	29.3	13.0	21.2	6.0	9.0		40.8
2	1.4	-2.5	-0.6	20.0	9.1	14.6	26.3	18.3	22.3	25.2	11.1	18.2		0.2	Tr.	Tr.
3	1.5	-2.9	-0.7	23.2	11.7	17.5	26.4	15.3	20.9	18.9	8.3	13.6		1.6		6.9
4	7.0	-2.7	2.2	17.6	6.9	12.3	28.9	14.1	21.5	21.4	10.2	15.8	0.3	Tr.		
5	7.2	-2.0	2.6	20.2	6.5	13.4	28.0	15.5	21.8	23.0	6.9	15.0		Tr.		
6	7.9	-1.3	3.3	22.7	12.5	17.6	28.0	16.0	22.0	26.2	14.0	20.1	6.2	Tr.		Tr.
7	6.2	1.6	3.9	16.5	7.5	12.0	24.4	14.2	19.3	23.8	11.1	17.5	2.5	7.9		
8	5.5	0.3	2.9	19.0	4.3	11.7	30.3	18.0	24.2	23.2	7.7	15.5				Tr.
9	2.3	-1.1	0.6	19.7	7.8	13.8	32.7	18.2	25.5	22.8	13.4	18.1				0.4
10	3.6	-0.6	1.5	22.5	7.3	14.9	32.5	16.1	24.3	21.6	8.5	15.1	2.4		Tr.	
11	4.8	-0.9	2.0	23.1	3.8	13.5	32.2	18.4	25.3	24.4	7.1	15.8			Tr.	Tr.
12	16.0	-0.4	7.8	27.5	11.2	19.4	31.7	20.5	26.1	22.4	11.3	16.9	2.2			4.0
13	11.5	1.2	6.4	34.0	16.0	25.0	27.7	16.4	22.1	13.9	5.5	9.7		0.6	1.3	Tr.
14	12.5	-1.6	5.5	27.7	14.8	21.3	24.6	13.8	19.2	17.6	4.6	11.1		0.4	7.4	
15	15.9	-2.9	6.5	21.8	9.5	15.7	20.8	10.2	15.5	20.7	4.0	12.4			0.3	
16	27.2	7.7	17.5	21.0	6.2	13.6	24.5	7.0	15.8	21.1	10.6	15.9	2.2			
17	19.6	4.0	11.8	24.6	6.1	15.4	28.2	12.2	20.2	25.5	14.2	19.9	1.3			0.2
18	6.2	1.5	3.9	25.7	10.7	18.2	29.5	16.2	22.9	28.9	13.5	21.2	Tr.		Tr.	
19	10.2	0.0	5.1	21.3	14.4	17.9	28.4	16.7	22.6	28.9	11.8	20.4		Tr.	0.9	
20	12.4	2.7	7.6	21.5	10.6	16.1	32.5	16.5	24.5	29.5	11.0	20.3		33.1		
21	18.0	2.0	10.0	12.3	8.0	10.2	28.5	15.9	22.2	21.2	15.7	18.5	5.2	Tr.		7.4
22	18.9	4.3	11.6	18.0	5.2	11.6	30.2	10.5	20.4	21.6	10.8	16.2	2.9			3.8
23	14.9	1.7	8.3	22.3	5.0	13.7	25.6	16.3	21.0	13.1	9.5	11.3	1.2		10.4	4.8
24	21.4	4.3	12.9	24.8	9.9	17.4	27.1	13.9	20.5	21.6	6.9	14.3		0.2	Tr.	Tr.
25	18.8	10.7	14.8	26.4	14.7	20.6	22.9	9.8	16.4	20.2	6.8	13.5	4.7	Tr.	2.2	
26	19.3	8.2	13.8	23.4	12.3	17.9	22.6	8.2	15.4	22.9	10.2	16.6				
27	22.6	5.4	14.0	27.0	9.8	18.4	26.0	11.4	18.7	25.9	9.3	17.6		2.2		
28	27.2	9.9	18.6	25.8	14.7	20.3	29.9	14.7	22.3	26.8	13.2	20.0		9.9		0.6
29	19.2	8.5	13.9	28.9	14.5	21.7	26.7	15.2	21.0	19.8	6.2	13.0	20.3	Tr.	0.6	
30	10.0	4.5	7.3	27.7	12.2	20.0	21.8	10.8	16.3	22.0	4.6	13.3	25.2		Tr.	
31	14.7	2.6	8.7				25.0	7.3	16.2	25.6	13.6	19.6				7.2
TOTAL	12.6	2.0	7.3	22.7	9.6	16.2	27.5	14.3	20.9	22.9	9.8	16.4	82.6	65.1	23.1	76.1

SOURCE: Fisheries and Environment Canada, 1979

APPENDIX C

INVENTORY SAMPLING METHODS

C.1 Vegetation Mapping Method

The vegetation types of the Assiniboine Forest were located and identified from a panchromatic air photograph taken in August of 1979 by Northway Survey Corporation. Further assessment was accomplished by the examination of standard stereopairs taken in May, 1979 (AS79002 L-1N: 129 - 131, AS79001 L-2: 40 - 41; Scale = 1:15840) observed with binocular and hand-held stereoscopes. Substantiation of the delineated areas was accomplished through subsequent 'ground truthing' and resulted in the production of Map 7.

C.2 Vegetation Sampling Method

C.2.1 Introduction

In 1975, Evans (page 6) identified fifteen sites for intensive vegetation analysis within the Assiniboine Forest Study Area. In an attempt to provide a standard for comparison, this study has utilized the same analysis sites as the Evans study in all but one case. The only exception in the site selection occurred in the Marsh community: the Eve Werier Memorial Pond subsumed the area mentioned in the 1975 study conducted by Evans and necessitated the selection of a site on edge of the pond. The selection of a similar site to that described by Evans was expected although a high probability

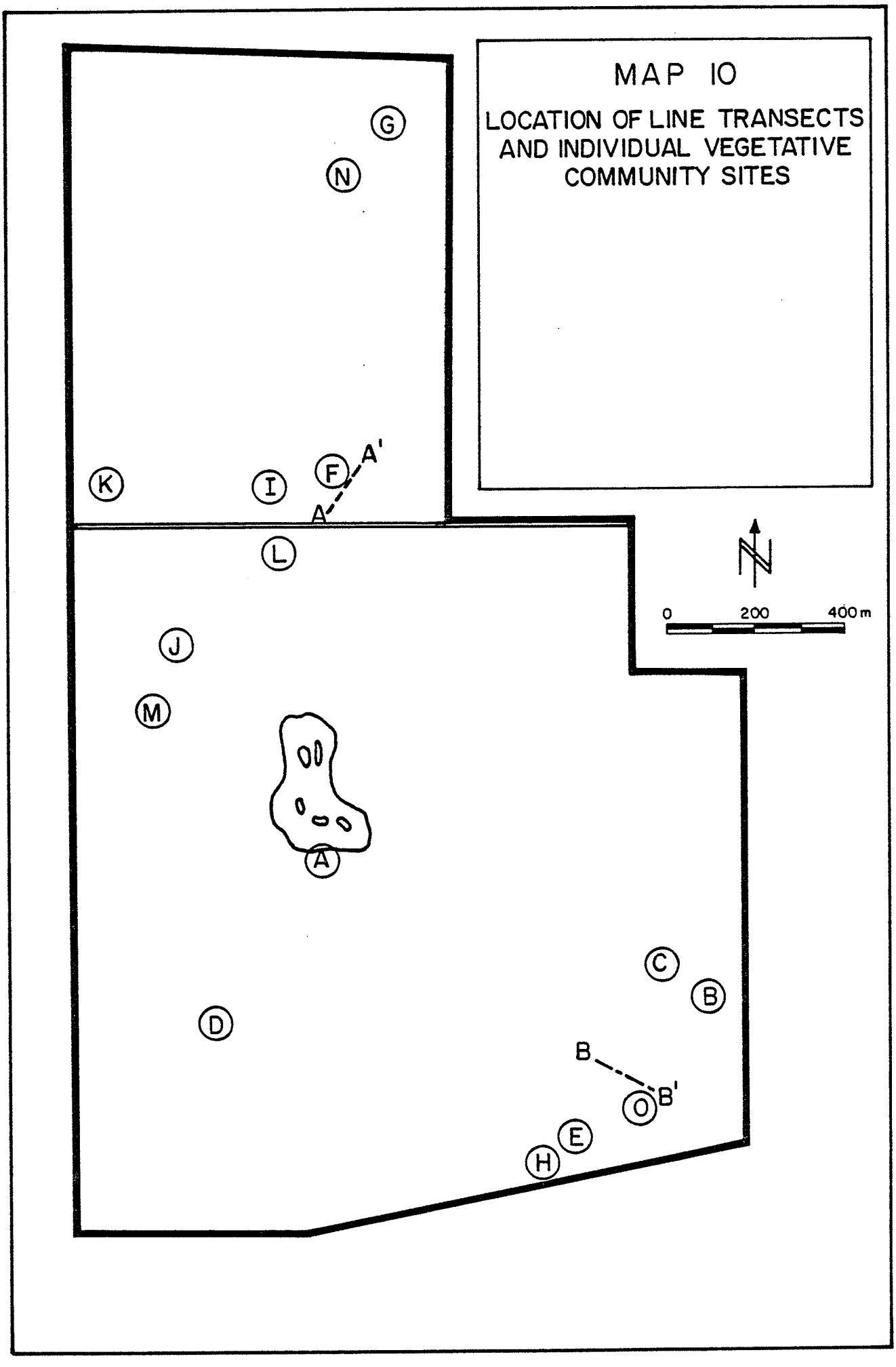
exists for a greater species diversity due to the proximity of the pond. Sites selected for intensive vegetation analysis are listed in Table 1 and illustrated in Map 10.

In 1975, the Evans study claimed to have established ten permanent quadrats in each of the previously mentioned sites as listed in Table 1 and although an extensive search was undertaken, little evidence could be found of the markers denoting the sites. Consequently, reconstruction of the vegetation analysis quadrats was necessary. The sites were located by methods as close as possible to the Evans study to enable future documentation of vegetative changes.

C.2.2 Analysis of Individual Communities

The plots for analysis of individual communities were established in the following manner. The position of the initial stake was determined by a random toss. From the point of impact, a series of quadrats was established, each measuring two metres by one-half metre, arranged in a staggered diagonal pattern (See Figure 10).

The species present in each quadrat were recorded and assigned a cover estimate, based on the Braun-Blanquet Scale (Phillips, 1959:116). Table 7 below indicates the relative cover values according to the Braum-Blanquet system.


MAP 10
LOCATION OF LINE TRANSECTS AND INDIVIDUAL VEGETATIVE COMMUNITY SITES
G
N
K
I
F
A'
A
L
0
200
400m
J
M
A
C
B
D
B
B'
O
E
H

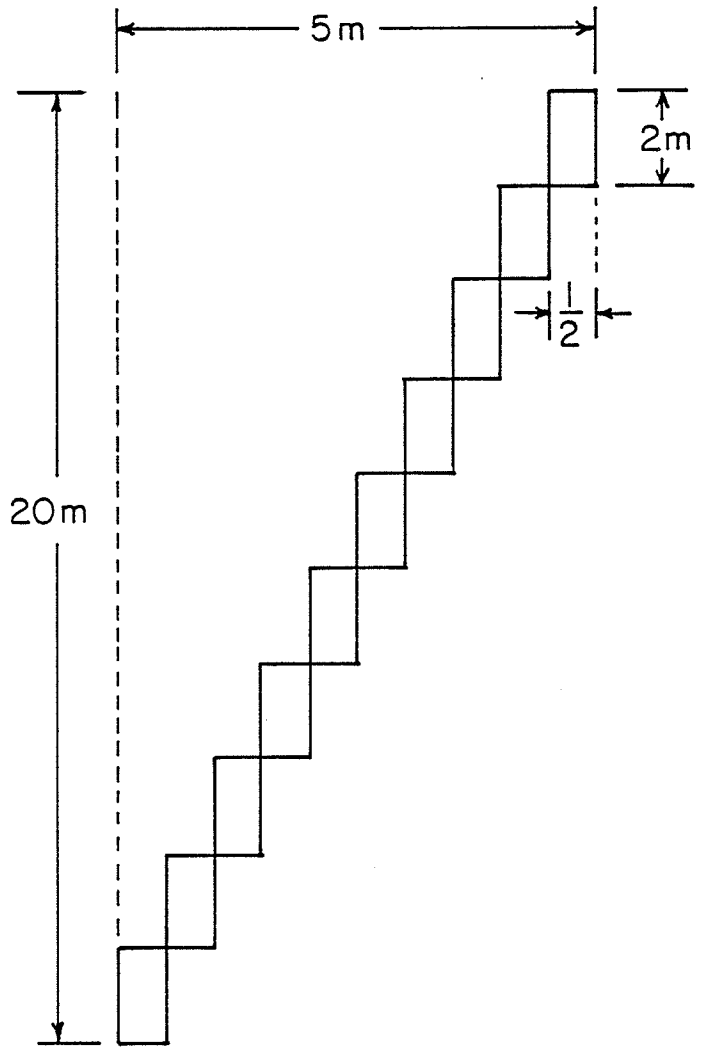


FIGURE 10

ARRANGEMENTS OF QUADRATS FOR INDIVIDUAL COMMUNITIES

SOURCE : EVANS , 1975 : 7

Table 7

Braun-Blanquet Cover-Abundance Scale

Value	Description	Coverage
1	Single Individual	
2	Isolated Individuals	< 20 %
3	Scattered Plants	20% - 50%
4	Plants Common	50% - 75%
5	Plants Abundant	75% - 100%

Further substantiation of individual communities was accomplished through the use of detailed line transects. The line transects were designed such that a large number of community types were sampled to allow for the development of species lists and habitat analysis.[1] The line transects follow Evans (1975) study and are shown on Map 14. The transects were laid using a tape measure and examined every five metres.

C.2.3 Point Quarter Assessment

The point quarter assessment method provides an estimate of tree dominance, frequency and absolute number in woodlands

[1] Refer to Appendix E and Chapter 3, respectively for complete listing of information derived from the line transects.

(Evans, 1975:13). Point quarter assessment procedure involves the random selection of a point within the sample area by the toss of a stake. From the point of impact, the surrounding area is divided into quarters and the closest tree in each quarter was measured for diameter at breast height (dbh)[2], distance from the impact point and identified as to the species. The basal area of the tree was also calculated. The point quarter assessment was conducted within the sample plot for an additional ten points.

The data collected from the point quarter assessment were summarized by the calculation of relative dominance, relative density and mean cross-sectional area for each species present in each of the sample areas. The Importance Value reflects the relative measure of importance of the species in a particular sample plot. The following formulae were used to calculate the relative measures:

$$\text{number of trees/ha} = \frac{\text{area of one hectare}}{\text{mean area of tree}}$$

$$\text{relative frequency} = \frac{\text{number of individuals of species}}{\text{total number of trees sampled}}$$

$$\text{mean cross-sectional area} = \frac{\text{total basal area of species}}{\text{number of trees of species}}$$

---

[2]Diameter at breast height (dbh) is defined as the measurement of diameter of woody stems greater than or equal to 7.62 cm at 1.3 metres above ground.

$$\text{relative dominance} = \frac{\text{total basal area of species} \times 100}{\text{total basal area for all species}}$$

$$\text{importance value} = \text{relative frequency} + \text{relative dominance}$$

The average tree health state for species in each sample plot was also determined. Tree health estimates were made during the point quarter assessment and are given in Appendix E.

