PRELIMINARY GUIDELINES FOR THE DEVELOPMENT OF THE SHOAL LAKE AREA IN MANITOBA'S INTERLAKE

by

Robert Douglas Ross

A Practicum Submitted to the Natural Resource Institute, University of Manitoba in Partial Fulfillment for the Degree Masters of Natural Resource Management.

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A practicum submitted to the Faculty of Graduate Studies of the University of Manitoba in partial fulfillment of the requirements of the degree of

MASTER OF NATURAL RESOURCE MANAGEMENT

ABSTRACT

Through careful planning and management techniques it is possible to achieve higher land use values through multiple land use than would otherwise be achieved through any single land use alone. This practicum considers the land capabilities around the East and West Shoal Lakes in Manitoba's Interlake Region and formulates guidelines for the development of the area which would allow for multiple use. The study looks at methods of valuating each land use, and indicates some of the problems inherent in methods of valuation. As well, the study suggests methods of alleviating problems or conflicts which may arise through multiple land use. The three land uses which are considered as compatable for multiple use within the study area are wildlife production, agricultural production and recreational use.

ACKNOWLEDGEMENTS

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1. INTRODUCTION

1.1 The Problem and its Setting

The study area, which consists of the East and West Shoal Lakes, is situated approximately forty miles northwest of Winnipeg in Manitoba's Interlake Region. Since the late nineteenth century the Shoal Lake area has been noted for its abundance of wildlife, particularly waterfowl. Indeed, such famous naturalists as Ernest Thompson Seton and P. A. Taverner made frequent visits to the area to observe and study the waterfowl.

Historically, the area was not only noted for its waterfowl. The broad grassland areas surrounding the lakes were recognized early for their grazing capability, and as early as 1884 the area was settled and cattle raising begun.

Recently, the area has been recognized by the Provincial Government as one of the few significant natural areas close to Winnipeg conducive to various forms of consumptive and non-consumptive recreation.

It can be concluded from the above that the area has historical, current and future importance for wildlife production and staging, agriculture in the form of ranching, and recreation. The problem is, therefore, to develop guidelines for a multiple use plan for the area which will allow for a compatability to exist between the three uses.

1.2 Multiple-Use Planning

Multiple use is defined as, "the use of a tract of land for two or more purposes, either at different times during the

year or simultaneously", (Clawson, Knetsch, 1966). Such is the case in the Shoal Lake Area.

The question may then be asked, why multiple land use? Why not simply decide on the best land use and then use the land for this sole purpose? The answer is one of economics. Economically speaking, the sum of the total values created by multiple use is generally greater than the value of any single use, (Clawson, Knetsch, 1966).

Another reason, however, for multiple use is a social reason. In some cases, such as combined agriculture and recreational use, the public demands both uses. This is the case in the Shoal Lake Area. Ranchers need the land for grazing or hay production, and others want the land for recreation. Still others want to use the land for wildlife production. There is no single use which will therefore maximize the value of the land for any individual user group. The maximum benefits to be obtained are the sum of all land uses, or multiple land use of the area. It must be understood by each user, however, that in order to have multiple use of this land and gain maximum use from it, that each must be prepared to realize and accept the other users' interests as well as his own.

Agriculture and Recreational Use -

In North America today, the vastness of the lands has caused land users, the populace in general, to be somewhat spoiled. In many cases multiple land use, although considered, has not been implemented, and the land has retained its original use. Hence,

agricultural lands were improved and used for agriculture, wetlands which were too wet to be drained were allowed to remain for waterfowl production, and other likely areas were developed for recreation areas. So far there has been little purposeful effort to change such thinking. Yet, as populations increase, and demand for the lands for a growing range of uses increases as well, this idea of single land uses will have to be modified. As a result, some planning in this field should be begun now, so that workable concepts can be developed for the future.

Such planning does exist and has existed for some time in other countries. In England, for example, the total land area is similar in size to the State of Michigan, and her population six times that of the State of Michigan, yet it boasts some very beautiful natural areas and national parks, (Johnson, 1971). Also, much of the land in the national parks is not public but private land, controlled to some degree by the crown. These lands exhibit multiple use in that although they are classed as national parks, and although the landscape beauty, recreational benefits and historic areas are maintained, agricultural use is allowed to continue. Through careful planning and management the maximum value is obtained from the land through multiple use.

Therefore, it follows that where conflicts arise in Manitoba through conflicts of land use, a multiple use plan for these lands should be developed. If carefully planned and managed, a compatability of the uses can be realized and maximum use of that land obtained.

1.3 Objectives of the Study

The main objective of the study is to suggest guidelines for development of a multiple use plan for the area described as the Shoal Lake Study Area, (Fig. 2.1). Also, the study outlines some of the problems associated with the loss of land for agricultural production, and suggests possible solutions to these problems. As a secondary objective, the study provides a recreational plan for the study area.

1.4 Limitations to the Study

The study is limited to preliminary guidelines for a development plan for East and West Shoal Lakes for non-intensive outdoor recreational use, agricultural production and wildlife production. The study does not attempt to develop a plan for managed hunting, nor does it go as far as to select specified land uses for each section of land within the study area. Only the three land uses mentioned above are considered in the study. Intensive land uses such as cottaging, non-farm residential development and other agricultural activities such as feedlots were not taken into account.

2. BACKGROUND DATA

2.1 Access

The normal means of access to the Shoal Lakes Area is by automobile. The area is bounded by Provincial Trunk Highway (PTH) 322 to the east, PTH 415 to the north and PTH 518 to the west. Two additional roads have recently been built to facilitate access to the lakes. These include a road from PTH 322 west to within one mile of East Shoal Lake. Two parking lots have been built at the end of this road. Another road has been upgraded to the south of West Shoal Lake along the southern edge of the game bird refuge (see Fig. 2.1).

2.2 Regional Population and Economy

Population in the study area itself is extremely sparse with only one household residing within the actual boundaries of the study area. Fifteen families live in close proximity (within 2 miles) to the study area.

The economic base for the majority of these households is cattle ranching. Most operate beef cattle operations of a relatively small scale. Two of these operations, the Blue Meadows Ranch and H & H Ranch, operate on a larger scale. The H & H Ranch, located close to the southern boundary of the West Shoal Lake game preserve, is a feedlot operation.

The average yearly income of most ranchers is relatively low as compared to other Interlake regions (Interlake Fact, 1968).

Not all residents of the area are ranchers. Within the last 3 years land in eighty acre parcels has been sold. These

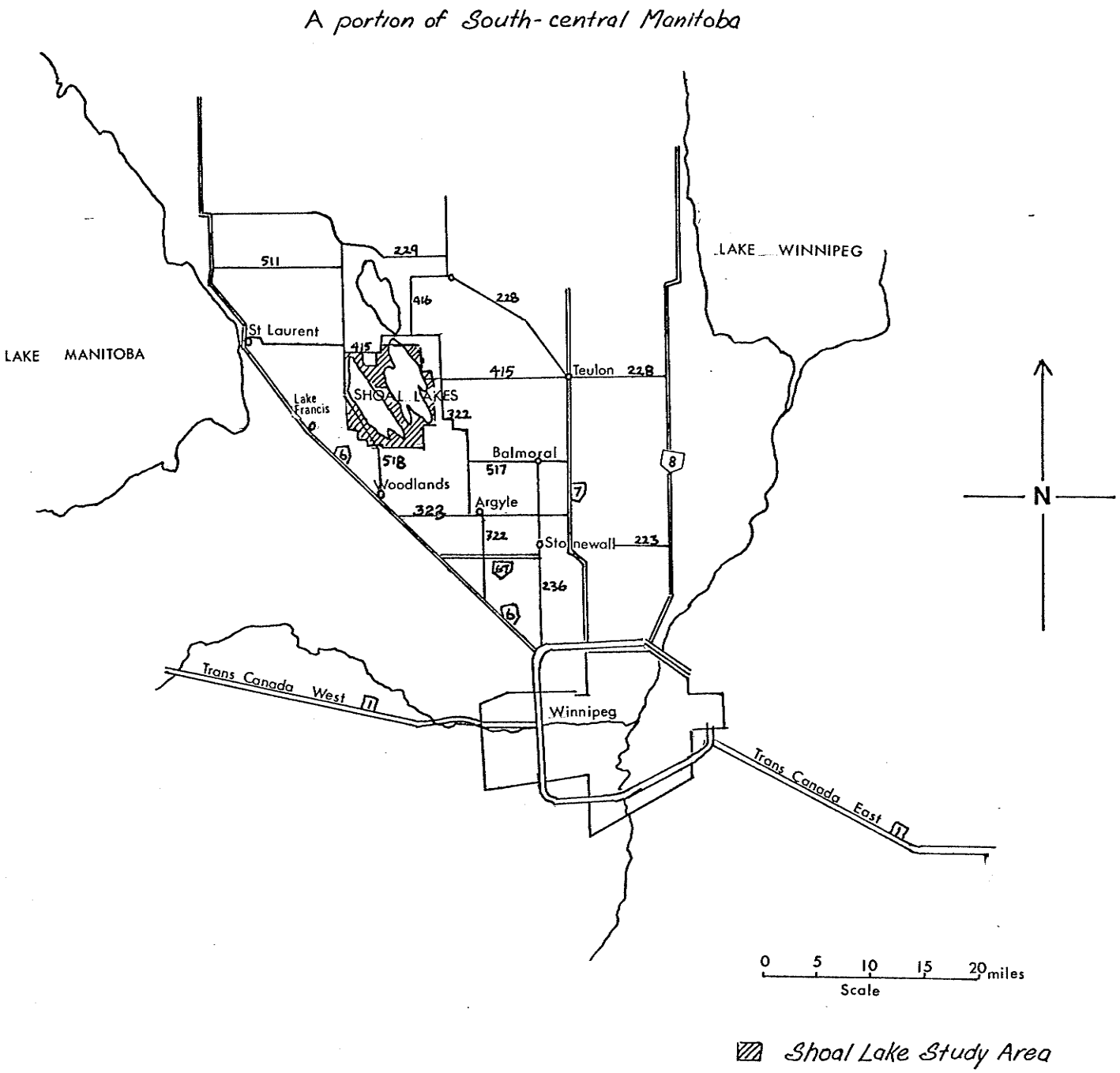


FIGURE 2.1 *the Location of the Shoal Lake Study Area*

SOURCE: MANITOBA DEPARTMENT OF TOURISM, RECREATION AND CULTURAL AFFAIRS, 1976

parcels are being bought by non-farming persons, often from the city, who are retreating to a rural life. Those contacted commute daily to work in Winnipeg. Average income of these people is estimated to be much higher than the ranchers in the area.

2.3 Natural Resources

2.3.1 Topography and Geology

The Shoal Lake area consists of a gently undulating glacial till plain with a swell-and-swale topography of North-west to South-east orientation (Weir, 1960). Close to the lake shore some of the till plain has been modified by wave action forming beach ridges (see plate 1). Elevation of the area is at 800' - 850' above sea level (Ehrlich, et.al., 1953).

Geologically the area is included in the Silurian group formed 430 - 410 million years ago. The major geological formations consist of dolomite and the surface deposits are predominately of the same material. On some areas, especially along the beach ridges, deposits of coarse sand and gravel exist. Numerous large glacial erratics are found in the area, especially on the finger of land extending up between the lakes (see plate 2).

2.3.2 Soils

Rendzina soils are the major type found in the area. Such soils are common to grasslands and are developed from high lime parent material with at least a 60% calcium carbonate content. A lack of phosphorus and nitrogen as well as a very stony soil surface is also evident (Ellis, 1938).

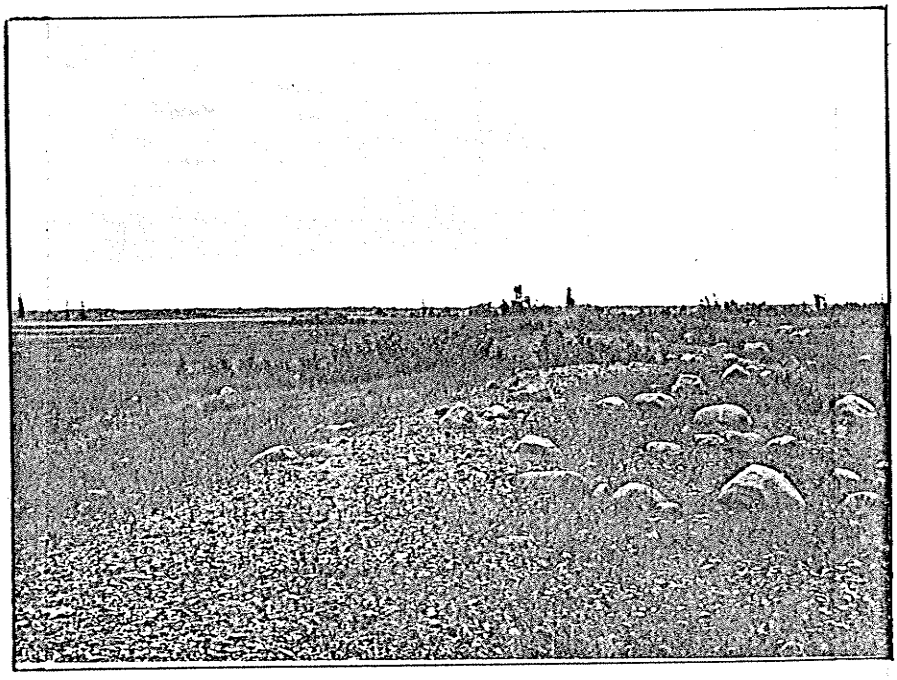


Plate 1 : Beach ridges formed by wave action in the Shoal Lake Study Area.

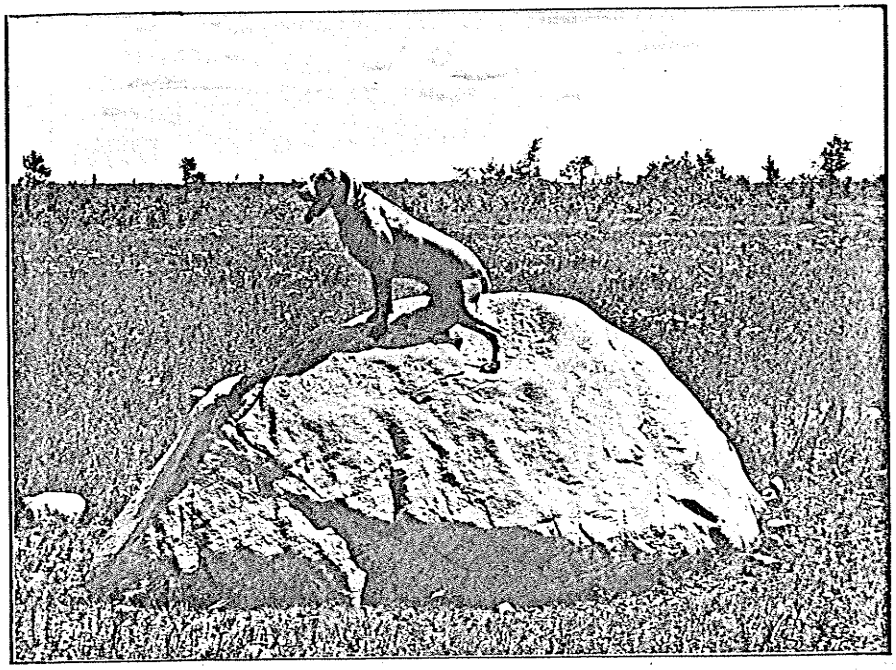


Plate 2 : Large glacial erratics can be found in the Shoal Lake Study Area.

This soil type can be broken down further into various subtypes of which the Marsh saline flats soil complex and the Clarkleigh series of soils are the two major ones (see Fig. 2.2).

Marsh Saline Flats Complex - This soil type is related to the poorly drained low areas. It consists of Calcareous Gleysol and Saline Rego Gleysol, both of which are highly calcarious. Only reeds, sedges and salt tolerant plants are able to grow in these soils (Ehrlich, et.al, 1953).

Clarkleigh Series - This soil type is a silty clay loam. Again it is very saline and the vegetation types associated with it are sedges, salt tolerant plants and willows.

Rendzina soils are coincident with grass-tree association. Due to the high lime content in the Marsh Saline Flats Complex and the Clarkleigh Series tree growth in areas near to the lakes is inhibited (Ehrlich, et.al, 1953).

Cultivation of these soils is discouraged due to the stony nature of the surface as well as the high salinity. Some land is cultivated to a minor degree to the immediate east of East Shoal Lake. However, no cultivation has been attempted in areas of the Marsh Saline Flats Complex or the Clarkleigh Complex (Ehrlich, et.al, 1953).

