

BURNSTICK LAKE MANAGEMENT PLAN

Calgary
1996

Alberta Environmental Protection

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FROM: Peter G. Melnychuk
Deputy Minister

OUR FILE REFERENCE:

YOUR FILE REFERENCE:

TO: Honourable Ty Lund
Minister

DATE: April 24, 1997


TELEPHONE: 427-6236

SUBJECT: BURNSTICK LAKE MANAGEMENT PLAN

In response to your questions about the proposed Natural Areas within the Burnstick Lake Management Plan, I have the following comments.

While the proposed Natural Areas (consisting of lands around the southwest tip of Burnstick Lake and around the perimeter of Birch Lake) do not fill any specific gaps due to their relatively small size, they do contribute to the rounding of the overall protected areas system as unique and significant features. The sites also contribute to the recreation and heritage appreciation goals of Special Places. The designation of these Natural Areas will also not impinge on the landbase targets of Special Places, and should not significantly impact the process because of the considerable public consultation and information that has already taken place during the development of this plan.

I hope this helps to alleviate your concerns. If you have no further questions or concerns, I would encourage you to approve the enclosed plan so we can proceed with implementation.

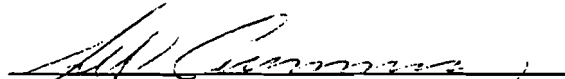

Peter G. Melnychuk

Enclosure

Approved: Ty Lund
Honourable Ty Lund

APPROVAL PAGE

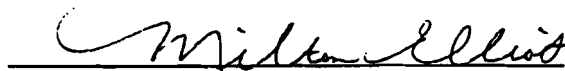
We hereby approve the Burnstick Lake Management Plan as an official policy for the management of the Burnstick Lake Planning Area. The plan reflects the Government's intent to protect and maintain the natural environment of the planning area while providing opportunities for controlled recreational and resource development.


Mayor, Summer Village of Burnstick Lake


Nov 12/96
Date


Administrator, Summer Village of Burnstick Lake


Nov 12/96
Date


Reeve, Municipal District of Clearwater #99

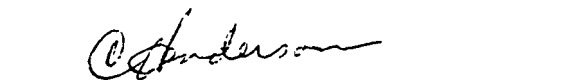
January 23, 1997
Date


Manager, Municipal District of Clearwater #99

January 23, 1997
Date


Assistant Deputy Minister, Natural Resources
Service

Feb 26/97
Date


Assistant Deputy Minister, Land and Forest Service

Feb 26/97
Date

David Spink
A/ Assistant Deputy Minister, Environmental
Regulatory Service

March 13, 1997
Date

Raoul Gauthier
Assistant Deputy Minister, Corporate
Management Service

March 16, 1997
Date

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1.0 INTRODUCTION

1.1 Overview

Burnstick Lake is located in forested foothills near Caroline, Alberta. The lake is popular for recreational activities including mainly fishing, boating, camping, cottages, wildlife viewing and hunting. The lake has a water surface of 295 ha in an area about 4.5 km long and one km wide. Land around the lake is mainly public land. Shorelands and extensive areas of emergent and floating vegetation provide habitat for a variety of animals including moose, deer, bear, bald eagle, loons, great blue heron, grebes and songbirds. Northern pike is the dominant sport fish in the lake. Resource use in the planning area includes timber, domestic livestock grazing, petroleum and natural gas and trapping.

Current development in the planning area consists of a cottage subdivision, a campground, and several oil exploration roads and well sites. Phase one of a proposed multi-phase resort is currently under development. Owing to lack of information concerning the capability of the lake to withstand further development, this management plan was initiated.

1.2 Planning Area

Figure 1 shows the planning area, and includes the lake, portions of West and East Stony Creeks and adjacent lands approximately 1.6 km in width around the lake. Birch Lake, a small water body located just to the north of Burnstick Lake, is also included. The size of the planning area is 20.8 km².

1.3 Purpose and Scope of the Plan

The purpose of Burnstick Lake Management Plan is to provide guidelines for the protection, management and orderly development of lands and resources around the lake. The plan will determine whether the lake can withstand further development, and if so, the plan will set out the scope and standards for development. The plan provides a statement of management intent for the planning area and direction for locating development and pursuing activities. The plan is non statutory. Specifically, the plan provides local authorities with guidelines and supporting information for:

- (a) review of, making decisions and placing conditions on applications for commercial recreational development and resource development proposals,
- (b) the types, standards and density of development and activities allowed,

The plan provides industry and the public with:

- (a) a clear statement of objectives for recreational and resource management, and guidelines to ensure that development is compatible with other uses within the planning area,
- (b) specific guidelines for developing and operating commercial facilities and conducting recreational and industrial activities.

The plan provides a common set of guidelines to all stakeholders who have interests in land and resource management in the area. This includes Alberta Department of Environmental Protection, Alberta Economic Development and Tourism, M.D. Clearwater #99, Summer Village of Burnstick Lake and commercial operators who have dispositions in the area.

This plan also contains a map that shows existing and proposed development restrictions for the planning area (see Figure 6).

1.4 Policy and Planning Context

Burnstick Lake is located on Green Area public land in the M.D. of Clearwater #99. Development control is exercised through provisions of the Public Lands Act by placement of conditions on surface lease agreements. Alberta Department of Environmental Protection (from now on may be called the Department) makes decisions on land use applications under authority of legislation and policies in effect for the area. The Alberta Tourism and Recreation Leasing (ATRL) process is used to ensure that applications are reviewed promptly and efficiently; also to recognize the business and financial requirements associated with development proposals, such as detailed studies and public disclosure. The Department uses the M.D. of Clearwater #99 development control bylaws as a guide for placement of conditions on dispositions. The M.D. of Clearwater #99 is referred on surface disposition applications with development control implications (e.g., commercial recreation structures and industrial developments of a permanent nature). The M.D. of Clearwater issues development permits subject to its land use bylaws.

The Nordegg-Red Deer River Sub-regional Integrated Resource Plan (IRP), 1986 provides general policy direction for land and resource use and protection in light of other policies and legislation (e.g., Public Lands Act). The IRP contains resource management objectives and guidelines for the area. Zoning identifies units of land for which land use intents and objectives are identified. Section 1.6 contains a summary of IRP policy direction for Burnstick Lake.

Since the Nordegg-Red Deer River Sub-regional IRP was approved, changes in uses and demands around Burnstick Lake have created a need for more detailed policy direction. Boating on the lake has increased and concerns have arisen concerning safety and impact on the natural environment. The lake has become recognized as regionally significant for its combination of landscape features and wetland habitat. A diversity of watchable wildlife is found here. Also, the lake has become increasingly popular for recreation and tourism. A resort is under development on the south side of the lake. This has created concerns about how much development is appropriate for the lake.

Once this plan is approved, the Department will adopt this plan as an official land use policy for the area. For example, applications for leasing public land within the planning area will be screened by the Department to ensure the proposed use of public land meets all guidelines contained in the plan. Local land management authorities will use the plan for guidance in determining future development approval, and at their discretion, for amending bylaws following the plan to provide legal status for decision making in the planning area.

The management plan will provide policy direction to ensure that development is consistent with protection of the natural environment and public safety on the lake and adjacent land.

1.5 Planning Process

A planning team coordinated preparation of the Burnstick Lake plan. The planning team consisted of stakeholders who have interests or responsibilities in land and resource management in the planning area. Appendix 1 contains the planning team membership list.

The planning team prepared a terms of reference document to guide preparation of the plan. A public involvement program was part of the planning process. Interested members of the public reviewed the terms of reference document and provided comments to the planning team before the document was completed and approved. A mailing list was developed to notify people at critical stages of the planning process, while opportunities were provided for review and voicing opinion on the draft plan. Appendix 1a contains a list of public meetings held concerning recent development at Burnstick Lake.

1.6 Existing Land Use Policies and Studies

Land and Resources. The Nordegg-Red Deer River Sub-Regional IRP contains a resource management strategy that includes broad resource management objectives for the entire IRP planning area. The IRP zones an area around Burnstick Lake as General Recreation. The general intent of this zone is to retain a variety of natural environments to serve as a focus for a wide range of recreational activities.

More specific resource management intents, objectives and guidelines are given for each Resource Management Area (RMA). (An RMA is a geographical unit that has similar resource management intent throughout.) RMAs are used to focus the decision-making process on a specific area. The IRP identifies Burnstick Lake as a major focal point for recreation within the Red Deer-Raven RMA. In this context, the plan notes the existing camping and cottage area on the north side of the lake and the existence of an "Alberta Recreation and Parks 200 ha reservation on the south shore for future development as a recreation area." The plan also describes Burnstick Lake as the only significant lake fishery within the RMA. The General Recreation Zone recognizes the lake as having the highest recreational and aesthetic values within the RMA.

Most of the remaining land within the Burnstick Lake planning area is zoned Multiple Use Zone. The management intent of this zone is to provide for the management and development of the full range

of available resources, while meeting long term objectives for watershed management and environmental protection. Birch Lake and an area south of East Stony Creek are zoned Critical Wildlife. The intent of this zone is to protect watershed and wildlife habitat that are essential to the maintenance of specific fish and wildlife populations.

The Summer Village of Burnstick Lake is zoned Facility Zone. The intent of this zone is to recognize existing or approved settlement and commercial development areas.

Regional Lake Perspective. The document, *Regional Lake Perspective: Inventory and Policy Directions*. 1976. Red Deer Regional Planning Commission, classifies Burnstick Lake as a "provincial development lake." The document was developed under the philosophy of protecting the resource and planning for future public needs where possible to allow private interests to be pursued. While the document does not provide official policy for the area, it contains a perspective of lake development potential that can be used for planning purposes. Burnstick Lake was assigned a provincial scenic rating because it met the criteria of having a very high waterfowl, ungulate or sport fish capability despite any other rating. It was assigned a provincial development rating because it already supports development or can support development based on recreation capability analyses, land uses and ownership patterns. Combining these two ratings produced the "provincial development lake" classification.

Novak Report. In 1979 Alberta Environment commissioned a study to consider the whole spectrum of recreational uses of the lake area. The study, *Burnstick Lake Site Plan*. 1980. *Leonard Novak Landscape Architect Ltd.*, assessed the physical resources and uses of the area immediately around the lake. The study identified the main issues that prevailed in planning for the lake and prepared a plan with recommendations for the conservation and development of the site. The study also compared recreational use at Burnstick Lake with other parks and campgrounds in the region as part of the assessment for demand for recreational activity space at Burnstick Lake. Information was gathered from site inspections, government records and from interviews with provincial resource agencies, local authorities and representatives of campers and cottagers.

The report addressed issues such as water quality, boating, the impact of oil exploration and development, demand for camping space, boating and trail use. The report recommended protection of the existing high quality natural environment be a primary objective for management of the area. While the report was never adopted as a policy for management of the lake, some of its recommendations were carried out. For example, the municipal campground was refurbished. The report provides useful background information and a perspective of historical issues for planning purposes.

1.7 Boating Regulations

In 1996 Alberta Environmental Protection introduced the blanket restriction "10-30 Rule" to ensure the safe use of Alberta waterbodies and beaches by recreational boaters.

The "10-30 Rule" provides for a ten kilometre per hour speed limit within 30 metres of the shore on all of Alberta's waterbodies. As with all rules, there are certain exemptions and those that apply to Alberta are as follows:

- Boaters may exceed the 10 km/h speed limit if towing a water skier, surfboarder or for other similar use, in a trajectory that is perpendicular to the shore *when it is safe to do so* and only if no other restrictions apply.
- The restriction does not apply to rivers that are less than 100 metres in width.

With the above exceptions, the "10-30 Rule" applies to all waterbodies throughout the province and does not have to be shown with signs. However, where signs are posted showing speed restrictions, the posted limit prevails in the area identified.

2.0 RESOURCE INFORMATION AND ANALYSIS

2.1 Setting and Biophysical Features

Burnstick Lake is located on Stony Creek, a tributary of the James River, about 72 km west and 24 km south of Red Deer. The lake is in the Lower Boreal Cordilleran Ecoregion of Alberta. An all-weather gravel road south of Caroline provides access to the area.

2.1.1 Climate

The planning area is located in the Boreal Ecoprovince (Strong 1992), characterized by short, cool summers and long, cold winters with relatively low annual precipitation. Yearly precipitation is approximately 50 cm. Most precipitation falls as rain in June and July. Further information on the climate of the area is contained in *Biophysical Inventory of Shoreland Areas - Burnstick Lake* (Bentz *et al*, 1994).

2.1.2 Geomorphology

Bedrock geology consists of shales and sandstones of the Alberta group. The Cardium and Viking sandstone layers, which bear important petroleum resources, underlie the region at a depth of 2 500 m below the surface.

Hummocky ablation terrain is a prominent landform dominating the northeast part of the planning area. The knob and kettle topography has resulted in a complex interspersed of depressional organic deposits and small wetlands with elevated and well-drained knolls. An undulating till-plain occurs south of the lake and is composed of baseline till of Rocky Mountain origin. Occasional glaciofluvial channels and larger meltwater channels that drained former glacial lakes dissect the ground moraine.

Surficial materials are glacial till which forms the basis of gray-wooded soils known as Lobley loam. These soils are stony, sandy clay with limited organic content.

Information on geomorphology is taken from *Biophysical Inventory of Shoreland Areas - Burnstick Lake* (Bentz *et al*, 1994). This report contains a more detailed description of the geology and geomorphology of the area.

2.1.3 Water Resources

Watershed. Burnstick Lake has a watershed area of 62.6 km². There is one major inlet stream, West Stony Creek, and an outlet stream, East Stony Creek. These normally flow all year. East Stony Creek flows into the James River which flows into the Red Deer River. Historically the lake outlet was regulated by beaver dams. The lake level is now artificially controlled by a weir.

The physical characteristics of Burnstick Lake are shown in Table 1. The volume of the lake is small

compared to its drainage area, and as a result, residence time for water in the lake is short.

Table 1. Physical Characteristics of Burnstick Lake

Water surface area, km ²	2.95*
Volume, million m ³	14.5*
Maximum depth, m	18*
Average depth, m	5*
Drainage basin area, km ²	62.6*
Elevation (m) above sea level	1186.007*
Water residence time, years	approximately 5 years
Drainage area/lake area	21
*On date of sounding, July 21/71	

Many sloughs and muskeg occur in the lowlands north and east of Burnstick Lake and in small hollows south of the lake. Beavers have dammed many creeks that enter the lake. Birch Lake, located just north of Burnstick Lake, has no inlet or outlet.

Lake Characteristics. Burnstick Lake basin occupies a total area of 393 ha, including extensive areas of aquatic emergent vegetation. The surface area is 295 ha in size with a limited area of deep water. The lake has a maximum depth of 18 metres. The remaining area of the lake is shallow and supports aquatic plant growth. The contour of the lake is shown in Figure 2. Uncleared dead trees and submerged tree trunks and branches remain in small areas off the points at the west end, in the main marsh at the northeast shore and along the south shore. These were left when the water was raised in 1975. In the early 1980s a channel was dredged in the eastern part of the lake to improve boating access to the main body of the lake.

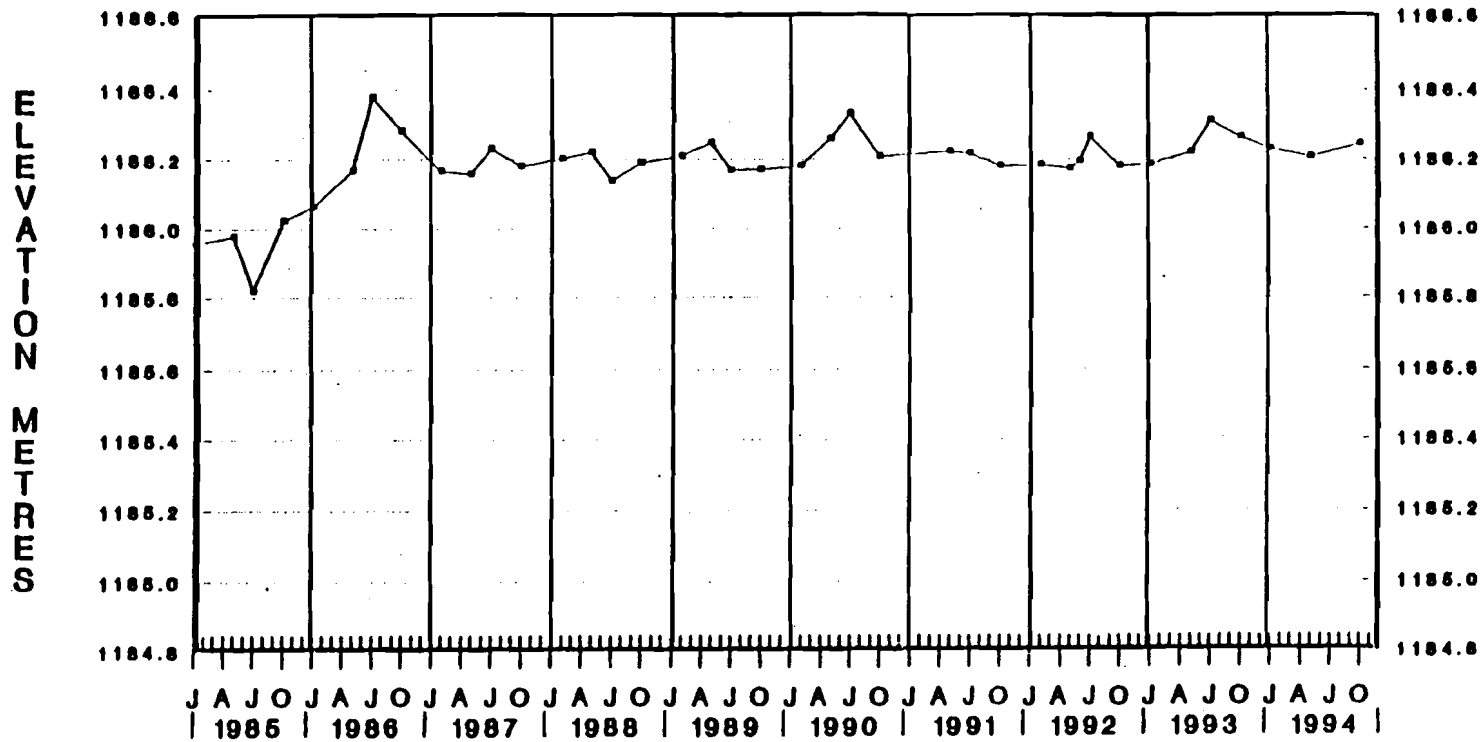
A level control weir was first installed for wildlife protection in 1945. In 1975, the weir was rebuilt by Alberta Environment for recreational and fisheries purposes. The weir sill elevation is 1186.105 metres above sea level. The water levels have remained fairly stable from 1977 to the present. A graph of water levels from 1985 to 1994 is shown in Figure 3.

