MISTIK MANAGEMENT LTD.

2017 20-YEAR FOREST MANAGEMENT PLAN

Volume I

Background Information Document

2017 FOREST MANAGEMENT PLAN – VOLUME I

BACKGROUND INFORMATION DOCUMENT

for the

Mistik and L&M Forest Management Agreement (FMA) Areas

For the 20-year period from April 1, 2017 to March 31, 2037

Box 9060

Meadow Lake, Saskatchewan

Canada, S9X 1V7

Library and Archives Canada Cataloguing in Publication

Nesdoly, Roger G., 1954
Mistik Management Ltd. 2017: 20-year forest management plan / Roger G. Nesdoly.

Includes bibliographical references.
Title: Mistik Management Ltd. 2017 20-Year Forest Management Plan Vol l Background Information Document
ISBN 978-0-9699737-2-0 (Vol I and Appendices)

2017 FOREST MANAGEMENT PLAN – VOLUME I

for the

Mistik and L&M Forest Management Agreement (FMA) Areas

For the 10-year period from April 1, 2017 to March 31, 2027

*I hereby certify that I have prepared this **Volume I – Background Information Document** to the best of my professional skill and judgement in accordance with the requirements of the Forest Planning Manual.*

Submitted by:

August 16, 2017

Roger G. Nesdoly RPF

Date

Plan Author
Chief Forester and General Manager
Mistik Management Ltd.

Approved by:

August 17/17

Dave Stevenson

Date

Manager of Forest Planning, Policy, and Protection
Saskatchewan Ministry of Environment

2017 FOREST MANAGEMENT PLAN – VOLUME I

for the

Mistik and L&M Forest Management Agreement (FMA) Areas

For the 10-year period from April 1, 2017 to March 31, 2027

PLANNING TEAM MEMBERS

Public Advisory Group

Allyson Brady (Saskatchewan Ministry of Environmental Society)

John (Jack) Purves (Goodsoil/West District)

Tony Leeson (St. Walburg)

Saskatchewan Ministry of Environment
Mark Doyle
Narayan Dhital
Nadine Penney
Kathleen Gazey
Amy Slack

Silvacom Ltd.

Ryan Spooner

Mistik Management Ltd.
Robert Follette
Niska Hodgson
Cliff McLauchlan
Karl Schulz
Roger Nesdoly

Meadow Lake Mechanical Pulp

Paul Orser

2017 FOREST MANAGEMENT PLAN – VOLUME I
for the
Mistik and L&M Forest Management Agreement (FMA) Areas

Identification of sections of the

Forest Management Plan – Volume I

not prepared by the Plan Author

The following individuals contributed significantly to the documentation of various sections of this document:

Brock Folkersen, Legal Counsel for Mistik Management Ltd.(retired), Saskatoon, Saskatchewan.

Section 16.3

Kathleen Gazey, Area Forester, Saskatchewan Ministry of Environment, Meadow Lake, Saskatchewan.

Section 14

James McQueen, Department of Rural Economy, University of Alberta, Edmonton, Alberta.

Sections 6, 7 and 16.4.4 to 16.4.6

Glenn Padbury, Agriculture Canada, Saskatoon, Saskatchewan and **Ken Van Rees**, Department of Soil Science, University of Saskatchewan, Saskatoon, Saskatchewan.

Sections 5.5, 5.6 and 5.10

Steve Van Wilgenburg, Canadian Wildlife Service, Saskatoon, Saskatchewan.

Section 6.1 and 6.7

Nathan Friesen, Heritage Branch, Regina, Saskatchewan and **Jim Finnigan**, Western Heritage Services Inc., Saskatoon, Saskatchewan.

Section 6.11

Silvacom Ltd., Edmonton, Alberta.

All map products and most data summaries used throughout the document.

ACKNOWLEDGEMENTS

I would like to thank the participants of Mistik's **Public Advisory Group** and **2017 FMP Planning Team** for their dedicated and collaborative involvement in the preparation of the **Volume I – Background Information Document**.

Other individuals/organizations have provided significant support in the development and review of portions of this document. In particular, I would like to thank:

Silvacom Ltd. staff

PHOTO CREDITS

Mistik is grateful to **Marlow** and **Leslie Esau and Glen Cariou** for undertaking to capture the Mistik FMP area and associated people, communities and forest use activities in digital photographs. Many of the photos used in this document are from Marlow/Leslie's and Glen's work.

John Murray provided the photograph of the white-tailed deer in Figure 6.22 of this document.

Gilbert Proulx provided the photographs of fur-bearing mammals in Figure 6.43 of this document.

Heidi den Han provided the picture of the Black-throated green warbler in Figure 6.65 (via **Steve van Wilgenburg**).

Several photographs were accessed from the **Saskatchewan Ministry of Environment** and **Saskatchewan Food and Agriculture** websites.

Steve van Wilgenburg conducted all the field work and GIS mapping associated with creating the image in the bottom panel of Figure 6.83 (the image represents a tremendous amount of field work).

And lastly thanks to the many **Mistik staff** who provided various photographs.

Roger G. Nesdoly RPF

Plan Author

Chief Forester and General Manager

Mistik Management Ltd.

Note

From a strategic perspective a Forest Management Plan for the L&M FMA is embedded within this document. Landbase metrics include values for the L&M FMA. As such Mistik's and L&M's Forest Management Agreements, will hereby known as the Mistik FMP Area throughout the rest of the documentation.

1 TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

2 EXECUTIVE SUMMARY

On behalf of Mistik Management Ltd. (Mistik), and its Board of Directors, I am pleased to present **Volume I - Background Information Document** of **Mistik's 2017 20-Year Forest Management Plan** (FMP) completed in fulfillment of the requirements of *The Forest Resources Management Act,* the Province of Saskatchewan's *Forest Management Planning Document (August 2007)/Forest Management Planning Standard (draft April 26, 2017)* and Mistik's *Forest Management Agreement (2002)* with the Province of Saskatchewan.

Mistik's **2017 FMP Volume I - Background Information Document** provides both the Province of Saskatchewan and the public with a variety of information related to sustainable forest management of Mistik's Forest Management Agreement (FMA) area. This background information document addresses the following topics:

- Provincial policies, manuals, regulations and standards related to forestry;
- Mistik's existing 2007 20-Year Forest Management Plan commitments;
- Mistik's Environmental Impact Statement approval conditions;
- Resource management plans associated with Mistik's FMP area;
- Saskatchewan Ministry of Environment identified issues within the Mistik FMP area;
- Strategic forestry-related business direction reports;
- Licenses and legal agreements pertaining to resource use on the FMP area;
- Public issues and concerns related to forest management on the FMP area from 2007 to 2015;
- Other reports pertaining to forest management on the FMP area;
- Location of the license area;
- Historical overview of the license area;
- Key elements of the FMA license;
- Independent operators;
- Mistik's forest management principles;
- Mistik's voluntary environmental and forest certification programs;
- Mistik-related socioeconomic contributions locally and provincially;
- Historical overview of Mistik's forestry activities;
- Current factors affecting determination of harvest levels;
- Administration of existing 20-Year FMP and Environmental Assessment Act approval;
- Socioeconomic profile of local communities associated with the Mistik FMP area;
- Biophysical description of the Mistik FMP area;
- Land uses and values within the Mistik FMP area;
- Current forest condition of the Mistik FMP area;
- Natural disturbances and forest health in the Mistik FMP area;
- Description of key aspects of forest management activities within the Mistik FMP area;
- Timber volume requirements by mills and independent operators and delivery to mills.

The completion of this document is Mistik's most recent step in demonstrating ongoing commitment to sustainable forest management of Saskatchewan's boreal forests. It also underscores Mistik's corporate vision of being an innovative, responsible and adaptive forest management company that continually strives to improve its relationships, services and trust with the land, local people and local mills.

Roger G. Nesdoly RPF

Chief Forester and General Manager

3 PROVINCIAL SOURCES OF DIRECTION

3.1 PROVINCIAL FOREST MANAGEMENT MANUALS AND STANDARDS

The Forest Resources Management Act (FRMA) in Saskatchewan requires the holder of a Forest Management Agreement (FMA) to develop a Forest Management Plan (FMP) that covers a period of 20 years and revise the (Twenty Year) plan every 10 years. T*he EA Act* states that a person shall not proceed with a development (as defined in *The EA Act*), until Ministerial Approval has been received. It further sets requirements for a process of environmental impact assessment intended to inform the Minister of the potential impacts of a development prior to making a decision regarding the development. Following January 2015 amendments to *The Forest Resource Management Act* (FRMA), a decision under Section 39.1 of *The Forest Resource Management Act*, now constitutes an approval under section 15 or 16 of *The Environmental Assessment Act*, eliminating the need for dual approvals. The Forest Service Branch is responsible to assess whether the FMP meets the requirements of FRMA and sections 9 to 14 of *The EA Act*.

The FMP process is guided by the Saskatchewan Environmental Code and corresponding Forest Management Planning Chapter (D.1.5), which came into effect on January 5, 2015. The current Forest Management Planning Document (2007) has been under revision since 2012 and Mistik has been a participant in the redevelopment process. The Mistik FMP Planning Team has cooperatively agreed to take a hybrid approach, incorporating important elements of the 2017 Draft Planning Standard and streamlining some redundant requirement from the current (2007) standard.

3.1.1 INTEGRATED FOREST LAND USE PLAN (IFLUP) FOR THE MISTIK FMP AREA

The *Forest Resources Management Act,* states that the minister may require that an integrated forest land use plan be prepared:

'The minister may require that an integrated forest land use plan be prepared for a planning area for the purpose of co-ordinating policies, programs and activities to guide and regulate existing and potential uses of land within that planning area.'

There is no integrated forest land use plan prepared for the Mistik FMP area.

3.1.2 MISTIK'S 2007 20-YEAR FOREST MANAGEMENT PLAN (FMP)

In preparing Mistik's 2017 20-Year FMP, Mistik's existing 2007 20-Year Forest Management Plan (FMP) will be referenced to support compilation of background information. The existing 2007 20-Year FMP will also be referenced to identify and maintain key areas of consistency with respect to forest management objectives and practices that will continue to be useful in the future. Key areas of departure from existing prescribed forest management objectives and practices will also be identified.

Mistik's existing 2007 20-Year FMP is comprised of two documents.

The Mistik Management Ltd. 20-Year Forest management Plan is comprised of two volumes: Volume I Background Information Document with associated appendices and Volume II Forest Management Plan with associated appendices plus the 2007 20-Year Forest Management Plan Change in Development Document (The Environmental Assessment Act – Section 16).

3.1.3 OTHER RESOURCE MANAGEMENT PLANS

In preparing Mistik's 2017 20-Year FMP, other resource management plans (approved or draft) that are relevant to the management of forests in Mistik's FMP area will be referenced to support compilation of background information and to provide direction related to establishment of forest management objectives and practices. There are currently three resource management plans that have relevance to forest management activities within the Mistik FMP area:

1. **Woodland Caribou – Forestry Impact Mitigation Plan** (Mistik, 2009);
2. **Cold Lake / Waterhen River Task Force Report** (Saskatchewan Watershed Authority, 1994);
3. **Status and Management of Wildlife in Saskatchewan (1999-2001)** (Saskatchewan Ministry of Environment, January 2003).

3.1.4 SUMMARY OF RESOURCE MANAGEMENT CHALLENGES WITHIN THE MISTIK FMP AREA.

Saskatchewan Ministry of Environment has identified three forest management issues within the Mistik FMP area:

1. Annual softwood harvest volume;
2. Management of independent operators;
3. Non utilization of the entire FMA (e.g. northern areas).

3.1.5 STRATEGIC BUSINESS DIRECTION REPORTS

Mistik, in fulfilling its timber procurement responsibility to its shareholders, is continuously assessing new timber supply options, opportunities for increased timber utilization and reducing overall timber cost to mills. In support of strategic business direction initiatives, Mistik maintains ongoing assessments of timber supply and utilization.

Timber Supply and Utilization References:

Mistik Management Ltd. 1997. Wood Opportunities for the NorSask FMLA and Surrounding Area. Internal Report. Mistik Management Ltd., Meadow Lake, Saskatchewan, Canada. 68 pp.

Mistik Management Ltd. 1997. Northern Opportunities – A Plan to Develop the Forest Resource in Northern Saskatchewan. Internal Report. Mistik Management Ltd., Meadow Lake, Saskatchewan, Canada. 10 pp.

Mistik Management Ltd. (Balisky) 1999. Mistik and Mills – Forests and Fiber. Mistik Management Ltd., Meadow Lake, Saskatchewan, Canada. 75 pp.

Mistik Management Ltd. (Keddy) 2000. CTL and Mistik – A Review of the First 15 Months. Mistik Management Ltd., Meadow Lake, Saskatchewan, Canada. 42 pp.

4 LOCATION OF THE LICENSE AREA

The Mistik Forest Management Agreement area (FMA) and the L&M Forest Management Agreement area (combining to make the Mistik FMP area) is located in northwest Saskatchewan adjacent to the Alberta border (Figure 4.1 and Map 1 – Appendix E). The Mistik FMP area encompasses 1,878,499 hectares of forests, water and non-forested land. Most of the FMP area is located north of the town of Meadow Lake extending north to the Kimowin River (north end of Peter Pond Lake), bordered on the west by the Alberta/Saskatchewan border and the Cold Lake Air Weapons Range and on the east by Dore Lake, Lac la Plonge and Lac Ile a la Crosse. An additional portion of the FMP area occurs south of Meadow Lake. The FMP area is currently managed within the context of thirteen management units, including timber reserve and recreation areas (Figure 4.2 and Map 2 – Management Units, Appendix E) ranging in size from 13,705 ha to 355,677 ha. The average management unit size is 152,700 ha. Table 4.1 identifies the management units and respective areas (ha) comprising the current Mistik FMP area.

Management Unit 85 L&M FMA is included in Mistik's Forest Management plan from a strategic perspective. Due to the small size of the L&M FMA the preparation of a separate forest management plan comes at a great financial cost for little perceived benefit to L&M and the province. The inclusion of the L&M FMA within Mistik's FMP provides L&M with financial scales of economy while also generating more reliable forestry related metrics. L&M is a separate FMA and as thus requires its own annual operational approvals.

Table 4.1 Management unit summary

Management Unit	Gross Area (ha)	% of Total Area
79-Timber Reserves	5,907	<1%
78- Recreation Areas	6,317	<1%
20-Beaver River	13,705	1%
03-Big Island Lake	37,926	2%
12-Murray Bay	62,412	3%
02-Pierceland	112,426	6%
09-Ile a la Crosse	119,855	6%
10-Buffalo Narrows	125,665	7%
07-Beauval	149,212	8%
01-Divide	160,128	9%
04-Waterhen	186,515	10%
08-Canoe Lake	189,585	10%
21-Peter Pond	283,956	15%
11-Dillon	355,677	19%
85-L&M	69,211	4%
Total	**1,878,499**	**100**

* Does not include Villages, Exclusions, Indian Reservations, Midnight Lake, and Settlements.

4.1 COMMUNITIES AND INFRASTRUCTURE

Approximately 30 communities exist within or adjacent to the Mistik FMP area (Figure 4.3, Map 3 – Communities and Infrastructure, Appendix E). Approximately half of these communities are comprised of First Nation and Métis populations. The FMP area is relatively well-roaded. Ten provincial highways occur within the limits of the FMP area (Highways # 155, 165, 903, 904, 908, 919, 925, 941, 965 and 165). Additionally, Mistik has constructed several provincial forestry Class 1 roads including the East/West Road, Stewart Lake Road, Upper Cummins Road and the Vermette Road. There is no rail service to Meadow Lake. Oil and gas infrastructure occurs on the west side of the FMP area but is most dominant in the area immediately to the south of the Cold Lake Air Weapons Range.

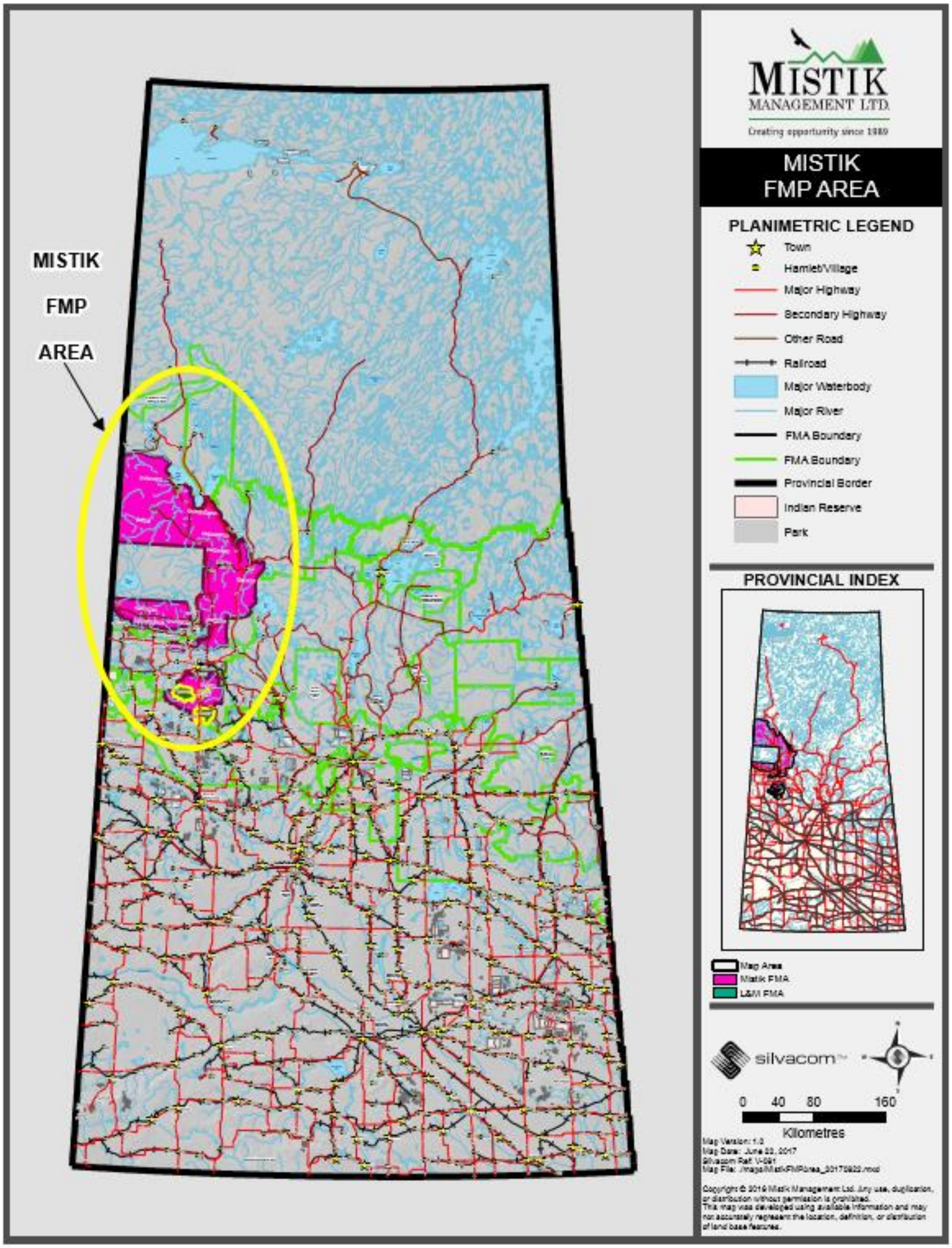


Figure 4.1 The Mistik FMP area in a provincial context

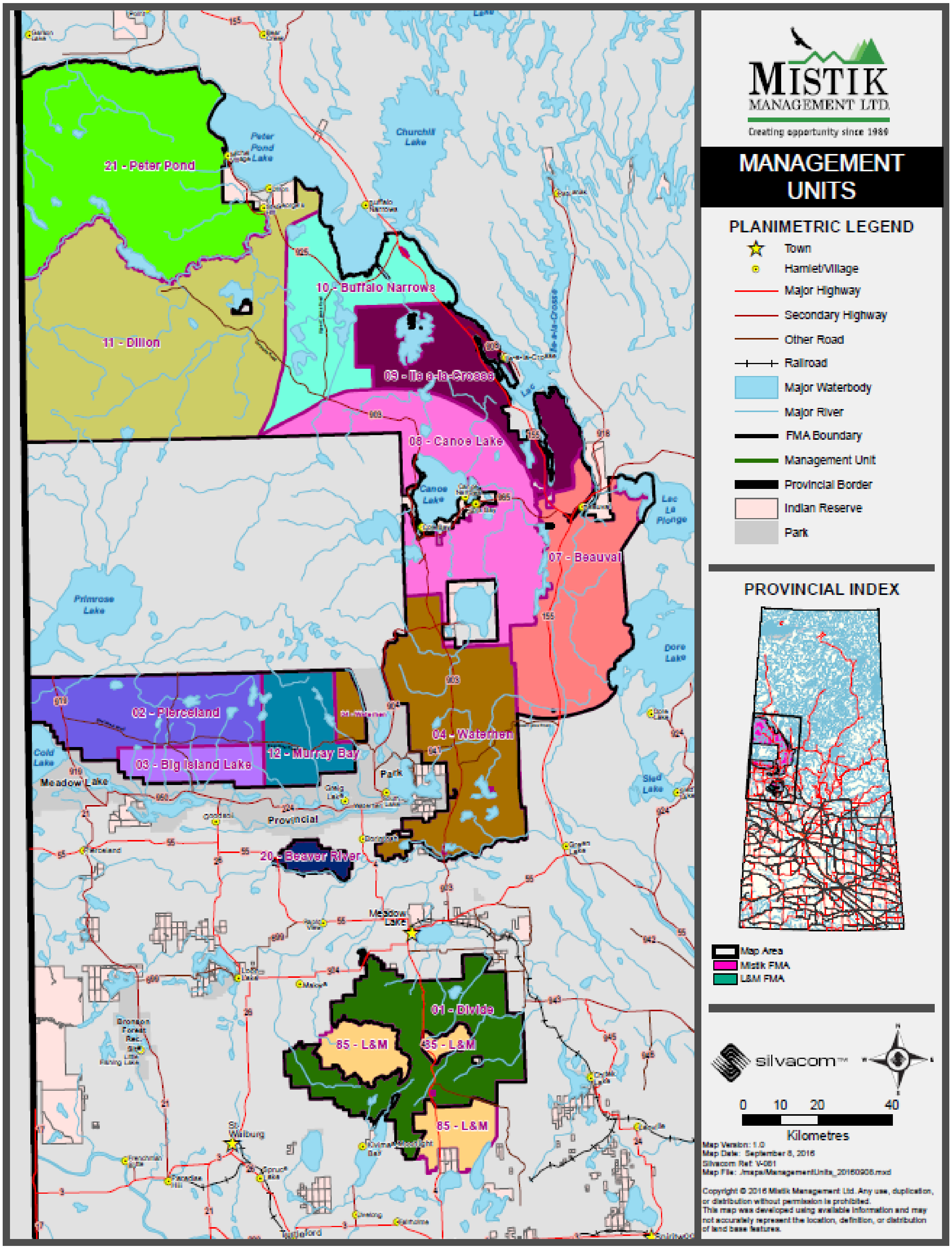


Figure 4.2 Mistik FMP area management units

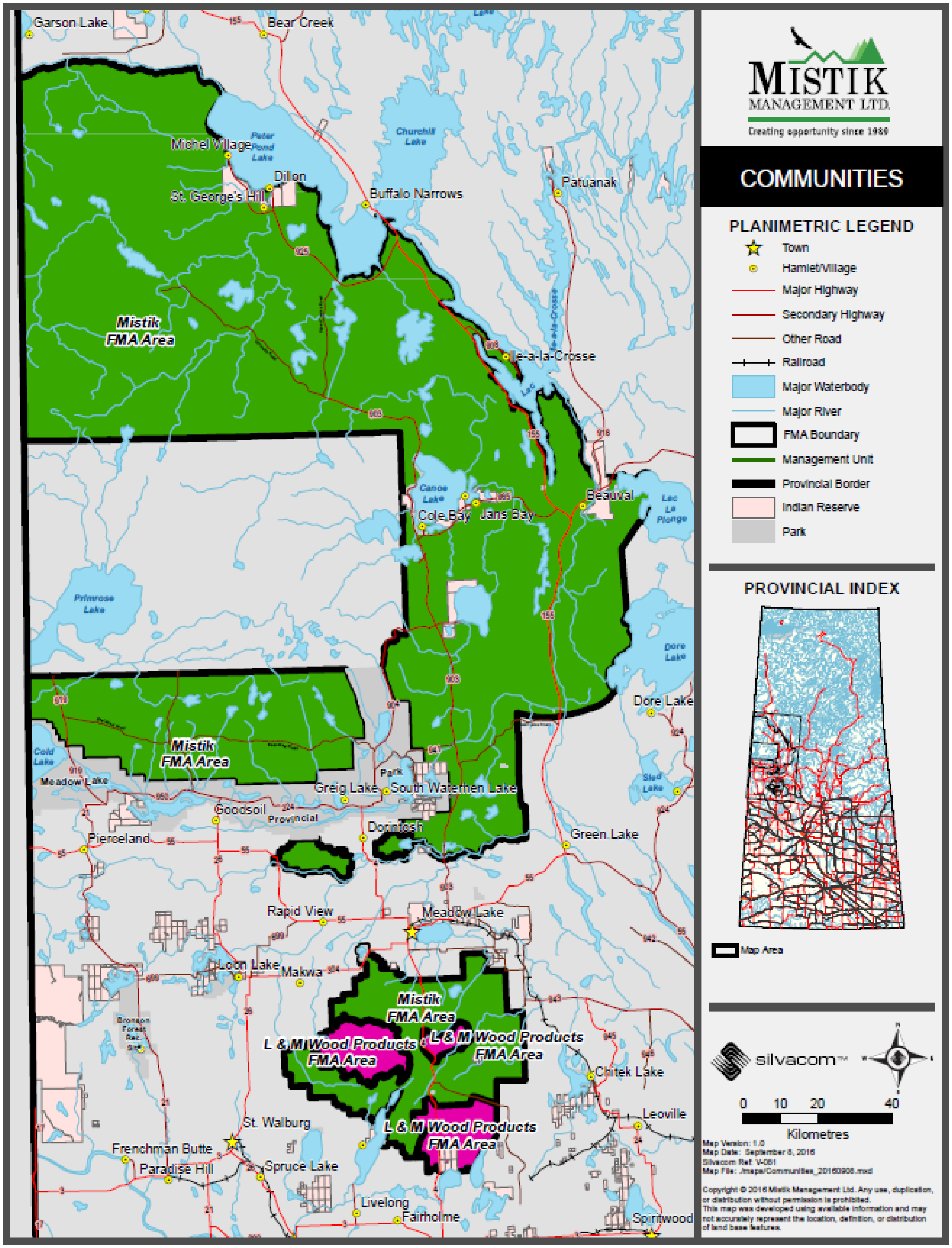


Figure 4.3 Communities and infrastructure within the Mistik FMP area

5 BIOPHYSICAL DESCRIPTION OF THE MISTIK FMP AREA

5.1 PHYSIOLOGY

The Mistik FMA occurs within the physiographic region known as the Interior Plains, which is a vast area of low relief extending east and north from the mountainous Cordilleran Region to the Canadian Shield (Bostock, 1970). In the central and southern parts of the Prairie Provinces, the Interior Plains Region is divided into three physiographic divisions: The Manitoba Plain, the Saskatchewan Plain and the Alberta Plain (Ellis and Clayton, 1970). These plains are separated from east to west on the basis of major elevation changes which coincide with the three prairie "steppes" identified in the Palliser journals of the early 1860's. The Mistik FMA itself spans the transition between the Saskatchewan Plain and the Alberta Plain, which is marked most notably by the prominent south- and east-facing slopes of the Mostoos Hills at an elevation of 500-600 meters. For the most part the Saskatchewan Plain extends eastward from the Mostoos hills and includes both the Beaver River and Ile a la Crosse plains, whereas the Alberta Plain is comprised of the Thickwood Hills in the south and the Mostoos and Grizzly Bear Hills in the north

5.2 REGIONAL DRAINAGE

With the exception of a small area in the southern part of the Thickwood Hills Upland that drains into the North Saskatchewan River drainage basin, and a very small area in the extreme northwest along the Alberta border that drains north into the Athabasca River, the Mistik FMP area occurs entirely within the Churchill River basin. The southern part of the FMP area is drained largely via the Beaver and Waterhen Rivers, whereas the northern part is drained by numerous small streams which flow northeastward into Peter Pond Lake and Lac Île-à-la-Crosse and eventually the Upper Churchill River.

As a general rule within the FMP area, the headward extension of streams in steeply sloping terrain is governed by the direction and steepness of the slope, resulting in a sub-parallel drainage pattern. In gently sloping areas, the headward extension is governed more by differences in the erodibility of the surficial materials, resulting in a dendritic pattern. Streams occurring in steeply sloping upland areas, such as the Moostos escarpment, usually flow in deep-set, well-defined valleys throughout their course in the upland; while those in smoother landscapes, such as the Cowan and Waterhen rivers, usually flow in poorly-defined valleys whose banks are subject to overflow. Oversized drainage systems, or misfit streams, where relatively small streams flow in large valleys, which are former glacial meltwater channels, also occur in the FMP area. Many of the valleys along the east-facing slopes of the Mostoos Hills Upland are former glacial meltwater channels. The oblique alignment of many of these valleys relative to the slope is also indicative of their glacial origin.

5.3 BEDROCK GEOLOGY

Marine and nonmarine sandstones, and silt and clay shales of Cretaceous age (100-135 million years) form the bedrock surface over the entire FMP area. These rocks are a result of alternating periods of marine and nonmarine deposition which correspond to the alternating regressions and transgressions of the Cretaceous sea in the western portion of the Interior Plains of North America (Whitaker, 1972).

Lower Cretaceous strata (Manville Group), consisting of interbedded fine to coarse sand, silt, and clay, occur beneath the glacial drift in the northeastern part of the area and outcrop just north of the FMP area boundary. The sandy glacial deposits found in this part of the map area are derived from these sediments.

Upper Cretaceous strata, consisting of both calcareous and noncalcareous silts and clays, underlie the glacial deposits in the remainder of the map area. Although noncalcareous shales normally weather to acid clays, the mixing of limestones and other calcium bearing minerals into these shales by glacial action has resulted in high base status surficial geologic deposits.

5.4 GLACIAL GEOLOGY

The surficial geologic deposits overlying the bedrock are the result of continental glaciations during the Pleistocene Epoch, roughly 10,000 to 1,000,000 years ago. These deposits, collectively referred to as glacial drift, range in thickness from less than 70 m in parts of the Beaver River Plain, to over 300 m in the Mostoos Hills.

Glacial drift can be divided into two distinctive but gradational groups of material: unstratified drift laid down by glacier ice, and stratified drift laid down by glacial meltwater. Unstratified drift, or glacial till, consists of an unsorted mixture of mineral fragments ranging in size from large boulders to minute particles of clay. This size range was recognized in the descriptive Scottish name given to glacial till, "boulder clay". Stratified glacial drift consists of materials transported by glacial meltwater and deposited either within or beyond the ice sheet. During transportation and deposition, the materials are sorted into various size fractions resulting in deposits of dominantly sandy, silty or clayey texture. The particle size distribution, or texture, of stratified deposits is a function of the nature of the original material, the speed and volume of the moving water, and the distance the materials were carried prior to deposition. Glacial till that has been partially sorted by water and contains sorted material represents a gradation between unstratified and stratified drift and is termed modified glacial till. Glacial till that has been eroded by swiftly flowing water is termed eroded glacial till. Eroded till is commonly found in valleys and along steeply-sloping escarpments, and is characterized by a relative abundance of surface stones, gravel, and coarse sand; and a scarcity of silt and clay.

Sediments deposited by rapidly moving glacial meltwater are termed glaciofluvial deposits. These deposits consist largely of coarse sands and gravels, and occur in the form of outwash plains, eskers, kames, and crevasse fillings. Sediments deposited in glacial lakes are termed glaciolacustrine deposits, and consist chiefly of silts and clays.

5.5 LANDFORMS

A landform is a portion of the earth's surface that is recognized by its shape or distinctive surface expression and by the nature of its surficial materials. Based on their particular shape or surface expression landforms can be hummocky, undulating, ridge and swale, or dissected. Hummocky landforms, often named knob and kettle landforms, consist of a series of well drained knolls or hills, generally short, steep slopes and poorly drained basins, potholes, or depressions having little or no external drainage. Undulating landforms are somewhat similar in form but typically have longer slopes and produce a wavelike pattern of low local relief. Ridge and swale landforms are characterized by well drained, steep-sided ridges, flanked by swales or elongated poorly drained depressional areas between the ridges. The ridges are generally parallel, but may be subparallel or intersecting. Dissected landforms are those with external drainage provided by one or more drainage channels. Landforms in which none of these patterns are prominent are considered to be unpatterned.

Based on the nature of the surficial deposit, landforms can be divided into mineral landforms and organic landforms. Most mineral landforms in the FMP area are the result of continental glaciations and are comprised of glacial till, glaciofluvial, glaciolacustrine and fluvial-lacustrine deposits. Recent fluvial and eolian deposits occur only to a limited extent. Organic landforms consist of organic residues, or peat, which result from the cyclical growth and decay of hydrophytic vegetation. They occupy very poorly drained, low-lying or depressional areas in which a water-saturated environment is maintained throughout most of the growing season. Three major types of organic landforms occur in the map area: bogs, fens, and swamps.

5.5.1 GLACIOFLUVIAL LANDFORMS

Glaciofluvial landforms consist of stratified sediments sorted and deposited by rapidly moving glacial meltwater either within or beyond the margin of the ice sheet. The sediments are coarse textured, being gravelly in areas where the glacial meltwater velocities were high, and sandy where they were slower.

Glaciofluvial landforms in the FMP area occur mainly in the form of floodplains, or as deltas where streams empty into glacial lakes. They cover relatively large areas and are generally characterized by nearly level to gently sloping topography. Some of the larger outwash plains in the FMP area occur in the vicinity Keeley Lake. Outwash plains characterized by steeply-sloping topography are less common, but are found west of the Beaver River. Shallow, sandy glaciofluvial sediments overlying either till or glaciolacustrine sediments occur extensively in the Beaver River Plain. These sediments were presumably deposited on the ice surface and then redeposited on the underlying surface when the ice melted. Since these glaciofluvial deposits are generally less than a metre thick, the surface form and topography conforms largely to that of the underlying material.

5.5.2 GLACIOLACUSTRINE LANDFORMS

Glaciolacustrine landforms are comprised of stratified sediments deposited in glacial lakes. The sediments are generally silty or clayey in texture and are often layered or varved. A varve consists of two layers: a thick, light-colored, layer of silt and fine sand laid down in the spring and summer; and a thin, dark-colored, layer of clay laid down in the fall and winter.

Glaciolacustrine landforms generally occur in the form of glacial lake plains which cover large areas and are characterized by nearly level to gently undulating topography such as the level agricultural area near Meadow Lake. Within the FMP area, however, they are often steeply sloping such as those found southeast of Waterhen Lake and sporadically with the Beaver River Plain. Moreover, they are typically found at elevations considerably above the surrounding terrain and are composed of distinctly varved, fine sands and silts. Presumably, these sediments were initially deposited in confined basins or channels on the ice surface and later redeposited when the ice melted. Occasionally glaciolacustrine sediments also occur in till-dominated areas, where they overlay the lighter textured till sediments on the lower slopes in the landscape. The till occurs at the surface on the knolls and upper slopes.

5.5.3 FLUVIAL-LACUSTRINE LANDFORMS

Fluvial-Lacustrine landforms, as the name implies, are comprised of stratified sediments that were deposited under alternating fluvial and lacustrine conditions. These sediments are coarse in texture and contain bands or layers of silty or clayey sediments. The bands normally occur in a wavy pattern parallel to the surface, but are occasionally vertically orientated, and sometimes discontinuous. They vary in thickness from about 0.5 to 10 cm, and occur at intervals of 2 to 30 cm or more. Fluvial-Lacustrine landforms are common in the Beaver River Plain south and east of Keeley Lake and are often found roughly to steeply sloping topography.

5.5.4 MORAINAL LANDFORMS

Morainal landforms consist of ice-lain material called glacial till, which is a heterogeneous mixture of stone, gravel, sand, silt, and clay that exhibits little or no evidence of sorting or stratification. It varies considerably in composition depending upon the type of materials incorporated into the ice; the manner in which these materials were transported and deposited during glaciation; and the subsequent alterations such as those due to erosion. The glacial till in the FMP area is generally light grayish-brown to dark gray in color, sandy loam to clay loam in texture, and weakly calcareous.

Morainal landforms range from nearly level ground moraines having slopes of less than 5%, to rolling glacial till plains and eroded escarpments with slopes of 20% or more. They are by far the most extensive landform in the FMP area occupying extensive tracts in the Thickwood and Mostoos Hills.

5.5.5 EOLIAN AND RECENT FLUVIAL LANDFORMS

These types of landforms are comprised of sediments laid down since glaciation. Eolian landforms consist of sandy glaciofluvial and glaciolacustrine sediments that have been modified and redeposited by wind, forming sand dunes. Recent fluvial landforms consist of stratified sediments associated with floodplains and levees of stream courses. Post glacial landforms occur to a very limited extent in the FMP area.

5.5.6 BOG LANDFORMS

Bogs are organic landforms composed largely of forest and sphagnum peat. Forest peat is a heterogeneous mixture of woody and herbaceous organic residues derived from mosses, shrubs and trees. It is usually dark brown to reddish-brown in color and moderately- to well-decomposed. Sphagnum peat, as the name implies, is derived mainly from sphagnum moss. It is generally light colored, and relatively undecomposed with its vegetative components easily identifiable.

Bogs can be subdivided on the basis of their surface morphology into the following types: bowl bog, flat bog, raised bog, and domed bog. Bowl bogs and flat bogs are composed mainly of forest peat, except around their margins where the forest peat is often overlain by a shallow layer of sphagnum peat. Both bog types usually support dense stands of either black spruce, or black spruce and larch. Bowl bogs occur in small, undrained depressions generally 0.5 ha to 2 ha in size, whereas flat bogs generally occur in level, low-lying areas of 10 ha to 1000 ha or more.

A raised bog, as the name implies, is usually a metre or more above the surrounding terrain and consists of sphagnum peat overlying forest peat. Since the only source of water is precipitation, these bogs provide a nutrient-poor environment for plant growth and are commonly treeless, or support only sparse stands of stunted black spruce or larch. Raised bogs vary in size from a few hectares to a hundred hectares or more.

A domed bog is characterized by a raised or convex surface which, in cross-section, gives it a domed appearance. Domed bogs are formed either by the accumulation of sphagnum peat, or by uplift due to permafrost. Those formed by the action of permafrost are commonly referred to as palsas and occur in the form of mounds or ridges 1m to 2 m above the surrounding terrain. Palsas generally support black spruce, many of which are tilted due to soil movement caused by permafrost. In the FMP area domed bogs occur sporadically north of the Air Weapons Range, but, because of their small size, they are not delineated on the soil map.

5.5.7 FEN LANDFORMS

Fen landforms consist of peat derived mainly from sedges, and to a lesser extent from grasses, shrubs, and aquatic species such as pondweed and water plantain. The peat is generally very dark brown in color and has a matted or layered structure. It is usually moderately decomposed, although in most fens the degree of decomposition increases slightly from the surface downward.

Fen landforms are divided on the basis of their surface morphology into the following types: bowl fen, horizontal fen, patterned fen, and stream fen. Bowl fens occur in small, undrained depressions about 0.5

ha to 2 ha in size. The vegetation in bowl fens is dominated by sedges, although grasses, willows and alder often occur in the drier areas around the edge. A sparse tree cover of stunted larch, and a shrub layer dominated by swamp birch frequently occur. Due to fluctuations in the water table, the peat itself is generally shallower and more highly decomposed than in other fen landforms.

Horizontal fens cover extensive areas up to 2,000 ha or more and are characterized by a relatively level surface with no marked differences in elevation. The peat is generally deep (> 1 m) and moderately decomposed with the water table at or near the surface throughout the growing season. Horizontal fens are generally treeless, but occasionally support sparse stands of stunted larch or black spruce. The lesser vegetation is dominated by sedges and swamp birch.

Patterned fens are similar to horizontal fens, except that they occur in very gently sloping areas and are characterized by a series of low, relatively parallel ridges which lie perpendicular to the general slope. These ridges are usually about 3 to 5 m across, 10 to 50 cm high, and 30 to 100 m or more apart. In some areas, the ridges form a net-like surface pattern. The vegetation on the ridges consists mainly of stunted larch and black spruce, ericaceous shrubs, feathermosses and sphagnum mosses. In the intervening areas, the vegetation is similar to that in most horizontal fens.

Stream fens occur along low gradient streams. The peat is generally moderately to well decomposed, and often contains thin layers of sands and silts due to periodic flooding. The vegetation in stream fens commonly consists of grasses and shrubs such as willow, although sphagnum is occasionally found along their drier margins.

5.5.8 SWAMP LANDFORMS

Swamp landforms are comprised mainly of moderately-well and well decomposed forest peat, although relatively undecomposed feathermoss or sphagnum hummocks sometime occur. Woody materials, and thin layers of sand or silt, often occur near the bottom of the forest peat deposits.

Swamps are strongly influenced by nutrient-rich groundwater derived from the surrounding mineral terrain. During the spring and early summer, the water table is usually at or near the surface with many pools of water present, but by late summer it is usually well below the surface. The subsequent drying conditions, which promote a rapid decomposition of the peat, coupled with the relatively nutrient-rich conditions provide various environments for plant growth. Consequently, plants that are characteristic of such diverse habitats as bogs, fens, and poorly drained mineral soils commonly occur more or less together in swamps. Some of the more common species include black spruce, larch, white birch, alder, willow, sedges, mosses, and several aquatic species. Swamp landforms occur along small, intermittent creeks, or in level or gently sloping areas having poor external drainage. Most swamps are less than a hectare in size and are thus not shown on the map.

5.6 SOILS

The soils of the FMP area are classified according to the Canadian System of Soil Classification, 1978 edition, which is a hierarchical system of classification in which the classes are defined on the basis of specific soil properties which to a large extent reflect the pedogenic process involved in their formation. The characteristics of the major soil orders occurring in the FMP area are as follows:

5.6.1 BRUNISOLIC ORDER SOILS

In the Mistik FMP area, Brunisolic soils occur most commonly on coarse textured glaciofluvial and fluvial-lacustrine deposits, and occasionally on coarse textured glacial till. The dominant soil forming processes in these soils are lessivage and podsolization, however, because of their high porosity and the sandy nature of the deposits, insufficient clay, or iron and aluminum are retained in the B horizon to form a Bt or Bf horizon, characteristic of Luvisolic and Podzolic soils respectively.

Most Brunisolic soils in the FMP area are developed on materials with a high base status, and thus are classified in the Eutric Brunisol Great Group. The driest types are classified as the Orthic Eutric Brunisol subgroup and are characterized by a L-F-H layer at the surface, underlain directly by a brownish colored Bm horizon. The dominant subgroup is the Eluviated Eutric Brunisol which is characterized by a L-F-H layer at the surface, underlain by a diagnostic Ae horizon and a more reddish colored Bm horizon. The well-developed Ae horizon is reflective of the slightly moister conditions compared to the Orthic Brunisol which lacks an Ae horizon. A small area of Dystric Brunisolic soils occur in the vicinity of Lac Île-a-la-Crosse.

Brunisolic soils typically support jack pine and to a lesser extent forest types such as aspen, aspen-pine and pine-black spruce. Many of the stands are sparse and patchy due to insufficient moisture and nutrients. The understory vegetation also reflects a deficiency in soil moisture and is commonly characterized by xerophytic species such as *Elymus innovatus, Arctostaphylos uva-ursi, Vaccinium myrtilloides* and *Cladonia* species. On the lower slopes under imperfect drainage Gleyed Eutric Brunisol soil profiles occur and the lesser vegetation is typically comprised of *Pleurozium shreberi, Petasites palmatus* and *Mertensia paniculata* with greater amounts of *Ledum groenlandicum* and *Equisetum species.* These sites typically support more productive stands than the upper slopes

The Kewanoke and Pine soil associations are dominantly Brunisolic Order soils. Kewanoke soils are developed on **gravelly** textured glaciofluvial deposits, whereas Pine soils occur on **sandy** textured glaciofluvial deposits which have occasionally been reworked by wind. Brunisolic soils developed on coarse textured sandy glacial till occur to a limited extent in the FMP area. Kewanoke soils are found sporadically throughout the Mostoos escarpment and the southern part of the Mostoos Upland where they are often associated with eroded river valleys. Pine soils occupy extensive tracts to the south and east of the Mostoos Escarpment in the St Cyr and Waterhen Plains and the Canoe Lake Lowland. Brunisolic soils developed on sandy glacial till occur near Lac Île-a-la-Crosse. Since this area has not been mapped in detail, the soils have not been given an official name, but they are similar in characteristics to Bow River soils which are mapped extensively south of Lac La Ronge. The sandy glacial till is thought to have been derived mainly from the Shield and subsequently deposited by the glaciers along its southern boundary.