2.3.3 Natural Vegetation

The vegetation types found in the area are illustrative of the soil types found. Near the lakes, where the soil types are saline, few tree species are able to survive except on ridges where drainage is better. In these low saline

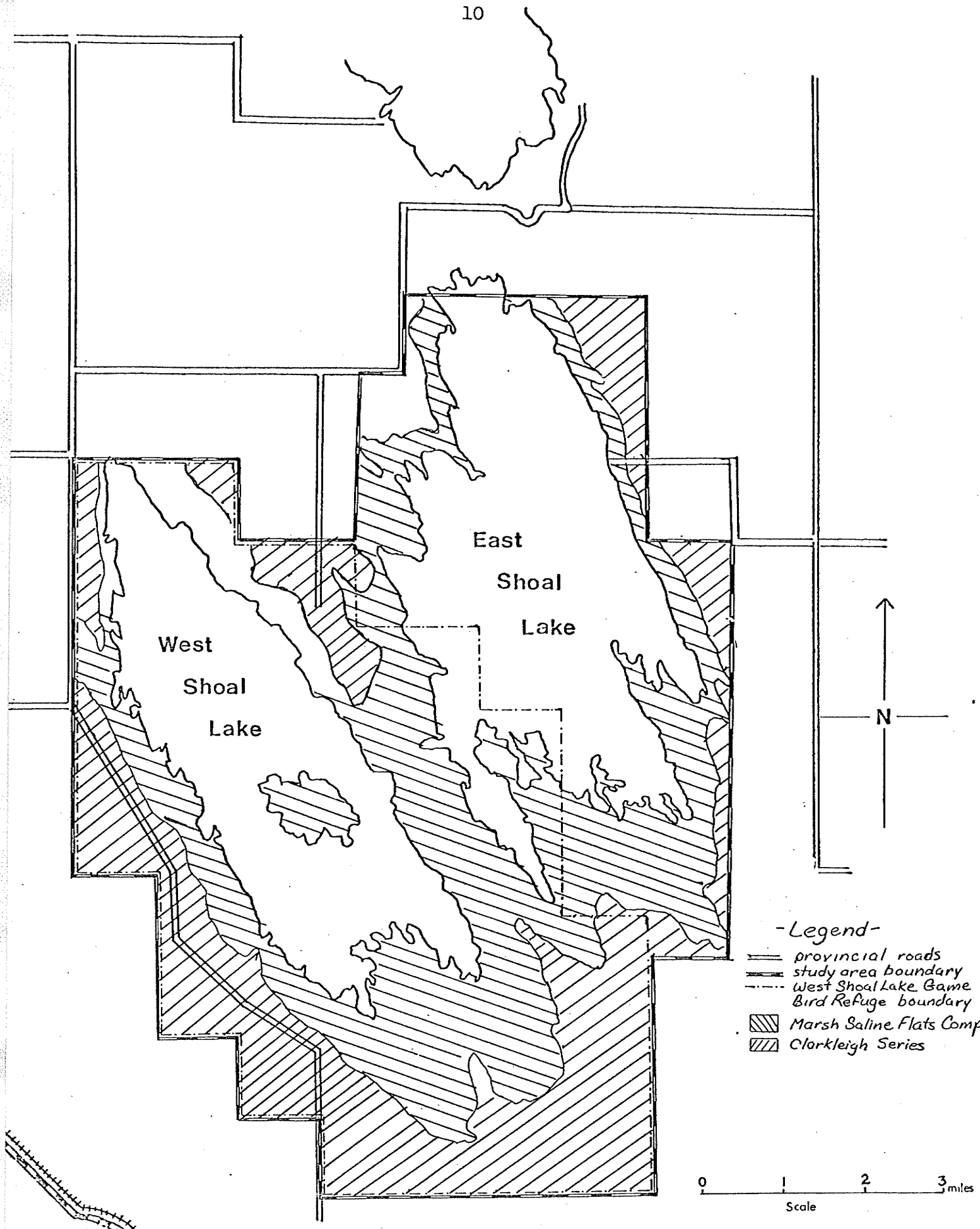


FIGURE 2.2 *Soil Varieties in the Shoal Lake Study Area*

SOURCE: Teulon Soil Report : Department of Mines Resources & Environmental Management

areas the vegetation consists mainly of sedges, reeds, cattails and other marsh plants. In some less saline locations willows are found.

In areas of less saline soils trees are common. The major species in the area is balsam poplar intermixed with trembling aspen, bur oak and some eastern cottonwoods. Some Manitoba maples can be found on the land between the lakes. A bluff of white spruce trees exists, however, these are alien to the area and were planted by man. (See Appendix IV for a list of plant species found in the study area.)

2.4 Land Capabilities

Due to the nature of the soils and topography of the study area, its capabilities are limited. The following section summarizes the land capabilities for agriculture, ungulates, waterfowl and recreation, as established by the Canada Land Inventory.

2.4.1 Agriculture (see Fig. 2.3)

The classification of agricultural capability is based on the nature of the soils in the area, and takes into account certain assumptions. These assumptions are as follows: (Canada Land Inventory Soil Capability for Agriculture, 1968)

i) all methods of agriculture are managed under a mechanized system.

ii) improvements to the land are assumed to be not greater than any which the Farmer can do himself.

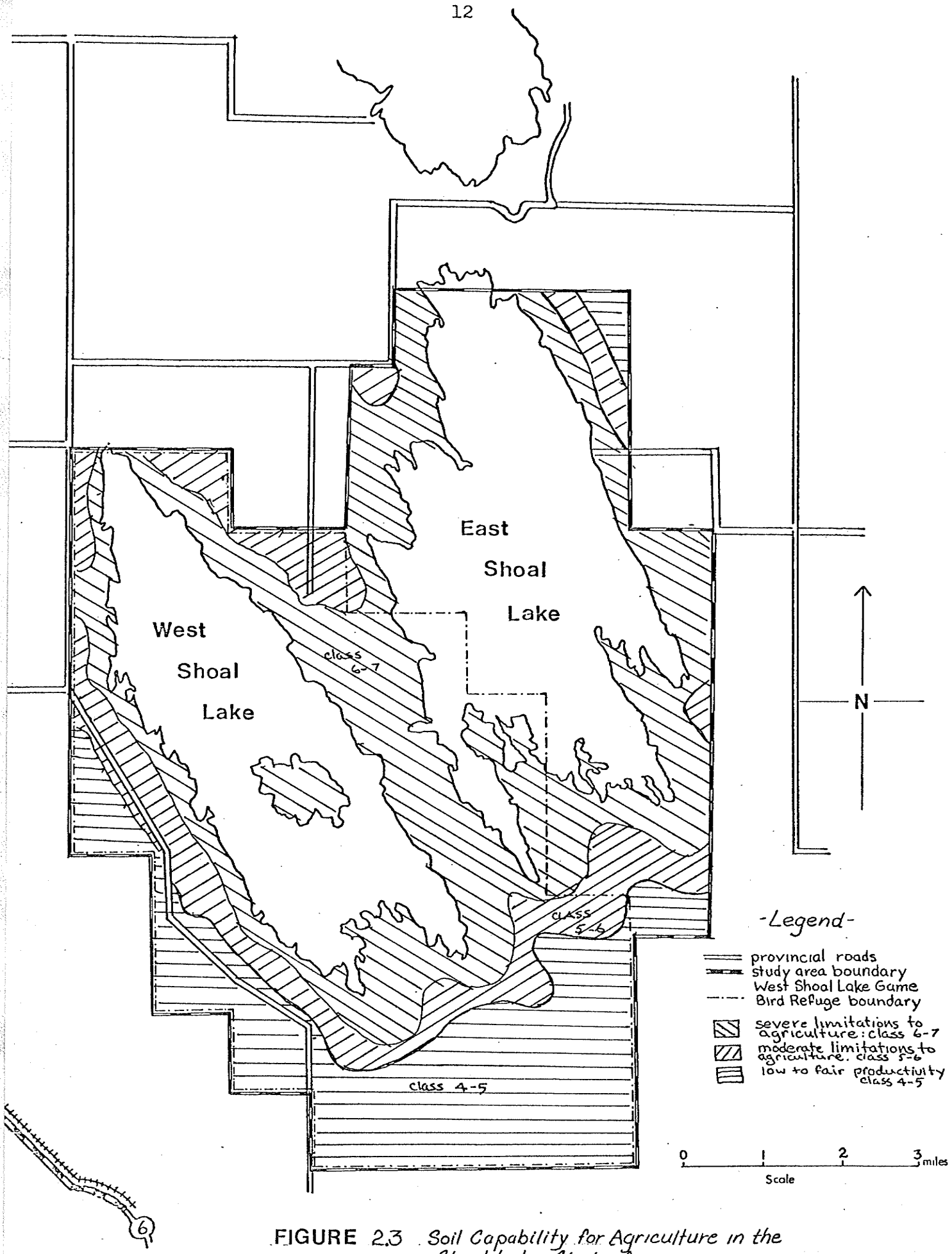


FIGURE 2.3 *Soil Capability for Agriculture in the Shoal Lake Study Area*

SOURCE: CANADA LAND INVENTORY MAPSHEET 62-I FOR AGRICULTURE PRODUCTION

If the Farmer does no improvements the agricultural capability of the land assumes no improvements.

iii) Factors such as distance to market, kinds of roads, farm location, farm size, type of ownership, cultural patterns, skill of the farmer and natural crop hazards are not taken into account in the land capability assessment.

iv) The various capabilities are based on the farming intensity rather than the kind of crop.

v) Agricultural capability refers to the capability of the land to grow crops.

Class 6 - 7

The majority of the land (Fig. 2.3) is classified as having Class 6 to Class 7 capability ratings for agriculture. This land has little value for agricultural practices due to poor drainage and salinity. Agricultural practices are limited to the natural perennial forage crops already growing for use in grazing. Improvement of this land is not thought to be feasible.

Class 5 - 6

Other soils in the area which are further back from the lake are listed as having Class 5 to 6 capability ratings for agriculture. Due to the excess water and salinity, the capability of the area is limited to growing wild hay for grazing. However, a certain degree of improvement is possible.

Class 4 - 5

The land surrounding the study area is limited in the types of crops which can be grown. The soils here have a low to fair productivity and the application of commercial fertilizer is a necessity. However, agricultural crops are grown in this area to a limited degree.

In conclusion, the agricultural capability for the study area is very low. In fact, very little land is used for tame agricultural crops. Most of the area is used for wild hayland or as pasture land for cattle.

2.4.2 Land Capability for Recreation

The recreation capability of the land is based on the outdoor recreational use which may be sustained per unit area of land per annum under perfect market conditions. The term "perfect market conditions" implies a uniform demand and accessability for all areas. Therefore, the recreational capability takes into account only the natural capability, and does not include social factors such as nearness to population centers. Further assumptions for deriving the recreational capabilities are as follows: (Canada Land Inventory Land Capability for Recreation, 1972)

i) the capabilities are designed in accordance with present popular preferences in non-urban outdoor recreation.

ii) the land is ranked according to its natural capabilities under existing conditions whether

natural or modified.

iii) it is assumed that sound management practices will be used.

iv) water bodies are classed with the adjoining shoreline or land unit and not individually.

v) the biological productivity (that is the area's capability of producing waterfowl for hunters) is not considered.

The recreational capability of the area (see Fig. 2.4) is classified as moderate. The area has a natural capability to sustain a moderate annual use provided the activities are not concentrated in any one area.

The area's features include the non-consumptive uses such as wetland wildlife viewing, hiking and canoeing on the lakes. As well, the flat topography interspersed with small bluffs of trees, provides a picturesque setting for the photographer or for picnics. Consumptive uses include hunting.

Intense recreational activities associated with beaches and motorized water sports are not possible due to the shallowness of the lakes and the lack of any shoreline with an acceptable beach character.

The area does have a recreational capability for forms of low-key, less intense, outdoor recreation.

2.4.3 Land Capability for Wildlife (Ungulates)

The only wild ungulate occurring in the study area is the white tailed deer (Odocoileus virginianus). The

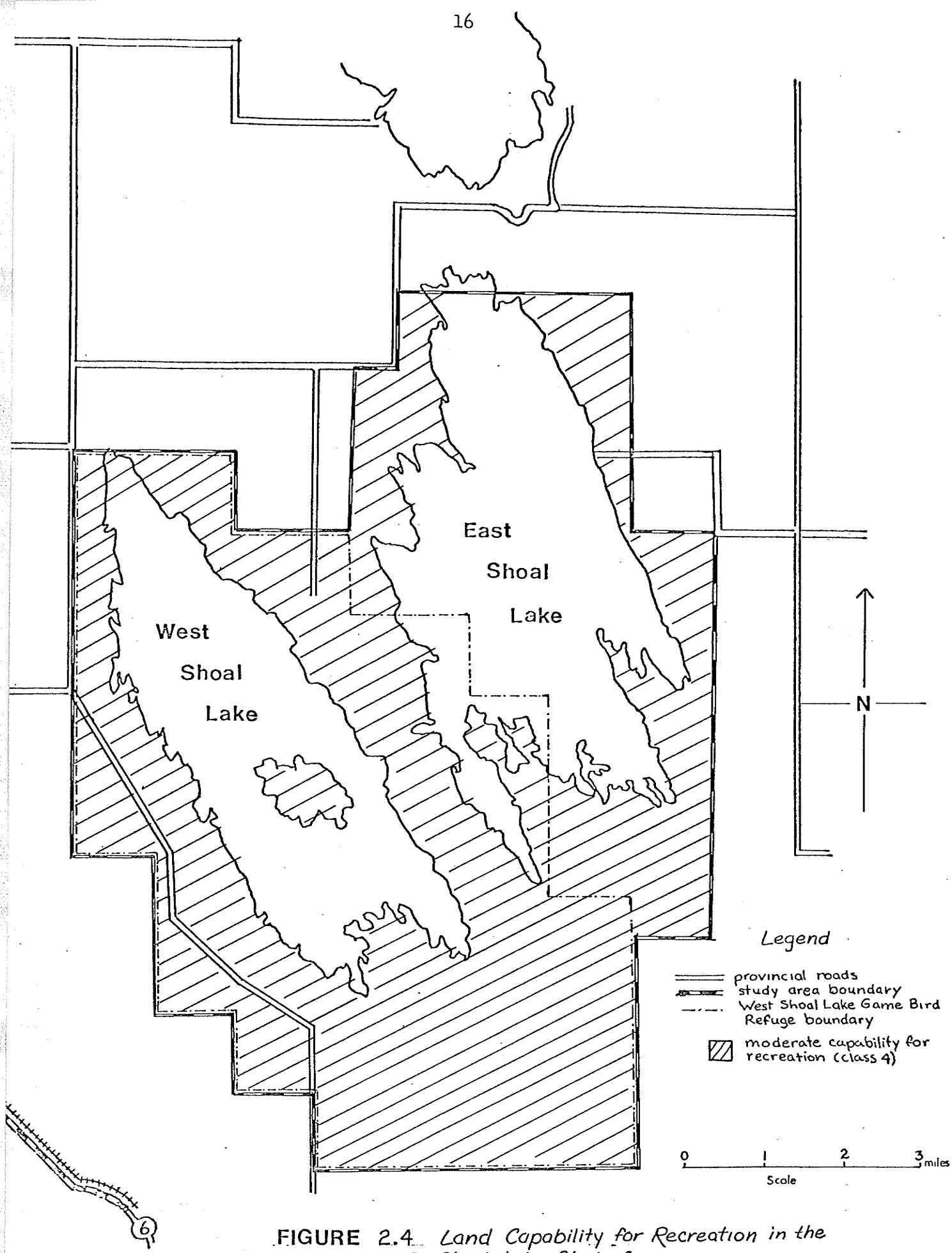


FIGURE 2.4 *Land Capability for Recreation in the Shoal Lake Study Area*

SOURCE: CANADA LAND INVENTORY MAPSHEET FOR RECREATION CAPABILITY: SELKIRK MAPSHEET 62I

classification of the capability of the area for the white-tail is based on the optimum vegetational stage that can be maintained with good wildlife management. The ratings of the area do not reflect present land use, ownership, convenience of access, or degree of hunting pressure. The rating, therefore, is done on an ecological basis without human interaction (Canada Land Inventory, Land Capability for Wildlife - Ungulates, 1971).

The Canada Land Inventory classes the study area (see Fig. 2.5) as having severe limitation to deer production in the immediate area of the lakes, tapering off to moderate and only slight limitations as the distance from the lakes increases. This trend is due to the greater shelter and food in the wooded areas around the lake. In the areas of slight limitations the capabilties are moderately high with the chance of reduced production during some years.

There are, at present, some deer wintering areas close to the study area as indicated on Fig. 2.5.

2.4.4 Waterfowl capability

The C. L. I. capability ratings are established on the following criteria: (Canada Land Inventory, Land Capability for Waterfowl, 1971)

i) the optimal vegetational stage that can be maintained when good wildlife management is practiced.

ii) the ratings do not reflect present land use, ownership of land, lack of access, distance from cities, and the amount of hunting pressure.

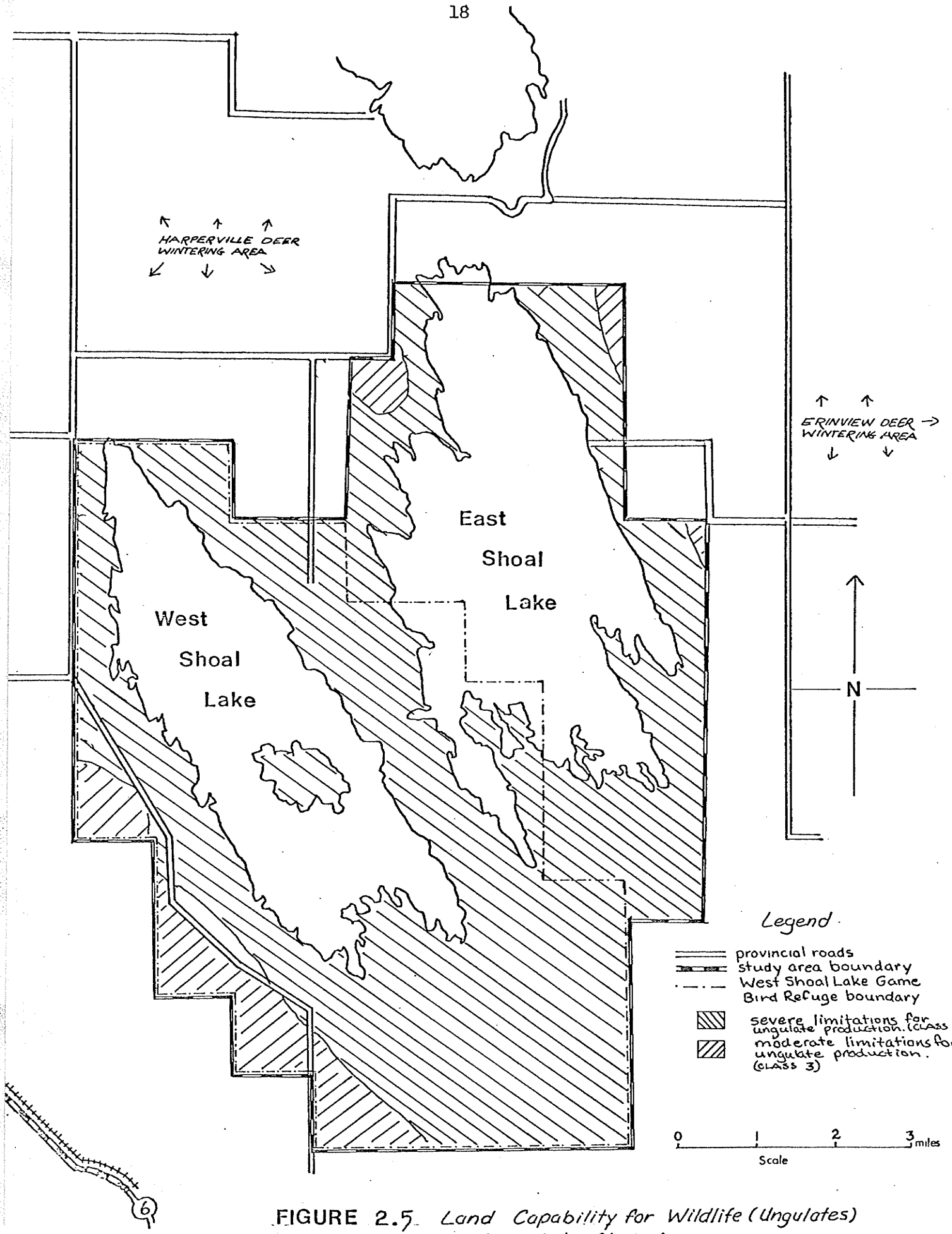


FIGURE 2.5 *Land Capability for Wildlife (Ungulates) in the Shoal Lake Study Area*

Source: CANADA LAND INVENTORY MAPSHEET FOR WILDLIFE (UNGULATE) PRODUCTION: SELKIRK MAPSHEET 62I

All lands within the Shoal Lake Study Area are rated as 3M by the Canada Land Inventory. This rating infers that the lands may not be useful for waterfowl production, but are important as migrational or staging. They are important as staging areas due to the large water expanse, the closeness of food sources and seclusion. Production is poor due to a lack of cover.