To provide a picture of water level fluctuations on Burnstick Lake over longer periods of time, a water balance for Burnstick Lake was simulated for each year from 1972 to 1993. The simulation was based on a lake sill elevation of 1186.105 metres. The simulation suggests that the lake level generally fluctuates within 0.5 m of the sill elevation. Lake levels usually peak some time during the months of May to July.



Figure 2

Water Levels 1985-94



• ACTUAL MEASUREMENTS — ASSUMED

APPROXIMATE GSC DATUM
ALBERTA ENVIRONMENTAL PROTECTION
LATEST AVAILABLE WL. 1186.24 M OCT 13/94

Figure 3

Simulated lake level information for Burnstick Lake is kept at the Red Deer Regional Office of Alberta Environmental Protection.

Flood hydrographs were also developed for Burnstick Lake assuming a starting elevation of 1186.105 metres. Floods of return periods of 100 years, 50 years, 20 years and 10 years were routed through the lake. The hydrographs were derived using data from Bearberry Creek near Sundre.

The lake responds surprisingly quickly to any rainfall or runoff event due to its small area. In a 1:10 year flood, flood hydrographs show the lake elevation can rise over one metre. Floods of a larger size, such as a 1:100 year flood, will have a duration of three days and may raise the water higher than one metre. Water Resources Services of Alberta Environmental Protection maintains hydrographic information on Alberta lakes.

Birch Lake is 35 ha in size and is shallow (average depth is about 3 m, maximum depth is 9 m). Birch Lake may have been part of Burnstick Lake in its geological past.

Water Quality. Burnstick Lake has low concentrations of total phosphorus and chlorophyll-a, and deep Secchi depth readings, so that it falls in the oligotrophic category. The lake has excellent water quality.

Alberta Environmental Protection, with assistance from local cottage owners, conducted water quality sampling during the summers of 1993 and 1994. The sampling program confirmed that the lake is low in salinity; that is, the water contains low concentrations of major ions and other dissolved substances (Table 2). The dominant ions are bicarbonate and calcium, as often happens for lakes with low total dissolved solids concentration. The concentration of several constituents (eg., TDS, calcium) was slightly higher in 1994 than 1993, but this is within the normal year to year variation that would be observed in any lake.

The dissolved oxygen, temperature, pH and conductivity profiles suggest that the water column was stratified (a layer of warm water overlies a layer of cool water). It is likely the lake remained stratified for most of the summer, because at the bottom, the temperature was near 4° C and the level of dissolved oxygen was very low. Because the cool water is denser than the warm water overlying it, the lake is very resistant to mixing by wind. Stratified lakes tend to have better water quality during the summer than lakes that mix. In stratified lakes, the nutrient-rich bottom sediments are isolated from the suspended algae growing in the upper layer. However, only the deep areas of Burnstick Lake would stratify, so it may behave more like a mixed lake because much of it is shallow.

Table 2. Water Quality, Burnstick Lake. Average concentrations of major ions, nutrients, chlorophyll-a and other variables for Burnstick Lake in summer 1993 and 1994. Units are mg/L unless indicated otherwise.

	1993	1994
pH (range), pH units	8.15 - 8.30	8.05 - 8.32
Conductivity, uS/cm	239	254
Total Dissolved Solids	125	133
Calcium	31	34
Magnesium	11	12
Sodium	<3	<3
Potassium	<0.5	<0.5
Sulphate	3	3
Chloride	0.5	0.5
Bicarbonate	156.2	167.2
Carbonate	<1	1
Total Hardness, CaCO ₃	124	131
Total Alkalinity, CaCO ₃	128	138
Iron	0.01	0.05
Silica	5.6	6.8
Total Phos. mg/m ³	15	16.3
Chlorophyll a, mg/m ³	2.3	2.7
Secchi depth, m	6.5	5.8

The amount of algae in the water, as measured by chlorophyll, remained low throughout the summer, and the water was clear. There were no apparent peaks during the warmest part of the summer as occurs in more productive lakes. Observations by cottagers suggest that shallow waters of the lake may be productive for some forms of algae. Filamentous algae (floating brown clumps and mats) and slicks of planktonic algae have been observed in shallow water at various times during the summer in recent years. Sessile algae on submerged wood and rocks have also been observed.

Phosphorus concentrations also remained low and fairly constant over the summer, although rainfall in July 1993 increased the water level in the lake. Presumably phosphorus entered the lake via higher flows in West Stony Creek. Note that the lake was less transparent (Secchi depth was shallower) in

May 1994 as well, when there were more algae in the water. Such variations from year to year occur in all lakes, and do not indicate water quality deterioration.

Water quality in most lakes is governed by both natural and human-related factors. For many Alberta lakes, the bottom sediments contribute large quantities of phosphorus to the lake water during the summer, promoting algal blooms. This process does not appear to be occurring to any great degree in Burnstick Lake, and therefore good water quality is maintained through the summer. It will be important to make sure that human activities in the lake's watershed do not contribute to water quality degradation by increasing the nutrient supply to the lake.

Examples of human activities (without appropriate phosphorus control measures) that could affect lake water quality include: conversion of forest or bush to farmland and parks, use of fertilizers, cottage development, construction of roads, buildings, well sites and pipelines (erosion of soil), shoreline/lake bed disturbances (e.g. dock construction), livestock in the watershed, particularly with access to inflow streams or the lake, and faulty or poorly maintained septic systems along the lakeshore.

Bacteriological Survey. In 1995 the Department conducted a preliminary bacteriological survey at Burnstick Lake to determine whether a problem might exist and warrant further study. Except for the beach near the municipal campground, only the areas where creeks entered the lake showed evidence of fecal coliform bacteria in the samples. All the bacterial counts, including the highest counts from the area where West Stony Creek enters the lake, were well below the provincial interim guideline for direct contact recreation, and therefore not a cause for concern.

Ground Water. Burnstick Lake is located on a tree-covered, moraine plateau approximately 19 kilometres north of the James river. The main water course flowing into the lake is West Stony Creek with outflow on the east end by Stony Creek. A small unnamed water course is also shown on the 1:50,000 map sheet (82-0/15) entering at the midpoint on the southern shore.

Water quality is generally good, with total dissolved solids usually less than 1000 ppm. The chemical character of the water is usually calcium-magnesium bicarbonate or sodium carbonate.

Information on the groundwater resources of this area has been gleaned from the ARC publication entitled "Hydrogeology of the Calgary-Golden Area" (report 77-2, Ozoray, 1977), and from local water well driller reports. Most potable water supplies appear to be obtained from sandstone and shale aquifers of the underlying Paskapoo Formation. The predicted yields from this formation are a possible 25 to 100 imperial gallons per minute and are derived mainly from qualitative rather than quantitative data. Actual yields as calculated from short-term pumping tests range from 0.8 to 17.9 igpm. A total of 16 well records has been obtained for the planning area. Except for one well belonging to Municipal District of Clearwater #99, all wells are completed in bedrock formations with an average depth of approximately 150 feet (47 m).

The development implications of the preceding information can only be stated in general terms. With

respect to geological and topographic setting, the deposits of glacial moraine should provide adequate protection of the underlying aquifers by virtue of their high clay content while still being suitable in many cases for on-site disposal of sewage effluent (e.g., septic fields). This is of course subject to the current regulations of the Plumbing Inspections Branch, Alberta Labour. Similarly, the availability of groundwater supplies does not appear to be a limiting factor to development.

2.1.4 Flora and Vegetation

Vegetation is diverse owing to hummocky terrain. In depressions and poorly drained areas, plant communities are typical of boreal wetlands, marshes, patterned wetlands and beaver pond complexes. Upland areas consist of aspen, pine and spruce woodland. Regionally uncommon plants include round-leaved bog-orchid (*Habenaria orbiculata*). Permanent marsh vegetation fills the margins and bays at the ends of the lake. This plant diversity adds to the scenic quality of the area and contributes to its wildlife production potential. Appendix 2 contains a plant list for the planning area.

Vegetation Community Types. The biophysical report identifies nine different plant communities around the lake:

1. Aspen-white spruce/prickly rose-low bush cranberry/bunchberry
2. Balsam poplar white spruce/low bush cranberry-prickly rose/wild sarsaparilla
3. Lodgepole pine-aspen-white spruce/prickly rose/bunchberry
4. Lodgepole pine-white spruce-aspen/alder/wild sarsaparilla
5. Lodgepole pine-black spruce/Labrador tea/*Vaccinium* spp./feathermoss
6. Black spruce/Labrador tea/horsetail/feathermoss
7. Black spruce-tamarack/Labrador tea/Bog cranberry/Sphagnum moss
8. Swamp birch-willow/Sedge/Moss
9. Sedge-cattail marsh

The biophysical inventory report contains a more detailed description of these vegetation community types in the planning area.

Aquatic Plants. Emergent plants common to Burnstick Lake include sedge (*Carex* sp.), cattail (*Typha latifolia*) and bluejoint (*Calamagrostis canadensis*). Yellow pond-lily (*Nuphar variegatum*) grows in patches in shallow parts of the lake. Other species include water arum (*Calla palustris*) and various species of pondweed (*Potamogeton* sp.). Water arum is the predominant emergent plant at the edges of Birch Lake.

2.1.5 Fauna

A broad spectrum of wildlife species uses the planning area. The most common ungulates are white-tailed deer, mule deer, elk and moose. Coyote are plentiful while lynx, cougar, wolf and black bear are present in low numbers. Beaver, weasel, marten, mink, muskrat and squirrels are common. Feral horses also occur in the area. (Feral horses are not considered wildlife under Alberta legislation).

The planning area contains key moose habitat. Lands classified as FO1, GF2, GLO1 and O2 on the Ecological Land Classification map are the best moose habitat in the planning area. The total area of these lands is 141 ha (7% of planning area).

The lakes and ponds support strong populations of chorus and wood frogs. The extensive marsh areas on Burnstick Lake provide prime nesting habitat for exceptional numbers of black terns, grebes, ducks, blackbirds and several pairs of common loon. A bald eagle pair is known to nest at Burnstick Lake. Bald eagles are not at risk in Canada but there are only two known nesting sites in the M.D. of Clearwater #99. Breeding pairs generally are restricted to larger water bodies with fish and relatively little human disturbance. Bird populations in the planning area generally increase during spring and fall migration (e.g., trumpeter swan, American coot, grebes).

Appendix 3 contains a bird species list for Burnstick Lake. This list is likely to increase over the years.

2.1.6 Landscape

The natural environment around the lake and the foothills and distant mountain scenery are part of the main attractions of the lake. Views include the lake vista with foothills and mountains in the background, expansive marshes, bays and undisturbed mixed forest along the shorelines.

Alterations to the natural visual landscape include a cottage development, campground, parking area and boat launch, access roads and water weir. The relatively small scale of the developments and screening by native vegetation reduces the visual impact on the natural landscape.

2.1.7 Environmentally Significant Features

In 1991 a report on environmentally significant areas (ESAs) was prepared for the M.D. of Clearwater #99. The main purpose of the study was to provide an inventory of environmentally significant areas of regional, provincial, national or international importance. Information was gathered so the sensitivity of significant areas could be evaluated and management strategies prepared. The study determined Burnstick Lake to be a regionally significant site.

The study described Burnstick Lake to have a concentration of significant features in a diverse wetland-upland complex. The Boreal Forest portion of the Red Deer Regional Planning Commission (RDRPC) area contains few such wetland-upland complexes. Significant features include those that have limited distribution or best represent the features within the RDRPC area. These include wetland complexes, areas of diverse hummocky terrain, key moose habitat, nationally vulnerable birds such as great gray owl and regionally uncommon birds and plants such as pileated woodpecker and round-leaved bog orchid.

The study suggested that management for protecting ESAs address activities that reduce the habitat diversity for breeding birds, impact plant and animal habitats or which may have adverse impact on

wildlife populations. Activities included logging, clearing and drainage, additional roads and uncontrolled vehicle access.

An area at the west end of Burnstick Lake (West Stony Creek Candidate Natural Area) has been proposed for protection of approximately 250 hectares of land. The intent of the Natural Area designation is to preserve scenic and sensitive natural features from disturbance, while providing opportunities for observing nature.

Birch Lake is also being considered for nomination as a Natural Area to protect the heron colony on the lake.

Figure 6, page 48 contains a map that shows wetland complexes and proposed Natural Areas in the planning area.

2.2 Prehistorical Resources

2.2.1 Archaeological Resources. There are no recorded archaeological sites within the planning area, likely because no surveys have been previously conducted in the area. As a result, there is currently no known constraint on potential development within the planning area. However, some landforms in the area exhibit potential for the occurrence of archaeological sites and might be recommended for examination if developments were proposed. These include the north and south shorelines of the lake, which represent relatively flat, well drained features, overlooking what would have been a boggy stream bed that may have been attractive as grazing area. This potential tends to diminish the further back from the lake that one gets. Any major development in the planning area that will cause subsurface disturbance should be reviewed to determine whether an Historical Resources Impact Assessment is required.

2.2.2 Palaeontological Resources. There are no known palaeontological localities within the planning area boundaries. The area involves lands that have been categorized on the "Palaeontological Resources Sensitivity Zones" map as possessing "unknown" palaeontological resources sensitivity.

2.3 Historical Resources

2.3.1 Historic Structures. No known historic period sites have been recorded in the proposed development areas. Therefore, an Historical Resources Impact Assessment for historic period resources (structures, dams, canals, bridges, fortifications, trails, portages, battlefields, etc.) would not be recommended for proposed developments in the planning area. However, should such remains be encountered they are to be reported to the Historic Sites and Archives Service.

2.3.2 Historical Use. Historical use around the lake began in about the 1930s. Originally a bush trail provided access to the lake from Caroline. The first road into the area was constructed in the 1930s and was essentially a wagon trail. Activities at this time included hunting, fishing and trapping. A

Charlie Kimbel settled just west of the lake in the late 1930s. He constructed a log cabin next to Stoney Creek about one-half mile west of the lake, fenced a quarter-section of land and had a few horses and cows. A John Yaeger and George Miller settled just west of the present campground At this time. They constructed a combined log cabin and barn structure, and had a few milk cows. Small quantities of butter were taken to Caroline and sold. Trips to Caroline were made for groceries about once a week by team and wagon. The Pengelly family also homesteaded north of the lake about this time.

Also, in the 1930s a Harry Norton tried to establish a fox farm just north of the present campground. He constructed several pens and began raising Alaska blue fox. Apparently he abandoned the venture soon after it began.

The lake attracted fishermen year-round at this time. Netting the lake for pike and suckers is reported. The Benson and McCain families from nearby Kevisville made regular trips to the lake for fishing.

Other activities appeared in the 1940s. An earth-fill dam was constructed at the main outlet of the lake in 1945. Logging had begun and bush mills began operating in the area. Cattle grazing around the lake began in about the 1930s and is now managed through a grazing allotment system. The wagon trail was upgraded to its present-day standard in the 1960s when the first wellsites were drilled near the lake.

A cottage subdivision was established in 1969 when the Public Lands Division of Alberta Lands and Forests offered leased lots through a public draw. The subdivision was incorporated as the Summer Village of Burnstick Lake in 1992. In the 1960s Alberta Forest Service developed a campground near the east end of the lake. The campground was taken over by I.D. #10 in 1973. The campground is currently under lease to the M.D. of Clearwater #99 and is operated by the Caroline Chamber of Commerce.