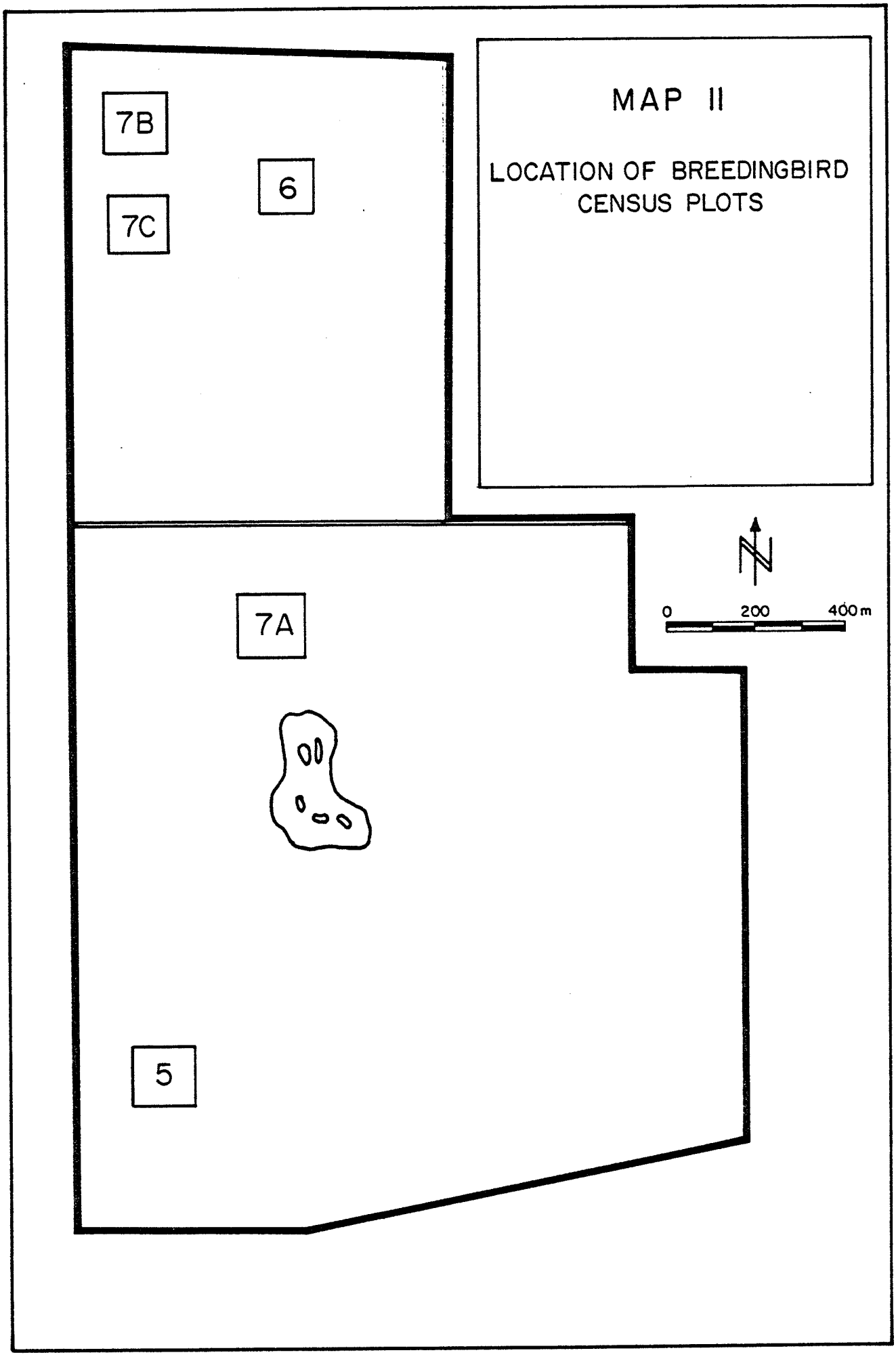
C.3 Breeding Bird Census Method

A series of sample plots was utilized in the census of the breeding bird populations of the Assiniboine Forest. Five sites were selected based upon the sites previously established by Cuthbert and Koonz (1976). Each of the 2.43 hectare plots corresponds to a vegetation type as given in Evans (1975:6):

1) Aspen Community
2) Aspen (Oak) Community
3) Aspen-Oak Community
4) Intermediate Aspen-Oak Community
5) Dense Aspen-Oak Community.

The location of the plots is shown on Map 11.

As the permanent plots mentioned in the Cuthbert and Koonz study were established in 1976, reconstruction of the grid system in a manner similar to that recommended by


MAP II
LOCATION OF BREEDINGBIRD CENSUS PLOTS
7B
6
7C
7A
5
0
200
400m

Kendeigh (1944) was necessary. Each plot measured 152.5 m square and is comprised of a 30.5 m grid for a total of 36 census stations.

Census work occurred between 0500 hrs and 0800 hrs CDT (approximately) in the period between 15 June 1979 and 13 July 1979.[3] Singing males were recorded and the number and species of territorial males was recorded. Appendix F contains the summary of breeding bird data in a modified form of that suggested by van Velzein (1972). A species list of birds of the Assiniboine Forest was developed from the bird census, review of earlier censuses and consultation with the Manitoba Museum of Man and Nature and is given in Appendix D.

C.4 Soil Mapping Method

The production of Map 13, Soils of the Assiniboine Forest, was accomplished through a thorough system of soil sampling and analysis, vegetation analysis and topographic interpolation. Soil sampling methods are summarized in the next section.

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[3]The unusual weather conditions, including high winds, heavy rainfall and below average temperatures lengthened the breeding season.

C.5 Soil Sampling Method

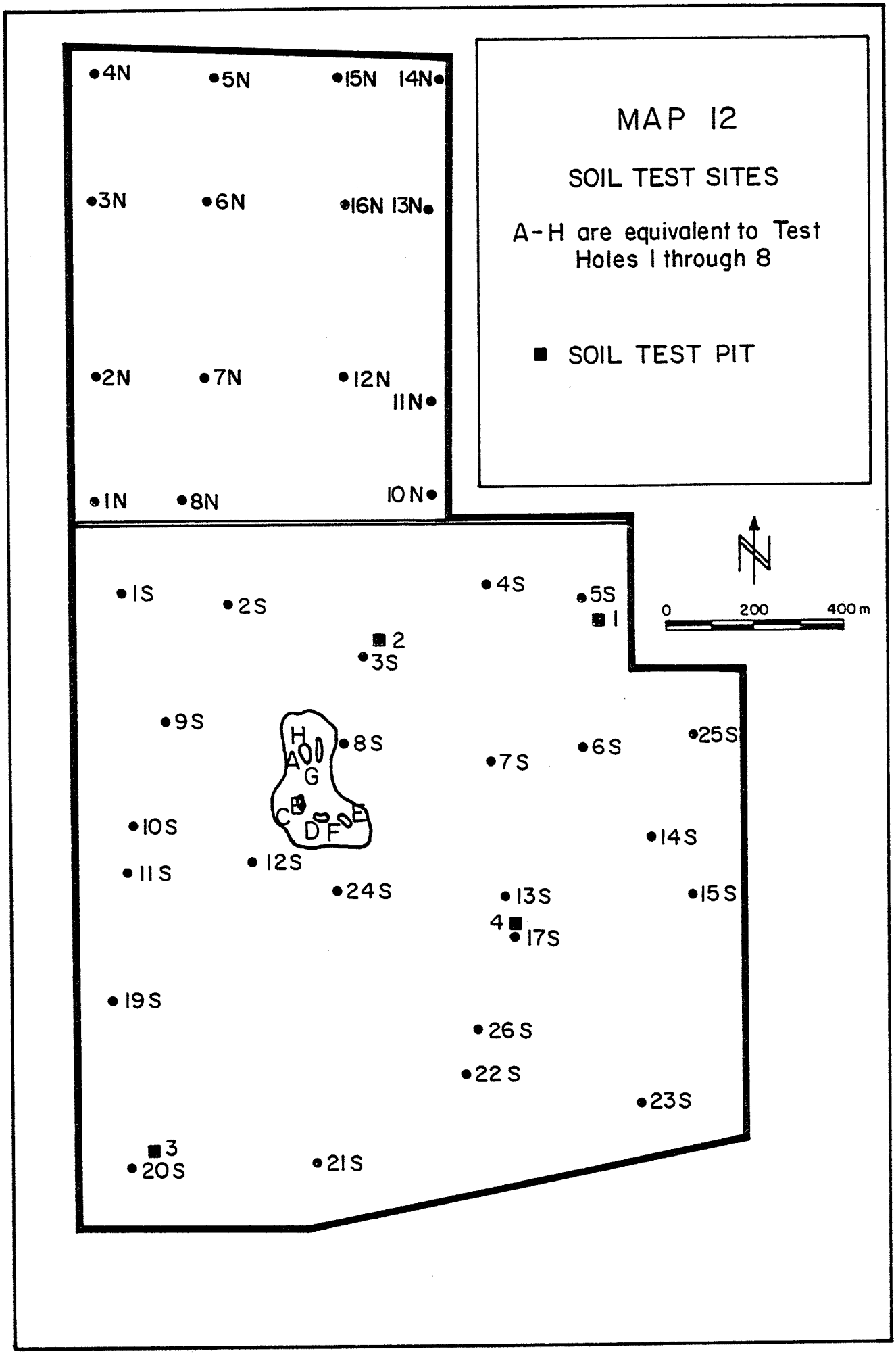
C.5.1 Soil Core Sampling Method

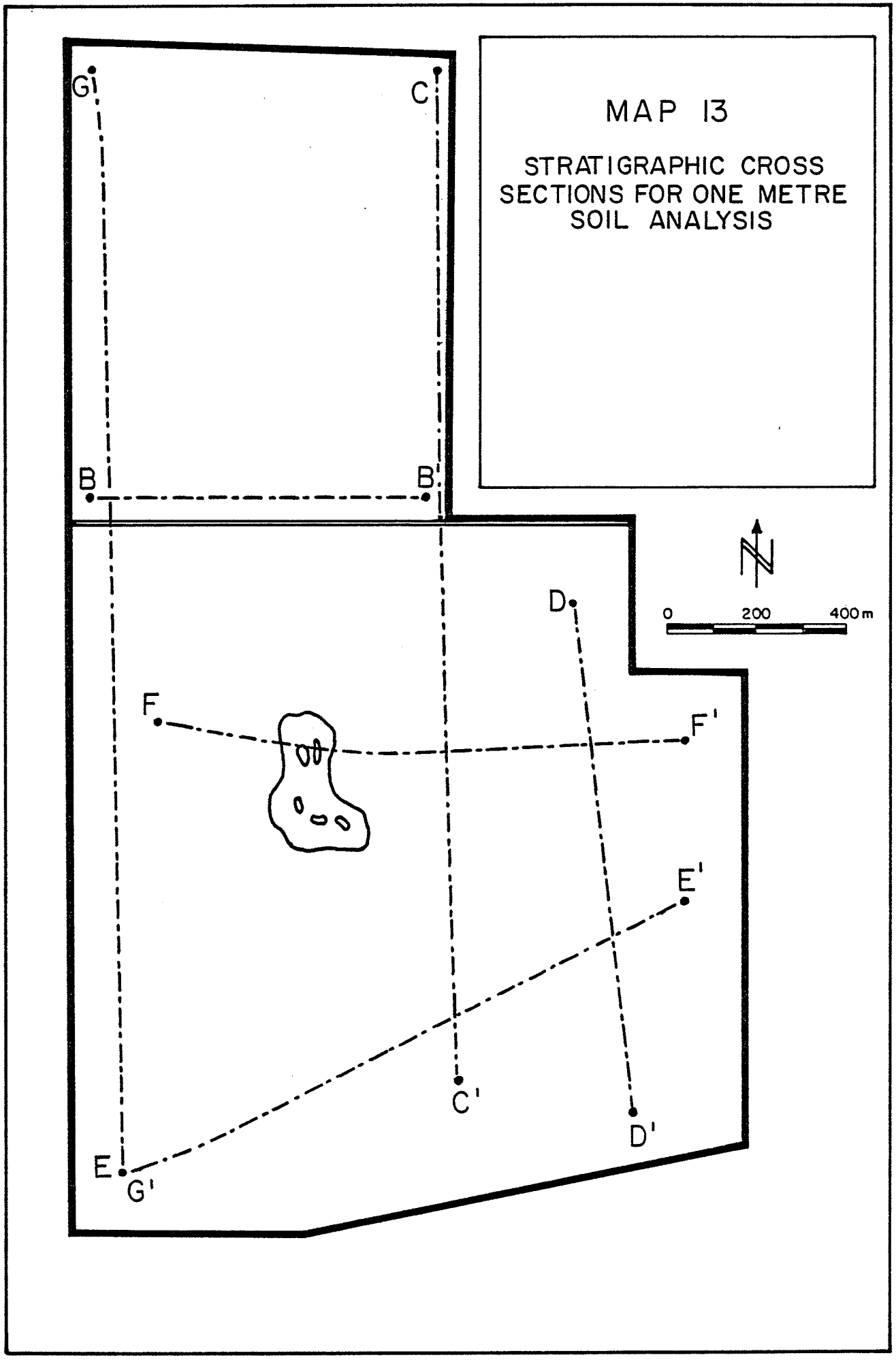
An integral component of the production of the soils map (Map 9) is field sampling. The field sampling program was designed to cover the majority of the area of the Assiniboine Forest. Soil cores were obtained by using a 1.5 metre screw auger with a diameter of 14 cm. The auger was used to extract soil samples in 14 cm segments until a depth of one metre was reached. The soil sample segments were tested for texture and tested with a 2M HCl solution to determine the presecne and degree of lime carbonate. A total of 42 cores was taken from locations shown on Map 12 and the results are tabulated in Appendix F. Stratigraphic cross-sections were constructed as per Map 13.

C.5.2 Soil Profile Method

Based upon the preliminary analysis of soils as determined by the soil core sample method, four sites were selected (See Map 16) for soil pit profiles.

The profile pits were dug in the two major surficial material types: clay (well and imperfectly drained) and clay-silty clay (well and imperfectly drained). At each site, the vegetal mat was carefully removed and placed aside for eventual replacement, and the pit was dug with dimensions of one cubic metre. Analysis on site consisted of a diagrammatic representation of the profile layers, bulk density, porosity


MAP 12
SOIL TEST SITES
A-H are equivalent to Test Holes 1 through 8
SOIL TEST PIT
4N
5N
15N
14N
3N
6N
16N
13N
2N
7N
12N
11N
1N
8N
10N
1S
2S
4S
5S
1
2
3S
9S
8S
7S
6S
25S
10S
14S
12S
11S
24S
13S
15S
4
17S
19S
26S
22S
23S
3
20S
21S
H
A
G
C
B
D
F
E
0
200
400m


MAP 13
STRATIGRAPHIC CROSS SECTIONS FOR ONE METRE SOIL ANALYSIS
G
C
B
B'
D
0
200
400 m
F
F'
E'
C'
D'
E
G'

and permeability, presence of carbonates, structure and mottling and Munsell colors of each horizon. Samples from each horizon were analysed by the Soil Survey Section of the Department of Soil Science, University of Manitoba. The results of the pit profiles are given in Appendix I.

APPENDIX D

PLANT, BIRD AND ANIMAL SPECIES LISTS

D.1 Plant Families Identified within Assiniboine Forest as of September, 1979.

FAMILY NAME	COMMON NAME	TOTAL SPECIES
Division *PTERIDOPHYTA*		
Equisetaceae	Horsetail	1
Division *SPERMATOPHYTA*		
Subdivision *Angiospermae*		
Class *Monocotyledoneae*		
Typhaceae	Cattail	1
Alismataceae	Water-plantain	1
Graminae	Grass	17
Cyperaceae	Sedge	6
Juncaceae	Rush	1
Liliaceae	Lily	7
Iridaceae	Irish	1
Orchidaceae	Orchis	2
Class *Dicotyledoneae*		
Salicaceae	Willow	7
Betulaceae	Birch	2
Fagaceae	Beech	1
Urticaceae	Neetle	1
Santalaceae	Sandalwood	2
Polygonaceae	Buckwheat	3
Chenopodiaceae	Goosefoot	2
Ranunculaceae	Crowfoot	6

D.1 Cont'd.

FAMILY NAME	COMMON NAME	TOTAL SPECIES
Cruciferae	Mustard	2
Saxifragaceae	Saxifrage	3
Rosaceae	Rose	14
Leguminosae	Pea	17
Polygalaceae	Milkwort	1
Anacardiaceae	Sumach	1
Violaceae	Violet	3
Onagraceae	Evening Primrose	1
Araliaceae	Ginseng	1
Umbelliferae	Parsley	6
Cornaceae	Dogwood	1
Pyrolaceae	Wintergreen	1
Monotropaceae	Indian-pipe	1
Primulaceae	Primrose	2
Oleaceae	Olive	1
Gentianaceae	Gentian	2
Apocynaceae	Dogbane	2
Asclepiadaceae	Milkweed	3
Convolvulaceae	Convolvulus	2
Labiatae	Mint	8
Scrophulariaceae	Figwort	2
Plantagrinaceae	Plantain	1
Rubiaceae	Madder	2
Caprifoliaceae	Honeysuckle	6
Campanulaceae	Bluebell	2
Compositae	Composite	46
	TOTAL	202

D.2 Plant Species Identified Within the Assiniboine Forest as of September, 1979

COMMON NAME	SCIENTIFIC NAME
Family *Equisetaceae* (Horsetail)	
Field Horsetail	*Equisetum arvense* L.
Family *Typhaceae* (Cat tail)	
Broadleaf Cat tail	*Typha latifolia* L.
Family *Alismataceae* (Water-plantain)	
Water-plantain	*Alisma triviale* Pursh.
Family *Graminae* (Grass)	
Northern Wheatgrass	*Agropyron dasystachym* (Hook.) Scribn
Couch Grass	*Agropyron repens* L. Beauv.
Slender Wheatgrass	*Agropyron trachycaulum* (Link.) Malte
Big Bluestem	*Andropodon gerardi* Vitman
Slough Grass	*Beckmannia syzigachne* (Steud.) Fern
Smooth Brome Grass	*Bromus inermis* Leyss
Canada Wild Rye	*Elymus canadensis* L.
Wild Barley	*Hordeum jubatum* L.
Rice Cut Grass	*Leersia oryzoides* (L.) Sw.
Switch Grass	*Panicum virgatum* L.
Timothy	*Phleum pratense* L.
Canada Blue Grass	*Poa compressa* L.
Fowl Meadow Grass	*Poa palustris* L.
Kentucky Blue Grass	*Poa pratensis* L.
Common Reed Grass	*Phragmites communis* Trin.
Cord Grass	*Spartina pectinata* Link
Porcupine Grass	*Stipa spartina* Trin
Family *Cyperaceae* (Sedge)	
Sedges	*Carex* spp.
Beaked Sedge	*Carex rostrata* Stokes

D.2 Cont'd.