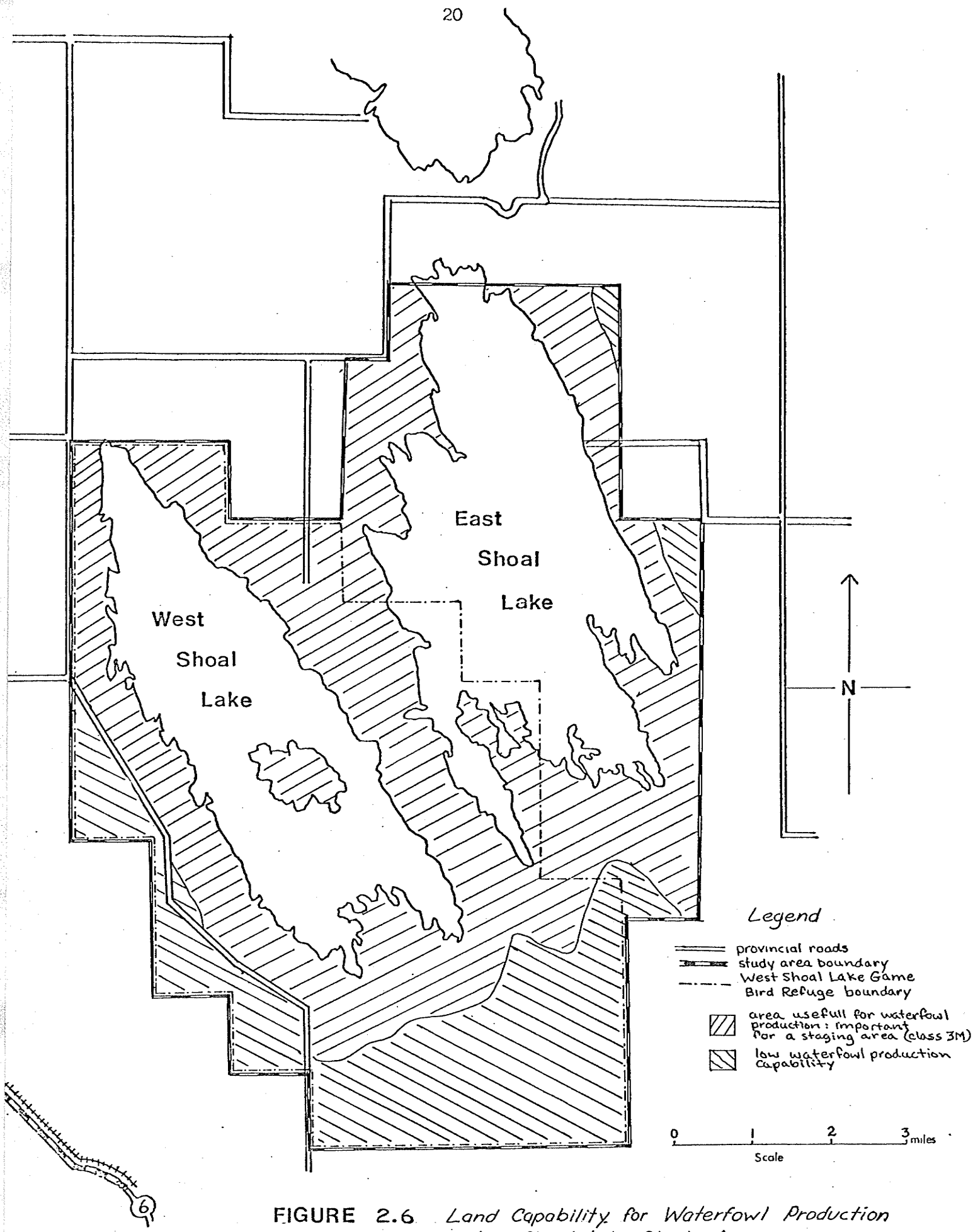


FIGURE 2.6 *Land Capability for Waterfowl Production in the Shoal Lake Study Area*

Source: CANADA LAND INVENTORY MAPSHEET FOR WATERFOWL PRODUCTION CAPABILITY: SELKIRK MAPSHEET 62-I

3. PRESENT LAND USE AND LAND USE VALUES

3.1 Present Land Use

The study area includes both the East and West Shoal Lakes and those lands adjacent to and between the lakes. This area was chosen as it includes the majority of the grassland area where the conflict between wildlife and agriculture use is concentrated. Also, this area has the greatest desirability for any form of recreation use.

Much of the surrounding area consists of aspen parkland and, although important for production of wildlife such as deer, it does not specifically apply to the study.

The total area included in the development plan is 40,208 acres. Of this area 27,520 acres is part of the West Shoal Lake Game Bird Refuge. A further analysis of land distribution in the study area can be seen in Table 3.1. (For a complete breakdown of land ownership by section, see Appendix II.)

Table 3.1 LAND OWNERSHIP IN THE SHOAL LAKE STUDY AREA

	Acres of Land in Each Township				TOTAL ACRES	% TOTAL
	TP15-R1W	TP15-R2W	TP16-R1W	TP16-R2W		
East Shoal Lake	407	329	3057	5211	9004	23.0
West Shoal Lake	-	4700	-	5106	9806	24.0
Private Land	1800	3197	1252	1896	8145	20.0
Crown Land	1633	6554	1311	3755	13253	33.0
TOTALS	3840	14780	5620	15968	40208	100.0

Source: Land Ownership Ledgers, Department of Renewable Resources and Transportation Services.

As can be seen in Table 3.1, much of the land in the area (47%) is included in the East and West Shoal Lakes. Of the remaining land area the majority is owned by the crown and the remainder is privately owned (33% and 20% respectively) (see Fig. 3.1).

The major use of both the crown or privately owned lands is agriculture. The natural grasslands are used for both grazing and the production of wild hay.

3.1.1 Crown Lands

The land owned by the crown is leased to various individuals for grazing and hay production. This land is very important to many of the ranchers in the area as they own very little land of their own. They depend on crown lands to a large extent to enable them to raise enough cattle to attempt to make their enterprise solvent.

Of the 13,253 acres of crown land in the study area, a total of 12,013 acres is currently being leased to individuals in the form of hay and grazing leases. Under these leases the lessee may use the land for either hay production or as grazing lands. At present the leases are granted for as long as the lessee wishes to hold the lease, provided that the lessee is making use of that land for grazing or hay production for his own use. The lessee may not sell any of the hay obtained from the leased land, and he is obliged by the Government of Manitoba to practice good management of those lands. In this regard the lessee is required to construct and/or maintain the fences on his land, and can only pasture a limited number of cattle as

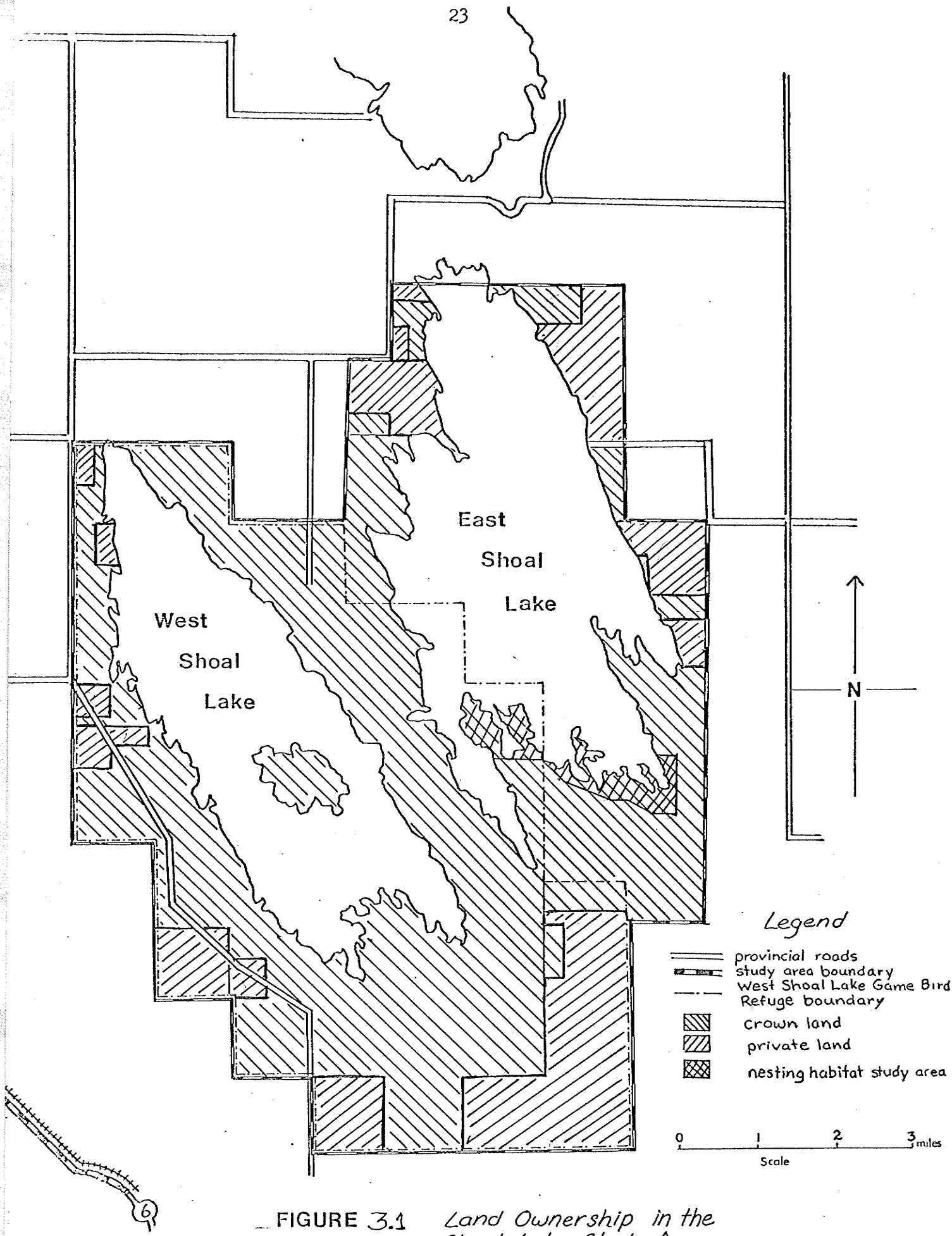


FIGURE 3.1 *Land Ownership in the Shoal Lake Study Area*

SOURCE: LAND OWNERSHIP LEDGERS, DEPARTMENT OF RENEWABLE RESOURCES AND TRANSPORTATIONAL SERVICES.

provided in the lease, so as to not overgraze the land. Land leased has been inspected by government personnel and limits to the lands grazing capability have been set. The lessee must comply with these limits or risk forfeiting his lease. Due to a manpower shortage, and the number of leases to inspect, enforcement of these limits has not been feasible, and at times overgrazing does occur. This problem is hoped to be alleviated through multi-disciplinary planning committees which have recently been set up to improve land use.

At present, due to low cattle prices, there is no charge for the leases. This is a temporary condition, however, and may be subject to revision when cattle prices increase.

Land available for leasing is distributed to those who apply for a lease according to the need of that particular person. Each person or group wishing to lease land must first submit an application, which is reviewed before that lease is granted.

The grazing capacity of the land for cattle is determined for each leased $\frac{1}{4}$ section, and each $\frac{1}{4}$ section is given a corresponding rating in animal unit months (a.u.m.). An a.u.m. is the number of animals a $\frac{1}{4}$ section can support for a period of one month. This number is based on the forage production capability of the land, and assumes that each animal unit requires 26 pounds (12 kg) of dry matter per day. The animal unit is assumed to weigh 1000 pounds (450 kg) (Smoliak, et.al, 1976).

In the Shoal Lake Area, the animal unit months are calculated assuming a five month grazing season. On the

average this grazing capability is 30 a.u.m., that is, on the average, each 160 acres within the study area will, with proper management, support 30 beef cows for a grazing period of five months. Using this figure, the maximum potential for grazing cattle on crown lands can be calculated. This is shown in Table 3.2.

Alternately, certain land can be used for hay production. The hay production capability for the land is estimated to be 15 tons (13.5 metric tonnes) per $\frac{1}{4}$ section. Therefore, an estimated production capability of crown lands for hay is estimated in Table 3.2.

TABLE 3.2 MAXIMUM HAY AND GRAZING PRODUCTION IN THE SHOAL LAKE STUDY AREA

	NUMBER OF ACRES	NUMBER OF $\frac{1}{4}$ SECTIONS IN AGRICULTURAL PRODUCTION	MAXIMUM GRAZING PRODUCTION OF BEEF CATTLE[1] (number of animals)	MAXIMUM HAYING PRODUCTION[2] (tons)
Leased Crown Lands	12014	75.0	2250	1125
Private Lands	8145	50.0	1530	765
Wildlife Nesting Study	422	-	-	-
TOTAL	20581	125.0	3750	1890

1 based on an average value of 30 animals per $\frac{1}{4}$ section (Fetterly, 1977) (personal communication). The actual number of animals will vary according to the vegetation growth conditions experienced in any one year.

2 based on an average yield of 15 tons per acre (Ross, 1977) (personal communication).

Of the crown lands not presently being leased, 422 acres is being used by the Southern Region of the Renewable Resources Division of Renewable Resources and Transportation Services as a study area. The study is to determine variations in nesting frequency of waterfowl between areas along the East Shoal Lake where grazing is allowed, and the study area where grazing is not allowed. The boundaries of this area are shown in Figure 3.1.

3.1.2 Private Lands

In the study area 10,826 acres are privately owned, however, in general, its use is similar to that of the crown lands previously mentioned. That is, the land is used either for cattle grazing or for haying. A rough estimate of its production capabilities can be established as well using the same average capability figures as were used to calculate capacities for the crown lands. These capabilities are shown in Table 3.2.

3.1.3 Other Possible Land Uses

There is one other use to which the land could be put. Over the past three years some land around the study area has been subdivided into 80 acre lots and sold to people wishing a home in the country. This use is not considered in the study area itself due to various reasons. These include:

1) At present, the demand is not sufficient and private landowners can provide an adequate number of lots.
2) The open nature of the majority of the land within

the study area does not provide as aesthetically pleasing area as the land outside the study area.

3) The fluctuations in water levels and the low nature of much of the land within the study area make building impractical.

3.2 Land Use Values

Alternate uses of land present variations in economic returns from that land. At present, the major land use in the study area is agriculture. However, according to the Canada Land Inventory, the land does have potential for both wildlife and recreation as well. There exists, therefore, an opportunity for multiple land use in the Shoal Lake study area.

As was mentioned previous, the sum of the total values created by multiple use is greater than the value of any single use (Clawson, Knetsch, 1966). Intuitively, this seems to hold true. If an area is looked at from the point of view of its total land use value, then by having more than one use the total land use value for the area will be greater. This statement assumes, of course, that the uses are compatable. It also assumes that each section of land within the area as a whole, is put to the use where the optimum returns, both socially and economically are derived. Where land uses are in conflict, such as grazing and haying as opposed to waterfowl production, each use must be studied carefully so that that portion of the total area is put to its best use.

In order to determine the best use for each portion of

land within the study area, at least two factors should be looked at. The first is the economic value of the various land uses. It is necessary to attempt to place a dollar value on each land use, and then estimate the value of each portion of land for each use. Once this is done, the different uses for a specific piece of land can be compared, to see which use will give the best economic returns. It should be noted that some land uses values, such as the value of wildlife production, can only be estimated.

Economic values are not the only concern when selecting the optimum land use. A very important concern is the distribution of the returns from that land. That is, who will benefit from the returns generated by a particular land use?

The Environmental Research Group (1974) discovered from an interview analysis conducted in the southeastern United States, that most waterfowl hunters earn in excess of $10,000 per year. On the other hand, data from the Interlake Fact (1968) shows that the average income of ranchers using land in the study area is approximately $7,000 per year. Therefore, if land is used for the production of waterfowl, the value of the land use will benefit a higher income group more than if the land is used for haying and grazing.

This results in a distributional problem, and the planner must look at the overall social benefits or costs associated with each particular land use, before deciding what is the best use to put the land.

Both of these concerns should be considered when deciding to what use the specific sections of land should be put. This section will attempt to show how, if possible, to value the land

in the Shoal Lake area for each resource use, in order to obtain optimum benefits from the area as a whole.