In recent years an extensive network of seismic cutlines, access roads and wellsites has developed in the area. Road access is now available from west of Caroline via Highway No. 54 and west of Sundre via Highway No. 584.

2.4 Land Development Capability

2.4.1 Canada Land Inventory

The document, *Regional Lake Perspective: Inventory and Policy Directions* (Red Deer Regional Planning Commission, 1976) summarized Canada Land Inventory (CLI) information for central Alberta. Land rated as having high capability for recreation is uncommon in central Alberta (only two sites that are not shorelands are rated as high). Further, only 2.5% of lake shorelands within 1.6 km of water's edge are rated as high. In this context, shorelands at Burnstick Lake have considerably high value for public recreational use. CLI rates shorelines around Burnstick Lake as class three,

which is considered to have high recreational capability. The glossary contains further information on the Canada Land Inventory.

Birch Lake is considered too small to have a shoreland recreational capability rating.

2.4.2 Ecological Land Classification and Evaluations

A biophysical inventory and land use evaluation conducted in 1994 assessed the capability of the plan area to support development. A report titled *Biophysical Inventory of Shoreland Areas - Burnstick Lake, Alberta* (Bentz et al. 1993) contains the results of the inventory and evaluations study.

The specific objectives of the study were to:

- conduct a biophysical inventory of shorelands next to Burnstick Lake,
- produce maps at a scale of 1:10 000 showing ecological land classifications, shoreline types, emergent aquatic vegetation and vegetation disturbance,
- develop land-use capability ratings of biophysical map units for the following activities: buildings without basements, septic tank absorption fields and road location,
- provide reconnaissance-level inventory of animal life in the planning area.

The biophysical report describes map units or ecosites based on similar patterns of surficial materials, landform, drainage, parent materials and vegetation. Ecosites were mapped at a scale of 1:20 000. Final cartography was done at a scale of 1:10 000. Copies of this map may be obtained from Land and Forest Service. Appendix 4 contains a list of the ecosites mapped within the planning area.

Ecosites were evaluated on their suitability for the construction or installation of buildings without basements, septic tank absorption fields and roads. Evaluations are expressed as limitation ratings for development. In areas having moderate to severe limitations for development, the presence of high clay content in the soil, poor soil drainage and susceptibility to flooding in depressional sites, and steep slopes next to the shoreline are the main constraints for development. Additional design, construction and maintenance may be required to overcome these constraints. Sometimes, modifications may include artificial drainage, runoff control, extended sewage absorption fields and extra excavation. Fifty-one percent of the planning area is rated as having moderate to severe limitations for development, 45.1 % has severe limitations and 3.7% has moderate limitations. The biophysical report contains a more detailed description of how land use evaluations were carried out for the planning area. Figure 4 contains a map that shows the distribution of development limitation ratings within the study area. Appendix 4 contains an overview of the results of each evaluation procedure.

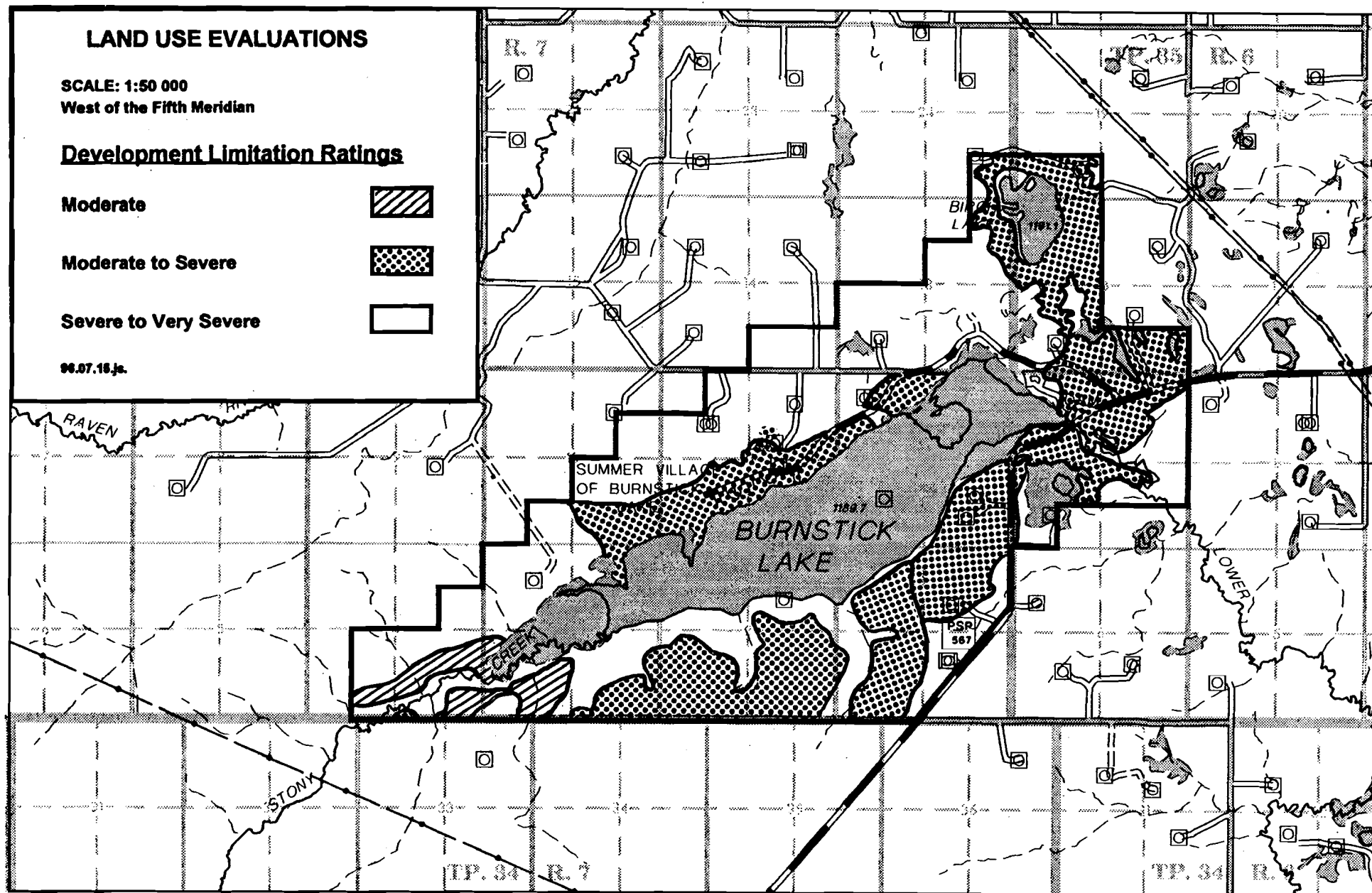


Figure 4

2.4.3 Recreational Capacity

Overview. There are at least three factors that may influence the amount of recreational activity a lake can sustain. One is the amount of shoreland that can support recreational use and development. Two is the area of water suitable for the safe operation of boats. Three is the capacity of the lake to absorb nutrients from human activities without changing the existing water quality. Water quality may be the prime consideration in determining the amount of development that some lakes can sustain, or carrying out appropriate strategies to minimize the addition of nutrients to the water.

Shoreline Capacity. Shoreline capacity estimates are based on the area of land surrounding a lake that can be developed for recreation. Primary considerations are soil depth and type, depth to ground water, topography and slope.

The *Biophysical Inventory of the Shoreland Areas of Burnstick Lake* (Bentz *et. al*, 1994) rates about 950 ha of land in the planning area as having moderate or moderate to severe limitations for development. The report suggests ways of overcoming limitations (e.g., artificial drainage, soil modification.)

Boating Capacity. Boating capacity of lakes has been used as a criterion for development the shoreland can support. First, a boating capacity estimate is determined. This estimate is then used to determine how much development (e.g., cottages, camping sites, day use sites) should be allowed so as not to exceed the lake's capacity to support boats originating from these developments.

The capacity of a lake to support boating is related to a combination of physical and social factors. For example the size, depth and shape of a lake all affect the area of usable water surface on a lake. Furthermore the size, speed and type of boats and user expectations about acceptable boating on the lake also affect its capacity. Consequently, the use of lake boating capacity for planning purposes should recognize the limitations imposed by all the factors that affect it.

For comparative purposes, a boating capacity model was applied to Burnstick Lake. Studies on North American lakes (Jaakson, 1970) suggest that on average four hectares is considered an acceptable standard for the safe and pleasant operation of a boat. Based on this standard, Burnstick Lake could accommodate approximately 42 motor boats at a time (open deep water = 169 ha). The area of open deep water is taken from *Biophysical Inventory of Shoreland Areas - Burnstick Lake, Alberta* (Geowest Environmental Consultants, 1994).

Lake Water Quality. Phosphorus is the plant nutrient most often implicated in water quality deterioration in recreational lakes. If the supply of phosphorus to a lake should increase, the amount of suspended algae and other water plants in the lake water may increase. This leads generally to a decrease in the recreational quality of the lake.

External phosphorus sources to lakes include direct deposition from the atmosphere (rain, snow and dust), runoff from areas of native vegetation (delivered to the lake in streams and runoff),

groundwater inflow and droppings from animals such as beavers and waterbirds. Human activities that may act as a source of phosphorus include livestock wastes, clearing of natural vegetation, development of cottages and campgrounds (sewage and grey water), roads and fertilizers.

Not all the phosphorus entering the lake contributes to algal growth. Some settles out in the bottom, and the bottom sediments of the lake have the capacity to adsorb phosphorus from the water. Thus, the sediments may act as a buffer. In some lakes, however, the bottom sediments release phosphorus in summer, stimulating algal blooms. Phosphorus entering the lake may also be taken up by aquatic plants.

Estimating the phosphorus supply to a lake is one way of evaluating present and potential future impacts of land use activities on the lake's water quality. Phosphorus supply estimates for Burnstick Lake were calculated in 1995 (Alberta Environmental Protection, 1995. *An Evaluation of Phosphorus Sources to Burnstick Lake.*) Appendix 5 contains a section from this report describing how phosphorus sources were estimated, and a complete excerpt of the conclusions from the report. The main conclusions of this report are summarized as follows:

- There is very little difference in the estimated phosphorus supply between present and future scenarios.
- The results suggest that the lake water quality is higher than what would be expected from the estimated phosphorus inputs to the lake. If this is so, there is a risk that eventually aquatic plant growth may increase and water clarity may be reduced.
- The development of small campgrounds, such as the Burnstick Lake Resort, would likely have a minimal impact on water quality in the lake as a whole.
- Outside the natural phosphorus supply from forested land, it is likely that the greatest single source of nutrients for Burnstick Lake is cattle within the watershed, especially those with access to the lake and its inflow streams.
- The preservation of water quality should be a major focus of decision-making for development within the watershed. It should be possible to protect water quality in the lake, and still allow carefully controlled development.

2.5 Current Use and Demand

Figure 6 (see page 48) contains a map that shows existing land uses and development in the planning area. The following sections contain a description of current use and demand within the planning area.

2.5.1 Recreation

Overview. Burnstick Lake supports many outdoor recreation activities. The lake is popular for fishing, boating, water skiing, and swimming. The land surrounding the lake is used for equestrian riding, all-terrain-vehicle riding, hiking, snowmobiling, wildlife viewing, hunting and random camping.

In a 1994 recreation survey (Burnstick Lake Management Plan Questionnaire), the most popular summer activities were fishing (65% of respondents) followed by swimming (57%), wildlife viewing (42%), picnic/sunbathing (42%), hiking (39%), motorized boating (39%) and canoeing (32%).

Fishing. Burnstick Lake provides opportunities for fishing in a natural setting. The lake is popular for fishing. Data on total fishing use are unavailable. However, campers from the municipal campground generate an estimated 4 225 angling-days in the summer months, based on the percentage of campers who reported they fish. Additional angling-days are added by cottagers and other public.

Angling occurs throughout the summer and winter. The current extent of the harvest is unknown since angler surveys have not been recently conducted at this lake. The entire fishery resource in this lake has been allocated to the sports fishery.

Burnstick Lake Fishery. Burnstick Lake supports naturally reproducing sport fish populations of northern pike and yellow perch. Spawning areas for these species are dispersed about the lake. The weed beds are critical for both perch and pike. Perch spawn in and use the weed beds for escape cover. Pike spawn in shallow weedy areas next to the shore where water temperatures warm up rapidly in the spring. Spawning area available for pike likely increased when the water level of the lake was raised in 1946. Pike could use much of the lake for spawning, especially the east and west parts of the lake.

Walleye were introduced into the lake from 1991 to 1993 (15,000 - 20,000 each year). The introduction appears to have been successful. However, it is too early to tell if the walleye will spawn in the lake. In 1994 few were of legal size to be harvested. If the walleye were to spawn, spawning would most likely occur along the north and south shores of the lake, where rubble areas are present. Weed beds would also serve as rearing and feeding areas. If natural reproduction takes place, the lake will be evaluated to find out whether additional spawning areas will be required. Fish and Wildlife would do what is necessary to improve the walleye fishery.

Test netting done on Burnstick Lake in October 1994 suggests that Burnstick Lake probably could provide a sustainable yield of 4.9 kg/ha of fish per year (1435.7 kg of fish). This includes all fish species including sport fish and suckers. Test netting showed that sport fish comprised 40% of the fish population in the lake. This works out to a sustainable yield of 575 kg of fish per year (73% northern pike, 21% walleye and 6% yellow perch).

Using the mean size of the fish caught in the gill nets, no more than 437 pike, 175 walleye and 401 yellow perch should be harvested each year.

A winter creel completed in 1983 obtained information on angler use and harvest on Burnstick Lake. Assuming each angling party (mean of 2.5 anglers per boat) catches one fish of each species per trip (2.5 angler days), this lake could support 1090 angler days of angling for northern pike and 960 days for yellow perch. In the winter of 1983 anglers were spending approximately 600 angler days fishing

for perch.

Yellow perch were introduced in the early 1970s and by early 1980s had established a popular sport fishery with fish of good size. By the mid-1980s fish size was declining, although numbers were good. Few perch were detected through test-netting in 1994, although their numbers are expected to come back, as the species has high reproductive potential.

Burnstick Lake provides a small but important fishery for anglers within the region. Anglers come from Calgary, Edmonton and other parts of the province as well. The fishery is comparable to other sport fisheries in the region (e.g., Medicine Lake) although not quite as productive as Medicine Lake.

Birch Lake Fishery. Birch Lake was last stocked with 15,800 brook trout in 1995. Because of occasional winter-kill, the lake has not provided a reliable fishery. Birch Lake will continue to be stocked every second year with brook trout.

An oil industry road provides vehicle access to within a short walk of Birch Lake.

Wildlife Viewing. Burnstick Lake is one of sixty Watchable Wildlife Viewing Sites in Alberta. During selection of these sites, the lake's wildlife was rated provincially significant. The planning area also contains a candidate natural area.

Birch Lake supports a great blue heron nesting rookery. The heron rookery is particularly valuable because it is easily accessible and has over 50 nests (above the provincial average). There are 75 known heron rookeries in Alberta.

Wildlife viewing is very popular and dependent on the abundant bird species that use the area. Loons, blue herons, bald eagles, nighthawks and western tanagers are especially valuable because they nest here. While accessibility for wildlife viewing is excellent, the wildlife viewing potential at Burnstick and Birch Lakes has not been fully developed. Directional signage, parking facilities and information services would provide an improved service for people who want to view wildlife.

Hunting. The demand for hunting opportunities is high but the use levels in this area are expected to remain stable at the current levels. The plan area (20.8 km²) is 1.8 % of Wildlife Management Unit (WMU) #318 (1154 km²). Based on a 1993 phone questionnaire of recreational hunters, this area provided the following days of hunting:

Table 3. Recreational Hunting

SPECIES	HARVEST ESTIMATE (Planning area)	SUCCESS RATE (WMU area)	HUNTING DAYS	HunterDays Per Animal
White- tailed deer	2	19%	47	27
Mule deer	2	52%	31	11
Moose	1	62%	9	9
Elk	0	7%	28	90

Black bear, grouse and duck hunting also occur here but don't likely exceed 30 days. Subsistence hunting by natives may also occur at low levels.

Trails. Trail use includes mainly walking, off-highway vehicle riding, cross-country skiing and snowmobiling. Trail routes follow mainly seismic trails and former roads. Recreational trail development has been minimal, so motorized and non-motorized use occurs on the same trails. The lake is popular for snowmobiling. Some commercial trail riding also occurred in 1994.

Random Camping. Random camping occurs at a few locations around Burnstick Lake, but no statistics are available.

Boating. Boating on Burnstick Lake occurs mainly on summer weekends. A tally conducted in 1994 by the Summer Village of Burnstick Lake suggested that an average of 32 water craft could be expected on the lake on a weekend day. The majority were power boats (24), but canoes (5) and sail boats (3) were also observed. The highest number of boats counted on the lake occurred on July 16, 1994 when 57 power boats and a total of 60 boats were tallied (included boats tied to docks). More than 42 boats were counted on the lake (including boats tied to docks) on nine separate days during the summer. When asked what could be done to make their stay safer and more enjoyable, twelve percent of lake users surveyed stated that boat size and speed should be limited, and seven percent stated that large power boats should not be allowed.