COMMON NAME	SCIENTIFIC NAME
Three-seeded Sedge	*Carex trisperma* Dewey
Fox Sedge	*Carex vulpinoidea* Michx.
Spike Rush	*Eleocharis* spp.
Hardstem Bulrus	*Scirpus acutus* Muhl.
Family *Juncacaea* (Rush)	
Rush	*Juncus balticus* Willd. var. *littoralis* Engelm
Family *Liliaceae* (Lily)	
Asparagus	*Asparagus officinalis* L.
Lily	*Lilium philadelphicum* L.
Wild Lily-of-the-Valley	*Maianthemum canadense* Desf. var. *interius* Fern
False Spikenard	*Smilacina racemosa* (L.) Desf.
False Solomon Seal	*Smilacina stellata* (L.) Desf.
Carrion flower	*Smilax herbacea* L. var. *lasioneura* (Hook.) D.C.
Smooth Camass	*Zygadenus elegans* Pursh.
Family *Iridaceae* (Iris)	
Blue-eyed Grass	*Sisyrinchium montanum* Greene
Family *Orchidaceae* (Orchis)	
Yellow Lady's-Slipper	*Cypripedium calceolus*
Frog Orchis	*Habenaria viridis* (L.) R. Br. var. *bracteata* (Muhl.) Gray
Family *Salicaceae* (Willow)	
Balsam Poplar	*Populus balsamifera* (L.)
Aspen Poplar	*Populus tremuloides*

D.2 Cont'd.

COMMON NAME	SCIENTIFIC NAME
Pussy Willow	*Salix discolor* Muhl.
Gray Willow	*Salix humilus* Marsh.
Sandbar Willow	*Salix interior* Rowlee
Flat-leaved Willow	*Salix planifolia* Pursh
Willow	*Salix* spp.
Family *Betulaceae* (Birch)	
American Hazelnut	*Corylus americana* Walt.
Beaked Hazelnut	*Corylus cornuta* Marsh.
Family *Fagaceae* (Beech)	
Bur Oak	*Quercus macrocarpa* Michx.
Family *Urticaceae* (Nettle)	
Stinging Nettle	*Urtica dioica* L. var. *procera* (Muhl.) Wedd.
Family *Santalaceae* (Sandalwood)	
Pale Commandra	*Commandra pallida* A. DC.
Bastard Toadflax	*Commandra livida* Rich.
Family *Polygonaceae* (Buckwheat)	
Doorweed	*Polygonum aviculare* L.
Knotweed	*Polygonum lapathifolium* L.
Curled Dock	*Rumex crispus* L.
Family *Chenopodiaceae* (Goosefoot)	
Orache	*Atriplex patula* L.
Lamb's-Quarters	*Chenopodium album* L.

D.2 Cont'd.

COMMON NAME	SCIENTIFIC NAME
Family *Ranunculaceae* (Crowfoot)	
Canada Anemone	*Anemone canadensis* L.
Cut-leaved Anemone	*Anemone multifida* Poir.
Bristly Buttercup	*Ranunculus pensylvanicus* L.f.
Macoun's Buttercup	*Ranunculus macounii* Britt.
Seaside Buttercup	*Ranunculus cymbalaria* Pursh
Purple Meadow-rue	*Thalictrum dasycarpum* Fisch. & Lall.
Family *Cruciferae* (Mustard)	
Wild Mustard	*Brassica kaber* (D.C.) L.C. Wheeler
Marsh Yellow Cress	*Rorippa islandica* (Oeder) Borbas var. *fernaldiana* Butt. & Abe.
Family *Saxifragaceae* (Saxifrage)	
Alumroot	*Heuchera richardonii* R. Br.
Low Gooseberry	*Ribes hirtellum* L.
Northern Gooseberry	*Ribes oxyacanthoides* L.
Family *Rosaceae* (Rose)	
Saskatoon	*Amelanchier alnifolia* Nutt.
Hawthorn	*Crataegus* spp.
Wild Strawberry	*Fragaria virginiana* Dcne.
Three-flowered Avens	*Geum triflorum* Pursh
Silverweed	*Potentilla anserina* L.
American Plum	*Prunus americana* Marsh
Canada Plum	*Prunus nigra* A.t.
Pin Cherry	*Prunus pensylvanica* L.f.
Choke Cherry	*Prunus virginiana* L.
Smooth Rose	*Rosa blanda* Ait.
Prickly Rose	*Rosa acicularis* Lindl.
Wild Raspberry	*Rubus idaeus* L. var *strigosus*

D.2 Cont'd.

COMMON NAME	SCIENTIFIC NAME
Dewberry	*Rubus pubescens* Raf.
Meadowsweet	*Spirea alba* Du Roi
Family *Leguminosae* (Pea)	
Dwarf False Indigo	*Amorpha nana* Nutt.
Ascending Purple Milk Vetch	*Astragalus striatus* Nutt.
Milk Vetch	*Astragalus goniatus* Nutt.
Caragana	*Caragana arborescens* L am.
Wild Licorice	*Glycyrrhiza lepidota* (Nutt.) Pursh
Pale Vetchling	*Lathyrus ochroleucus* Hook.
Wild Peavine	*Lathyrus venosus* Muhl. var. *intonsus* Butt. & St. John
Marsh Vetchling	*Lathyrus palustris* L.
Black Medick	*Medicago lupulina* L.
Alfalfa	*Medicago sativa* L.
White Sweet Clover	*Melilotus alba* Medic.
Yellow Sweet Clover	*Melilotus officinalis* (L.) Pall.
Alsike Clover	*Trifolium hybridum* L.
Red Clover	*Trifolium pratense* L.
White Clover	*Trifolium repens* L.
Vetch	*Vicia americana* Muhl. var. *augustifolia* Nees.
Tuffed Vetch	*Vicia cracca* L.
Family *Polygalaceae* (Milkwort)	
Seneca Snakeroot	*Polygala senega* L.
Family *Anacardiaceae* (Sumach)	
Poison Ivy	*Rhus radicans* L. var. *rydbergii* (Small) Rehder

D.2 Cont'd.

COMMON NAME	SCIENTIFIC NAME
Family *Violaceae* (Violet)	
Violet	*Viola nephrophylla* Greene
Violet	*Viola pensylvanica* Michx. var. *leiocarpa* (F. & W.)
Purple Prairie Violet	*Vioa pedatifida*
Family *Onagraceae* (Evening Primrose)	
Fireweed	*Epilobium augustifolium* L.
Family *Araliaceae* (Ginseng)	
Wild Sarsaparilla	*Aralia nudicalis* L.
Family *Umbelliferae* (Parsley)	
Water Hemlock	*Cicuta maculata* L.
Cow-parsnip	*Heracleum lanatum* Michx.
Snakeroot	*Sanicula mariland ica* L.
Water-parsnip	*Sium suave* Walt.
Heart-leaved Alexander	*Zizia aptera* (Gray) Fern.
Golden Alexander	*Zizia aurea* (L.) Koch
Family *Cornaceae* (Dogwood)	
Red-Osler Dogwood	*Cornus stolonifera* Michx.
Family *Pyrolaceae* (Wintergreen)	
Pink Wintergreen	*Pyrola asarifolia* Michx.
Family *Monotropaceae* (Indian-pipe)	
Indian Pipe	*Monotropa uniflora* L.

D.2 Cont'd.

COMMON NAME	SCIENTIFIC NAME
Family *Primulaceae* (Primrose)	
Fringed Loosestrife	*Steironema ciliatum* L.
Tufted Loosestrife	*Naumburgia thyrsiflora* L. Duby
Family *Oleaceae* (Olive)	
Green Ash	*Fraxinus campestris* Britt.
Family *Gentianaceae* (Gentian)	
Closed Gentian	*Gentiana andrewsii* Griselo.
Fringed Gentian	*Gentiana crinita* Froel.
Family *Apocynaceae* (Dogbane)	
Spreading Dogbane	*Apocynum androsaemifolium* L.
Dogbane	*Apocynum sibiricum* Jacq.
Family *Asclepiadaceae* (Milkweed)	
Dwarf Milkweed	*Ascelepias ovalifolia* Dcne.
Milkweed	*Ascelepias syriaca* L.
Swamp Milkweed	*Ascelpias incarnata* L.
Family *Convolvulaceae* (Convolvulus)	
Hedge Bindweed	*Convolvulus sepium* var. *americanus*
Dodder	*Cuscuta* spp.
Family *Labiatae* (Mint)	
Giant Blue Hyssop	*Agastache foeniculum* (Pursh) Ktze.
Dragonhead	*Moldavica parviflora* (Nutt.) Britt.
False Dragonhead	*Dracocephalum formosius* (Lunell) Rydb.
Hedge-nettle	*Stachys palustris* L.
Mint	*Mentha avevense* L.
Wild Bergamot	*Monarda fistulosa* L.

D.2 Cont'd.

COMMON NAME	SCIENTIFIC NAME
Water Horehound	*Lycopus americanus* Muhl.
Marsh Skullcap	*Scutellaria galericulata* L.
Family *Scrophulariaceae* (Figwort)	
Owl's Clover	*Orthocarpus luteus* Nutt.
Marsh Speedwell	*Veronica scutella* L.
Family *Plantaginaceae* (Plantain)	
Common Plantain	*Plantago major*
Family *Rubiaceae* (Madder)	
Northern Bedstraw	*Galium septentrionale* R.& S.
Sweet-scented Bedstraw	*Galium triflorum* Michx.
Family *Caprifoliaceae* (Honeysuckle)	
Twining Honeysuckle	*Lonicera dioica* L. var. *glaucescens* (Rydb.) Butters
Tartarian Honeysuckle	*Lonicera tatarica* L.
Snowberry	*Symphiocarpus occidentalis* Hook.
Mannyberry	*Viburnum lentago* L.
Downy Arrowwood	*Viburnum rafinesquianum* Schuttes
High-bush Cranberry	*Viburnum trilobum* Marsh.
Family *Campanulaceae* (Bluebell)	
Creeping Bluebell	*Campanula rapunculoides* L.
Harebell	*Campanula rotundifolia* L.
Family *Compositae* (Composite)	
False Dandelion	*Agoseris glauca* (Pursh) Raf.
Hawk's-beard	*Crepis runciata* (James) T.& G.

D.2 Cont'd.

COMMON NAME	SCIENTIFIC NAME
Woolly Hawkweed	*Hieracium albertinum* Farr.
Hawkweed	*Hieracium umbellatum* L.
Blue Lettuce	*Latuca pulchella* (Pursh) DC.
Sowthistle	*Sonchus arvensis* L.
Prickly Sowthistle	*Sonchus asper* (Hill)
Dandelion	*Taraxacum officinale* Weber
Yarrow	*Achillea millefolium* L.
Woolly Yarrow	*Achillea lanulosa* Nutt.
Burdock	*Arctium lappa* L.
Arnica	*Arnica chamissonis* Less.
Absinthe	*Artremisia absinthum* L.
Pasture Sage	*Artremisia frigida* Willd.
Prairie Sage	*Artremisia ludoviciana* Nutt. var. *gnaphalodes* (Nutt.) T. & G.
Wormwood	*Artremisia vulgaris* L.
Rayless Aster	*Aster brachyatis* Blake
Lindley's Aster	*Aster ciliolatus* Lindl.
Many-flowered Aster	*Aster pansus* (Blake) Cronq.
Smooth Aster	*Aster laevis* L.
Small Blue Aster	*Aster simplex* Willd.
Beggartick	*Bidens frondosa* L.
Canada Thistle	*Circium arvense* (L.) Scop.
Field Thistle	*Circium discolor* (Muhl) Spreng.
Flodman's Thistle	*Circium flodmanii* (Rydb.) Arthur
Swamp Thistle	*Circium muticum* Michx.
Fleabane	*Erigeron acris* L.
Canada Fleabane	*Erigeron canadensis* L.
Smooth Fleabane	*Erigeron glabellus* Nutt.
Philadelphia Fleabane	*Erigeron philadelphicus* L.
Fleabane	*Erigeron strigosus* Muhl.

D.2 Cont'd.

COMMON NAME	SCIENTIFIC NAME
Curly Gumweed	*Grindelia squarrosa* (Pursh) Dunal.
Rhombic-leaved Sunflower	*Helianthus latifolius* var. *subrhomboideus* (Rydb.) Fern.
Narrow-leaved Sunflower	*Helianthus maximilianii* Schrad.
Jerusalem Artichoke	*Helianthus tuberosus* L.
Meadow Blazingstar	*Liatris punctata* Hook.
Dotted Blazingstar	*Liatris ligulistylis* (A.Nels.) K. Schum.
Scentless Camomile	*Matricaria maritima* L.
Pineappleweed	*Matricaria matricarioides* (Less.) Porter
Arrow-leaf Colt's foot	*Petasites sagittatus* (Pursh) Gray
Black-eyed Susan	*Rudbeckia serotina* L.
Groundsel	*Senecio* spp.
Canada Goldenrod	*Solidago canadensis* L. var. *canadensis*
Late Goldenrod	*Solidago gigantea* Ait.
Showy Goldenrod	*Solidago nemoralis* Ait.
Rigid Goldenrod	*Solidago rigida* L.

D.3 Bird Families Identified Within Assiniboine Forest as of September, 1979.

FAMILY NAME	COMMON NAME	TOTAL SPECIES
Anatidae	Swans, Geese and Ducks	7
Accipitridae	Kites and Hawks	2
Falconidae	Falcons	1
Phasianidae	Quails, Partridge and Pheasants	1
Meleagrididae	Turkeys	1
Rallidae	Rails, Gallinules and Coots	2
Haematopodidae	Oystercatchers	1
Scolopacidae	Woodcock, Snipe and Sandpipers	1
Columbidae	Pigeons and Doves	2
Cuculidae	Cuckoos, Roadrunners and Anis	1
Strigidae	Owls	6
Caprimulgidae	Goatsuckers	1
Trochilidae	Hummingbirds	1
Picidae	Woodpeckers	5
Tyraniidae	Tyrant Flycatchers	8
Hirundinidae	Swallows	3
Corvidae	Jays	3
Paridae	Titmice, Verdins and Bushtits	1
Sittidae	Nuthatches	2
Troglodytidae	Wrens	2
Mimidae	Mockingbirds and Thrashers	2
Turdidae	Thrushes, Robins and Bluebirds	3
Bombycillidae	Waxwings	2
Laniidae	Shrikes	1
Vireonidae	Vireos	3
Parulidae	Wood Warblers	12
Ploceidae	Weaver Finches	1
Icteridae	Meadowlarks, Blackbirds and Orioles	7
Thraupidae	Tanagers	1
Fringillidae	Grosbeaks, Finches, Sparrows and Buntings	19
	TOTAL	102

D.4 Bird Species Identified Within Assiniboine Forest as of September, 1979.[1]

COMMON NAME	SCIENTIFIC NAME
Family *Anatidae* (Swans, Geese and Ducks)	
Canada Goose	*Branta canadensis* (Linnaeus)
Mallard	*Anas platyrhynchos*
Green-Winged Teal	*Anas carolinineis* Gmelin
Blue-Winged Teal	*Anas discors* L.
Gadwall	*Anas strepera*
American Widgeon	*Mareca americana*
Wood Duck *	*Aix sponsa*
Family *Accipitridae* (Kites and Hawks)	
Red-tailed Hawk	*Buteo jamaicensis* (Gmelin)
Broad-winged Hawk	*Buteo platypterus* (Vieillot)
Family *Falconidae* (Falcons)	
Sparrow Hawk	*Falco sparverius* L.
Family *Phasianidae* (Quails, Partridge and Pheasants)	
Gray Partridge	*Perdix perdix*
Family *Meleagrididae* (Turkeys)	
Wild Turkey	*Meleagris gallo pavo*

[1]This list was prepared from field notes and a review of previous studies (See Richards, 1974 and Cuthbert and Koonz, 1976). Confirmed breeders are marked with an asterisk (*).

D.4 Cont'd.