3.2.1 Land Use Values for Haying or Grazing

Estimating an exact value for haying or grazing uses is dependent on the productivity of the land. As described in section 3.1, the capability of the land for grazing is based on the number of animals one quarter section can support over a five month period without overgrazing the land. This capability is given as animal unit months (a.u.m.) and is estimated by agricultural crown lands inspector, Mr. Ray Fetterly, to be 30 a.u.m. for the Shoal Lake Study Area. Once the a.u.m. capability is known, the total productivity of beef in pounds can be estimated by calculating the gain in pounds per head over the five month grazing period, and multiplying this figure by the optimum number of cattle which can be grazed. By multiplying the total number of pounds of beef produced by the price per pound, a value of land for beef production can be estimated.

Hay production can be estimated by multiplying the average yield per quarter section by the market price per ton of wild hay. In the study area it is estimated that the average yield per quarter section for hay is fifteen tons (Ross; Ogilvy; Fetterly; 1977) (personal communication).

An example showing how the agricultural use values can be determined is shown in Table 3.3. In this example an estimate of the value of hay and grazing use is given for the area in general. An average a.u.m. of thirty cattle per quarter

section was used in the example for cattle production capability and an average value of fifteen tons of hay per quarter section for hay production.

TABLE 3.3 AN ESTIMATE OF THE VALUE OF THE AGRICULTURAL USES IN THE SHOAL LAKE STUDY AREA

A.	Cattle Production (Gross 1976 dollar values)	
i)	number of quarter sections grazing	125.0
ii)	optimum average number of cattle that can be grazed per five month season[1]	3750.0 animals
iii)	expected seasonal gain in pounds of beef per animal[2]	250.0 pounds
iv)	total gain in beef from the land per five month season	937500.0 pounds
v)	total monetary returns from beef at $0.35 per pound[3]	$328,125.00
vi)	total returns per quarter section from cattle product	$ 2,625.00
B.	Hay Production (Gross 1976 dollar values)	
i)	number of quarter sections presently in hay	4.0
ii)	average yield per quarter section[4]	15.0 tons
iii)	gross total value of $15.00 per ton[5]	$900.00
iv)	gross value of hay production per quarter section	$225.00

1 Based on an average capacity of 30 animals per quarter section (Fetterly, 1976) (personal communication).

2 Estimated average gain for a beef steer pastured on the study area (Ogilvy, 1977)(personal communication).

3 Assuming a price of $0.35 per pound to be an average. (From Manitoba Stock Quotations, January, 1977.)

4 Assuming an average yield of 15 tons/quarter section (Ross, Ogilvy, Fetterly, 1977)(personal communication).

5 Assuming an average value of hay over the past three years to be $15.00 per ton (Ross, Ogilvy, 1977)(personal communication).

When calculating the agricultural use values for specific quarter sections, the specific production capabilities should be used for that particular quarter section. These values in a.u.m. units can be obtained from the Agricultural Crown Lands Department of the Government of Manitoba.

3.2.2 Land Use Values for Wildlife Production

Estimating the value of lands used for wildlife[1] production necessitates putting a value on the wildlife itself. Values can be estimated for wildlife which have a specific market value, such as furbearers. However, if the wildlife have no specific market value, it is very difficult to estimate a value for them. Generally, as is the case with waterfowl, a value is derived indirectly by calculating what a hunter is willing to pay to shoot one bird. Various factors such as the distance travelled to hunt, quality of the hunt, the opportunity cost of the time spent hunting and the actual expenses incurred while hunting, must all be considered. Therefore, to place a value on a bird becomes even more difficult as that value is very subjective. It depends on each of the above mentioned considerations and possibly more.

Different values have been calculated to estimate the value of hunting to a hunter based on the above mentioned factors. One such value was calculated by the Environmental Research Group (1974) using data collected from interviews with people in the Southeastern United States. They estimate that on the average a hunter spends $59.00 (1976 dollar values)

[1] using waterfowl as an indicator species.

to hunt for one day. Therefore, if the number of hunter days are known, the number of hunter days per bird can be calculated, and from this the value per bird can be estimated. This value for the Shoal Lake Area is calculated in Table 3.4. The value is based on 1974 data. Ideally, an average value for a number of years should be calculated, in order to obtain a more meaningful figure. The value per duck in table four is therefore only an estimate.

TABLE 3.4 CALCULATION OF WATERFOWL VALUE IN THE SHOAL LAKE AREA

Number of hunter days[1]	225
Number of birds shot[2]	118
Number of birds taken per hunter day	.52
Value of one hunter day[3]	$ 59.09
Value of one bird[4]	$113.60

1 Source: Renewable Resources and Transportation Services, 1974. data

2 Source: Renewable Resources and Transportation Services, 1974.

3 Source: Environmental Research Group (1974).

4 1976 dollar values.

Now that the value per bird harvested has been calculated, the value of the land for waterfowl production can be estimated. B. Oetting (1977) estimates that from nest surveys conducted within the Waterfowl Study Area,

the optimum annual production of the land presently managed for waterfowl will be four birds per quarter section by 1981. Given this figure it can be assumed that the value of this land when the optimum production has been reached will be $454.40. It must be noted that this figure is only an estimate and assumes that factors affecting waterfowl production (eg. predation) do not change in the next four years.

The land in the study area also has capabilities for the production of other wildlife as well. The values related to the production of most other species of wildlife within the study area cannot be measured due to insufficient data. However, when allocating land use the existence of these animals should be taken into consideration. For example, improved waterfowl habitat will improve the habitat for red fox, by increasing the small mammal populations. It is estimated that fox populations could possibly reach a sustainable population of one fox per section. The average value of a fox pelt over the last six years is $25.71 (1976 dollar values) (Manitoba Department of Renewable Resources and Transportation Services, 1976). Therefore, an additional value of $25.71 per section can be added to the value of wildlife production for improved nesting areas.

Ideally, studies should be done to calculate the optimal wildlife production of the improved nesting areas for all wildlife in the area. Where values can be placed on the wildlife, these should be summed to give the total value for

the wildlife production.

3.2.3 Land Use Values for Recreational Use

Ascertaining a monetary value for outdoor recreation is a difficult procedure, as almost all of the benefits of outdoor recreation are intangible. That is, they are benefits, such as aesthetic enjoyment, to which monetary values cannot readily be placed.

Because of the difficulty in measuring the value of recreational use, its value can only be estimated. Various methods do exist for estimating recreational use, but all are subject to question.

One method uses the opportunity costs of taking the land out of alternate uses. For example, if the value of the land is X dollars for agricultural use, and the land is taken out of agricultural production and used for recreation, then the recreational value could be said to be X dollars. This is a very poor estimate as no attempt has been made to measure the intangible benefits. The land, depending on its recreational capability could have either a much higher value than X dollars, or a much lower value. This method does not really measure the recreational value at all.

Another method is the valuation according to the entrance fees paid to use the area. Unless the fees are high enough to represent the actual worth of the area to the user, then they will tend to underestimate the value of the recreational area. Such is the case in many public parks where the fee charged is a "token" fee, and does not represent the

actual value of a days use of that park by an individual.

A third approach to valuing recreational use actually does take into consideration the value of the use of a park by an individual. One method using this approach is the Hotelling-Clawson method. It is based on the demand for the area, and represents the willingness of an individual to pay for use of that area (Ross, 1974). In this method various factors are combined to measure the value. They include the distance one has to travel to reach the area, the quality of the recreational area, the closeness and quality of alternative recreational areas, and other costs related to pursuit of activities at the area itself. Values obtained in this way are far more accurate than the other methods mentioned previously, as the value of the land is represented by what the public is willing to pay to use it.

A last method for valuation of recreational use is through direct interviews. Here the public are asked one of two questions:

i) what is the maximum price you are willing to pay for the use of the outdoor recreation facilities, or

ii) what is the maximum compensation you are willing to accept for the loss of access to the recreation facilities? (Ross, 1974).

Problems arise with this method, however. For example, if the park is a public good the user may understate his answers. He does not want to bid the value of the area up, in case his taxes increase to pay for use of the facility. Alternatively,

the user may be so keen on the area in question that he overestimates its value (Ross, 1974). Since the responses vary with the user interpretation of the question asked, the results are often inconsistent, and doubt is cast as to the value of this technique.

The most accurate method of measuring the recreational value is probably the Hotelling-Clawson method, because of the numerous considerations which can be included in it. Unfortunately, for this study insufficient data exists for measuring the recreational value of the Shoal Lake Study Area, by the Hotelling-Clawson or any other acceptable method. According to Darsan Wang (1977), it is difficult to derive a realistic value for recreation in an extensive use area such as the one in question. All that can be said is that the value of recreation would be positive and would therefore add to the value of the area in total. This, of course, is assuming that the recreational use of the area is not so great that it conflicts with the other uses.

3.2.4 Conclusions

1. Once values have been estimated for each portion of land (for example each quarter section), they can be used as a guide to establish the best use of that land. These values will reflect the capability of that land for the particular use.

2. Economic values for land use should not be considered as the only guide for land allotment. Other considerations are very important. These include the question of distribution -

to whom will the benefits of the project accrue? It is necessary to consider how loss of agricultural land will affect the rancher, and any loss of agricultural production on the rancher's part can be rectified. Some suggestions for maintaining the present level of agricultural production, while increasing the level of waterfowl production are indicated in chapter four.

When deciding what lands should be set aside for wildlife production other important parameters should be used. For example, the value of the land for waterfowl production relative to other lands in the province should be considered. As well, the cost of improving the land in proportion to the number of wildlife the improved lands would produce, should be looked at closely. The actual value per bird to be gained should be used only as a guide, but not at all as a basis for decisions.

In this study a value has been used only as an example to show that carefully planned and managed multiple use of an area can yield a higher return than any single yield. Thus for the Shoal Lake Study Area, lands which are extremely poor for cattle production could be better used for wildlife production. Before land is set aside for wildlife production, however, careful studies by biologists should be conducted to assess the wildlife populations in the study area relative to habitat objectives and provincial long range wildlife population goals.

3. When considering the study area as a whole, the land use value from multiple use is in fact greater than any single use. If recreation were the single use in the area, its value would probably be very low as demand for recreational use of the area, not including hunting, is very low. However, it can be said that the value that does exist is a positive value. Personal interviews with the few visitors encountered in the study area during 1975-1976 suggest this is so.

Calculating the values for agricultural use or for wildlife production show that some areas give a higher overall value for one use than for the other. For example, the land along the lakeshore of NW 32-15-1W has a value of $454.40 for waterfowl, whereas it has a value of only $350.00 for agricultural production. (This figure is based on grazing assuming a production capability of 4 a.u.m.) On the other hand, NE 30-15-1W has an agricultural production value of $3062.50 and a waterfowl production value of only $454.40.

Where a section of land has a compatability for more than one use, then this multiple use will yield a higher valuation than any single use. For example, some of the land within the study area can be used for both recreational use and cattle production. The value of multiple use on these lands would be higher than if the land were used for either recreation or cattle production alone. Also, some land if managed carefully can support cattle production and wildlife production. Again, in this case, the value of the multiple use would be greater than a single use.

Not all the land in the study area is compatable for multiple use. However, certain areas are, and through careful allocation of land uses according to the land capabilities multiple land use can occur.

4. LOSS OF LAND FOR AGRICULTURAL PRODUCTION: SOME PROBLEMS AND SOLUTIONS

Where lands are to be taken out of agricultural production there arises the possibility of lost production to the rancher, as well as certain other problems. This section attempts to define the problems caused due to loss of land to wildlife production, and suggest means of correcting some of these problems.

4.1 Problems

Various problems related to the conflict of agricultural and wildlife use arise. They include both biological and socio-economic problems.

a) Waterfowl Habitat Needs

In order to nest most waterfowl require an area with sufficient vegetation cover to hide their nests from various predators. Ideally the nests should be close to water, again for protection as well as to provide food. The native grasses and sedges to be found in the study area are adequate for nesting provided they are allowed to grow and are not grazed. However, around the Shoal Lakes most of the land is used for grazing purposes, keeping the grass too short to provide adequate nesting cover for waterfowl.

b) Agricultural Needs

The agricultural needs are basic - food and water for cattle. The cattle need the natural vegetation for nourishment and that causes conflicts with waterfowl production. This has already been explained. (Cattle also need the lakes for a water supply and this causes a conflict as well.) If access to the lakeshore is

unrestricted to the cattle, then much of this lakeshore land, valuable for waterfowl production, is disturbed. Such disturbances and destruction of the lakeshore by the cattle are a detriment to nesting and have been observed to cause additional nest losses of up to 10%. It might be thought that an easy way to eliminate this problem would be to simply fence the shoreline, and allow only restricted access to the lakes for cattle watering purposes.

From discussions this with Mr. Ray Fetterly of the Manitoba Government's Agricultural Crown Lands Department in Arborg, it was discovered that restricted access to the lakes would perhaps allow for greater waterfowl production, but in doing so would create another agricultural problem. Cattle would tend to remain relatively near these lake access points and overgrazing of the somewhat delicate vegetational cover would result.

c) Socio-economic Needs

A last aspect relating to the problems associated with agricultural versus waterfowl uses deals with the socio-economic needs of the area. As mentioned earlier, many of the farms in the area are relatively small beef cattle operations and some have only limited land resources of their own. As a result, they rely heavily on the leased crown lands both for grazing and haying purposes in order to maintain viable operations. For these people it is necessary that the land be kept in agricultural production. The ranchers would gain little or nothing (excluding intangible benefits) from increased waterfowl production. Yet, if the land is left in agricultural use, it is possible that they could gain an estimated $2625.00 per section through increased beef production or $225.00

per section through hay production. In an area of low farm incomes such returns are very important to the farmer.

Taking into consideration the fact that the farm incomes in the area are low, and that the yield per quarter section of leased land is also low, it could be argued that the government is, in fact, doing the ranchers a disservice by encouraging them to remain in a marginal situation.

Perhaps it is inefficient to encourage subsistence operations that have little chance of improving their situation. Yet, conversation with these ranchers and the area agricultural representatives reveals that they would prefer to stay in their present situation rather than change. Given this fact, the social value of the ranchers for ranching the land appears to be greater than their social value of earning their livelihood by other means. Therefore, it is necessary from a socio-economic point of view to keep as much land as possible in agricultural production.

4.2 Possible Solutions to the Problems

Several possibilities exist for developing solutions to the above problems. All are related to increasing the amount of land for waterfowl production, while maintaining the present agricultural production.

The first problem is to increase waterfowl production, hence increase the amount of ungrazed lands adjacent to the lakeshore. The first method is to distinguish through studies blocks of land along the lakeshore which have a particularly high

capability for waterfowl production. The present leases for these lands could then be cancelled, and the lands specifically set aside for waterfowl production.

The second method is similar, but involves the use of less grazing land. In this method buffer strips are established along the shoreline. The strips should be wide enough only to contain enough grassland to provide adequate nesting space. Any areas where the shoreline is difficult to define due to marsh conditions, would be included in the buffer strips.

With access cut off to the lake for watering purposes alternate means of watering the livestock could be used. The high water table in the study area makes dugouts one practical solution. Sufficient dugouts could be constructed where lake access has been cut off, therefore providing water without disturbing nesting sites. It should be noted that it would be necessary to have enough dugouts to prevent overgrazing in areas near the dugouts.

In lieu of dugouts, or as a supplementary watering system, corridors could be constructed to the lakeshore at sufficient intervals to keep overgrazing to a minimum.

Yet another method, which would be more condusive to multiple use of the land, would be to construct shallow ditches of specified lengths and at specified intervals along the lakeshore. Such ditches would provide water for the cattle, while drawing them away from the actual lakeshore itself. This, in turn, would act to help decrease the destruction of nesting areas along the lakeshore by the cattle, without the need of costly fences. It would also allow both agricultural production and wildlife production to take place on the same area of land with a minimum of land use conflict.

The second major problem is maintaining the agricultural production. In the case of buffer strips this should not create too much of a problem as most of the land directly adjacent to the lakes is of low capability for haying and grazing. Here the major concern for the ranchers would be that provision be made for watering purposes. The loss to the rancher of productive agricultural land would be minimal.

The loss of larger blocks of land for waterfowl production are of concern to the rancher as these lands have a higher capability for haying and grazing than the land taken by the buffer strips. In cases where this is done some form of compensation should be made to the rancher for loss of that land.

Four possibilities exist. The first is to purchase private lands either within the study area or outside it and lease this land back to the ranchers. Land purchased would have to be as close to the original leased land as possible, and have at least as high a capability for haying and grazing as the original leased land. By purchasing these lands the rancher would not lose potential cattle production.

The only drawback to this solution is that it would be costly considering present land prices. However, the acquisition of the leases and purchases of new land could be done over an extended time period and hence spread the costs out over a number of years.

The second solution would be offer payments to ranchers for lost production due to cancelled leases. Payments would be made only for a specified time period to allow the rancher time to change his production methods. Such a method of payments would be

a poor solution to this problem, however. The payments would probably only postpone a loss of income for the rancher. The land exchange method would also offer a longer term solution.

The third solution would entail government sponsored land improvement. The government could improve other leased lands in the study area so as to increase their yield. This increased yield would balance any losses suffered by the rancher through the loss of leased land, and his agricultural production could be maintained.

A fourth solution deals with the sale of specified crown lands to lessees who have had their leases revoked. These lands would have to be land with some degree of capability of improvement. By selling such land to the rancher and helping with the initial improvement of the land, that rancher would probably be better off than he was with the poorer quality leased land. Also by selling the land rather than leasing it, the long term improvements by the rancher would be greatest, as he would have a long term vested interest. As well, due to its higher agricultural capability, the amount of land which is sold could be less than the land which was formerly leased, without adversely affecting agricultural production.

4.3 Guidelines of Agricultural-Waterfowl Problems and Solutions

i) Areas of high waterfowl production should be selected and leases for use of these lands should be cancelled over an extended time period. The lands should be managed by government biologists for waterfowl production. Some buffer strips should be established as well.

ii) All lands set aside for waterfowl production should not be leased.

iii) Where water accessability has been cut off, dugouts should be constructed to facilitate watering the cattle.

iv) If dugout construction is not possible sufficient access corridors through waterfowl production lands to the lake should be built for cattle watering purposes.

v) Ideally shallow ditches should be constructed from the waters edge to maintain the lakeshore and provide water for the cattle.

vi) Where large leases are cancelled other lands should be made available to the rancher to maintain his potential cattle production. Alternately, lands presently leased could be improved at government expense or sold to and improved by private individuals so as to maintain agricultural production.