Boating activity is expected to increase with the opening of phase one of Burnstick Lake Resort. Assuming there will be one boat per two units and one boat in three will be on the lake at any one time, phase one would be expected to add five boats to the lake $(30 \div 2) \div 3 = 5$.

Municipal Campground. A 64-unit public campground is located on the northeast shore of Burnstick Lake. The campground is located on a 28.2 ha lease, which is held by the Municipal District of Clearwater #99. The Caroline Chamber of Commerce operates the campground, which

is open from the May long weekend to the September long weekend. Visitation at the campground was 2 400 camping units or approximately 6 500 user-nights in 1994. Services include gravelled camping pads, pump-out toilets, a water well, public telephone, playground, centralized garbage bins and firewood. A constructed beach is located near the campground. Most of the sites are for single units; some units may be occupied by two groups. A group camping area is available. Activities include mainly fishing, swimming and boating.

A concrete boat launch and wooden dock are located on the north shore of the lake above the spillway channel. People who stay in the campground are the main users of the boat launch and dock. Most of the use is related to fishing; water skiing occurs during the warmer part of the summer.

Summer Village (Private Cottages). The Summer Village of Burnstick Lake is located on the north shore of the lake and generates an estimated 15 000 user-days of recreation on an annual basis.

The Summer Village of Burnstick Lake is a 57-unit cottage development serviced by an all-weather road, power and telephone. Average lot size is 0.11 ha, with a range from 0.08 to 0.14 ha. The total size of the development is 18.2 ha. All 57 lots are occupied; three cottages are permanent residences, and more can be expected in the near future. The buildings are generally small, with varying sizes and materials. A central boat launch serves the Summer Village and is also used by public. Approximately 40 private docks have been constructed by cottage owners. Services include two central water pumps, and central garbage bins on a utility lot near the main road. There are ten private water wells. Pit toilets are common but with recent upgrading, nine units have holding tanks, and three have septic fields. More are being added each year. (Regulations and approvals for septic fields come from the Plumbing and Inspection Branch, Alberta Department of Labour). Most of the units use propane gas and are supplied with electrical power.

Burnstick Lake Resort. Phase one of a proposed 13.5-hectare multi-phase resort is under development on the south side of the lake. Phase one includes the construction of a 30-unit campground, store, boat launch and dock, pump-out toilets, water well and staff cabin. The approved dock has a T-design with a total length of 30 m (100 ft) and an estimated capacity of ten boats. A small beach may also be constructed. Clearing for new roads within the lease area was completed in 1994. A new road along an existing right-of-way provides access from the main road east of the lake to the resort lease-area. Construction of this road was completed in 1996. An adjacent abandoned wellsite has been used for temporary storage of firewood. The resort will provide an estimated 3 000 user-nights of camping a year.

The resort owner has indicated plans for additional phases of resort development. Additional phases would require about three to four additional hectares of land adjacent to the existing lease. Overnight capacity would be planned to increase by about 55 units (e.g., camping units, rental cabins, group camping area). Approval of any future expansion and development of the resort would be subject to requirements imposed by current legislation and government policies, and this plan when approved.

Appendix 6 contains a map that shows the resort development area.

Birch Lake. Birch Lake, located in the northeast corner of the planning area is also popular for fishing and wildlife viewing. A formal wildlife viewing site is under development, overlooking the great blue heron nesting colony on Birch Lake.

2.5.2 Tourism

Overview. Recreation is a primary activity on and around Burnstick Lake. The recreational experience which people expect to have when they visit Burnstick Lake is unique to the region. For example, people enjoy the natural scenery, excellent water quality, fishing and watchable wildlife and a variety of facilities such as the campground, parking areas, boat launches, constructed beaches and cottages. Any future development of the recreation and tourism potential of the planning area should consider how these existing recreational opportunities can be protected and maintained.

Tourism Potential. Burnstick Lake, with its natural setting and proximity to a large urban market, is attractive for tourists interested in a variety of water-based and land-based recreational activities. Currently it is a popular destination for the regional market area. The potential for Burnstick Lake to attract additional tourists will be dependent on available facilities and activities, and the level of marketing the area receives. The private sector will play a key role in the development and delivery of any additional tourism accommodation or associated activities. However, the physical and environmental characteristics of the Burnstick Lake Management Planning Area will be limiting factors with respect to all future recreation and tourism development proposals.

2.5.3 Agriculture

Agricultural resources in the planning area consist mainly of unimproved wooded rangeland. All rangeland within the planning area is on public land. Grazing on public land in Alberta is authorized under dispositions issued pursuant to the Public Lands Act. These dispositions include:

- (a) Forest Grazing Licenses,
- (b) Grazing Lease,
- (c) Grazing Permit,
- (d) Head-Tax Grazing Permit.

The plan area encompasses parts of two head-tax grazing permit areas:

- (a) North Burnstick Head Tax Area,
- (b) Northeast Burnstick Head Tax Area.

The Nordegg-Red Deer River IRP identifies grazing as a compatible use within most of the plan area. Local range management practices include grazing up to the shores of Burnstick Lake. Grazing is usually restricted to the months from June 1 to October 31. Recommendations for grazing outside

these dates may be made based on "range readiness" if it occurs consistently before or later than June 1 of each year.

Two other grazing dispositions adjoin the plan area, one to the south west and one to the west of the plan area.

Local residents have expressed concern about the potential impact of cattle on riparian areas. No recent information is available concerning erosional problems within the planning area.

The North Burnstick Head Tax Grazing Area has 913.5 approved animal-unit-months of grazing. Based on old inventory data, approximately one-third of the animal-unit-months (AUMs) fall within the planning area. The new inventory data (incomplete compilation in June 1996) is showing about 20% of the approved animal-unit-months of grazing fall within the planning area.

The Northeast Burnstick Head Tax Grazing Area has 1 731 approved animal-unit-months of grazing. Approximately 30 AUMs of the approved total are within the planning area.

2.5.4 Trapping

The entire plan area (20.8 km²) is within registered trapping area #1999 (402.9 km²). This area has been very productive for beaver, coyote, muskrat, marten and mink. Species such as weasel, squirrel and snowshoe hare are also taken regularly. Wolf, fox and fisher are occasionally caught. No issues or concerns relative to this plan have been identified.

2.5.5 Minerals

Mineral activity within the planning area consists of exploration and development of petroleum and natural gas of the Caroline Field. Oil was first discovered here in 1975 and natural gas first produced in 1979. A total of 17 wells has been drilled; five currently produce oil and two produce gas. One well, which was directionally drilled, produces oil from under Burnstick Lake. Two other wells are abandoned, three are suspended (may be non productive), and three are used for injection of solvent or water. Also, two wells have been drilled very recently. Exploration within the planning area in 1994 may lead to the development of additional wells.

Oil production comes from three separate formations of the Colorado Group: the First White Specks, the Cardium and the Viking. The gas is from the Viking Formation, as well as from the Ostracod Zone and the Ellerslie formation of the Lower Manville. These productive horizons are found at depths of approximately 2 500 m to 3 100 m below surface. Pipelines connect several wells here to the regional pipeline system. All of the oil and gas production is sweet, that is it contains no hydrogen sulphide.

Wellsite leases occupy a total area of 22.9 ha; there is a total of 39.3 km of seismic lines and 9.7 km of buried pipeline. Power lines service some wells. There are 21 petroleum and natural gas (PNG)

dispositions that underlie the entire planning area, with some areas having two leases superposed (for shallow and deeper rights). Amoco holds 14 of the 21 leases and PetroCanada holds four, while three other companies hold single leases. More exploration can be anticipated because there are still non-producing formations and areas that may have good potential. Oil and gas production will continue for many years.

There are parts of two metallic and industrial mineral exploration permits that underlie all of the planning area. These reflect the recent interest in the possibility of encountering formations that might contain diamonds or other rare minerals; however, no discoveries have been made.

2.5.6 Roads and Utilities Infrastructure

Infrastructure around the lake is associated with industrial, recreational and leisure residential development. Most of this development is located on the north and east side of the lake and is accessible by gravelled, all-weather roads. Burnstick Lake Resort located on the south side of the lake, and is accessible by a 1.29 km road along a municipal road allowance. The total length of roads, including municipal roads, is 15.9 km. (Road construction on road allowances is subject to approval by the Municipal District, which sets construction standards).

An aboveground powerline services the Summer Village and well sites in the area. A buried telephone line services the municipal campground and the Summer Village. Telephone service is planned for the resort on the south side of the lake.

An earth dam and concrete weir is located on East Stony Creek, at the outlet of the lake. Figure 6 contains a map that shows existing development in the planning area.

2.5.7 Timber

The land around Burnstick Lake is extensively forested. Timber supplies consist mainly of coniferous stands of white spruce and lodgepole pine intermixed with aspen. All the commercially available timber resources in the general area are committed to quota holders and miscellaneous timber use. Quota holders are generally forest companies who hold the right to harvest a specified share of the annual allowable cut within a forest management unit. Miscellaneous timber use areas define land within a forest management unit to provide timber for local use. Timber is allocated for local use through Local Timber Permits and/or Commercial Timber Permits. Timber is managed on a sustained yield basis. The Burnstick planning area lies within the B6 forest management unit where all timber has been allocated to:

- (a) Sunpine Forest Products Forest Management Agreement Area that is contained within the Forest Reserve west of the Burnstick Lake planning area. Sunpine's FMA has no effect on the planning area in relation to timber commitments,
- (b) Spray Lakes sawmills have a quota allocation contained partly within the Forest Reserve and

partly within the Green Area outside the Forest Reserve. (The part within the Forest Reserve is also partly within Sunpine's FMA). Spray Lake's quota has no effect on timber commitments within the planning area,

- (c) The B6 Miscellaneous Timber Use area is contained within the B6 Management Unit and supplies timber to meet local demand of the residents and is sequenced entirely within the Green Area outside the Forest Reserve around Burnstick Lake.

All timber within the Burnstick Lake planning area will be sequenced to supply timber to meet the local demand as committed under the Miscellaneous Timber Use area. Figure 5 shows a map of timber resources in the planning area.

The productivity of land around Burnstick Lake for growing timber is classified into three categories: non-productive, productive and potentially productive. The glossary contains definitions of these categories. The area of each category in hectares is as follows:

Productive	852.3	Burnstick Lake ¹	387.7
Potentially Productive	185.3	Birch Lake	34.8
Non-Productive	575.7	Planning area	2035.8

The area of productive forest land may be somewhat less than these figures suggest when buffers and facilities within the planning area are considered.

Timber harvesting in any one area is generally planned over a twenty-year quadrant. During this time no more than half the timber may be harvested, less areas excluded to provide for stream and lakeshore protection, tourism and recreational needs, and other environmental concerns. Timber may be removed in two-pass or three-pass systems, with approximately twenty-year intervals between each pass. There has been no commercial timber harvesting within the planning area to date. The B6 management unit is being re-inventoried.

Harvesting Planning and Operational Ground Rules would presently allow logging within 200 meters of the high water mark of Burnstick Lake. However, site specific conditions would be considered during approval of any timber harvest around the lake. Under the ground rules, buffers around the lake are available for selective logging to control disease, windfall and fire hazards should conditions warrant. Landscape logging within the visual area around Burnstick Lake is a requirement to maintain the aesthetics of the area from the impact of timber harvesting.

¹

Area calculation includes aquatic emergent vegetation. Timber map calculation may differ from ELC calculations used in other parts of this plan.

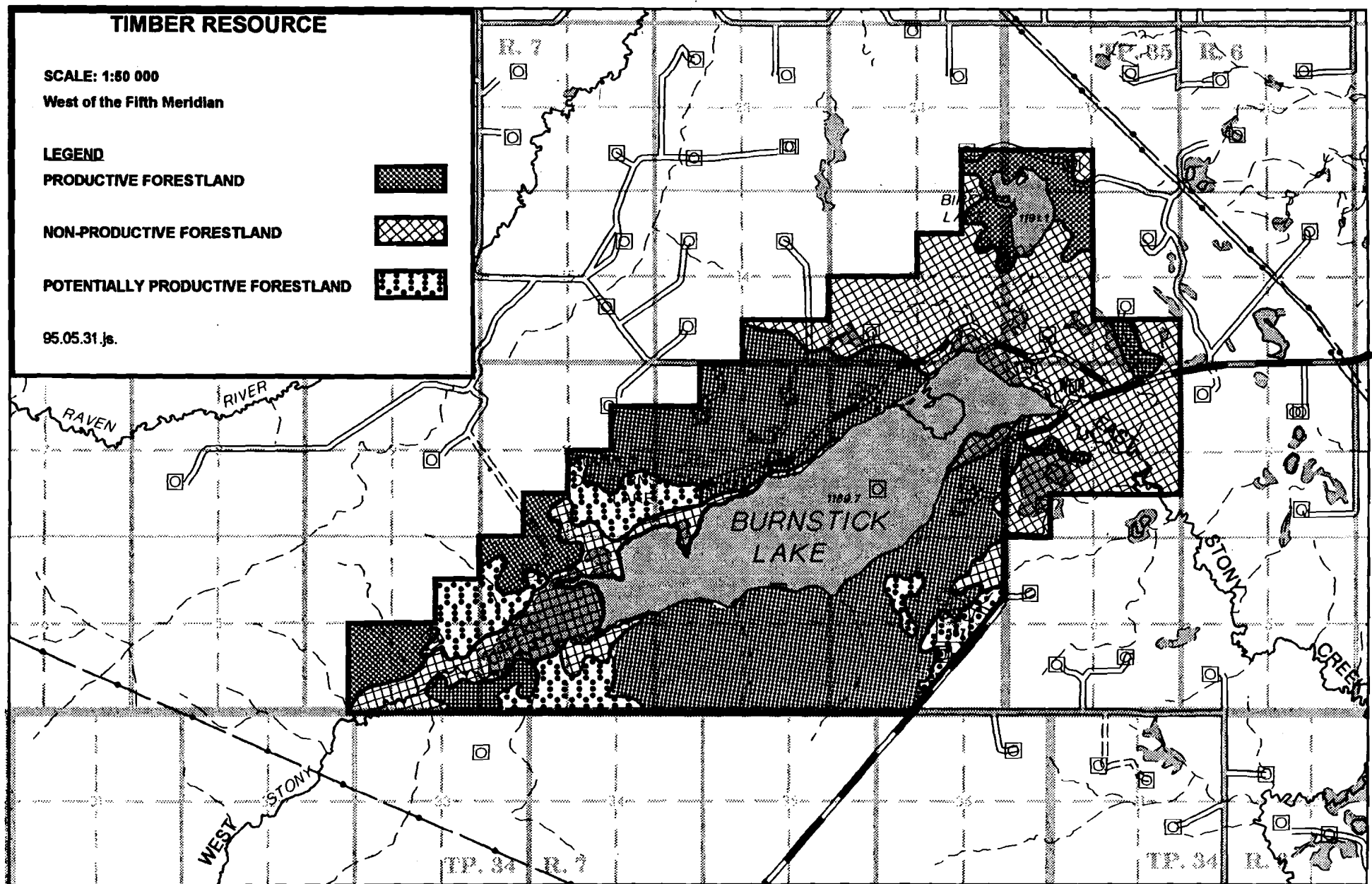


Figure 5

2.6 Planning Area Issues

Current use and demand for additional development and activities within the planning area have created the need for a lake management plan. An approved plan will provide guidelines that any existing and any future development must meet to maintain an acceptable level of environmental quality on and around the lake. The main planning area issues are summarized as follows:

1. How should shoreland uses and development be controlled to minimize impact on water quality?

Impacts of recreational development on water quality can be reduced by various means. Avoiding slopes and unstable ground, using pumpout toilets, proper installation of septic fields and restricting use of fertilizers are helpful in minimizing the artificial addition of phosphorus into the lake. Proper construction of lakeshore developments and runoff control works also reduce the entry of phosphorus and sediment into the lake. For example, providing storm water detention and retention areas and stabilizing disturbed areas minimizes addition of sediment to the lake. Appendix 7 contains a list of conditions from a Water Resources Permit for Burnstick Lake.

The impacts of resource uses such as cattle grazing, timber harvesting and oil and gas exploration and development on water quality can be minimized in various ways. Grazing impacts can be minimized by maintaining range in good condition, and using sound management practices such as providing salt locations away from lakes and water courses. Timber harvesting impacts can be minimized by leaving buffers of undisturbed vegetation along lakes and permanent water courses, and proper installation of stream crossings where roads cross streams. Oil and gas impacts can be minimized through the use of heli-assisted seismic programs to avoid the creation of new trails, ensuring wellsites are setback from water bodies and proper construction of roads and stream crossings.

2. How should future shoreland development be controlled to maintain desired types and levels of recreational activities such as boating on the lake?