Well drained Brunisolic soils are among the poorest forest soils due to their low moisture holding capacity and susceptibility to drought. They are also low in organic matter and a number of essential plant nutrients, particularly nitrogen. Moreover, their sandy texture and loose structure renders them relatively susceptible to disturbance by heavy machinery. On the other hand, because of their coarse texture and high porosity, they are not very susceptible to either compaction or water erosion.

5.6.2 CRYOSOLIC ORDER SOILS

Cryosolic soils are permanently frozen soils. In the Mistik FMP area they are found occasionally in organic deposits that have a thick undecomposed Sphagnum spp. surface layer and that occur under a dense stand of black spruce. Cryosols have been found in the FMP area north of the air weapons range, and while their total extent is unknown, it is probably only a few hectares. Most permanently frozen soils in the FMP area are palsas which occur in the form of mounds or ridges 1m to 2 m above the surrounding terrain. Palsas generally support black spruce, many of which are tilted due to soil movement caused by permafrost, a phenomenon sometimes referred to as a ‘drunken forest.

5.6.3 GLEYSOLIC ORDER SOILS

Gleysolic soils occur in poorly drained depressional areas, and are saturated or are under reducing conditions throughout most of the growing season. They typically support hydrophytic vegetation and commonly have a shallow (40 cm) surface layer of peat. Some of these soils have a dark colored Ahg horizon below the organic layer, and, in areas where water moves downward through the soil, they have a grayish colored, platy Aeg horizon and a dark colored Btg horizon.

Gleysolic soils are found on the lower slopes of many landscapes in the upland areas of the FMP area, although some rather large tracts of shallow peaty Gleysolic soils are thought to occur along the Alberta border north of the Air Weapons range. On the most recent soil maps no attempt was made to classify Gleysolic soils at the great group or subgroup levels of the classification, or to map them as separate soil associations. Rather they are considered part of the catenary sequence and are included in the map unit descriptions of the applicable soil association.

Because of excessive wetness forest productivity is low and most Gleysolic soils are considered unproductive, although on occasion they support merchantable stands of 15-20 m black spruce. Black poplar is also often indicative of poorly drained Gleysolic soils. Like Organic soils they are highly susceptible to rutting by heavy machinery due to the surface layer of peat and water-saturated subsurface.

5.6.4 LUVISOLIC ORDER SOILS

Luvisolic soils are well to imperfectly drained soils formed as a result of the lessivage process. The profiles have a surface organic layer (L-H horizon) underlain by an ashy-gray colored Ae horizon, and then a dark brown colored, textural Bt horizon. The lessivage process is nurtured in Luvisolic soils by organic acids which form in the organic layers and move downward through the mineral soil dissolving such constituents as carbonates, sesquioxides and clays. The carbonates, sesquioxides and other soluble salts are generally moved below the B horizon whereas the clays are deposited, forming a Bt horizon. The Bt horizon in medium and fine textured soils is usually continuous with depth; but in some coarser textured soils, it commonly occurs as bands or thin layers about 0.5 to 10 cm thick. Frequently, a transitional AB horizon occurs between the Ae and Bt horizons.

Luvisolic soils are the most extensive group of soils in the FMP area and occur mainly on glacial till, and to a lesser extent on glaciolacustrine, and the finer textured fluvial-lacustrine and glaciofluvial deposits which have sufficient clay (>5%) in the parent material to form a textural Bt horizon. Luvisolic soils in the FMP area are classified in the Gray Luvisol great group, with the dominant subgroups being the Orthic Gray Luvisol, the Brunisolic Gray Luvisol, and the Gleyed Gray Luvisol.

Well drained Luvisolic soils are the most productive soils in the FMP area supporting a mosaic of hardwoods (aspen, white birch) softwoods (white spruce, black spruce, jack pine, balsam fir) and mixedwoods. The lesser vegetation is equally diverse reflecting in general the long term soil moisture conditions and perhaps more importantly the species composition and canopy density and of the forest stand.

As mentioned previously Luvisolic soils occur mainly on glacial till, with the most common soils being the Loon River and Bittern Lake associations. Loon River soils, which are Gray Luvisolic soils developed on loamy textured glacial till, occupy extensive tracts in the Thickwood Upland, the Mostoos Escarpment and the Mostoos Upland. Exploratory surveys suggest they also extend northward into the Christina and Dillon Plains. Luvisolic soils developed on clayey glacial till have also been found sporadically north of 55 degrees where large amounts of shale bedrock have been incorporated into the till during glaciation. Bittern Lake soils are Luvisolic soils having a shallow (<1m) layer of sandy fluvial material overlying the loamy glacial till. These soils are found most commonly in Waterhen Plain where they are often associated with sandy Pine and Waterhen River soils.

Luvisolic soils developed on glaciolacustrine sediments include the Dorintosh, La Corne, Waterhen River and Flotten soils. Dorintosh soils are developed in silty and clayey glaciolacustrine materials, while the parent material of La Corne soils is comprised of fine sandy deposits having at least 15% clay. Both deposits are generally varved and exhibit a distinct platy structure. Each varve consists of two layers: a relatively thick, light brownish-gray to pale brown colored, layer deposited during the summer months, and a thinner, dark grayish-brown colored, more clay-rich layer deposited in winter. Dorintosh soils are typically found on relatively level landscapes, whereas La Corne soils are most commonly associated with rolling landscapes formed by deposition of glacial meltwater into ice-walled channels or valleys either within or on top of the ice. The La Corne soils found east of Waterhen Lake are an example. Flotten soils are similar to Dorintosh soils except that they have a shallow layer of sandy glaciofluvial material at the surface. The parent material of Waterhen River soils is generally sandy but contains layers, or "bands", of dark colored, medium to moderately fine textured sediments. The bands vary in thickness from 0.5 to 8 cm, and occur at intervals of 2 to 30 cm or more. The bands are often discontinuous and normally occur in a wavy pattern parallel to the ground surface, but occasionally they are vertically orientated. The thin bands are dense, compact, and dark reddish-brown in color. Both Flotten and Waterhen soils are found mostly in the Waterhen Plain.

Due to their favorable soil moisture regime, Luvisolic soils are the most productive soils in the FMP area. For well drained Luvisolic soils, whose only source of moisture is precipitation, forest productivity is governed largely by the soil's moisture holding capacity, or in other words by it's ability to store and subsequently supply moisture to the tree during periods of moisture stress, which in turn is generally related to the amount of clay in the soil - the higher the clay content, the higher the soil's moisture holding capacity.

In sloping landscapes, precipitation that does not enter the soil directly moves down slope as runoff, the amount being governed by the shape of the landscape, the permeability of the soil, as well as the frequency, intensity, and duration of rainfall events, the snowmelt conditions and so on. Runoff also contributes to ground water, which, when close to the surface can also affect the soil's moisture regime. The net result is that soils found on the lower slopes often receive additional moisture which can significantly improve their productivity. If the amount of additional water is minimal, then the soil will typically exhibit reddish-colored mottles either at depth (>75 cm) within the profile, or within the Ae horizon due to a temporary water table perched above a compact B horizon. These soils are termed moderately well drained. If soil remains above field capacity for significant periods, the soil will exhibit mottling throughout the profile and is considered to be imperfectly drained. These soils are called Gleyed Gray Luvisols. All other factors being equal, these soils provide a more reliable source of moisture than the well drained types, and their productivity is higher. If the moisture conditions are such that peat forms at the surface, the soils are considered poorly drained (Gleysolic soil), and forest productivity is usually significantly lower compared to the imperfectly drained types.

5.6.5 ORGANIC ORDER SOILS

Organic soils are derived mainly from organic deposits, or peat. In peat formation, the main factor which enables the organic residues to accumulate is excess water, which causes a deficiency of oxygen and reduced microbial activity. Oxidation of plant remains proceeds more slowly, and organic matter, or peat, accumulates at the soil surface. In the Mistik FMP area excess water occurs in the low lying areas due to local runoff or a high groundwater table. The development of peat is also promoted by a high acid and low nutrient environment, which further reduces microbial activity.

In general, the nature of organic soils depends upon the kinds of plants from which they were formed, the nutrient status of the water, and the decomposition processes involved in their formation. In the FMP area, organic soils occur mainly in poorly drained, low-lying, level to slightly depressional areas, and to a lesser extent along gently sloping stream channels. Organic soils that occur on relatively level terrain are usually deep and relatively uniform in composition with depth, whereas those occurring in small depressions, and along streams are generally subjected to fluctuating water tables, and exhibit a more complex stratification.

The depth of an organic profile considered for classification is the upper 160 cm, and is referred to as the "control section". Separation of Organic Order soils into great groups and subgroups is based largely on the depth of the peat deposit and its degree of decomposition. In the present survey, the organic soils are classified and mapped at the great group level. There are three great groups, representing increasing degrees of decomposition, namely Fibrisols, Mesisols, and Humisols.

Organic soils, because of their high porosity and extremely low load-bearing capacity, could, in theory at least, be considered highly susceptible to compaction in the sense that their bulk density would likely increase dramatically under the weight of modern machinery. Even when organic soils are drained, their bulk density increases substantially due to decomposition and subsequent subsidence. The significance of this increase in bulk density, however, has to be viewed in the context of the soils extremely low natural bulk density (0.08 to 0.30 Mg/m^3), which, even if increased 2 to 3 fold, may not significantly affect plant growth.

Rather, the concern with organic soils and even mineral soils having a shallow layer of peat at the surface has to do with their susceptibility to disturbance or displacement. Again due to their low load-bearing capacity, these soils can be severely damaged, sometimes almost beyond recognition, with almost any type of mechanized summer operations. And while as a practical matter, this problem may be considered moot because organic soils rarely if ever support commercial stands, they are commonly found throughout most landscapes which make them a factor when planning forestry operations.

Organic soils cover large expanses in the Waterhen and Dillon Plains as well as in the Canoe Lake Lowland and along the Alberta border in the Christina Plain and the Mostoos Upland. In fact, apart from the Mostoos Escarpment, Organic soils are common throughout of the FMP area. The Bagwa Lake and Lavallee Lake associations are Organic soils.

Bagwa Lake soils occur mainly on horizontal fens, and to a lesser extent on patterned fens, bowl fens and stream fens. The peat surface of Bagwa Lake soils is relatively level compared to the hummocky microtopography associated with other Organic soils.

The vegetation associated with Bagwa Lake soils is dominated by *Carex* spp. The shrub layer, if present, is usually dominated by *Betula pumila*; however, in the drier fens, *Salix* spp. and *Alnus rugosa* may also be important and are often the dominant shrubs in stream fen landforms. *Eriophorum* spp. and several aquatic species are often present in the wetter fens. Grasses, particularly *Calamagrostis* spp., frequently occur along the drier margins of the fen. A sparse tree cover of mainly stunted larch and a few black spruce commonly occur on the ridges in patterned fens, and in the drier parts of some horizontal and bowl fens.

Bagwa Lake soils are very poorly drained. In most horizontal and patterned fens, the water table is either at or near the surface throughout most of the year. These soils and those around the margins of small lakes are the wettest organic soils in the map area. Bagwa Lake soils that occupy bowl and stream fens are subject to extreme fluctuations in the water table and are often unsaturated, particularly during the latter part of summer or in years of exceptionally low precipitation.

Bagwa Lake soils are developed on fen peat in which the major peat former is *Carex* spp. Woody materials are rarely abundant. The upper 20 to 30 cm of the peat is usually undecomposed (fibric) with most of the material being identifiable as to its botanical origin. Beneath this layer the peat is moderately decomposed (mesic), dark brown to very dark brown in color, and layered. The degree of decomposition usually increases with depth. The peat in the lower parts of the profile is usually well decomposed (humic). Well decomposed fen peat is very dark brown or black in color and structureless.

Lavallee Lake soils occur mainly in flat bogs and, to a lesser extent, in bowl and raised bogs. The flat bogs usually occupy large tracts, whereas the bowl and raised bogs occur as small isolated areas in landscapes dominated by mineral soils. Lavallee Lake soils are very poorly drained, although the water table is usually 50 cm or more below the surface during most of the growing season. The peat surface of Lavallee Lake soils often has a hummocky microtopography, particularly where sphagnum is abundant. These soils commonly support moderate and dense black spruce and larch-black spruce stands. The understory is characterized by ericaceous shrubs such as *Ledum groenlandicum* and *Vaccinium vitis-*

idaea as well as *Sphagnum* spp., *Cladonia*, spp., *Pleurozium schreberi* and other feathermoss species. Other species commonly found include *Chamaedaphne calyculata, Oxycoccus microcarpus, Kalmia polifolia and Rubus acaulis*.

Lavallee Lake soils are derived from forest and sphagnum peat. Forest peat is mainly residues from the forest cover and from such understory vegetation as ericaceous shrubs and feathermosses. It is usually very dark brown to reddish-brown in color and has a fine fibred structure. Woody materials are common throughout forest peat. Sphagnum peat commonly occurs at the surface of Lavallee Lake soils, and may extend to a depth of 1 to 2 m. It is typically undecomposed (fibric) and light brown to yellowish brown in color. In many Lavallee Lake soils, the sphagnum and/or forest peat is underlain at depths of 1 to 2 m by well decomposed fen peat.

5.6.6 REGOSOLIC ORDER SOILS

Regosolic soils are weakly developed soils in which horizon development is either nonexistent or too weak to meet the requirements of other soil orders. Lack of horizon development in these soils is typically due to either youthfulness (recent deposits) or to instability (erosion or slumping). Regosolic soils are found only occasionally in the Mistik FMP area either on recent fluvial or alluvial deposits, or on eroded deposits along steeply sloping valley walls or eroded sandy deposits. The dominant subgroup is the Orthic Regosol.

5.7 ECOLOGICAL LAND CLASSIFICATION

An ecosystem is a community of organisms (including people), interacting with one another, plus the physical environment in which they live and with which they interact. The ecosystem concept states that the earth operates as a series of interrelated systems within which all components are linked so that a change in one component brings about a corresponding change in other components. Ecosystems are holistic in the sense that the full range of biophysical characteristics is considered, including the land which is an important and integral component of the environment (Bailey, 1996).

Ecological land classification is a process of classifying and delineating ecologically distinctive areas of land, so one can better understand their similarities and relationships. Each land area is viewed as a discrete system resulting from the interaction of geology, climate, soils, landforms, vegetation and, at times, human factors. Ecological land classification stresses the interrelationships among components rather than treating each one as a separate characteristic of the landscape, and because of the linkages among systems, modification of one system may affect the operation of surrounding systems. The underlying basis for delineation of ecological units is to capture the major ecological composition and the linkages between the various components as opposed to dealing with resources as singular and independent items. And although the ecosystem concept implies equality among components (soils, climate, vegetation etc.), all components may not be equally significant throughout the hierarchy. The dominance or importance of any one factor may vary considerably in defining the spatial expression of an ecosystem at every scale.

Establishing ecosystem boundaries on a map involves dividing the landscape where the structures exhibit a consistent or significant degree of change when compared to adjacent systems. Since land classification is a natural classification based on multiple factors, the key to placing boundaries on an ecological map is an understanding of genetic processes (how it originated) or an understanding of the causes of class differences as opposed to the effects.

Climate, which is the composite of the generally prevailing weather of a region over the long term, offers the logical basis for delineating large ecosystems. As the primary source of energy and water, it is the primary control for ecosystem distribution. As the climate changes, the other components of the system change in response, and as a result, ecosystems of different climates differ significantly. Macro scale areas (ecoregions, ecozones) have an essentially homogenous macro climate.

Landform is an important criterion for recognizing smaller divisions within macro ecosystems. Landform, with its geologic substrate and surface shape and relief, often modifies climatic regimes both regionally (e.g. Mostoos Upland) and locally. Landforms often form natural ecological boundaries.

The Ecological Land Classification System for Canada employs ecological units at three hierarchical levels to stratify the country into areas of ecological uniformity (Ecological Stratification Working Group, 1995). At the national level the system divides Canada's natural landscapes into 15 Terrestrial Ecozones, which are in turn subdivided into over 150 Ecoregions and then into more than 5000 Ecodistricts. Ecodistricts are further linked to the more than 17,000 soil-landscape polygons of the 1:1 million scale Soil Landscapes of Canada map series, which as the name implies, provide an inventory of the country's land resources in terms of major soil (texture, soil profile) and landscape characteristics (surficial geologic materials, slope, and landform) (Acton et al., 1992).

The Ecological Land Classification System for Saskatchewan was developed as part of the national system and is thus compatible with that in the neighbouring provinces as well as with the rest of Canada. In Saskatchewan, four Ecozones corresponding roughly to the prairie, boreal forest, Canadian shield and northern subarctic areas of the Province are recognized. To incorporate increasing levels of detail, these broad ecosystems are subdivided into eleven Ecoregions and then further into more than 150 Landscape Areas (Padbury and Acton, 1994). Landscape Areas in the Saskatchewan system are comparable to Ecodistricts in the national system. The Mistik FMP area occurs within the Boreal Plain Ecozone, and almost entirely within the Mid-Boreal Upland Ecoregion, with a small area within the Boreal Transition Ecoregion.

5.7.1 MID-BOREAL UPLAND ECOREGION

The Mid Boreal Upland Ecoregion comprises the area immediately south of the Shield in central and western Saskatchewan, plus in several large more or less isolated upland areas, such as the Thickwood and Pasquia Hills. It is bordered on the south by the Boreal Transition Ecoregion which, as the name implies, corresponds to the area of transition between the boreal forest region to the north and the prairies to the south. On the east it is border by the Mid Boreal Lowland. The Mistik FMP area occurs almost entirely within the Mid-Boreal Upland Ecoregion.

Physiographically, this ecoregion comprises a series of rolling uplands characterized by an ascending sequence of steeply sloping eroded escarpments, hummocky glacial till plains and level plateau-like tops; surrounded by undulating plains often dominated by undulating glaciofluvial and glaciolactrine deposits.

.
Most of the ecoregion is characterized by loamy, Gray Luvisolic soils, although Organic soils are often found at the upper elevations where the terrain is relatively flat and surface drainage is poorly developed. The forests for the most part grow taller here than on the Shield to the north and account for the bulk of the province's merchantable timber. Aspen occurs throughout the ecoregion and is dominant on the south-facing slopes of the major uplands. Where moisture conditions are more favorable, white spruce is often mixed with aspen. Pine assumes its usual dominance in sandy areas. Black spruce and tamarack dominate the low-lying peatland areas. In the Mistik FMP area, the Mid Boreal Upland is divided into the following 10 Landscape Areas.

5.7.1.1 GARSON LAKE PLAIN

The Garson Lake Plain extends northwest from Peter Pond Lake to La Loche and the Alberta border. The Mistik FMP area occurs in the southern part of the Garson Lake Plain. The area is relatively level with elevations ranging from about 425 to 450 m. Local drainage for the most part is north via Brown Creek into the Kimowin River and then back into Peter Pond Lake.

The relatively low-lying, gently rolling landscape is characterized by a mosaic of peatlands intermittent uplands. The peatlands are typically shallow supporting dense stands of black spruce and tamarack. The uplands are a mix of sandy glacial till and glaciofluvial sediments. Many of the sandy areas are poorly drained and support dense stands of black spruce with the soils being mainly Gleysolics. The more hummocky landscapes are comprised of loamy glacial till deposits. Gray Luvisolic soils supporting trembling aspen often mixed with jack pine are characteristic of these areas.

5.7.1.2 CHRISTINA PLAIN

The Christina plain is a relatively level plain sloping gradually from an elevation of slightly over 600 m in the Grizzly Bear hills just west of Peter Pond Lake to about 550 m along the Alberta border and south of Dillon Lake. To the north and east of the hills it descends more rapidly to an elevation of about 500 m along its northern boundary with the Garson Lake Plain. With the exception of area along the Alberta border that drains west into the Athabasca River, the area drains into Peter Pond Lake mostly via the Dillon and Kimowin rivers.

In the Grizzly Bear Hills, the landscapes, in places, are strongly rolling with the surficial deposits consisting mainly of glacial till with lesser amounts of sandy glaciofluvial deposits. As usual, Gray Luvisolic soils are associated with the loamy till deposits, whereas Eluviated Brunisols are found on the sandy materials. Elsewhere the landscapes are more undulating with relatively large tracts of shallow peatlands found along the Alberta border. Organic soils occupy a significant part of the area.

The vegetation is mostly coniferous forest, with black spruce and to a lesser extent jack pine being the dominant trees. Dense black spruce is commonly associated with shallow organic deposits along the Alberta border. Mixed stands of aspen and white spruce or jack pine are found elsewhere.

5.7.1.3 DILLON PLAIN

The Dillon Plain is an undulating area that slopes gently northeastward from the base of the Mostoos upland at about 500 m, to Peter Pond Lake at 400 m. Local drainage is via the Nipin, Dillon and McCusker rivers into Peter Pond Lake.

Surficial deposits are comprised mostly of loamy glacial till, which is overlain in places by shallow sandy glaciofluvial sediments. As usual Gray Luvisolic soils occur on the glacial till deposits and Eluviated Brunisols occurring on the sandy materials. Nearly 40% of the area is peatland with the most extensive areas occurring along the base of the Mostoos Upland.

The vegetation is largely a mixedwood forest of aspen, white spruce and jack pine. Pure stands of jack pine are found in some of the sandy areas, and some black spruce is found in the peatlands, although most of the peatland are sparsely-treed or treeless fens.

5.7.1.4 MOSTOOS UPLAND

The Mostoos Upland is a major bedrock-controlled upland extending east from the Alberta border almost 100 km, and almost 120 km north from the Waterhen River to Vermette and Dillon Lakes. The bulk of the Upland within the Mistik FMP area occurs north of the Air Weapons Range. Here the terrain slopes gradually northeastward from an elevation of over 700 m near the Alberta border to about 500 m along its boundary with the Dillon Plain and Canoe Lake Lowland. Surface drainage is via the many small streams and rivers that form part of the McCusker and Nipin rivers systems that empty into Peter Pond Lake. The remaining part of the Moostos Upland which occurs within the FMP area comprises a narrow strip of relatively level terrain that slopes gradually southward from Air Weapons range to the Mostoos Escarpment. Apart from area that drains west into the Martineau River, surface drainage is via the many small creeks which flow through the Mostoos Escarpment into the Waterhen River system.

The landscape is mainly a hummocky moraine, although along the moderately sloping north-facing slopes, the terrain is often dissected by a number of small drainage channels. The surficial deposits are mainly weakly calcareous, loamy textured glacial till, although in some areas the till is overlain by gravely glaciofluvial deposits. Gray Luvisols and Eluviated Brunisols soils are dominant on the loamy and sandy soils respectively. About a third of the area is covered by peatlands, most commonly fens and to a lesser extent bogs.

Coniferous stands of jack pine, often mixed with black spruce are dominant on the well drained sites, while pure and mixed stands of aspen, white spruce and pine also occur. Most peatlands are fens and are thus characterized by sedges and often by sparse stands of tamarack and to a lesser extent black spruce.

5.7.1.5 MOSTOOS ESCARPMENT

The Mostoos Escarpment comprises the prominent steeply sloping south- and east-facing slopes of the Mostoos Hills. Elevations range from a little over 500 m at the base of the Escarpment to more than 700 m at the boundary with the Mostoos Upland. Surface drainage is either east into Keeley, Waterhen of Flotten lakes or south into the Waterhen River system.

The landscape is a moderately to steeply sloping, eroded escarpment dissected by a series of deep-set, well defined valleys. Many of these rather large valleys, which are up to 1000 m across and nearly 100 m deep, contain relatively small creeks or streams called ‘misfit’ streams, which indicates that they were former glacial meltwater channels. Moreover, many of these valleys, particularly along the east-facing slopes, are oriented on an oblique angle to the general slope, which is also indicative of their glacial origin. The surficial deposits are largely till, with some shallow glaciofluvial sands and gravels. In contrast to most other Landscape Areas in the FMP area, there are few peatlands in the Mostoos Escarpment.

The forests are mainly trembling aspen, perhaps reflecting the generally south-facing exposure, although in the valleys themselves the aspen is often mixed with pine or white spruce.

5.7.1.6 WATERHEN PLAIN

The Waterhen Plain slopes gradually from an elevation of about 500 m at the base of the Moostos Escarpment north and east to about 450 m at Canoe Lake and Île-a-la-Crosse. Surface drainage is mostly east and then north via the Waterhen and Beaver Rivers or north into Keeley and Canoe Lakes.

The landscape of the Waterhen Plain is variable due to the nature and origin of the water-lain sediments which overlie the glacial till in most areas. The stratified sediments were originally derived from erosion of the valleys in the Mostoos Escarpment, and then carried eastward and deposited in confined basins or channels on the ice surface in the Waterhen Plain. Later when the ice melted, the sediments were redeposited on the underlying till surface. Typically, this type of deposition, yields a chaotic distribution of sediments and landscape features. For example, east of Waterhen Lake hummocky, steeply sloping, fine sandy to silty textured water-lain sediments, tens of meters thick, occur at elevations considerably above the surrounding terrain, whereas in the northern part of the plain between Keeley and Canoe lakes and in places along the base of the escarpment, the glacial till is overlain by only a few centimetres of sandy stratified materials. And again along the west side of the Beaver River, hummocky, steeply sloping sandy materials, tens of meters thick, are found at elevations significantly above the surrounding area. Organic terrain or peatland occupy about 15-20% of the area and, as usual, is confined to the low-lying depressional areas of the landscape.

Reflecting the influence of the underlying sediments, the vegetation is also diverse, varying from aspen and mixed aspen-white spruce stands on loamy deposits in the south and along the base of the escarpment, to sparse stands of jack pine associated with the sands south of Keeley Lake and along the Beaver River. Most of the peatlands are either treeless or support a sparse stands of tamarack.

5.7.1.7 LA PLONGE PLAIN

The La Plonge Plain itself extends north from Lac La Plonge to the Shield and east as far as Pinehouse Lake, but the Mistik FMP area covers only a small area in the extreme southwest between the south arm of Lac Île-a-la-Crosse and the Beaver River. Here the landscape is largely an undulating plain comprised of sandy glaciofluvial sediments, as opposed to the rest of the La Plonge Plain which is characterized by sandy till with a ridge and swale type of landscape. Peat deposits are found in the low-lying depressional areas, which occupy almost a third of the area.

As expected on these dry sandy deposits, the vegetation is dominated by jack pine with a lichen understorey. In the low-lying poorly drained areas the vegetation is typically sedges and swamp birch along with a scattering of tamarack and black spruce.

5.7.1.8 ILE-A-LA-CROSSE PLAIN

The Île-a-la-Crosse Plain is a relatively level to gently rolling area between Lac Île-a-la-Crosse and Churchill Lake, although the Mistik FMP area covers only a small area southwest of Lac Île-a-la-Crosse and the MacBeth Channel. Southwest of the Lac Île-a-la-Crosse the landscapes, typical of those near the Shield and throughout most of the Île-a-la-Crosse Plain, exhibit a ridge and swale pattern oriented in a northwest-southeast direction reflecting the underlying bedrock surface and most importantly the direction of glacial ice movement. The ridges comprise sandy glacial till sediments and Brunisolic soils and are covered mostly by dense stands of jack pine sometimes mixed with black spruce, although there are some aspen near Lac Île-a-la-Crosse itself. The poorly drained intervening swales are largely treeless fens, although scattered tamarack and black spruce occur in some areas.

The landscapes west of the MacBeth Channel, unlike those in the rest of the Île-a-la-Crosse Plain are typically hummocky and comprised of loamy glacial till with Luvisolic soils. The better soil conditions favor the growth of aspen and on occasion white spruce which is rarely found on the sandy ridge and swale type of landscapes.

5.7.1.9 DORE LAKE LOWLAND

The Dore Lake Lowland is a vast expanse of mostly organic terrain extending west from Dore Lake to the Beaver River and north from Sled Lake to Lac La Plonge. Surface drainage is northward via the Beaver River, although a few small streams empty directly into Dore and Sled lakes. Elevations are in the order of 450 to 500 m.

The organic terrain is comprised of both bogs and fens. The bogs being slightly drier support dense stands of black spruce, while the fens are dominated by sedges along with sparse stands of tamarack and to a lesser extent black spruce. Interspersed among the bogs and fens are islands of mineral terrain a meter or two above the surface of the peat. These upland areas are comprised of loamy glacial till which is sometimes overlain by sandy glaciofluvial sediments and occasionally by clayey materials. These areas are characterized by Luvisolic soils supporting trembling aspen and white spruce. Around the margins of these uplands, the soils are often imperfectly or poorly drained and support mostly black spruce. Sandy glaciofluvial sediments supporting jack pine are found along the Beaver River.

5.7.1.10 THICKWOOD UPLAND

This is one of several large upland areas that occur south of the main Mid Boreal Upland Ecoregion area in Saskatchewan. Like the Pasquia and Porcupine hills near the Manitoba border, the Thickwood Upland is a bedrock-controlled upland that is significantly higher in elevation than the surrounding terrain and as a result has a relatively cool, moist climate similar to that in the main part of the Mid Boreal Upland Ecoregion some 50 km or more to the north.

The Thickwood Upland, which forms the divide between the Churchill and Saskatchewan River systems, extends from Meadow Lake south about 60 km to just past Turtle and Helene lakes. The height of land occurs at an elevation of about 750 m a few kilometres north of Turtle Lake.

The Thickwood Upland is largely an undulating glacial till plain, although a few ridged landforms or flutings occur northeast of Turtle Lake. These flutings, which mark the direction of glacier movement, are orientated northeast to southwest. Surficial deposits are almost exclusively loam to clay loam textured glacial till. Organics as usual, overlie the till in the low-lying areas and account for about 20% of the area – a large tract occurs northeast of Turtle Lake. Isolated areas of shallow glaciofluvial sands and gravels are found throughout the area but occupy less than 5% of the total area. A small area of clayey glaciolacustrine sediments occur near Turtle Lake. Most of the mineral soils are Gray Luvisols but because of the level topography and relative impervious nature of the surficial deposits, many soil show evidence of restricted drainage and are classified as being either moderately well or imperfectly drained (Gleyed Gray Luvisol).

The Thickwood Upland is slightly cooler and moister than the Bronson Upland to the west, in part due to its slightly higher elevation. This, coupled with its finer textured soils and more subdued topography, favours the growth of coniferous and mixedwood stands over pure aspen forests which are confined largely to the lower elevations around the margins of the upland. The bulk of the Thickwood Upland supports mixed stands of aspen and white spruce. Jack pine is typically found on the sandy and gravely deposits, although many tall productive stands of jack pine occasionally mixed with black spruce are common on the imperfectly drained Gray Luvisolic soils at the upper elevations. Most of the organic terrain is fens supporting sedges along with sparse stands of tamarack and the occasional black spruce.

5.7.2 BOREAL TRANSITION ECOREGION

Throughout most of the Province the Boreal Transition Ecoregion is characterized by a mix of forest and farmland marking the southern advance of the boreal forest and the northern limit of arable agriculture. In the Meadow Lake area, however it roughly corresponds to the tract of relatively low-lying land between the Mostoos Hills to the north and the Thickwood Hills to the south. Because of the lower elevations the climate of the Boreal Transition Ecoregion is warmer and slightly drier than the Mid-Boreal Upland Ecoregion, and the soils are more diverse with Chernozemic soils typically found at the lower elevations where internal drainage is slightly restricted, and Gray Luvisolic soils found in the well drained the local upland areas. Similar to the Mid-Boreal Upland Ecoregion, Brunisolic soils occur on the well drained sandy glaciofluvial deposits and Organic soils occupy the low-lying poorly drained areas.

4.7.2.1 St Cyr Plain **-** The St Cyr Plain extends in a narrow band from Greig Lake at the base of the Mostoos escarpment southeastward to Chitek Lake, but only a small fraction west of Waterhen Lake is within the Mistik FMP area. Here the topography is level to gently undulating, and the soils are mainly Eluviated Brunisols developed on sandy textured glaciofluvial deposits. Organic terrain occupies about 15% of the area and there are a few isolated areas of fine sandy fluvial-lacustrine deposits, but they probably account for only about 5% of the area within the FMP area. As expected jack pine stands with a lichen understorey are characteristic of these extremely dry sites, with aspen being found on some of the finer textured soils. Most of the peatlands are treeless fens dominated by sedges, swamp birch and willow.

5.8 INTERPRETATIVE GUIDELINES AND ASSUMPTIONS

This section is included to provide a description of the thirteen management units within the Mistik FMP area in terms of their physiograply, surface drainage, soil and landscape conditions as well as interpretations related to forest productivity, erosion risk, compaction and disturbance (rutting). The interpretations are based on the following guidelines and assumptions.

5.8.1 FOREST SOIL PRODUCTIVITY

Within the context of the relatively cool, dry continental climate of Boreal Plain Ecozone, differences in forest productivity from place to place are related largely to the local soil conditions, with the productivity at a given location being more or less directly related to the quality of the soil there.

In the broadest sense, the quality of a soil is a measure of its ability to provide a medium for plant growth, to regulate water flow through the environment, and to serve as an environmental filter (Larson, 1991). In other words, soil quality describes how effectively the soil is able to accept, retain and release nutrients and water, to promote root growth, to sustain biological and chemical process, and to respond to management and resist degradation. Indicators of soil quality, particularly in relation to its ability to provide a medium for plant growth, have to do with 1) the provision of an adequate physical rooting environment, 2) the capacity of the soil to store water, and 3) the provision of an adequate nutrient supply. In the boreal forest region of northern Saskatchewan, nutrient availability, available soil water, and the soil structural conditions (bulk density, pore space distribution) in relation to root development are considered the most important.

In Saskatchewan, most forest soils are considered **low** in the major essential plant nutrients, particularly in comparison to prairie agricultural soils, and in relation to the nutrient requirements of common agricultural crops (wheat, canola, alfalfa etc.). When evaluated in relation to the requirements of spruce, pine, aspen etc., the nutrient status is less clear, being dependent on numerous interrelated factors including the soil type and associated drainage conditions, the species composition and growth stage of the stand, the climate in relation to moisture availability and the like. For example, fertilization trials carried out on mature aspen, pine and white spruce stands north of Prince Albert in the late 1970's were inconclusive even though high levels of the major essential nutrients were applied, suggesting that the soils there were not particularly nutrient deficient. On the other hand, fertilization trials on similar soils using seedlings have, in some cases, shown significant responses.

The relationship between soil moisture regime and forest productivity is reasonably straight forward. For well drained soils whose only source of moisture is precipitation, forest productivity is governed largely by the soil's moisture holding capacity, or in other words by it's ability to store and subsequently supply moisture to the tree during periods of moisture stress. In turn, the soil's moisture holding capacity is generally related to the amount of clay in the soil, and to a lesser extent, to its organic matter content. In general, therefore, the higher the clay content, the higher the soil's moisture holding capacity and the more productive the soil.

In sloping landscapes, precipitation that does not enter the soil directly moves down slope as runoff, the amount being governed by the shape of the landscape, the permeability of the soil, as well as the frequency, intensity, and duration of rainfall events, the snowmelt conditions and so on. Runoff also contributes to ground water, which, when close to the surface can also affect the soil's moisture regime. The net result is that soils found on the lower slopes often receive additional moisture which can significantly affect their productivity.

If the amount of additional water is minimal, then the soil will typically exhibit reddish-colored mottles either at depth (>75cm) within the profile, or within the Ae horizon, the latter being the result of a temporarily water-table perched above a compact B horizon. These soils are termed moderately well drained. If soil remains above field capacity for significant periods, the soil will exhibit mottling throughout the profile and is considered to be imperfectly drained. All other factors being equal, these soils provide a more reliable source of moisture than the well drained types, and their productivity is higher.

If the soil remains above field capacity during most of growing season, it is considered poorly drained, and tree growth diminishes sharply compared to that on the well and imperfectly drained types. Indicative of sustained water-logged conditions, these soils have duller colors and less mottling than the imperfectly drained profiles, although mottles may occur in the upper horizons. They also characteristically have a shallow surface layer of peat, which is also indicative of excess water. In fact, peat accumulation is a simple and reliable indicator of poor soil drainage conditions. Soils having peat accumulations greater than 40 cm are classified as Organic soils and are considered to be very poorly drained. These soils, at best, support only marginal commercial stands.

It is important to emphasize that the above relationships between soil moisture regime and forest productivity are general guidelines and must be viewed in the context of the adaptability and edaphic range of specific tree species. Jack pine and to a lesser extent aspen, for instance, are considered more drought resistant compared to other species, while black spruce and tamarack are better adapted to excess moisture.

5.8.2 SOIL DEGRADATION POTENTIAL AS INFLUENCED BY SOIL PROPERTIES AND CLIMATE

Soil disturbance refers to the visible change in a soil from its natural state. Forest management activities often result in various types of soil disturbance ranging from mineral soil exposure from skidding logs across the surface, to severe soil disturbance (also referred to as soil degradation) which results in a change in the physical, chemical or biological properties resulting in a loss in productivity. These activities can vary from soil compaction, to rutting to soil erosion. This section will discuss the relationship between the potential for soil degradation and various soil properties and climate factors for the FMP area.

5.8.2.1 SOIL COMPACTION

Soil compaction is generally the unseen disturbance in the harvest block, although it is generally associated with roadways or heavy machine traffic areas in the block. Soil compaction results from the pressure exerted by tire or track forest equipment on the soil. When the load bearing capacity of the soil is no longer able to support the equipment the load causes the soil to compact (i.e. increase mass per unit volume) which results in a higher bulk density or increased soil resistance. The increase in bulk density will alter total porosity (decrease in air spaces or pores in soil) as well as the pore size distribution (i.e. loss of large size pores and gain in very small diameter pores). In addition, compacted soils decrease the water holding capacity of the soil, slow the rate of water flow and decrease gas exchange. The smaller pores can also inhibit root penetration and growth and the cumulative effects of all these factors can negatively impact vegetation growth and site productivity. However, on soils with lower bulk densities (< 1.0 g/cm^3) such as alluviums along rivers, some degree of compaction may actually benefit plant growth. The effect of forest machinery on soil physical properties, especially bulk density, and on subsequent tree growth has been well documented (Lull, 1959; Froehlich, 1973; Greacen and Sands, 1980; Corns, 1987).

Soil compaction can occur on all soil types depending on the load, soil conditions (organic matter content, texture, amount of water in the soil, degree of soil freezing) and number of passes. Tracked forest equipment such as feller bunchers have larger surface contact areas and reduced ground pressure thus reducing soil compaction compared to wheeled equipment such as skidders. The number of machine passes to compact a soil varies but normally one or two passes can result in a 5-20% increase in soil bulk density. Generally, after five passes on fine textured soils or 10 passes on coarse textured soils, the majority of the compaction has occurred on the site. The most likely candidates for compaction would be the low organic matter clayey soils (Dorintosh Association), particularly when they are wet.

In the British Colombia Forest Practice Code guidebook (British Columbia Environment, 1995), compaction hazard ratings are directly related to the soil's texture or, in essence, to its clay content. The higher the clay content, the higher the hazard. Thus, sands and loamy sands are considered least susceptible to compaction; sandy loams and loams are intermediate, and clayey soils are highest. However, because forest soils in Saskatchewan differ from those in B.C., other factors must be considered such as the high organic matter levels found in the surface horizons of some soils which markedly improves their structure and reduces the compaction hazard.

In assessing the soil compaction hazard, consideration should be given not only to the likelihood or degree of compaction, but also to the rate at which a compacted soil can be expected to improve with the passage of time. Studies have shown that the effects of compaction can persist for decades, but they also show that, due to wetting-drying and freeze-thaw cycles and the like, soils often improve over time (Hatchell et. al. 1970; Hatchell and Ralston, 1971). In general, the rate of improvement is related to the soil's clay content, with the more clay, the faster the improvement. Also, soils containing montmorillonite or other clays having an expanding lattice structure tend to improve much faster than others, which is a pertinent fact given that the dominant clay mineral in the soils of the Mistik FMP area is montmorillonite. However, when soils are severely remoulded (i.e. loss of soil structure through shearing of soil material) and compacted natural or rehabilitation treatments are less effective at restoring soil structure and porosity (McNabb 1994, 1995). In fact, freeze thaw cycles or tillage treatments may retain the small intra-aggregate porosity until the activities of soil fauna or root systems can create larger pore distributions (McNabb, 1995).

For intensive use such as that associated with trails, roads, landing sites, etc. where continued use of heavy machinery almost invariably creates a massive, highly compact, unproductive soil, it is likely the medium to moderately coarse textured glacial tills, with their wide particle size distribution, would be most susceptible to compaction, particularly compared to the finer textured lacustrine sediments of the same particle size class or those with coarser texture (Wasterlund, 1985). Again research would be required to assess both the degree of compaction and likely rate of amelioration under such circumstances in the Mistik FMP area.

Organic soils, because of their high porosity and extremely low load-bearing capacity, could, in theory at least, be considered highly susceptible to compaction in the sense that their bulk density would likely increase dramatically under the weight of modern machinery. Even when organic soils are drained, their bulk density increases substantially due to normal decomposition and subsequent subsidence. The significance of this increase in bulk density, however, has to be viewed in the context of the soils extremely low natural bulk density (0.08 to 0.30 Mg/m^3), which, even if increased 2 to 3 fold, may not significantly affect plant growth.

Rather, the concern with organic soils and even wet mineral soils having a shallow layer of peat at the surface has to do with their susceptibility to disturbance or displacement. Again due to their low load-bearing capacity, these soils can be severely damaged, sometimes almost beyond recognition, with almost any type of mechanized summer operations. And while as a practical matter, this problem may be considered moot because organic soils rarely if ever support commercial stands, they are found in most landscapes and, in places, occupy large areas making them a factor when planning forestry operations.

Many of the sandy soils often have only a thin or discontinuous organic litter layer at the surface, which, combined with their rather loose, structureless surface mineral horizon, makes them significantly more susceptible to disturbance from other mineral soils.

5.8.2.2 SOIL RUTTING

Rutting occurs when the load exceeds the ground bearing capacity of the soil causing the load to break through the soil and be displaced causing depressions or ruts in the soil. Usually fine textured soils (fine sands, loams to clays) are more susceptible to rutting than coarse textured soils (medium to coarse sands, gravelly soils); however, any soil texture that is saturated is highly susceptible to rutting. As well, organic or peaty-type soils are also very susceptible to rutting compared with mineral soils, and depending on the thickness of the organic layer, rutting may not impact the mineral soil. Rutting not only can increase soil bulk density but it detrimentally alters the soil structure by remolding the soil which severely reduces the air-filled porosity thus reducing soil water infiltration and permeability (McNabb, 1993). Rutting can also damage root systems by cutting or shearing of the roots with repeated machine traffic.

5.8.2.3 SOIL EROSION

Water erosion is a natural phenomenon as part of geological processes. In the geological past, huge volumes of land material were moved by glaciers, while at present the main agents are wind and water. Erosion occurs naturally in forested areas and can be accelerated by human activity to levels that cause environmental problems, thus erosion exceeding the natural rates through harvesting and road building activities, is defined as accelerated erosion. Three types of water erosion can occur in harvest blocks ranging from sheet, rill to gully erosion. Wind erosion can occur on exposed fine textured soils (very fine sands or silt loams) where the surface has dried.

In the Mistik FMP area, the risk of wind erosion is virtually nonexistent under normal forest management practices unless relatively large areas are cleared, and the protective forest floor layer is destroyed or significantly disturbed. Wind erosion may occur on exposed very fine sands or silty surface layers after fires have removed the forest floor and this can be seen in the Wiggins Bay country where there are active sand knolls.

The risk of exposed soil to water erosion is a function of the amount, frequency and intensity of precipitation, the steepness, uniformity and length of slope, and textural and structural characteristics of the soil which in turn govern infiltration and permeability (Wischmeier and Smith, 1978).

Naturally occurring water erosion in the Mistik FMP area is also extremely low, being relegated to a few major river valleys and steeply sloping escarpments where bedrock is exposed and vegetative cover is poor. Moreover, with most forest harvesting and site preparation activities, the litter and other debris left on the surface is generally sufficient to control water erosion. Water erosion is, however, often observed along road-cuts, ditches and in other areas of sloping terrain where the vegetative cover is largely removed leaving the surface mineral soil unprotected or on road features through improper placement of culverts and water control features.

5.9 MANAGEMENT UNIT DESCRIPTIONS

5.9.1 PETER POND (MU 21)

Covering about 280,000 ha in the northernmost part of the FMP area, the Peter Pond management unit extends eastward from the Alberta border to Peter Pond Lake and from its northern boundary along the Kimowin River south to the Dillon River, which constitutes its southern boundary.

With the exception of small area along the Alberta border that drains west into the Athabasca River, surface drainage is ultimately eastward into Peter Pond Lake. A height-of-land bisects the area at about 56 degrees with the northern part being drained by the Kimowin river system, while the Dillon river system drains most of the southern area. The east-facing slopes of the Grizzly Bear Hills drain directly into Peter Pond Lake.

The Peter Pond management unit comprises nearly the entire Christina Plain, which, apart from the Grizzly Bear Hills, is a relatively level plain sloping generally eastward from the Alberta border. Here the landscapes consist of a mix of Gray Luvisolic soils developed on loamy glacial till deposits, large tracts of organic terrain, and sporadic occurrences of Eluviated Brunisolic soils developed on sandy glaciofluvial deposits. For the most part the well drained Gray Luvisolic soils are the most productive, with the sandy glaciofluvial deposits being significantly less so, due to their lower soil moisture holding capacity, although in many areas the lower slopes are either imperfectly or poorly drained and productivity can thus be highly variable within local landscapes. Because of the relatively level landscape, erosion risk is low. The compaction risk is also low, particularly on the sandy deposits. On the whole the area has a relatively low potential for merchantable timber because of the large tracts of Organic terrain. Even in the hummocky glacial till areas, the knoll and depression type landscape coupled with the cool moist climate favour the development of peat on the lower slopes. Given the expanse of Organic soils disturbance would be a concern with almost any type of mechanized summer forestry practice.