5. A RECREATIONAL PLAN

5.1 Introduction

In section 3 it was stated that although an exact value cannot be given for recreational use, any value from that use would be positive unless the use conflicted with the other two land uses. This section suggests a plan for recreational use of the Shoal Lake Area which would keep any conflicts to a minimum. In order to keep conflicts to a minimum, recreational activities should be low-key or, in other words, non-intensive (excluding hunting).

The majority of recreational facilities should be concentrated on the East Shoal Lake for the following reasons:

i) Ease of access: Already, two parking lots exist along the east side of the East Shoal Lake. Also an extension of PTH 415 to Erinview Church allows for relatively easy access to the lakeshore for canoe launching.

Access to the West Shoal Lake is not possible by existing roadways. New roads would have to be constructed, and this would be costly.

ii) West Shoal Lake Game Bird Refuge: Since the West Shoal Lake is a waterfowl refuge very little recreational impact should be allowed. For this reason only one hiking trail is planned to extend into the refuge. All other facilities are concentrated in the East Shoal Lake area.

Restrictions to recreational use:

Certain restrictions as to the recreational use of the study area are listed here. Although it is realized that at present enforcement of these restrictions would be difficult, if not

impossible, they should exist in order to give some form of protection to the area. These restrictions could be put on a sign at both major picnic sites, especially the East Lake site. The restrictions are listed in Table 5.1.

TABLE 5.1 RESTRICTIONS TO RECREATIONAL USE IN THE SHOAL LAKE STUDY AREA

RESTRICTION	RATIONALE
i) No open fires except where firepits are provided.	The dry grasses in the spring and fall are a fire hazard.
ii) No camping except in designated areas.	To restrict physical impact on the study area due to camping to specified areas.
iii) Where no garbage receptacles exist, all litter is to be packed out.	It would be impractical to have garbage receptacles in all areas where litter may accummulate, therefore, all litter should be packed out.
iv) Access to islands should be restricted to authorized personnel during the nesting season.	To avoid disturbing nesting sites of waterfowl such as pelicans, cormorants, grebes and egrets which are known to nest on the islands.
v) No powerboats of any form are to be allowed on the lakes.	The shallowness of the lakes and the presence of partially submerged rocks create a serious hazard for powerboats, or sail boats.
vi) No loaded firearms are to be allowed in any picnic or camping area.	To avoid accidental discharge of firearms within these sites.
vii) All dogs must be kept in strict control.	To avoid stray dogs within the study area, and lessen the chance of the predation of nests by dogs.
viii) Any use of the area is at the owners own risk.	

5.1.1 Limits to Recreation

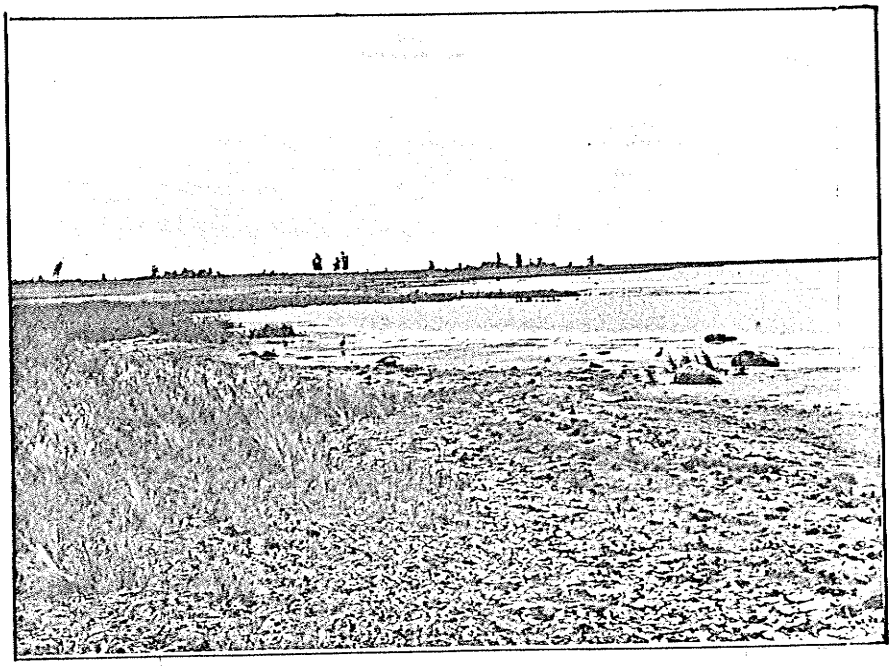
a) Water quality: The salinity of the water makes the lakes poor for recreational activities such as swimming. The salinity is also one of the reasons for the disappearance of fish in the lakes disallowing fishing as a possible recreational pursuit.

b) Water depth: The East and West Shoal Lakes are very shallow and contain many partially submerged shoals, and small rocky islands. For this reason the lakes are not conducive to any form of power boating or sailing. The only type of boating possible would be canoeing.

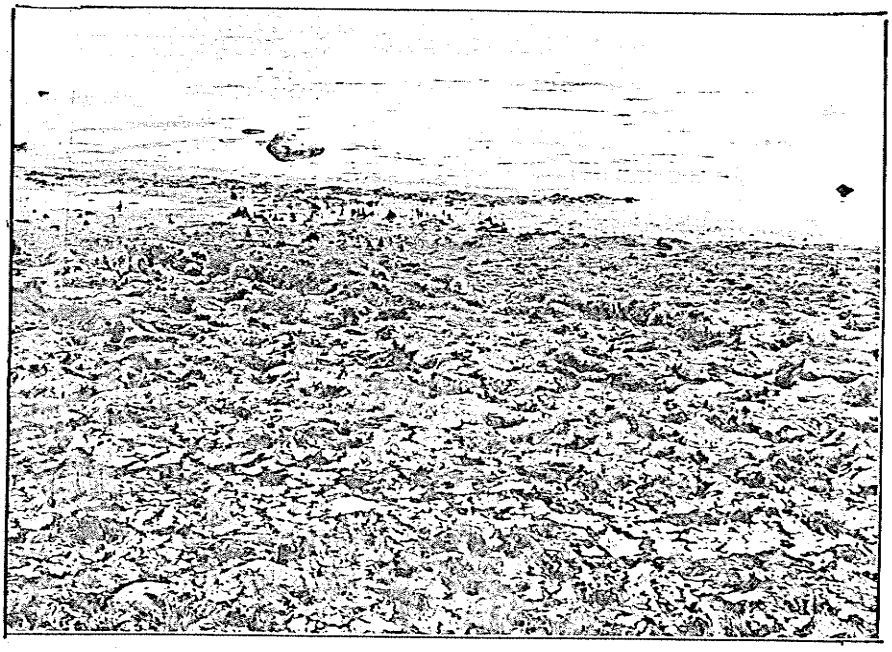
c) Shoreline: (see plates 3. and 4.) For the most part the shoreline is composed of rocks, mud, a combination of the two. Often no definite shoreline exists and rushes, phragmites and cattails extend right into the lake. No sand beaches exist along the shores of either lake. Lack of beaches discourages use of the lake for intensive beach use and prohibits swimming.

A small sand beach exists on the shore of the large island in the middle of the West Shoal Lake, but access, and the fact that the island is an important nesting area for grebes, makes its use unacceptable.

d) Vegetation cover: (see plate 5.) Due to the existing salinity and poor drainage of the soil



Plates 3 & 4: The shorelines of East and West Shoal Lakes are unsuitable as beaches.



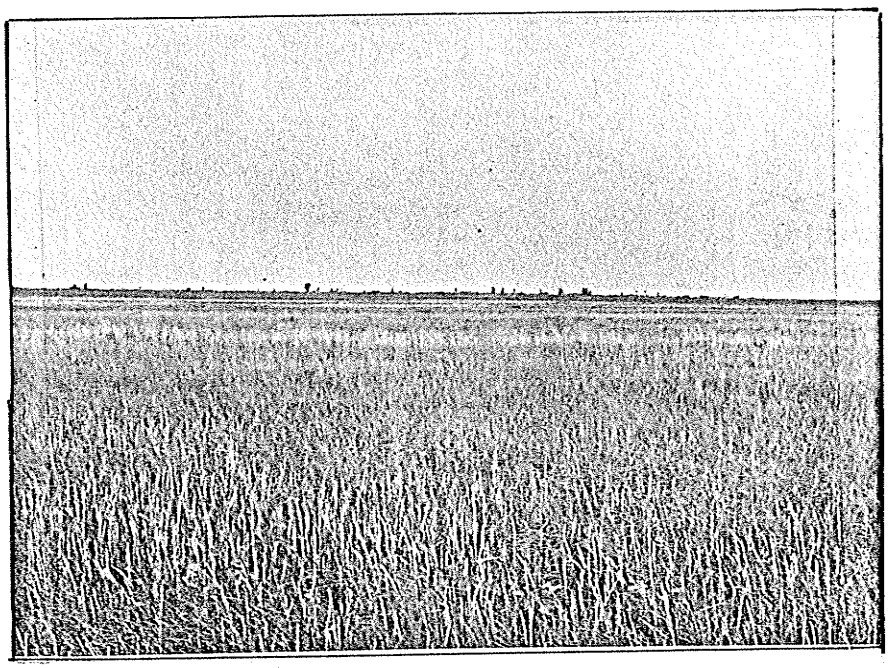


Plate 5: Vegetation cover adjacent to East Shoal Lake

adjacent to the lakes, limits vegetation to sedges and grasses. Some clumps of aspen and wolf willow exist but they are few. In general, the area immediately adjacent to the lakes is devoid of trees, creating a lack of shelter from the sun or wind. A lack of this shelter inhibits recreational use of the area.

3) Drainage and access: The poor drainage in the area makes access to the lakeshore difficult in the spring and even during moderately moist summers. Access is further inhibited by the fact that no roads extend to the lakeshore. The closest road comes only to just within one-half mile of the lakeshore.

5.1.2 User Types

Although the limitations may seem severe, the area is conducive to some very popular recreational activities. For the most part these activities are directed to a specific type of user, to whom many of the area's limitations are, in fact, assets.

Not all recreation need be directed toward intensive recreational use, where often the city life styles are simply transposed to a wilderness setting, and the automobile substituted by a powerboat. A growing need is being felt for more subtle forms of recreation in areas where development is at a minimum. Because of the limitations to recreation in the Shoal Lake area, it is suited to development as an area of subtle low-key recreational use. With this in mind,

development for recreation should be kept at a minimum and the recreation should be directed toward those users who wish to get away from the noise and crowds of the more intense recreational areas.

5.2 Characteristics of the Area Which are Important for Recreation

5.2.1 Wildlife

The major aspect of the Shoal Lake Area which makes it important for recreation is its abundance of wildlife, mainly waterfowl and shorebirds. The area lies directly on the migration routes of many waterfowl and is a very important staging area for the birds during these migrations. As a result, the area is a virtual paradise for birdwatchers in the spring and fall.

The area also serves as an important nesting area for many waterfowl as well as shorebirds and other bird species. The most important residents are a colony of pelicans which nest on islands in both the West and East Shoal Lakes and the Western Grebe which also nests on both lakes.

Other forms of wildlife in, or adjacent to, the area include white-tailed deer, coyotes, muskrats, various frogs and garter snakes. (See Appendix V for a partial list.)

5.2.2 Topography and Vegetation

Although the flat topography and lack of shelter are a limit to recreation in one sense, they are considered an asset to some. The Shoal Lakes lie in an area of natural grassland or prairie. This in combination with the swell-and-

swale topography make the area unique, and of interest to both the prairie botanist, the geologist, or to those who simply enjoy expanses of treeless prairie.

The prairie type is mixed, although as mentioned earlier, sedges and other wetland vegetation are dominant close to the lakes. Patches of big bluestem are evident in the southern portion of the study area along fencelines where grazing is inhibited. Many other prairie plants are found in the area, creating vast patches of color during the summer months. (For a list of vegetation to be found in the study area, see Appendix IV.)

5.2.3 History

A last important characteristic of the area is its history. Presently, many people come to the area to visit Erinview Church. Other buildings particularly around the East Shoal Lake are of historic importance. For a complete history of the area see Appendix I.

5.3 Possible Forms of Recreation Activities

Recreational activities in the area should be non-intensive, and should be compatable with the type of individual who would use the area. Some examples of possible seasonal activities are:

hiking
backpacking
canoeing
birdwatching
picnicing
crosscountry skiing
snowshoeing
winter camping
skating on the ice on the lakes

The above are all non-consumptive recreational activities. Consumptive recreational activities exist, such as hunting and trapping. While hunting is very popular in the study area recreational trappers are rare.

5.3.1 Existing Recreational Facilities

Some recreational facilities do exist, although they also serve to control hunter activity in the area. These facilities are concentrated on the eastern shore of East Shoal Lake and include the following: (see Fig. 5.1)

1) Two miles of road from PTH 322 to within approximately one mile of the lake.
2) Two parking areas at the ends of above road to facilitate recreationists, and to keep vehicles off leased crown lands used as pastures.
3) Planting of trees in the NE quarter of Section 29 and the SE quarter of Sections 32 TP15 R1, to provide additional shelter to enhance recreational activities.
4) A hiking trail exists from the southern parking lot to a point of land extending out into East Shoal Lake. This trail is not properly marked at present and is therefore difficult to follow.
5) Improvement of a roadway from Erinview Church to within approximately $\frac{1}{2}$ mile from the East Shoal Lake.

As well, $2\frac{1}{4}$ miles of road improvement was undertaken along the southern edge of the West Shoal Lake

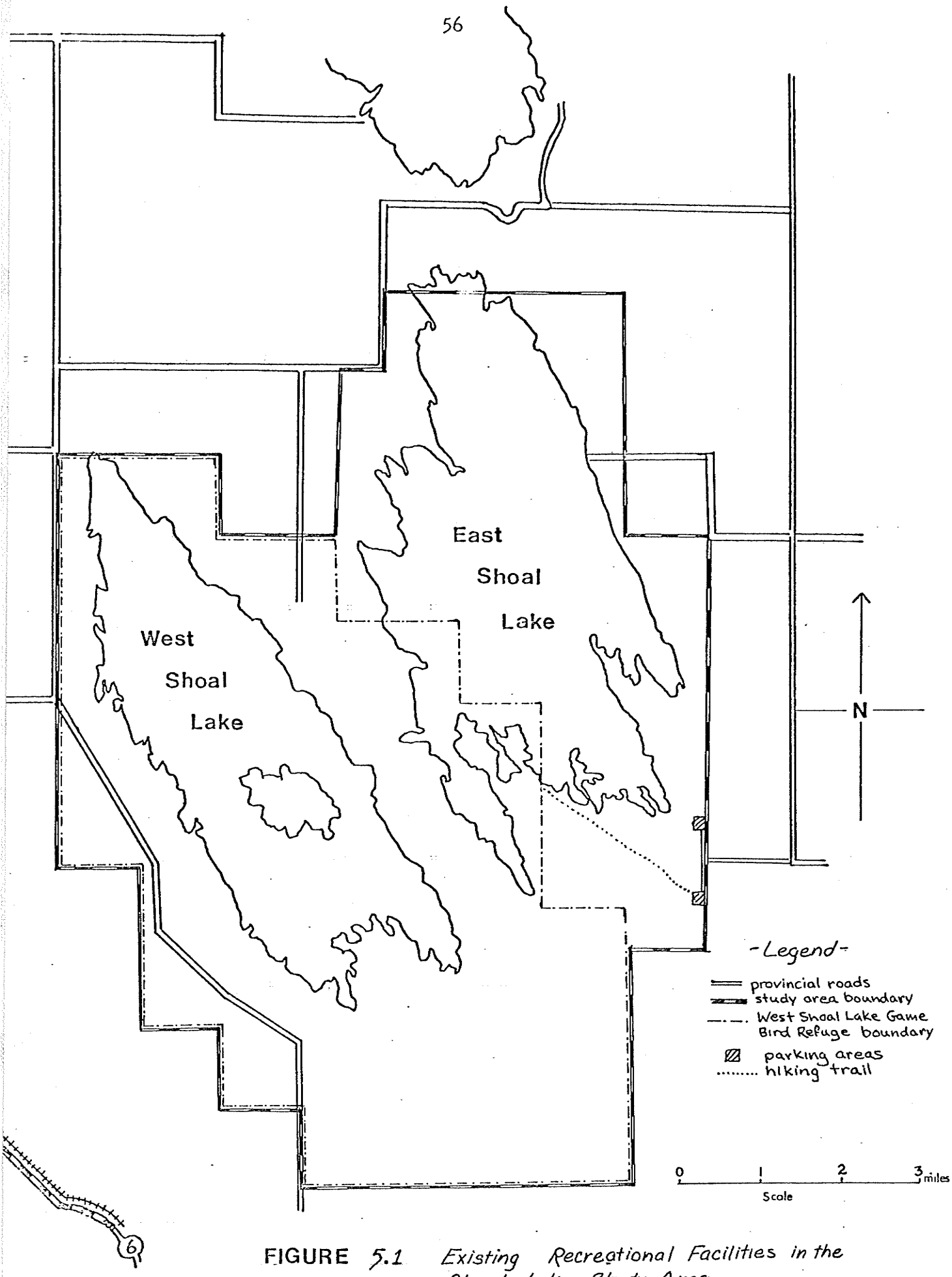


FIGURE 5.1 *Existing Recreational Facilities in the Shoal Lake Study Area*

Game Bird Refuge in order to provide better access for hunters and farmers.

5.3.2 Proposed Recreational Facilities

Some further recreational facilities could be started immediately. These facilities would include those which are relatively cheap and easy to implement. All would be aimed at opening the area to further non-consumptive visitor use. Some, such as certain hiking trails, would serve dual purposes in that they would also be beneficial to hunters.

5.3.2.1 Hiking Trail System

Development of a system of hiking trails in the area would be in line with a low-intensity use, and would enhance the area for other recreational uses such as birdwatching, photography and backpacking. Certain factors should be kept in mind in designing and constructing trails. These include:

A. A trail head sign should be located at the beginning of each trail showing:

   i) the name of the trail
   ii) a map indicating the trail route
   iii) the trail length.