COMMON NAME	SCIENTIFIC NAME
Family *Rallidae* (Rails, Gallinules and Coots)	
American Coot	*Filia americana*
Sora Rail	*Porzana carolina*
Family *Haematopodidae* (Oystercatchers)	
Killdeer	*Charadius vociferus*
Family *Scolopacidae* (Woodcock, Snipe and Sandpipers)	
Common Snipe	*Capella gallinago*
Family *Columbidae* (Pigeons and Doves)	
Rock Dove	*Columba livia*
Mourning Dove*	*Zenaidura macroura*
Family *Cuculidae* (Cuckoos, Roadrunners and Anis)	
Black-billed Cuckoo*	*Coccyzus erythropthalmus*
Family *Strigidae* (Owls)	
Great Horned Owl	*Bubo virginianus*
Snowy Owl	*Nyctea scandiaca*
Screech Owl	*Otus asio*
Long-eared Owl	*Asio otus*
Short-eared Owl	*Asio flammeus*
Boreal Owl	*Aegolius funera*
Family *Caprimolgidae* (Goatsuckers)	
Common Nighthawk	*Chordeiles minor*

D.4 Cont'd.

COMMON NAME	SCIENTIFIC NAME
Family *Trochilidae* (Hummingbirds)	
Ruby-throated Hummingbird	*Archilochus colubris*
Family *Picidae* (Woodpeckers)	
Yellow-shafted Flicker	*Colaptes auratus*
Red-headed Woodpecker	*Melanerpes erythrocephalus*
Yellow-bellies Sapsucker	*Sphyrapicus varius*
Hairy Woodpecker *	*Dendrocopus villosus*
Downy Woodpecker *	*Dendrocopus pubescens*
Family *Tyrannidae* (Tyrant Flycatchers)	
Western Kingbird	*Tyrannus verticallis*
Eastern Kingbird	*Tyrannus tyrannus*
Great Crested Flycatcher *	*Myiarchus crinitus*
Eastern Phoebe	*Sayornis phoebe*
Yellow-bellied Flycatcher	*Empidonax flaviventrus*
Traill's Flycatcher	*Empidonax trailli*
Least Flycatcher *	*Empidonax minimus*
Eastern Wood Peewee	*Contopus virens*
Family *Hirundinidae* (Swallows)	
Tree Swallow *	*Iridoprocne bicolor*
Purple Martin	*Progne subis*
Barn Swallow	*Hirundo rustica erythrogaster*
Family *Corvidae* (Jays, Magpies and Crows)	
Blue Jay	*Cyanocitta cristata*
Common Crow *	*Corvus brachyrhynchos*
Magpie	*Pica pica* (Hudson)

D.4 Cont'd.

COMMON NAME	SCIENTIFIC NAME
Family *Paridae* (Titmice, Verdins and Bushtits)	
Black-capped Chickadee	*Parus atricapillus*
Family *Sittidae* (Nuthatches)	
Red-breasted Nuthatch	*Sitta canadensis*
White-breasted Nuthatch	*Sitta carolinensis*
Family *Troglodytidae* (Wrens)	
House Wren *	*Troglodytes aedon*
Short-billed Marsh Wren	*Cistothorus platensis*
Family *Mimidae* (Mockingbirds and Thrashers)	
Catbird	*Dumetella carolinensis*
Brown Thrasher	*Toxostoma rufum*
Family *Turdidae* (Thrushes, Robins and Bluebirds)	
American Robin *	*Turdus migratorius*
Veery	*Hylocichla fuscescens*
Hermit Thrush	*Hylocichla guttata*
Family *Bombycillidae* (Waxwings)	
Cedar Waxwing	*Bombycilla cedrorum*
Bohemian Waxwing	*Bombycilla garrulus pallidiceps*
Family *Laniidae*	
Northern Shrike	*Lanius excubitor*

D.4 Cont'd.

COMMON NAME	SCIENTIFIC NAME
Family *Vireonidae* (Vireos)	
Red-eyed Vireo *	*Vireo olivaceus*
Philadelphia Vireo	*Vireo philadephicus*
Warbling Vireo *	*Vireo gilvus*
Family *Parulidae* (Wood Warblers)	
Black and White Warbler *	*Mniotilta varia*
Nashville Warbler	*Vermivora ruficapilla*
Myrtle Warbler	*Dendroica coronata*
Yellow Warbler	*Dendroica petechia*
Chestnut-sided Warbler *	*Dendroica pensylvanica*
Black-poll Warbler	*Dendroica striata*
Oven-bird *	*Seivrus aurocapillus*
Connecticut Warbler *	*Oporornis agilis*
Mourning Warbler	*Oporornis philadelphia*
Yellow-threat *	*Geothlypis trichas*
Wilson's Warbler	*Wilsonia pusilla*
American Redstart	*Setophaga ruticilla*
Family *Ploceidae* (Weaver Finches)	
House Sparrow *	*Passer domesticus*
Family *Icteridae* (Meadowlarks, Blackbirds and Orioles)	
Bobolink	*Volichonyx oryzivorus*
Western Meadowlark	*Sturnella neglecta*
Red-wing Blackbird	*Agelaius phoeniceus*
Northern Oriole *	*Icterus galbula*
Brewer's Blackbird	*Euphagus cyanocephalus*
Purple Grackle	*Quiscalus quiscalus*
Cowbird *	*Molothrus ater*

D.4 Cont'd.

COMMON NAME	SCIENTIFIC NAME
Family *Thraupidae* (Tanagers)	
Scarlet Tanager	*Piranga olivacea*
Family *Fringillidae* (Grosbeaks, Finches, Sparrows and Buntings)	
Rose-breasted Grosbeak *	*Pheucticus lucovicianus*
Indigo Bunting	*Passerina cyanea*
Evening Grosbeak	*Hesperiphona vespertina*
Purple Finch	*Carpodacus purpureus*
Pine Grosbeak	*Pinicola leucura*
Hoary Redpoll	*Acanthus exilipes*
Redpoll	*Acanthus flammea*
Pine Siskin	*Spinus pinus*
American Goldfinch	*Spinus tristus*
White-winged Grossbill	*Loxia leucoptera*
Towhee	*Pipilo erythropthalamus*
Savannah Sparrow *	*Passerculus sandwichensis*
Vesper Sparrow	*Pooecetes gramineus*
Slate-colored Junco	*Junco hyemalis*
Chipping Sparrow	*Spizella passerina*
Clay-colored Sparrow *	*Spizella pallida*
Song Sparrow	*Melospiza melodia*
Swamp Sparrow	*Melospiza georgiana*
Snow Bunting	*Plectophenax nivalis*

D.5 Mammalian Families identified within the Assiniboine Forest as of September, 1979

FAMILY NAME	COMMON NAME	TOTAL SPECIES
Soricidae	Shrews	4
Vespertilionidae	Bats	5
Leporidae	Rabbits and Hares	3
Sciuridae	Squirrels	7
Muridae	Rats, Mice and Voles	3
Dipodidae	Jumping Mice and Jerboas	1
Canidae	Dogs	1
Procyonidae	Raccoons and their Allies	6
Cervidae	Deer	1
	TOTAL	31

D.6 Mammals identified within Assiniboine Forest study area as of September, 1979[1]

COMMON NAME	SCIENTIFIC NAME
Family *Soricidae* (Shrews)	
Masked Shrew	*Sorex cinereus*
Arctic Shrew	*Sorex arcticus*
Pigmy Shrew	*Microsorex hoji*
Short-tailed Shrew	*Blarina brevicauda*
Family *Vespertilionidae* (Bats)	
Little Brown Bat	*Myotis lucifugus*
Silver-haired Bat	*Lasionycteris noctivagans*
Red Bat	*Lasiurus borealis*
Hoary Bat	*Lasiurus cinereus*
Big Brown Bat	*Eptesicus fucus*
Family *Leporidae* (Rabbits and Hares)	
Snowshoe Hare	*Lepus americanus*
Jackrabbit	*Lepus townsendii*
Eastern Cottontail	*Sylvilagus floridanus* (Allen)
Family *Sciuridae* (Squirrels)	
Eastern Chipmunk	*Tamis striatus* (L.)
Richardson's Ground Squirrel	*Spermophilus richardsonii*
Thirteen-lined Ground Squirrel	*Spermophilus tridecemlineatus*
Franklin's Ground Squirrel	*Spermophilus franklinii*
Gray Squirrel	*Sciurus carolinensis*
Red Squirrel	*Tamia sciurus hudsonicus*
Northern Flying Squirrel	*Glaucomus sabrinus* (Shaw)

D.6 Cont'd.

COMMON NAME	SCIENTIFIC NAME
Family *Muridae* (Rats, Mice and Voles)	
Deer Mouse	*Peromyscus maniculatus*
Red-Backed Vole	*Clethrionomys gapperi*
Meadow Vole	*Microtus pennsylvanicus* (L.)
Family *Dipodidae* (Jumping Mice and Jerboas)	
Meadow Jumping Mouse	*Zapus hudsonicus* (Zimm.)
Family *Canidae* (Dogs)	
*Coyote	*Canis latrans*
Family *Procyonidae* (Raccoons and Their Allies)	
*Raccoon	*Procyon lotor* (L.)
Mink	*Mustela vison* (Schreber)
Short-tailed Weasel	*Mustela erminea*
Least Weasel	*Mustela nivalis*
Striped Skunk	*Mephitis mephetis* (Schreber)
Long-tailed Weasel	*Mustela frenata*
Family *Cervidae* (Deer)	
White-tailed Deer	*Odocoileus virginianus* (Zimm.)

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*Probable visitor

[1]This listing was compiled from Richards, 1974; Cuthbert and Koonz, 1976 and sightings by the author.

D.7 Amphibians identified within the Assiniboine Forest as of September, 1979

COMMON NAME	SCIENTIFIC NAME
Spotted Salamander	*Ambystoma maculatum*
American Toad	*Bufo americanus*
Northern Spring Pepper	*Hyla crucifer*
Eastern Gray Tree Frog	*Hyla versicolor*
Boreal Chorus Frog	*Pseudacris triseriata*
Green Frog	*Rana clamitans*
Mink Frog	*Rana septentrionalis*
Wood Frog	*Rana sylvatica*
Leopard Frog	*Rana pipiens*

D.8 Fish species identified within the Assiniboine Forest as of September, 1979[1]

COMMON NAME	SCIENTIFIC NAME
Fathead Minnow	*Pimephales promelas* (Raf.)

[1] Presence of *Pimephales promelas* (Raf.) is due to initial stocking of the Eve Werier Memorial Pond by Insect Control Research officers of the City of Winnipeg. The initial planting was 2500 fish and the population is reported to be established. (Richards, F., 1980: Personal Communication).

D.9 Reptile species identified within the Assiniboine Forest as of September, 1979*

COMMON NAME	SCIENTIFIC NAME
Red-sided Garter Snake	*Thamnophis sirtalis*
*Common Snapping Turtle	*Chelydra serpentina*

*Introduced species

APPENDIX E

INVENTORY SAMPLING DATA

E.1 Line Transect A

SPECIES	POINTS ALONG TRANSECT (m)																					
	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
Kentucky blue-grass (*Poa pratensis*)	80.0	80.0	80.0	60.0	80.0	80.0	60.0	80.0	50.0	60.0	100.	100.0	100.0	100.0	100.0	100.0	80.0	80.0	50.0	80.0	80.0	80.0
Burr oak (*Quercus macrocarpa* Michx.)		17.5	40.0	100.0		7.5	40.0			100.0		20.0				2.5						32.5
Trembling aspen (*Populus tremuloides*)						7.5	2.5						5.5					38.0	15.0	12.5	20.0	
Sand-bar willow (*Salix interior* Rowlee)	4.5	5.0	2.0						60.0								2.5	9.0		9.5	10.0	
Gray willow (*Salix humilis* Marsh)											20.0				20.0	7.0			100.0			
American hazelnut (*Corylus americana* Walt.)					22.5								5.0									40.0
Saskatoon (*Amelanchier alnifolia* Nutt.)		7.5	2.5		5.0	32.5	1.5	24.0	5.0	10.0		7.5										
Snowberry (*Symphoricarpos occidentalis*)	21.5	22.5			8.0		2.5		40.0	7.5	7.5	15.0	15.0				21.0				5.0	
Smooth rose (*Rosa blanda*)	31.5	15.0	25.5	11.5	20.5	14.5	17.5		22.0	7.5		2.5			2.5	17.5	12.5	10.0	19.0	10.0	12.5	2.5
Goldenrod (*Solidago canadensis*)	8.0				20.0			5.0	3.5							2.5		11.5				
Purple meadow rue (*Thalictrum dasycarpum* Fisch.& Lall.)	5.0	2.5						3.5			2.5	3.0		2.5			5.0	2.0				
Strawberry (*Fragaria virginiana* Duchesne)		6.5	36.0									5.0		10.0	7.5	5.0	2.5					30.0
Northern bedstraw (*Galium septentrionale* R.&S.)	5.0	3.5	2.5	1.5		1.0		5.0	3.0		4.0	3.5		1.5	2.5	7.0		1.5	1.5			1.5
Common yarrow (*Achillea millefolium* L.)						20.0					2.0		.5	1.0								

E.1 Continued

SPECIES	POINTS ALONG TRANSECT (m)											POINTS ALONG TRANSECT (m)										
	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
Purple milk-vetch (*Astragalus goniatus* Nutt.)										2.0				2.5								
Pale vetchling (*Lathyrus ochroleucus* Hook.)	10.0																					
Dandelion (*Taraxacum officinale* Weber)	5.0												2.5									
Large-flowered false dandelion (*Agoseris glauca* (Nutt.)Greene)								.5				.5	2.5									
White sage (*Artemesia ludoviciana* Nutt.)								1.5				.5	2.0	8.0								
False solomon's-seal (*Smilacina stellata* (L.) Desf.)										3.5												
Canada anemone (*Anemone canadensis* L.)											3.5									2.5		
Poison ivy (*Rhus radicans* L.)																					12.5	
Overstory	some oak	Oak-aspen	Aspen oak	Oak	Oak-aspen	Oak-aspen	Oak	Oak	some oak							Aspen	Aspen	Aspen	Aspen-willow	Aspen	Willow aspen	Aspen-oak

SPECIES	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180
Couch Grass (*Agropyron repens (L.) Beauv.*)	80.0	80.0	70.0	70.0	60.0	80.0	75.0	60.0	65.0	60.0	45.0	30.0	30.0	40.0	40.0	35.0	45.0	60.0	35.0	25.0	30.0	60.0	80.0	80.0	70.0	60.0	60.0	30.0	35.0	45.0	30.0	35.0	45.0	40.0	40.0	35.0	40.0
Wheat Grass (*Agropyron dasystachyum (Hook) Scribn.*)	10.0	10.0	10.0	20.0	20.0	15.0	20.0	17.5	10.0	15.0	5.0	5.0	5.0																								
Kentucky Blue-Grass (*Poa pratensis L.*)	5.0	5.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	5.0	5.0	5.0																								
Canada Thistle (*Cirsium arvense (L.) Scop.*)	80.0	80.0	60.0	40.0	30.0	10.0	10.0	40.0	20.0																												
Field Sowthistle (*Sonchus arvensis L.*)	5.0			5.0	2.0			10.0	15.0	20.0	10.0	5.0	8.5						2.5		7.5				3.5		15.0			2.5		5.0					
Dandelion (*Taraxacum officinale Weber*)	5.0																																				
Yellow Sweet Clover (*Melilotus officinalis (L.) Lam.*)	5.0																																				
White Sweet Clover (*Melilotus alba Desr.*)	5.0												5.0																								
Vetchling (*Lathyrus palustris L.*)				30.0							5.0	7.5							2.5				7.5		2.5								2.5	2.5		2.5	
Common Cattail (*Typha latifolia L.*)				10.0																																	
Goldenrod (*Solidago canadensis L.*)							18.0	35.0			5.0		5.0		7.5		30.0	19.5	10.0	5.0																	
Wild Mint (*Mentha arvensis L.*)					3.0																																
Loosestrife (*Lysimachia terrestris (L.) BSP*)					3.0		6.5																						5.0		41.0	5.0	7.5	10.0	10.0	7.5	10.0
Smooth Rose (*Rosa blanda Ait.*)								17.5									10.0													5.0		5.0	10.0			10.0	2.5
Meadowsweet (*Spiraea alba Du Roi*)							10.0	10.0	35.0	10.0	10.0																										
Pussy Willow (*Salix discolor Muhl.*)										65.0	5.0	17.5	10.0																								
Trembling Aspen (*Populus tremuloides Michx.*)														5.0	5.0	5.0	6.0	2.5	17.5		7.5	3.0		7.5	15.0	20.0							5.0	5.0			
Burr Oak (*Quercus macrocarpa Michx.*)												5.0									20.0							12.5			5.0				5.0	67.5
American Hazelnut (*Corylus americana Walt.*)													20.0	15.0	7.5	5.0		60.0				10.0		20.0		55.0		30.0	60.0	10.0	10.0				40.0	7.5
Snowberry (*Symphoricarpos occidentalis Hook.*)													5.0	5.0	10.0	11.0		8.5	11.5	4.5	5.0								12.5	2.5		5.0	5.0	5.0	5.0	10.0
Saskatoon (*Amelanchier alnifolia Nutt.*)														4.0			15.0	15.0			5.0		3.0		5.0	5.0		10.0				12.5	30.0	25.0	85.00	33.5	
Red-Osier Dogwood (*Cornus stolonifera Michx.*)																									2.5		80.0		10.0	5.0							
Wild Plum (*Prunus americana Marsh.*)																																		15.0			
Northern Gooseberry (*Ribes oxyacanthoides L.*)																								1.0			5.0										
Raspberry (*Rubus idaeus L.*)																				42.5		5.0	11.0		35.0	28.5	72.5	27.5	20.0								
Giant Hyssop (*Agastache foeniculum (Pursh) Ktze.*)																						6.0	5.0	7.0		5.0											
False Solomon's Seal (*Smilacina stellata (L.) Desf.*)																					5.0								5.0						4.0		
Canada Anemone (*Anemone canadensis L.*)																			5.0			27.5	31.5	12.5													
Golden Alexander (*Zizia aurea (L.) Koch.*)																						2.5			15.0												
Wild Morning Glory (*Convolvulus sepium L.*)																			17.5	20.0	7.5		2.6	1.0													
Western Red Lily (*Lilium philadelphicum L.*)																								2.5	3.0	4.0			9.0	5.0							
Purple Meadowrue (*Thalictrum dasycarpum Fisch. & Lall.*)																			7.5			2.6				5.0				20.0	11.0	22.5	15.0	12.5	15.0		2.5
Wild Sarsaparilla (*Aralia nudicaulis L.*)																										22.5	30.0	67.5	5.0								
Poison Ivy (*Rhus radicans L.*)																													10.0								
Northern Bedstraw (*Galium septentrionale R.& S.*)														7.5	5.0	9.0			2.5			2.5	5.0						6.5		2.5	2.5	2.5		5.0	5.0
Sedge (*Carex spp.*)																															10.0						2.5
Overstory										Pussy-willow	Pussy-willow	Aspen	Pussy-willow	Aspen	Aspen	Aspen	Aspen	Aspen/Oak	Aspen	Aspen								Hazelnut Aspen Dogwood	Oak/Aspen	Oak/Aspen	Aspen/Oak	Oak/Aspen	Sask-atoon/Aspen	Aspen/Oak	Oak/Aspen Sarsa-	Oak/Aspen	Oak