In the prominent Grizzly Bear Hills just west of Peter Pond Lake where elevations rise to over 600 m, the landscapes are mainly strongly rolling with the surficial deposits consisting of glacial till and lesser amounts of sandy glaciofluvial deposits. The exception is at the upper elevations, where the glacial till landscapes are hummocky with relatively low local relief. Here the glacial till deposits on the lower slopes and depressional areas are overlain by shallow peat deposits. As usual, Gray Luvisolic soils are associated with the loamy till deposits, whereas Eluviated Brunisols are found on the sandy materials. Water erosion could be a concern along the steeply sloping east-facing slopes. The Grizzly Bear Hills is the most productive area in Peter Pond management unit, in large part due to the limited occurrence of Organic soils and fewer sandy glaciofluvial soils compared to the rest of the area.

5.9.2 DILLON (MU 11)

The Dillon management unit, covering about 350,000 ha, extends south from the Dillon River to the Air Weapons Range, and east from the Alberta border some 70 km to about Cummins Lake. From an elevation of 730 m near the Alberta border the terrain slopes gently northeastward to the edge of the Mostoos Upland where it descends more quickly to about 460 m in the Dillon Plain. Although the northeast-facing slopes of the Mostoos Hills area are prominent, particularly west of Vermette Lake, on the whole they are not nearly as steep and highly dissected as those on the east and south side of the hills. Surface drainage is either north into the Dillon River or northeast via the Nipin River which joins the Dillon River just south of Peter Pond Lake.

Throughout most of the Mostoos Upland hummocky glacial till landscapes with low local relief predominate, although there are some large tracts of organic terrain. Along the Alberta border Organic soils are dominant although many are shallow and support dense stands of black spruce. Glaciofluvial landscapes are also common near the border. In the rougher terrain along the northeast-facing escarpment glacial till landscapes again predominate, but surface drainage is well developed and there is much less organic terrain there compared to the rest of the upland. On the low-lying relatively level Dillon Plain, however, there are again large expanses of organic terrain intermixed with relatively low relief glacial till landscapes. Sandy glaciofluvial deposits are found overlying the till in some places.

Forest productivity is reasonable good on the loamy glacial till deposits, somewhat limited by a lack of moisture on the sandy glaciofluvial deposits and severely limited by excessive wetness in the Organic soil areas. In many landscapes internal drainage is restricted on the lower slopes and productivity can be highly variable within the landscape itself depending upon the specific drainage conditions. Water erosion risk is generally low except in some of the steeply sloping areas along the escarpment. Compaction risk is minimal but because of the widespread occurrence of organic soils much of the area would be highly susceptible to disturbance during summer. Even some of the sandy soils, which have a loose structureless surface mineral horizon and only a thin discontinuous surface organic layer are moderately susceptible to disturbance by heavy machinery.

5.9.3 BUFFALO NARROWS (MU 10)

The Buffalo Narrows management unit is a low-lying tract of land in the eastern part of the Dillon Plain. The terrain slopes very gradually northward from an elevation of about 490 m near the Air Weapons

Range to about 430 m at Peter Pond Lake some 50 km to the north. In total the unit covers slightly over 120,000 ha.

Surface drainage is not well developed and as a consequence there are large tracts of organic terrain, mainly fens, which occupy a third of more of the area. The remaining upland is characterized by level to gently glacial till landscapes characterized by Gray Luvisolic soils supporting mainly aspen or mixedwood forests. Productivity is reasonably good in the upland areas, and of course minimal in the often treeless fens. Because of the more or less level topography, water erosion is not an issue, nor is compaction. As usual the organic deposits are highly susceptible to machinery in winter.

5.9.4 ILE-A-LA-CROSSE (MU 09)

The Ile a-la-Crosse management unit comprises the northern part of the Canoe Lake Lowland, the extreme western edge of the Ile a-la-Crosse and La Plonge Plains, and the northernmost tip of the Waterhen Plain.

Within the Canoe Lake Lowland, the management unit is comprised almost entirely of a large mostly treeless fen which stretches south from Kazan Lake over 50 km to Amyot Lake. The exception is a couple of small areas between Kazan and Niska lakes which are characterized Gray Luvisolic soils developed on loamy glacial till.

In the Ile a-la-Crosse Plain the management unit comprises a narrow strip along the highway just to the west of Lac Ile a-la-Crosse. Here the landscape is a gently undulating glacial till plain, but unlike most till deposits in the FMP area, these deposits are sandy in texture being derived from the nearby Shield and deposited by the glacier as it moved to the southwest. This sandy type of till is common along the southern edge of the Shield from the Clearwater River east as far as Lac La Ronge as well as on the Shield itself.

In the La Ronge Plain between the South Bay on Lac Ile a-la-Crosse and the Beaver River the landscape is a gently undulating, sandy glaciofluvial plain characterized by Brunisolic soils and supporting a dominantly jack pine forest, while in the remainder of the management unit which comprises the northern tip of the Waterhen Plain, the soils are also very sandy but the landscape is rougher exhibiting, in places, a dune-like appearance. The forest is also dominated by jack pine.

On the whole the Ile a la Crosse management unit being comprised mainly of organic and very sandy soils is not very productive. The most productive areas are small areas of Luvisolic soils developed on loamy till west of Kazan Lake. Although some of the area is quite hilly, water erosion is not a serious problem because of the porous nature of the sandy substrate. Compaction is not a problem on these sandy soils, but those in the La Ronge Plain and particularly those in the Waterhen Plain where the landscapes are rougher would be susceptible to disturbance.

5.9.5 CANOE LAKE (MU 08)

The Canoe Lake management unit, comprising some 200,000 ha, extends in an arc from the northern boundary of the air weapons range east as far as Amyot Lake and then south as far as Keeley Lake. The area is relatively level with surface drainage locally into either Canoe or Keeley Lakes.

In the Canoe Lake Lowland, the area to the north of Canoe Lake is mostly organic terrain with few if any trees, while along the eastern side of the management unit there is a mix treeless fens and sandy Pine Sand soils supporting mainly jack pine. The remaining part of the unit between Keeley and Canoe lakes is in the Waterhen Plain. Here the terrain is rougher being comprised mainly of Gray Luvisol soils developed on glacial till overlain by a shallow layer of fine sandy water-lain deposits (Bittern Lake soils). Coarse textured Pine Sand soils supporting open jack pine with a lichen understorey are also commonly found. Stratified fine sandy La Corne soils are found on fairly hilly terrain just south of Canoe Lake, and banded

Waterhen River soils are scattered throughout this part of the area. Clayey textured glacial till soils have also been found in this area, but they are of very limited extent.

The loamy Bittern Lake and Loon River soils are most productive, although the Gray Luvisol La Corne soils as well as those found along the northern boundary of the air weapon range would be equally productive. For the area as a whole, however, productivity is limited by the vast tracts of unproductive organic soils which occupy over a third of the area, and the significant areas or coarse textured sandy soils. Water erosion risk could be significant in the along the Mostoos escarpment, and as usual the organic and coarse sandy deposits would be susceptible to disturbance.

5.9.6 BEAUVAL (MU 07)

This management unit essentially follows the Beaver River for about 60 km from its confluence with the Waterhen River west of Dore Lake, north to the town of Beauval. The area to the east of the Beaver River occurs within the Dore Lake Lowland, and for the most part consists of a large peatland intermixed with small islands of level, well drained upland terrain. These so-called islands are typically characterized by Gray Luvisolic soils developed on either loamy glacial till in the northern part of the area, or silty or clayey glaciolacustrine sediments in the south. And while these upland areas are reasonably productive, they only occupy a small part (<10%) of the total area. The remaining peatlands are composed of both treeless or sparsely-treed fens, as well as bogs supporting black spruce.

To the east of the Beaver River in the Waterhen Plain the topography is noticeable rougher compared to the east side. In fact, in places the slopes are steep and the landscape has a dune-like appearance due reworking of the coarse sands by wind. The deposits consist of an array of stratified surficial sediments including coarse and fine sands, banded sands, along with silts and clays which are typically overlain by fine sands. As expected productive varies widely. The most productive are the Flotten soils which are Gray Luvisolic soils developed on silty and clayey lacustrine sediments overlain by fine sands. The Gray Luvisolic Waterhen River soils are developed in fine sandy material containing thin ‘bands’ of finer textured materials. The bands vary in thickness from 0.5 to 8 cm, and occur at intervals of 2 to 30 cm or more. These soils, while not as productive as Flotten or Dorintosh soils, are considerably more productive and typically exhibit tree growth which is noticeably better than expected given their overall sandy texture.

The clayey textured Dorintosh soils would be considered susceptible to initial compaction but they occupy an extremely small area. The rest of the soils are either sandy or have a sandy surface layer and would not be very susceptible to compaction. Disturbance could be a concern with the very sandy Pine soils especially those on steep slopes. Due to the generally sandy texture of the sediments, water erosion would not be problem expect perhaps on the steepest slopes.

5.9.7 WATERHEN (MU 04)

Physiographically this management unit can be divided into two distinct regions. The bulk of the management unit, covering some 150,000 ha or more, occurs within the relatively low-lying Waterhen Plain from Keeley Lake almost 70 km south to the Beaver River. Surface drainage is mainly eastward via the Waterhen River, although in the north most streams empty into Keeley Lake. Along the southern boundary drainage is via the Beaver River.

The landscapes here are highly variable due to the nature and origin of the water-lain stratified sediments which overlie the glacial till in most areas. For the most part these sediments were derived originally from the eroded valleys of the adjacent Mostoos Escarpment. From there they were carried eastward and deposited in confined basins or channels on the ice surface and later redeposited on the underlying glacial till when the ice melted. This process typically yields a chaotic distribution of sediments and landscape features including both gently undulating and steeply sloping sandy glaciofluvial plains, undulating to moderately sloping glacial till plains, steeply sloping varied lacustrine sediments formed as a result of deposition by glacial meltwater in ice-walled channels or valleys either within or on top of the ice, and relatively large tracts of poorly drained organic terrain.

As usual the coarse textured glaciofluvial materials are typically characterized by Pine soils and open jack pine stands with a lichen-dominated understorey. Aspen as well as mixed stands of aspen-white spruce and aspen-jack pine are more common on the finer textured Luvisolic soils, whereas the organic terrain is often treeless or supports sparse stands of tamarack and to a lesser extent black spruce.

The most productive soils are the clayey Dorintosh soils, but they only occupy a small area along the Beaver River. The Bittern Lake, Loon River, Flotten and La Corne soils are only slightly less productive than the Dorintosh soils because of their lower soil moisture holding capacity. The sandy Pine soils are often droughty, but the sandy Waterhen River soils which containing thin ‘bands’ of finer textured materials are considerably more productive and typically exhibit tree growth which is noticeably better than expected given their overall sandy texture.

The clayey textured Dorintosh soils would be considered susceptible to initial compaction, but as mentioned previously, they occupy only a small area. The rest of the soils are either sandy or have a sandy surface layer and would not be susceptible to compaction. Disturbance could be a concern with the very sandy Pine soils especially those on steep slopes. Due to the generally sandy texture of the sediments, water erosion would not be problem expect perhaps on the steepest slopes.

The rest of the management unit occurs in the Mostoos Escarpment where the landscape is characterized by a series of large deep-set, well defined valleys which are up to 1000 m across and nearly 100 m deep. These valleys typically contain relatively small creeks or streams called ‘misfit’ streams indicating that most were former glacial meltwater channels. Mature stands of aspen are common along the escarpment. The surficial deposits are largely till, and in contrast to most other areas in the FMP area there are few peatlands. The intervening uplands between the valleys are characterized by Loon River soils, which are reasonably productive as are the upper and mid slopes of the valleys. The lower parts of the valley walls are often eroded and there are many coarse textured materials there, which are significantly less productive compared to the Loon River soils. Water erosion would be a serious concern in the valleys if the vegetation and productive organic surface layer were removed.

5.9.8 MURRAY BAY (MU 12)

The Murray Bay management unit also consists of two distinct landscapes. The northern part along the southern boundary of the Air Weapons Range is part of the Moostos Upland. Here the terrain is a relatively level to gently undulating glacial till plain, and since surface drainage is not well developed, there are large tracts of poorly drained organic terrain. The soils on the uplands are mostly Gray Luvisols of the Loon River Association, although in places a thin layer of gravely deposits are found at the surface (Kewanoke soils).

By contrast the southern part comprises the steep Moostos Escarpment, which slopes almost directly southward from an elevation of 730 m to less than 600 m over a distance of only about 10-15 km. Typical of the Moostos Escarpment the landscape is characterized by a series of large deep-set, well defined valleys containing small creeks or ‘misfit’ streams indicating that most were former glacial meltwater channels. Mature stands of aspen are common along the escarpment. The surficial deposits are largely till, and in contrast to the northern part of this management unit, there are few peatlands. The intervening uplands between the valleys are characterized by Loon Rivers, which are reasonably productive as are the upper and mid slopes of the valleys. The lower parts of the valley walls are often eroded and there are many coarse textured materials there, which are significantly less productive compared to the Loon River soils. Water erosion would be a serious concern in the valleys if the vegetation and productive organic surface layer were removed. And of coarse the organic terrain would be susceptible of almost any kind of mechanized machinery.

5.9.9 PIERCELAND (MU 02)

This management unit, which comprises the western parts of the Moostos Upland and the Moostos Escarpment, is similar to the Murray Bay unit in that the northern part within the Moostos Upland is a relatively level to gently undulating glacial till plain, while the southern part, and in particular the southwestern part, is characterized by a series of large valleys and intervening uplands typical of the Moostos Escarpment. The soils throughout the area are mostly Gray Luvisols of the Loon River Association and to a minor extent the Dorintosh Association, although there are significant areas of organic terrain in the northern part. In fact, there is a rather large tract of organic terrain along the Air Weapon Range east of Jukes Lake which is part of the Primrose Plain. There are also some small areas of gravely Kewanoke soils along the base of the escarpment.

Along its southern boundary waters are borne southward by a number of small streams which empty into the Waterhen River, but in the northern part the streams flow westward through the Muskeg River and then south into Cold Lake and the Waterhen system via the Martineau River.

The most productive soils are the clayey Dorintosh soils, but they only occupy a small area in the vicinity of the Martineau River. The Loon River soils are only slightly less productive than the Dorintosh soils because of their lower soil moisture holding capacity. The gravely Kewanoke soils are often droughty, and are considered significantly less productive than the Loon River soils.

The clayey textured Dorintosh soils would be considered susceptible to initial compaction, but as mentioned previously they occupy an extremely small area. Disturbance could be a concern with the very gravely Kewanoke soils especially those on steep slopes. Water erosion would be a serious concern in the valleys if the vegetation and productive organic surface layer were removed, and the organic soils would be susceptible to almost any kind of mechanized machinery.

5.9.10 BIG ISLAND LAKE (MU 03)

This management unit occurs entirely within the Mostoos Escarpment which slopes southward from an elevation of 650 m to less than 600 m at the its southern boundary. Typical of the Moostos Escarpment the landscape is characterized by a series of large deep-set, well defined valleys containing small creeks or ‘misfit’ streams indicating that most were former glacial meltwater channels. Mature stands of aspen are common along the escarpment. In the valleys surficial deposits are largely till, which tends to be highly eroded on the lower slopes. Gravelly glaciofluvial materials (Kewanoke soils) are common on the lower slopes; and there are few peatlands in the valley bottoms. The intervening uplands between the valleys are characterized by Loon River soils, which are reasonably productive as are the upper and mid slopes of the valleys. The lower eroded parts of the valley walls are significantly less productive compared to the Loon River soils. These soils are similar to the Kewanoke soils which are found occasionally in the upland. Water erosion would be a serious concern in the valleys if the vegetation and productive organic surface layer were removed. And of course the organic terrain would be susceptible of almost any kind of mechanized machinery.

5.9.11 BEAVER RIVER (MU 20)

Located between the Waterhen and Beaver rivers, this level to gently undulating area of about 10,000 ha is comprised almost entirely of Pine soils developed on coarse sandy glaciofluvial deposits, and organic deposits (fens) which are typically found on the lower slopes and depressions. Because of the level topography and porous nature of the deposits, surface drainage in not well developed.

As expected forest productivity is relative low due the droughty nature of the Pine soils, and the significant area of organic terrain. Because of the level landscape and high permeability of the sandy materials, water erosion would be very low. The risk of compaction is also low, although both the sands and the organic materials would be highly susceptible to disturbance.

The Beaver River management unit along with the extreme southwest corner of the Waterhen unit occurs within the Boreal Transition Ecoregion as opposed to the rest of the FMP area which is in the Mid Boreal Upland Ecoregion. As the name implies the Boreal Transition Ecoregion is a transitional area between the prairie region and the boreal forest, and in the Meadow Lake area it roughly corresponds to the lowland area between the Thickwood Hills to the south and the Moostos Hills to the north. Soil conditions, as expected, are variable with the well drained uplands normally being characterized by Gray Luvisolic soils supporting aspen, white spruce and pine similar to that in the Mid Boreal Upland. Likewise, the very coarse textured glaciofluvial deposits, such as those in the Beaver River management unit, are normally characterized by Eluviated Brunisolic soils and support mainly jack pine similar to that Boreal Upland. But in the low-lying areas where internal soil drainage is slightly restricted and surficial deposits are of medium to fine texture, dark colored Chernozemic soils usually develop such as around Meadow Lake, along the Makwa River, and south of the Waterhen River near Goodsoil.

5.9.12 DIVIDE (MU 01)

The Divide management unit occurs entirely within the bedrock-controlled Thickwood Upland, which forms the divide between the Churchill and Saskatchewan River systems. The height of land occurs at an elevation of about 750 m a few kilometres north of Turtle Lake.

For the most part the area is an undulating glacial till plain, although a few ridged landforms or flutings occur northeast of Turtle Lake. Soils are almost exclusively Gray Luvisols developed on loam to clay loam textured glacial till (Loon River Association), but because of the level topography and relatively impervious nature of the surficial deposits, many soil show evidence of restricted drainage and are considered either moderately well or imperfectly drained. Organic or peat material, as usual, overlies the till in the low-lying areas and accounts for about 20% of the area. Isolated areas of shallow glaciofluvial sands and gravels are found throughout the area but occupy less than 5% of the total area. A small area of clayey Dorintosh soils occurs near Turtle Lake.

Due to its comparatively high elevation, the Thickwood Upland is significantly cooler and wetter than the surrounding area. This combined with the loamy textured soils and more subdued topography, favours the growth of coniferous and mixedwood stands as opposed to the pure aspen forests which prevail around the margins of the upland. Jack pine is typically found on the sandy and gravely deposits, although many tall productive stands of jack pine occasionally mixed with black spruce are common on the imperfectly drained Gray Luvisolic soils at the upper elevations. Most of the organic terrain is fens supporting sedges along with sparse stands of tamarack and the occasional black spruce.

The Divide management unit is arguably the most productive unit in the FMP area, due mainly to the preponderance of loamy textured Loon River soils and the fact that many are either moderately well or imperfectly drained. The Dorintosh soils near Turtle Lake are equally as productive, but they occupy only a small area. The gravely Bodmin soils which are scattered throughout the area and generally droughty due to their gravely texture and resultant low moisture holding capacity, although many deposits are shallow and are underlain by glacial till which increases productively substantially. Compaction could be problem on the clayey Dorintosh soils and to a lesser extent on the gleyed Loon River types. Due to the more or less level to gently undulating landscape, water erosion risk is minimal.

5.9.13 L&M (MU 85)

The L&M management unit consists of three distinct, spatially separate areas embedded within Mistik's 01 Divide management unit (Figure 4.2). The three spatially distinct areas have names (e.g. Divide, Lavigne and Helene) associated with them for ease of reference and identification. The Divide area is located in the western part, the Lavigne area is located in the central and the Helene area is located in the southeastern part of the Divide management unit. As the 85 L&M management unit is wholly embedded within Mistik's 01 Divide management unit, the 01 Divide management unit description also applies to this management unit.

5.10 CLIMATE

The climate for the Mistik FMP area is characterized as a sub-arctic type (Dfc) according to Köppen's classification where winters are long and severe and summers are short and cool (< four months with a mean temperature > 10ºC). The mean annual temperature for Meadow Lake is 0.8 ºC with January temperatures averaging -17.2 ºC and July temperatures of 16.7 (Figure 5.1). The extreme maximum temperature for Meadow Lake is 37.2 ºC in August of 1991 and the extreme minimum is -47 ºC in December of 1990. The average frost free days range from 96 days in Meadow Lake to 123 days in Buffalo Narrows based on the period 1981 to 2010 (Table 5.1). The annual growing degree days (GDD) (base of 5 ºC) for the region ranged from a low of 1330 in Loon Lake to a high of 1469 in Cold Lake. Within the FMP area, Meadow Lake and Buffalo Narrows had GDD of 1360 and 1413, respectively.

Table 5.1 Frost free and growing degree days data for locations in and around the Mistik FMP area.

Location	Avg Date of Last Frost	Avg Date of First Fall Frost	Avg Length of Frost Free (days)	Growing Degree Days (base 5ºC)
Fort McMurray	May 30	September 6	97	1375
Buffalo Narrows	May 23	September 6	123	1413
Cold Lake	May 20	September 14	116	1469
Meadow Lake	May 29	September 3	96	1360
Loon Lake	June 8	August 31	82	1330

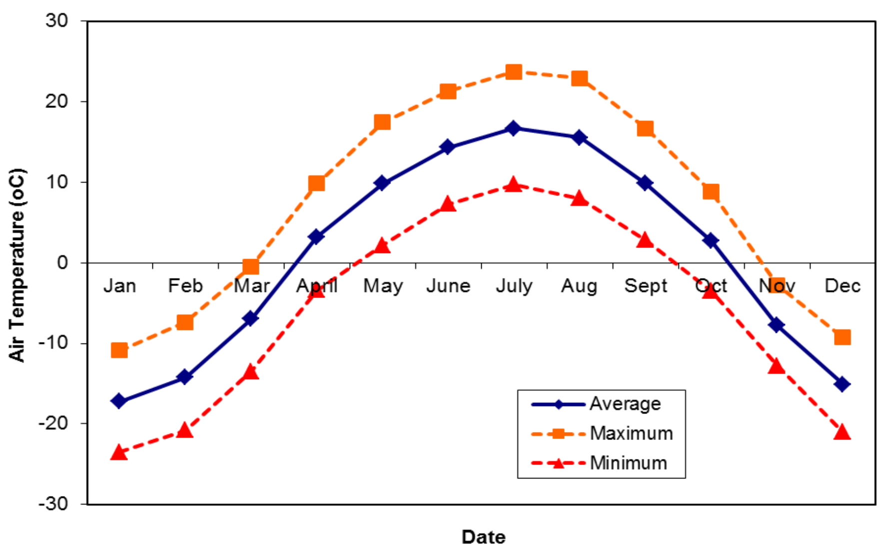


Figure 5.1 Average, maximum, and minimum monthly air temperatures for Meadow Lake for the period of 1981-2010.

Mean annual temperatures for Buffalo Narrows to the north is 1.0 ºC with January temperatures of -17.5 ºC and July temperatures of 17.7 ºC (Figure 5.2). The extreme maximum temperature for Buffalo Narrows is 35 ºC in August of 1991 and the extreme minimum is -47 ºC in January of 1996.

The region would also be characterized as dry subhumid according to Thornthwaites moisture classification. Total precipitation for the Meadow Lake region averages 415 mm a year with 317 mm and 123 cm of the precipitation occurring as rainfall and snowfall, respectively during the period 1981-2010

(Figure 5.3). The majority of the precipitation (76%) occurs from May to September with about 75 mm occurring in the month of July. To the north in Buffalo Narrows, total annual precipitation is higher at 449 mm with 317 mm occurring as rainfall and 139 cm as snow (Figure 5.4). Snow depths are highest in February averaging 30 and 21 cm for Buffalo Narrows and Meadow Lake, respectively (Figure 5.5).

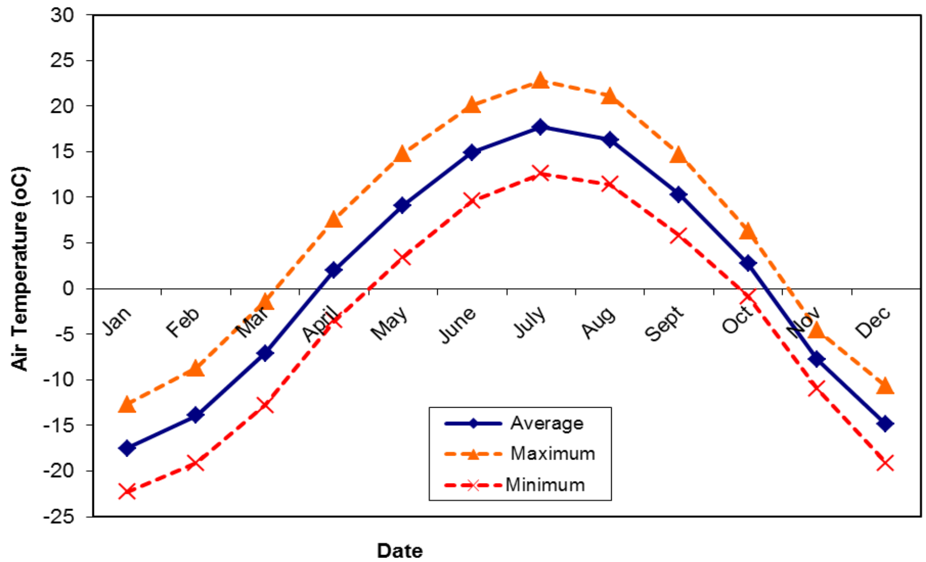


Figure 5.2 Average, maximum, and minimum monthly air temperatures for Buffalo Narrows for the period 1981-2010.

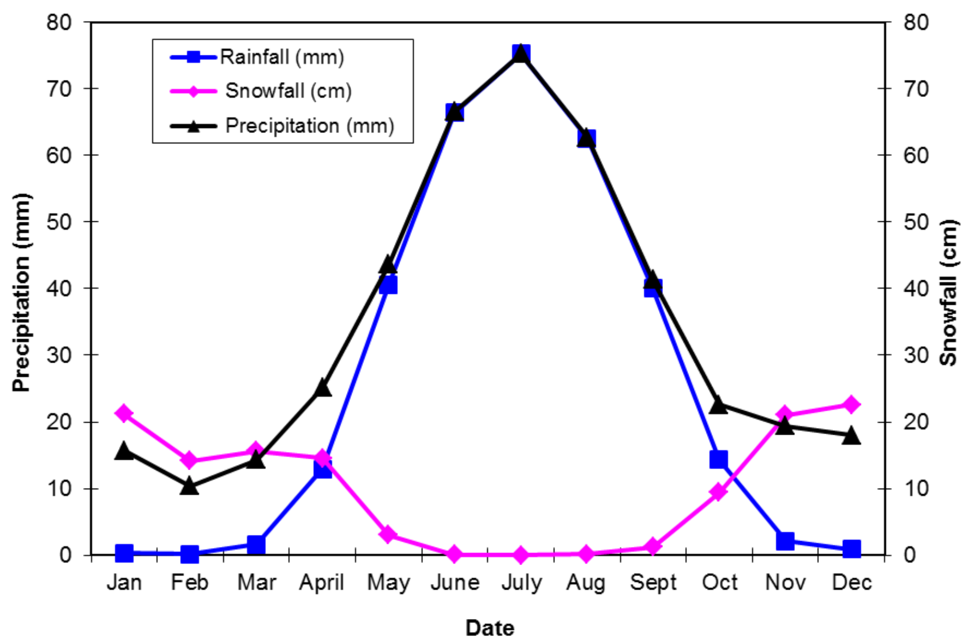


Figure 5.3 Monthly rainfall, snowfall, and total precipitation for Meadow Lake for the period 1981-2010

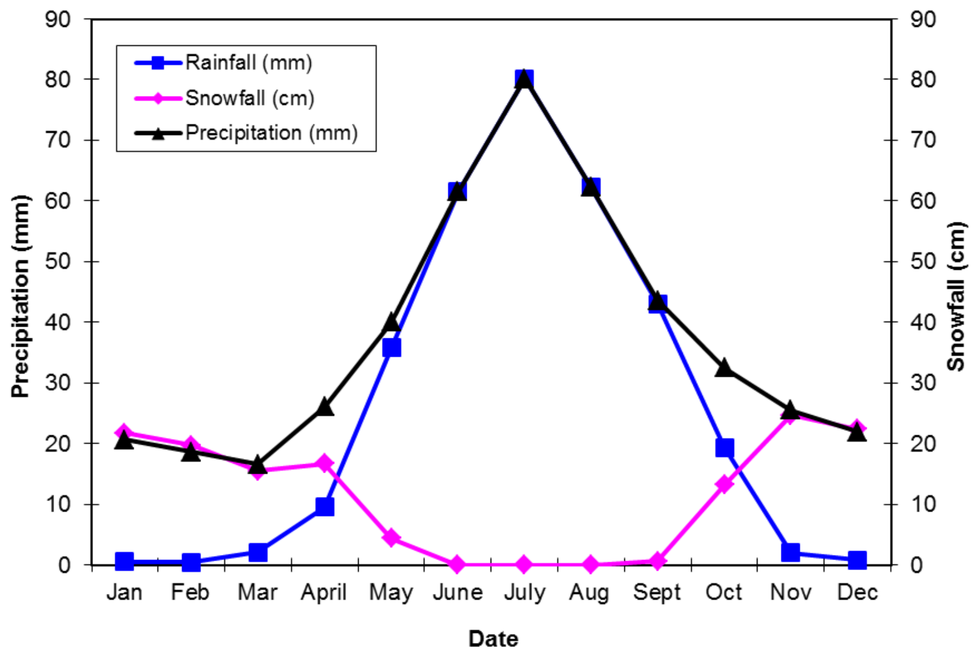


Figure 5.4 Monthly rainfall, snowfall, and total precipitation for Buffalo Narrows for the period 1981-2010.

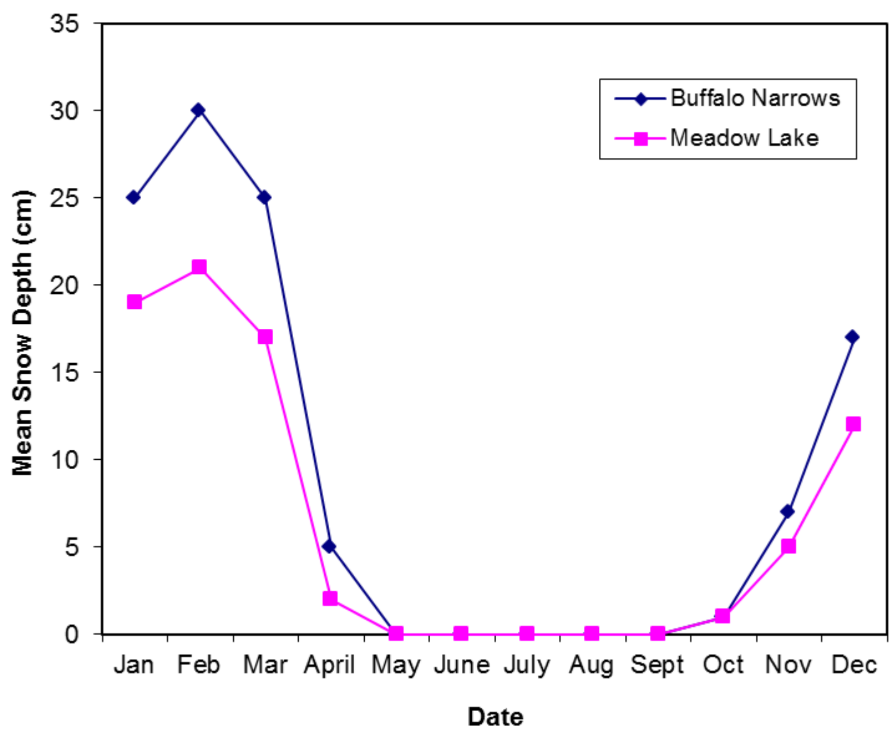


Figure 5.5 Mean snow depths for Meadow Lake and Buffalo Narrows for the period 1981-2010.

Using climate stations from within and around the FMP area, total precipitation has fluctuated from year to year from 1980 to 2004 (Figure 5.6). Maximum total annual precipitation ranges from 551 mm for Meadow Lake in 1998 to 634 mm for Buffalo Narrows in 1996 while minimum annual precipitation ranges from 260 mm for Buffalo Narrows in 1998 to 306 mm for Meadow Lake in 1990. Total precipitation for the southern and northern regions of the FMP area appears similar during the 1980s; however, during the early 1990s and 2000s the northern portion received more precipitation than the southern region.

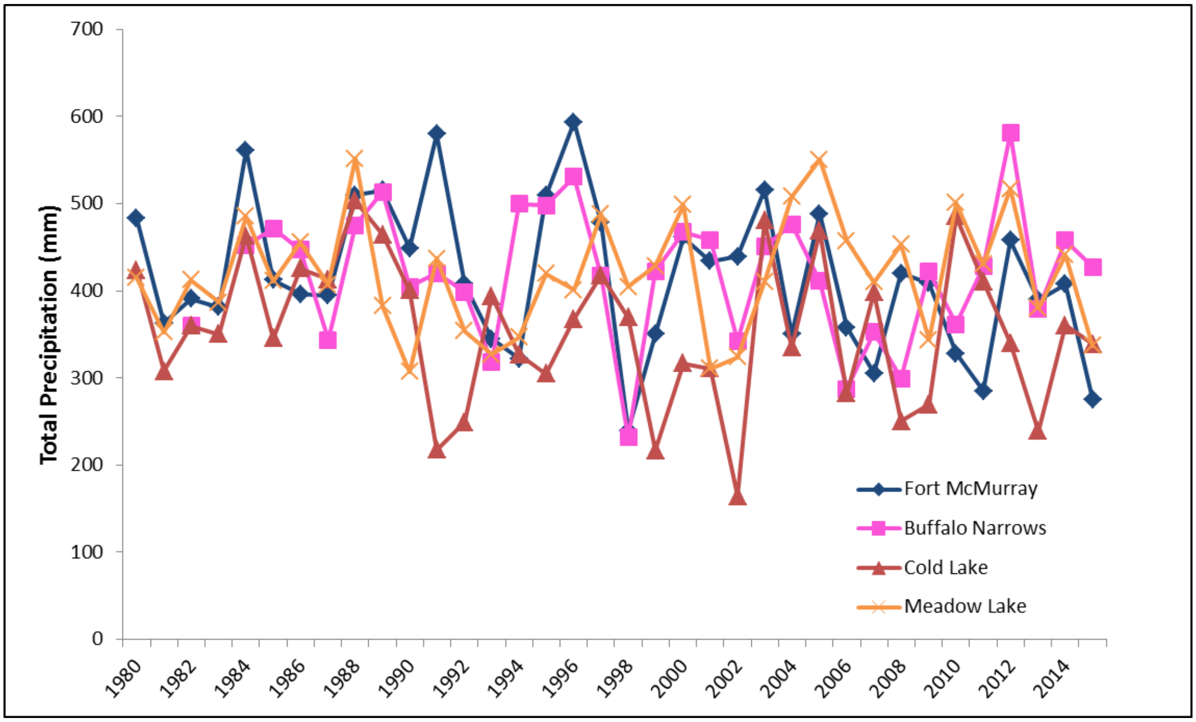


Figure 5.6 Annual total precipitation for areas located in and around the Mistik FMP area between 1980 and 2015

Rainfall events across the FMP area are important to understand because of the effects on soil moisture and potential impacts from harvesting practices. Average rainfall events throughout the region range from 40 to 80 mm during the growing season with the highest amounts occurring in June and July (Figure 5.7). Historically, the maximum rainfall events have occurred in June with up to 200 mm for the northern portion of the FMP area and in September around Meadow Lake (Figure 5.8). Figure 5.9 shows rainfall events greater than 100 mm a month where Buffalo Narrows had seven of the 24 years in June at this level whereas Meadow Lake had four in the last 24 years in July and August with rainfall events > 100 mm. Rainfall intensity for Meadow Lake (Figure 5.10) and Buffalo Narrows (Figure 5.11) show that the majority of rainfall events are between 2 and 5 mm with few rainfall events > 25 mm.

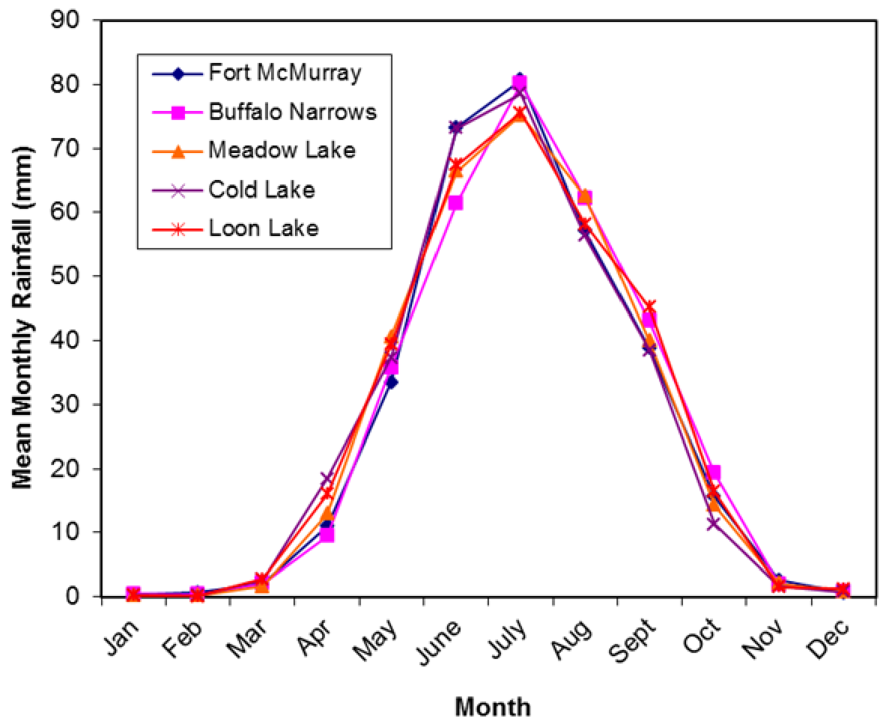


Figure 5.7 Mean monthly rainfall for areas located in and around the Mistik FMP area between 1981 and 2010.

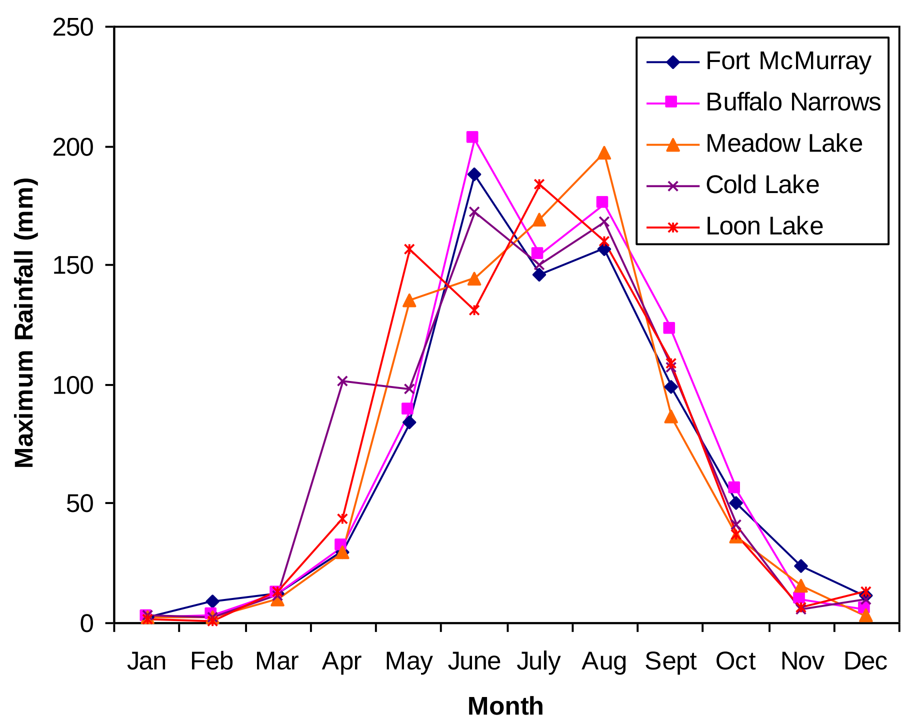


Figure 5.8 Monthly maximum rainfall for areas located in and around the Mistik FMP area between 1980 and 2004.

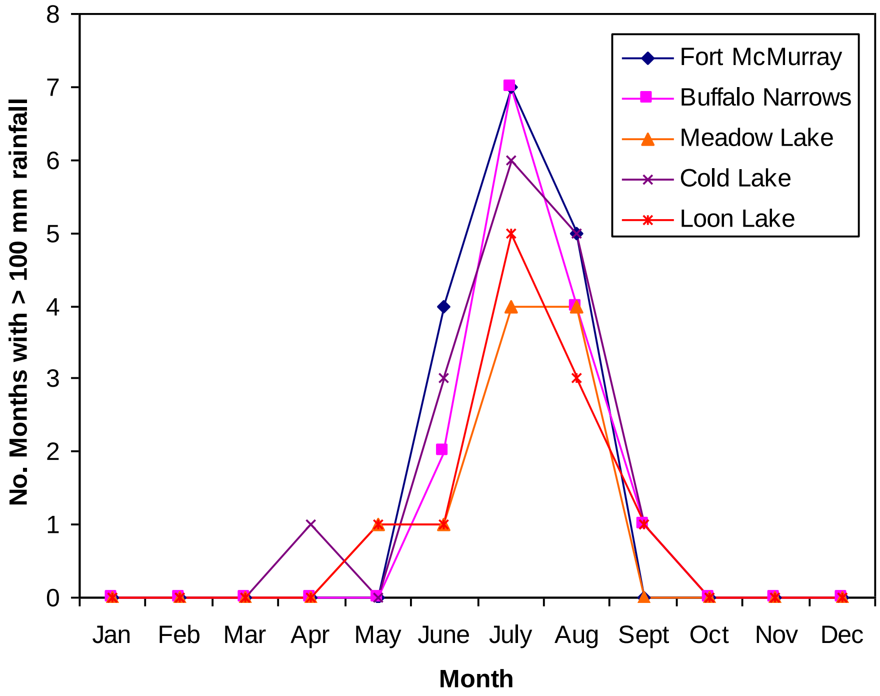


Figure 5.9 Number of months where rainfall was >100 mm for areas located in and around the Mistik FMP area between the years 1980 and 2004.

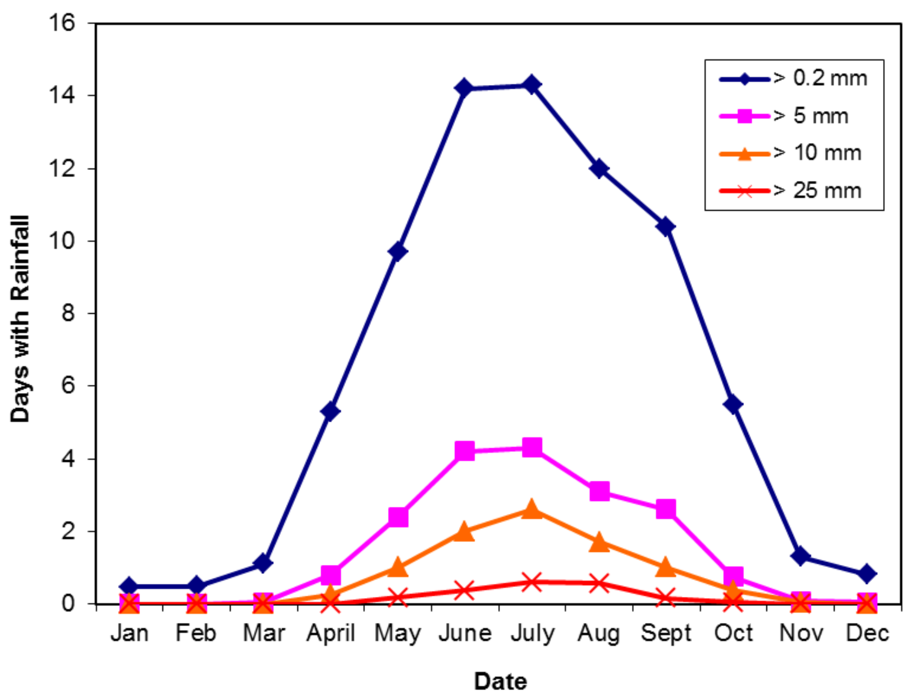


Figure 5.10 Rainfall intensity for Meadow Lake between 1981 and 2010.