Current information suggests that increased boating levels on Burnstick Lake may reduce the lake's attractiveness for boating and other recreational activities. Any new future development must consider how it may impact boating on the lake.

3. How should the sport fishery be managed?

Burnstick Lake is considered to have relatively low potential to grow sport fish owing to its oligotrophic classification. The sport fishery in Burnstick Lake has changed in recent years owing to heavy angling pressure. In addition, walleye have been introduced to the lake. Monitoring and appropriate management will be required to ensure a viable sport fishery in the planning area.

4. How should any potential conflicts between resource uses (e.g., minerals exploration and development and timber harvesting) and recreational values be minimized?

The area near Burnstick Lake has high recreational value, including natural aesthetic values and a natural vegetation buffer that helps to maintain the high water quality of the lake. Any activities such as mineral exploration and development and timber harvesting should be carefully controlled near the lake to minimize any potential impacts.

5. How should the potential negative impacts of recreational and resource activities and development on wildlife be minimized?

Burnstick Lake planning area contains important wildlife viewing areas and species associated with wetland complexes in the area. The sport fishery is an attractive but limited resource. Any development plan must address the possible impact the development may have on wildlife populations, especially waterbird nesting areas and fish habitat. A range of management techniques, including land use zoning, education and restrictive measures may be required to maintain viable populations of wildlife in the area.

3.0 RESOURCE MANAGEMENT STRATEGY

Overview

Burnstick Lake's natural forested setting, excellent water quality, fishing potential and watchable wildlife resources make it a unique regional resource. However, information and public opinion collected for this plan suggest that recreational development is approaching a maximum acceptable level. For example, Burnstick Lake's capacity for additional development is very limited. As well, the amount of land around the lake that can support additional recreational development is limited. The effects of other resource and land uses such as oil and gas development, grazing and any future timber harvesting also need to be considered. The following section contains general direction for environmental protection and development control around the lake.

Management Intent

The primary management intent for the Burnstick Lake Planning area is to provide for an amount and diversity of public recreation that will be consistent with its aesthetic, ecological and environmental quality and features, and make provision for other appropriate *resource and land* uses while minimizing conflict. More specifically, the intent will be to maintain the natural, wilderness-like setting of Burnstick Lake and ensure that activities compatible with this setting such as fishing and wildlife viewing are not compromised. Environmental protection will be given high priority in any land and resource management strategy and land use decision. This section contains resource management objectives and guidelines required to fulfill the management intent for the planning area.

Management of land and resource uses within the planning area will place emphasis on public recreation, and will not exclude some private use where appropriate. Land and resource management decisions will consider the following priority areas: water quality, land capability evaluations, natural aesthetics, special management areas such as candidate Natural Areas and the heron colony, fisheries and wildlife viewing such as waterbirds.

Eastern slopes zoning along with the list of permitted uses as described in the Nordegg-Red Deer River Sub-regional Integrated Resource Plan provide general direction for land and resource management in the Burnstick Lake area. Figure 6 (see page 48) contains a map that shows the location of IRP zones within the planning area. In addition, this map shows lands under protective notation and lands that this plan recommends for rezoning from Multiple Use to Critical Wildlife.

The *Biophysical Inventory of Shoreland Areas - Burnstick Lake, Alberta* (Bentz *et al*, 1994), contains supporting information (e.g. soil limitations, slope) for directing any future development to appropriate locations within the planning area and providing guidelines to minimize environmental impacts (e.g. sewage disposal).

Burnstick Lake, because of its size and extensive shallow areas, has limited capacity for additional water-based development without changing the existing character of the lake and patterns of

recreational use. This management plan considers these constraints.

The following sections contain management objectives for each resource area, and guidelines for carrying out the objectives. When evaluating whether a use or activity is appropriate for the planning area, the intended use or activity is measured against all the objectives and guidelines to ensure compliance with this plan.

3.1 Recreation

Recreation is a primary resource activity within the planning area. Activities like camping, fishing, swimming and boating focus on Burnstick Lake. Other activities like wildlife viewing, hunting and trails focus on the land area. Future recreational activity within the planning area may be constrained by existing recreational concerns and issues that include:

Water related concerns: Boating conflicts (eg., types of boats, noise) and boating safety (e.g., snags, too many boats).

Land related concerns: Aesthetics (e.g., vegetation screening), land use conflicts, impacts of industrial activities on recreation, conflicts among recreation activities (eg., motorized vs. non-motorized) and public access to lakes.

Recreation Management Objectives

1. To maintain or improve natural recreational values of the planning area.
2. To protect the natural aesthetics of the area, especially around the lakes.
3. To ensure recreational activities are consistent with maintaining the natural environment.
4. To maintain development around the lake consistent with desired recreational activities on the lake.
5. To minimize conflicts between recreation and other land uses.
6. To minimize conflicts between motorized and non-motorized activities.

Recreation Management Guidelines

1. No increase in access for boating will be permitted. Parking areas will be limited to accommodate only existing *capacity*. Boat launch replacements will not be increased in size.

2. Additional recreation and tourism development may be permitted if the proponent can show that recreational values (e.g., aesthetics, watchable wildlife viewing, fishing) and public safety (e.g., boating) can be maintained. Note: This guideline applies only to the social aspects of the values mentioned, as opposed to biophysical aspects which are addressed in following sections.
3. New developments will be prohibited on steep slopes and soil types subject to erosion (e.g., biophysical units M3 and MGF1) and on biophysical units having severe and very severe development ratings for buildings without basements (e.g., F01, GL1, GL01, M5, MGF1, M01, O1, O2, O3 as defined by the biophysical report).
4. Existing visual vegetation screens will be maintained from the water for new developments.
5. A 30 m natural vegetation buffer will be maintained between all developments and the lake, except where access is required to approved lakeshore developments (authorization required under the Water Resources Act).
6. The Summer Village will be encouraged to establish by-laws to protect the natural aesthetics and watershed along the shoreline of Burnstick Lake within the Summer Village.
7. The Department will support a review of boating concerns and the need for boating restrictions on the lake for public safety purposes.
8. Recreational trail developments will be permitted where they do not impact critical fish and wildlife habitat (see Wildlife guidelines). Where possible, new trails will follow existing cleared lines and adhere to aesthetic guidelines within 200 metres of lakes.
9. Random camping will be monitored. Where problems occur (e.g., near the outlet of the lake), random camping will be controlled to minimize conflicts with other resource and recreational activities and impacts on the natural environment.
10. Public access to the lakeshore will not be restricted except as required to protect special features such as eagle nests.
11. A public advisory committee will be created for information exchange purposes, and to monitor and report to Land and Forest Service (LFS) about issues on this plan.
 - a. During ATRL stage one pre-application meetings, proponents will be encouraged to contact the public advisory committee to discuss their plans.
 - b. After formal application through ATRL is made, LFS will inform the committee of any commercial recreation development applications at the public disclosure stage, and of extensions to approved development applications and permits.

Section 4.1 contains additional information on the public advisory committee.

3.2 Water and Watershed

Burnstick Lake has excellent water quality. The lake is classified as oligotrophic with low productivity of algae.

The lake water level was raised by a weir that replaced a beaver dam. However, shallow areas still have snags and tree stumps protruding from the water, and care needs to be taken by boaters. Periodically, muskeg vegetation islands break free from the shoreline and float into and on to beach areas, creating problems that restrict usage.

Resource Management Objectives

1. To manage the water resources of the area consistent with present legislation and to ensure sustainability of the water resource.
2. To maintain or improve present quality of water.
3. To minimize the impact of existing development and potential development on the present quality of the water.
4. To maintain water fluctuations within the framework of the present weir operations.

Resource Management Guidelines

1. All new developments will be reviewed on a site and development specific basis within a 200 metre buffer around the lake. New developments will be set back a minimum of 30 metres, except for water developments such as beaches, docks and walking trails. The cumulative effects of beaches and docks will be considered during review of applications.
2. Recreational facilities at or near the shoreline will be designed to accommodate the historic range of water levels of the lake.
3. Development will be designed to minimize any potentially negative impacts on the lake. Roads, parking lots and sewage facilities will be located and designed to minimize stormwater runoff and prevent sewage effluent from entering the lake. Approvals under the Alberta Environmental Protection and Enhancement Act and the Plumbing and Drainage Act will be required for all water and waste systems.
4. Lake water quality will be monitored on an as needed basis and appropriate measures will be taken to ensure its continued sustainability. (Refer to the Water Quality, Recreation Capacity and Implementation Sections in this plan for more detailed information).
5. The clearing and removal of emergent and submergent vegetation will require approval under the

Water Resources Act. The evaluation of the type of vegetation removal (e.g., by hand or mechanical means) will be based on site specific application. The following guidelines will be the minimum standard to be met:

- a. any developments will be restricted to removal of aquatic vegetation to a maximum of about 20% of the vegetated lake frontage of the development. In some areas of critical habitat, vegetation removal may not be permitted,
- b. developments will be restricted to having a single communal beach/swimming area development, if approved,
- c. mechanical means of vegetation removal only will be permitted (no herbicides).

6. The removal of any vegetation on the lake bed or bank will be evaluated on a site specific basis by the Department.

7. Floating vegetation will be monitored and any problems addressed on a case-by-case basis by the Department.

8. The use of pesticides and herbicides within 30 m of lakes will be restricted to minimize their impact on water quality. The use of fertilizers near lakes is discouraged. The use of fertilizers will be prohibited in new commercial developments. The Summer Village of Burnstick Lake will be encouraged to limit the use of fertilizers by cottage owners.

3.3 Fisheries

Fishing for northern pike has been the primary use of this area. Brook trout fishing in West Stony Creek also has a long history but the size of the creek and lack of access have limited its use. Yellow Perch fishing is also popular in Burnstick Lake. If the recent introductions of walleye into Burnstick succeed that species will be very popular with people fishing. Birch Lake has potential to provide excellent brook trout fishing if overwinter survival can be assured.

Resource Management Objectives

1. To protect habitat areas and to maintain water quality that are important for specific fish populations:

- a. spawning and rearing areas for walleye, northern pike and yellow perch in Burnstick Lake.
- b. spawning, rearing and overwintering areas for brook trout in West Stony Creek.
- c. spawning, rearing and overwintering areas in East Stony Creek.

2. To provide optimum angling in Burnstick Lake by maintaining and where possible enhancing natural reproducing game fish populations.

3. To further information on fish populations for fisheries management purposes.

4. To enhance the fish overwintering potential of Birch Lake.
5. To provide angling opportunities by establishing a brook trout fishery that is not detrimental to the blue heron population.

Resource Management Guidelines

1. Angling regulations will require regular review in relation to angler use, harvest levels and fish population conditions to ensure the long term survival of naturally reproducing sport fish populations.
2. Periodic angler surveys will be required on the lakes in this planning unit to measure recreational use and fish harvest.
3. The walleye introduction in Burnstick Lake will be monitored to determine the success of the plant and if natural reproduction is occurring.
4. Birch Lake will continue to be stocked with brook trout when there is excess stock.
5. The feasibility of aerating Birch Lake will be considered.
6. Fisheries management plans will be developed for Burnstick and Birch Lakes. The plans will be compatible with any plans for other lakes and streams in the area.
7. Protection of fisheries and fisheries habitat will be accomplished through continued participation of Fisheries Management and Water Management, Water Administration Branch in referral systems dealing with development in and around water bodies.

3.4 Wildlife

The species associated with the lakes are the primary ones in the planning area. Species such as herons, bald eagles, loons, grebes, ducks, terns and blackbirds require the protection of their nesting and feeding habitat. Much of the area is in its natural state and traditional wildlife uses such as hunting, viewing and trapping will be maintained. Development of viewing opportunities and habitat improvement will be promoted.

Resource Management Objectives

1. To maintain and improve a productive great blue heron and cormorant rookery at Birch Lake.
2. To protect bald eagle nesting habitat.
3. To maintain and improve suitable nesting and feeding areas currently existing for waterfowl and marsh species on Burnstick and Birch Lakes.

4. To maintain wild ungulates, furbearers and upland bird species at current densities.
5. To maintain sufficient wildlife habitat for current densities of wildlife.
6. To maintain and improve the Watchable Wildlife Program.
7. To maintain Burnstick Lake's attractiveness for staging and resting migratory birds.

Resource Management Guidelines

1. Prevent unnatural destruction of habitat at the heron rookery, control levels of harassment near the rookery and ensure shoreline buffers are maintained on Birch and Burnstick Lakes to provide feeding areas for the herons. Provide nesting platforms to maintain nesting sites. Establish a Natural Area around Birch Lake to emphasize natural value of lake area.
2. Harassment and detrimental land uses around eagle nesting sites and waterbird staging, resting and nesting areas (e.g., within 200 m on water and 500 m on land of the eagle nest in LSD 2, Sec. 12, Twp 35, Rge 7, W5) will be discouraged by non-regulatory means (e.g., seasonal restrictions on seismic activity, educational techniques). Eagle nesting habitat and quality will be monitored and replaced as necessary with an artificial structure to maintain nesting habitat.
3. Minimize losses of current vegetation cover types in lakes and within 200 m of lake shorelines. Maintain snag trees for wildlife where possible during any timber removal operations. No cutting of trees on the island in Birch Lake where the great blue heron colony exists will be permitted except for habitat improvement purposes.
4. Encourage local volunteer placement of suitable nesting structures (boxes, platforms) for birds at appropriate locations.
5. Place signs at boat launches and docks to educate boaters about waterfowl concerns, and any impacts may be mitigated by the Department (e.g., placing buoys to deter boaters). Educational techniques will be used to minimize the effect of boating wave action and human activities during April 1 - August 20 bird breeding season.
6. Recreational hunting will continue to be managed by existing methods.
7. Harvesting of furbearers will continue unless restrictions are required to resolve conflicts with other uses.
8. Protection of wildlife habitat will be addressed through continued participation of Alberta Fish and Wildlife in referral systems dealing with development around the lake. Mitigation techniques will be used where required.

9. Undertake habitat improvement projects where feasible to enhance existing habitat, without detriment to other featured species.

10. Watchable Wildlife opportunities/viewing sites may be developed:

- a. upgrade the signage and viewing site facilities as funds and public use allow.
- b. ensure beaver are a featured species.
- c. publish a bird viewing checklist.
- d. design improvements to minimize damage caused by vandalism.

11. Campers, cottage owners and campground operators will be encouraged to minimize bear attractants (food, garbage, carcasses). All facilities will be designed and operated in a manner to minimize attractants.

12. Important wildlife areas including ecosite O2 and a 100m area adjacent to lakes (see Land Use and Zoning Map, Figure 6) are recommended to be included within Critical Wildlife Zone 2. Note: A plan amendment to the Nordegg-Red Deer River Sub-regional IRP may be required for rezoning these lands.

13. To protect wildlife habitat, power boats will not be encouraged. Boating regulations may be implemented where warranted to regulate periods of boat use, speed limits and areas of use on both Burnstick and Birch Lake (subject to federal legislation).

3.5 Agriculture

Grazing of livestock has occurred around Burnstick Lake since about the 1930s. With increasing recreational use, conflicts have been reported. Over time, the following issues have developed associated with the grazing of livestock within the planning area:

1. Effects on water quality and stream bank erosion,
2. Adequate forage carryover for wildlife,
3. Concerns associated with livestock grazing within recreational areas (e.g., Summer Village of Burnstick Lake).

A new range management plan is being developed for this area. The range management plan will address the above issues about ongoing management of livestock grazing around Burnstick Lake. The following guidelines will provide guidance to the range management plan and to any future agricultural activities within the planning area.

Resource Management Objectives

1. To manage grazing within the Burnstick Lake planning area to ensure that grazing will be carried out in a manner compatible with the high recreational and conservation values of the area.

2. To maintain grazing levels at current animal unit months on a sustainable basis.
3. To protect riparian areas from cattle impacts.
4. To maintain adequate forage carryover for wildlife.

Resource Management Guidelines

1. Cattle use will be monitored and if problems such as erosion and pollution are found, appropriate measures will be taken (e.g., off-lake watering areas, creation of stream crossings, fencing). Any measures taken will be monitored for a time to ensure the desired effect is being achieved or to make additional changes to management strategies.
2. Range improvement is acceptable for maintaining AUMs where compatible with other resources in the plan area.
3. Grazing of livestock will be permitted within the proposed West Stony Creek Natural Area. However, where conflicts cannot be resolved, grazing may be excluded on a site basis.
4. Priority will be given to a new range inventory for the North Burnstick Head Tax area (1995) and a revised range management plan developed from the new inventory data. Any problems associated with grazing of livestock along the West Stony Creek and Burnstick Lake will be addressed in the revised range management plan. Some issues that will be addressed include:
 - a. cattle-recreational conflicts
 - b. development of water sources
 - c. wildlife issues (e.g., carryover for wildlife)
 - d. range improvement
 - e. riparian area management
 - f. Burnstick Lake water quality studies 1993-1994 and 1995
5. Salting locations will be kept at least 500 m away from lakes and West Stony Creek.