E.3. The Mean Number of Trees per Hectare, Mean Cross-Sectional Area, Relative Frequency and Dominance, and Importance Value of Tree Species as Ascertained by the Point-Quarter Method.

SITE	MEAN NUMBER OF TREES/HECTARE	SPECIES	MEAN CROSS-SECTIONAL AREA (cm^2)	RELATIVE FREQUENCY (%)	RELATIVE DOMINANCE (%)	IMPORTANCE VALUE
D	5,694.761	Aspen	42.3	100.0	100.0	200.0
		TOTAL	42.3	100.0	100.0	200.0
E	2,415.46	Aspen	126.1	100.0	100.0	200.0
		TOTAL	126.1	100.0	100.0	200.0
F	15,060.24	Aspen	11.4	90.0	95.6	185.6
		Willow spp.	4.8	10.0	4.4	14.4
		TOTAL	16.2	100.0	100.00	200.0
G	6,317.12	Aspen	17.1	92.5	99.0	191.5
		Willow spp.	.7	2.5	.1	2.6
		Other	2.9	5.0	.9	5.9
		TOTAL	20.7	100.0	100.0	200.0
H	1,615.51	Aspen	213.2	85.0	89.0	174.0
		Oak	282.2	7.5	10.4	17.9
		Willow spp.	17.9	7.5	.6	8.1
		TOTAL	513.3	100.0	100.0	200.0

E.3 Cont'd.

SITE	MEAN NUMBER OF TREES/HECTARE	SPECIES	MEAN CROSS-SECTIONAL AREA (cm^2)	RELATIVE FREQUENCY (%)	RELATIVE DOMINANCE (%)	IMPORTANCE VALUE
I	9,708.74	Aspen	14.2	77.5	76.0	153.5
		Oak	25.9	12.5	22.3	34.8
		Willow spp.	2.4	10.0	1.7	11.7
		TOTAL	42.5	100.0	100.0	200.0
J	4,566.21	Aspen	75.1	90.0	95.3	185.3
		Oak	108.9	2.5	3.8	6.3
		Willow spp.	8.3	7.5	.9	8.4
		TOTAL	192.3	100.0	100.0	200.0
K	22,421.53	Aspen	8.9	90.0	84.9	174.9
		Oak	25.1	5.0	13.2	18.2
		Willow spp.	5.1	2.5	1.3	3.8
		Other	2.0	2.5	.6	3.1
		TOTAL	41.1	100.0	100.0	200.0
L	8,818.34	Aspen	21.0	37.5	47.9	85.4
		Oak	13.7	62.5	52.1	114.6
		TOTAL	34.7	100.0	100.0	200.0

E.4. Percentage Estimates of Tree Health

Site	Species	Condition of Trees			
		Good	Fair	Poor	Very Poor
D	Aspen	7.5	75.0	17.5	0.0
E	Aspen	22.5	70.0	7.5	0.0
F	Aspen	0.0	45.0	40.0	5.0
	Willow spp.	0.0	5.0	5.0	0.0
G	Aspen	22.5	55.0	10.0	5.0
	Willow spp.	2.5	0.0	0.0	0.0
	Other	0.0	5.0	0.0	0.0
H	Aspen	7.5	57.5	15.0	2.5
	Oak	5.0	2.5	0.0	0.0
	Willow spp.	10.0	0.0	0.0	0.0
I	Aspen	5.0	47.5	20.0	5.0
	Oak	0.0	12.5	0.0	0.0
	Willow spp.	0.0	10.0	0.0	0.0
J	Aspen	47.5	37.5	5.0	0.0
	Oak	0.0	2.5	0.0	0.0
	Willow spp.	0.0	7.5	0.0	0.0
K	Aspen	25.0	62.5	2.5	0.0
	Oak	2.5	2.5	0.0	0.0
	Willow spp.	0.0	2.5	0.0	0.0
	Other	0.0	2.5	0.0	0.0
L	Aspen	10.0	15.0	7.5	5.0
	Oak	45.5	17.5	2.5	0.0

SOIL MATERIALS
North Section

SITE NO.	VEGETATION	DRAINAGE	LAYER DEPTHS (cm)	TEXTURE	EFFERVESCENCE PRESENCE OF CARBONATES
1N	Aspen Oak	Intermediate to Well	0 - 100	Clay	56 - 84 Moderate 84 - 100 Strong
2N	Aspen Oak	Intermediate to Well	0 - 100	Clay	14 - 42 Moderate 42 - 100 Strong
3N	Aspen Oak	Intermediate to Well	0 - 100	Clay	21 - 42 Moderate 42 - 100 Strong
4N	Aspen Oak and Willows	Intermediate	0 - 100	Clay	56 - 84 Moderate 84 - 100 Slight
5N	Aspen	Intermediate	0 - 100	Clay	28 - 35 Moderate 35 - 77 Strong 77 - 100 Moderate
6N	Dead Aspen Oak & Willows	Intermediate	0 - 100	Clay	35 - 42 Moderate 49 - 100 Strong
7N	Oak Aspen	Well	0 - 100	Clay	56 - 63 Slight 63 - 77 Moderate 77 - 100 V Strong

E.5 Continued

SITE NO.	VEGETATION	DRAINAGE	LAYER DEPTHS (cm)	TEXTURE	EFFERVESCENCE PRESENCE OF CARBONATES
8N	Aspen, Oak, & Willow	Intermediate	0 - 100	Clay	28 - 35 Slight 35 - 63 Moderate 63 - 100 Strong
9N	Aspen Oak	Intermediate to Well	0 - 14 14 - 42, 84 - 100 42 - 84	Clay Silty Clay Silty Clay Loam	14 - 100 V Strong
10N	Oak	V Well Dry Soil	0 - 84 84 - 100	Clay Silty Clay	63 - 70 Moderate 70 - 100 Strong
11N	Aspen, Willows	Poor	0 - 100	Clay	70 - 100 Strong
12N	Oak, Aspen	Well, Dry Soil	0 - 100	Clay	14 - 21 Slight 21 - 35 Moderate 35 - 100 Strong
13N	Aspen	Intermediate	0 - 100	Clay	21 - 35 Slight 35 - 49 Moderate 49 - 100 Strong
14N	Aspen	Intermediate	0 - 100	Clay	No
15N	Aspen, A Few Willows	Intermediate to Well	0 - 100	Clay	28 - 100 Strong
16N	Aspen, Oak	Well	0 - 42 42- 56 56 - 70 70 - 84 84 - 100	Clay Silty Clay to Silty Clay Loam to Silty Loam Sandy Loam Loamy Sand Sandy Clay	35 - 56 Strong 56 - 70 Slight 70 - 100 No

SOIL MATERIALS
South Section

NO.	VEGETATION	DRAINAGE	LAYER DEPTHS (cm)	TEXTURE	EFFERVESENCE PRESENCE OF CARBONATES
1S	Aspen & A Few Willows	Intermediate	0 - 28 28 - 42 42 - 100	Clay Silty Clay Clay	14 - 63 Strong 63 - 91 Moderate 91 - 100 Slight
2S	Wet Aspen	Poor to Intermediate	0 - 100	Clay	49 - 60 Moderate 70 - 160 Strong
3S	Oak	Well	0 - 100	Clay	35 - 100 Strong
4S	Oak Aspen	Well	0 - 100	Clay	84 - 91 Moderate 91 - 100 Strong
5S	Aspen, Willows Coltsfoot	Poor Very Wet	0 - 100	Clay	66 - 100 Moderate
6S	Oak Aspen	Well	0 - 14 14 - 28 28 - 100	Clay Silty Clay Clay	14 - 100 Strong
7S	Oak Aspen Dry Soil	Well	0 - 100	Clay	38 - 42 Slight 42 - 100 Strong
8S	Oak	V Well V Dry Soil	0 - 100	Clay	28 - 35 Moderate 35 - 100 V Strong
9S	Prairie	Well Quite Dry Soil	0 - 100	Clay	28 - 35 Slight 35 - 49 Moderate 49 - 100 V Strong

E.6Continued

NO.	VEGETATION	DRAINAGE	LAYER DEPTHS (cm)	TEXTURE	EFFERVESENCE PRESENCE OF CARBONATES
10S	Aspen Oak	Well	0 - 14, 56 - 70 14 - 42 42 - 56 70 - 100	Clay Silty Clay Sandy Clay Silty Clay Loam	14 - 84 Strong 84 - 100 Moderate
11S	Aspen Oak	Well	0 - 14, 84 - 100 14 - 28, 70 - 84 28 - 35 35 - 42-56 56 - 70	Clay Silty Clay Silty Clay Loam Silty Loam Silty Loam to Silty Clay Loam to Silty Clay	14 - 100 Strong
12S	Aspen Oak	Well Dry Soil	0 - 21, 42 - 63, 70 - 100 21 - 42, 63 - 70	Clay Silty Clay	28 - 35 Moderate 35 - 77 Strong 77 - 100 Moderate
13S	Aspen Oak	Well Dry Soil	0 - 100	Clay	42 - 100 Strong
14S	Grass Meadow Sedge, Willow	Poor	0 - 100	Clay	14 - 21 Moderate 21 - 100 Strong
15S	Wet Meadow Sedge	Poor	0 - 28, 70 - 100 28 - 35, 42 - 56 35 - 56 56 - 70	Clay Silty Loam Silty Clay Loam Silty Clay	0 - 100 Moderate

E.6 Continued

NO.	VEGETATION	DRAINAGE	LAYER DEPTHS (cm)	TEXTURE	EFFERVESENCE PRESENCE OF CARBONATES
16S	Aspen Oak	V Well V Dry Soil	0 - 56 56 - 77, 84 - 100 77 - 84	Clay Silty Clay Silty Clay Loam	35 - 42 Moderate 42 - 100 V Strong
17S	Oak, Aspen	Well Dry Soil	0 - 14, 49 - 56 14 - 49 56 - 70 70 - 100	Clay Silty Clay Silty Clay Loam Silty Loam	14 - 70 V Strong 70 - 100 Moderate
18S	Aspen, Oak	Well	0 - 100	Clay	70 - 100 Moderate to Strong
19S	Aspen, A Few Willows	Poor	0 - 14, 63 - 100 14 - 28, 42 - 49 28 - 42 49 - 62	Clay Silty Clay Loam Silty Loam Silty Clay	14 - 70 Strong 70 - 100 Moderate to Strong
20S	Aspen, A Few Willows	Poor	0 - 14 14 - 35, 56 - 100 35 - 42 42 - 56	Clay Silty Clay Loam Silty Loam Silty Clay	0 - 7 Moderate 7 - 42 Strong 42 - 56 Moderate 56 - 100 Moderate
21S	Aspen, A Few Willows	Poor	0 - 21 21 - 35 35 - 42, 56 - 100 42 - 56	Clay Silty Clay Silty Clay Loam Silty Loam	14 - 56 Strong 56 - 70 Moderate 70 - 100 Slight
22S	Aspen	Intermediate	0 - 14 14 - 21 21 - 100	Clay Silty lay Loam Silty Loam	14 - 70 Strong 70 - 100 Slight to Moderate
23S	Disturbed Ground V Dry Soil	Poor	0 - 14, 28 - 100 14 - 28	Clay Silty Clay	0 - 100 Strong

E.6 Continued

NO.	VEGETATION	DRAINAGE	LAYER DEPTHS (cm)	TEXTURE	EFFERVESENCE PRESENCE OF CARBONATES
24S	Oak, Aspen	Intermediate to Well	0 - 100	Clay	63 - 70 Moderate 70 - 100 Strong
25S	Wet Disturbed Meadow Dry Soil	Poor	0 - 14, 70 - 100 14 - 21, 63 - 70 21 - 35, 56 - 63	Clay Silty Clay Silty Clay Loam Silty Loam	0 - 28 Moderate 28 - 100 Strong
26S	Aspen, Coltsfoot	Poor to Intermediate	0 - 100	Clay	70 - 100 V Strong

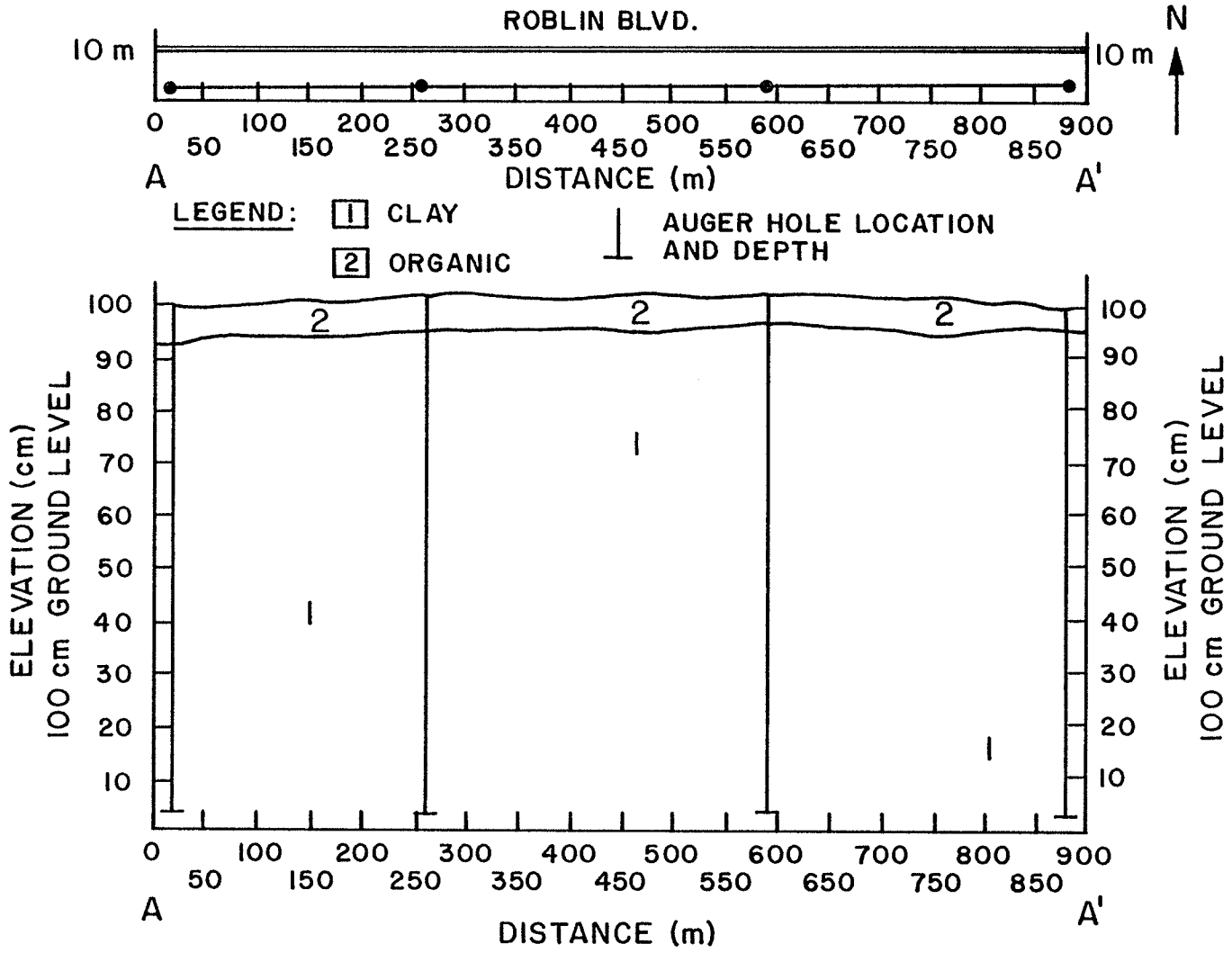


FIG. 11.