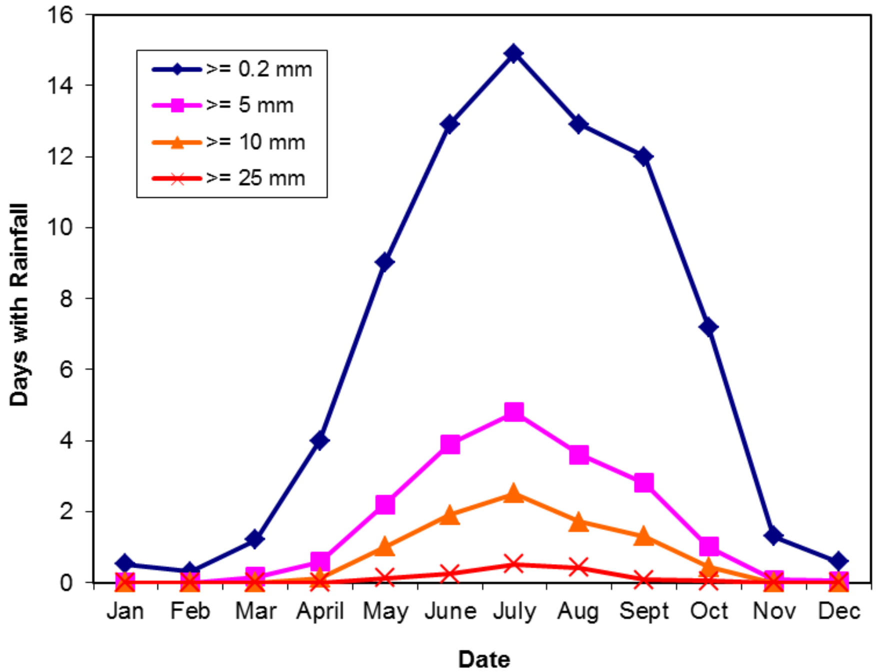


Figure 5.11 Rainfall intensity for Buffalo Narrows between 1981 and 2010.

5.11 WATER YIELDS FOR MANAGEMENT UNITS

5.11.1 DRAINAGE SYSTEMS

The Thickwood Hills Uplands, located south of Meadow Lake, divides the Churchill River and North Saskatchewan drainage basins in the FMP area. The Thickwood Hills Upland, with elevations just above 732 m drops down to the south with elevations of 640 m while to the north the elevation drop is greater down to 594 m. Water from both of these drainage systems drains eastwards eventually ending in Hudson Bay. Just to the north of the northern limits of the FMP area is the Clearwater River system which drains westward into the Athabasca River and eventually into the Mackenzie River System. Several water sampling stations were used to describe the watersheds in the FMP area and their locations are presented in Figure 5.12 and information regarding the stations can be found in Table 5.2.

5.11.2 WATERSHED DESCRIPTIONS AND SUB-BASINS

5.11.2.1 BEAVER RIVER WATERSHED

The Beaver River originates in Alberta and drains an area of approximately 48,800 km^2 of which 31,000 km^2 is in Saskatchewan. In the southern region of the FMP area, Makwa and Meadow Lakes drain northwards into the Beaver River and on the eastern portion of the watershed, Green Lake, Sled Lake, Dore Lake and Lac la Plonge drain northwards into the Beaver River where it eventually drains into Lac Île-à-la-Crosse and the Churchill River system. The major tributaries that drain into the Beaver River include the Makwa, Meadow, Cowan and Waterhen rivers.

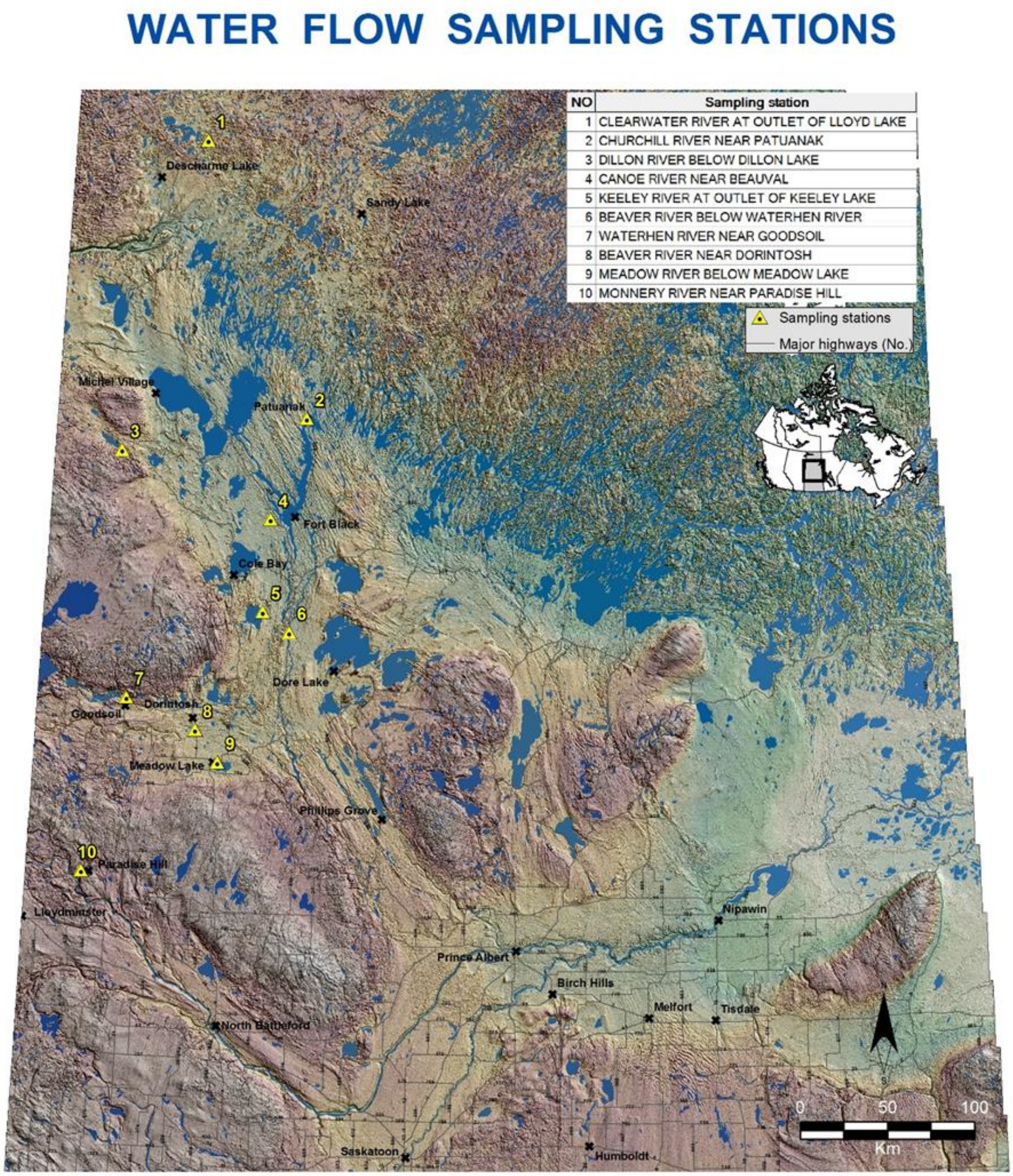


Figure 5.12 Location of water flow sampling stations in and around the Mistik FMP area.

Table 5.2 Water sampling station characteristics

Station Number	Station Name	Latitude	Longitude	Data Year From	Data Year To	Drainage Area (km2)
07CD006	CLEARWATER RIVER AT OUTLET OF LLOYD LAKE	57°19'50" N	108°45'50" W	1973	1995	4250
06BB003	CHURCHILL RIVER NEAR PATUANAK	55°55'23" N	107°43'32" W	1973	2014	78700
06BA002	DILLON RIVER BELOW DILLON LAKE	55°42'52" N	109°23'48" W	1970	2014	2330
06BB005	CANOE RIVER NEAR BEAUVAL	55°23'48" N	108°01'7" W	1973	2014	4730
06BB004	KEELEY RIVER AT OUTLET OF KEELEY LAKE	54°55'6" N	108°3'13" W	1971	1995	1020
06AG001	BEAVER RIVER BELOW WATERHEN RIVER	54°49'9" N	107°48'38" W	1971	2015	45000
06AF005	WATERHEN RIVER NEAR GOODSOIL	54°26'45" N	109°13'21" W	1979	1979	7760
06AD001	BEAVER RIVER NEAR DORINTOSH	54°17'47" N	108°36'16" W	1979	1983	20500
06AD010	MEADOW RIVER BELOW MEADOW LAKE	54°8'10" N	108°23'40" W	1958	2015	3340
05EF004	MONNERY RIVER NEAR PARADISE HILL	53°32'28" N	109°31'38" W	1967	2014	875

The Beaver River is the largest river within the FMP area having an average discharge of 20 and 44 m^3/s (measured at Dorintosh [Station ID 06AD001] and just below the Waterhen River [Station ID 06AG001], respectively) during the period 1972-2015 (Figure 5.13 and Figure 5.14). For comparison purposes, the discharge for the Churchill River to the north of the FMP area at Patuanak (Figure 5.15) averages 130 m^3/s (from 1973-2014) while the North Saskatchewan River at Red Deer Creek averages 227 m^3/s (from 1972-2014). The flows increase in the spring with the spring thaw and peak in May with flows averaging 58 and 109 m^3/s for the Beaver River at the Dorintosh and Waterhen River locations, respectively and then slowly decreasing throughout the year with minimum flows in February (Figure 5.16). Maximum peak flow for the river occurred in May of 1974 with discharge rates of 372 and 549 m^3/s for the Dorintosh and Waterhen River locations, respectively while the lowest flows between 1972 and 2015 occurred in 1993 with discharge rates of 0.4 and 3 m^3/s for the Dorintosh and Waterhen River locations, respectively (Figure 5.13 and Figure 5.14). The Meadow River also drains into the Beaver River and has discharges that average 2.4 m^3/s for the period 1977-2015 (Figure 5.17). Maximum flows for 1977-2015 were recorded in May of 2013 at 33.1 m^3/s while minimum flows were approximately 0 m^3/s for eight of the recorded years.

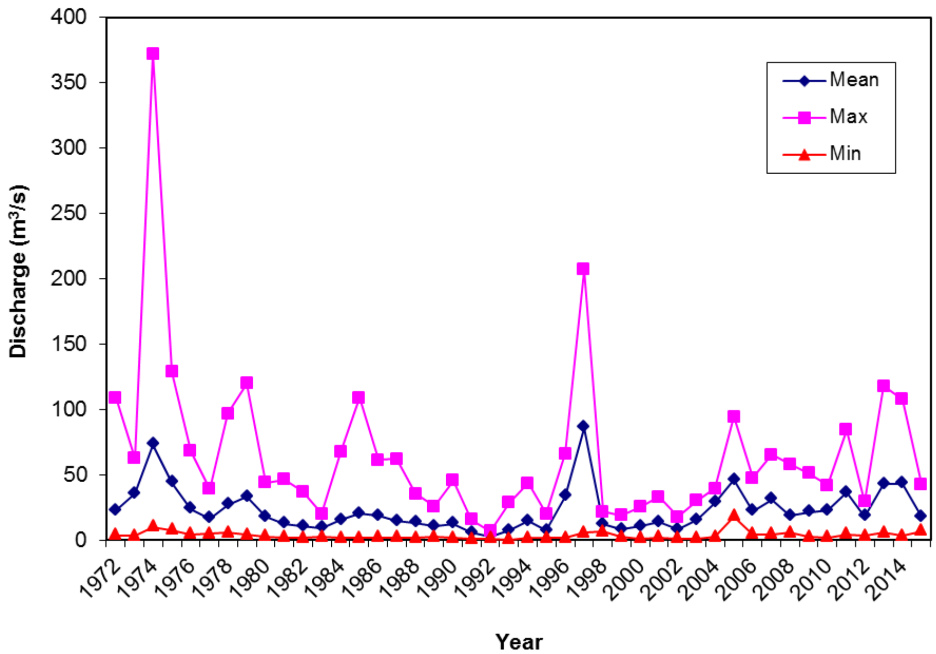


Figure 5.13 Mean, maximum, and minimum annual discharge for the Beaver River near Dorintosh for the period 1972-2015.

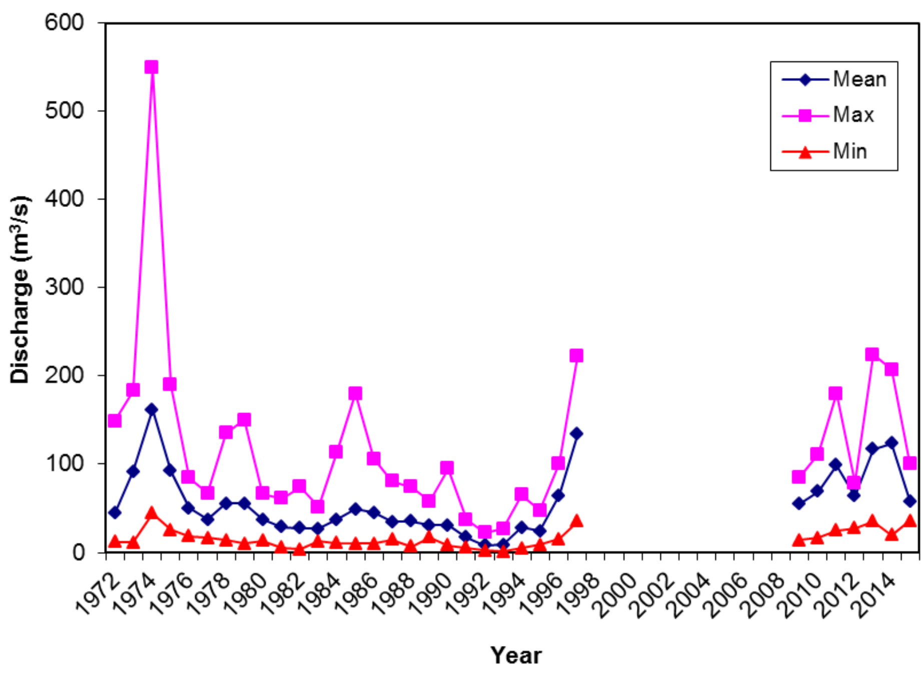


Figure 5.14 Mean, maximum, and minimum annual discharge for the Beaver River below the Waterhen River for the period 1972-2015 (gaps in graph are due to lack of data).

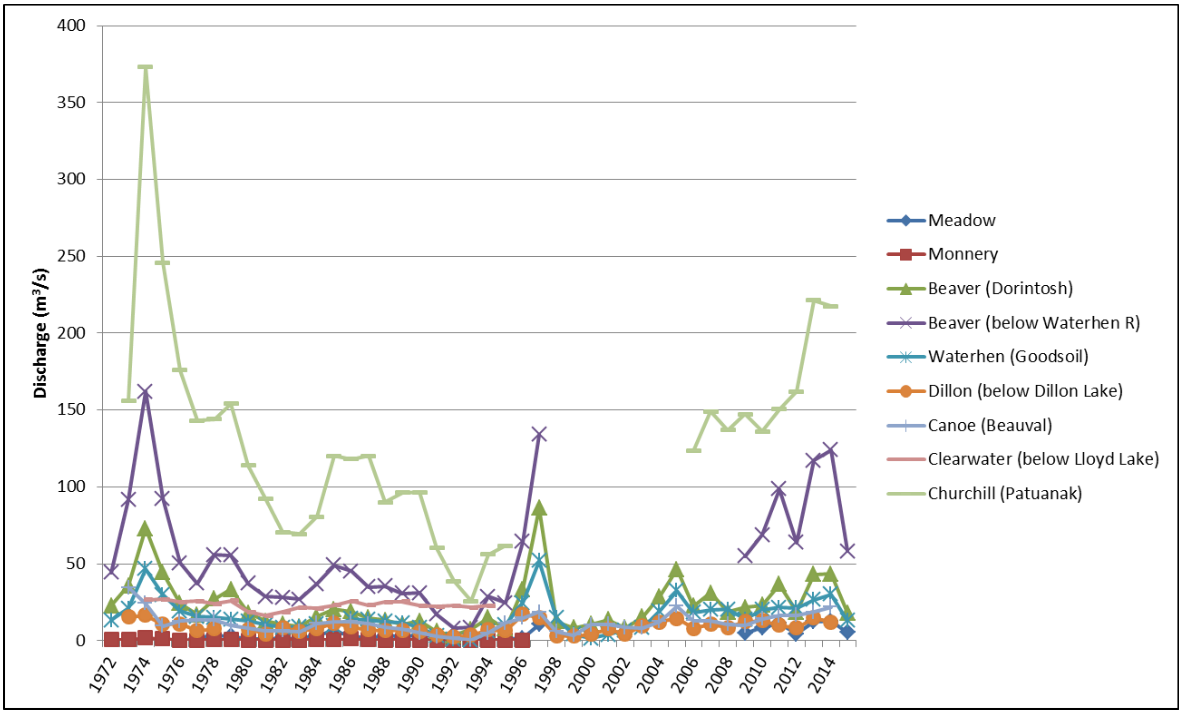


Figure 5.15 Mean annual discharge rates for various rivers within and outside the Mistik FMP area (gaps in graph are due to lack of data).

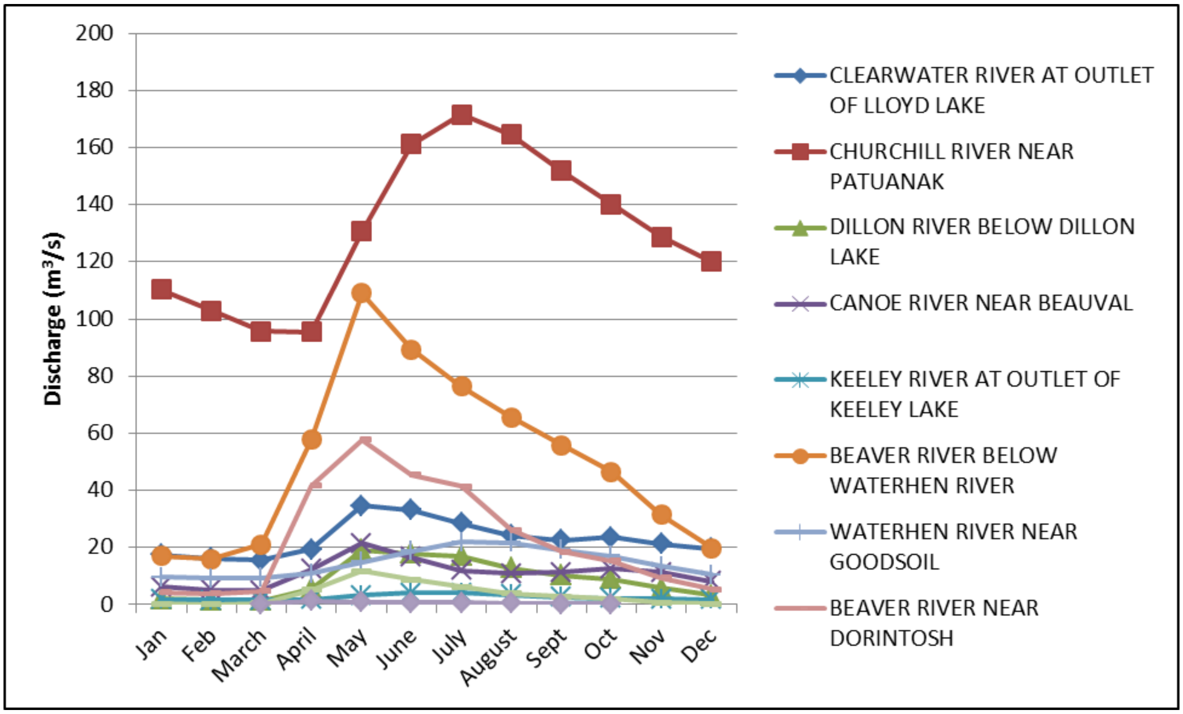


Figure 5.16 Mean monthly discharge for several rivers within and outside the Mistik FMP area .

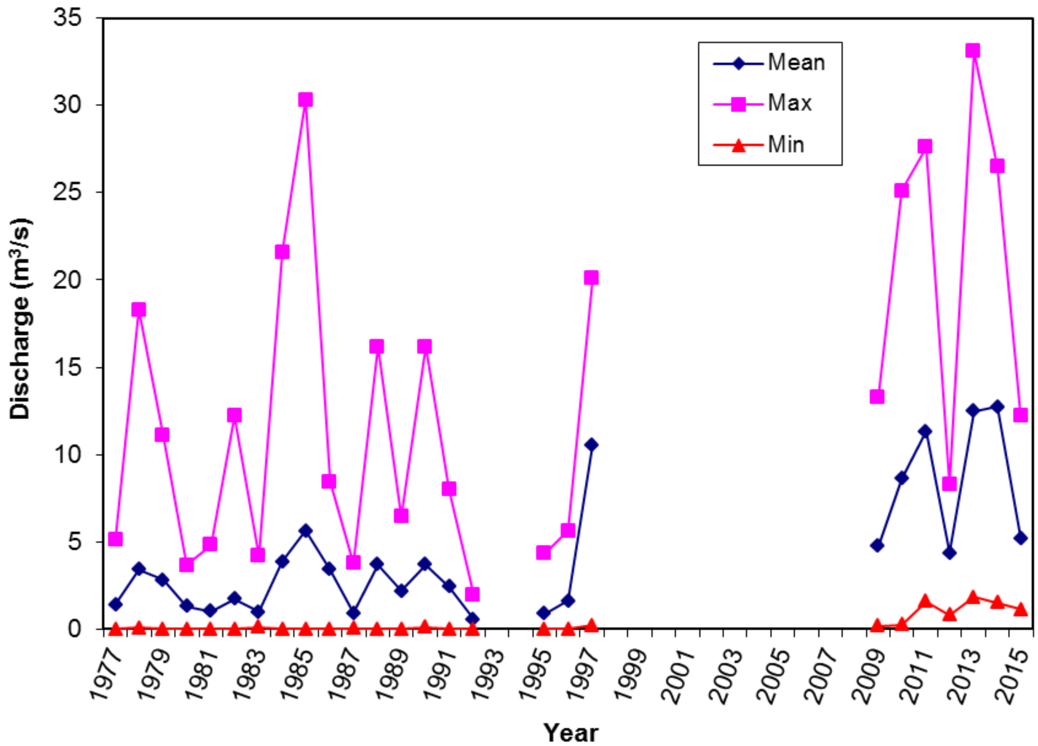


Figure 5.17 Mean, maximum, and minimum annual discharge for the Meadow River below Meadow Lake for the period 1977-2015 (gaps in graph are due to lack of data).

5.11.2.2 WATERHEN RIVER

The Waterhen River drains the region north of the Beaver River through a series of lakes and rivers in Meadow Lake Provincial Park and empties into the Beaver River on the east side of the FMP area between Beauval and Green Lake. The river drains an area of approximately 11,100 km^2 and travels a distance of about 115 km starting from Lac des Îles to the confluence of the Beaver River. The Waterhen is the major drainage system for runoff from the southern portion of the Mostoos Hills via Primrose and Cold Lakes that then drain into the Cold River and into the Waterhen River.

Average annual discharge rates for the Waterhen River recorded at Goodsoil are 13 m^3/s for the period 1972-1995 (flows from 1996 to 2015 were only recorded from March to October) with a maximum flow of 94.5 m^3/s in June of 1974 and a minimum flow of 0.001 m^3/s in February of 1993 (Figure 5.18). Unlike the Beaver River, the peak flows for the Waterhen River at Goodsoil occur between June and July averaging 21.5 m^3/s and gradually decline to 9 m^3/s in January to March (Figure 5.16). The peak flows later in the year could be a result of the numerous lakes in the watershed that act as storage reservoirs and thus dampen the flows as well as baseflow from the Mostoos Hills to the north of the river.

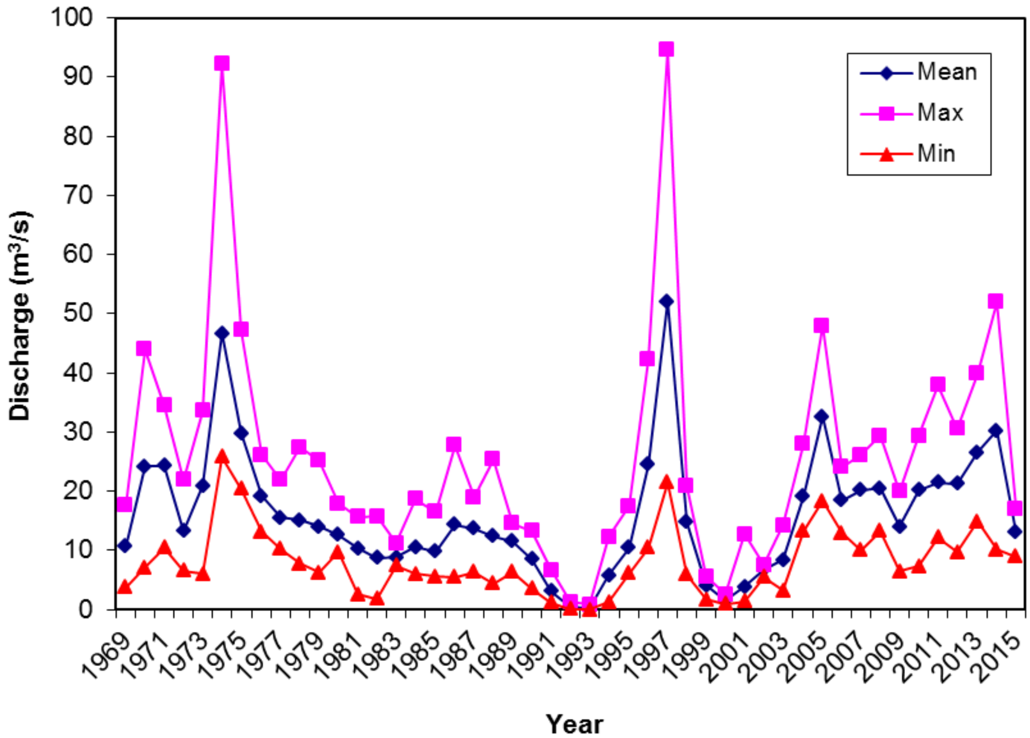


Figure 5.18 Mean, maximum, and minimum annual discharge for the Waterhen River near Goodsoil for the period 1969-2015

5.11.2.3 UPPER CHURCHILL RIVER

In the central part of the FMP area, east of the Mostoos Hills there are a number of lakes that drain northwards from the Waterhen Plain. Major lakes in this area include Canoe and Keeley Lakes and these lakes drain into Lac Île-à-la-Crosse which drains northward into the Churchill River system. There are also a number of tributaries that drain the Mostoos Hills into this watershed.

The average annual discharge for the Canoe River averages 11.0 m^3/s and ranged from 0.7 to 24.2 m^3/s for the period 1974 to 2014 (Figure 5.19). Maximum discharges of 55.7 and 61 m^3/s were recorded in 2014 and 1974, respectively and a minimum flow of 0 m^3/s was recorded in 1993. On a monthly basis, flows for the year peak in May averaging 21.5 m^3/s and slowly decrease for the rest of the year (Figure 5.16).

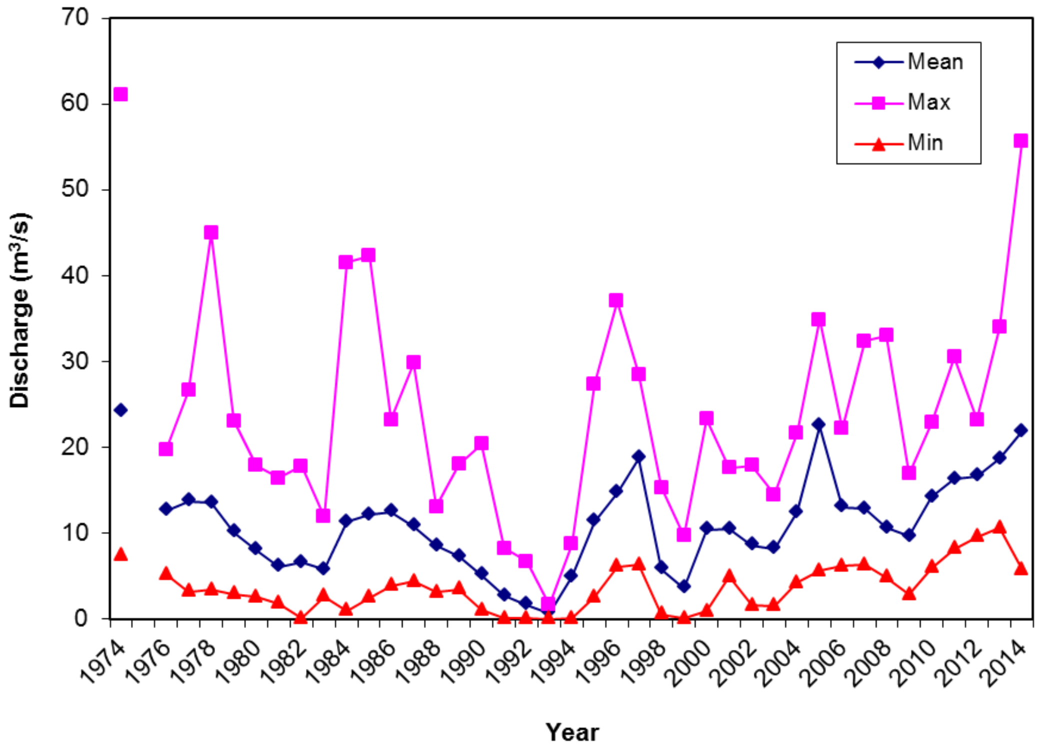


Figure 5.19 Mean, maximum, and minimum annual discharge for the Canoe River for the period 1974-2014.

Disturbances on the landscape can also influence discharge rates for rivers in the FMP area. The large Moose Fire in the Primrose Air Weapons Range/Mistik FMP area in 1995 and other adjacent fires in 1995 in the Waterhen Plain (i.e. Hawk Fire) likely had some effect on the discharge rates for the Canoe River during 1995 to 1997. In August of 1995, 175 mm of rain fell in the region with 76 and 36 mm falling on August 8 and 9, respectively. Due to the large area of the watershed that had been burnt and lack of vegetation for evapotranspiration much of this rainfall ended up as runoff which was very obvious by the large discharge flows in August through October (Figure 5.20). Daily discharge rates increased immediately the day after the rain events. Discharge rates the following year in 1996 during spring melt peaked were ranged between 30 and 39 m^3/s from May 1 to June 26 and in 1977 the flows during May to November were higher than normal. For comparison, discharge flows for 1986 and 2001 were included where in 1986, 145 mm of precipitation occurred in July (however, spread out over the month) and in 2001 approximately 202 mm of rainfall occurred in June (119 mm during 4 days). There was a small increase in discharge in July of 1986 due to the increased rainfall. A larger increase in discharge, however, was observed in June of 2001 due to the rain events but with six years of regrowth in the area, there was also less potential for runoff and peak flows with greater vegetation cover and evapotranspiration.

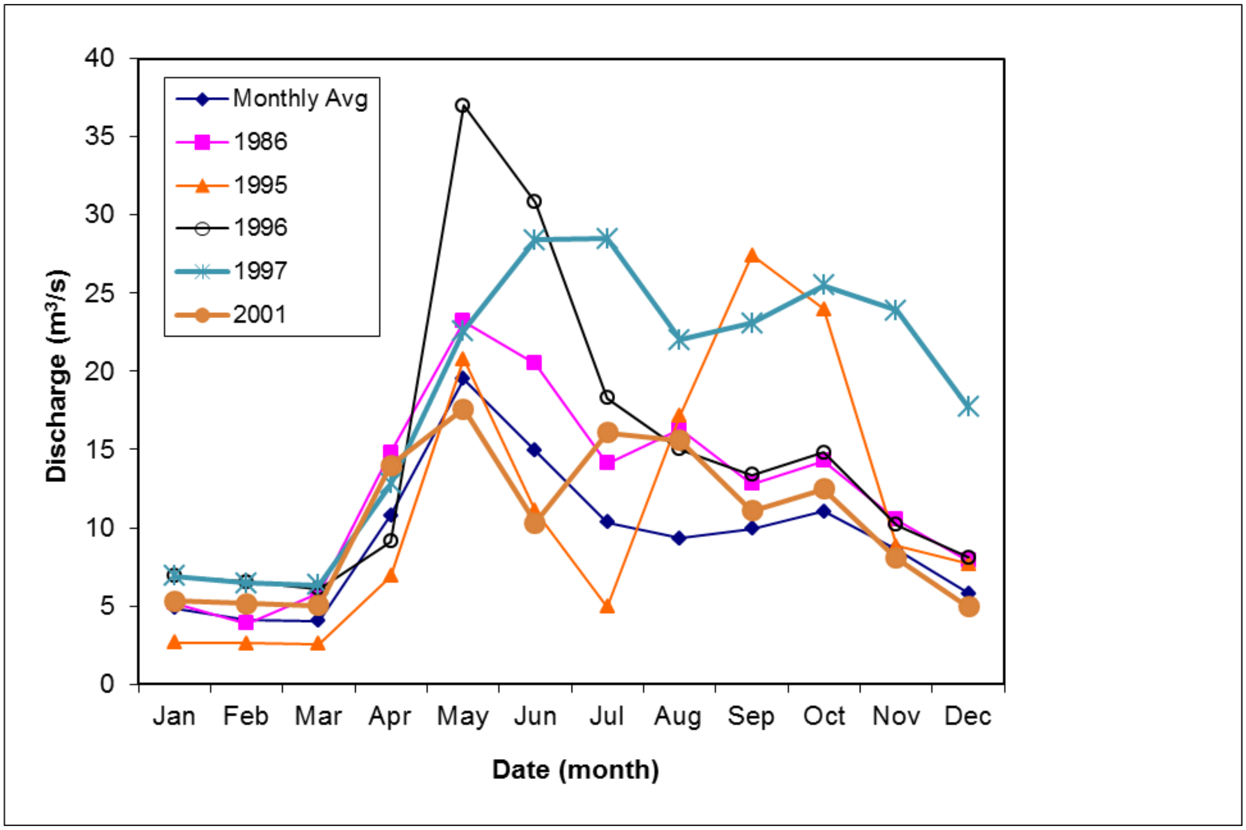


Figure 5.20 Monthly discharge flows for the Canoe River for the period 1973-2004 (monthly avg) and for 1986, 1955-1997, and 2001

Discharge flows for the Keeley River averaged 2.5 m^3/s and ranged between 0.5 and 4.9 m^3/s during the period 1973-1994 (Figure 5.21). The maximum flow was recorded in 1974 at 10.4 m^3/s while the lowest flow was 0.13 m^3/s in 1992 for that period. On a monthly basis, peak flows of 4 m^3/s occur in June and July and again slowly decrease for the remainder of the year to approximately 1.5 m^3/s during the winter months (Figure 5.16). This water sampling station has not been operational since 1994.

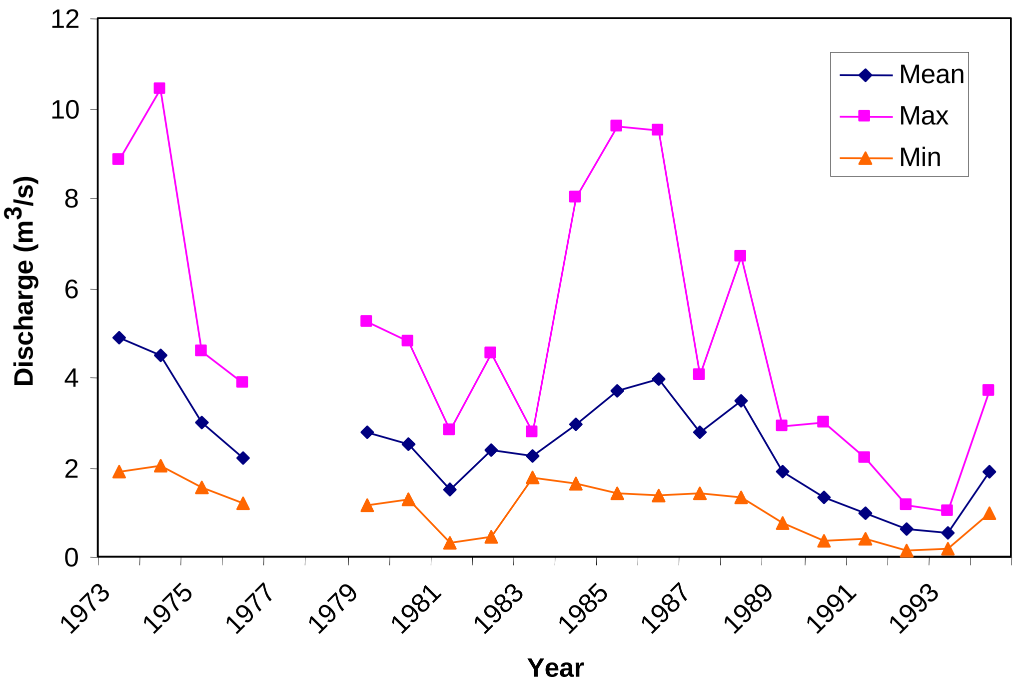


Figure 5.21 Mean, maximum, and minimum annual discharge for Keeley River for the period 1973-1994 (gaps in graph are due to lack of data).

Waters flowing from Canoe and Keeley Lake flow into Lac Île-à-la-Crosse and then drain into the Churchill River. The hydrograph station on the Churchill River at Patuanak has the largest discharge rates on the north side of the FMP area averaging 131 m^3/s on an annual basis from 1973 to 2014 (Figure 5.22). The maximum flow was recorded in 1974 at 577 m^3/s and the lowest flow was measured in 1994 at 23.9 m^3/s. Peak flow during the year occurs in July at 172 m^3/s (Figure 5.16).

In the northern region of the FMP area, the area is drained by the Dillon, Nipin and McCusker rivers which flow northwards into Peter Pond Lake. Churchill Lake, connected to Peter Pond Lake at Buffalo Narrows, drains into Lac Île-à-la-Crosse and into the Churchill River system. North of Peter Pond Lake is the Kimowin River system which flows westwards in the Grizzly Bear Hills and then flows eastwards and drains in to the north end of Peter Pond Lake. The Dillon River has an average flow of 8.8 m^3/s for the period of 1973-2014 with a maximum discharge recorded in 1985 of 73.8 m^3/s and a minimum flow of 0.25 measured in 2005 (Figure 5.23). During the year, peak flow for Dillon River is 19.0 m^3/s in the month of May due to spring melt (Figure 5.16).

To the north and outside of the FMP area is the Clearwater River which drains westward into the Athabasca River system. Flows on the Clearwater below Lloyd Lake, on an annual basis, average 23.0 m^3/s for the period 1974-1994 with maximum flows of 42 m^3/s recorded in 1974 and a minimum flow of 8.15 m^3/s recorded in 1982 (Figure 5.24). Maximum flows during the year occur in May and June at 34 m^3/s (Figure 5.16). Monitoring of this station has appeared to cease after 1994.

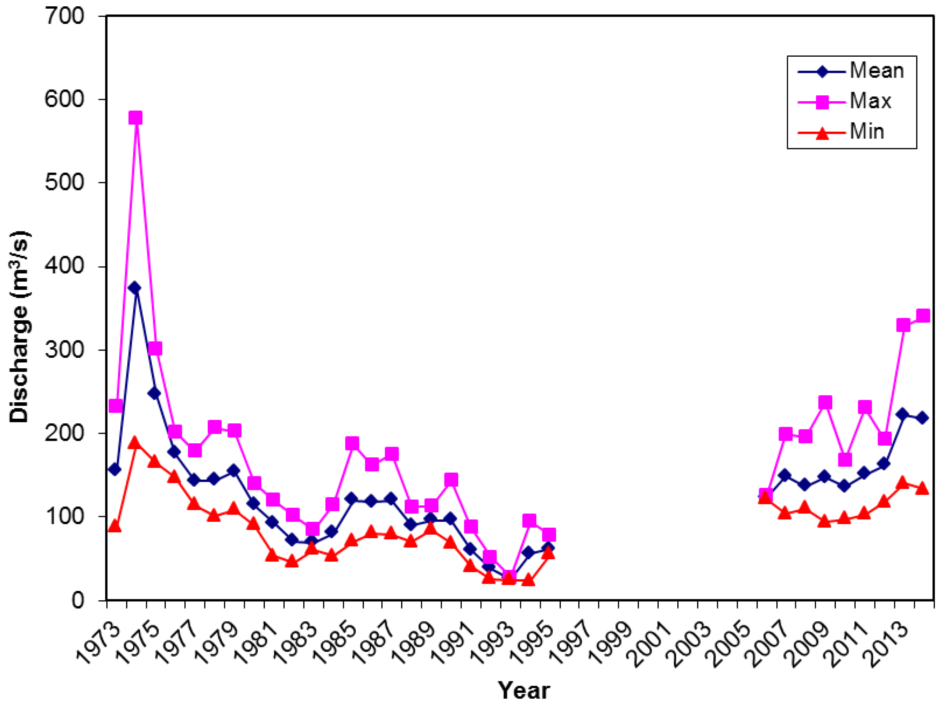


Figure 5.22 Mean, maximum, and minimum annual discharge for Churchill River at Patuanak for the period 1973-2013 (gaps in graph are due to lack of data).

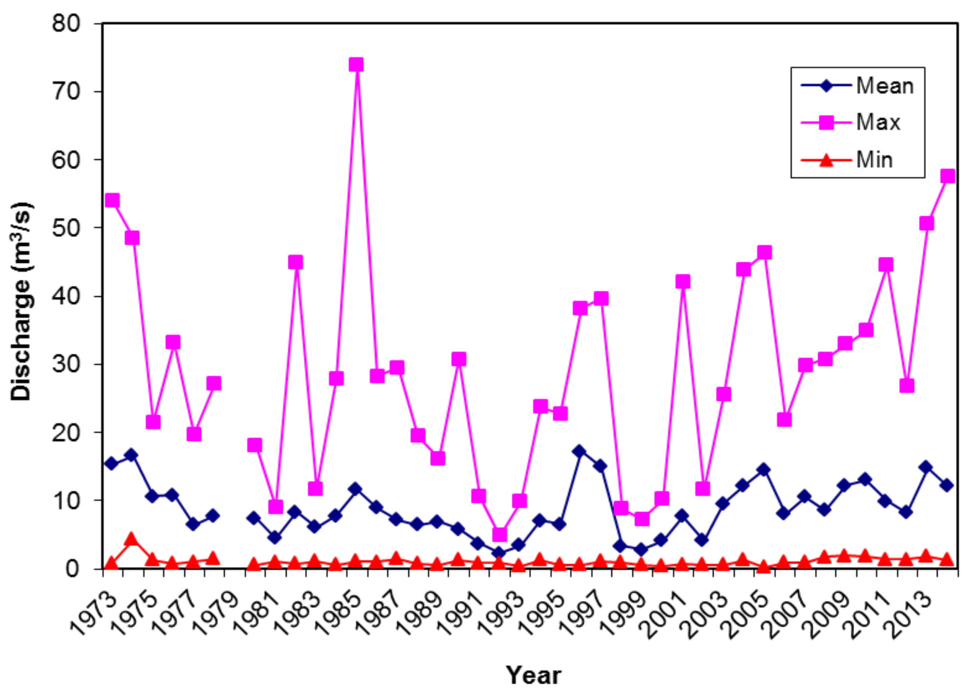


Figure 5.23 Mean, maximum, and minimum annual discharge for the Dillon River for the period 1973-2014 (gaps in graph are due to lack of data).

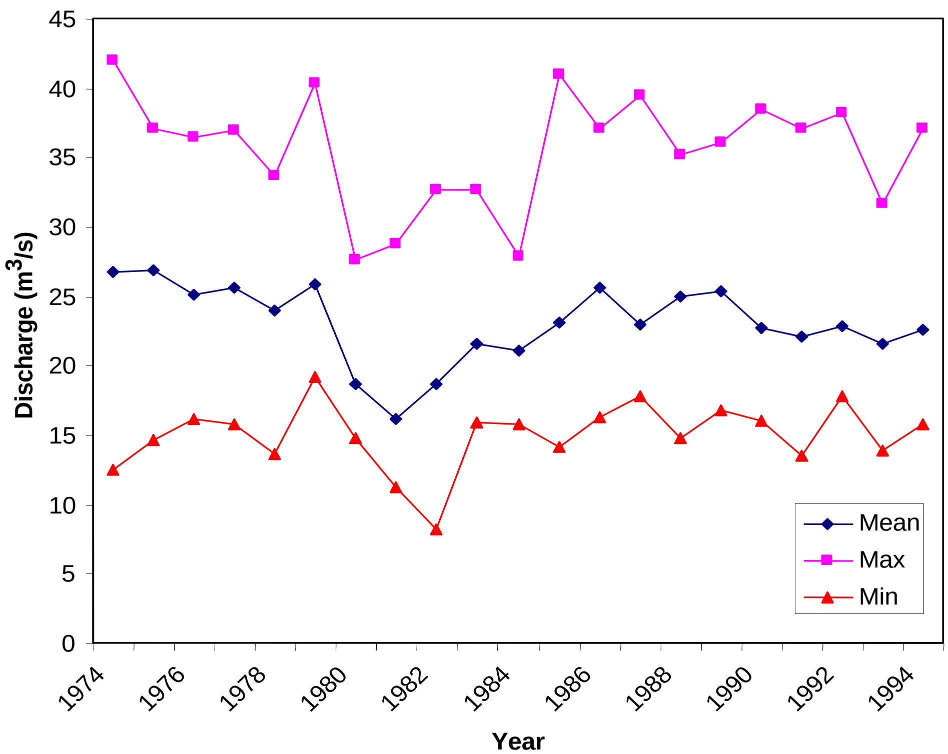


Figure 5.24 Mean, maximum, and minimum annual discharge for the Clearwater River for the period 1974-1994.