3.6 Minerals

The planning area has important oil and gas developments and undeveloped minerals potential. Owing to the high recreational values within the planning area, especially near Burnstick Lake, there is potential for conflicts between mineral exploration and development and recreational activities. This section contains objectives and guidelines to minimize conflicts.

Resource Management Objectives

1. To allow for the exploration and development of oil and natural gas.

Resource Management Guidelines

1. Mineral resource exploration and development will follow the existing regulatory approval processes, and when this plan is approved, guidelines in this plan. Mineral resource exploration and development will be allowed where consistent with minimizing land disturbances.
2. Surface disturbances of mineral exploration and development activities will minimize impacts on watershed, wildlife habitat, recreation, aesthetics and other resource values.
3. Mineral exploration and development in Zone 2 Critical Wildlife (see Figure 2) will be permitted under the existing approval processes, provided the value of the area to wildlife can be maintained. Any impacts of mineral activities in important habitat areas will be mitigated where possible to maintain habitat capability in or adjacent to the project area. Reclamation will have wildlife habitat as a high priority in Zone 2.
4. New well sites or minerals facilities may be subject to the following:
 - a. sites having traditional recreational use or having high potential for recreational development to be avoided,
 - b. developments to be set back from campgrounds and cottage areas at least 100 m, development of new access to the lake to be prohibited,
 - c. public access on roads to well sites may be controlled or prohibited for reasons of environmental protection and safety,
 - d. drilling applications within 200 m of Burnstick and Birch Lakes will be assessed to ensure that natural scenery as viewed from the lake is not disturbed, and to protect against leakage and erosion. Wellsites will be set back a **minimum** 100 m from the lake.
5. Where new seismic exploration routes are approved, only heli-assisted seismic activity will be permitted to avoid creation of new trails, consistent with Land and Forest Service regional policy for geophysical activities. Seismic requests will be reviewed on a site basis within 200 m of Burnstick and Birch Lakes. Handstringing of geophones only will be permitted within 200 m of Burnstick and Birch Lakes. Activities within candidate and Order-in-Council natural areas will be consistent with any guidelines specific to these areas.
6. Burnstick and Birch Lakes will be off-limits to destructive seismic programs. Water Resources Services will put these lakes on their restricted list.
7. Resource activities may have to be restricted or be managed differently to accommodate recreational needs.

3.7 Timber

The main concern about timber harvesting within the planning area is the potential for cutovers being visible from the lake. Selective cutting will be the method of timber harvesting used within the

Burnstick Lake planning area and as such should lessen user conflicts associated with timber harvesting. Logging truck traffic is another concern. However, with appropriate measures, impacts on recreational activities can be mitigated.

Resource Management Objectives

1. To maintain present timber harvest commitments for the B6 Miscellaneous Timber Use Area on a sustained yield basis within the Burnstick Lake planning area.
2. To ensure that timber harvesting and associated activities are compatible with the recreational and conservation values of the Burnstick Lake planning area.

Resource Management Guidelines

1. Timber removal within the 200 m buffer around Burnstick Lake and Birch Lake will be restricted to selection cutting for fire hazard reduction, protection against insect and disease, sanitation and habitat enhancement and approved recreational developments. Wildlife needs will be considered prior to removal of old trees.
2. Per cent removal of canopy will be the harvesting method used in harvesting timber for the area outside the 200 m buffer to minimize visual impact.
3. No millsites will be allowed within the planning area.
4. Timber harvesting will be restricted to winter only, except timber salvage on petroleum-related dispositions.
5. Development of new access routes for timber extraction will be minimized. New trails would have minimal line-of-sight (e.g., meandering trails).
6. No clearcutting of areas greater than 2.0 ha would be allowed unless required for insect and disease control purposes.
7. Timber harvesting shall consider the needs of hiking, cross-country skiing, equestrian and other non-lake surface activities. Landscape logging is another requirement to ensure the aesthetics within the planning area are maintained.
8. No cutting of timber will occur within the boundaries of the candidate natural areas unless insect/disease/fires hazards build up within these areas to a point where the intrinsic values of the area outside these areas are threatened. The Department will determine when values are threatened.
9. Hauling on timber haul roads will be restricted to frozen ground conditions.

10. Alberta's *Forest Landscape Management Policy* guidelines will apply to any openings that have sightlines from the lake.

Note: Should the candidate natural areas not be approved, then the timber outside the 200 m buffer within these areas would be treated the same as the timber outside the 200 meter buffer around Burnstick and Birch Lakes.

3.8 Historic and Cultural Resources

No archaeological surveys have been done around Burnstick Lake. However, archaeological resources probably exist within the planning area. Development involving surface disturbances may require archaeological assessments before a project going ahead.

Resource Management Objectives

1. To identify, protect and preserve historic resources (archaeological, palaeontological, historic period and natural), as defined in the Historical Resources Act, from impacts related to future resource developments.
2. To manage historic resources sites for scientific, educational and interpretive purposes.

Resource Management Guidelines

1. Resource uses in the planning area involving land surface disturbance may require Historical Resources Impact Assessments before development as outlined under Section 33(2) of the Historical Resources Act.
2. The Archaeological Survey of Alberta, Resource Management Section, will participate in the land use referral process to review any proposed developments (a) within 400 metres of the lake margin, and (b) within 100 metres of creeks and other stream courses.
3. Historic resources sites considered to be of provincial significance will be protected and preserved.
4. If any fossils are noted within the planning area, staff of the Royal Tyrrell Museum (Andy Neuman, 823-7707) should be contacted immediately.

3.9 Utilities Infrastructure and Roads

There is a moderate degree of roads and utility rights-of-way development in the planning area, especially on the north and east side of the lake. Industrial roads serve several wellsites located in the planning area. Seismic lines provide access for recreational vehicles (e.g., ATVs, snowmobiles). Cottagers have expressed concerns about noise from recreational vehicles and industrial traffic. There are no controls regulating off-road vehicle traffic in the planning area.

Resource Management Objectives

1. To maintain existing public access.
2. To minimize additional access to the lake.
3. To minimize conflicts created by vehicle access.
4. To minimize public safety hazards created by access facilities.
5. To minimize the effects of increased infrastructure corridors and roads.

Resource Management Guidelines

1. The coordination and shared use of infrastructure routes (e.g., roads, pipelines, seismic lines) between resource developers will be encouraged through the referral and planning processes.
2. Location of all infrastructure routes and corridors will be based on the most environmentally and economically efficient option and reviewed by all concerned referral agencies.
3. Subject to consultation with Municipal District of Clearwater #99, transition from commercial road operation and maintenance to public road operation and maintenance should occur if the commercial road receives a significant amount of public use and fits into the road system development plan. (This is standard M.D. policy).
4. Construction of all roads associated with new developments will be the responsibility of the developer.
5. All proposed road developments along public road allowance must conform to the standards of local authorities (M.D. of Clearwater #99 and Summer Village of Burnstick Lake) and must be approved by these authorities prior to development.
6. New roads/parking areas for wildlife viewing at Birch Lake and Burnstick Lake will be permitted where not in conflict with other uses, subject to other guidelines in this plan.
7. New access proposals within 200 m of the lake will be reviewed relative to potential impacts on other recreational uses and water quality. Appropriate measures will be taken to minimize impacts. No new roads will be constructed within 100 m of Burnstick and Birch Lakes, except where required for access to approved recreational developments.

3.10 Ecological Resources

Ecological resources in the planning area include some regionally uncommon plant sites and two

proposed Natural Areas, the West Stony Creek and Birch Lake. Ecological sites related to fish and wildlife resources are addressed in the relevant sections.

Resource Management Objectives

1. To protect identified ecological resources from impacts related to human activity and resource developments.

Resource Management Guidelines

1. Locations of regionally uncommon plants (*Habenaria orbiculata*) will be confirmed and protected from development.
2. Applications for establishment of West Stony Creek and Birch Lake Candidate Natural Areas through Order-in-Council are supported by this plan (Figure 6 contains proposed boundaries).
3. Any proposed expansions to the Natural Areas as shown in Figure 6 will be reviewed by the Department to ensure consistency with this plan.

3.11 Wildfire

The Burnstick Lake management plan area is a part of a large area within the Southeast Slopes Region. This area is prone to man caused fires through residential, recreational and industrial use/developments. This area is also prone to wet lightning storms. During the summer months, the Land and Forest Service maintain fixed land detection from two fire towers. During high risk periods the area is patrolled by an initial-attack crew and forest guardians based within the Clearwater District. The Land and Forest Service policy is to use aggressive initial attack on all fire starts.

The Summer Village of Burnstick Lake has a forest fire prevention agreement with Land and Forest Service and issues its own fire permits within the Summer Village.

Resource Management Objectives

1. To control and manage wildfire according to Land and Forest Service provincial forest fire protection system.

Resource Management Guidelines

1. The Land and Forest Service will continue to maintain and improve upon the present fire prevention, detection, presuppression and suppression systems in place to minimize the occurrence and impact of uncontrolled fires. Fires will be treated in accordance with the existing Land and Forest Service mandate and policies.

2. All recreational developments, industrial developments and sub-divisions will be required to have a fire protection plan in place. Preparation of the fire protection plan will be the responsibility of the developer. Format will be provided by the Land and Forest Service.
3. The Land and Forest Service will use what it deems necessary to control fire spread.
4. Bulldozers and other heavy equipment will not be used for fire suppression within the 200 meter buffer around Burnstick and Birch Lakes except where necessary to protect human development and safety.
5. Fire camps will be located outside the Natural Areas and the 200 meter buffer that surrounds Burnstick and Birch Lakes.
6. A known bald eagle nesting site is located in LSD 2, Sec. 12, Twp. 5, Rge. 7, W5. Fire crews will be instructed to avoid cutting down trees within 200 meters of this nesting site.
7. No cutting of trees is allowed on the island in Birch Lake where the great blue heron colony exists.
8. Fire fighting in the candidate natural area will be subject to any management guidelines/plan that are developed for the Natural Areas.
9. Use of prescribed fire will be permitted to reduce fire hazards by eliminating the build-up of fine fuels (e.g., grass), and for wildlife management purposes if the need arises, as determined through appropriate assessment techniques.

Figure 6. Land Use and Zoning Map

4.0 PLAN IMPLEMENTATION, REVIEW AND AMENDMENT

4.1 Implementation

The Burnstick Lake Management Plan will be implemented within the terms of appropriate legislation, policies and programs of government. Recommended programs and activities will be subject to budget and program priorities. Appropriate government referral and review systems will apply to the planning area. A consultative notation (CNT) will be placed on Land Status Automated System (LSAS) so that application reviews within the planning area are referred to this plan. Land and Forest Service will be responsible for ensuring the plan is adopted and implemented.

Public Advisory Committee. A public advisory committee will be formed to monitor and review implementation of the Burnstick Lake Management Plan (see Section 3.1). The following guidelines will be followed:

- a. Land and Forest Service (LFS) will convene a meeting soon after this plan is adopted to initiate formation of the committee,
- b. approximately six to nine public members will be selected to form balanced representation of various interests (e.g., boaters, cottagers, naturalists, commercial recreation, grazing, oil and gas, timber, fish and game). One member may represent more than one interest. The committee will select its own chairperson,
- c. the committee will monitor implementation of this plan and advise LFS of issues and local concerns. Note: The Departmental referral system will be the process that LFS will use for placing conditions on geophysical applications; LFS may advise the committee of such applications for information purposes only.
- d. The committee may undertake projects such as improving watchable wildlife resources and natural area stewardship, either as directed by this plan or in coordination with LFS,
- e. the committee will meet on an annual basis or as required. The committee will develop a terms of reference to define its specific structure and role.

Water Quality Monitoring. Water quality monitoring of Burnstick Lake is recommended to ensure that any water quality problems concerning development around the lake are detected early and appropriate measures are taken to correct the problem. Monitoring programs should be designed to detect contamination from fecal coliform bacteria and addition of nutrients from sewage disposal and runoff. Sampling after a long weekend in the summer should be carried out to determine whether fecal coliforms might be a problem. The results of the analysis would be used to determine the need for additional sampling or investigation. Lake water quality monitoring, done in 1993-94, should be considered at five-year intervals, or as recommended by the Department.

4.1.2 Recommended Integrated Resource Plan Amendment

Critical Wildlife Zone boundary changes are proposed within the Burnstick Lake Management Planning Area (see Figure 6, page 48). A plan amendment to the Nordegg-Red Deer River Sub-regional Integrated Resource Plan may be required for these changes.

4.2 Review

The plan should be reviewed every five years by Land and Forest Service together with other stakeholders directly involved with the development of the plan. The review will determine whether the plan requires changes and to determine the extent of changes required to update the plan. A public advisory committee may also monitor changes within the planning area and report these to LFS.

4.3 Amendment

Changes to the resource management direction in the plan may be required because of the five-year review, government requests or a request from an individual, group or organization outside government. Opportunities for public review of proposed amendments will be provided before changes are approved by the Department.

GLOSSARY OF TERMS

Adsorbition - The chemical action of one substance holding another substance on its surface.

Canada Land Inventory - The Canada Land Inventory (CLI) is a comprehensive survey of the land capability and use in the settled portion of Canada. Through reconnaissance surveys resource analysts determined resource capability for waterfowl, ungulates, recreation, forestry and agriculture. Information is printed on 1:250 000 scale maps. Resource capabilities are assigned a rating from one to seven, one having the highest capability rating. Resource capability of lakeshores and lake shorelines can be determined from the ratings. CLI maps were produced in the early 1970s.

Consultative Notation (CNT) - A CNT indicates that an agency has declared an interest in a parcel of land and wishes to be consulted prior to any commitment or disposition being issued on the land. However, a CNT does not impose any land use restriction on the land.

Cumulative Effects - Since the mid-1980s cumulative effects have increasingly become a priority in the area of environmental impact assessment. One definition is "effects . . . which occur so frequently in time or so densely in space that they cannot be assimilated or combine with effects of other activities in a synergistic manner." (Canadian Environmental Assessment Research Council 1988). The recent Alberta Environmental Protection and Enhancement Act requires an environmental impact assessment to include a description of potential cumulative impacts.

Alberta Energy and Utilities Board - The Alberta Energy and Utilities Board is a government appointed board responsible for the orderly and efficient development of Alberta's energy resources and to ensure that Albertans receive safe and efficient utility service at rates which are reasonable and just.

Development - Improvements made to facilitate any form of access or activity through the removal of vegetation and modification of soils or construction of facilities or buildings.

Environmental Resource Committee (ERC) - There are six environmental resource committees (ERCs) composed of regional directors from agencies with public land and resource-related interests. These committees have the primary responsibility of identifying regional planning priorities and coordinating the implementation of approved Integrated Resource Plans.

Environmentally Significant Area (ESA) - ESAs are important, useful and often sensitive features of the landscape. They provide long-term benefits to our society by maintaining ecological processes and by providing useful products. Examples of ESAs include areas that are unsafe for development in their natural state such as floodplains or steep slopes, aquifer recharge areas and land that contains rare or unique geological features, significant, rare or endangered plant and animal species.

Hazard Reduction - Treatment of living or dead forest fuels to diminish the likelihood of a fire starting, and to lessen the potential rate of spread and resistance to control. Synonym - **Fuel Treatment**.

Lake Bed/Bank - Under the Water Resources Act, any disturbance to the lake bed or bank (that part of the shoreline which is affected by normal water level fluctuation) requires authorization.

Land Status Automated System (LSAS) - LSAS is an on-line data base system that is a registry for crown

lands and the surface and subsurface interests defined on them. It is a business system used by all land-based government departments to assist in decision making. It is also used by the private sector to assist in their decision making.

Natural Area - Natural Areas are protected public lands, set aside with the main objective of maintaining their natural features. Natural Areas in Alberta are established pursuant to the Wilderness Areas, Ecological Reserves and Natural Areas Act.

Nordegg-Red Deer River Sub-Regional Integrated Resource Plan (IRP) - is the Government of Alberta's resource management policy for public lands and resources for a 9 900 square km area of land west of Rocky Mountain House and Sundre.

Oligotrophic - Waters with a small supply of nutrients and hence low in organic matter production.

Prescribed Burning - The knowledgeable application of fire to a specific land area to accomplish predetermined forest management or other land use objectives. Synonym - **Fire Use**.

Prescribed Fire - Any fire deliberately utilized for prescribed burning; usually set by qualified fire management personnel according to a predetermined burning prescription.

Note: In some cases, a wildfire that may produce beneficial results in terms of the attainment of forest management and other land use objectives may be allowed to burn under certain burning conditions according to a predefined burning prescription, with limited or no suppression action, and as such may be considered a form of prescribed fire.

Productive Forest Land - is land that is capable of yielding 50 cubic meters per ha (13+/-7 cm) of gross roundwood volume for all tree species by age of 120 years. **Potentially productive** forest land is land that can produce a productive forest stand by 120 years. This could include lands that have been disturbed by logging, forest fires, insect/disease attack, or damage caused by windfall. **Non-productive** forest land is land that is not capable of yielding 50 cubic metres per ha (based on trees with a minimum diameter of 13 cm measured at the stump and seven cm at the top) or greater of roundwood volume for all tree species by age of 120 years. Non-productive land includes permanent grasslands, marshes, etc.