SOIL MATERIAL CROSS SECTION OF NORTH EDGE OF NORTH SECTION A—A'.

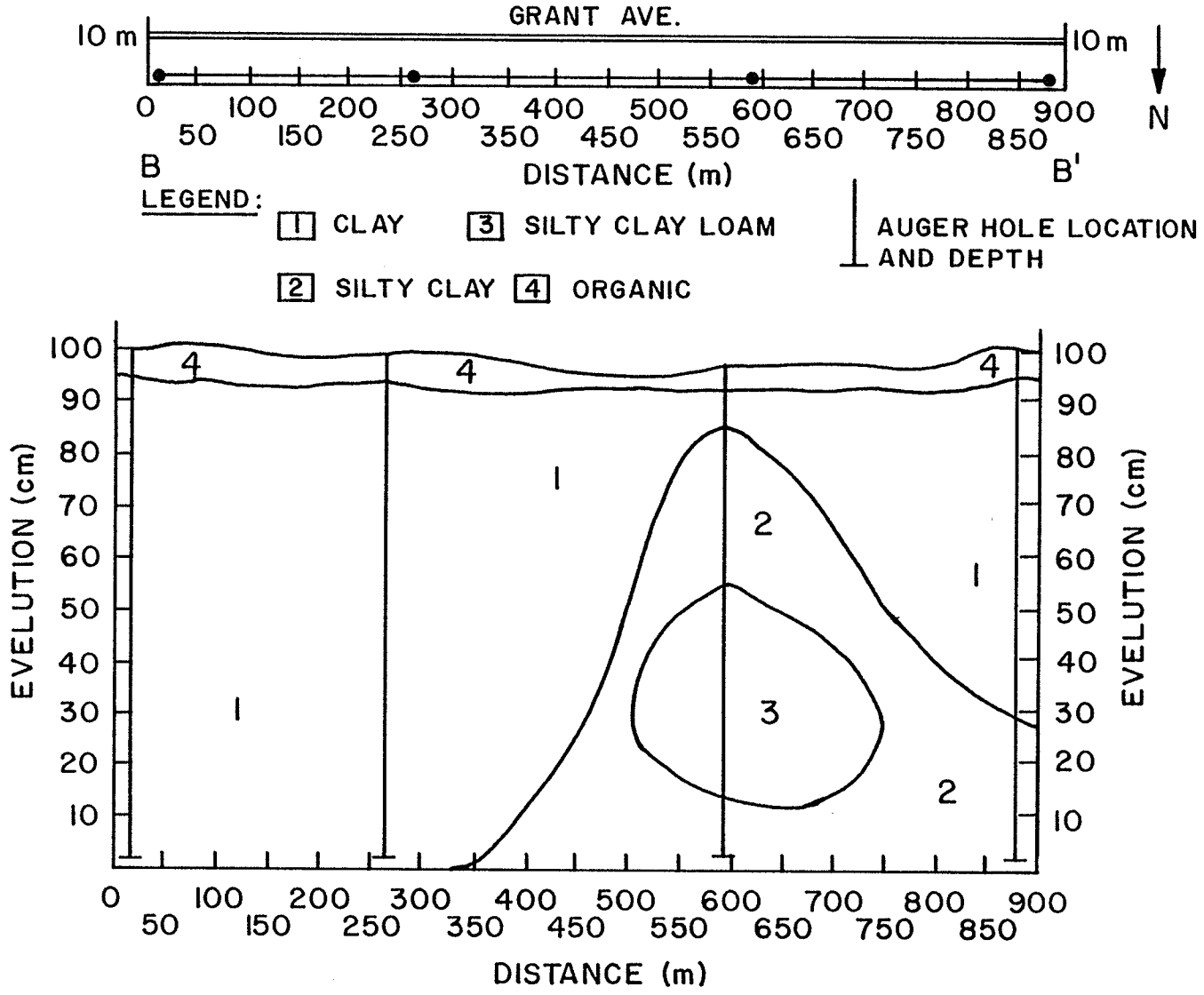


FIG. 12.

SOIL MATERIAL CROSS SECTION OF SOUTH EDGE OF NORTH SECTION B–B'

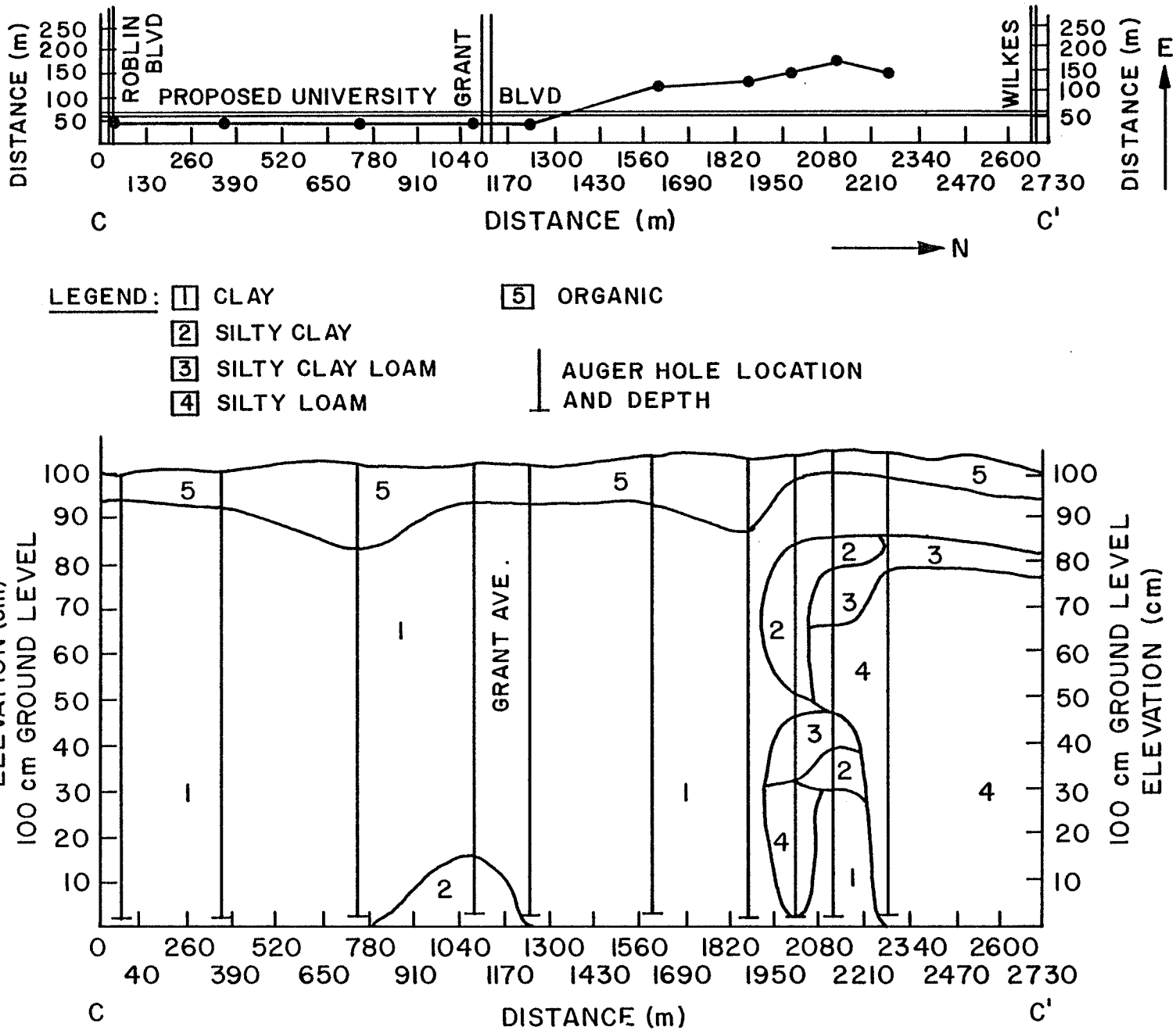


FIG. 13.

SOIL MATERIAL CROSS SECTION OF EAST EDGE OF NORTH SECTION AND THROUGH SOUTH SECTION C – C'

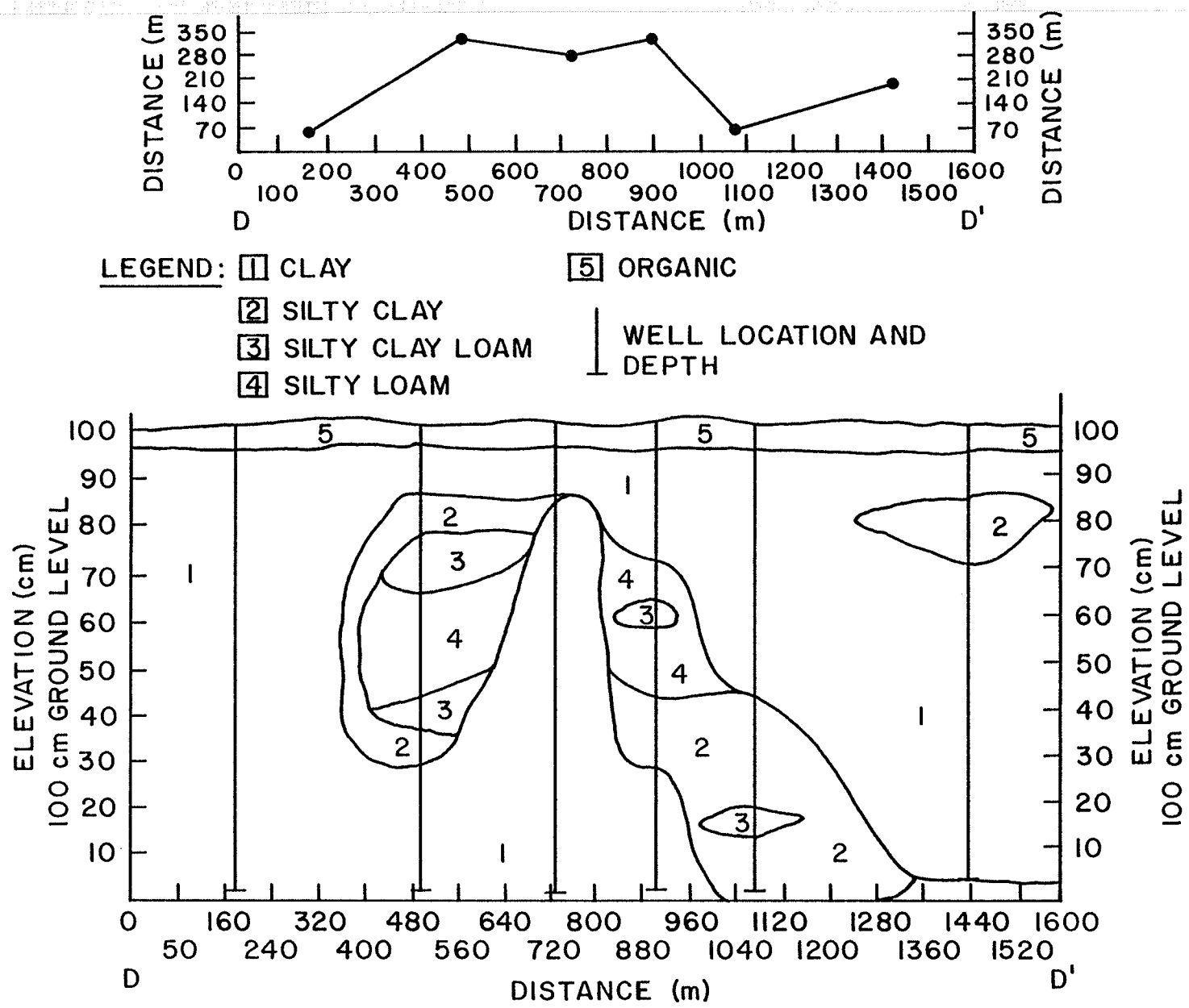


FIG. 14.

SOIL MATERIAL CROSS SECTION OF EAST EDGE OF SOUTH SECTION D–D'

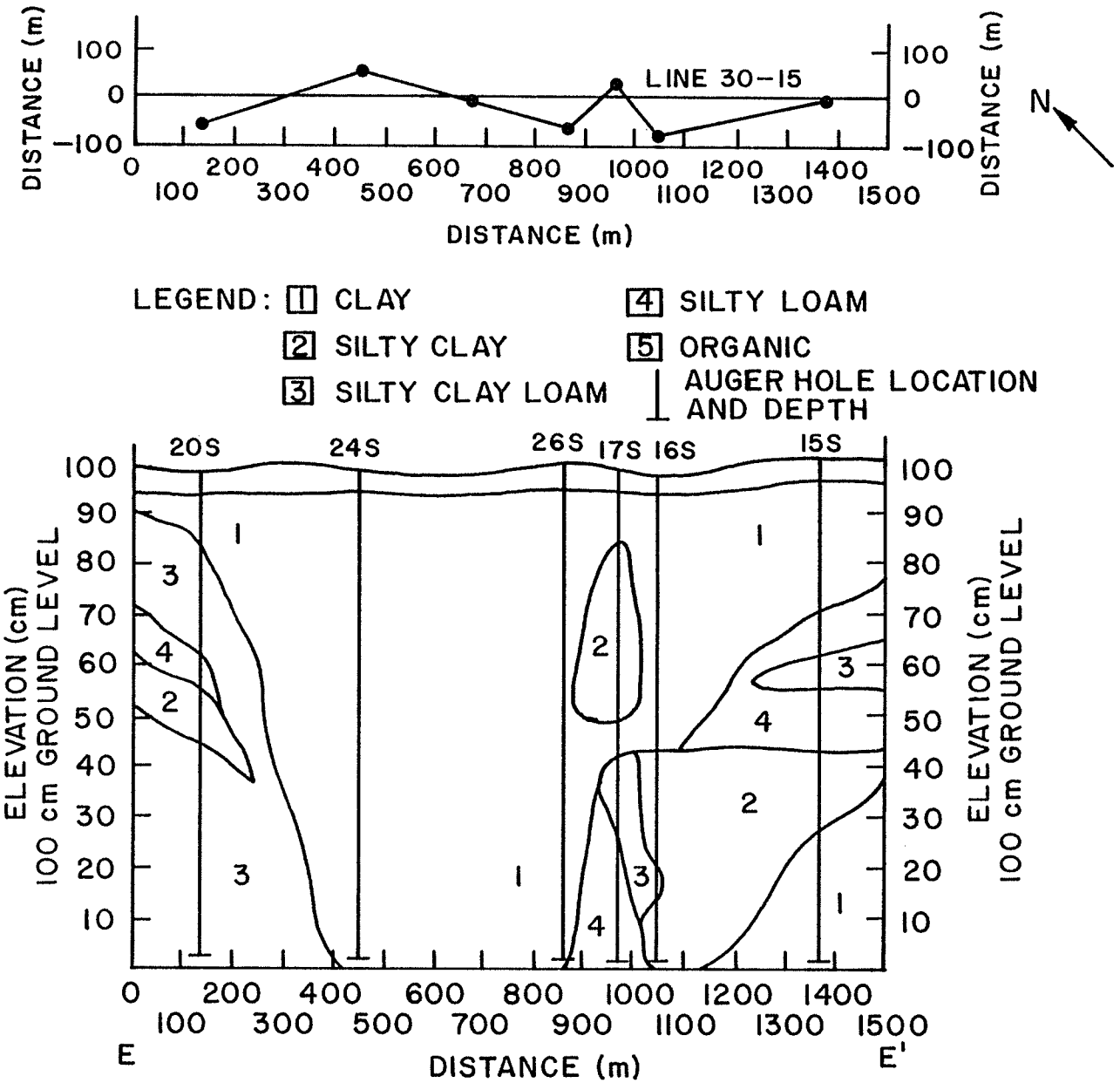


FIG. 15.