5.11.2.4 NORTH SASKATCHEWAN RIVER

There are many streams in the Thickwood Hills Uplands that drain south to the North Saskatchewan River and major lakes in the uplands include Turtle and Brightsand Lakes. To the west and outside of the FMP area, the Monnery River flows south and waters from Turtle and Brightsand Lake flow via the Turtle River into the Monnery River before entering the North Saskatchewan River.

Flow for the Monnery River at Paradise Hill is very low compared to other recorded rivers in the FMP area but average annually 0.6 m^3/s for the period 1968-2014. Maximum flows occurred in 1986 at 4.31 m^3/s while the lowest flow was recorded as essentially 0 m^3/s in 2011 and 2013 (Figure 5.25). Peak flows during the year occur in May after spring melt and averaged 0.83 m^3/s (Figure 5.16).

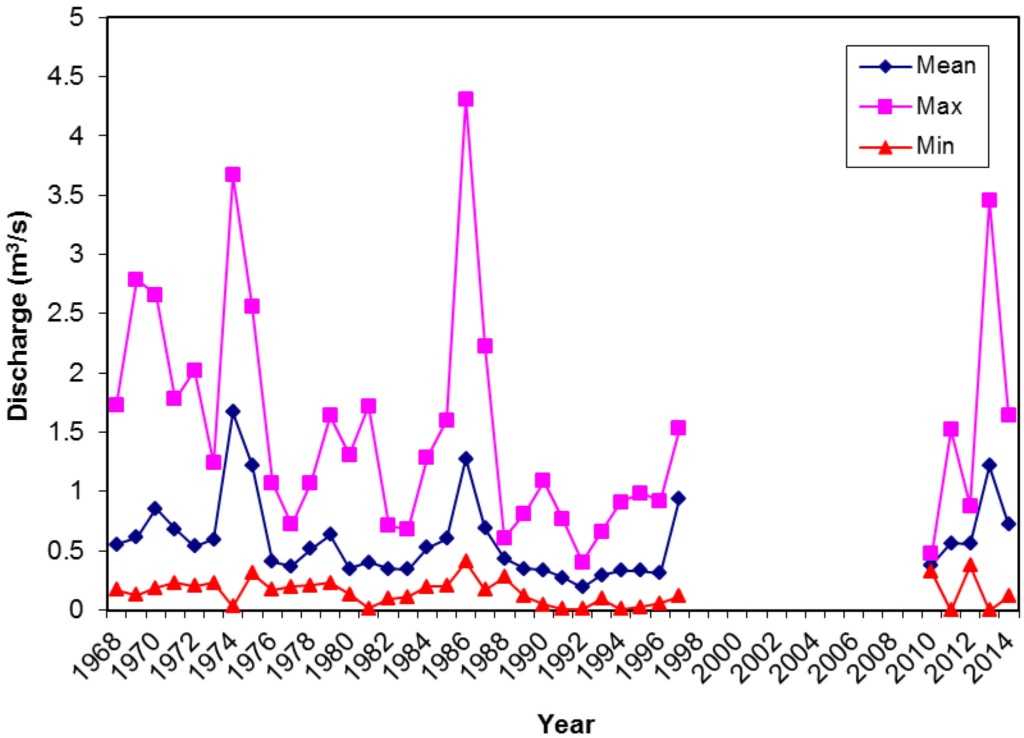


Figure 5.25 Mean, maximum, and minimum annual discharge for the Monnery River for the period 1968-2014 (gaps in graph are due to lack of data).

6 OTHER LAND USES AND VALUES IN THE MISTIK FMP AREA

Under *the Forest Resources Management Act*, Mistik has a responsibility to identify other land values and uses within its FMP area and how those values and uses are accommodated and maintained. Mistik has no regulatory mandate to directly manage other forest use values. Mistik's primary focus, in relation to other ecological and socioeconomic forest values, is to attempt to minimize forestry-related impacts to other forest values. Where possible, and appropriate, Mistik attempts to integrate and enhance other forest values. It is the opinion of Mistik staff that the key requirements for maximizing the effectiveness of mitigation, integration and enhancement opportunities are scientific understanding and public participation.

Hunting (including subsistence, traditional use, recreational and guided outfitting), trapping, ranching (grazing), fishing, berry-picking, mushroom-picking, firewood gathering, nature and scenic appreciation (birding, camping, hiking, photography, ecotourism), recreational use (snowmobiling and ATV use), medicinal-plant use and wild rice harvesting are common non-timber forest product uses conducted for business, recreation and subsistence purposes in the Mistik FMP area. Some of these activities have developed, to some extent, into commercial or semi-industrial enterprises. In the recent past, significant industries have grown (and in some cases waned) around commercial freshwater fisheries, mink-ranching, blueberry picking, and guided outfitting for deer and bear. Recently, ecotourism has become a business opportunity for several northern communities. Wild rice harvesting has become one of the most significant non-timber forest use industries in the Mistik FMP area. A significant number of the small lakes and waterways throughout the FMP area are actively seeded and harvested on an annual basis. Mistik has coordinated a limited amount of timber harvesting activity and road access adjacent to some lakes to facilitate wild rice seeding and harvesting activities undertaken by local people. Lastly, there are significant heritage values (sites of archaeological significance) throughout the FMP area. Saskatchewan Ministry of Environment has a significant role in administrating the commercial uses of all non-timber forest products through permitting and compliance.

The primary industrial use, other than forestry, within the Mistik FMP area is oil and gas exploration and development. Oil and gas related activity is coordinated by MoE and is concentrated in the southern portion of the Mistik FMP area. Assessment of timber dues for timber removal related to oil and gas exploration is calculated according to terms outlined within the Mistik Forest Management Agreement. Where practical, Mistik accepts salvaged timber from well sites, seismic, and pipeline right-of-ways. Dues and fees from salvaged timber are forwarded to the government and the Mistik Forest Management Fund.

The following documentation provides more detail pertaining to individual forest land values and uses within the Mistik FMP area. How those values and uses are impacted by forest management activities and what measures are implemented by Mistik to mitigate impacts to non-timber values and uses are also described in detail.

6.1 FISH VALUES

There are 452 lakes greater than five ha in size and numerous significant waterways (rivers and creeks) within the Mistik FMP area (Figure 6.1). Many of these lakes and waterways contain fish species that are of commercial or sport fishery significance. Of the 68 species of fish known to exist within Saskatchewan, 31 have been identified within the Mistik FMP area (Table 6.1).

Figure 6.1 Lakes within the Mistik FMP area

Table 6.1 Fish species within the FMP area

#	Common Name	Latin Name	Use
1	Walleye	*Stizostedion nitreum*	Traditional Commercial Sport
2	Northern Pike	*Esox lucius*	Traditional Commercial Sport
3	Lake Whitefish	*Coregonus clupeaformis*	Traditional Commercial Sport
4	Burbot	*Lota lota*	Traditional Commercial Sport
5	Lake Trout	*Salvelinus namaycush*	Traditional Commercial Sport
6	Sauger	*Stizostedion canadense*	Traditional Commercial Sport
7	Longnose Sucker	*Catostomus catostomus*	Traditional Commercial
8	White Sucker	*Catostomus commersonii*	Traditional Commercial
9	Lake Herring	*Coregonus artedii*	Traditional Commercial

#	Common Name	Latin Name	Use
10	Yellow Perch	*Perca flavescens*	Sport
11	Rainbow Trout	*Onchorynchus mykiss*	Sport
12	Brown Trout	*Salmo trutta*	Sport
13	Brook Trout	*Salvelinus fontinalis*	Sport
14	Splake	*Salvelinus fontinalis x Salvelinus namaycush*	Sport
15	Northern Redbelly Dace	*Chrosomus eos*	n/a
16	Finescale Dace	*Chrosomus noegaeus*	n/a
17	Longnose Dace	*Rhinichthys cataractae*	n/a
18	Slimy Sculpin	*Cottus cognatus*	n/a
19	Spoonhead Sculpin	*Cottus ricei*	n/a
20	Lake Chub	*Couesius plumbeus*	n/a
21	Brook Stickleback	*Culea inconstans*	n/a
22	Iowa Darter	*Etheostoma exile*	n/a
23	Johnny Darter	*Etheostoma nigrum*	n/a
24	Deepwater Sculpin	*Myoxocephalus thompsoni*	n/a
25	Emerald Shiner	*Notropis atherinoides*	n/a
26	Common Shiner	*Notropis cornatus*	n/a
27	Spottail Shiner	*Notropis hudsonius*	n/a

#	Common Name	Latin Name	Use
28	Log Perch	*Percina caprodes*	n/a
29	Trout Perch	*Percopsis omiscomaycus*	n/a
30	Fathead Minnow	*Pimephales promales*	n/a
31	Ninespine Stickleback	*Pungitius pungitius*	n/a

Of these 31 species, 11 are sought after as sport fish (angling), 9 are utilized commercially (netted) and 9 form part of the traditional use (Aboriginal subsistence) fishery. None of the fish species within the FMP area are considered endangered. The greatest variety of fish species occurs in the Ile a la Crosse and Waterhen Management Units. Each of these management units supports more than 20 different species of fish. There is a significant and growing demand for sport fishing in the area. The most popular sport fish are northern pike (Figure 6.2), walleye, perch, burbot and various trout (Figure 6.3) species. Fishing is popular throughout the year (Figure 6.4).

Figure 6.2 Northern pike is a popular sport fish within lakes of the Mistik FMP area

Figure 6.3 Many of the lakes within the FMP area have been stocked with various trout species (splake is shown above)

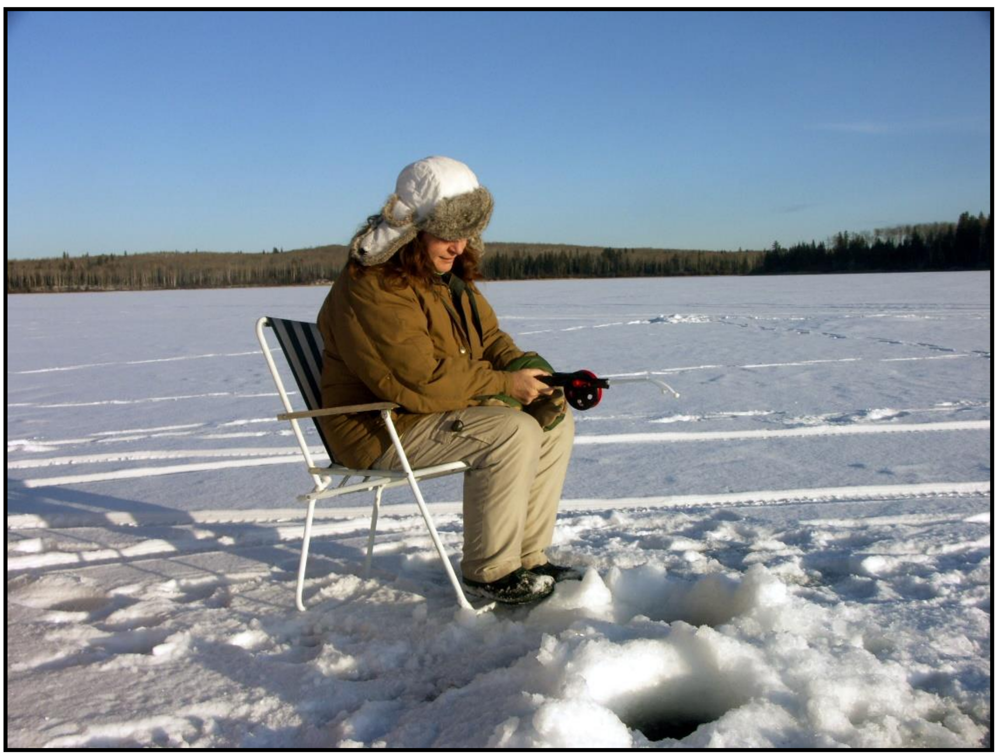


Figure 6.4 Fishing is popular year-round

Whitefish, walleye, pike and mullet (sucker) are the primary fish species commercially fished from the lakes within the Mistik FMP area. Approximately 50% of Saskatchewan's commercial fish harvest is derived from waterbodies within or adjacent to the Mistik FMP area. For the period 1984 to 2014, Dore Lake (on the east boundary of the FMP area) supported the most productive commercial fishery. For the same period, the least productive commercially fished lakes within the FMP area were Dillon and Vermette Lakes (Figure 6.5 and Figure 6.6).

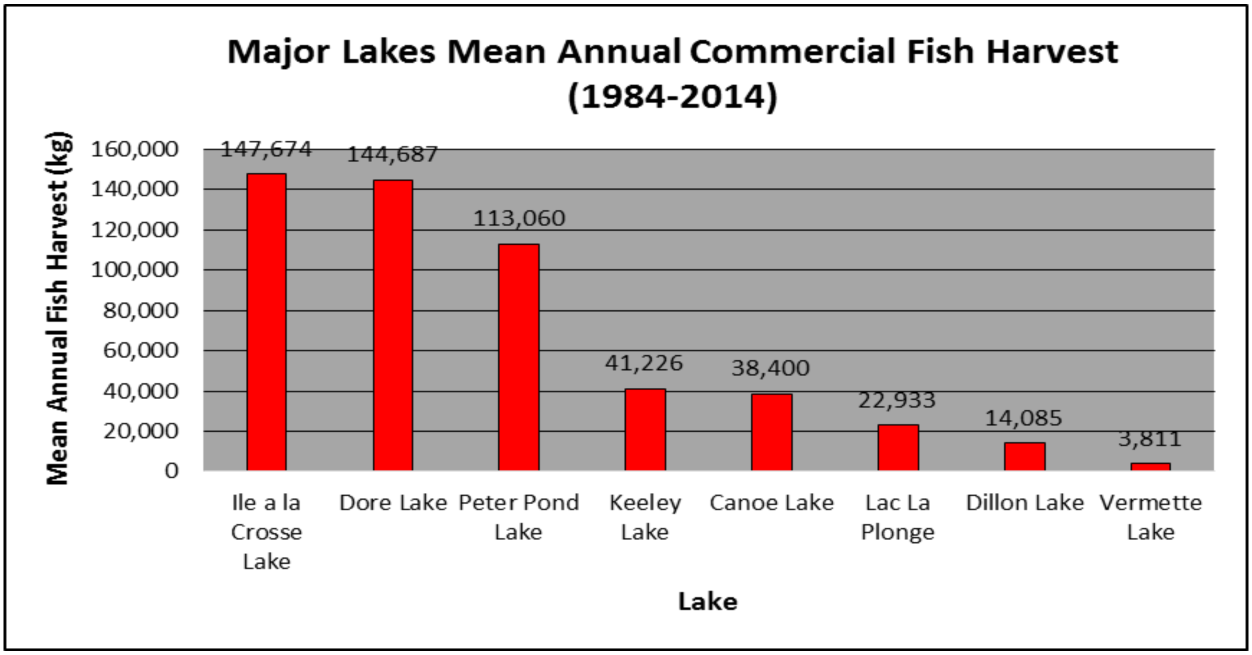


Figure 6.5 Mean annual commercial fish harvest from selected major lakes within the Mistik FMP area from 1984 to 2014.

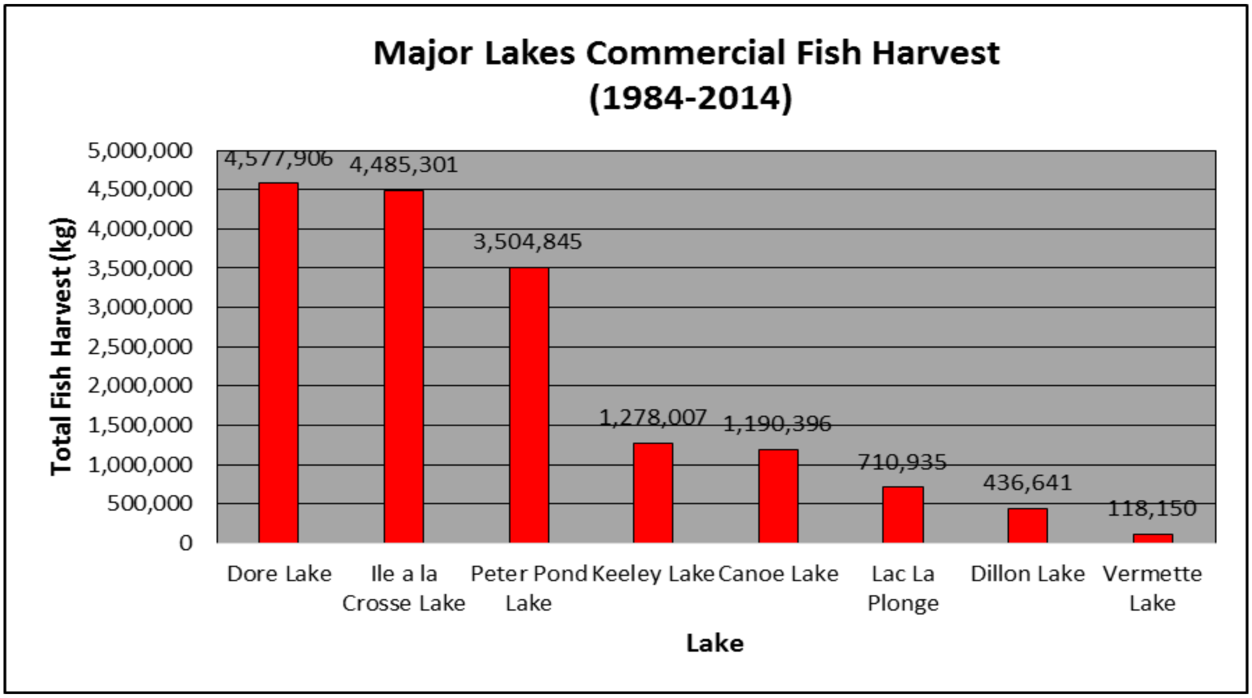


Figure 6.6 Cumulative commercial fish harvest from selected major lakes within the Mistik FMP area from 1984 to 2014.

For the period 1984 to 2014, northern pike was the most common fish caught in the commercial fishery followed by whitefish, walleye and other (mullet, etc.) species (Figure 6.7 and Figure 6.8).

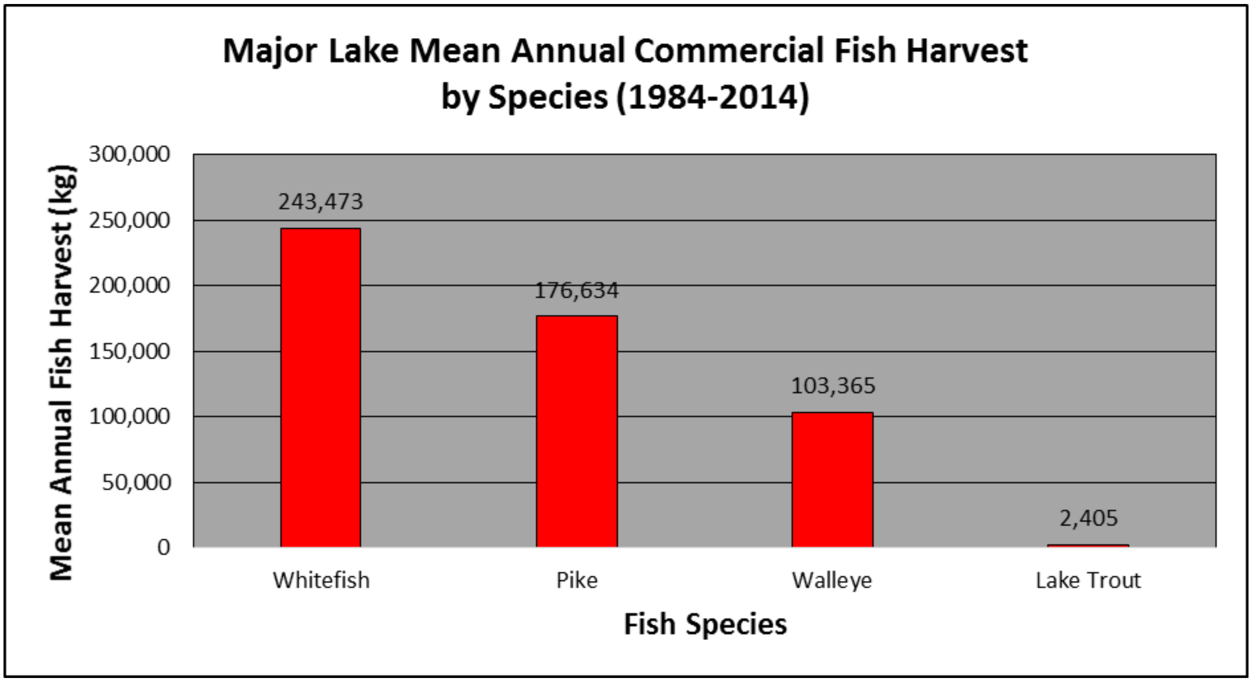


Figure 6.7 Annual average commercial fish harvest by species from selected major lakes within the Mistik FMP area from 1984 to 2014

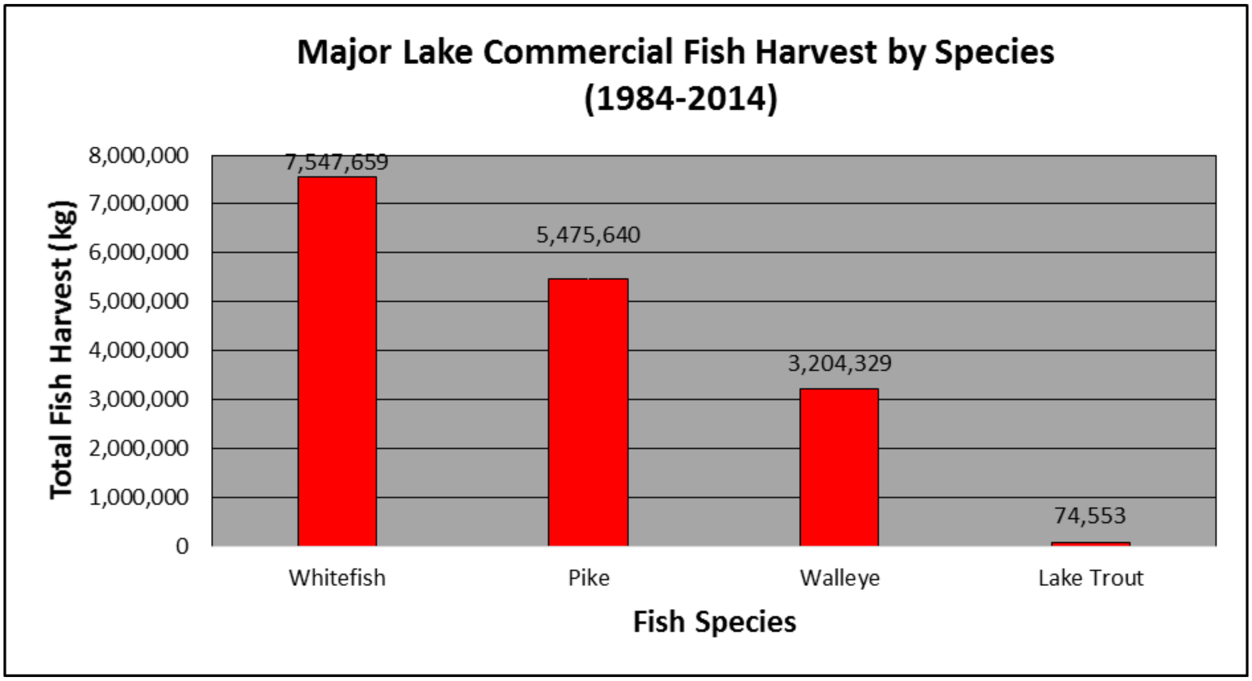


Figure 6.8 Cumulative commercial fish harvest by species from selected major lakes within the Mistik FMP area from 1984 to 2014.

Annual fish harvest related to the commercial fishery has fluctuated significantly over the period 1984 to 2014 (Figure 6.9). The largest fish catch occurred in 1987 when over 700,000 kg of fish were caught. Two years later, in 1992, the least amount of fish was caught (315,000 kg).

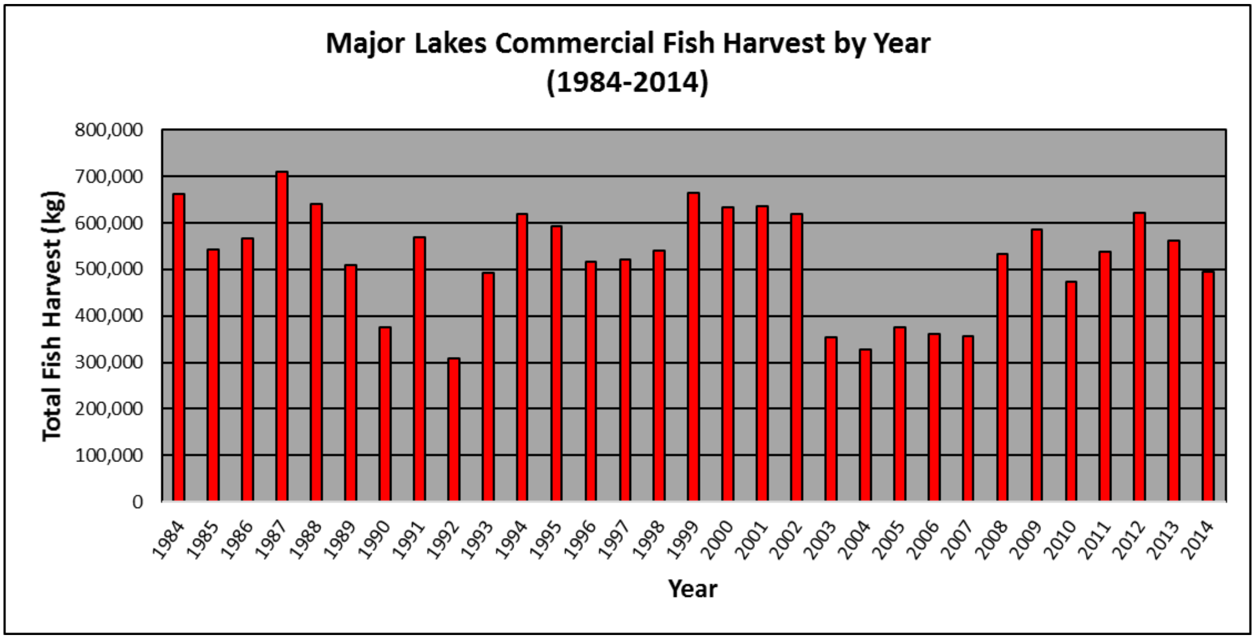


Figure 6.9 Cumulative commercial fish harvest from selected major lakes within the Mistik FMP area from 1984 to 2014.

Saskatchewan Ministry of Environment monitors fish population levels in many of the lakes within the Mistik FMP area and also stocks many lakes in the Mistik FMP area with various sport and commercial fish species on a periodic basis[1].

6.2 WATERFOWL VALUES

Saskatchewan is renowned for its waterfowl populations. Due to the significant area of aquatic and wetland ecosystems within the Mistik FMP area, a high diversity (> 35 species) and number of waterfowl species are found within the limits of the FMP area. Mistik has focused its avian monitoring efforts in the upland portion of the boreal forest where forest harvesting impacts are greatest. Additionally, most of the species of waterfowl are well monitored as part of an international program run by the United States Fish and Wildlife Service in collaboration with Environment Canada. The FMP area supports unique habitat for waterfowl. For example, Kazan Lake supports important breeding and feeding habitat for American white pelicans (Figure 6.10) and Double-crested cormorants (Figure 6.11). There are two well-documented cormorant colonies on the islands in Kazan Lake. Pelicans also nest on these islands. Seasonal sport hunting of waterfowl is a popular pastime within and adjacent to the Mistik FMP area. Common aquatic avian species include Common Loon, Pied-billed Grebe, American White Pelican (Figure 6.10), Great blue heron, Double-crested cormorants (Figure 6.11), Bufflehead, Common goldeneye and Ring-necked duck (Figure 6.12).

Seasonal sport hunting of waterfowl is a popular pastime within and adjacent to the Mistik FMP area.

---

[1] Information on stocking levels in Saskatchewan lakes can be found at
http://www.environment.gov.sk.ca/Default.aspx?DN=14803e3a-079e-42cd-930c-b808398e4a2a

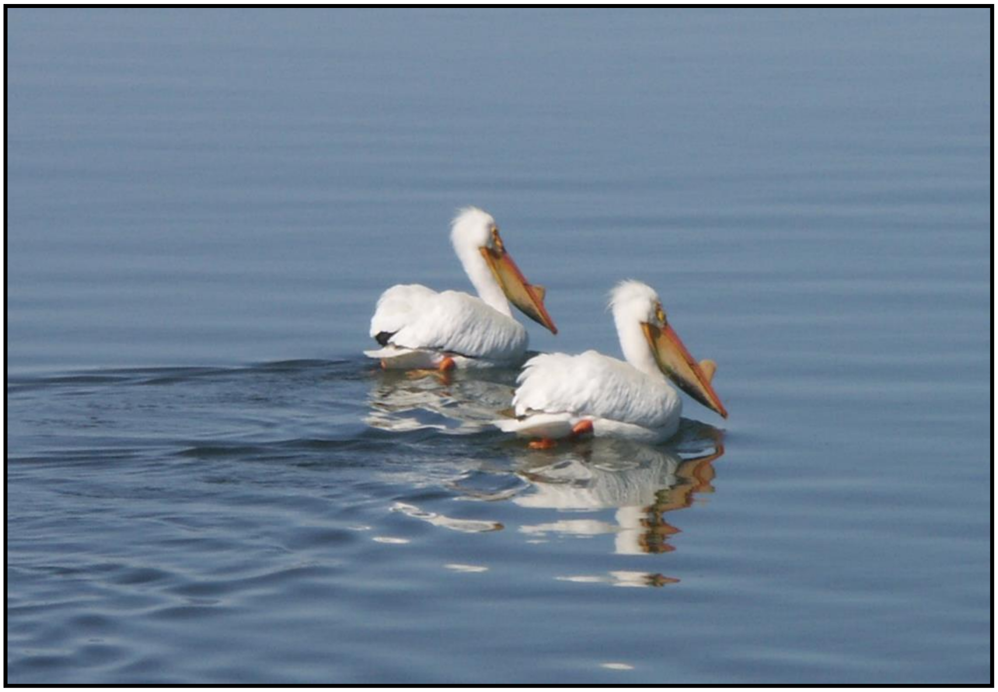


Figure 6.10 American white pelicans on the Waterhen River

Figure 6.11 Double-crested cormorants on Flotten Lake

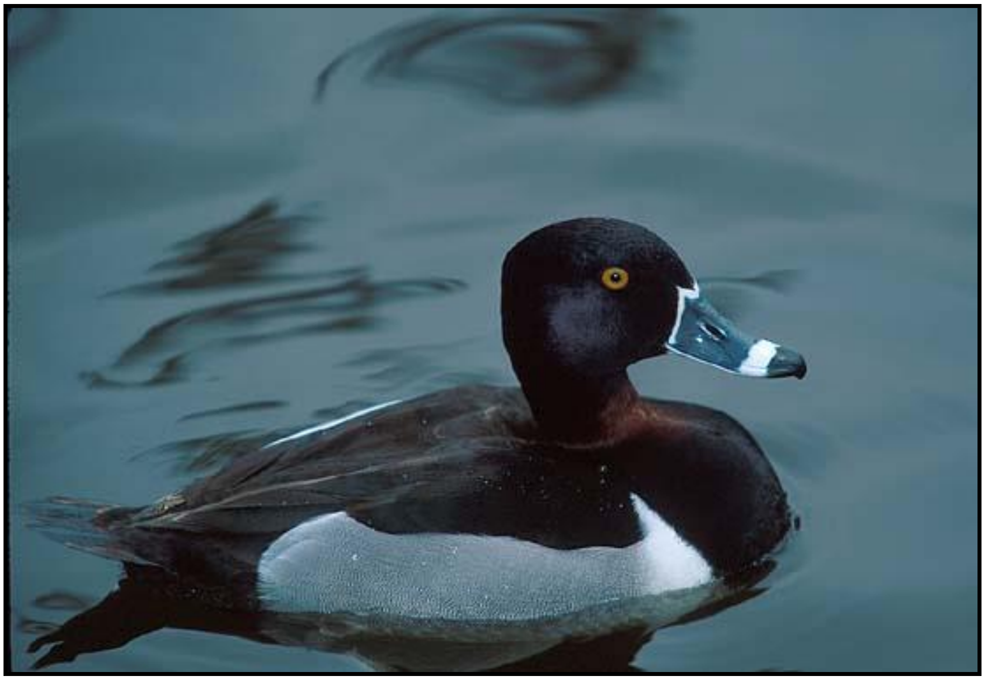


Figure 6.12 Ring-necked ducks are commonly seen waterfowl within the Mistik FMP area

6.3 WILD RICE VALUES

Wild rice harvesting has developed into one of the most important aquatic-related non-timber products in the Mistik FMP area (Figure 6.13 and Figure 6.14). A significant number of the small lakes and waterways throughout the FMP area are actively seeded and harvested on an annual basis. Good access to wild rice lakes is an important aspect for wild rice growers. Mistik has coordinated a limited amount of timber harvesting activity and road access adjacent to some lakes to facilitate wild rice seeding and harvesting activities undertaken by local people. Some examples are Parker Lake, Shallow Lake and Minnow Lake plus smaller unnamed waterbodies. The western wild rice producing region of Saskatchewan corresponds closely with the Mistik FMP area. Wild rice production from the Western Region area has accounted for 38% of the total annual harvest in Saskatchewan. Saskatchewan produces a significant amount of the total wild rice production in Canada.

Figure 6.13 Wild rice harvesting is a relatively low-capital cost activity

Figure 6.14 A typical crop of wild rice during the growing season

6.4 DRINKING WATER VALUES

The water, in many of the waterbodies and waterways, within the Mistik FMP area is regularly used for human consumption. A known source of potable water used frequently by local Beauval community residents is at the outflow point (weir location) of Lac La Plonge (Figure 6.15). Mistik was involved with upgrading the old bridge site in 2001 (Figure 6.16). Local residents expressed their concern that the access to the waterway and that local water quality be maintained. When upgrading the La Plonge River crossing, Mistik attempted to maintain and facilitate continued easy access to clean, potable water for the local residents (Figure 6.17).

Figure 6.15 Lac La Plonge weir site

Figure 6.16 Old crossing site and access to drinking water on the La Plonge River

Figure 6.17 Mistik undertook measures to maintain the quality of the local water supply and to maintain continued access to the existing access point on the La Plonge River

6.5 AQUATIC RECREATION AND SCENIC VALUES

Aquatic recreation opportunities abound in the Mistik FMP area. Besides angling, popular recreational activities include kayaking, canoeing, motorboating, sailing, water sports, swimming and scenic (aesthetic) / nature appreciation (Figure 6.18 to Figure 6.21).

Figure 6.18 Kayaking is becoming a popular mode of accessing lakes within the FMP area and adjacent parks

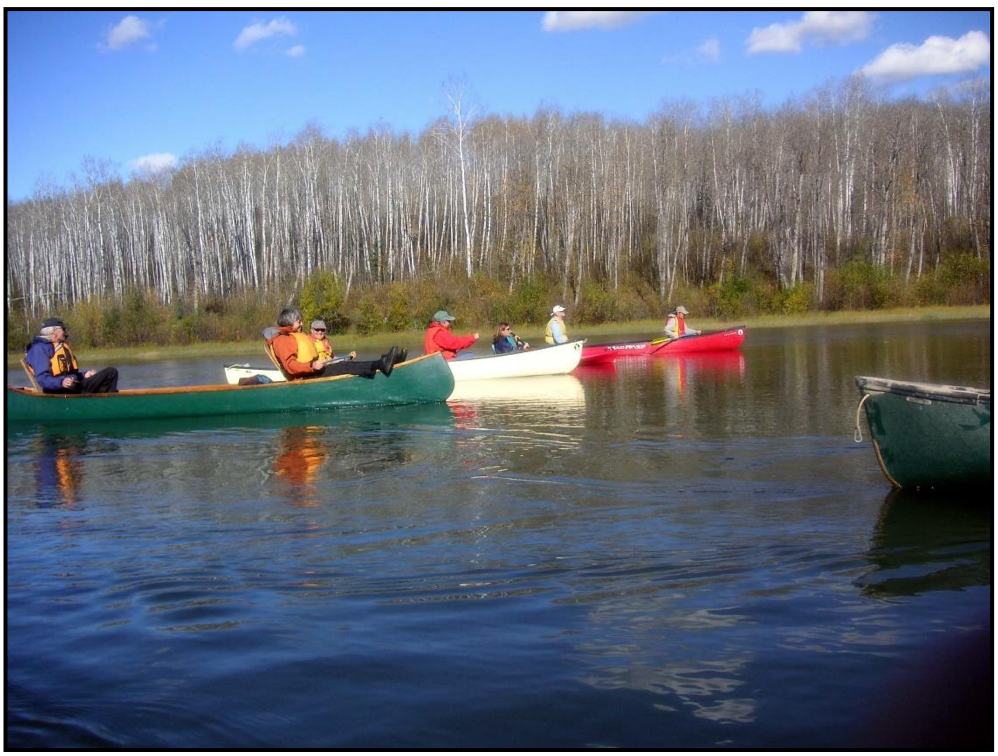


Figure 6.19 Canoeing on the Waterhen River

Figure 6.20 For the angler, a small motorized fishing boat is the preferred mode of accessing the best fishing locations on lakes within the FMP area and adjacent parks

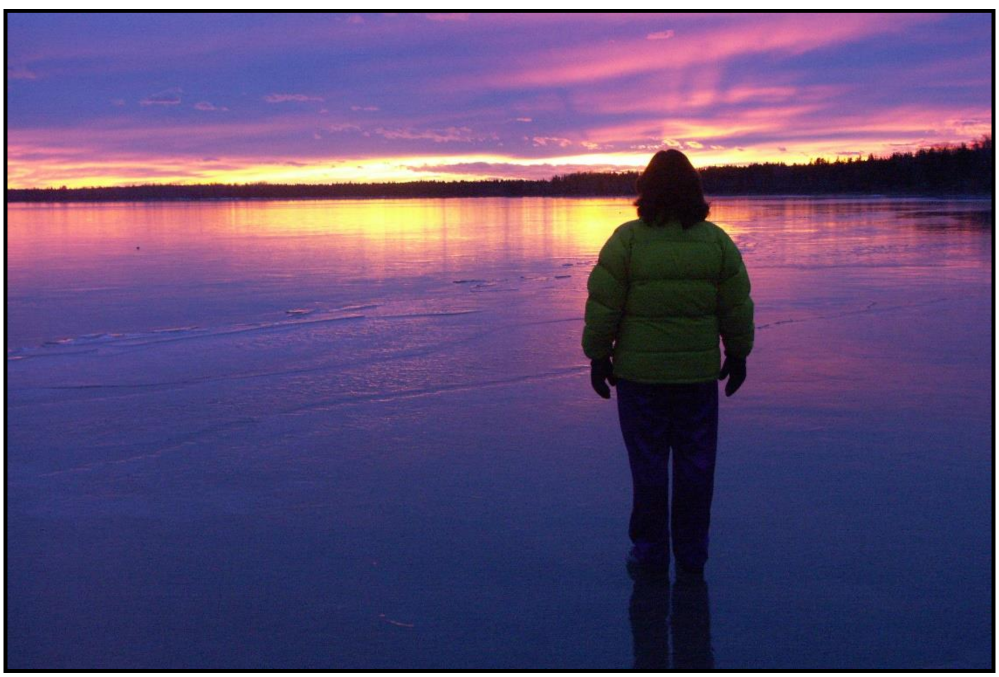


Figure 6.21 The aquatic-related scenic values within the FMP area and adjacent parks are unparalleled

6.6 WILDLIFE AND HUNTING VALUES

Wildlife is abundant within the Mistik FMP area. The most common large mammals within the FMP area include white-tailed deer, moose and lesser numbers of elk and woodland caribou. Saskatchewan Ministry of Environment undertakes periodic surveys of population trends for select wildlife. The population surveys are undertaken within the context of the provincial Wildlife Management Zones (WMZs) (Map 12 – Wildlife Management Zones, Appendix E). The provincial WMZ boundaries do not correlate well with the boundaries of the Mistik FMP area. However, WMZs 66, 67, 69 and 73 all overlap with the Mistik FMP area to some extent. For the purposes of summarizing wildlife population data Mistik has focused on data pertaining to WMZs 67, 69 and 73 (refer to Map 12 – Wildlife Management Zones in Appendix E).

Hunting (including subsistence, recreational and guided outfitting) is a major forest use activity within the Mistik FMP area. There are approximately 70 white-tailed deer outfitting licenses (Map 13 – Deer Outfitting Areas, Appendix E) and approximately 55 bear outfitting licenses (Map 14 – Bear Outfitting Areas, Appendix E) allocated within the Mistik FMP area. The most commonly hunted large mammals within the Mistik FMP area include white-tailed deer, moose and lesser numbers of bear, elk and woodland caribou. Woodland caribou are no longer hunted by sport hunters in Saskatchewan, although there exists an Aboriginal right to hunt woodland caribou for subsistence purposes. Where possible, Saskatchewan Ministry of Environment maintains detailed annual reports of hunting statistics for select wildlife species. The hunting statistics are summarized within the context of the provincial Wildlife Management Zones (WMZs). There are a significant number of ungulates harvested each year by individuals exercising their Aboriginal rights to hunt for traditional and subsistence use purposes. The harvest data for the various species described below do not reflect harvesting associated with traditional or subsistence use purposes. The actual total harvest number for each wildlife species shown below is significantly higher than indicated in the following documentation due to unregulated hunting by Aboriginal people[2].

6.6.1 WHITE-TAILED DEER

White-tailed deer Figure 6.22 are abundant in the Mistik FMP area. Survey data, shown in Figure 6.23 and Figure 6.24, show a strongly increasing population trend for white-tailed deer in the Divide and Waterhen Deer Management Units (DMUs). The current white-tailed deer population in both DMUs exceeds the target population objective established by Saskatchewan Ministry of Environment. Surveys post 2005 were not available.

[2] Personal communication with Rhys Beaulieu in 2006, Regional Wildlife Biologist (Meadow Lake), Saskatchewan Environment.

Figure 6.22 White-tailed deer in recently harvested area within the Mistik FMP area

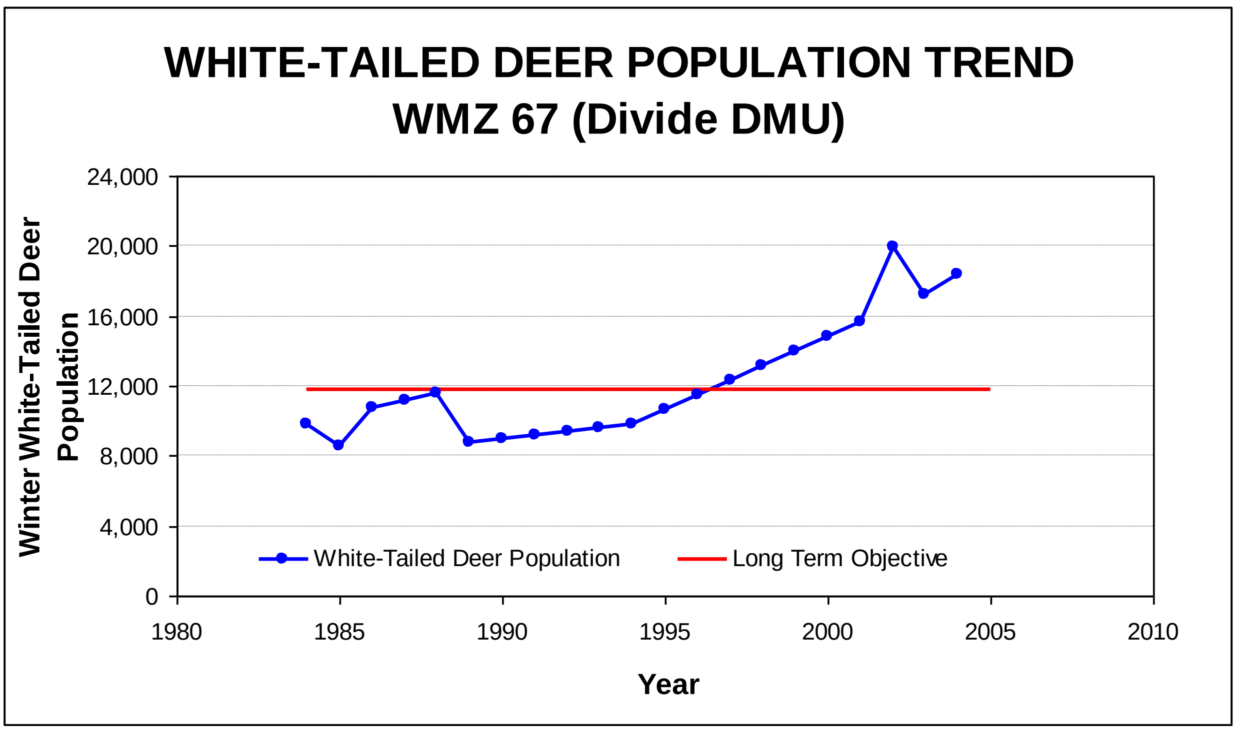


Figure 6.23 White-tailed deer population trend for the Divide DMU.