Protective Notation Reservation (PNT) - A PNT imposes a restriction on land use usually due to specific natural features of the land. Reservations are established to administratively identify specific sites that a government agency requires for protection or future use.

Weir Sill Elevation - Elevation of stop logs which keeps the lake at a prescribed level.

Wildfire - An unplanned or unwanted natural or man-caused fire, as contrasted with a prescribed fire.

APPENDICES

Appendix 1. Planning Team Membership/Stakeholders

Planning Team

Land and Forest Service of Alberta Environmental Protection (Chair and team member)

Natural Resources Service of Alberta Environmental Protection:

- Recreation and Protected Areas
- Water Management Division
- Wildlife Management Division

Alberta Economic Development and Tourism

Mineral Resources of Alberta Energy

Municipal District of Clearwater #99

Summer Village of Burnstick Lake

Red Deer Regional Planning Commission (until March 31, 1995)

Burnstick Lake Resort

Resource People to Planning Team

Doug Taylor, Public

Larry Rhude, Fisheries Management Division, Natural Resources Service

Pat Mitchell, Water Management Division, Natural Resources Service

Caroline Chamber of Commerce

Stakeholder List

Identified government departments and services (in addition to team members, include Protected Areas, Public Land Service of AFRDA, Alberta Transportation), Local MLAs

Local municipalities (Summer Village of Burnstick Lake, M.D. Clearwater #99)

Commercial interests/developers,

Cottage owners,

Red Deer River Naturalists (F.A.N.),

Concerned citizens,

Industrial users in area, e.g. Trans-Alta,

Recreational users (e.g. boaters, campers, fishermen, trail riders,),

Recreational groups and associations with interests in the area,

Preservation of Agricultural and Living Space Society (PALLS)

Concerned Residents Action Group (CRAG),

Oil companies working in area (Petro Canada, Shell, Amoco, Canadian Hunter),

Fish and Game Association (Rocky, Sundre),

Trappers, hunters,

People who attended public meetings (Water Resources, Sept 11/93 and Summer Village Nov. 13/93).

Western Walleye Council,

Lease holders

North Burnstick Grazing Association,

Caroline Chamber of Commerce,

Shell Wildlife Habitat Committee,

Alberta Tourism Partnership

Canadian Association of Petroleum Producers

Trout Unlimited

Appendix 1a. Meetings

1. Water Resources Act Public Meeting
September 11, 1993
Crammond Hall
2. Open House, Review of Burnstick Lake Management Plan Terms of Reference
June 8, 1994
James River Community Hall
3. Cottagers' Review of Terms of Reference
July 2, 1994
Summer Village of Burnstick Lake
4. Public Meeting, Review of Burnstick Lake Draft Management Plan
April 19, 1996
James River Community Hall
5. Meeting of Concerned Local Citizens, Review of Burnstick Lake Draft Management Plan
May 6, 1996
Caroline Arena

Appendix 2. Plant List - Burnstick Lake

- 1 Fairy-bells
- 2 S/F'd Solomon's-seal
- 3 Calypso Orchid
- 4 M/Eared Chickweed
- 5 Baneberry
- 6 Blue Clematis
- 7 Early Buttercup
- 8 Meadow Rue
- 9 Wild Gooseberry
- 10 Wild Black Current
- 11 Swamp Red Current
- 12 Saskatoon
- 13 Wild Strawberry
- 14 Pin Cherry
- 15 Choke Cherry
- 16 Dwarf Raspberry
- 17 Dewberry
- 18 Pea Vine
(Ochroleucus)
- 19 Red Clover
- 20 White Clover
- 21 Bicknell's Geranium
- 22 Wild Blue Flax
- 23 Early Blue Violet
- 24 Bog Violet
- 25 Western Canada Violet
- 26 Fireweed
- 27 Sarsaparilla
- 28 Cow Parsnip
- 29 Bearberry
- 30 Labrador Tea
- 31 Blueberry
- 32 Bluebells (Tall
Lungwort)
- 33 Wild Mint
- 34 Indian Paintbrush
- 35 Twining Honeysuckle
- 36 Low-bush Cranberry
- 37 Yarrow
- 38 Pussytoes (Low
Everlasting)
- 39 Heart-leaved Arnica
- 40 Dandelion
- 41 Canadian Buffalo Berry
- 42 Bracted Honeysuckle
- 43 Bog Cranberry
- 44 Bunchberry
- 45 Golden Saxifrage
- 46 Golden Corydalis
- 47 Celery-leaved Buttercup
- 48 Bishop's Cap
(Mitrewort)
- 49 Wild Lily-of-the-Valley
- 50 Wolf Willow
- 51 Tall Huckleberry
- 52 Crow Berry
- 53 Sheep Sorrel
- 54 Green Smartweed
- 55 Blue-eyed grass
- 56 Balsam poplar
- 57 Yellow Pond-lily
- 58 Nettle
- 59 Pale comandra
- 60 Monkshood
- 61 Canada Anemone
- 62 Sm/fl'd Crowfoot
- 63 Stinkweed
- 64 Yellow Avens
- 65 Three-flowered Avens
- 66 Common Wild Rose
- 67 Mountain Ash
- 68 Vetch spp
- 69 Marsh Violet
- 70 Crowfoot Violet
- 71 Devil's Club
- 72 Mountain Laurel
- 73 Shooting Star (saline)
- 74 Northern Gentian
- 75 Lilac fl'd Beardtongue
- 76 Common Butterwort
- 77 High-bush Cranberry
- 78 False Dandelion
- 79 Marsh Ragwort
- 80 Arrow-leaved Coltsfoot
- 81 Sow Thistle
- 82 Red-osier dogwood

Source: Summer Village of
Burnstick Lake. (May Species
Count, 1993)

Birch Lake

No visible algae, attached or
planktonic.
Calla palustris - Water arum
Chara sp.
Equisetum sp. - Horsetail
Myriophyllum - milfoil (prob. exalbescent -
Northern watermilfoil)
Najas flexilis - Naiad
Polygonum amphibium - Water Smartweed
Potamogeton natans - Floating-leaf

Pondweed
Potamogeton (pectinatus ?) - Sago
Pondweed
Potamogeton richardsonii - Claspingleaf
Pondweed
Potamogeton (zosteriformis ?) - Flat-
stemmed Pondweed
Ranunculus circinatus or aquatilis - White
Water Crowfoot
Sagittaria (prob. cuneata) - Arrowhead
Sparganium sp.

Burnstick Lake

Sessile algae readily visible at all areas on
wood, rocks; including upstream entrance
to weir.

Calla palustris - Water Arum
Chara sp.
Ceratophyllum demersum - Coontail
Equisetum sp. - Horsetail
Hippurus vulgaris - Mare's Tail
Myriophyllum (prob. exalbescent) -
Northern Watermilfoil
Nuphar variegatum - Yellow Pond-lily
Polygonum amphibium - Water Smartweed
Potamogeton friesii
Potamogeton natans - Floating-leaf
Pondweed
Potamogeton pectinatus - Sago Pondweed
Potamogeton richardsonii - Claspingleaf
Pondweed
Potamogeton zosteriformis - Flat-stemmed
Pondweed
Ranunculus circinatus or aquatilis - White
Water Crowfoot
Sagittaria (prob. cuneata) - Arrowhead
Sparganium eurycarpum - Giant Bur-
reed
Sparganium sp.
Utricularia (vulgaris ?) - Common
Bladderwort

Source: Summer Village of Burnstick Lake
survey, August 14, 1994. Specimens
identified by Pat Mitchell.

Appendix 3. Birds of Burnstick Lake

Pacific Loon	Western Wood-Pewee
Common Loon	Olive-sided flycatcher
Horned Grebe	Least Flycatcher
Red-necked Grebe	Eastern Phoebe
Eared Grebe	Eastern Kingbird
Western Grebe	Tree Swallow
Double-crested Cormorant	Barn Swallow
Great Blue Heron	Gray Jay
Trumpeter Swan	Blue Jay
Canada Goose	Clark's Nutcracker
Green-winged Teal	Black-billed Magpie
Mallard	American Crow
Northern Pintail	Common Raven
Blue-winged Teal	Black-capped Chickadee
Cinnamon Teal	Mountain Chickadee
Northern Shoveler	Red-breasted Nuthatch
Gadwall	White-breasted Nuthatch
American Widgeon	Brown Creeper
Canvasback	House Wren
Redhead	Marsh Wren
Ring-necked Duck	Ruby-crowned Kinglet
Lesser Scaup	Mountain Bluebird
White-winged Scoter	Swainson's Thrush
Common Goldeneye	American Robin
Barrow's Goldeneye	Yellow Warbler
Bufflehead	Yellow-rumped Warbler
Common Merganser	Chipping Sparrow
Ruddy Duck	Clay-colored Sparrow
Osprey	Red-winged Blackbird
Bald Eagle	Yellow-headed Blackbird
Northern Harrier	Rusty Blackbird
Broad-winged Hawk	Common Grackle
Red-tailed Hawk	Brown-headed Cowbird
Golden Eagle	Northern Oriole
Merlin	Pine Grosbeak
Ruffed Grouse	Purple Finch
Sora	
American Coot	
Killdeer	
Lesser Yellowlegs	
Solitary Sandpiper	
Spotted Sandpiper	
Upland sandpiper	
Marbled Godwit	
Semipalmated Sandpiper	
Common Snipe	
Bonaparte's Gull	
Common Tern	
Black Tern	
Great Horned Owl	
Snowy Owl	
Northern Hawk Owl	
Great Gray Owl	
Common Nighthawk	
Ruby-throated Hummingbird	
Rufous Hummingbird	
Belted Kingfisher	
Yellow-bellied Sapsucker	
Downy Woodpecker	
Hairy Woodpecker	
Northern Flicker	
Pileated Woodpecker	

Source: Fish and Wildlife Service of
Alberta Environmental Protection

Appendix 4.

Biophysical Inventory and Land Use Evaluations

Introduction. The following information is excerpted from *Biophysical Inventory of Shoreland Areas - Burnstick Lake, Alberta*, Geowest Environmental Consultants, Ltd. et al. 1994). The biophysical resource information presented in the biophysical report for Burnstick Lake is structured so as to form the basis for the future interaction of land-use planning with ecologically sound resource conservation practices. The term "biophysical" was coined in order to connote the blending of several fields of natural resource science as a way of describing ecosystems (Lacate 1969). Under this approach, the ecosystem is referred to in a holistic manner as being composed of a complex web of abiotic and biotic ecological components including geomorphology, bedrock geology, soils, vegetation and wildlife.

Field Survey. Field sampling was conducted from June 27th to July 8th, 1994, according to methods outlined in the Ecological Land Survey Site Description Manual (AEP, 1994). In total 34 detailed plots were established, where information on soils, parent materials, vegetation composition and site characteristics.

The shoreline inventory was carried out by circumnavigating the lake by boat and landing occasionally to confirm shoreline characteristics.

Emergent aquatic vegetation was delineated on aerial photographs during the survey by boating around the lake or adjacent to the outer boundary where it extended to the shore.

Ecological Land Classification Methods. Ecological land classification (ELC) is a hierarchal landscape mapping system in which the land surface is subdivided and classified into areas of similar environments. The map units are characterized by recurring patterns of surficial materials, landform, soil and vegetation. The primary method used to derive ecological units is aerial photo interpretation. Field checks are carried out to verify descriptions of the land units and to compile more detailed site, soil and vegetation information.

Each ELC unit is given a descriptive map unit symbol. For example, the letters in the ecosite symbol GL1 refer to the primary landform (in this case glaciolacustrine), while the numeric character, 1, refers to a subdivision based on soil, vegetation or physiographic features. The following is a key to the surficial materials found in the planning area:

GO-Fluvial and Organic Complex
GF-Glaciofluvial
GL-Glaciolacustrine
GLO-Glaciolacustrine-Organic Complex
M-Moraine
MGF-Moraine and Glaciofluvial Complex
MO-Moraine and Organic Complex
O-Organic Complex

Land Use Evaluation Methods. Methods for soil evaluation in this study are based on standard procedures in common use. Because of the variable nature of soil, small inclusions of unmappable soil types may be present in any map unit. An on-site investigation should be carried out before any specific site development or construction takes place. The evaluations, however, provide sufficient information for land managers to predict the type and degree of potential problems that may be encountered within particular map units, as well as the relative amount of on-site investigation that may be needed.

Definitions of soil limitation and suitability ratings are as follows:

None to Slight (NS)

A none to slight soil limitation is the rating given to soils that have properties moderately favourable for the rated use. The degree of limitation is minor and can easily be overcome.

Moderate (M)

A moderate soil limitation is the rating given soils that have properties moderately favourable for the rated use. This degree of limitation can be overcome or modified by special planning, design or maintenance. Some soils rated moderate require treatment such as artificial drainage, runoff control to reduce erosion, extended sewage absorption fields, extra excavation or some modification of construction plans generally used for soils of slight limitation.

Severe (S)

A severe soil limitation is the rating given soils that have one or more properties unfavourable for the rated use, such as steep slopes, flooding hazard, high shrink-swell potential, a seasonal high water table or a sandy surface texture. This degree of limitation requires major soil modification, special design or intensive maintenance which may be difficult and costly.

Very Severe (VS)

A very severe soil limitation is the rating given to soils that have one or more properties which are so unfavourable for the proposed use that the soils cannot be used for that purpose, or it appears economically impractical to do so. Examples of such properties are very steep slopes, frequent flooding, permanently wet soils, excessive stony soils or organic soils.

Soil Interpretations. Tables in the report provide ratings for soils that are evaluated for permanent buildings, septic tank absorption fields and road locations. Map units (ecosites) are described in the legend accompanying the Ecological Land Classification map.

Soil Interpretation Methods for Permanent Buildings. Table 4 in the report provides ratings for undisturbed soils that are evaluated for single family dwellings and other structures with similar foundations, with or without basements. Slope, susceptibility to flooding and seasonal wetness, which have effects beyond those related exclusively to foundations, are also considered. The properties affecting foundation support are those that affect bearing capacity and settlement under load, as well as those that affect excavation and construction costs. The properties affecting bearing strength and settlement of the natural soil are density, wetness, plasticity, texture and shrink-swell behaviour.

Soil Interpretation Methods For Septic Tank Absorption Fields. The septic tank absorption field is a subsurface tile system laid out so effluent from the septic tank is distributed with reasonable uniformity into the natural soil. When the effluent percolates into the ground, the impurities it contains are attacked by a myriad of biological organisms naturally present in the soil and effluent (Alberta Department of Manpower and Labour 1977).

Absorption fields are influenced by the ease of downward movement of effluent through the soil. Table 5 in the report provided findings for undisturbed soils that are based on the soils' ability to absorb and filter the liquid or effluent passed through the tile field. Soils with slow permeability are rated as severe. Clean sands and gravels with rapid permeability have slight limitations, unless a hazard exists for contaminating nearby water supplies. Permeability was not measured in the field, but was inferred from soil texture and morphology according to guidelines prepared by the Soil Water Interpretation Group (Coen and Wang 1987). A rating of severe does not necessarily mean that a septic system should not be installed in a given soil, but rather suggests the degree of difficulty in terms of installation and maintenance (Greenlee 1981).

Soil Interpretation Methods For Road Location. Table 6 in the report applies to soils evaluated for construction and maintenance of local roads, streets and parking areas. These are improved roads and streets having some kind of all-weather surfacing, commonly asphalt or gravel, that are expected to carry automobile traffic all year. They consist of:

1. underlying local soil material (either cut or fill) called the subgrade,
2. the base material of gravel, crushed rock or lime, or soil cement (stabilized soil) called the sub-base; and
3. the actual road surface or pavement, either flexible or rigid.

They are also graded to shed water, and have ordinary provisions for drainage. Except for the hardened surface layers, the roads and streets are built mainly from the soil at hand, and cuts and fills are limited usually to under 2 m. Excluded from consideration in this guide are highways designed for fast-moving, heavy truck traffic.

Properties that affect design and construction of roads and streets are:

1. those that affect the load-supporting capacity and stability of the subgrade, and
2. those that affect the workability and amount of cut and fill.

The American Association of State Highway Officials (AASHO) Group Index and Unified Soil Classifications, and the shrink-swell potential give an indication of the traffic-supporting capacity. Wetness and flooding affect stability. Slope,

depth to bedrock, stoniness, rockiness and wetness affect the ease of excavation and the amount of cut and fill required to reach and even grade (Greenlee 1981).

Land use Evaluations - Results.

Buildings Without Basements. No map units within the Burnstick Lake planning area are rated as having none to slight limitations for buildings without basements. Map units GF1 and GF2 are the only map units in the planning area rated as having moderate limitations for the construction of buildings without basements. This is because the soil materials have moderate potential for frost heaving and shrink-swell potential. Map units M1, M2, and M4 are rated as having moderate to severe limitations because of moderately well to imperfectly drained soils and fine clayey soil textures. These textures create problems due to frost heaving and a high shrink-swell potential.