B. All trails should be clearly marked with flagging tape or other more permanent markers at appropriate intervals.

C. Where the trail crosses fences, provision must be made to allow for easy crossing of these fences by hikers.

D. "Pack in/Pack out" plastic garbage bags should be made available to all hikers at the trail heads.

Such provisions will increase enjoyment of the trail by users and avoid frustrations which can occur with poorly marked and constructed trails.

A system of four trails of varying length could be constructed within the study area which would appeal to the various users. These trails are described as follows: (see Fig. 5.2)

1. RIDGE TRAIL: This trail would begin at the south parking lot and travel for approximately two miles along a ridge and terminate near the end of a finger of land extending into the East Shoal Lake. Vegetation along the ridge consists of stunted balsam poplar, and could offer some shelter for the hiker. The point of land on which the trail ends is at a high enough elevation to offer a good view of the surrounding lake and the waterfowl. These two features, plus the distance, make the trail excellent for the afternoon hiker who wishes to observe shore-birds and waterfowl.

   Also, since the point at the end of the trail is a favored hunting spot, the trail would allow easy access by hunters to this spot. At present hunters drive vehicles across grazing and hay

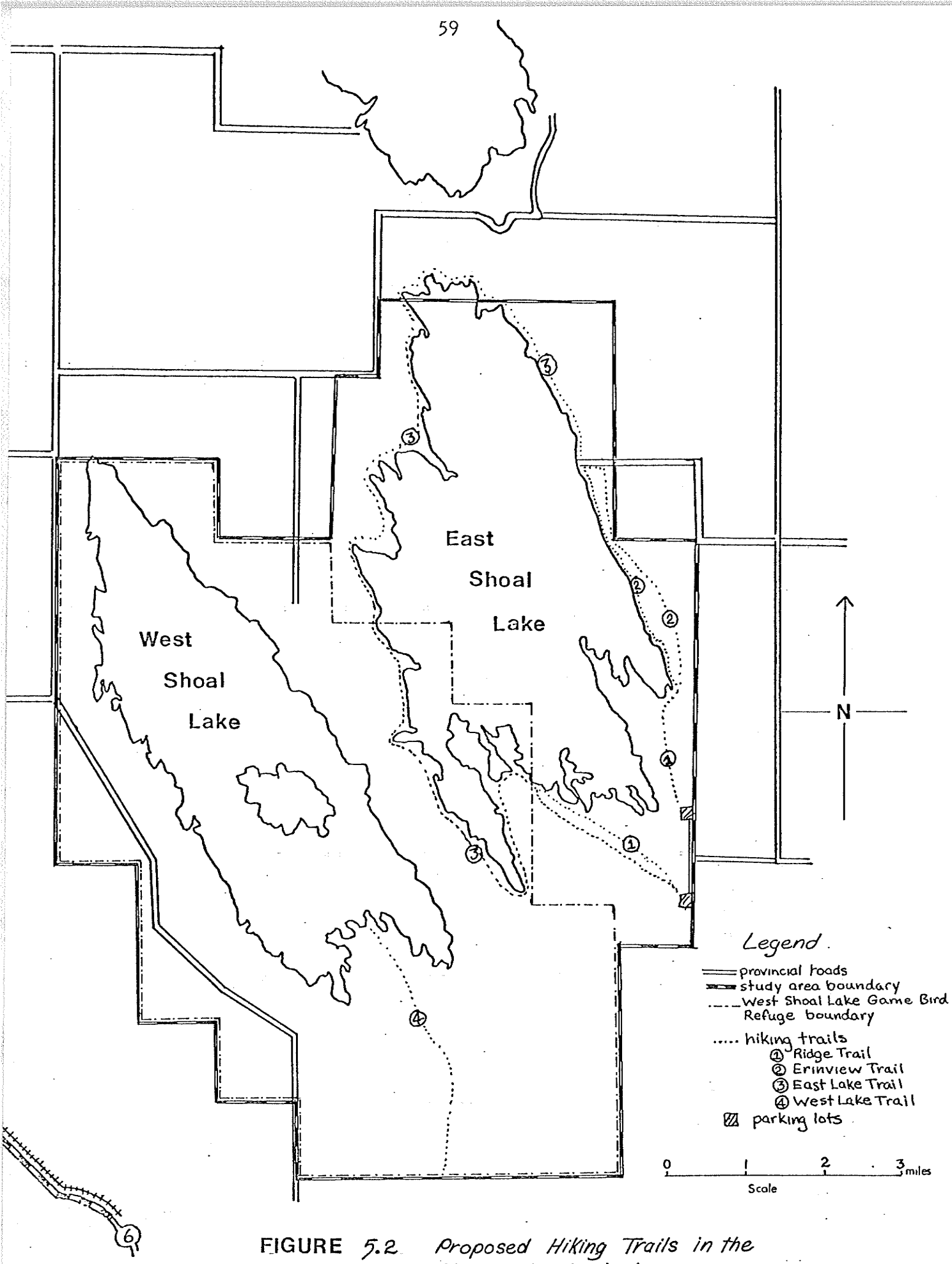


FIGURE 5.2 *Proposed Hiking Trails in the Shoal Lake Study Area*

lands to reach this point. This practice has caused some concern in the past. With the parking lot and access by way of a trail, the problem should be somewhat lessened.

A small tower could be erected at the end of this point to aid in waterfowl observation.

2. ERINVIEW TRAIL: This trail would begin at the East Shoal Lake north parking lot and extend northward following ridges to the Crawford house and then onwards to the Erinview Church. The trail should be made as a loop trail with the return trail following the lakeshore back to the north parking lot. The distance would be approximately six miles in each direction. Such a trail would cater to those wishing a day long hike.

   Features of interest along the trail would include prairie and wetland vegetation, shorebird and waterfowl habitat and historic interest points. Picnic-rest areas could be developed at Crawford homestead. This trail would be part of a longer backpacking trail which would go all around the East Shoal Lake.

3. EAST SHOAL LAKE TRAIL: This would be the longest trail in the system and would go completely around the East Shoal Lake. The trail would begin and end at the north parking lot on East

Shoal Lake and follow the Erinview trail as far as the Erinview Church. From here the trail would continue along the shore of the East Shoal Lake and end once again at the northern parking lot. Length of this trail would be approximately twenty miles.

A primitive campsite could be established between the lakes as indicated on Fig. 5.3. This trail would be for those wishing a backpacking experience. It would offer a chance to observe both shorebirds and waterfowl.

4. WEST LAKE TRAIL: This trail would begin at the southern edge of the Shoal Lake Game Bird Refuge at is what is now called the "White Gate". From here the trail would course through the bare grasslands of the refuge and terminate at a clump of trees at the end of a point extending into the West Shoal Lake. This area offers excellent viewing for waterfowl. The round trip trail length would be approximately five miles and would cater to those wishing a day long hike.

5.3.2.2 Picnic Areas

Due to the distance from Winnipeg and other large centers provisions must be made for picnic sites within the area. These sites are necessary not only for the users convenience, but also in order to keep litter and open fires to a restricted area.

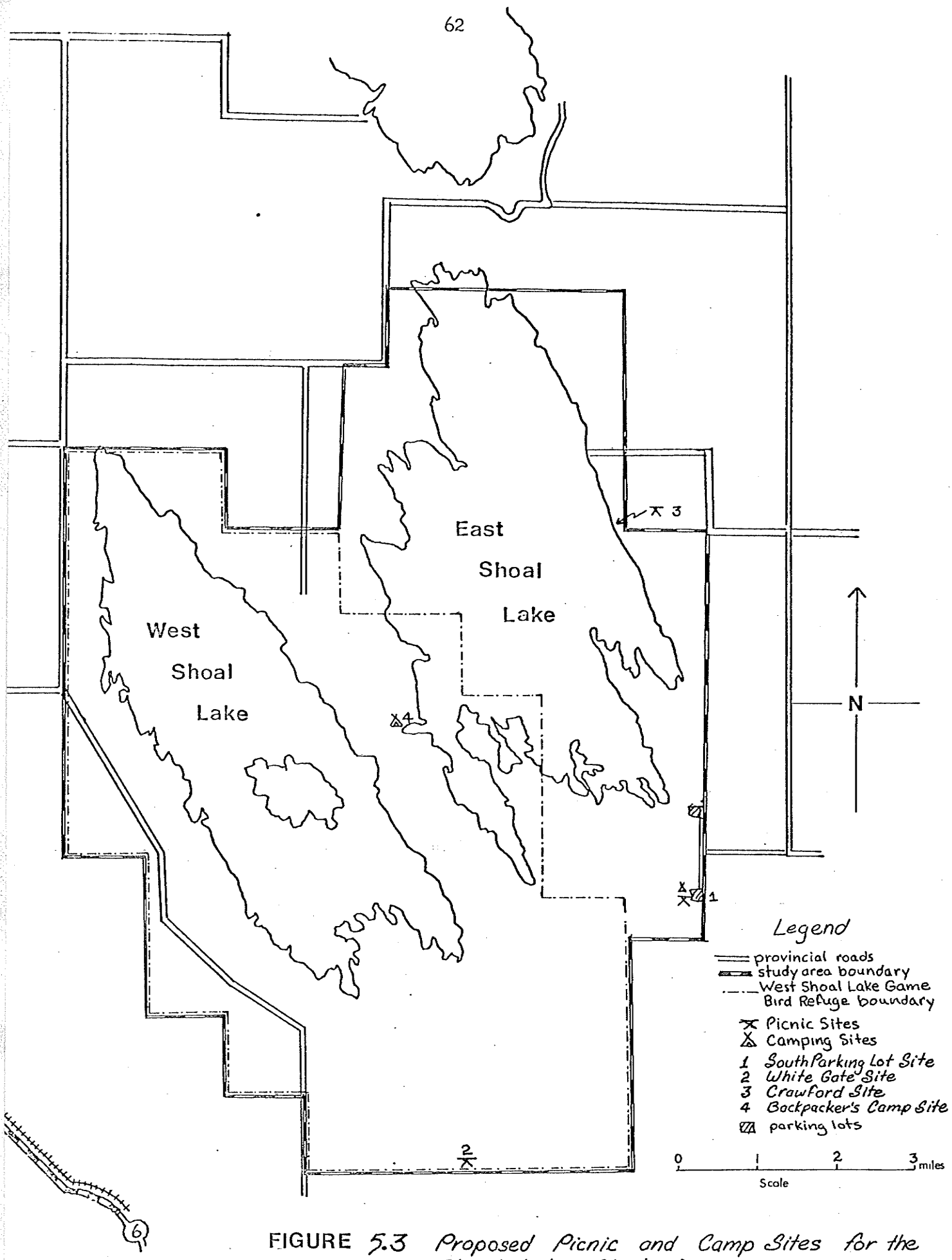


FIGURE 5.3 *Proposed Picnic and Camp Sites for the Shoal Lake Study Area*

Three picnic areas are suggested, two of these being somewhat larger than the third (see Fig. 5.3).

i) South parking lot site: This site was chosen due to its proximity to the majority of the trail heads and because it contains one of the two parking areas in the East Shoal Lake area used by hunters in the fall. It would cater to all users, the hiker, picnicer and hunter. The southern parking lot was chosen as the picnic site in preference to the northern lot, as the aspen bluff affords more shelter and makes the area more aesthetically pleasing.

This site would be a major picnic area and would have the following facilities:

1) five picnic tables
2) outdoor toilet facilities
3) garbage receptacles
4) fire pits

ii) White Gate Picnic Site: This would be the other major picnic area. The site was chosen mainly to cater to hunters in the fall. The worth of this site is, however, dubious as previous hunter attitudes suggest that such an area might be abused. This site particularly so, being located along the firing line, it is in the area of highest hunter density. Such a picnic area would be beneficial to the hunters, and therefore could be set up as a trial site for a one year period.

This site would consist of the following:

i) trial basis - toilet facilities (common outhouse)
- 2 picnic tables
- garbage receptacles

ii) permanent basis (if trial proves successful)
- toilet facilities
- 5 picnic tables
- garbage receptacles

No fire pits would be established at this site, and no open fires of any sort would be allowed.

iii) Crawford site: The Crawford homestead would make an excellent picnic area for hikers using the Erinview hiking trail. If offers an historic setting as well as shelter for the hikers. This site would be very small in size and have a minimum of facilities. These facilities would include one picnic table and toilet facilities. No garbage receptacles would be required as garbage would be carried out by the hiker.

Another possible picnic site exists to the west of Erinview Church just off the road allowance. Development of a site here is discouraged for two reasons:

i) The south parking lot site is close enough to provide a picnic area for those visiting the church.

ii) Development of a picnic site near the church may attract individuals who would not otherwise go to the area, and who could vandalize the church. It is best to keep any picnic sites away from the immediate area of the church.

5.3.2.3 Camping Sites

A campsite should be established within the study area for both hunters and for non-consumptive users, in order to control litter and to restrict camping to a designated area.

The best area for a campsite is at the southern parking lot picnic site. This site could serve a dual purpose for picnicing and camping. No improvements would be necessary other than those needed to create the picnic site.

Another campsite should be developed between the East and West Shoal Lakes for backpackers. This would lessen any impact camping would have on the area. Facilities for a primitive campsite of this type include at least, a sign specifying the camping site; or at most a picnic table and possibly toilet facilities. Garbage receptacles would not be needed as the hikers would pack out their own garbage. Open fires would not be allowed.

5.3.2.4 Canoeing Facilities

Canoeing is the major recreational use to which the lakes can be put. To facilitate this form of recreation a dock facility should be built along the shore of the East Shoal Lake directly west from Erinview Church. This facility need not be large, but should be constructed in such a way that it can be removed from the water so as not to be damaged by ice. No further roadway need be built right to the waters edge, as canoeist can park to

the west of Erinview Church and carry their canoes the short distance to the lake.

5.3.2.5 Winter Use

Although winter use of the area is minimal, possibilities do exist for winter use by crosscountry skiers and snowshoers. Such use is limited due to the lack of shelter from the elements. No further development is suggested for winter users. Summer hiking trails can be used for crosscountry skiing or snowshoeing and summer camping or picnic sites can be used for winter picnicing or camping.

5.3.3 Historic Facilities

As mentioned earlier, three buildings along the eastern shore of East Shoal Lake have great historic importance. These include the Robertson homestead, the Crawford homestead and the Erinview Church.

a) Robertson homestead: (SE 30-16-1E) This building, once a family home/hotel, has great historical value (see Appendix I). In the past decade it has deteriorated badly and will not survive if nothing is done to preserve it. At present, it is situated on private land owned by a Mr. J. C. Dumas, who has left it standing only because of public pressure to do so. This building should be inspected very soon in order to determine if it can be saved. If so, it should be purchased from Mr. Dumas and moved near to the Erinview Church property. Here it can be

restored and displayed as one of the earliest homes in the Shoal Lake area, and the only hotel.

b) Crawford homestead: (SW 20-16-1W) The Crawford homestead is of historic value as it was the first home to be built in the area. The homestead buildings consist of a grout-plaster overlog two storey house, and a fieldstone milkhouse. An inspection should be made of these to see if they can be made safe. If so, the land should be acquired from the present owner (Mr. Dumas) and the buildings repaired so that they can be used as picnic shelters, or shelters for cross-country skiing in the winter. Even if the buildings cannot be repaired, the area is still conducive to a picnic site and should be acquired. In either case, a sign could be posted relating the history of the site.

c) Erinview Church: (SE 30-16-1E) The Erinview Church (1884) and cemetery is the only historic building still in good condition in the study area. The church is kept up by the Anglican parish, and a service is still held each summer. The church draws many people to the area each year, who would probably make use of the proposed recreational facilities. Table 5.2 shows the statistics on the number of visitors to Erinview Church since the beginning of 1974.

TABLE 5.2 STATISTICS ON THE NUMBER OF VISITORS TO ERINVIEW CHURCH 1974 - 1976

YEAR	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	TOTAL
1976	-	3	-	22	47	38	72	62	60	45	-	-	349
1975	1	-	1	3	32	45	45	54	34	21	56	-	292
1974	-	-	5	2	7	36	44	78	39	37	26	12	286

Source: visitation register, Erinview Church, 1976.

5.4 Consumptive Recreational Use - Hunting

Up to this point only casual mention has been made of hunting, which is the major recreational use of the study area. In 1965 and 1966 a total of approximately 3945 hunters (Bidlake, 1966) made use of the area for waterfowl hunting. Because of the large numbers of hunters, and the questionable attitudes of some of these hunters, hunting in the area has become a problem. Conflicts arise between the hunters and the ranchers in the area, and even between the hunters themselves.

The problem stems partly from the lack of managed hunting areas close to Winnipeg, therefore creating overcrowding in areas of non-managed hunting such as the Shoal Lakes.

Most hunting pressure is concentrated along the southern edge of the West Shoal Game Bird Refuge or what is locally referred to as the "firing line". Here parties actually line up along the firing line road in order to attempt to shoot waterfowl as they fly out of the refuge. Hunter concentration is such that on one Saturday in 1976 a total of 150 hunters were counted along one

mile of the firing line road (Korda, 1976). Such large numbers of hunters greatly reduce the hunting quality of the area, and may be the cause of hunter-hunter conflicts. It is not a rare situation when two hunters will argue bitterly over ownership of one downed bird (Kieth, 1975).

In recent years, Managed Hunting Areas have been established in the Grant's Lake area as well as around the Oak Hammock Wildlife Management Area. These managed areas have provided better hunting quality as well as less conflicts between the hunter and landowner. With these facts in mind, it is suggested that some form of managed hunting area be established in the Shoal Lake area. Such a development would greatly increase the quality of the hunt, as well as reduce landowner-lessee-hunter conflict. Any managed area established should call for the following:

1) an end to the firing line.
2) hunters should be required to gain permission of access from landowner as well as from crown land lessees.
3) hunters should be required to register at designated hunter check stations.

One drawback to establishing managed hunting in the Shoal Lake area is the cost. Considerable expense would be incurred in creating check stations and extra staff for enforcement. Although managed hunting may not be possible immediately, it should be of high priority for the future.