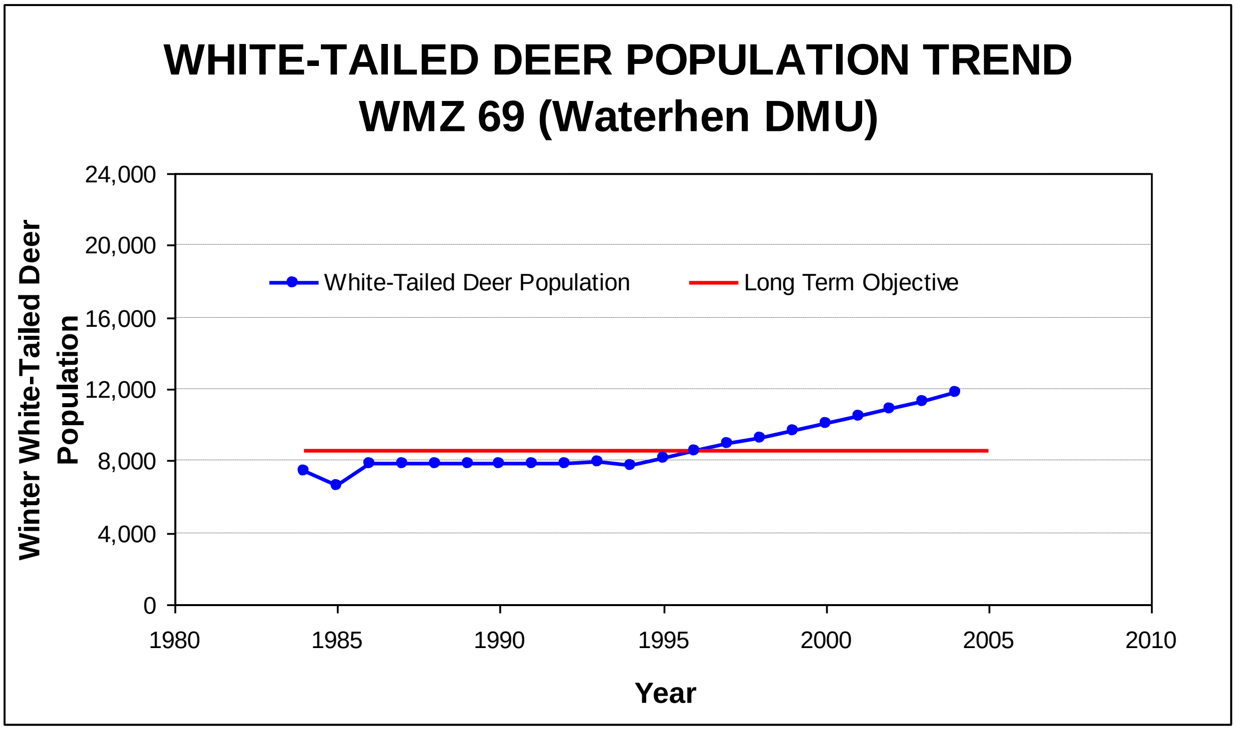


Figure 6.24 White-tailed deer population trend for the Waterhen DMU

Because the white-tailed deer populations are above the longer term population objective mean, regulated hunting (Figure 6.25) of white-tailed deer has been allowed to increase in recent years. Harvest data, shown in Figure 6.26, show a gradually increasing harvest trend for white-tailed deer in WMZs 67, 69 and 73. Two-thirds of the total white-tailed deer harvest (Figure 6.27), in the WMZs indicated, has occurred in WMZ 67. Guided non-resident hunters have accounted for over 50% of the total white-tailed deer harvest since 1993.

Figure 6.25 White-tailed deer hunting is a popular annual fall activity for resident hunters

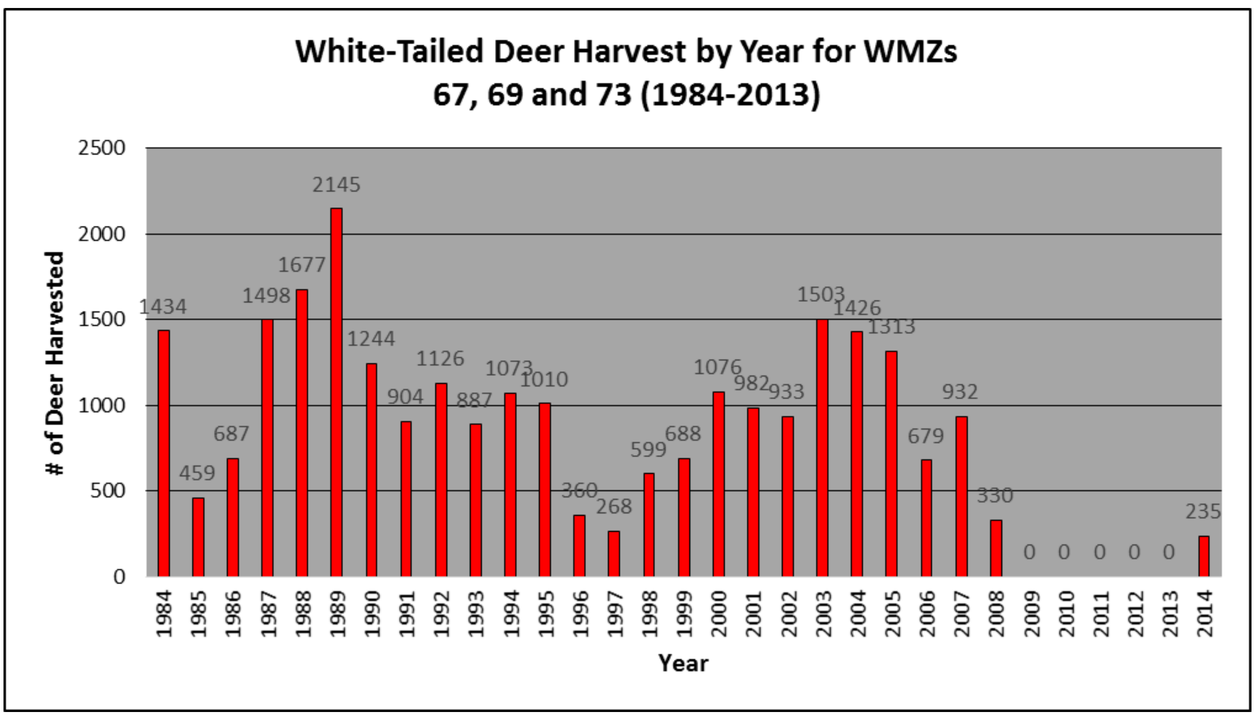


Figure 6.26 Total white-tailed deer harvest by year for WMZs 67, 69 and 73 (zero value indicates no data was available from MoE for that year))

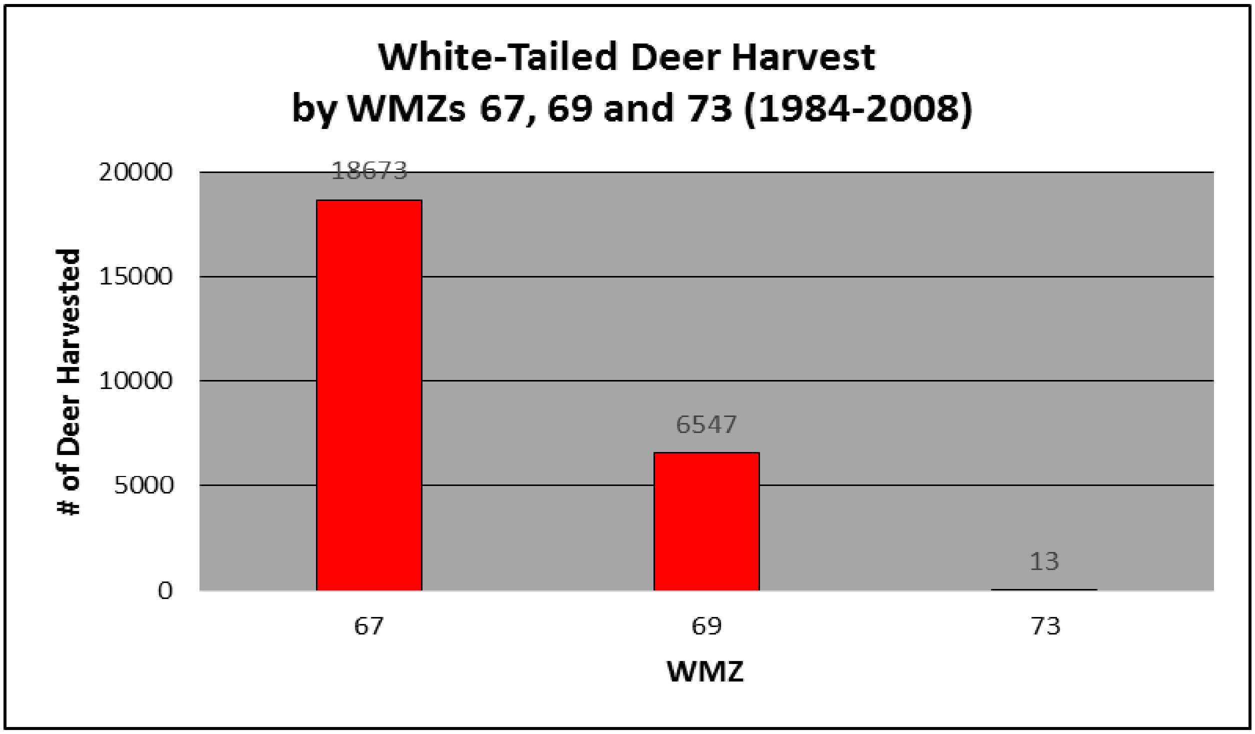


Figure 6.27 White-tailed deer harvest by WMZ for the period 1984 to 2008

6.6.2 MOOSE

Survey data, shown in Figure 6.28 to Figure 6.30, show a slightly increasing population trend for moose in the Divide, Meadow Lake/Cold Lake Air Weapons Range (CLAWR) and Churchill Moose Management Units (MMUs). The current moose (Figure 6.31) population in all MMUs, are either at or, exceed the target population objective established by Saskatchewan Ministry of Environment for each MMU. Surveys were not available post 2005.

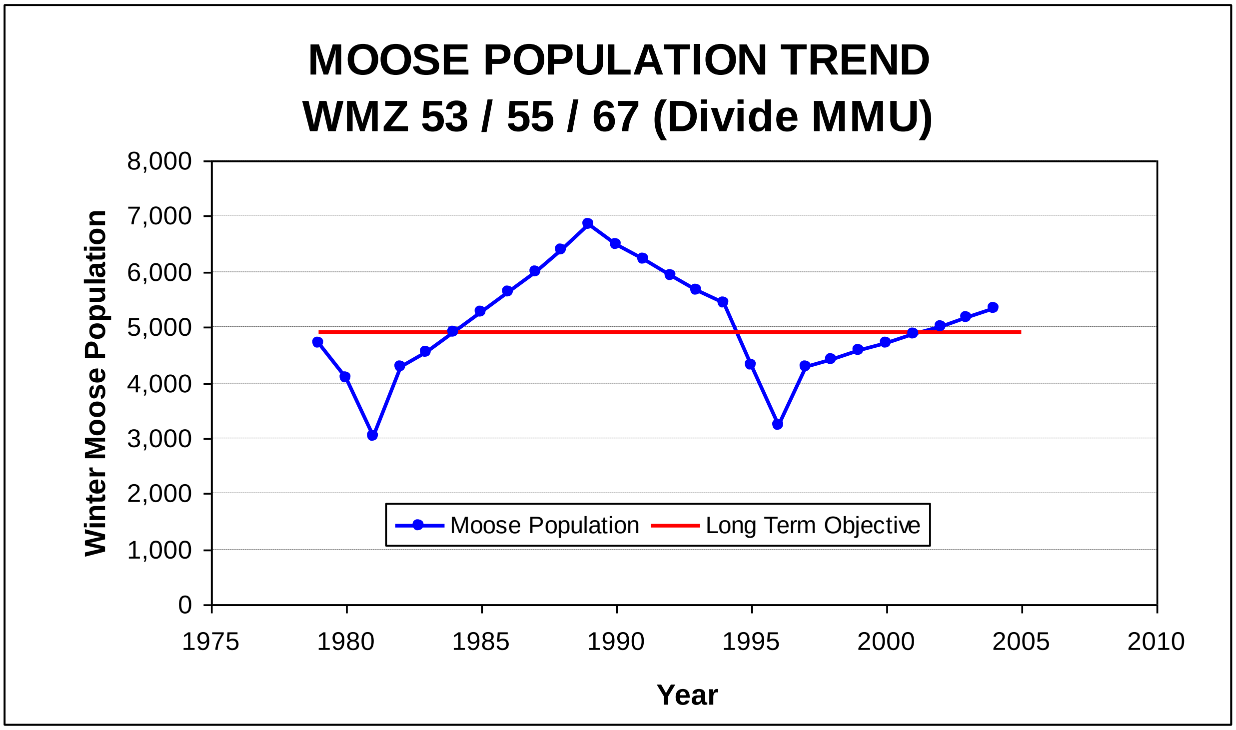


Figure 6.28 Moose population trend for the Divide MMU

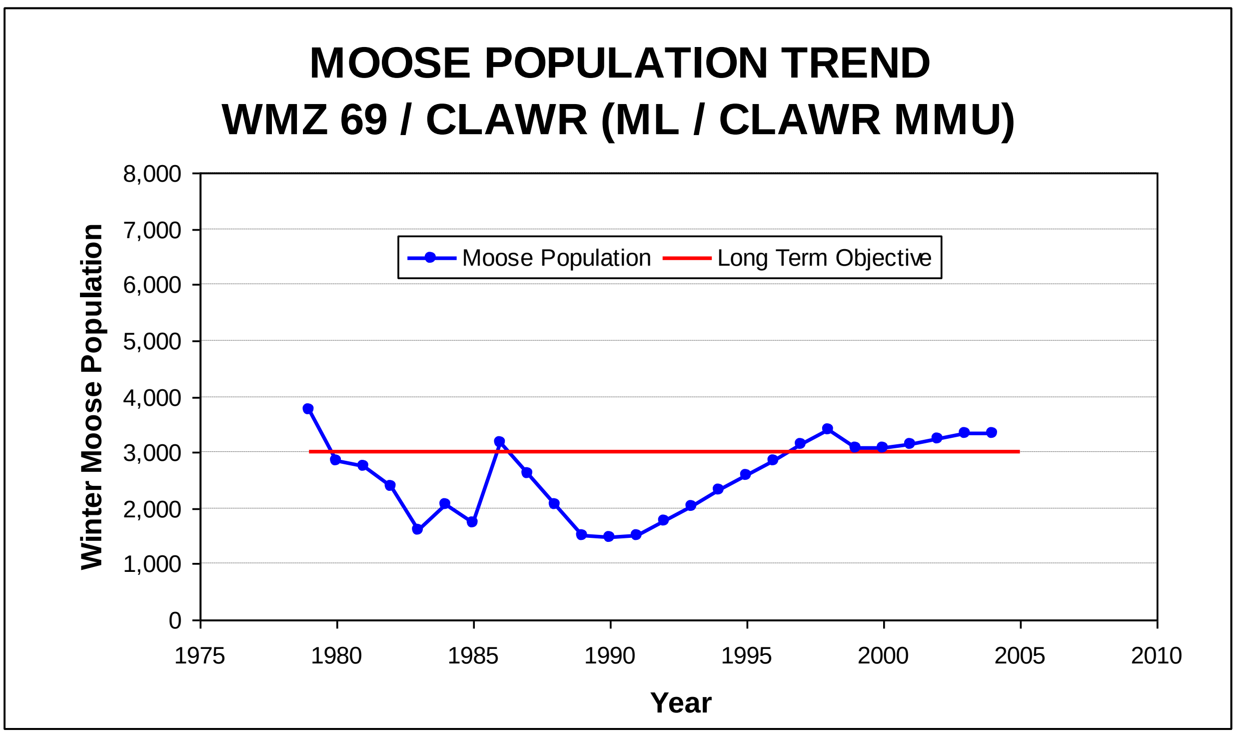


Figure 6.29 Moose population trend for the Meadow Lake / Cold Lake Air Weapons Range MMU

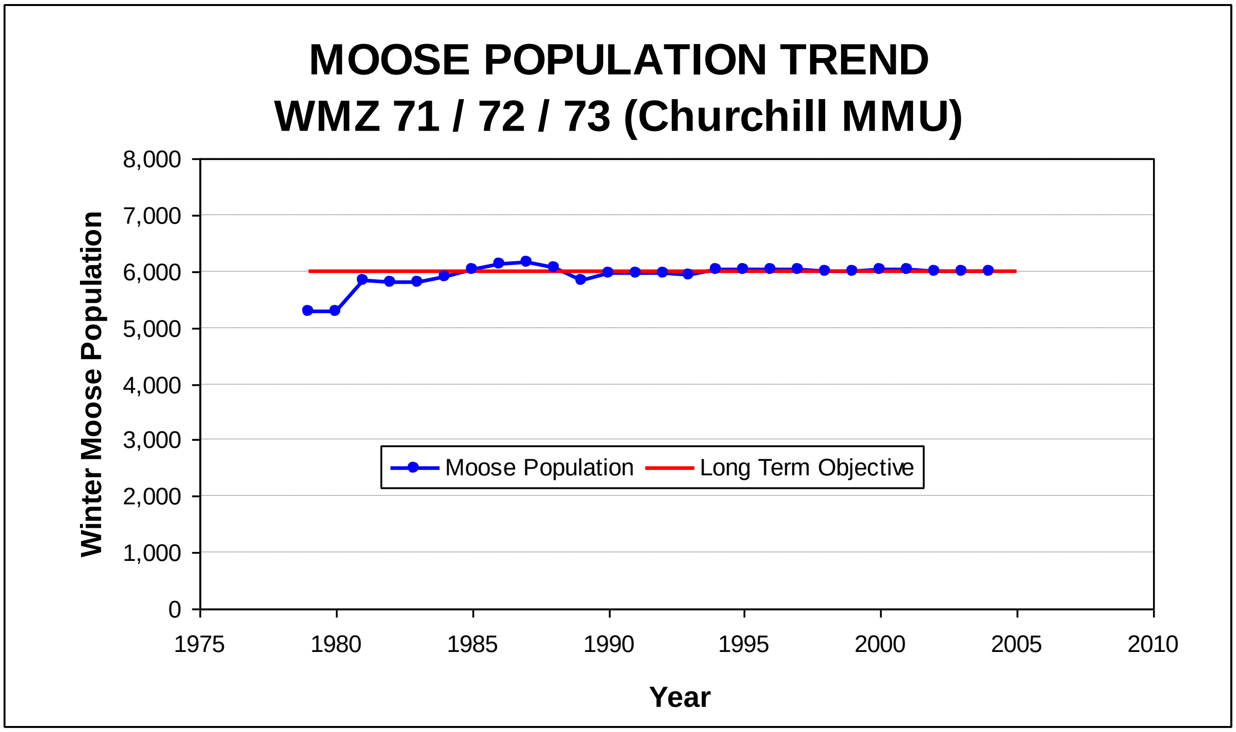


Figure 6.30 Moose population trend for the Churchill MMU

Figure 6.31 Moose are the largest ungulates in the Mistik FMP area

Moose are highly sought after as a sport hunting and subsistence game mammal (Figure 6.32). Moose harvest data (Figure 6.33) show periodic low harvest values and periodic higher harvest values on an approximately seven-year cycle for moose in WMZs 53, 55, 67, 69, 71, 72, 73 and the Cold Lake Air Weapons Range. Three-quarters of the total moose harvest (Figure 6.34), in the identified WMZs, has occurred in WMZs 53, 55 and 67.

Figure 6.32 Moose is highly sought after as a game animal within the Mistik FMP area

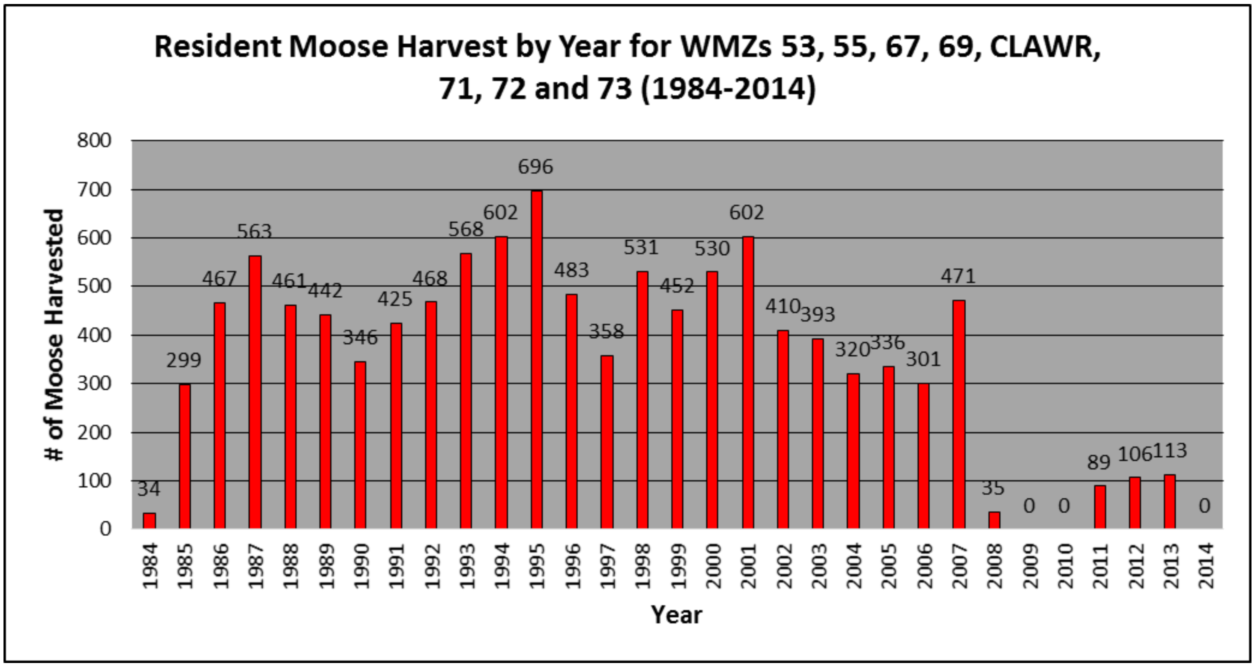


Figure 6.33 Total moose harvest by year for WMZs 53, 55, 67, 69, CLAWR, 71, 72, and 73 (zero value indicates no data was available from MoE for that year))

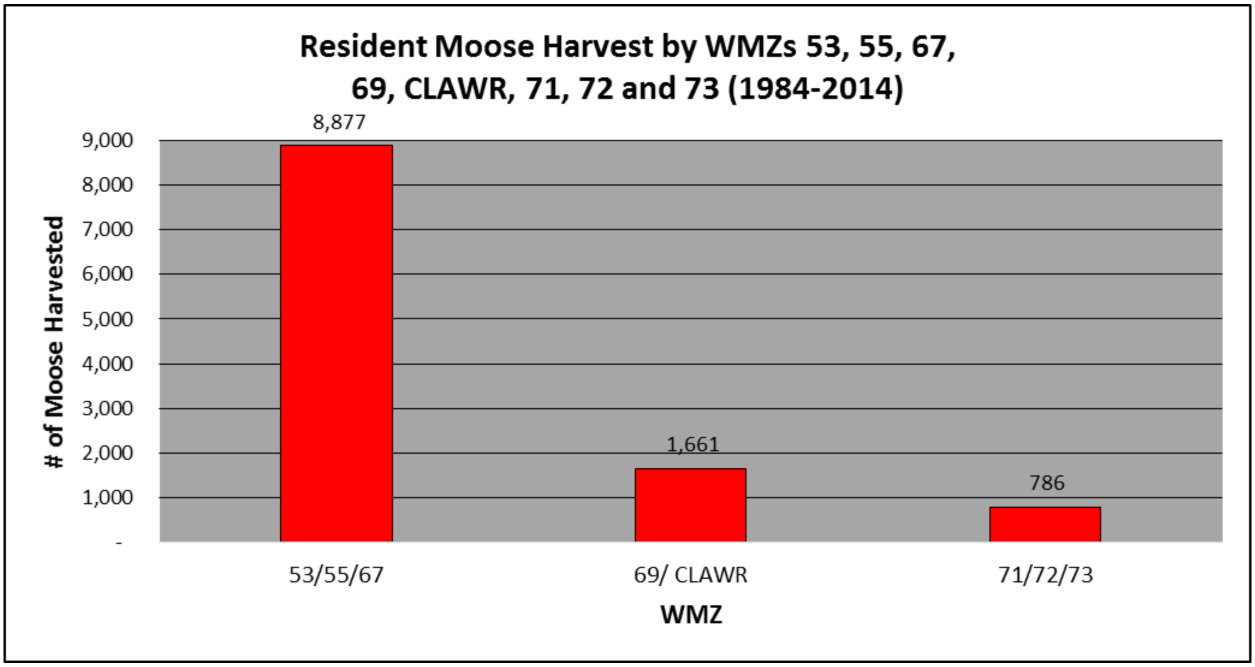


Figure 6.34 Moose harvest by WMZ for the period 1984 to 2014.

6.6.3 ELK

Survey data, shown in Figure 6.35 and Figure 6.36, show a sharply increasing population trend for elk (Figure 6.37) in the Bronson/Divide and Flotten Lake Elk Management Units (EMUs). However, the current elk populations in both EMUs do not meet the target population objectives established by Saskatchewan Ministry of Environment for each EMU. Surveys were not available post 2005.

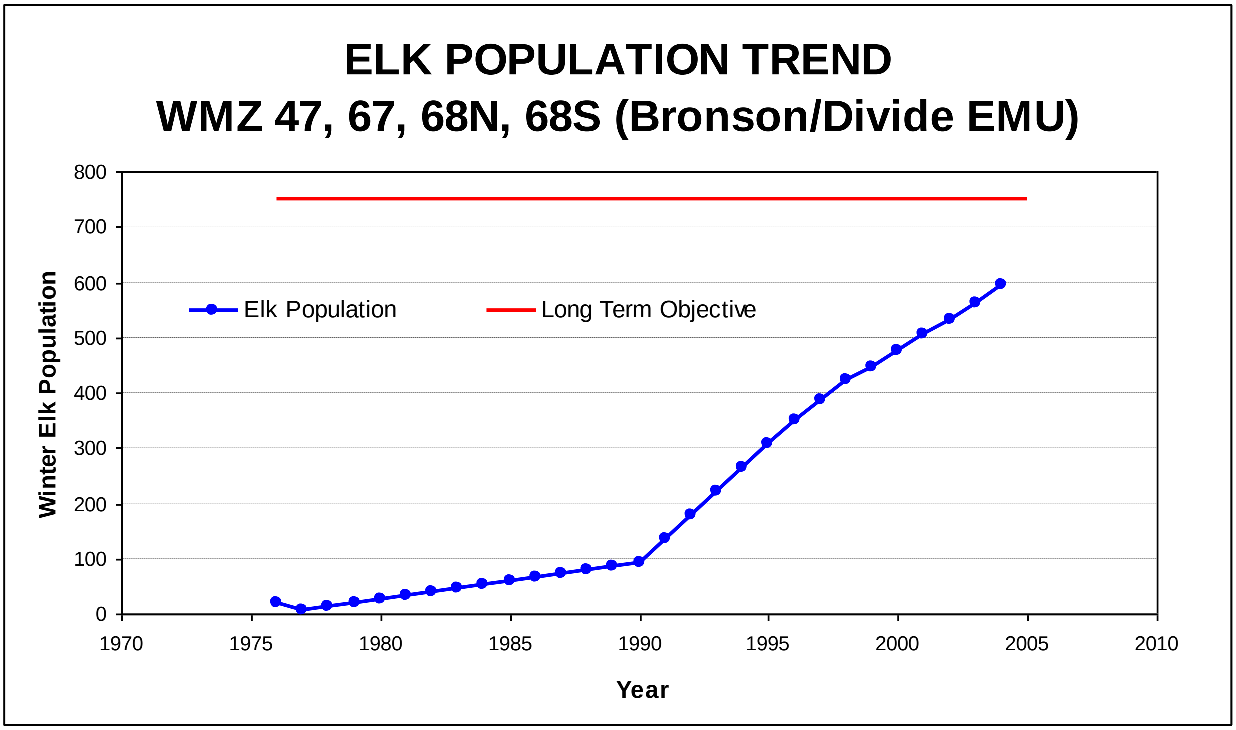


Figure 6.35 Elk population trend for the Bronson/Divide EMU

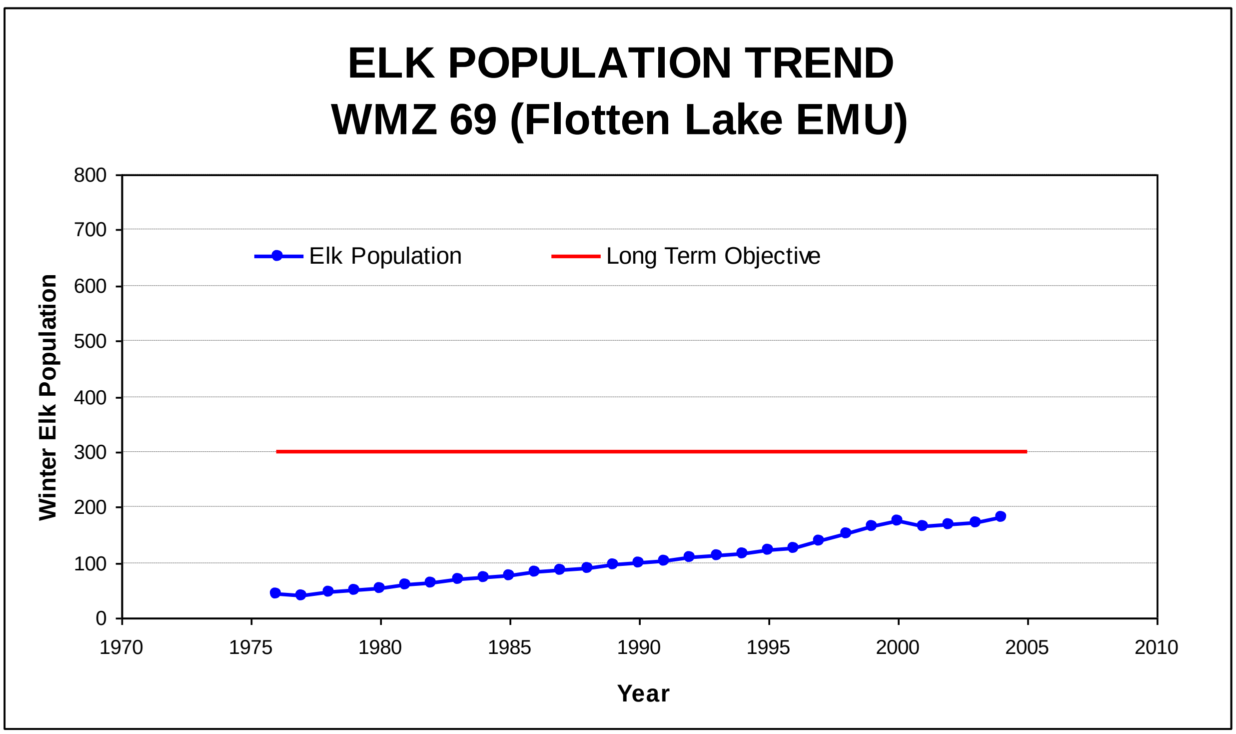


Figure 6.36 Elk population trend for the Flotten Lake EMU

Figure 6.37 Elk comprise a small portion of the ungulate population within the Mistik FMP area

Elk harvest data, shown in Figure 6.38 and Figure 6.39, show a decreasing elk harvest trend in WMZs 47, 67, 68S, 68N and 69. Two-thirds of the total elk harvest, in the identified WMZs, has occurred in WMZs 47, 67, 68S and 68N.

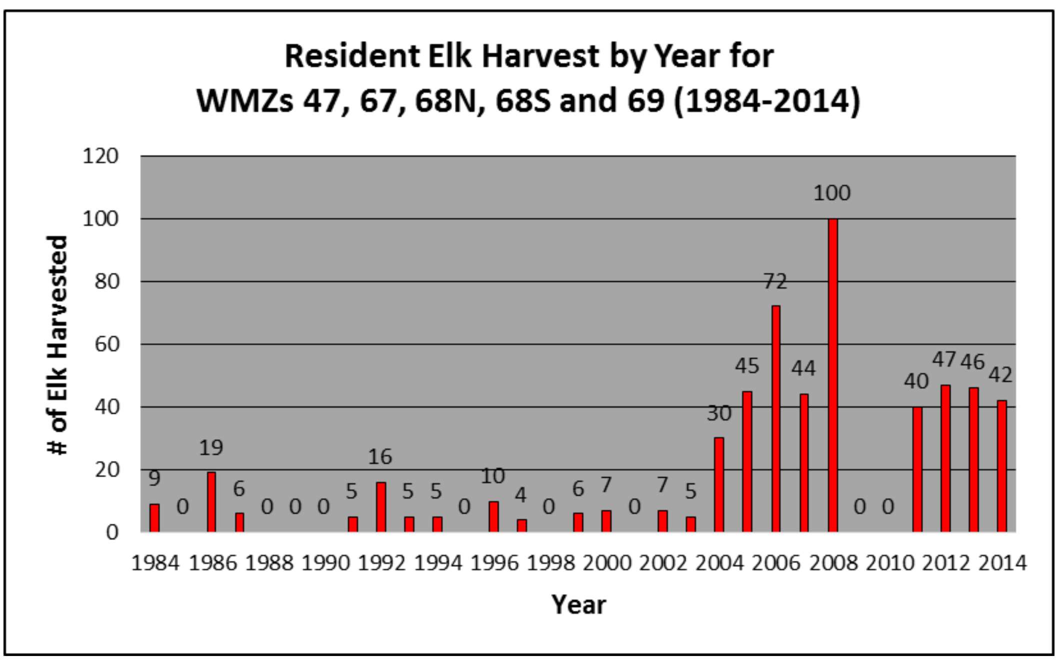


Figure 6.38 Total elk harvest by year for WMZs 47, 67, 68N, 68S, and 69 (zero value indicates no data was available from MoE for that year))

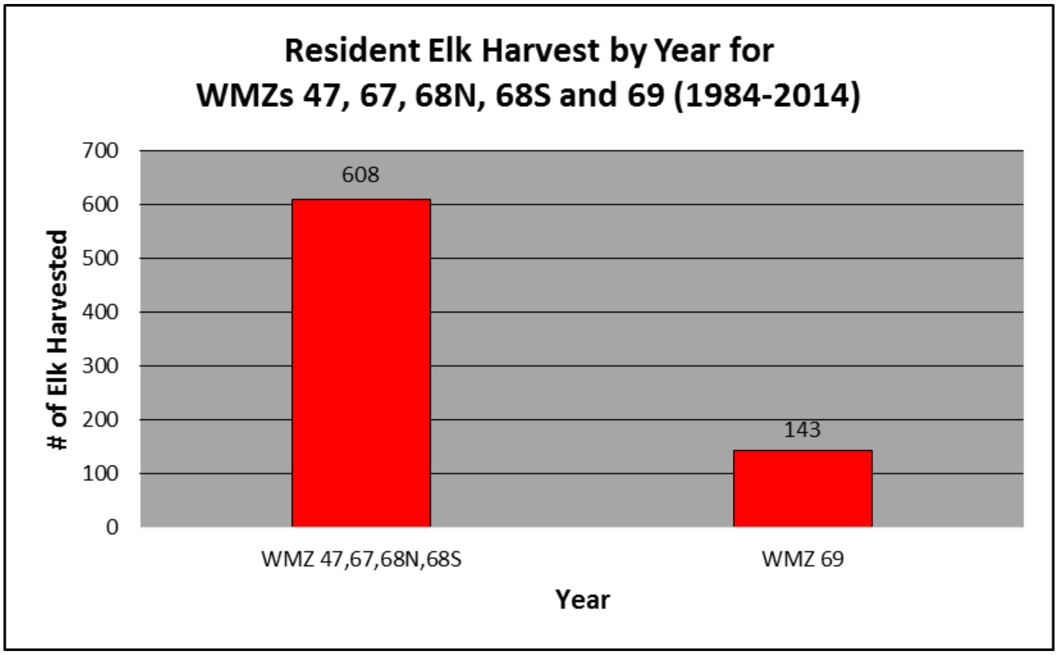


Figure 6.39 Elk harvest by WMZ for the period 1984 to 2014.

6.6.4 BLACK BEAR

Healthy populations of black bear (Figure 6.40) occur throughout the FMP area. There is no provincial dataset available pertaining to black bear population statistics. Saskatchewan Ministry of Environment does not conduct formal population surveys for black bear.

Figure 6.40 Black bear are widespread throughout the FMP area

Black bear harvest data, shown in Figure 6.41 and Figure 6.42, show a relatively static black bear harvest trend in WMZs 67, 69 and 73. The black bear harvest is relatively equally distributed among WMZs 67, 69 and 73. Most of the black bears are harvested by non-residents. It should be noted that there were no surveys completed post 2008.

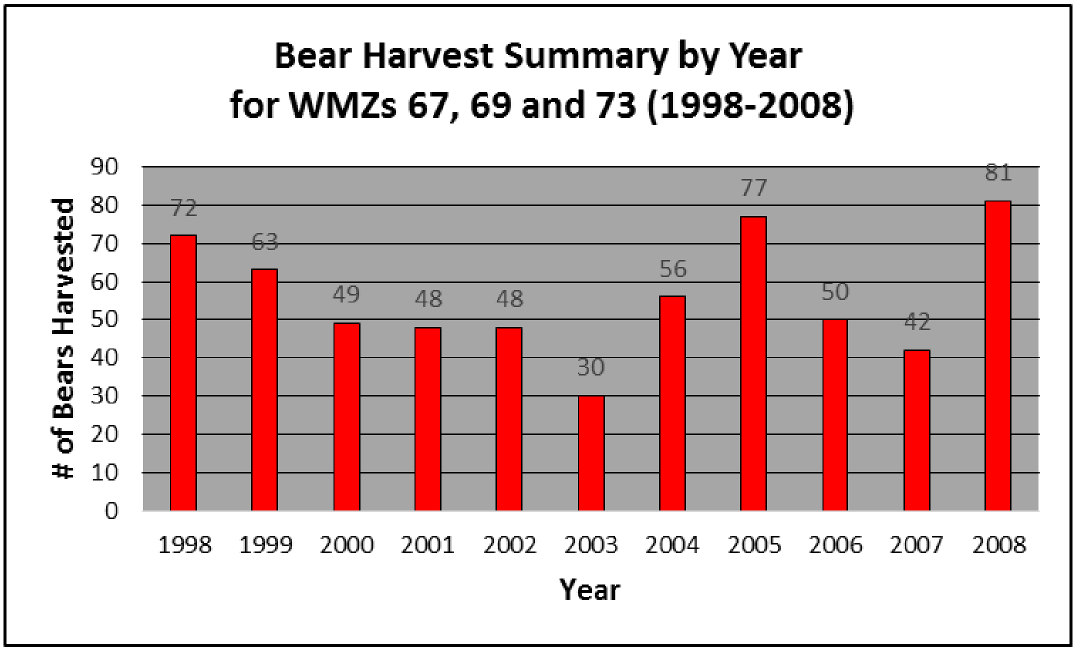


Figure 6.41 Total black bear harvest by year for WMZs 67, 69, and 73

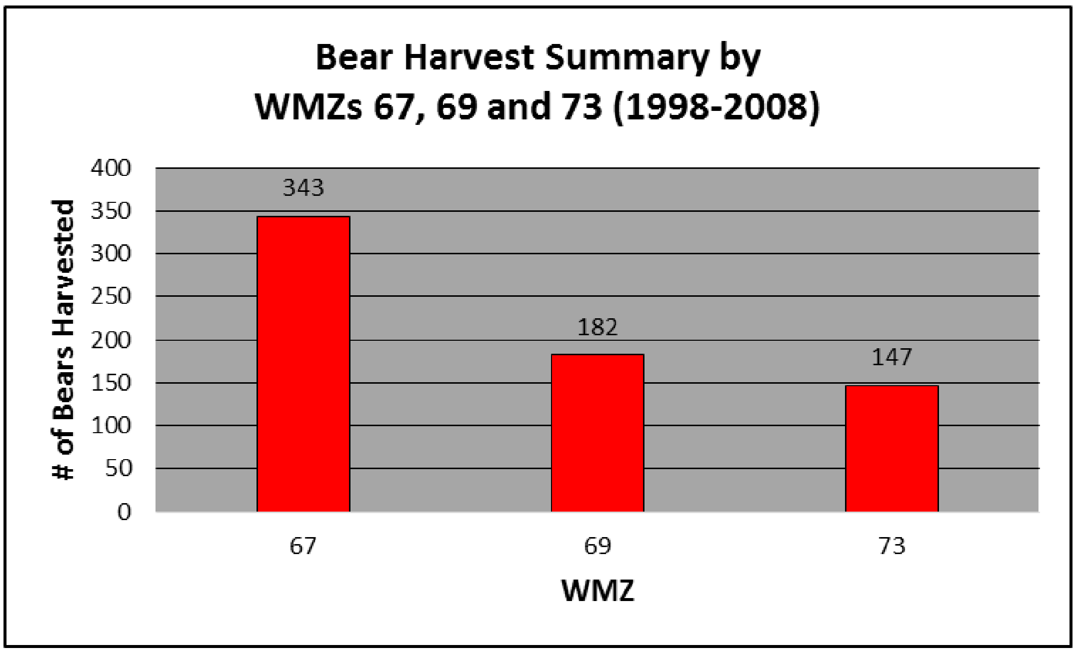


Figure 6.42 Black bear harvest by WMZ for the period 1998 to 2008.

6.7 FURBEARING MAMMALS AND TRAPPING VALUES

Common furbearers (Figure 6.43) within the FMP area include muskrat, beaver, otter, mink, wolf, red squirrel, snowshoe hare, weasel, mink, marten, fisher, red fox, coyotes and lynx. Wolverine and badger are known to occur in the FMP area but in very low densities.

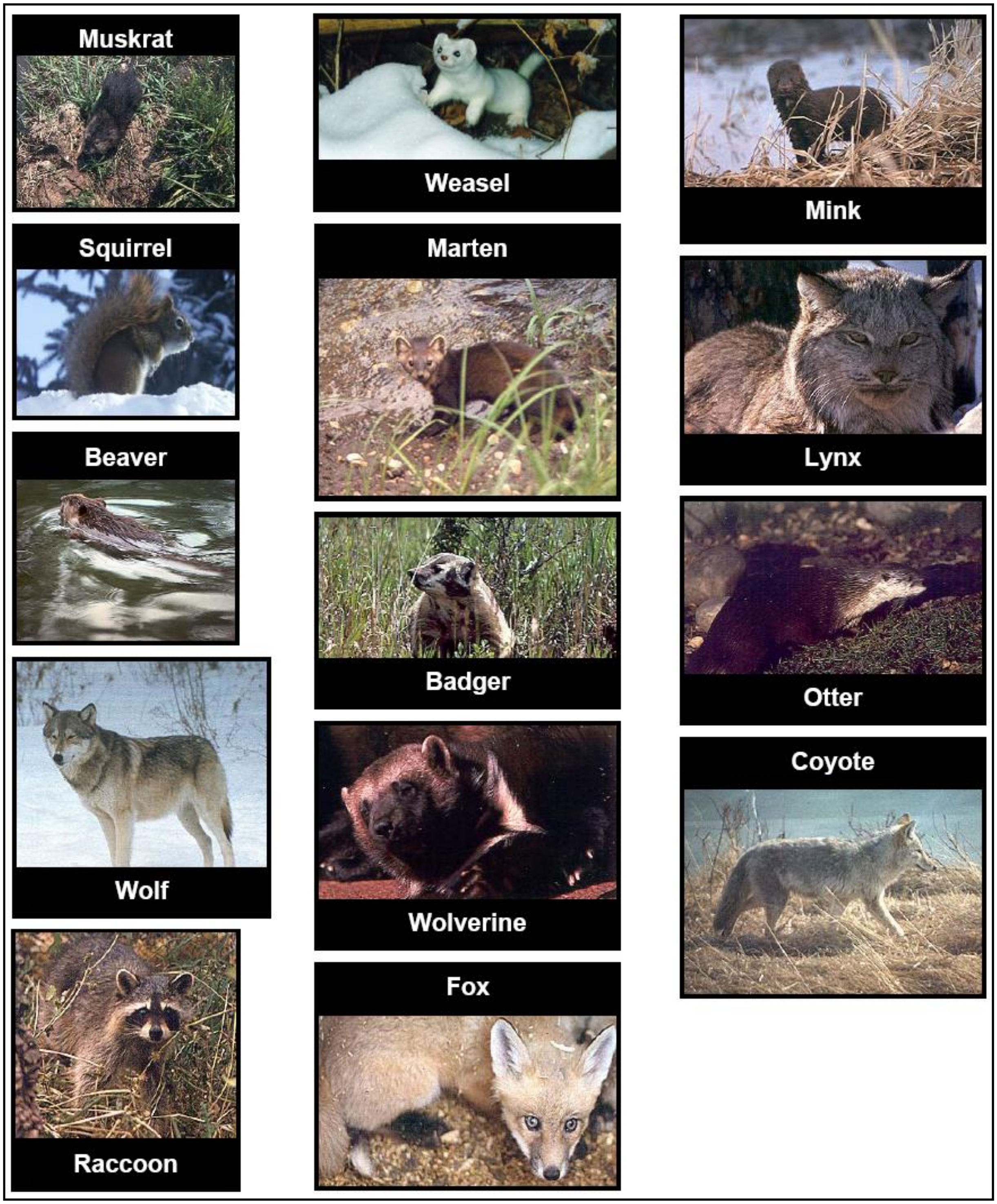


Figure 6.43 Furbearing mammals occurring within the Mistik FMP area

Trapping is conducted as a traditional use, recreational and semi-industrial forest use activity and is widespread throughout the Mistik FMP area (Figure 6.44 and Figure 6.45).