SOIL MATERIAL CROSS SECTION ALONG LINE FROM SITE 20 TO SITE 15. E–E'

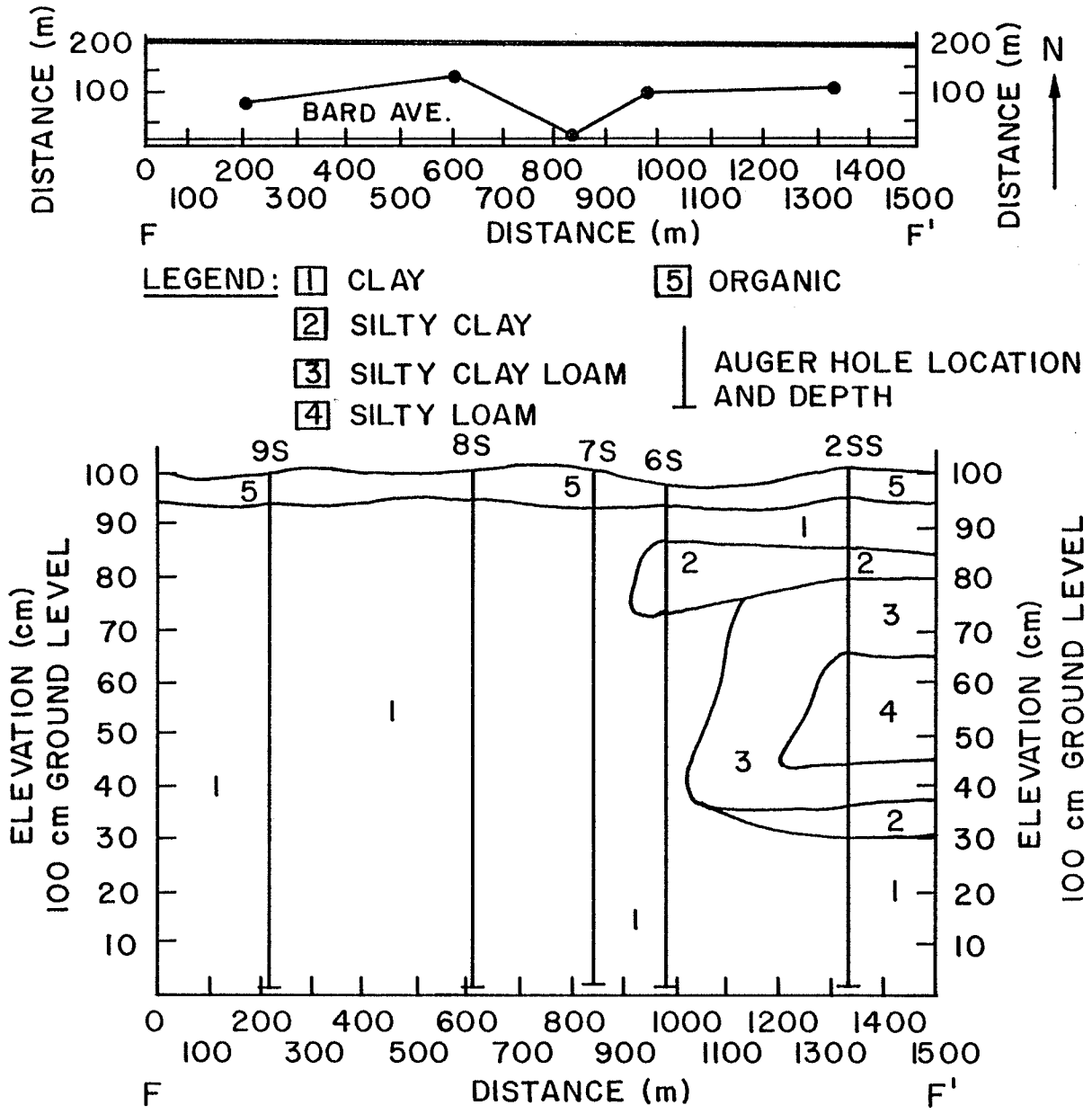


FIG. 16.

SOIL MATERIAL CROSS SECTION ALONG BARD AVE.
IN THE SOUTH SECTION F—F'

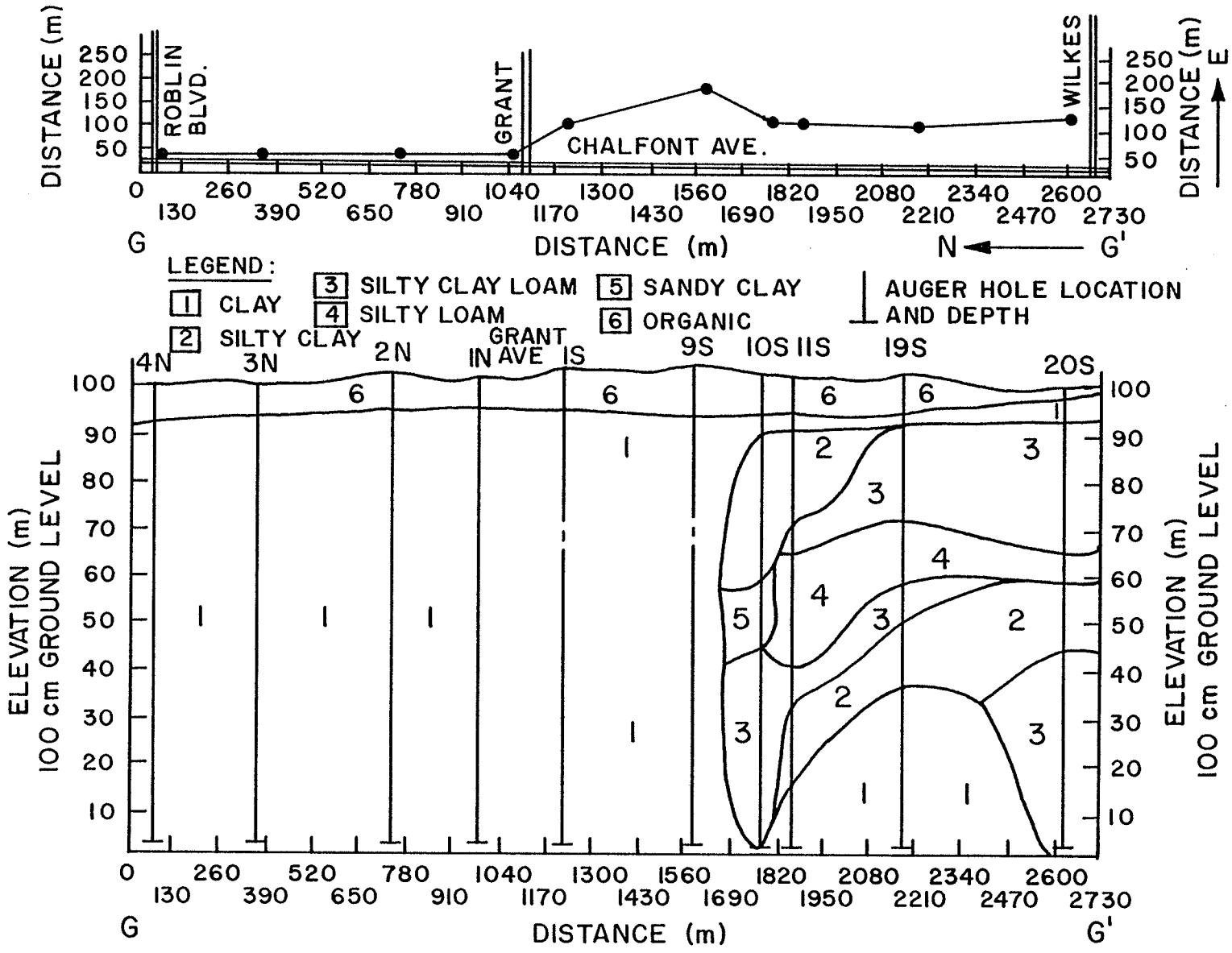


FIG. 17.

SOIL MATERIAL CROSS SECTION OF WEST EDGE OF ASSINIBOINE FOREST G—G'

APPENDIX F

SUMMARY OF BREEDING BIRD CENSUS

NOTE:
1. One singing male represents 41/square kilometer or 17/100 acres.
2. Two singing males represent 82/square kilometer or 33/100 acres.
3. Three singing males represent 123/square kilometer or 50/100 acres.
4. Four singing males represent 165/square kilometer or 50/100 acres.
5. The '+' represents a singing male with a territory less than 50% of the plot.

F .1 SITE 5A - OPEN ASPEN

Location: Assiniboine Forest, Winnipeg, Manitoba; 173.9 m. north and 61 m. east of the corner of Chalfont Rd. and Wilkes Ave.

Continuity: Established in 1976; no subsequent census.

Size: 2.43 hectares or 6.00 acres: (152.5 m. square, 30.5 m. grid laid out with a compass and measured rope).

Description of Plot: The forest crown consists of primarily of a large, uniform stand of mature trembling aspen (*Populus tremuloides* Michx.). The trees average 8 m. in height and canopy cover is approximately 70%. Thick patches of american hazelnut (*Corylus americana* Walt.) are found throughout the plot. Several dense stands of willow (*Salix* spp.) are located near the southern boundary. Other common understory species are red-osier dogwood (*Cornus stolonifera* Michx.) and smooth rose (*Rosa blanda* Ait.). The ground cover is dominated by dewberry (*Rubus pubescens* Raf.), loosestrife (*Steironema pumilum* Greene) and wild strawberry (*Fragaria virginiana* Duchesne).[1] The southwest corner of the plot is traversed by a trail used mainly for

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[1] A quantitative botanical analysis of the plot area is provided in the discussion of the Vegetation of the Assiniboine Forest Study Area.

horseback riding. Botanical names are from H. J. Scoggan, Flora of Manitoba, Nat. Mus. Canada, Bull. No. 140, 1957.

Edge: The eastern boundary is bordered by an overgrown road allowance. A small open meadow infringes on the southern border. The west side is within close approximity to the forest boundary, beyond which extensive housing development is taking place.

Topography: The terrain is essentially level. Elevation is 767.8 ft. or 234.0 m. ASL.

Weather: July 5 was clear, with a light breeze. July 13 was partly overcast with moderate winds and occasional rain showers towards the end of the census. Temperatures ranged from 16°C to 20°C.

Coverage: July 5 and July 13. All visits were between 5:00 and 7:30 AM DST. Total man-hours: 7.

Census: Blue Jay 2; Eastern Wood Peewee 2; Northern Oriole 2; Ovenbird 2; Tennessee Warbler 2; Mourning Dove +. Total: 6 species, 11 territorial males.

Remarks: A Warbling Vireo and Common Crow were heard beyond the southern boundary of the plot. Brewer's Blackbirds were commonly seen flying overhead.

F.2 SITE 6 - ASPEN (OAK)

Location: Assiniboine Forest, Winnipeg, Manitoba; 122 m. south and 366 m. east of the corner of Corydon Ave. and Chalfont Rd.

Continuity: Established in 1976; no subsequent census.

Size: 2.43 hectares or 6.00 acres: (152.5 m. square, 30.5 m. grid laid out with a compass and measured rope).

Description of Plot: The plot is predominantly covered by a uniform stand of mature trembling aspen (*Populus tremuloides* Michx.), averaging 9 m. in height. Canopy cover is approximately 70%. American hazelnut (*Corylus americana* Walt.) grows thickly in the northern portion of the plot, whereas the southern section supports dense patches of willow (*Salix* spp.) and saskatoon (*Amelanchier alnifolia* Nutt.). The lesser vegetation consists primarily of wild sarsaparilla (*Aralia nudicaulis* L.), goldenrod (*Solidago canadensis* L. and *S. gigantea* Ait.), poison ivy (*Rhus radicans* L.) and dewberry (*Rubus pubescens* Raf.). Botanical names from H. J. Scoggan, Flora of Manitoba, Nat. Mus. Canada, Bull. No. 140, 1957.

Edge: The plot is bounded by similar tree growth on all sides.

Topography: The terrain is essentially level. Elevation is 769.6 ft. or 234.6 m. ASL.

Weather: June 19 was partially overcast with moderate wind conditions. July was clear with light winds. Temperatures ranged from 14°C to 21°C.

Coverage: June 19 and July 10. All visits were between 5:00 and 7:30 AM DST. Total man-hours: 8.

Census: Northern Oriole 2; Tennessee Warbler 2; Warbling Vireo 2; Black-billed Cuckoo 1; Cedar Waxwing 1; Philadelphia Vireo 1; Rose-breasted Grosbeak 1; Rufores-sided Towhee 1; Veery 1. Total: 9 species; 12 territorial males.

Remarks: A clay-colored Sparrow and Great crested Flycatcher were heard beyond the southern boundary of the plot. A group of Brewer's Blackbirds and a pair of common Crows were observed flying overhead.

F.3 SITE 7A - OPEN ASPEN-OAK

Location: Assiniboine Forest, Winnipeg, Manitoba; 167.8 m. south and 198.2 m. east of the corner of Grant Ave. and Chalfont Rd.

Continuity: Established in 1976; no subsequent census.

Size: 2.43 hectares or 6.00 acres: (152.5 m. square, 30.5 m. grid laid out with a compass and measured rope).

Description of Plot: The plot is predominantly open aspen (*Populus tremuloides* Michx.), averaging 8 m. in height. Canopy cover is approximately 40% in the northern half and 70% in the southern half of the plot. Poor drainage throughout the northern half has resulted in a great deal of deadfall and scattered clumps of willow (*Salix* spp.). Shrub growth is dominated by american hazelnut (*Corylus americana* Walt.), red-osier dogwood (*Cornus stolonifera* Michx.) and smooth rose (*Rosa blanda* Ait.). Strawberry (*Fragaria virginiana* Duchesne) and wild sarsaparilla (*Aralia nudicaulis* L.) are the primary ground species. Two overgrown road allowances traverse the plot. Botanical names are from H. J. Scoggan, Flora of Manitoba, Nat. Mus. Canada, Bull. No. 140, 1957.

Edge: Aspen grows thickly along the west boundary, beyond which extends open prairie. The Eve Werier

Pond is located south of the plot.

Topography: The terrain is essentially level. Elevation is 772.0 ft. or 235.3m. ASL.

Weather: The weather was generally clear and calm, with a light wind on July 4. Temperatures ranged from 14°C to 20°C.

Coverage: July 4 and July 12. All visits were between 5:00 and 7:30 AM DST. Total man-hours: 8½.

Census: Northern Oriole 3; Tennessee Warbler 3; Eastern Wood Peewee 2; Great Crested Flycatcher 2; Least Flycatcher 1; Purple Martin 1; Red-eyed Vireo 1; Veery 1; Warbling Vireo 1. Total: 9 species; 15 territorial males.

Remarks: Other species seen on one occasion only include Catbird, Clay-colored Sparrow, Brown-headed Cowbird, Tree Swallow, Philadelphia Vireo and American Robin. A flock of Brewer's Blackbirds flew overhead on several occasions. A pair of Mallards was also observed flying overhead.

F.4 SITE 7B - INTERMEDIATE ASPEN-OAK

Location: Assiniboine Forest, Winnipeg, Manitoba; 61 m. south and 61 m. east of the corner of Roblin Blvd. and Chalfont Rd.

Continuity: Established in 1976; no subsequent census.

Size: 2.43 hectares or 6.00 acres: (152.5 m. square, 30.5 m. grid laid out with a compass and measured rope).

Description of Plot: The forest crown is dominated by trembling aspen (*Populus tremeloides* Michx.) and burr oak (*Quercus macrocarpa* Michx.). Average canpy height is 12 m. The northern portion of the plot consists of open oak, with scattered aspen extending approximately 100 m. south. Fairly thick aspen growth covers the remainder of the plot with scattered oak. Canopy cover is 80%. The thick shrub understory is dominated by american hazelnut (*Corylus americana* Walt.), saskatoon (*Amelanchier alnifolia* Nutt.), downy arrow-wood (*Viburnum rafinesquianum* Schultes), nannyberry (*V. lentago* L.) and highbushcranberry (*V. trilobum* Marsh.). The dominant ground cover species are wild sarsaparilla (*Aralia nudicaulis* L.), goldenrod (*Solidago canadensis* L. and *S. gigantea* Ait.), poison ivy (*Rhus radicans* L.) and dewberry (*Rubus pubescens* Raf.).

Botanical names are from H. J. Scoggan, Flora of Manitoba, Nat. Mus. Canada, Bull. No. 140, 1957.

Edge: The northern and eastern borders of the plot are within 61 m. of urban streets. A portion of the southern edge is bordered by open oak. The plot is otherwise bordered by similar tree growth.

Topography: The terrain is essentially level. Elevation is 772 ft. or 232 m. ASL.

Weather: The weather was generally clear and calm. Temperatures ranged from 12°C to 18°C.