5.5 Land Acquisition

Although most of the study area is already crown property,

several locations of importance are privately owned and should be purchased by the crown. Included in these acquisitions are land for recreational purposes as well as land for additional leasing purposes to take the place of lakeshore land used for waterfowl production. These lands include:

i) The Crawford homestead located on SW 20-16-R1W. This is the only land required for recreational purposes. Approximately 5 acres are needed.

ii) Additional land may be needed for the land exchange program although location of these lands will have to be established at a later date.

5.5.1 Land Easements

As well as land acquisition some easements will be necessary where hiking trails cross through privately owned lands. Easements will be needed for trails crossing privately owned lands.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Multiple use of a specified area does create a higher total value than would be created by any single use alone. Because of its land use capabilities, the Shoal Lake Study Area does lend itself to multiple use. The three uses to which the land can be put are agricultural production, wildlife production and recreation. Compatability between some or all of these uses does exist on certain lands within the study area, therefore allowing multiple land use to occur. However, careful planning and land use allocation is necessary to allow for multiple land use with a minimum of conflict between the uses.

6.2 Recommendations

1. Studies should be undertaken to determine more detailed land use capabilities for all the land within the study area.
2. Decisions concerning the land use for any particular section of land should be made by the multi-disciplinary study group which has recently been formed within the provincial government. Any decision should be made in close consultation with the area residents and the present lessees.

   This group, including the area residents and lessees, should also decide which of the alternate methods, as suggested in the study, should be used to maintain agricultural production for lessees who have had land

deleted from their leases.

3. If a recreational plan is implemented in the area, consideration should be given to the preliminary recreation plan as suggested in this study.
4. A plan to develop portions of the Shoal Lake Study Area as a managed hunting area should be considered.
5. A portion of the study area to be determined by the regional biologists should be considered for classification as a Wildlife Management Area in order to further manage and protect the wildlife. It is further suggested that the nesting islands be included in such an area.

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- ii) Capability for Waterfowl, Selkirk Mapsheet
- iii) Capability for Ungulates, Selkirk Mapsheet
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APPENDIX I A BRIEF HISTORY OF THE SHOAL LAKES

Although rather remote and obscure now, the immediate Shoal Lake Area has a colorful past, one not to be forgotten.

A. SETTLEMENT

The area was settled primarily by people from Eastern Canada who wished to begin ranching. The first settler, Wm. Crawford, (Proctor, 1960) arrived in 1874 and began his homestead on Section 20-16-1W. He was followed by others between the 1870's and 80's to homestead and ranch along the shores of the Shoal Lakes. Most of the settlers started their homesteads with some financial backing of their own, however, as Mrs. M. Proctor who was raised in the area states, "The area was more conducive to spending money than accumulating it" (Proctor, 1960). As a result, many of the original settlers moved on. Those who stayed lived off the bountiful wildlife, while trying to eke out an existance by ranching. Names of some of the early settlers include Robertson, Sims, Bird, Neal, Mannix and Hancock.

B. LANDFORMS

Although the vegetation and landforms of the area have remained relatively unchanged throughout the years, the physical appearance of the lake has changed considerably. Accounts of early visitors to the area (Gunn, 1867) and old maps (Fig. 7-1) show not three, but only one large Shoal Lake. The present beach ridges east of the East Shoal Lake show evidence of a time when the level of the lakes were much higher.

One early resident, Mr. P. Sherlock, now from Teulon, remembers when the water level was such that there were two lakes, a North Shoal Lake, and a South Shoal Lake. At that time the East and West Shoal Lakes

FIGURE 7.1

The Shoal Lakes as they appeared in 1888.

were joined by a large channel.

Fish populations were much higher in the 1890's, probably due to the fact that the water depth was greater than at present and the water was less saline. Now the fish in the lakes are limited to small minnows and sticklebacks. In 1891 a total catch of 1072 cwt. of fish (Waghorn, 1892) were taken from the Shoal Lake for use in the St. Laurent area.

C. WILDLIFE

The Shoal Lake area was becoming well known by the early 20th century, not for its ranching capabilities, but for its natural capability for wildlife. Many forms of wildlife ranging from small rodents such as muskrats to ungulates such as elk, mule deer and moose were to be found. The great numbers of waterfowl, however, proved to be the area's greatest asset. In fact, the Shoal Lakes were so well known that in 1917 a Mr. Percy Travener and Charles Young from the Victoria Museum of Ottawa spent a summer at the Shoal Lakes collecting specimens for the Museum's collection (Proctor, 1960). A total of 241 specimens of Manitoba birds along with various animals were collected at that time, and were sent to the museum for both study and display.

Previous to this, Mr. Donald Gunn, an early naturalist, knew the importance of the area for waterfowl. Mr. Gunn made an excursion from Winnipeg to the Shoal Lake in 1867 by oxcart in order to study the waterfowl and collect specimens (Gunn, 1867).

Such an abundance of waterfowl did not escape the hunter, even in the early part of this century. Hunting occurred to such a degree, and waterfowl numbers were reduced to such an extent, that in 1924

legislation was passed setting aside 38 sections of land around the West Shoal Lake as the West Shoal Lake Game and Bird Sanctuary (Proctor, 1960). The sanctuary still exists although its size has increased to 43 square miles or approximately 27,250 acres of land. The name has been changed as well. It is now the West Shoal Lake Game Bird Refuge and has been established under Regulation 92/66 (Renewable Resources and Transportation Services, 1976).

D. AN EARLY SETTLER: Mr. Fred Robertson

One of the earliest settlers added a great deal to the area's history. The Robertsons moved to East Shoal Lake in the late 1870's from their native England. In 1880 Mr. Robertson erected a six room house along the east shore overlooking the East Shoal Lake. Before long the house was to become a hotel or "stopping place" catering to ranch laborers or to visitors from the surrounding country. It was a lively place and included a bar and a large piano for entertainment (see plates 6 and 7).

Each week Mr. Robertson ran a stage coach from the hotel to Stonewall, in order to pick up supplies or new visitors.

Another attraction at the Robertson hotel was a steam launch, the Lady of the Lake, which was purchased by Mr. Robertson and run by a Mr. Mannix solely as a pleasure craft. It, along with the bar, piano, and games such as cricket and tennis, made the hotel an oasis of entertainment in an otherwise remote land (Proctor, 1960).

Mr. Robertson had another venture as well. He operated a lumbermill for a time until it was destroyed by fire (Sherlock, 1976).

The Robertsons remained on the shores of East Shoal Lake for 17 years before moving first to Portage la Prairie and then back to

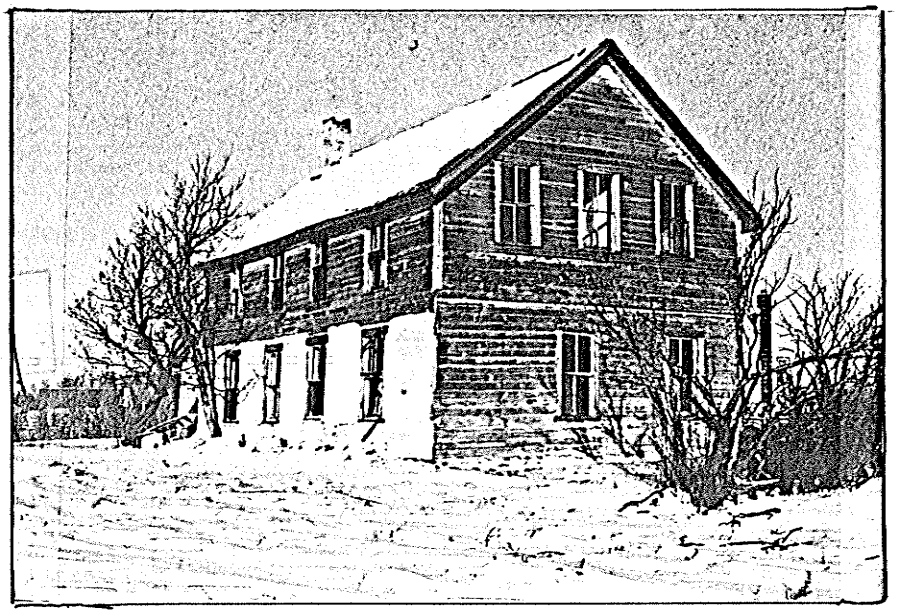

Plate 6: The Robertson home.

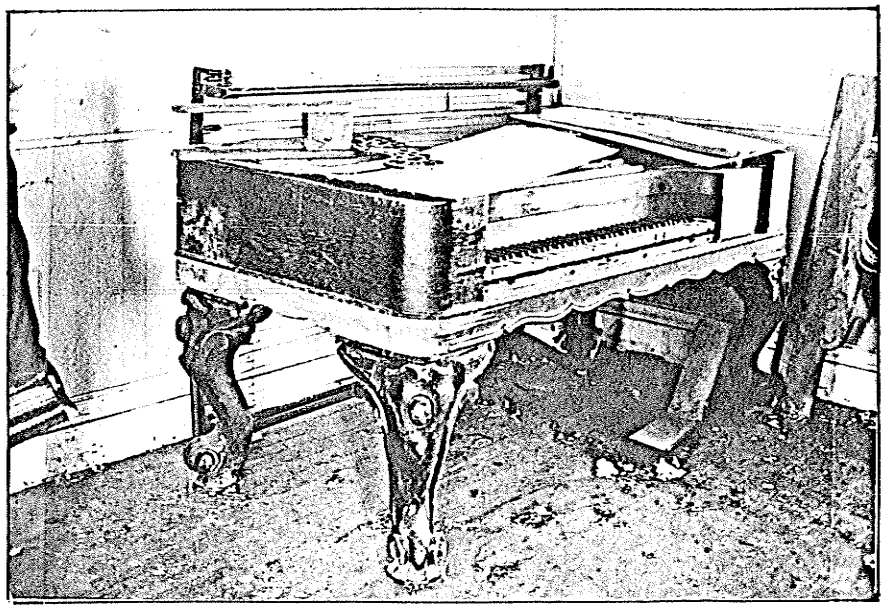

Plate 7: The old piano which provided entertainment for guests staying at the Robertson home.

England. The Lady of the Lake was sold before they left, cut in two, and sleighed to Selkirk where it was rebuilt and put into use on Lake Winnipeg. Unfortunately, it burned in the 1960's (Proctor, 1960).

It is interesting to note that after the Robertsons left, a family by the name of Ward took up residence in the Robertson home. Here Ted and Frank Ward of Ducks Unlimited fame were raised.

The Robertson home is still standing on the shores of Shoal Lake. However, it is slowly deteriorating. Fortunately, the old grand piano was removed a few years ago to a museum in Woodlands.

E. BUILDINGS

Besides the Robertson home, several other old buildings are still to be found on the eastern shores of East Shoal Lake. The most easily seen is the All-Saints Erinview Church (Fig. 7-2) (plate 8). This Anglican church was built in 1884 from money donated by Mr. Robertson's aunt in England, after she heard that no church existed close to the Robertson home (Proctor, 1960). The church is still in good condition, and one service is held yearly.

Another old building is the Crawford home (Fig. 7-2) (plate 9). This home was built in approximately 1876, and was the home of the William Crawford family. It was the first house to be built in the area. Although the home and its fieldstone milkhouse are still standing, they are both in bad repair. If steps are not soon taken, it won't be long before these historic buildings will be past repair.

F. A LIST OF EARLY SETTLERS IN SHOAL LAKE AREA

Fred Robertson
Wm. Crawford, 1874
Wm. Sims
Harry Stafford

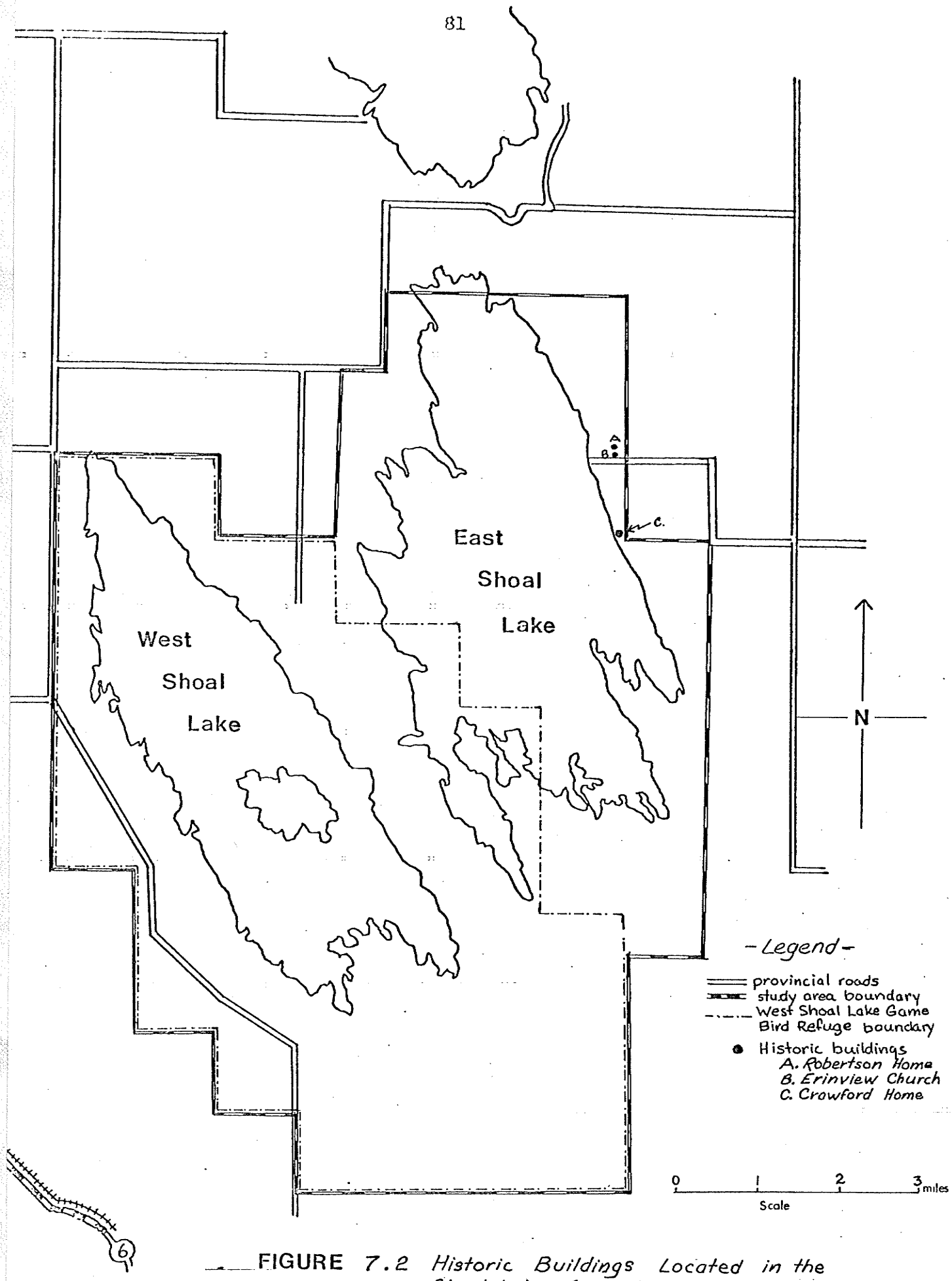

FIGURE 7.2 *Historic Buildings Located in the Shoal Lake Study Area*

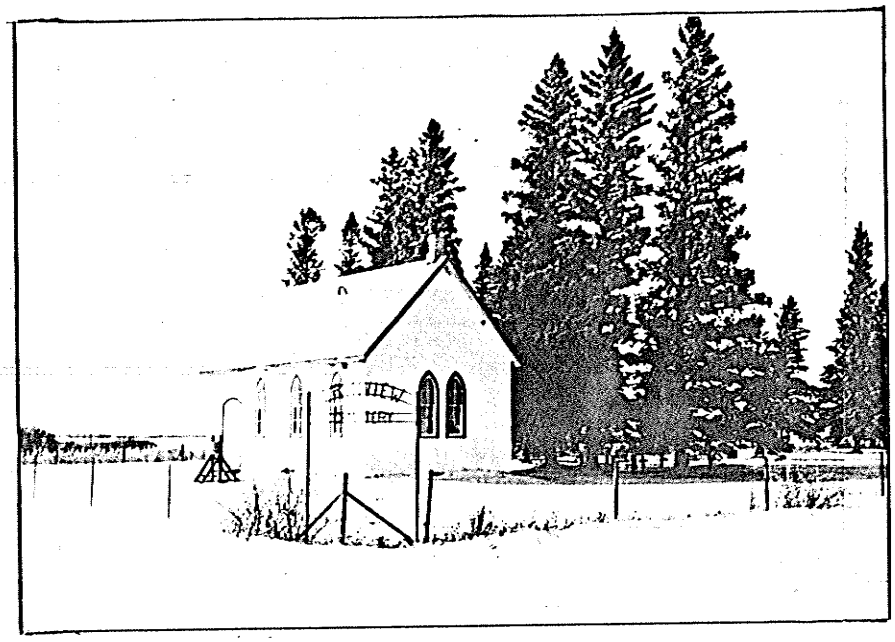

Plate 8: Erinview Church as it appears today.

Plate 9: The Crawford home as it appears today.

Thomas Bird
Edward Neal
James Hoyle Hirst
Edwin Sims
Fred Bennet
Charles Hancock
Wm. Mannix
F. Ward

Decendents: Mr. Pat Sherlock, Teulon
Mrs. Mattie Proctor, Woodlands

APPENDIX II LAND OWNERSHIP IN THE SHOAL LAKE STUDY AREA*

(By Section) (In Acres)

TOWNSHIP 15 RANGE 1 WEST					TOWNSHIP 15 RANGE 2 WEST				
Sec. No.	Lake Area		Crown Land	Private Land	Sec. No.	Lake Area		Crown Land	Private Land
	East Lake	West Lake				East Lake	West Lake		
7	-	-	-	640	10	-	-	-	640
18	-	-	-	640	11	-	-	640	-
19	-	-	120	520	12	-	-	-	640
29	20	-	620	-	13	-	-	640	-
31	209	-	431	-	14	-	80	560	-
32	178	-	462	-	15	-	110	370	160
					16	-	-	-	640
					20	-	-	103	537
					21	-	48	332	260
					22	-	520	120	-
					23	-	261	379	-
					24	-	61	579	-
					25	70	50	360	160
					26	-	590	50	-
					27	-	640	-	-
					28	-	590	50	-
					29	-	31	609	-
					31	-	-	540	160
					32	-	312	328	-
					33	-	640	-	-
					34	-	640	-	-
					35	47	127	466	-
					36	212	-	428	-
TOTAL	407		1633	1800	TOTAL	329	4700	6554	3197

* Source: Crown Lands Ledgers Renewable Resources and Transportation Services, Winnipeg.