Figure 6.44 Trapping is a widespread activity within the Mistik FMP area

Figure 6.45 Coyote furs harvested from the Mistik FMP area

In the province, trapping is conducted within the context of Fur Conservation Areas (FCAs) (Map 15 – Fur Conservation Areas, Appendix E) established in 1946. The smallest FCAs are Turtle Lake (M-055), Brightsand (M-056) and Neeb (M-058) (Figure 6.46). The largest FCAs are Dillon (N-021), Canoe Lake (N-013) and Ile a la Crosse (N-014).

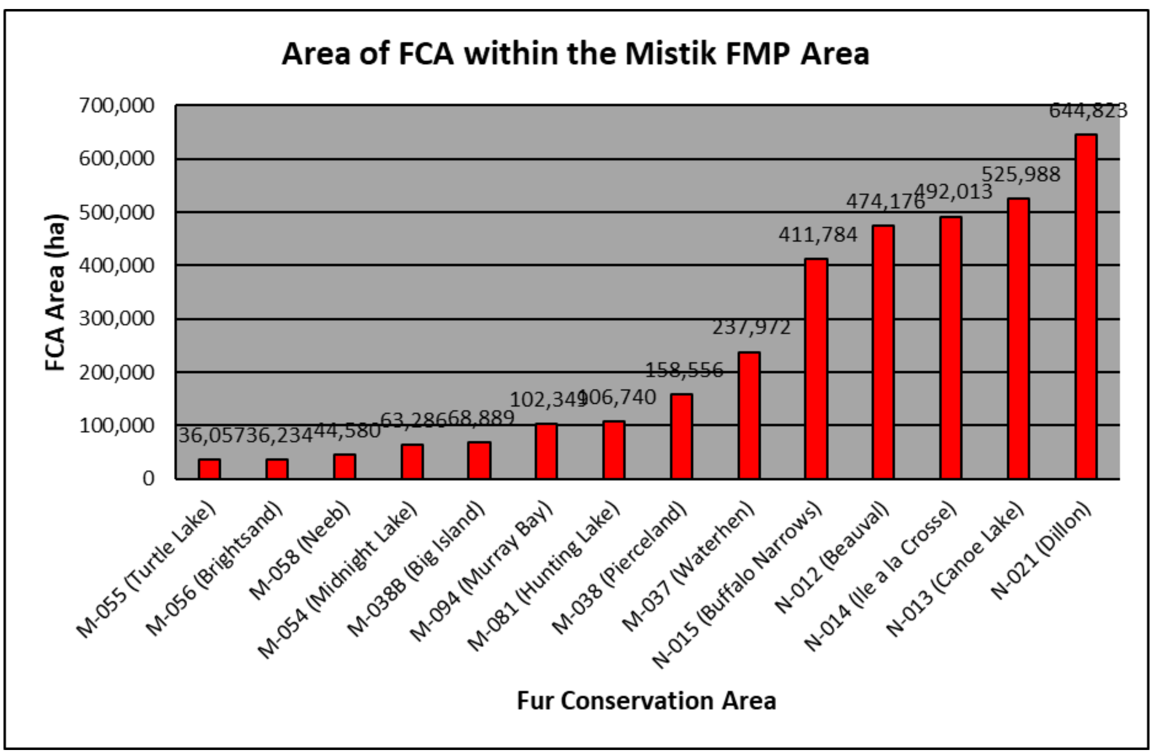


Figure 6.46 Size of Fur Conservation Areas (FCAs) associated with the Mistik FMP area

Each fur conservation area associated with the Mistik FMP area encompasses area in addition to, and outside of, the Mistik FMP area. Thus, there is trapping activity that occurs outside of the FMP area boundary. In general, a significant amount of area of each of the FCAs associated with the Mistik FMP area is within the FMP area limits (Figure 6.47). Ile a la Crosse (N-014), Neeb (M-058) and Buffalo Narrows (N-015) have the smallest amount of area within the Mistik FMP area. Dillon (N-021), Waterhen (M-037) and Pierceland (M-038) have the greatest proportion of area within the FMP area.

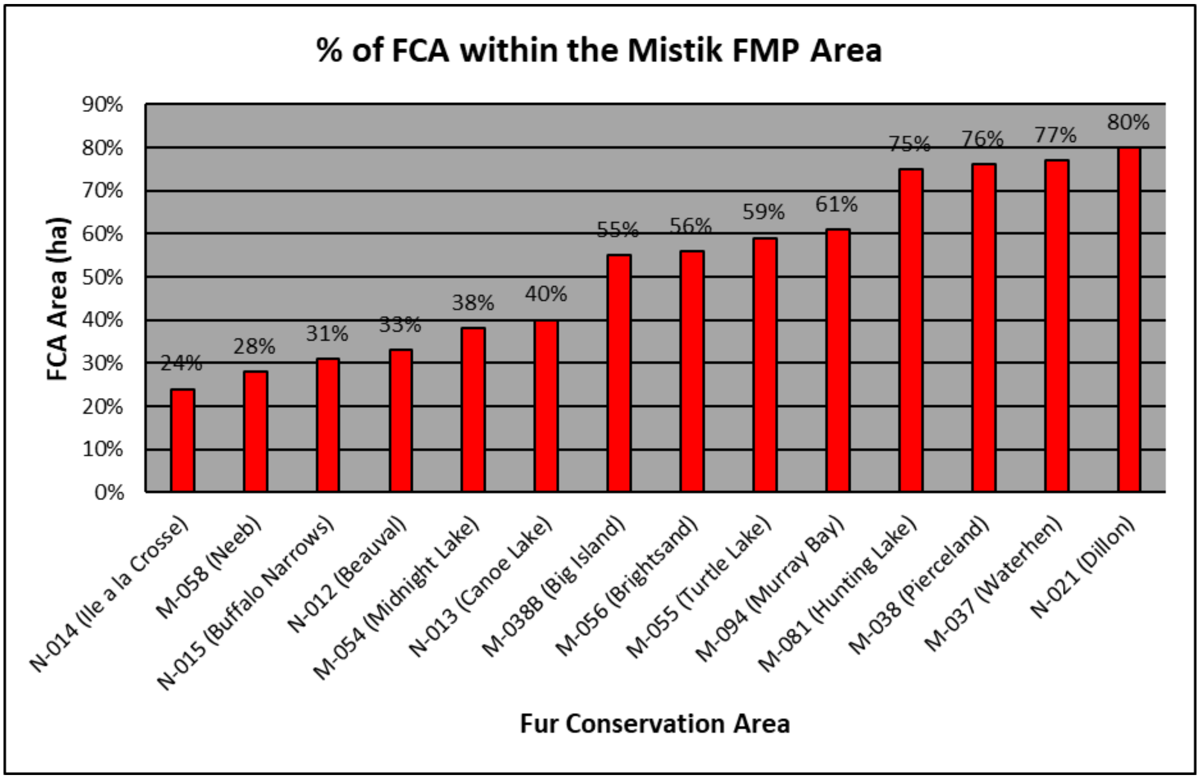


Figure 6.47 Proportion of FCAs within the Mistik FMP area

For the period 1988 to 2014, the total number of individuals trapping within the FCAs associated with the FMP area has mostly exceeded 100 individuals (Figure 6.48). The highest recorded number (285) of trappers for the period occurred in 1989. The fewest number (79) of trappers for the period occurred in 2007. For the period 1988 to 2014, on average there were approximately 154 trappers active within FCAs associated with the Mistik FMP area. There appears to be a decreasing trend in the overall number of trappers.

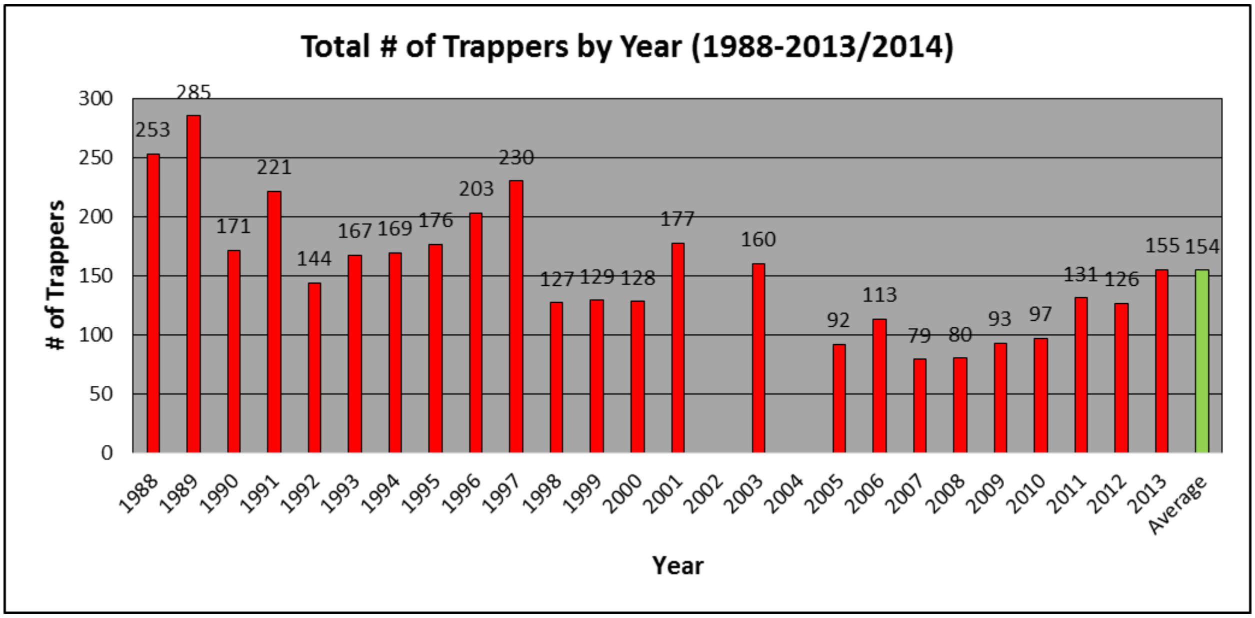


Figure 6.48 Total # of trappers by year for the period 1988 to 2013

On average, approximately 10,000 pelts have been harvested on an annual basis within FCAs associated with the Mistik FMP area since 1988 (Figure 6.49). The greatest number of pelts was harvested in the mid-90s with the peak harvest year being 1997.

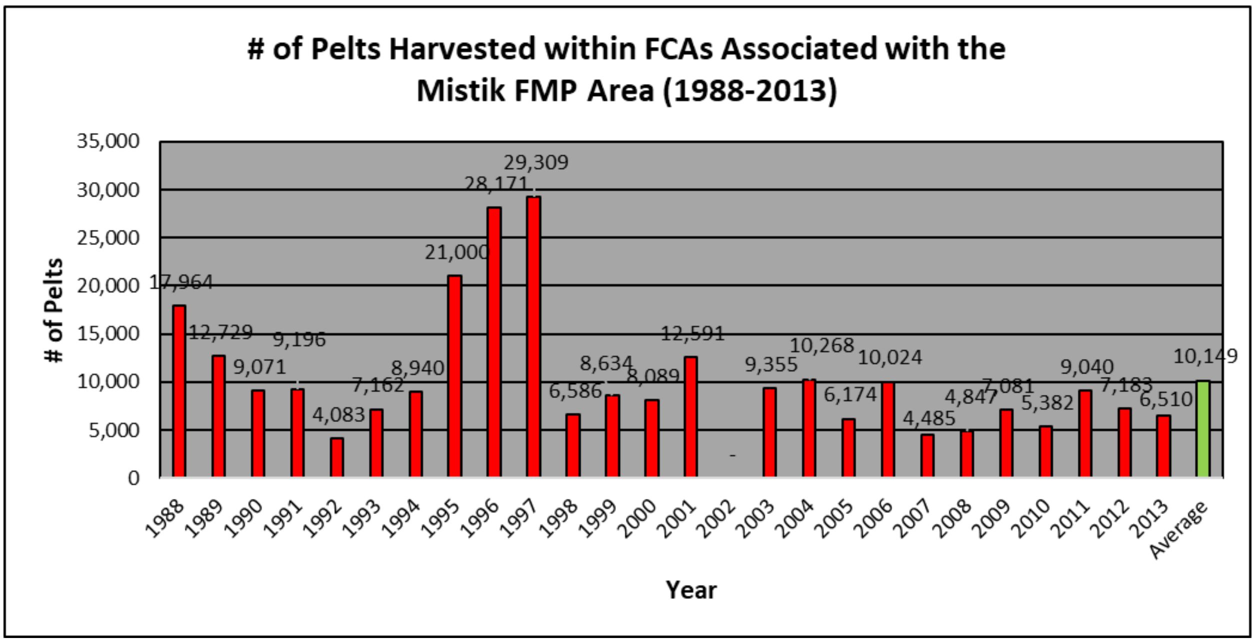


Figure 6.49 Total # of pelts harvested by year for the period 1988 to 2013

There was a significant difference in the total amount of pelts harvested for the period 1988 to 2013 among the FCAs (Figure 6.50). The least amount of pelts was harvested in the Brightsand (M-058), Big Island Lake (M-038B) and Turtle Lake (M-055) FCAs. The largest pelt harvests were generated within the Ile a la Crosse (N-014), Canoe Lake (N-013) and Buffalo Narrows (N-015) FCAs. The Ile a la Crosse FCA generated approximately double the # of pelts of next closest rival FCA.

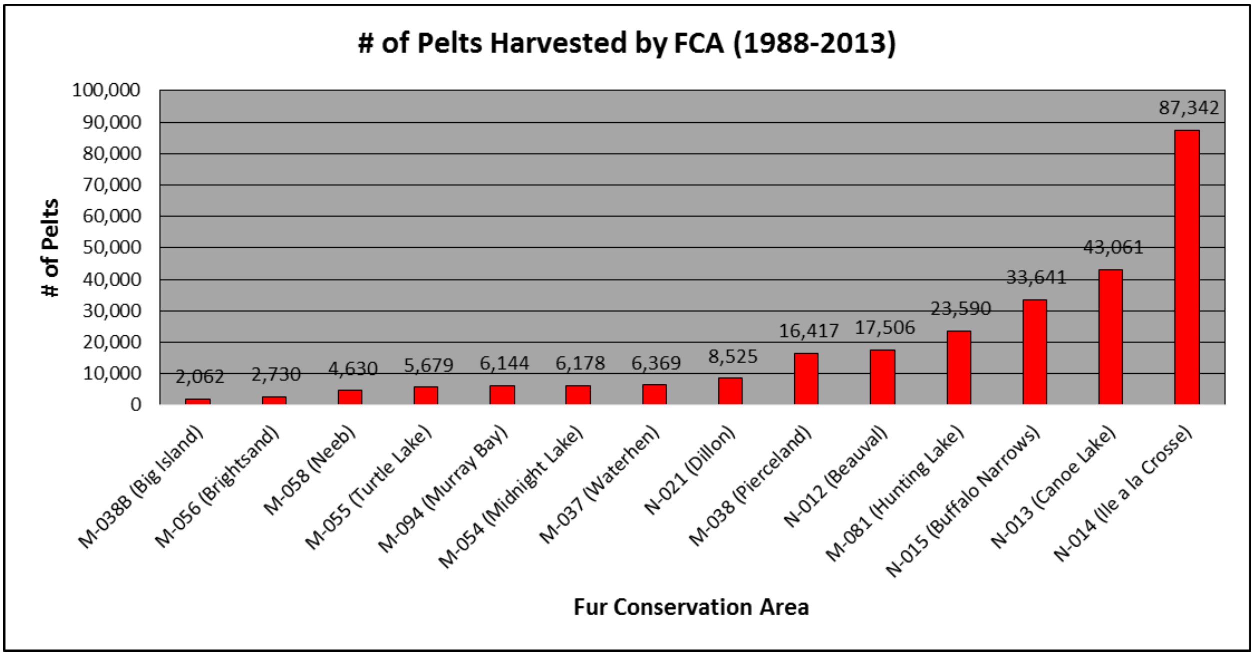


Figure 6.50 Total # of pelts harvested by FVA for the period 1988 to 2013

There was a significant difference in the average annual number of trappers active within the FCAs for the period 1988 to 2013 (Figure 6.51). On an annual basis, the least number of trappers were reported for the Brightsand (M-058), Big Island Lake (M-038B) and Waterhen (M-037) FCAs. The most number of trappers was reported for the Ile a la Crosse (N-014), Canoe Lake (N-013) and Pierceland (M-038) FCAs.

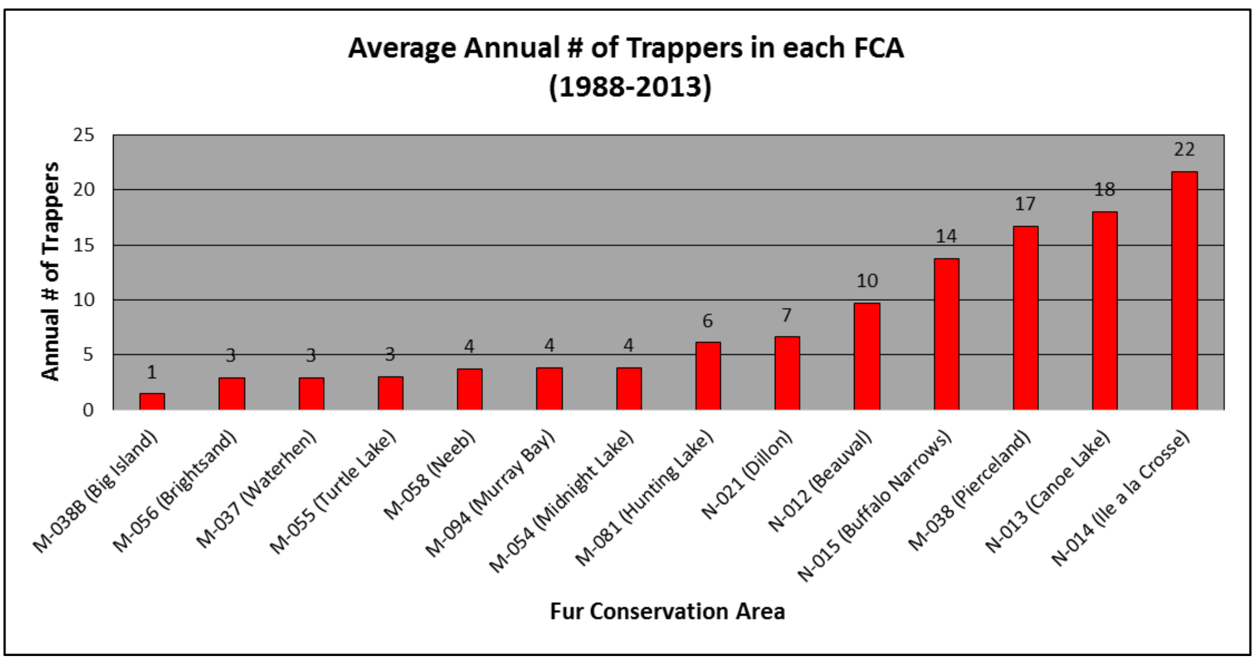


Figure 6.51 Average # of trappers per year by FCA for the period 1988 to 2013

The most commonly harvested species (Figure 6.52) for the period 1988 to 2014 was muskrat (~50% of the total harvest). Beaver, squirrel and muskrat represent the bulk of the pelts caught (84%). The least frequently harvested species was wolverine, raccoon, badger, wolf, and bear.

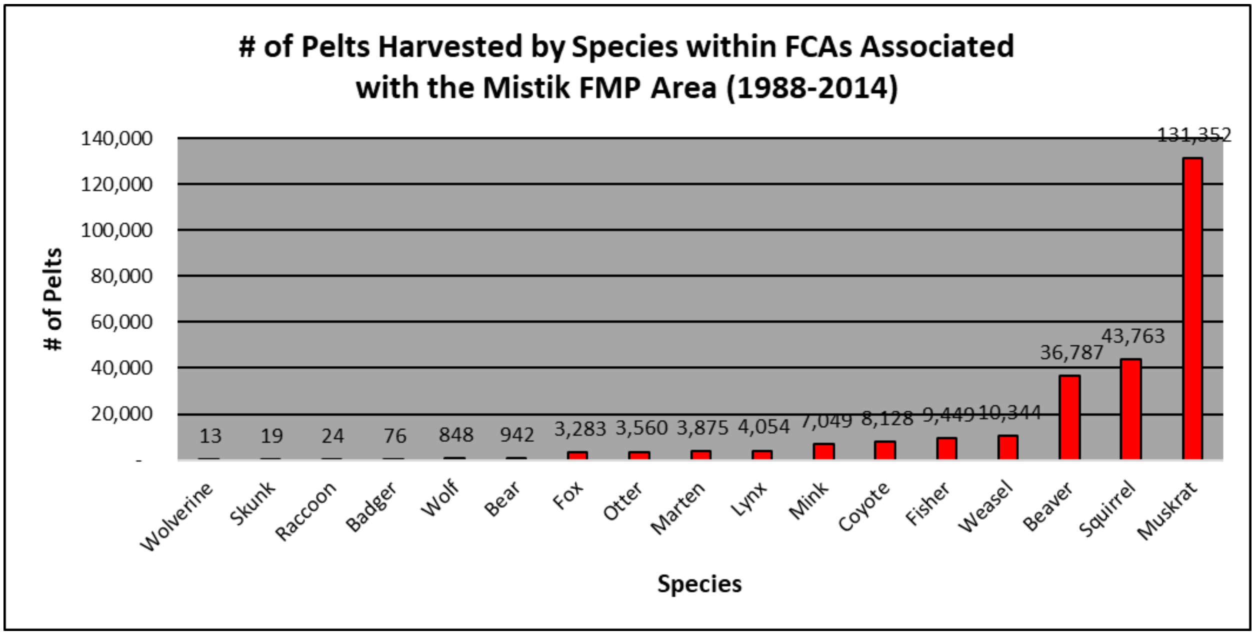


Figure 6.52 Total number of pelts per species for FCAs associated with the Mistik FMP area for the period 1988 to 2014

Over two-thirds of the species harvested for fur were aquatic-related species (muskrat, beaver, mink and otter). The remaining one-third of the species harvested were associated with upland forest areas (Figure 6.53).

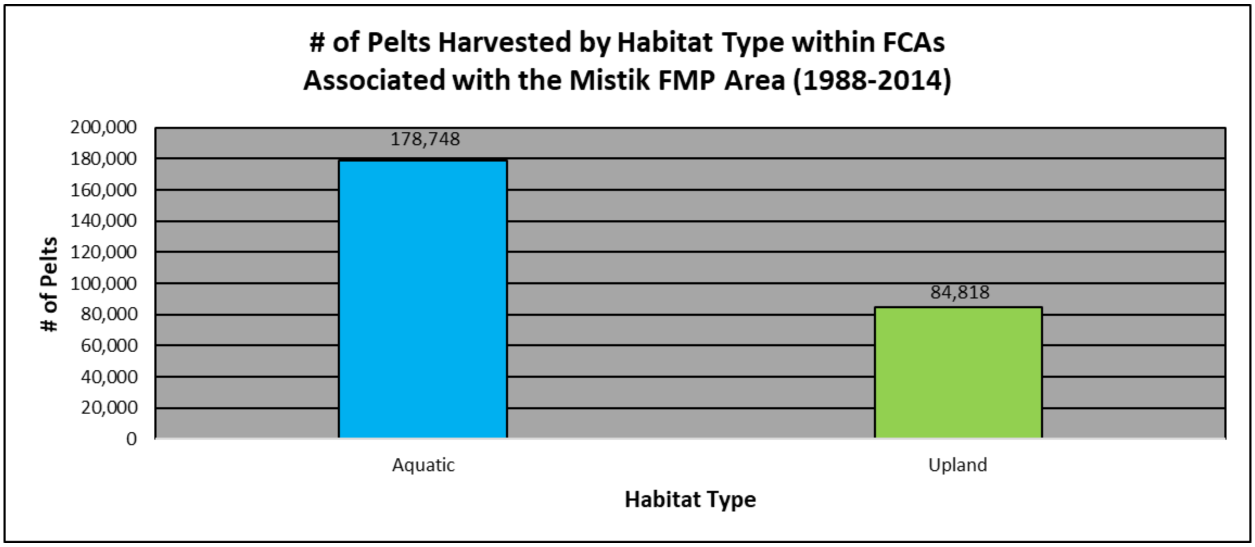


Figure 6.53 Total number of pelts harvested by habitat type for the period 1988 to 2014.

The most number of aquatic-related pelts were harvested in the Ile a la Crosse (N-014), Canoe Lake (N-013) and Buffalo Narrows (N-015) FCAs. The least number of aquatic-related pelts were harvested in the Brightsand (M-056), Big Island Lake (M-038B) and Neeb (M-058) FCAs (Figure 6.54).

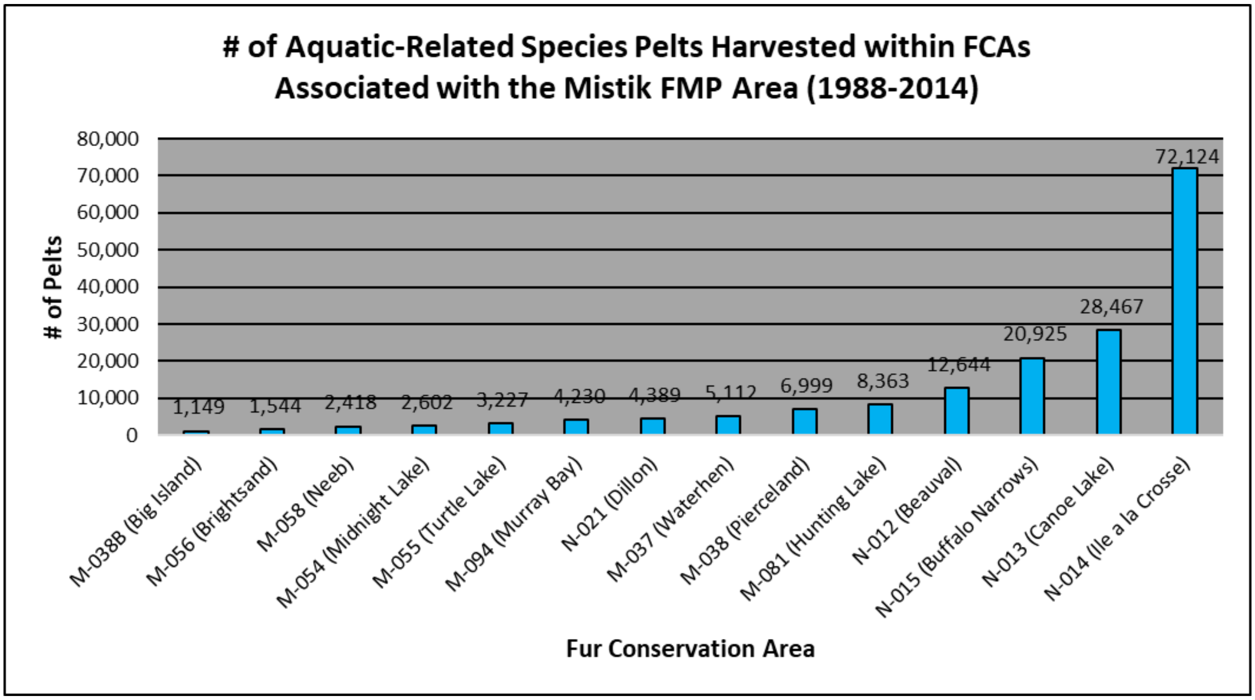


Figure 6.54 Total number of aquatic habitat-related species harvested within each FCA

The most number of upland-related pelts were harvested in the Hunting Lake (M-081), Ile a la Crosse (N-014) and Canoe Lake (N-013) FCAs. The least number of upland-related pelts were harvested in the Waterhen (M-037), Brightsand (M-056) and Big Island Lake (M-038B) FCAs (Figure 6.55).

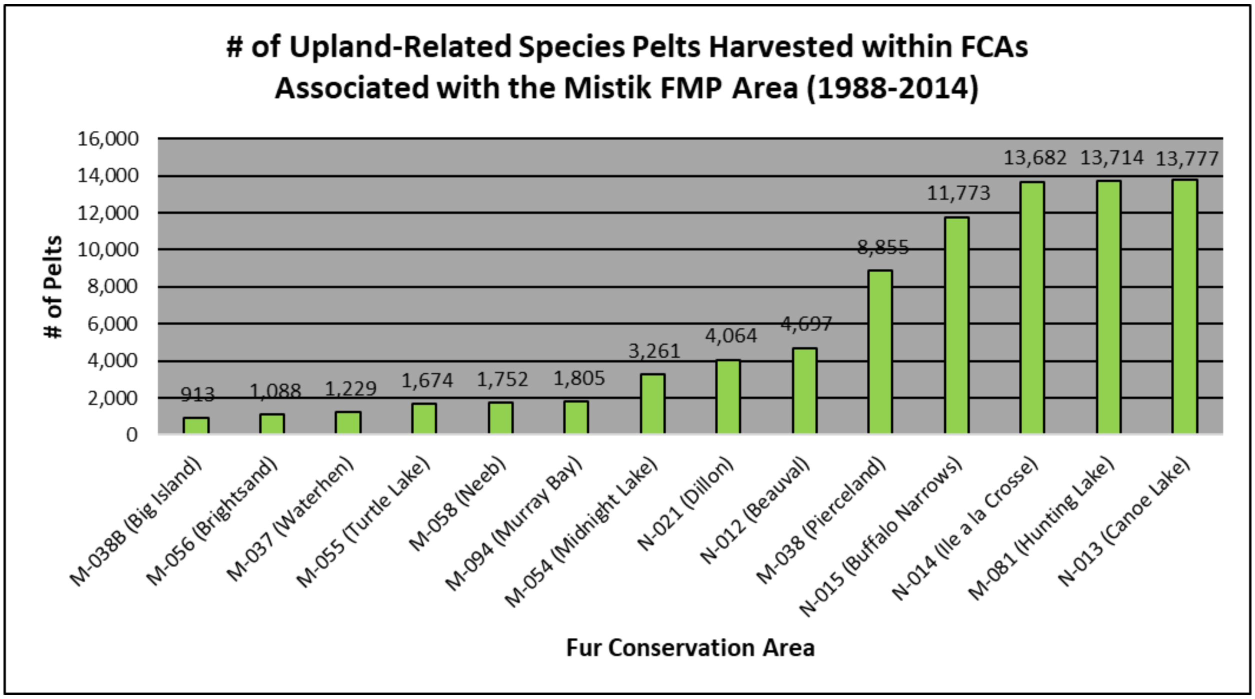


Figure 6.55 Total number of upland habitat-related species harvested within each FCA

Figure 6.56 is intended to provide a measure of 'FCA pelt productivity' in order to indicate which FCA is the best 'pelt factory'. The most productive FCAs in terms of number of pelts generated per unit area

(1,000 ha) of FCA were Hunting Lake (M-081), Ile a la Crosse (N-014) and Turtle Lake (M-055). The least productive FCAs, on a unit area basis were in the Dillon (N-021), Waterhen (M-037) and Big Island Lake (M-038B). There are a number of factors that may account for the differences between FCAs including significant habitat differences, significant small mammal population differences, overall number of trappers, individual trapper effort (likely related to fur price and cost of trapping) and access within the FCA area.

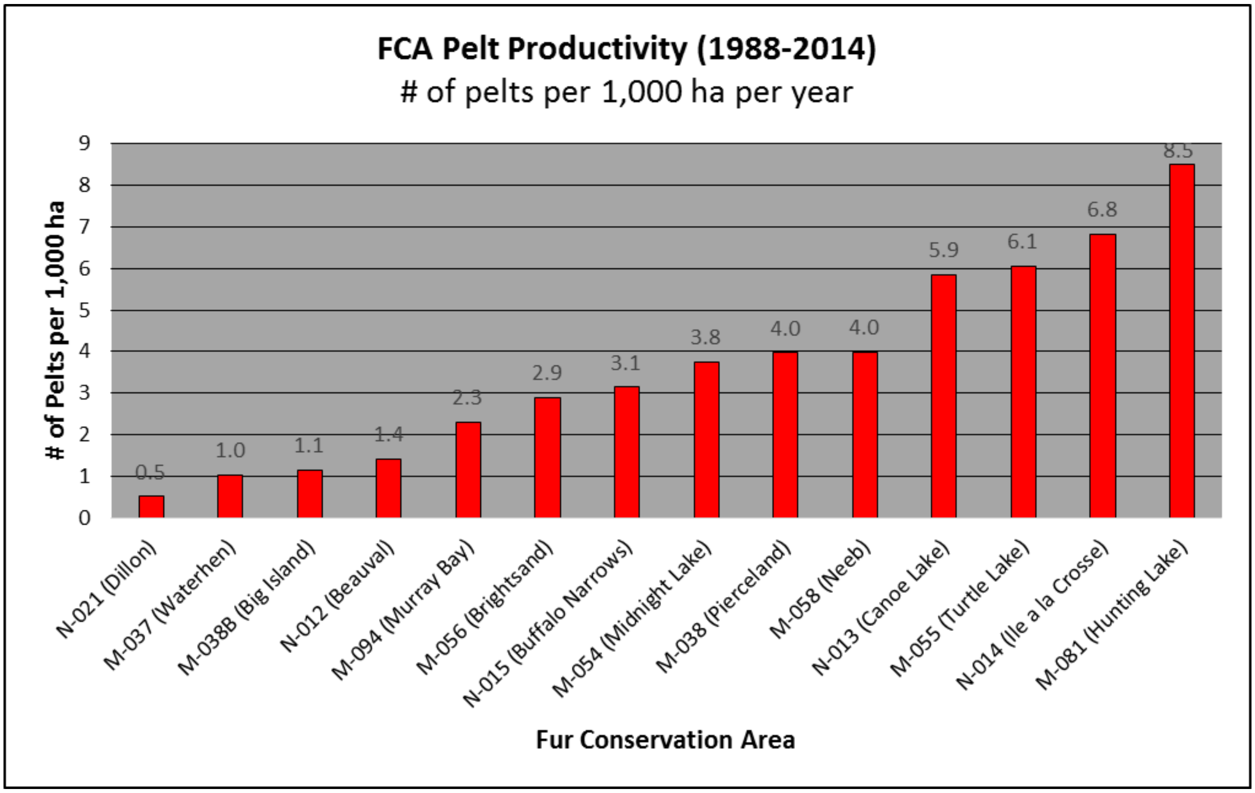


Figure 6.56 Average annual number of pelts per 1,000 ha within each FCA for the period 1988 to 2014

Figure 6.57 provides a measure of 'trapper density' (# of trappers per 1,000 ha of FCA area) in order to indicate which FCAs are the most 'crowded'. For the period 1988 to 2014, the greatest trapper density was reported in the Turtle Lake (M-055), Neeb (M-058) and Pierceland (M-038) FCAs. The least crowded FCAs, on a unit area basis were Dillon (N-021), Buffalo Narrows (N-015) and Waterhen (M-037).

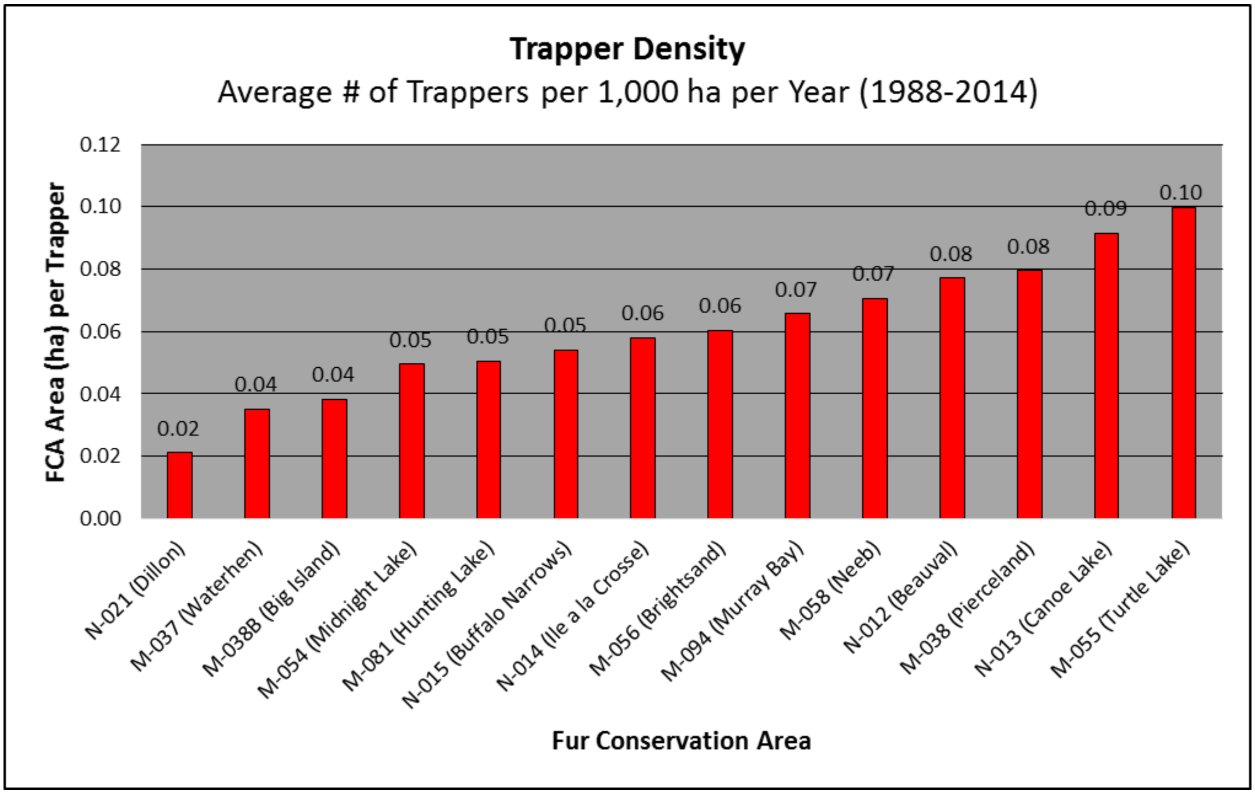


Figure 6.57 Average annual number of trappers per 1,000 ha within each FCA for the period 1988 to 2014

Figure 6.58 provides a measure of 'trapper success' (# of pelts per trapper per year) in order to indicate in which FCAs individual trappers had the most trapping success. For the period 1988 to 2014, the greatest trapper success was reported in the Beauval (N-012), Canoe Lake (N-013) and Buffalo Narrows (N-015) FCAs. The least trapper success was reported in Turtle Lake (M-055), Waterhen (M-037) and Neeb (M-058) FCAs. There are a number of factors that may account for the differences between FCAs including significant habitat differences, significant small mammal population differences, overall number of trappers, individual trapper effort (likely related to fur price and cost of trapping) and access within the FCA area.

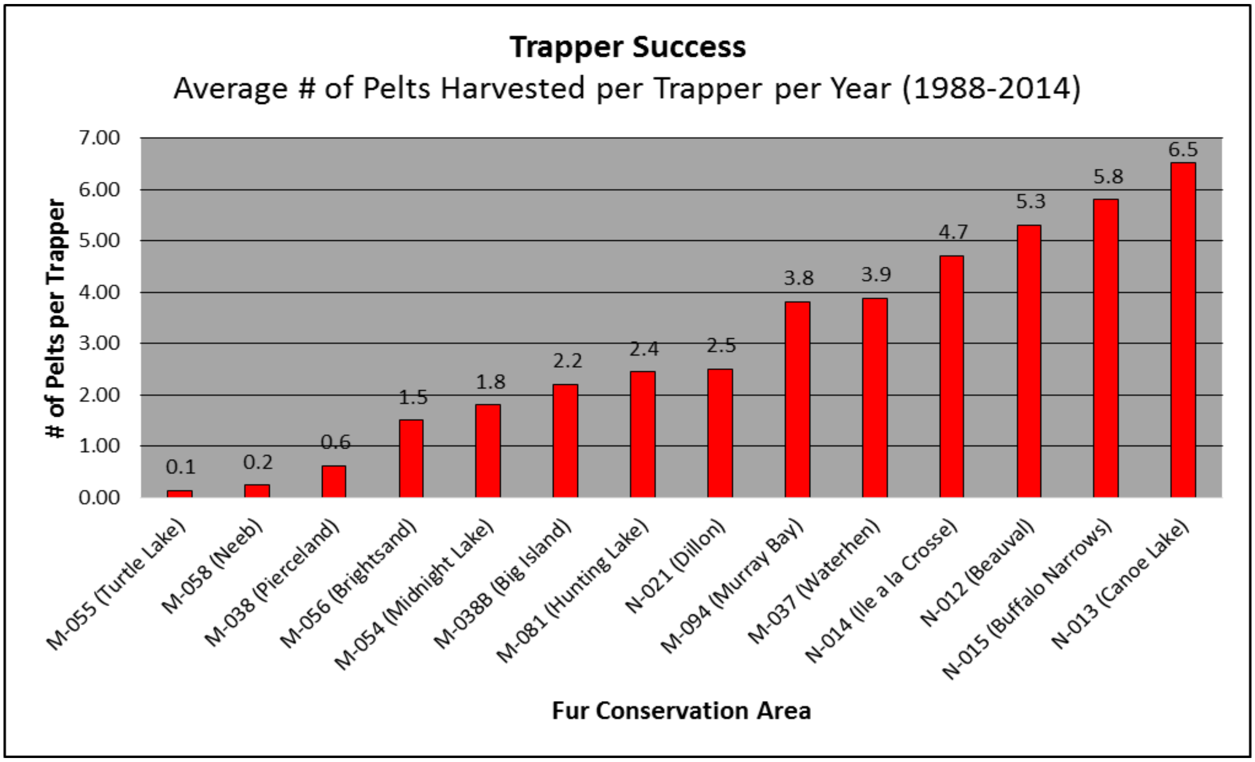


Figure 6.58 Average annual number of pelts per trapper within each FCA for the period 1988 to 2014

Figure 6.59 shows a strong relationship between the total number of trappers and total number of pelts harvested. The relationship suggests that as the number of individuals trapping within an FCA increases, the total number of pelts harvested also increases. Increased trapping effort results in increased number of pelts harvested.

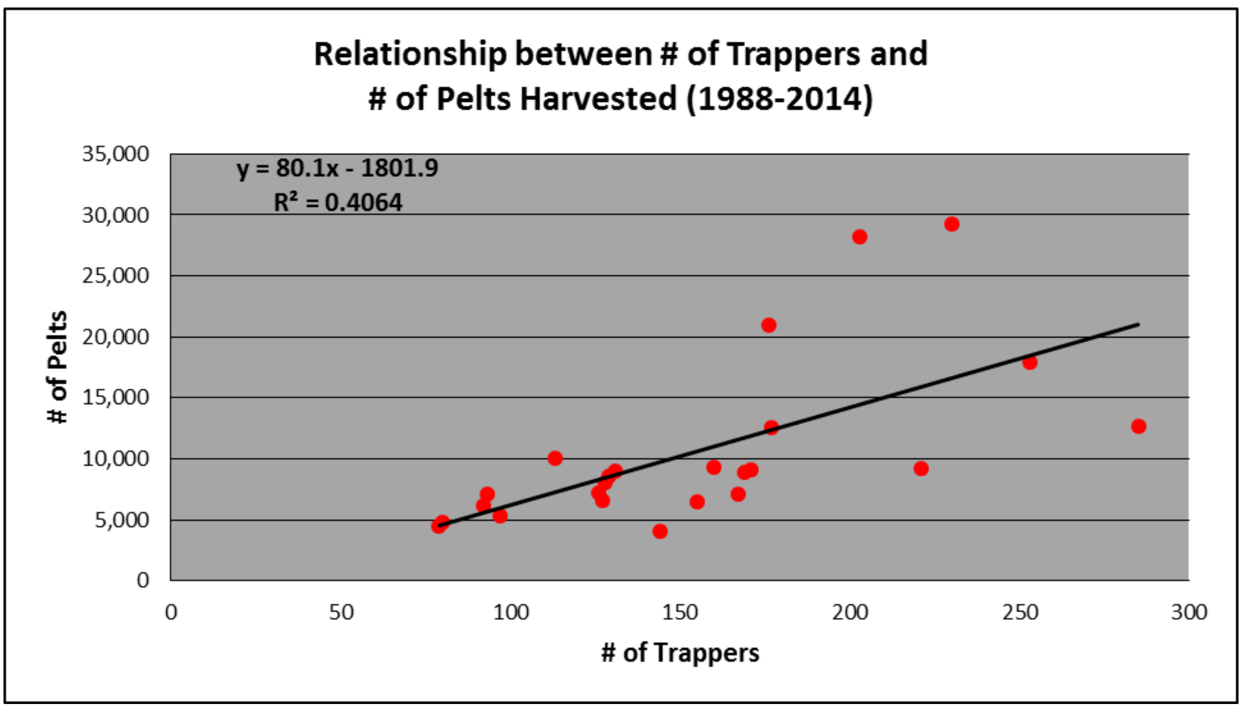


Figure 6.59 Relationship of total number of trappers vs. total number of pelts harvested for the period 1988 to 2014

Figure 6.60 shows a weak relationship between trapper density (# of trappers/ 1,000 ha) and total number of pelts harvested. Although the relationship is weak, the trend suggests that increasing trapper density ('crowding') within an FCA is correlated with diminished overall pelt harvest. There is a tendency for less number of pelts to be harvested the more crowded the FCA.