Coverage: June 15 and July 6. All visits were between 5:00 and 7:30 AM DST. Total man-hours: 8.

Census: Northern Oriole 5; Least Flycatcher 3; Blue Jay 1; Common Crow 1; Veery 1; Warbling Vireo 1; House Sparrow +; Tree Swallow +. Total: 8 species; 14 territorial males.

Remarks: Other species seen on one occasion only include Red-eyed Vireo, Brewer's Blackbird and American Robin. A Rose-breasted Grosbeak and Cedar Waxwing were seen outside the northwest boundary of the plot, and a pair of Mallards were observed overhead.

E.5 SITE 7C - DENSE ASPEN-OAK

Location: Assiniboine Forest, Winnipeg, Manitoba; 305 m. south and 30.5 m. east of the corner of Roblin Blvd. and Chalfont Rd.

Continuity: Established in 1976; no subsequent census.

Size: 2.43 hectares or 6.00 acres: (152.5 m. square, 30.5 m. grid laid out with a compass and a measured rope).

Description of Plot: The dominant canopy species are trembling aspen (*Populus tremuloides* Michx.) and burr oak (*Quercus macrocarpa* Michx.), averaging 8 m. in height. The poor drainage of the area is evident in the southern portion of the plot, where several wet clearings support a thick growth of willow (*Salix* spp.), american hazelnut (*Corylus americana* Walt.) and downy arrow-wood (*Viburnum rafinesquianum* Schultes). Patches of regenerating oak and aspen are also present. The northeast portion of the plot supports a dense stand of pure aspen, with a canopy cover of about 90%. Rose (*Rosa blanda* Ait. and *R. acicularis* Lindl.), snowberry (*Symphoricarpos occidentalis* Hook) and meadowsweet (*Spiraea alba* Du Roi) are prominent shrubs. The dominant ground-cover species are dewberry (*Rubus pubescens* Raf.), wild sarsaparilla (*Aralia nudicaulis* L.) and purple

meadowrue (*Thalictrum dasycarpum* Fisch. & Lall.). Botanical names are from H. J. Scoggan, Flora of Manitoba, Nat. Mus. Canada, Bull. No. 140, 1957.

Edge: The eastern side is within 30.5 m. of an urban street and is bordered by a larger proportion of oaks. The plot is otherwise bordered by similar tree growth.

Topography: The terrain is essentially level. Elevation is 772.0 ft. or 232 m. ASL.

Weather: The weather was generally clear and calm. Temperatures ranged from 16°C to 18°C.

Coverage: June 27 and July 11. All visits were between 5:00 and 7:30 AM DST. Total man-hours: 8.

Census: Northern Oriole 3; Clay-colored Sparrow 2; Tennessee Warbler 1; Great Crested Flycatcher 1; Tree Swallow 1; Mourning Dove ; Eastern Phoebie 1. Total: 7 species; 10 territorial males.

Remarks: Other species seen on one occasion only include American Robin, Black-capped Chickadee, Warbling Vireo, Veery, Catbird and Downy Woodpecker. A Rose-Breasted Grosbeak and Ovenbird were observed on the southern edge of the plot. Flocks of 3 or more Brewer's Blackbirds were commonly seen flying overhead.

APPENDIX G

FLORAL AND FAUNAL FEATURES OF SIGNIFICANCE FOR INTERPRETATION IN ASSINIBOINE FOREST

G.1 Introduction

The provision of interpretive services in the City of Winnipeg has been made, in all but the most recent years, on an ad hoc basis. With the establishment of the Living Prairie Museum, the first formal interpretive plan for a city park was developed in 1978 (See Harburn, 1978). Although a formal policy statement regarding the provision of interpretive services remains to be formulated, the emphasis of interpretive services is the provision of public education programs.

This appendix lists the regions of the Assiniboine Forest and their respective features of significance. Three main areas are covered; land forms and processes, aquatic and terrestrial ecosystems and human history. While each of the previous areas is of importance for the Assiniboine Forest, the major interpretive concept that should be taken as the linchpin of Assiniboine Forest interpretation is "aspen parkland and the urban environment" (Ross, 1980). Each of the theme areas will be examined to produce sub-themes which will list appropriate storylines. Storylines will form the basis for interpretive planning.

G.2 Theme: Terrestrial Ecosystems

Terrestrial ecosystems are one of the most important areas of concern. The terrestrial ecosystem theme is divided into sub-themes according to the various community types. A complete listing of floral and faunal species in the terrestrial ecosystem is supplied in Appendix D.

G.2.1 Typha Marsh Community Sub-theme

- Littoral succession and adaptation of plants to change in water levels
- Use of marsh community as protective cover by waterfowl during nesting and staging
- Use of marsh community as protective cover by whitetail deer during watering
- Human impact on marsh drainage vis à vis agriculture on the Prairies: marsh areas are vital in watershed recharge
- Human activities in marsh areas, such as trapping illustrate the man-nature link

G.2.2 Willow Scrub Community Sub-theme

- Moisture tolerant plants indicate drainage patterns of the Assiniboine Forest
- Nodal growth patterns of dominant plants of the area: willows and sedges
- Willow spp., in particular, provide browse for mammals

G.2.3 Wet Meadow Community Sub-theme

- The presence of dead trees reflects changes in water levels which have drowned trees

- Wet Meadow serves as a minor habitat area for white-tail deer, passerine birds and even mallard ducks in the spring season

G.2.4 Willow/Aspen Community Sub-theme

- Some evidence of progression towards higher seral stage reflected by invasion of aspen
- Changes in water levels over time have been manifested in soils and vegetation

G.2.5 Aspen Community Sub-theme

- Aspen habitat is dominated by hazelnut (*Corylus* spp.) which acts as an important food source for many animals
- Aspen trees, the dominant community species, are of significance through; the characteristic growth through suckering; heat distributing bark covering; diseases; and the utilization of the species as browse
- Aspen trees are important colonizing species on the prairies
- Many animals, such as squirrels, inhabit this community

G.2.6 Aspen/Oak Community Sub-theme

- Changing successional patterns arising from changes in soils and moisture regimes are reflected in the invading oak trees
- The presence of oak and aspen rising to a height of nine metres is evidence of advancing succession
- White-tail deer commonly frequent this community, along with other mammals such as skunks and hares

- Bird species nest frequently in this community; unusual breeding birds included here is the black-billed cuckoo. Wild turkeys, escaped from the Assiniboine Zoo have become naturalized in the north sector of the forest

G.2.7 Oak-Aspen Community Sub-theme

- Interpretive features similar to those found in Aspen/Oak Community

G.2.8 Oak Community Sub-theme

- The dominance of oak indicates succession and the changing soil conditions
- Oak trees are able to withstand fire more readily; as evidenced by the trees in the fire damage areas north of Grant Avenue
- Oak trees possess leaves with distinctive patterns that reflect the utilization of solar energy in trees

G.2.9 Prairie Community Sub-theme

- A remnant of the biome once dominating the western Canadian provinces, prairie community is a useful component in interpretation
- Native prairie species are present to illustrate prairie ecology
- Faunal features include deer and migratory prairie birds such as the bobolink

G.2.10 Disturbed Community Sub-theme

- Disturbed Community can function as an important reminder of the influence of man upon natural environments
- Weed ecology and control may also be examined in interpretive programming

G.2.11 Clover Community Sub-theme

- Homogenous nature of the Clover Community demonstrates dominance by an introduced species
- Influence of domestic animals (horses) as vectors

G.3 Theme: Aquatic Ecosystem

The Eve Werier Memorial Pond, located in the south segment of the forest is an important interpretive feature. Storylines for the pond area include:

- The use of the pond as a waterfowl production and resting
- Use of the pond by forest animals
- Wood duck nesting boxes
- The use of the pond in wildlife management (through deterring deer from leaving the forest in search of water) and pest management (stocking with fat head minnows to eat mosquito larvae).

G.4 Theme: Human history

While human impacts are in each of the previous sub-themes, the development of the Assiniboine Forest (as outlined in Appendix A) is a major interpretive concept.

APPENDIX H

RATINGS AND LIMITATIONS OF SOILS IN THE ASSINIBOINE FOREST FOR RECREATIONAL USE

Map Symbol	Soil Series	Intensive Picnic Area	Intensive Camp Area	Paths and Trails	Soil Features Affecting Use
Dc	Dencross clay	Severe	Severe	None to Slight	Poorly Drained; subject to ponding; sticky and slippery when wet
Fc	Fort Garry clay	Moderate	None to Slight	None to Slight	Well drained, clay surface is slippery and sticky if wet
Nc	St. Norbert clay	Moderate	None to Slight	None to Slight	Well drained, gently sloping; occasional ponding
Oc	Osborne clay	Severe	Severe	Severe	Poorly drained, ponding sticky and slippery when wet

RATINGS:

None to Slight - means the soil is very suitable for the particular use.

Moderate - means the soil has limitations for use but can be used under good management.

Severe - means that the soil has limitation characteristics which makes its use for recreational purposes unsound and/or very expensive. These soils often require extensive reclamative work.

SOURCE: Michalyna, et. al., 1975.

APPENDIX I

GENETIC PROFILES FOR EACH SOIL SERIES OF THE ASSINIBOINE FOREST

DENCROSS SERIES

Horizon	Designation	Depth (cm)	Color	Texture	Structure	Effervesence
1	L - H	4 - 0	10 YR 2/2 d.	clay	fine granular	none
2	Ah	0 - 15	2.5Y 3/1 d.	clay loam	fine granular	weakly calcareous
3	Ackgj	15 - 28	2.5Y 4/1 d.	loam	fine granular	strongly calcareous
4	Ckgj 1	28 - 42	2.5Y 7/1 d.	silty clay	massive to fine	very calcareous
5	Ckgj 2	42 +	2.5Y 7/1 d.	loam	granular	calcareous

FORT GARRY SERIES

Horizon	Designation	Depth (cm)	Color	Texture	Structure	Effervesence
1	Ah	0 - 18	10 YR 2/1 d.	silty clay	fine granular	none
2	Bm	18 - 46	2.5Y 5/2 d.	clay	fine prismatic to coarse granular	none
3	BCk	46 - 52	10 YR 4/3 d.	clay	medium to coarse granular	none
4	IIBCk	52 - 58	2.5Y 6/2 d.	stratified silty clay to silty clay	fine pseudo platy	strongly calcareous
5	IICk 1	58 - 80	10 YR 5/3 m.-	silty clay loam to clay	fine pseudo platy	very strongly calcareous
6	IICk 2	80 - 100	stratified brown to greyish brown	silt loam to clay	fine pseudo platy	very strongly calcareous
7	IICk 3	100 - 135	2.5Y 7/2 d.	silt loam to silty clay loam	fine platy	very strongly calcareous

OSBORNE SERIES

Horizon	Designation	Depth (cm)	Color	Texture	Structure	Effervesence
1	Ap	0 - 10	5Y 2/1 d.	clay	massive to medium granular	none
2	Acg	10 - 15	5Y 3/1 to 5Y 4/2 d.	clay	massive to fine granular	none
3	Ckg 1	15 - 30	5Y 4/1 d.	clay	massive	weakly calcareous
4	Ckg 2	30 - 60	5Y 4/1 d.	clay	massive	moderately calcareous
5	Ckg 3	60 - 90	5Y 4/1 d.	clay	massive	moderately calcareous

APPENDIX I - CONTINUED
GENETIC PROFILES FOR EACH SOIL SERIES OF THE ASSINIBOINE FOREST

ST. NORBERT SERIES

Horizon	Designation	Depth (cm)	Color	Texture	Structure	Effervesence
1	L - H	3 - 0				
2	Ahe	0 - 8	10YR 5/1 d.	clay	fine granular	none
3	AB	8 - 10	10YR 5/1 d.	clay	fine granular	none
4	Btj	10 - 25	10YR 4/1 d.	clay	fine granular	none
5	Bm	25 - 45	5Y 3/1 d.	clay	fine subangular blocky	none
6	BCk	45 - 60	5Y 5/2 d.	clay	massive to coarse granular	weakly calcareous
7	Ckg 1	60 - 90	5Y 5/2 d.	clay		weakly calcareous
8	Ckg 2	90 - 180	5Y 5/2 to 5Y 6/2 d.	clay	massive	moderately calcareous

SOURCE: Michalyna et. al., 1975.

G.1 Site 1 Soil Profile Analysis

General Description

Vegetation:	Willows and Coltsfoot
Drainage:	Very poor
Surficial Materials:	Fine textured lacustrine and alluvial deposits
Surface Texture:	Fine textured lacustrine and alluvial deposits
Topography:	Depression
Runoff:	Very slow
Permeability:	Very slow

Soil Description: Rego Humic Gleysol
Osborne Series

Sample	1 - 1	1 - 2	1 - 3	1 - 4
Textural Class	Si C	C	C	C
% V.C. Sand				
% C. Sand				
% M. Sand				
% F. Sand				
% V.F. Sand				
% Total Sand	9	6	4	4
% Silt	42	18	12	11
% Clay	49	76	84	85
pH	6.1	6.0	6.8	7.5
Conductivity	0.3	0.6	0.2	0.3
% $CaCO_3$ Eq.				4.4
% Calcite				2.3
% Dolomite				2.0
% Saturated Moisture	147	108	99	107

G.2 Site 2 Soil Profile Analysis

General Description

Vegetation: Oak
Drainage: Very well drained
Surficial Materials: Fine textured lacustrine and alluvial deposits
Surface Texture: Fine textured lacustrine and alluvial deposits
Topography: Gently sloping
Runoff: Moderate
Permeability: Moderately slow to slow

Soil Description: Orthic Dark Gray
St. Norbert Series

Sample	2 - 1	2 - 2	2 - 3a	2 - 3b
Textural Class	C	C	C	C
% V.C. Sand	1	0	0	
% C. Sand	1	1	0	
% M. Sand	1	1	1	
% F. Sand	4	4	2	
% V.F. Sand	14	21	10	
% Total Sand	21	27	13	9
% Silt	37	27	12	15
% Clay	42	46	75	76
ph	5.6	5.4	5.7	7.0
Conductivity	0.5	0.5	0.9	0.9
% $CaCO_3$ Eq.				8.8
% Calcite				6.4
% Dolomite				2.2
% Saturated Moisture	38	61	114	88

G.3 Site 3 Soil Profile Analysis

General Description

Vegetation:	Oak - Aspen
Drainage:	Very well drained
Surficial Materials:	Clay
Surface Texture:	Thin, moderately calcareous fine textured lacustrine sediments over variable depth of strongly calcareous silty sediments which overlie calcareous lacustrine clay
Topography:	Gently sloping
Runoff:	Moderate
Permeability:	Variable moderate to moderately slow

Soil Description: Gleyed Rego Black
Dencross Series

Sample	3 - 1	3 - 2	3 - 3a	3 - 3b	3 - 3c
Textural Class	C	SiC	SiCL	SiL	SiL
% V.C. Sand	0	0	0	0	0
% C. Sand	0	0	0	0	0
% M. Sand	0	0	0	0	0
% F. Sand	1	0	1	0	1
% V.F. Sand	21	17	17	16	12
% Total Sand	22	17	18	16	13
% Silt	34	42	52	58	64
% Clay	44	41	30	26	23
pH	7.2	7.4	7.5	7.7	7.7
Conductivity	0.5	0.3	0.4	0.4	0.3
% $CaCO_3$ Eq.	11.7	35.4	49.7	46.2	40.7
% Calcite	3.2	15.2	13.3	5.8	6.6
% Dolomite	7.8	18.6	33.6	37.3	31.4
% Saturated Moisture	74	53	43	37	45

G.4 Site 4 Soil Profile Analysis

General Description

Vegetation:	Oak - Aspen
Drainage:	Very well drained
Surficial Materials:	Clay
Surface Texture:	Thin moderately calcareous fine textured lacustrine sediments over variable depth of strongly calcareous silty sediments which overlie calcareous lacustrine clay.
Topography:	Gently sloping
Runoff:	Moderate
Permeability:	Variable moderate to moderately slow

Soil Description: Orthic Black Soil
Fort Garry Series

Sample	4 - 1	4 - 2	4 - 3a	4 - 3b	4 - 4
Textural Class	Cl	C	SiL	SiCl	C
% V.C. Sand	0	0	0	0	
% C. Sand	0	0	0	0	
% M. Sand	1	1	1	1	
% F. Sand	5	2	2	3	
% V.F. Sand	30	15	17	15	
% Total Sand	36	18	20	18	1
% Silt	25	15	56	47	4
% Clay	39	67	24	35	95
pH	6.8	6.9	7.3	7.5	7.7
Conductivity	0.2	0.5	0.3	0.3	0.3
% $CaCO_3$ Eq.			35.8	31.8	9.4
% Calcite			5.7	2.9	8.7
% Dolomite			27.7	26.6	0.7
% Saturated Moisture	46	90	41	46	121