All other map units have severe or very severe limitations due to flooding (F01, M01, 01, 02, 03), poor to very poor soil drainage (GL1, GL01, M01, 01, 01, 03) or excessive slope steepness (M3, M4, MGF1). Besides soil drainage problems, most of these map units have heavy textured, clayey mineral soils that are susceptible to excessive frost heaving and have a high shrink-swell potential. Rockiness or surface stoniness is not a problem in any of the map units.

Septic Tank Absorption Fields. The terrain within the Burnstick Lake planning area is moderately to poorly suited for the use of septic tank absorption fields for waste disposal. There are no map units that have none to slight limitations. Ecosites GF1 and GF2 have moderate limitations, primarily because of the slow permeability of the soil materials and the proximity of the map units to water bodies. Map units M1, M2 and M4 have moderate to severe limitations primarily because of the slow to very slow permeability of the fine-textured clayey soils. All other map units have severe or very severe limitations because of flooding and poor to very poor soil drainage. In addition, as mentioned previously, most of the map units have heavy textured, clayey mineral soils that are slowly to very slowly permeable.

Road Location. Map units GF1 and GF2 are the only map units in the Burnstick Lake planning area rated as having moderate limitations for road construction. Map units M1, M2, and M4 have moderate to severe limitations for the construction of roads. This is because of the higher susceptibility of the fine-texture clayey soils to frost heaving and the high shrink-swell potential that reduces traffic-supporting capacity. All other map units have severe or very severe limitations because of flooding. (F01, M01, 01, 02, 03) or poor to very poor soil drainage (GL1, GL01, M01, 02, 03). Map units MGF1, M3, and M5 have well to imperfectly drained soils but the presence of steep slopes creates significant limitations for road construction. The heavy textured, clayey mineral soil presents significant problems with frost heaving. The soil materials in these map units also have a high shrink-swell potential that provides a poor traffic-supporting capacity.

Table 4. Land Use Evaluations by Ecosite for permanent buildings, septic tank absorption fields and road location (Geowest Consulting Ltd., 1994).

Ecosite	Soil Limitations For		
	Buildings Without Basements	Septic Tank Absorption Fields	Road Location
Fluvial-Organic FO1	Very severe (F,W)	Very Severe (F,W)	Very Severe (F,W)
Glaciofluvial GF1 GF2	Moderate (S,H) Moderate (S,H)	Moderate (W,P) Moderate (W,P)	Moderate (S,H) Moderate (H)
Glaciolacustrine GL1	Severe (W,H,S)	Severe (P,W)	Severe (S,H,W)
Glaciolacustrine -Organic GLO1	Severe (W,H,S)	Very Severe (W,F,P)	Severe (S,H,W)
Moraine M1 M2 M3 M4 M5	Moderate to severe (S,H) Moderate to severe (S,H) Severe (T,S,H) Moderate to severe (P) Severe (S,H,T)	Moderate to severe (P) Moderate to severe (P) Severe (T,P) Moderate to severe (P) Severe (W,P,T)	Moderate to severe (S,H) Moderate to severe (S,H) Severe (T,S,H) Moderate to severe (S,H) Severe (W,T,S,H)
Moraine Glaciofluvial MGF1	Severe (T)	Severe (T,F)	Severe (T,F)
Moraine- Organic MO1	Severe (W,S,H)	Severe (W,P,F)	Severe (W,S,H)
Organic O1 O2 O3	Very severe (W,S,H) Very severe (W,S,H) Very severe (W,F,S,H)	Very severe (W,P) Very severe (W,P) Very severe (W,P,F)	Very severe (W,S,H) Very severe (W,S,H) Very severe (W,F,S,H)

Key to Landscape Evaluation

C - Surface stoniness
F - Flood Hazard
H - Potential Frost Heave
K - Percolation Rate

P - Permeability (too slow)
S - High shrink-swell potential
T - Topography - steep slope

W - Poor soil drainage
X - Permeability (excessive)
Y - Surface texture or organic matter

Appendix 5. Estimating the Phosphorus Supply to Burnstick Lake

The Surface Water Assessment Branch of Alberta Environmental Protection evaluated phosphorus sources to Burnstick Lake. Questions that needed to be addressed for this plan were:

- what is the present phosphorus supply to the lake, and does it seem to be in balance with measured water quality?
- how does the present level of anthropogenic inputs compare with natural inputs? How would additional development affect lake water quality (this would include cottage, resort, agricultural, forestry and other types of development)?
- what should be done now and in the future to ensure that lake water quality is protected?

The report, *Alberta. Department of Environmental Protection. 1995. An Evaluation of Phosphorus Sources to Burnstick Lake. Edmonton*, describes how phosphorus sources were estimated. The following excerpt is taken from this report:

Two approaches were used to estimate the phosphorus supply to Burnstick Lake. One approach was to use *export coefficients*. During Alberta Environmental Protection studies on Baptiste and Wabamun lakes, the total amount of phosphorus measured in streams for a year (the watershed phosphorus supply) was applied to the total land area in various land use categories, to derive phosphorus supplies per unit of land area, or phosphorus export coefficients. The coefficients derived from these studies are: forested land - 0.1 kg/yr; cleared - 0.2 kg/yr; urban - 1.0 kg/yr; wetlands - 0 kg/yr. from lands ranging from forested undeveloped land to cleared developed land.

The phosphorus supply from cattle within the watershed was estimated with a coefficient for phosphorus production from beef cattle manure. The coefficient assumes direct deposition of all manure into the lake or its inflow streams, which is unrealistic. Because cattle would spend time away from these water bodies, the following calculations were made to estimate the number of cattle: for the Lower James Allotment and Southwest Burnstick Head Tax Permit grazing dispositions, only 5% of the total number of cattle (446 Animal Unit Months/year = 22.3 AUMs) were used. The reason for this reduction is the lack of usable range along water bodies in these areas. For the North Burnstick Head Tax Permit disposition, it was estimated that only 25% of the disposition area is included in the Burnstick Lake watershed. The total number of cattle (980 AUMs) was reduced to 25% (245 AUMs), and this was reduced again by half, because it is assumed that cattle do not spend all of their time on the shore of the lake. The total for all cattle affecting the streams and lake is estimated at 145 AUMs, or 4350 Animal Unit days. This estimate is considered to be a "worst case" scenario (D. Smith and J. Simonson, Land and Forest Service, AEP, pers. comm.).

Another approach was to apply *flow-weighted mean phosphorus concentrations* from other Alberta streams to the estimated volume of runoff from the Burnstick Lake watershed for a particular year. Until 1995, West Stony Creek, the main inflow stream to Burnstick Lake, had never been sampled, nor has flow been monitored. However, a reasonable estimate of runoff from the Burnstick Lake watershed was obtained by extrapolating from nearby watersheds for specific years (F. Davies, pers. comm.). As well, phosphorus concentrations can be derived from studies on streams that are similar

to those in the Burnstick Lake area. In 1995, the data base on stream phosphorus concentrations was expanded considerably with a major project to assess the effects of agricultural activities on water quality throughout the province (Canada-Alberta Environmentally Sustainable Agriculture agreement, or CAESA, A.M. Anderson, pers. comm.). The flow-weighted average total phosphorus concentration for appropriate streams was applied to the estimated runoff volume from the watershed of Burnstick Lake for 1993. A flow-weighted average concentration, rather than an arithmetic average, tends to provide a more realistic estimate of the phosphorus supply, because it is biased toward periods when flows are highest. To provide a range of possible impacts, three concentrations were used for the calculation of the phosphorus supply from the watershed:

- **High** (0.089 mg/L) - an average flow-weighted mean concentration was taken from three central Alberta streams sampled in 1995 for the CAESA project, Rose, Christmas and Goose creeks; these watersheds have relatively low agricultural use and are reasonably well forested.
- **Low** (0.026 mg/L) - two forested streams in the Athabasca river drainage, the Sakwatemau River and Two Creek, were selected to represent concentrations from a largely natural watershed (Munn and Prepas 1986).
- **Medium** (0.065 mg/L) - a concentration measured in West Stony Creek in July 1995 falls between the first two concentrations. Although the value from West Stony Creek is not an annual flow-weighted concentration, it does provide a "ballpark" phosphorus concentration for the creek.

A volume-weighted concentration was also used to estimate the phosphorus supply from precipitation directly onto the lake. This coefficient is based on measured phosphorus in bulk summer precipitation from a study conducted on Narrow Lake near Athabasca by Shaw et al. (1989). A flow-weighted average phosphorus concentration in sewage leaking from shoreline systems was unavailable, so the contribution from sewage was estimated as in the export coefficient method. Similarly, the same contribution from cattle as used in the phosphorus export method was included in the estimate, though there were likely cattle in the watersheds of some of the streams providing the basis for the "High" concentration.

The conclusions from the report are as follows:

1. For the phosphorus supply estimates calculated from export coefficients, there is very little difference in the estimated phosphorus supply between present and future scenarios. Undoubtedly, the errors in constructing the budgets are much greater than the slight differences between them.
2. The phosphorus supply calculated from export coefficients for the watershed alone is very similar to that calculated using the concentration actually measured in West Stony Creek in July 1995. This similarity may indicate that the supplies estimated by these two methods are in the right "ballpark" for the lake.

3. If the phosphorus supply estimates are correct, the lake eutrophication model run seems to suggest that the amount of phosphorus entering the lake at present is greater than is reflected in the measured phosphorus and chlorophyll *a* concentrations from 1993 and 1994. If this is so, there is a risk that eventually the trophic status of the lake will change. An increase in productivity would be perceived as increased aquatic plant growth and reduced water clarity. An increase in the biomass of plant material in the lake could lead to the release of phosphorus from the bottom sediments in late summer. Such recycling of phosphorus from the bottom sediments is common in shallow Alberta lakes, and is largely responsible for the nuisance blue-green algae seen in lakes that are more productive than Burnstick. It is not possible to determine how long it may take for the lake water quality to change, but it would likely be in a decades time frame, based on our assessment in other lakes.

4. If the phosphorus supply has increased over the past few years, it is possible that aquatic vegetation at the west end of the lake or the bottom sediments are taking up the excess. If this is the case, the amount of algae suspended in the open water may not change. However, cottagers in the Summer Village contend that the amount of filamentous algae in the lake is increasing year by year. It seems possible that some of the nutrient supply is being channeled into filamentous algae, which is not measured during routine lake monitoring programs.

5. The development of small campgrounds, such as the Burnstick Lake Resort, would likely have a minimal impact on water quality in the lake as a whole, especially if sewage is removed from the watershed, the development is designed to minimize erosion and nutrient input, and natural vegetation is maintained as much as possible. However, this conclusion does not consider temporary impacts that would occur during construction, and local effects that might adversely affect the shoreline in the area of the resort.

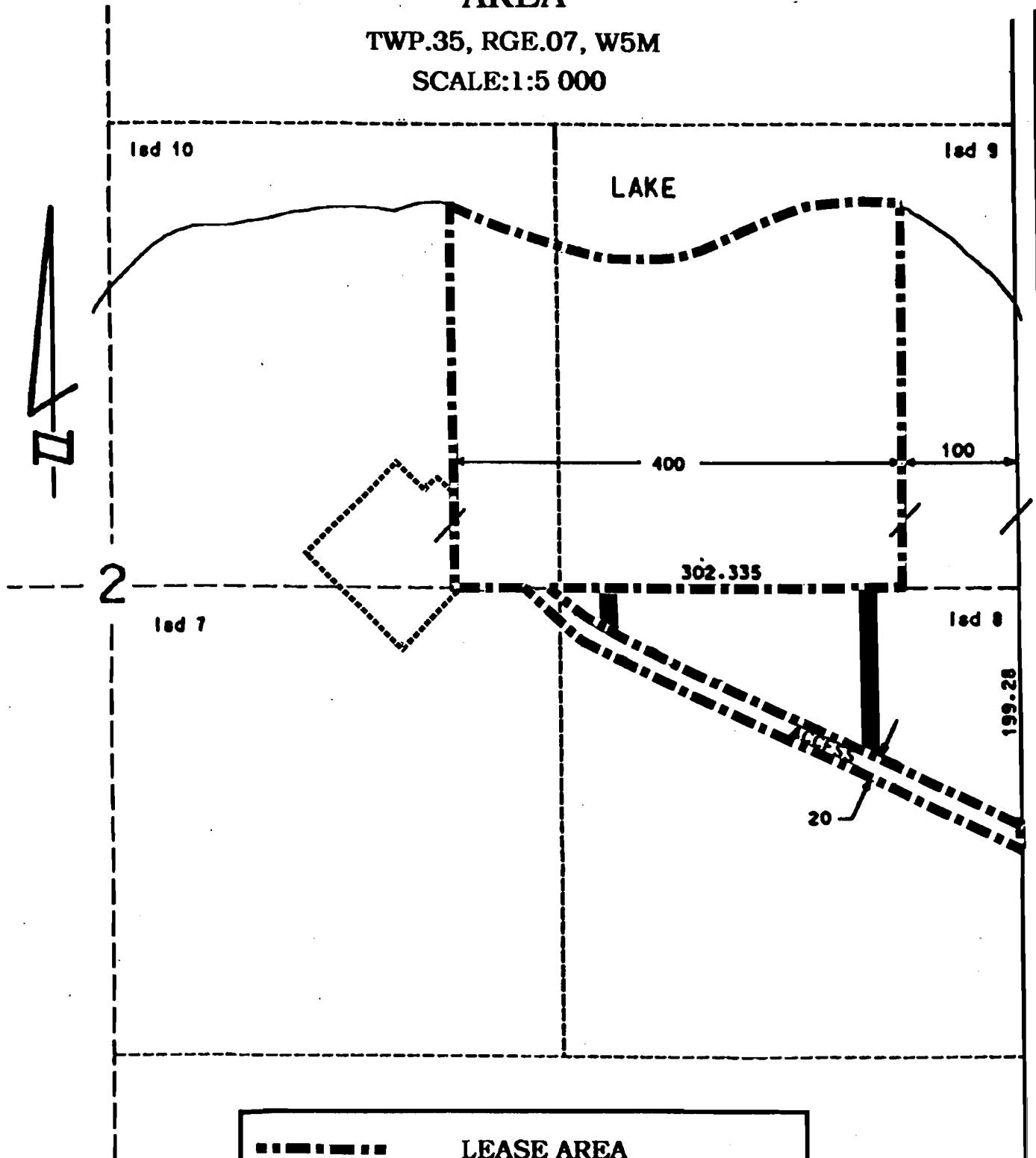
6. Outside of the natural phosphorus supply from forested land, it is likely that the greatest single source of nutrients for Burnstick Lake is cattle within the watershed, particularly those with access to the lake and its inflow streams. The impact of cattle is potentially greater than, for example, runoff from cleared land because most of the phosphorus in cattle manure is readily taken up by plants (highly bioavailable), whereas phosphorus in silt carried by streams may be only partially bioavailable. A focus of water quality protection for Burnstick Lake (or any lake) should be the removal of cattle from the lakeshore and inflow streams. It may be possible to retain them in the watershed if alternate watering facilities away from the lake could be provided.

7. The preservation of water quality should be a major focus of decision-making for development within the watershed. Prospective developers should be required to demonstrate that a change in land use (for example, from forest to cottages or campgrounds, or timber harvesting) would not increase the nutrient supply. It should be possible to protect water quality in the lake, and still allow carefully controlled development.

Appendix 6. BURNTSTICK LAKE RESORT DEVELOPMENT AREA

TWP.35, RGE.07, W5M

SCALE:1:5 000



LEASE AREA

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ABANDONED WELLSITE
(Unocal)

Appendix 7. Conditions Contained in Water Resources Permit #93-130-R
(Burnstick Lake Resort)

1. Copy of permit is to be available at job site during construction.
2. The development of the beach area will involve placing sand in the waters of Burnstick Lake within a staked area marked by Alberta Environmental Protection as Westerly Beach Limit and Easterly Beach Limit, but shall not exceed one metre (three feet) into the lake by 20 metres (66 feet) along the shoreline.
3. The seasonal installation and removal of the non-permanent dock must be done in such a manner as to not disturb the natural ground or vegetation. The seasonal installation and removal operation must utilize the boat launch.
4. The deposition of deleterious material on the ice or in the water is prohibited.
5. Precautions shall be taken to minimize siltation into the lake.
6. Disturbance of the bed and banks of the lake arising from any activity or equipment used in the construction is to be kept to a minimum and confined to the immediate site. The floating material at the proposed site shall not be disturbed.
7. Disturbed areas are to be stabilized and reclaimed to vegetation within one growing season.
8. Completed works are subject to final inspection and approval by the Department of Environmental Protection.
9. This Authority is in effect until (updated as required).
10. Contact five days prior to commencement of construction.

Additional note in covering letter: The control structure at the outlet of Burnstick Lake has artificially raised the water levels in the lake. These levels will fluctuate according to the precipitation in the area and has resulted in floating as well as submerged debris. It is advisable, and we strongly recommend you inform your patrons of the potential boating hazards. This could be accomplished by posting a sign at the boat launch.

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