Crown Lands Office, Arborg.

APPENDIX II (con't) LAND OWNERSHIP IN THE SHOAL LAKE STUDY AREA*
(By Section) (In Acres)

TOWNSHIP 16 RANGE 1 WEST					TOWNSHIP 16 RANGE 2 WEST				
Sec. No.	Lake Area		Crown Land	Private Land	Sec. No.	Lake Area		Crown Land	Private Land
	East Lake	West Lake				East Lake	West Lake		
5	77	-	563	-	1	640	-	-	-
6	630	-	10	-	2	271	-	369	-
7	640	-	-	-	3	-	438	202	-
8	400	-	110	130	4	-	640	-	-
17	42	-	238	160	5	-	620	20	-
18	630	-	10	-	6	-	71	217	352
19	420	-	220	-	7	-	411	162	67
30	218	-	-	422	8	-	640	-	-
31	-	-	160	540	9	-	488	120	-
					10	-	104	536	-
					11	192	-	448	-
					12	640	-	-	-
					13	640	-	-	-
					14	600	-	40	-
					15	-	98	222	320
					16	-	131	189	320
					17	-	610	30	-
					18	-	338	183	119
					19	-	411	157	72
					20	-	100	540	-
					22	-	6	160	154
					23	640	-	-	-
					24	640	-	-	-
					25	640	-	-	-
					26	308	-	-	332
					27	-	-	160	160
TOTAL	3057		1311	1252	TOTAL	5211	5106	3755	1896

* Source: Crown Lands Ledgers Renewable Resources and Transportation Services, Winnipeg

Crown Lands Office, Arborg.

APPENDIX III CHECK-LIST OF BIRDS FOUND IN THE SHOAL LAKE AREA

NOTE: R - rare
I - extinct from the area
B - nest in the area
RM - rare migrant
M - migrant
VR - very rare
* - non-verified sighting

This list was obtained from historic records compiled by numerous early naturalists who visited the area. These include Ernest Thompson Seton, Donald Gunn, Fred Dippie, Edward Arnold, Walter Raine, Frank Ward and a Herbert K. Job. The list was put together by P. A. Taverner, and appeared in the February 1919 issue of "The Canadian Field Naturalist". Although the data is very old, an attempt has been made to specify which birds do not exist in the area at present by crosschecking with Godfrey's Birds of Canada and consultation with Mr. Herb Copland (curator of ornithology, Museum of Man and Nature).

1.	Western grebe	Aechmophorus occidentalis	B
2.	Red-necked grebe	Podiceps grisegena	B
3.	Horned grebe	Podiceps auritus	B
4.	Pied-billed grebe	Podilymbus podiceps	B
5.	Common loon	Gavia immer	RM
6.	Ivory gull	Pagophila eburnea	VR
7.	Herring gull	Larus argentatus	B
8.	Ring-billed gull	Larus delawarensis	VR
9.	Franklin's gull	Larus pipixcan	B
10.	Bonaparte's gull	Larus philadelphia	VR
11.	Caspian tern	Hydroprogne caspia	RB
12.	Forster's tern	Sterna forsteri	B
13.	Common tern	Sterna hirundo	B
14.	Black tern	Chlidonias niger	B
15.	Double-crested cormorant	Phalcrocorax auritus	B
16.	White pelican	Pelecanus erythrorhynchos	B
17.	Red-breasted merganser	Mergus serrator	B
18.	Hooded merganser	Lophodytes cucullatus	B

19.	Mallard	Anas platyrhynchos		B
20.	Black duck	Anas rubripes		RM
21.	Gadwall	Anas strepera		B
22.	American widgeon(Baldpate)	Anas americana		B
23.	Green-wing teal	Anas crecca		B
24.	Blue-wing teal	Anas discors		B
25.	Cinnamon teal	Anas cyanoptera		*
26.	Shoveller	Anas clypeata		B
27.	Pintail	Anas acuta		B
28.	Wood duck	Aix sponsa		B
29.	Redhead	Aythya americana		B
30.	Canvasback	Aythya valisineria		B
31.	Lesserscaup	Aythya affinis		B
32.	Ring-necked duck	Aythya collaris		B
33.	Common goldeneye	Bucephala clangula		B
34.	Barrow's goldeneye	Bucephala islandica		*
35.	Bufflehead	Bucephala albeola		B
36.	Harlequin Duck	Histrionicus histrionicus		*
37.	White-winged scoter	Melanitta deglandi		B
38.	Ruddy duck	Oxyuva jamaicensis		B
39.	Snow goose	Chen caerulescens		M
40.	Ross' goose	Chen rossi		M
41.	White fronted goose	Ansur albifrons		M
42.	Canada goose	Branta canadensis	interior	MB
			parvipes	MB
			maxima	M
			hutchinsi	M
43.	Brant	Branta bernida		M
44.	Whistling swan	Olor columbianus		M
45.	Trumpeter swan	Olor buccinator		I
46.	American bittern	Botaurus lentiginosus		B
47.	Great blue heron	Ardea herodias		B
48.	Black-crowned night heron	Nycticorax nycticorax		B
49.	Whooping crane	Grus americana		I
50.	Sandhill crane	Grus canadensis		M
51.	Sora	Porzana carolina		B
52.	Yellow rail	Coturnicops noveboracensis		B
53.	American coot	Fulica americana		B

54.	Northern phalarope	Lobipes lobatus	M
55.	Wilsons's phalarope	Steganopus tricolor	B
56.	Common snipe	Capella gallinago	B
57.	Short-billed dowitcher	Limnodromus griseus	M
58.	Stilt sandpiper	Micropalama himantopus	M
59.	Pectoral sandpiper	Calidris melanotos	M
60.	White rumped sandpiper	Calidris fuscicollis	M
61.	Baird's sandpiper	Calidris bairdii	M
62.	Dunlin red-backed sandpiper	Calidris alpina	M
63.	Least sandpiper	Calidris minutilla	M
64.	Semipalmated sandpiper	Calidris pusillus	M
65.	Sanderling	Calidris alba	M
66.	Marbled godwit	Limosa fedoa	B
67.	Hudsonian godwit	Limosa haemastica	M
68.	Greater yellowlegs	Tringa melanoleucus	M
69.	Lesser yellowlegs	Tringa flavipes	M
70.	Solitary sandpiper	Tringa solitaria	M
71.	Willet	Catoptrophorus semipalmatus	B
72.	Upland sandpiper	Bartramia longicauda	B
73.	Buff-breasted sandpiper	Tryngites subruficollis	VR
74.	Spotted sandpiper	Actitis macularia	B
75.	Long-billed curlew	Numenius americanus	VR
76.	Black-bellied plover	Pluvialis squatarola	M
77.	American golden plover	Pluvialis dominica	M
78.	Semipalmated plover	Charadrius semipalmatus	M
79.	Piping plover	Charadrius melodus	B
80.	Killdeer	Charadrius vociferus	B
81.	Ruddy turnstone	Arenaria interpres	M
82.	Willow ptarmigan	Lagopus lagopus	VR
83.	Ruffed grouse	Bonasa umbellus	B
84.	Greater prairie chicken	Tympanuchus cupido	I
85.	Sharp-tailed grouse	Pedioecetes phasianellus	B
86.	Mourning dove	Zenaida macroura	B
87.	Marsh hawk	Circus cyaneus	B
88.	Sharp shinned hawk	Accipiter striatus	B

89.	Goshawk	Accipiter gentilis	B
90.	Red-tailed hawk	Buteo jamaicensis	B
91.	Swainson's hawk	Buteo swainsoni	R
92.	Rough-legged hawk	Buteo lagopus	M
93.	Broad-winged hawk	Buteo platypterus	B
94.	Bald eagle	Haliaeetus leucocephalus	VR
95.	Peregrine falcon	Falco peregrinus	VR
96.	Merlin	Falso columbarius	B
97.	American kestrel	Falco sparverius	B
98.	Long-eared owl	Asio otus	B
99.	Short-eared owl	Asio flammeus	B
100.	Great horned owl	Bubo virginianus	B
101.	Snowy owl	Nyctea scandiaca	M
102.	Black-billed cuckoo	Coccyzus erythropthalmus	B
103.	Belted kingfisher	Megaceryle alcyon	I
104.	Hairy woodpecker	Dendrocopos villosus	B
105.	Downy woodpecker	Dendrocopos pubescens	B
106.	Yellow-bellied sapsucker	Sphyrapicus varius	B
107.	Red-headed woodpecker	Melanerpes erythrocephalus	VR
108.	Common flicker (yellow-shafted)	Colaptes auratus	B
109.	Common nighthawk	Chordeiles minor	B
110.	Ruby-throated Hummingbird	Archilochus colubris	B
111.	Whip-poor-will	Caprimulgus vociferus	B
112.	Eastern kingbird	Tyrannus tyrannus	B
113.	Great crested flycatcher	Myiarchus crinitus	VR
114.	Olive-sided flycatcher	Nuttallornis borealis	B
115.	Eastern Wood Peewee	Contopus virens	B
116.	Yellow-bellied flycatcher	Empidonax flaviventris	M
117.	Eastern phoebe	Sayornis phoebe	B
118.	Least flycatcher	Empidonax minimus	B
119.	Horned lark	Eremophila alpestris	B
120.	Magpie	Pica pica	M
121.	Blue jay	Cyanocitta cristata	B
122.	Gray Canada Jay	Perisoreus canadensis	R
123.	Common raven	Corvus corvax	M
124.	Common crow	Corvus brachyrhynchos	B
125.	Bobolink	Dolichonyx oryzivorus	B

126.	Brown-headed cowbird	Molothrusater	B
127.	Yellow-headed blackbird	Xanthocephalus xanthocephalus	B
128.	Red-winged blackbird	Agelaius phoeniceus	B
129.	Western meadowlark	Sternella neglecta	B
130.	Northern oriole(Baltimore)	Icterus galbula	B
131.	Rusty blackbird	Euphagus carolinus	B
132.	Brewer's blackbird	Euphagus cyanocephalus	B
133.	Common grackle	Quisculus quiscula	B
134.	Evening grosbeak	Hesperiphona vespertina	B
135.	Purple finch	Carpodacus purpureus	B
136.	American goldfinch	Spinus tristis	B
137.	Pine siskin	Spinus pinus	B
138.	Snow bunting	Plectrophenax nivalis	M
139.	Lapland longspur	Calcarius lapponicus	M
140.	Chestnut collared longspur	Calcarius ornatus	B
141.	Vesper sparrow	Pooecetes gramineus	B
142.	Savannah sparrow	Passerculus sandwichensis	B
143.	Baird's sparrow	Ammodramus bairdii	B
144.	Leconte's sparrow	Ammospiza leconteii	B
145.	Sharp-tailed sparrow	Ammospiza caudacuta	B
146.	Harris' sparrow	Zonotrichia querula	M
147.	White-crowned sparrow	Zonotrichia leucophrys	M
148.	White-throated sparrow	Zonotrichia albicollis	B
149.	Tree sparrow	Spizella arborea	M
150.	Chipping sparrow	Spizella passerina	B
151.	Clay-colored sparrow	Spizella pallida	B
152.	Dark-eyed junco (slate colored)	Junco hyemalis	B
153.	Song sparrow	Melospiza melodia	B
154.	Lincoln's sparrow	Melospiza lincolnii	B
155.	Swamp sparrow	Melospiza georgiana	B
156.	Fox sparrow	Passerella iliaca	M
157.	Rufous-sided towhee	Pipilo erythrophthalmus	R
158.	Rose-breasted grosbeak	Pheucticus ludovicianus	B
159.	Purple martin	Progue subis	B
160.	Cliff swallow	Petrochelidon pyrrhonota	B
161.	Barn swallow	Hirundo rustica	B

162.	Tree swallow	Iridoprocne bicolor	B
163.	Bank swallow	Riparia riparia	B
164.	Cedar waxwing	Bombycilla cedrorum	B
165.	Loggerhead shrike	Lanius ludovicianus	B
166.	Red-eyed vireo	Vireo olivaceus	B
167.	Philadelphia vireo	Vireo philadelphicus	B
168.	Warbling vireo	Vireo gilvus	B
169.	Solitary vireo	Vireo solitarius	B
170.	Black & White warbler	Mniotilta varia	B
171.	Nashville warbler	Vermivora rufricapilla	B
172.	Orange-crowned warbler	Vermivora celata	B
173.	Tennessee warbler	Vermivora peregrina	B
174.	Cape May warbler	Dendroica tigrina	B
175.	Yellow warbler	Dendroica petechia	B
176.	Yellow-rumped warbler (Myrtle)	Dendroica coronata	B
177.	Magnolia warbler	Dendroica magnolia	B
178.	Chestnut-sided warbler	Dendroica pensylvanica	B
179.	Bay-breasted warbler	Dendroica castanea	B
180.	Black poll warbler	Dendroica striata	M
181.	Blackburnian warbler	Dendroica fusca	B
182.	Black-throated green warbler	Dendroica virens	B
183.	Palm warbler	Dendroica palmarum	B
184.	Ovenbird	Seiurus aurocapillus	B
185.	Northern water thrush	Seiurus noveboracensis	B
186.	Connecticut warbler	Oporornis agilis	B
187.	Mourning warbler	Oporornis philadelphia	B
188.	Common yellowthroat	Geothlypis trichas	B
189.	Wilson's warbler	Wilsonia pusilla	B
190.	Canada warbler	Wilsonia canadensis	B
191.	American redstart	Setophaga ruticulla	B
192.	American pipit	Anthus spinoletta	M
193.	Sprague's pipit	Anthus spragueii	B
194.	Gray catbird	Dumatella carolinensis	B
195.	Brown thrasher	Toxostoma rufum	B
196.	House wren	Troglodytes aedon	B

197.	Winter wren	Troglodytes troglodytes	B
198.	Short-billed marsh wren	Cistothorus platensis	B
199.	Long-billed marsh wren	Telmatodytes palustris	B
200.	Brown creeper	Certhia familiaris	B
201.	Red-breasted nuthatch	Sitta canadensis	B
202.	Black-capped chickadee	Parus atricapillus	B
203.	Ruby-crowned kinglet	Regulus calendula	B
204.	Veery	Catharus fuscescens	B
205.	Gray-cheeked thrush	Catharus minima	M
206.	Swainson's thrush	Catharus ustulata	B
207.	Hermit thrush	Catharus guttata	B
208.	American robin	Turdus migratorius	B
209.	Eastern bluebird	Sialia sialis	B
210.	Least bittern	Ixobrychus exilis	R
211.	Great Egret	Casmerodius albus	B
212.	Snowy Egret	Egretta thula	B

APPENDIX IV PARTIAL LIST OF PLANTS IN SHOAL LAKE AREA

The following represents only a partial list of plants in the area. It was compiled by the author during summer fieldwork.

Trees

Manitoba Maple (Box-elder)	Acer negundo
Bur Oak (Scrub Oak)	Quercus macrocarpa
Balsam Poplar (Black poplar)	Populus balsamiferia
Trembling Aspen (White poplar)	Populus tremuloides
Eastern Cottonwood	Populus deltoides
Willows	Salix
White spruce	

Grasses

Blue-eyed grass	Sisyriuchium angustifolium
Foxtail	Alopecurus aequalis
June grass	Koeleria cristata
Reed grass	Phragmites communis
Sedges	Carex sp.

Herbs

Bulrush	Scirpus validus
Cattail	Typha latifolia
Coltsfoot	Petasites sagiltatus
Duckweed	Lemna minor
Fireweed	Epilobium augustifolium
False dandelion	Ageris glauca
Golden rod (Canada)	Solidago canadensis
Gumweed	Grindelia squarrosa
Hoary Puccoon	Lithospermum canescens
Horsetail	Equisetum arvense

Hawksbeard	Crepis runcinata
Meadow Rue (veiny)	Thalictrum dasycarpum
Plantain	Plantago eriopoda
Potentilla (shrubby)	Potentilla fruticosa
Prairie Smoke	Geum triflorum
Purple Prairie Clover	Petalostemum purpurem
Purple vetch	Astragalus goniatus
Pussy toes	Antennaria campestris
Rose (prickly)	Rosa acicularis
Rose (smooth)	Rosa blanda
Rose (wood)	Rosa woodsia
Silverweed	Potentilla anserina
Wolfwillow (silver willow)	
Wormwood	Artemisiz biennis

APPENDIX V CHECK LIST OF ANIMALS IN THE SHOAL LAKE STUDY AREA

Amphibians	
Leopard frog	Rana pipiens
Wood frog	Rana sylvatica
Boreal Chorus frog	Pseudacris triseriata
Gray Tiger Salamander	Ambystoma tigrinum
Reptiles	
Red-sided garter snake	Thamnophis sirtalis
Western Plains garter snake	Thamnophis sirtalis
Northern red-bellied snake	Storeria occipitomaculata
Smooth Green snake	Opheodrys vernalis
Mammals	
White-tailed deer	
Striped skunk	
Short-tailed weasel	
Red fox	
Coyote	
Meadow jumping mouse	Zapus hudsonius
Muskrat	Ondatria zibethica
Meadow mouse	Microtus pennsylvanicus
Deer mouse	Peromyscuc maniculatus
Northern pocket gopher	Thomomys talpoides
Red squirrel	Tamiasciurus hudsonias
Thirteen-lined ground squirrel	Spermophilus tridecem lineatus
Richardson ground squirrel	Spermophilus richardsonii
Franklin ground squirrel	Spermophilus franklini
Least chipmunk	Eutamias minimus
Snowshoe hare	Lepus americanus
Eastern cottontail	Sylvilagus floridanus
Little brown bat	Myotis lucifugus