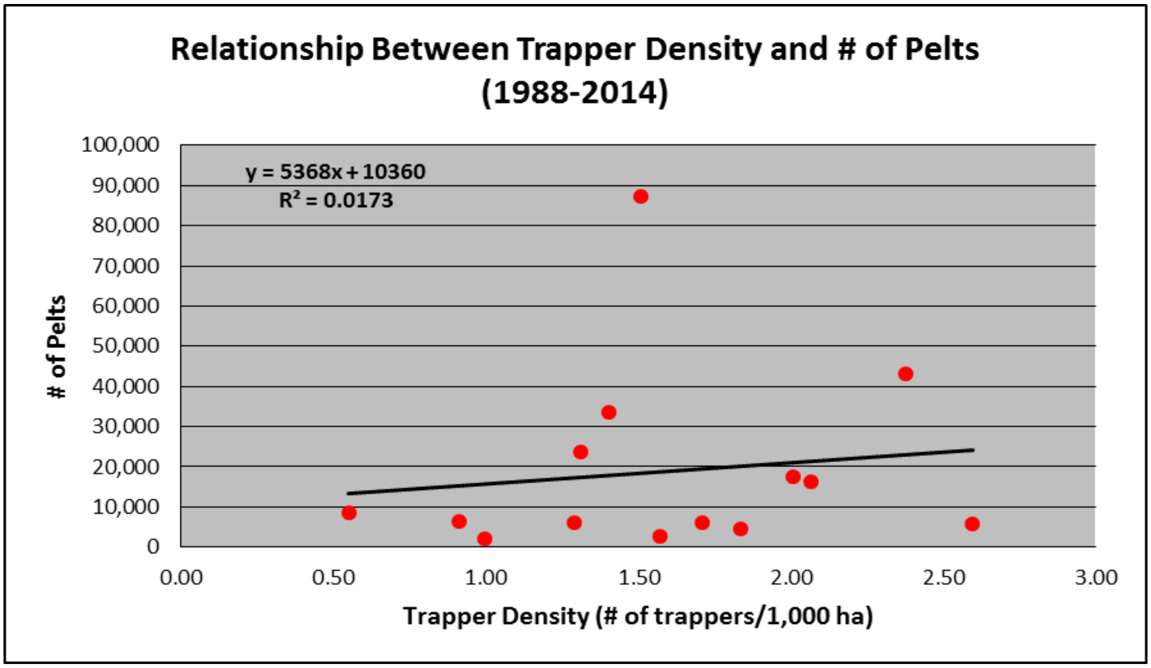


Figure 6.60 Relationship of trapper density vs. total number of pelts harvested for the period 1988 to 2014

Figure 6.61 shows a relatively strong relationship between total FCA area (ha) and total number of pelts harvested. The trend suggests that increasing FCA area (ha) is correlated with increased overall pelt harvest. The relationship shown in Figure 6.61 is likely a function of the strong correlation shown in Figure 6.62 depicting increasing number of trappers with increasing FCA area.

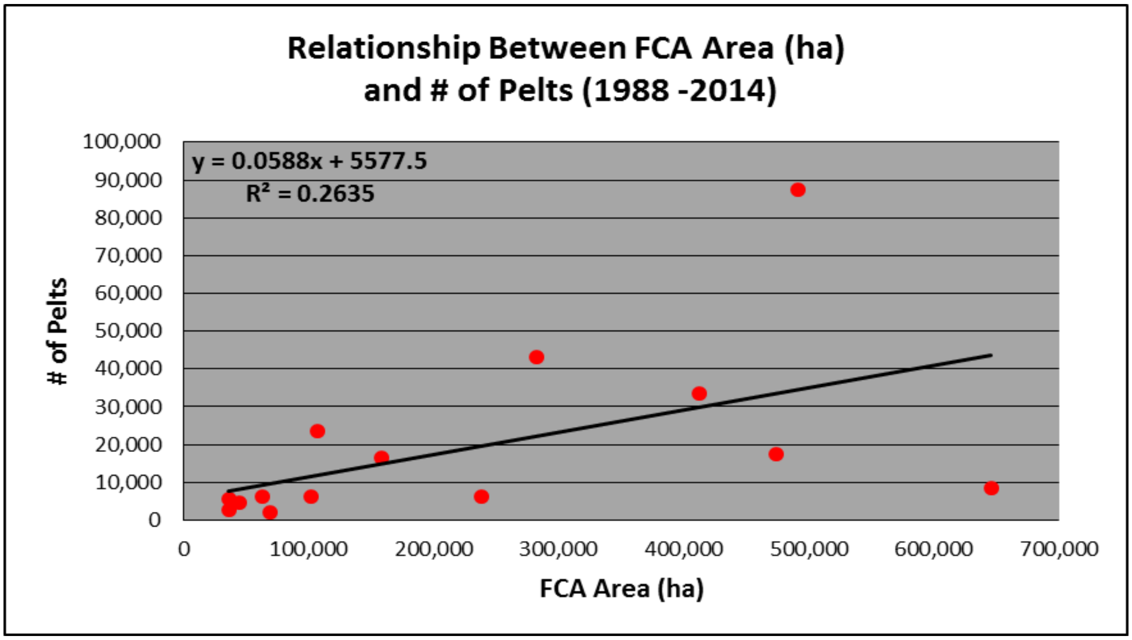


Figure 6.61 Relationship of FCA area (ha) vs. total number of pelts harvested for the period 1988 to 2014

Figure 6.62 shows a strong relationship between total FCA area (ha) and total number of trappers. The trend suggests that increasing FCA area (ha) is correlated with increased overall # of trappers.

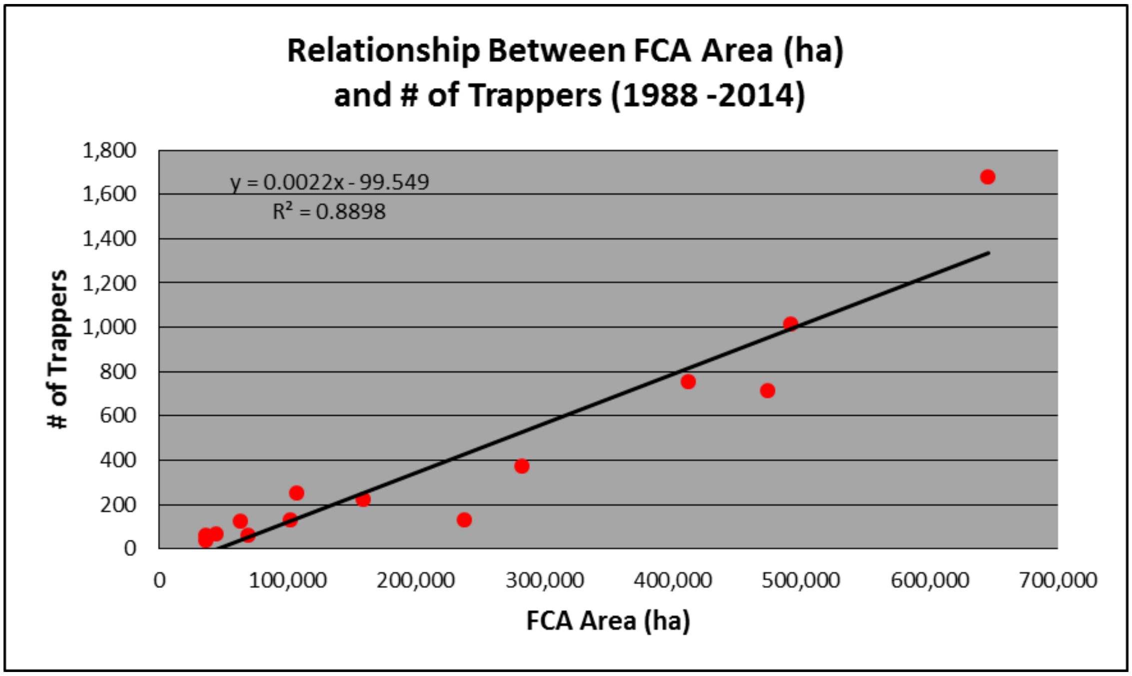


Figure 6.62 Relationship of FCA size vs. total number of trappers for the period 1988 to 2014

Figure 6.63 shows a weak relationship between total FCA area (ha) and trapper success (pelts/trapper). The trend suggests that increasing FCA area (ha) is correlated with decreasing individual trapper success. There is a very weak indication of greater individual trapper success in smaller FCAs than large FCAs.

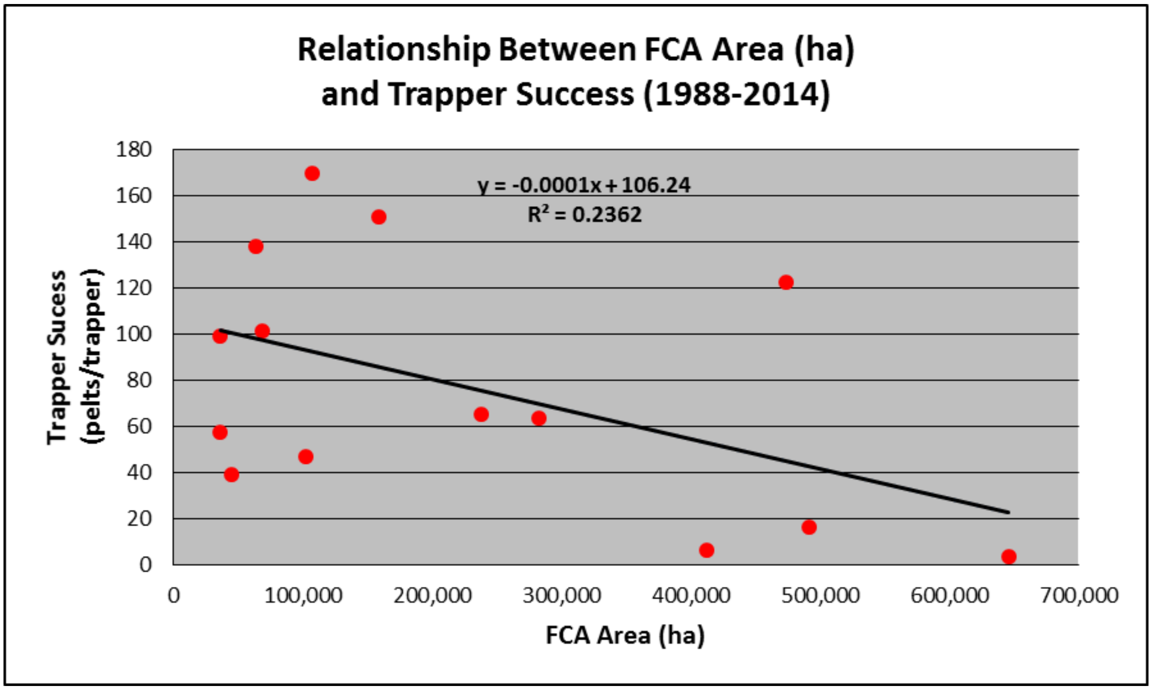


Figure 6.63 Relationship of FCA size vs. trapper success (pelts/trapper) for the period 1988 to 2014

Figure 6.64 shows a weak relationship between trapper density (trappers/1,000 ha) and trapper success (pelts/trapper). .

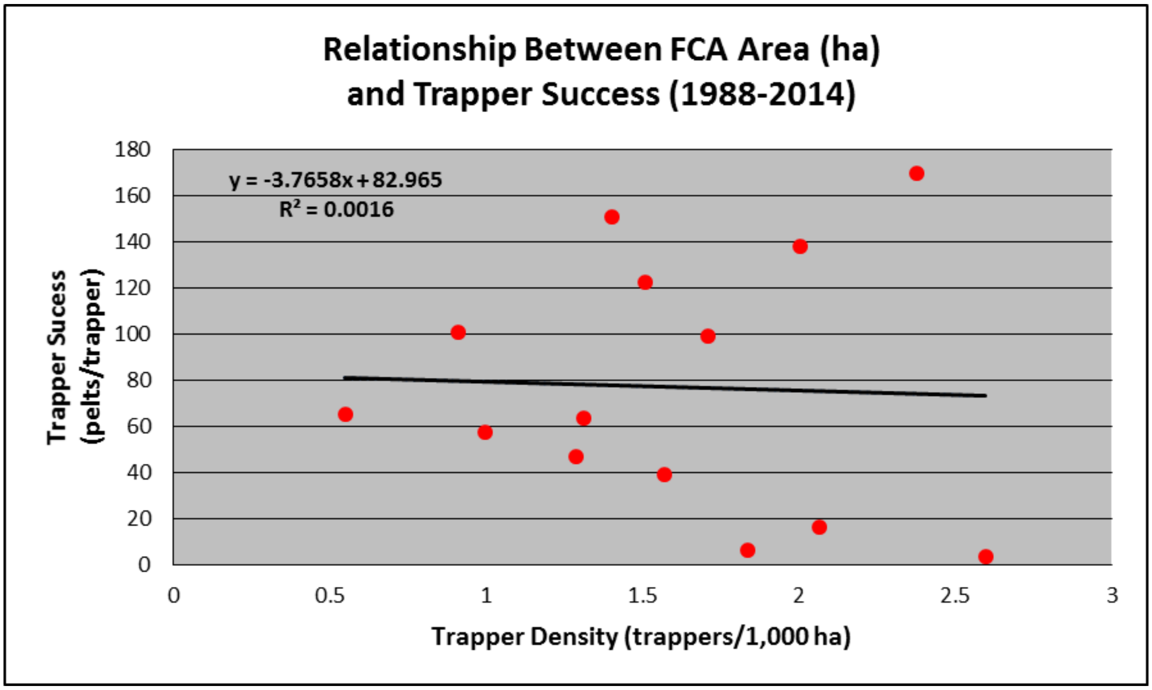


Figure 6.64 Relationship of trapper density (trappers/1,000 ha) vs. trapper success (pelts/trapper) for the period 1988 to 2014

The relationships shown above provide an indication of some of the trapping dynamics associated with the Mistik FMP area for the period 1988 to 2104. There are a number of interacting factors that contribute to overall pelt harvest including habitat availability, actual small mammal populations, overall number of trappers, individual trapper effort (likely related to fur price and cost of trapping) and access.

Over the past 10 years the largest amount of harvesting has been located within FCA M-37 (8,263 ha), while there was minimal impact on N-13B (193 ha) Table 6.2.

Table 6.2 Harvested area (ha) with each FCA

FCA	Area Harvested
M-37	8,263
M-38	3,379
M-38B	1,992
M-54	2,166
M-55	3,447
M-56	2,746
M-81	5,232
M-94	3,490
N-12	1,360
N-13A	2,678
N-13B	193
N-14	349
N-15	1,310
N-21	703

6.8 UPLAND BIRD VALUES

Saskatchewan harbours one of the richest avifauna's in North America, and the Mistik FMP area is no exception. Of the approximately 186 species of aquatic and upland-related birds breeding in Saskatchewan's boreal forest, over 100 upland boreal forest bird species have been identified within the Mistik FMP area. For many of these species, the boreal forest represents greater than 80% of their breeding habitat. Some characteristic migratory landbird species inhabiting the Mistik FMP area are the Sharp-shinned hawk, Broad-winged hawk, Ruby-throated hummingbird, Yellow-bellied sapsucker, Ovenbird, Canada warbler, Blue-headed (Solitary) vireo, and the Black-throated green warbler (Figure 6.65). There are a number of characteristic non-migratory species as well, including Ruffed grouse (Figure 6.66), Spruce grouse, Great gray owl, Boreal owl, Boreal chickadee, and Three-toed woodpecker. Mistik has focused avian monitoring efforts in the upland portion of the boreal forest (where forest harvesting occurs).

Figure 6.65 A black-throated green warbler

Figure 6.66 A ruffed grouse

The number of species (richness) of birds within forest stands differs depending on stand type. Mature aspen and mixedwood forest stands in the boreal region typically support the most number of bird species (60 to 70 species) (Figure 6.67[3]).

[3] Hobson, K. A. and E. Bayne. 2000. Breeding bird communities in boreal forest of western Canada: Consequences of 'unmixing' the mixedwoods. *The Condor*: 102: 759-769.

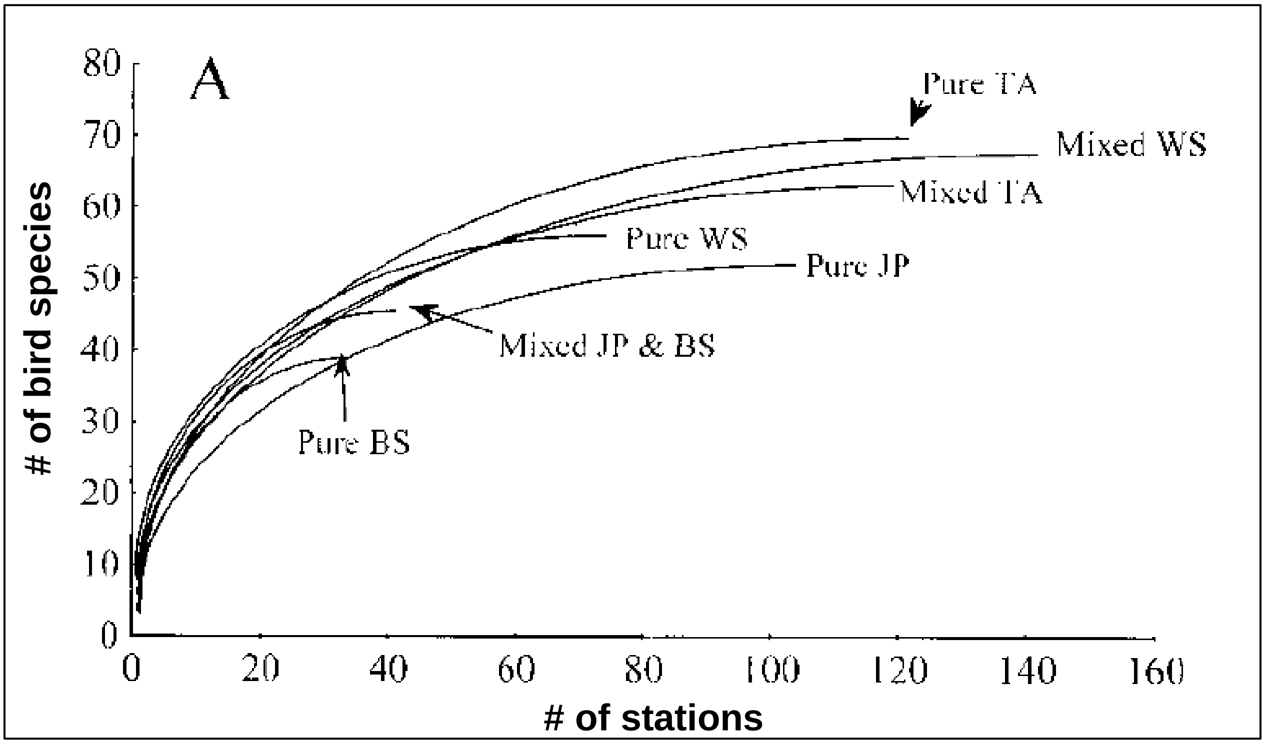


Figure 6.67 Trend in # of avian species by forest type and increasing # of observations

6.9 UPLAND FOREST NON-TIMBER PRODUCT VALUES

6.9.1 MUSHROOM PICKING

Mushroom picking (Figure 6.68) is a popular activity and can be a significant source of income, particularly after large fires, for local residents in the Mistik FMP area.

Figure 6.68 Black Morel (*Morchella elata*)

6.9.2 BERRY PICKING

Berry picking for personal use is widespread throughout the FMP area. The most popular berries picked within the FMP area are blueberries (Figure 6.69). Blueberries are abundant in the extensive jack pine stands throughout the Mistik FMP area.

Figure 6.69 Blueberries

6.9.3 MEDICAL PLANT USE

Mistik has received sporadic reports of medicinal plant collection and use within the FMP area. Mistik is currently unaware of the specific species being targeted for collection. Bog cranberries, shown collected by a local elder in the Beauval area, (Figure 6.70) have been reported to be used for medicinal purposes by Aboriginal people[4].

Figure 6.70 Bog cranberries

6.9.4 ECOTOURISM

Ecotourism is undertaken on a small scale in various locations throughout the FMP area. There are a number of resorts (Figure 6.71) and tour operators that cater to a range of cultural and wilderness experience interests. Photography (Figure 6.72), hiking, canoeing, cross-country skiing, snow-shoeing (Figure 6.73), camping (Figure 6.74), nature appreciation and traditional use / cultural experiences are all available on a guided tour basis or undertaken individually by local residents. Equipment rentals (canoe, kayaks, snow shoes, quads, bicycles, etc.) for self-guided experiences are available at various resorts and major centers in the vicinity of the FMP area.

[4] D. Johnson *et al.* 1995. Plants of the Western Boreal Forest and Aspen Parkland. Lone Pine Publishing, Edmonton, Alberta.

Figure 6.71 Inn-on-the-Lake, Little Amyot Lake near Beauval

Figure 6.72 Nature photography

Figure 6.73 Snow shoeing

Figure 6.74 Camping

6.10 METHODS USED BY MISTIK TO MAINTAIN THE DIVERSITY OF THE BOREAL FOREST

Mistik strives to maintain the diversity of boreal forest values throughout its forestry operations in the FMP area by utilizing:

1.Science-based, expert assessment and recommendation by specialists;

Mistik maintains an ongoing relationship with a number of agencies and individuals with scientific expertise in boreal forest hydrology and aquatic ecosystems dynamics. Specifically, the following organizations are currently assisting Mistik with expert advice pertaining to the maintenance of the integrity and function of aquatic ecosystems:

- **University of Saskatchewan (Sheri Owens, Mark Johnston)**

a. Assessment of Mistik's management options/responses to adapt to climate change.

- **Bandaloop Landscape-Ecosystem Services (David Andison)**

a. Assessment of the natural range of variability (NRV) related to landscape natural disturbance metrics within the Mistik FMP area.

- **Alpha Wildlife (Gilbert Proulx)**

a. Assessment of boreal forest wildlife populations and associated habitat types within the Mistik FMP area;
b. Assessment of wildlife species of concern and at risk within the Mistik FMP area and management recommendations;
c. Assessment of high conservation value forest areas with respect to wildlife species of concern and at risk within the Mistik FMP area;
d. Field assessments and monitoring of wildlife species of concern and at risk.

- **Canadian Wildlife Service (Steve Van Wilgenburg)**

a. Assessment of boreal forest avian populations and associated habitat types within the Mistik FMP area;
b. Assessment of avian species of concern and at risk within the Mistik FMP area and management recommendations;
c. Assessment of high conservation value forest areas with respect to avian assemblages of concern and at risk within the Mistik FMP area;
d. Field assessments and monitoring of avian assemblages of concern and at risk.

- **Saskatchewan Research Council (Mark Johnston)**

a. Assessment of climate change impacts to boreal forest ecosystems and associated forest management activities in the Mistik FMP area.

- **Saskatchewan Ministry of Environment (Gigi Pittoello, Rob Tether)**

a. Provision of provincial direction and wildlife population data with respect to wildlife habitat maintenance;
b. Ensure that local wildlife habitat initiatives by Mistik on the FMP area are consistent with provincial priorities.

2. Retention of regulatory-required riparian no-harvest areas adjacent to waterbodies (Map 16 – Riparian No-Harvest Areas**);**

A provincial forestry standard has been established to ensure that forest harvesting impacts adjacent to waterbodies is minimized. On the Mistik FMP area, Mistik ensures that riparian buffers (no harvest areas) are retained adjacent to all waterbodies which contain fish (Figure 6.75). A 15, 30 or 90 m buffer (cumulatively, a total of ~ 86,000 ha for the FMP area) is used depending on the size of the waterbody, known fisheries values and public use and aesthetic values (Figure 6.76).

Figure 6.75 A 90 m riparian buffer retained on Parker Lake (the harvest-related access also provides access to a very productive wild rice lake)

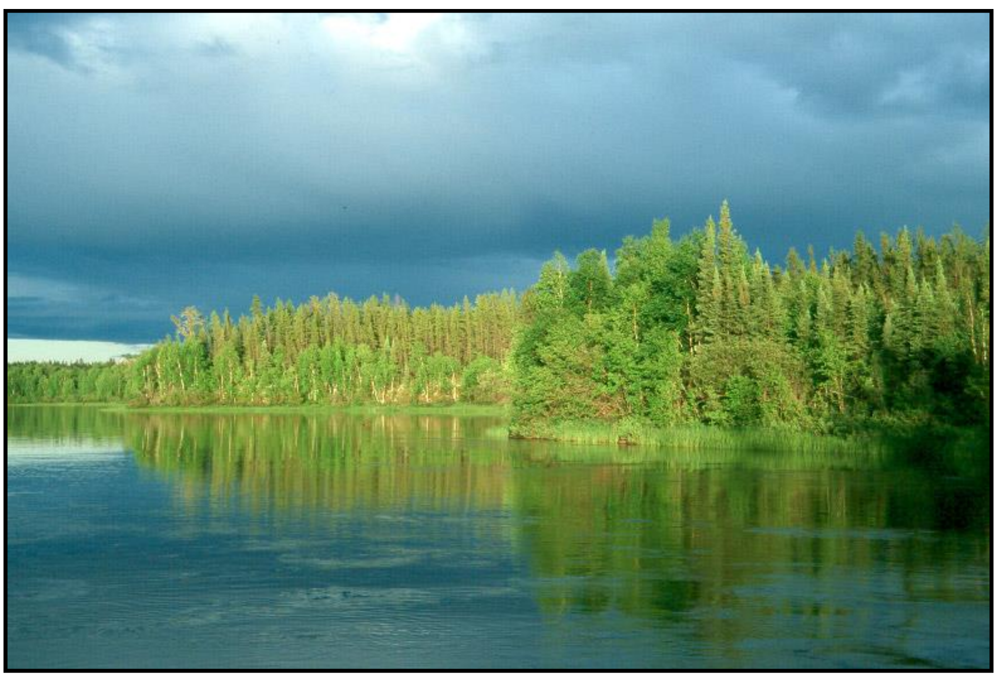


Figure 6.76 Riparian areas are of significant aesthetic appeal

4. Compliance with federal and provincial legal requirements with respect to the installation, maintenance and reclamation of watercourse crossing structures;

Mistik has established an internal standard operating procedure (a 'best practices' prescription) to ensure that all activity related to watercourse crossings are conducted in a manner that meets all regulatory and operational requirements (Figure 6.77).

Figure 6.77 A well-installed culvert crossing on a small watercourse

5. Maintenance of exiting watercourse crossing structures;

FMP area forestry standards have been established to ensure that effective erosion control measures are implemented. Maintenance of major watercourse crossing structures and associated drainage areas is undertaken by Mistik on an ongoing basis (Figure 6.78 and Figure 6.79**).**

Figure 6.78 The approaches on both sides of the Nipin River bridge were 'armored' to minimize erosion issues associated with the bridge site

Figure 6.79 A highly erosive area at 22 km on the Upper Cummins Road was re-engineered to address erosion issues

6. No use of pesticides;

Mistik has chosen not to use pesticides within the Mistik FMP area. Aquatic environments and associated plant and animal species may be particularly susceptible to adverse impacts associated with pesticide usage.

7. Fish habitat enhancement and fish habitat replacement;

In collaboration with federal and provincial regulatory agencies, Mistik has undertaken (and continues to undertake) fish habitat enhancement and fish habitat replacement projects (Figure 6.80).

Figure 6.80 A fish habitat enhancement project on Dennis Creek

8. Creation of specific forestry impact mitigation plans for all species at risk within the Mistik FMP area;

For each federally-listed or provincially-listed 'species at risk' within the Mistik FMP area, Mistik is committed to creating a detailed forestry impact mitigation plan. The plans are created with the collaboration of provincial wildlife experts, other agencies and Mistik Management Ltd.

Currently, woodland caribou (Figure 6.81) is the only wildlife species occurring within the Mistik FMP area listed as threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC, *Canadian Species at Risk, November 2004*). The preferred habitat of woodland caribou is mature forests which contain large quantities of lichen adjacent to wetland complexes composed of bogs and fens. The Mistik FMP area contains an abundance of such habitat.

Provincial woodland caribou experts estimate that there are approximately 300 woodland caribou within the Primrose Woodland Caribou Management Unit (WCMU). There are several known herds of woodland caribou within the FMP area occurring east of the Beaver River in the Beauval Management

Unit (Dore Lake), between Kazan Lake and Canoe Lake and the Cold Lake Air Weapons Range in the Ile a la Crosse and Canoe Lake Management Units (Kazan Lake), north of Upper Cummins Lake in the Buffalo Narrows Management Unit (Cummins Lake), in the Dillon Lake area (both in the Dillon and Peter Pond Management Units) and south of the Cold Lake Air Weapons Range in the Muskeg River Operating Area. In collaboration with the provincial woodland caribou taskforce, Mistik is developing a management strategy (*Woodland Caribou Forestry Impact Mitigation Plan - Draft*) for the protection of prime woodland caribou habitat in the vicinity of known herd locations throughout the Mistik FMP area. This forestry impact mitigation plan will be implemented within the context of the provincial woodland caribou recovery strategy process described in detail in the document **Recovery Strategy for Boreal Woodland Caribou (*Rangifer tarandus caribou*) in Saskatchewan**[5].

Figure 6.81 Woodland caribou are listed as a 'species at risk'

9. Operational implementation of expert recommendations and forestry impact mitigation plans;

Coarse filter – maintenance of diverse ecosystem types and attributes

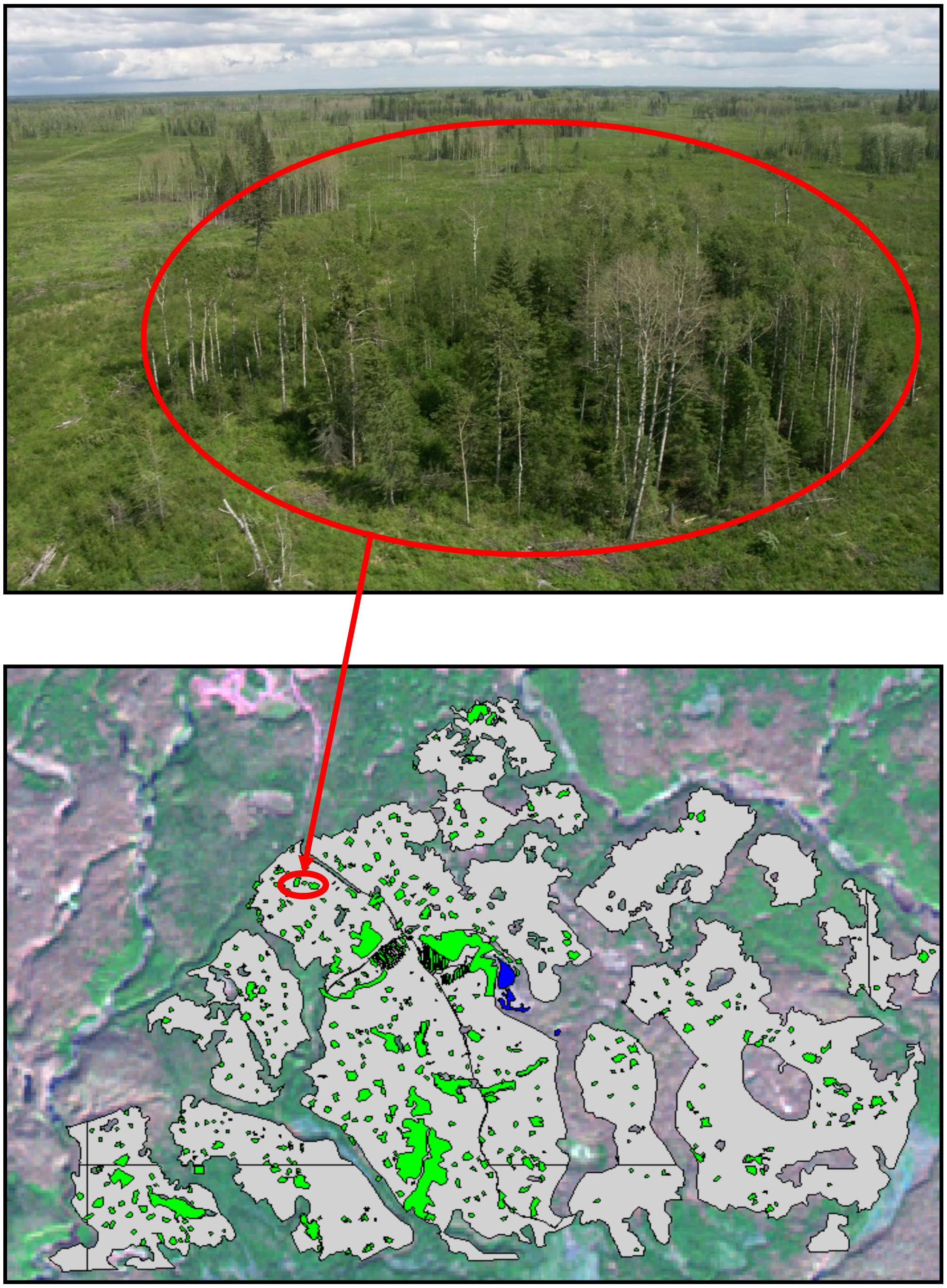
In conducting its timber harvest and renewal operations, Mistik attempts to emulate some of the features of the dominant natural disturbance regimes. The primary natural disturbance agent in Mistik's FMP area is fire (Figure 6.82). Most of the forest in the Mistik FMP area is less than 90 years old, a result of forest fires and in more recent years, the harvest of timber for lumber and pulp. The Great Fire of 1919 was one of the largest documented forest fires that swept through northwest Saskatchewan. It was responsible for shaping much of the mature forest in the Mistik FMP area today. The Great Fire of 1919 burned almost 800,000 hectares of boreal forest.

[5] Arsenault, A.A., Pl Flood, G. Pittoello, T. Trottier and B. Wynes. 2006 (draft). Recovery Strategy for Boreal Woodland Caribou (*Rangifer tarandus caribou*) in Saskatchewan. Saskatchewan Environment. Resource Stewardship Branch, Technical Report 2006. 41 pp.

Figure 6.82 Natural fire origin forestry patterns

MOSAIC harvest patterns

Where possible, Mistik plans harvest areas as disturbance events utilizing a 'one-pass' system. A diversity of harvest block sizes is planned. Natural (irregular) boundaries are used to define the perimeter of harvest areas. Mistik attempts to **m**aintain **o**verstorey **s**tructure **a**nd **i**mmature **c**anopies in a natural MOSAIC harvest pattern (Figure 6.83). By implementing these procedures, Mistik attempts to emulate the natural, fire-origin patterns and habitats found in the boreal forest landscape. Maintenance of forest structural diversity within post-harvest areas within the FMP area is important for a number of ecological and associated habitat values. Mistik's intent is to maintain a range of forest structural attributes post-harvest within every harvest block except in those cases where forest health issues dictate otherwise.



Source: Steve van Wilgenburg

Figure 6.83 The green areas represent post-harvest forest structure retention with the Mistohay Operating Area

Older forests

Maintenance of late seral stand types within the FMP area is important for a number of ecological values – age class diversity, forest structural diversity, tree species diversity and associated habitat diversity. Industrial timber extraction can, over time, completely remove late seral stand types from the forest landscape. Retention and recruitment of old forest types (Figure 6.84) must be explicitly managed for in order to achieve desired levels of late seral representation within the forest landscape.

Figure 6.84 An older-aged hardwood forest stand

Forest renewal

Mistik attempts to renew harvested forest stands to either their pre-harvest tree species composition or to a successional phase suitable to the harvested forest ecosite. Due to short fire return intervals and relatively large areas burned in the FMP area each year, Mistik has tailored its renewal program to minimize risk to silvicultural investment and maximize future forest management and timber product options. In general, Mistik attempts to maximize the area of mixedwood renewal, minimize investment per hectare (e.g., plant less trees per hectare while planting more total hectares) and accept natural forest succession dynamics as the preferred mode of minimizing risk and maximizing future forest management and timber product options. The following descriptions identify the most common broad successional pathways of harvested sites within the FMP area:

<u>Hardwood ('H') aspen, balsam poplar:</u>
If there is a component of aspen growing onsite at the time of harvest, harvested blocks will regenerate vigorously to hardwood (primarily aspen). In essence, the default natural forest renewal pathway for most hardwood and mixedwood stands is to pure hardwood ('H') stands. Mistik's approach to managing for hardwood stands is simply to monitor the success of natural forest renewal processes.

Mixedwood (‘HS’ and ‘SH’) aspen/jack pine:

If the site has a dominantly jack pine softwood component at the time of harvest, jack pine will likely regenerate naturally within 10 years of harvest from the cones scattered at the time of harvest. Mistik attempts to encourage natural jack pine renewal by scarifying harvested sites. The aspen and jack pine will regenerate as a mix to rotation age (~ 80 to 90 yrs). In cases where the jack pine has not renewed adequately, Mistik will plant jack pine or white spruce.

Mixedwood (‘HS’ and ‘SH’) aspen/white spruce or black spruce:

If the site has a dominantly white spruce or black spruce softwood component at the time of harvest, Mistik will plant white spruce or black spruce (Figure 6.85). The aspen and white spruce or black spruce will regenerate as a mix to rotation age (~ 80 to 90 yrs). Most natural stands of aspen/white spruce or black spruce exhibit several different age classes or understorey layers. The typical natural renewal pattern for white spruce or black spruce is for germination and growth under a hardwood canopy. White spruce produces periodic cone crops. The seed is released from the cones and dispersed by wind. These seeding events within a hardwood stand can occur repeatedly over decades. The end result is a single or multi-aged spruce understorey overtopped by an overstorey hardwood canopy. Given enough time (80 to 100 yrs), the spruce generally ‘trades places’ with the aspen and becomes ‘co-dominant’ with or ‘dominant’ to the aspen.

Figure 6.85 A planted one-year old spruce seedling

Softwood (‘S’) white spruce / black spruce / jack pine:

Pure stands of white spruce are not common in the FMP area. Pure white spruce stands are generally associated with very old stands where the hardwood component has ‘fallen out’ due to age. Most of the current natural white spruce-dominant stands commenced as mixedwoods at stand initiation. Given adequate time to grow, the softwood potential of mixedwoods expresses itself. Mistik plants WS within all harvest areas containing white spruce or black spruce[6].

The most common pure softwood type within the FMP area is jack pine. Jack pine grows vigorously on a range of sites. The most common growing conditions for jack pine is on sand-dominated soil types. These sites are generally of such low productivity that hardwood species do not grow well. Jack pine generally regenerates naturally within 10 years of harvest from the cones scattered at the time of harvest. Mistik attempts to encourage natural jack pine renewal by scarifying harvested sites. In the absence of adequate jack pine renewal, Mistik will plant these sites.

In the absence of Mistik's efforts to promote softwood renewal (scarification and tree planting), many of the harvested mixedwood stands within the FMP area would default to dominantly pure hardwood renewal. Mistik's prompt softwood renewal program (Figure 6.86) ensures that harvested mixedwood and pure softwood sites have the potential to grow into mixedwood and pure softwood stands over time. Mistik's renewal program demonstrates Mistik's commitment to maintaining the diversity of forest ecosystem types within the harvested productive forest land base.

Figure 6.86 A tree planter assisting in the establishment of a new mixedwood forest

For a number of timber and non-timber reasons, mixedwood stands are highly valued within the FMP area (Figure 6.87). Mixedwood stand types may offer the greatest potential for maximizing forest productivity - most diverse habitat attributes and the greatest potential for maximizing timber volume.

[6] Mistik has historically harvested very little pure black spruce forest types. Black spruce, as a defined forest growth type, is largely confined to peatland complexes within the FMP area. However, black spruce and white spruce can be found intermixed in a variety forest stand types – often at the transition areas between ecosites. Often, the forest inventory label for these mixtures of white and black spruce tends to recognize these as one or the other. Mistik does not hesitate planting mixed black and white spruce sites with white spruce.

Much of Mistik's currently merchantable harvest area is comprised of mixedwood (primarily aspen with a white spruce, jack pine, black spruce, balsam fir component) stands. It is Mistik's forest renewal goal to promote the growth of mixedwood stands.

Figure 6.87 A mosaic of mixedwood forest stands in the Mistik FMP area

Fine filter approach – maintenance of species at risk and representative ecosystem types not impacted by industrial activities

For specific species at risk and unique ecosystem types, Mistik implements site specific mitigative measures (avoidance and deferral of harvest within key habitat areas) as prescribed in forestry impact mitigation plans. The Province of Saskatchewan has established a network of protected areas throughout the province. Several of these provincial protected areas, encompassing an area of approximately 180,000 ha, are adjacent to the Mistik FMP area (Map 17 – Protected Areas, Appendix E). In addition to the provincially protected areas, the Cold Lake Air Weapons Range contributes an additional 400,000 ha of *de facto* protected area[7]. Within the Mistik FMP area, Mistik, in collaboration with the public, has identified additional 'special places' (Map 18 – Special Places, Appendix E). Mistik's 'special places' identify areas within the FMP area that contain perceived special cultural, social or ecological values. Mistik's 'special places' are not equivalent to 'protected areas' but represent areas with the FMP area that require enhanced planning involving increased levels of public consultation and/or expert input pertaining to harvest activities.

10.Identification of visually sensitive areas and maintenance of visual quality objectives;

Mistik has several visual quality objectives (VQOs) when conducting harvesting activities within visually sensitive areas (e.g. provincial highways and riparian areas) (Map 19 – Visually Sensitive Areas, Appendix E):

- Harvest impact will be visually dominant in the local landscape;
- Harvest impact will allow for significant viewscapes directly into the local harvest area;
- Harvest impact will maintain scenic diversity.

[7] The Cold Lake Air Weapons Range was created in 1952. It is provincial crown land (Alberta and Saskatchewan) on long term lease to the federal government. It is the only tactical bombing range in Canada and is an attractive training area for fighter aircraft crews from around the world. In a recent press release (August 2005), the Alberta Environmental Network issued a statement and a call to the Alberta and federal governments calling for recognition of the Cold Lake Air Weapons Range as a potential major contributor to protected areas within the boreal forest and worthy of detailed ecological studies leading to some form of formal 'protection' status (http://www.aenweb.ca/node/489).

With the exception of jack pine forest types, VQOs will be achieved by strategic placement of variable size retention patches and single trees. Local topography and existing forest structural diversity within and adjacent to the harvest blocks will be used to maintain scenic diversity.

11. Public participation and involvement in forestry planning and implementation;

In collaboration with nine advisory / co-management groups (Figure 6.88), Mistik seeks to understand local economic, social and ecological values and plan forestry operations in a manner that addresses local concerns as meaningfully as possible. Mistik has recently implemented a 'forest values' survey that is undertaken by participants in advisory / co-management groups. The results of the survey (Appendix D) serve to provide an indication as to the satisfaction of participants with Mistik's approach to involving the public and accommodating non-timber values. Periodically during the year, Mistik places a public advertisement in several local papers inviting the public to comment on any environment-related issues they perceive to be associated with Mistik's forestry activities. Mistik also ensures that identified site-specific values and 'special places' are identified spatially on operational maps so that the core values are explicitly addressed in planning and implementation (Map 18 – Special Places, Appendix E).

Figure 6.88 Mistik staff and members of Big Island Lake Cree Nation on a forestry field tour

12.Voluntary certification to international environmental and sustainable forest management standards;

Mistik's adherence to various internationally recognized forest certification standards[8] serves to provide a highly effective suite of environmental and sustainable forest management accountability mechanisms that are regularly audited through self-inspection and 3rd party audits demonstrating continuous improvement in the planning and operational implementation of forestry activities.

6.11 ARCHAELOGICAL AND HERITAGE VALUES

The Mistik FMP area has been inhabited by humans for approximately 8,000 years. The first settlers are suspected to have arrived in the area via either an ice bridge across the Bering Strait or over a land bridge that was revealed due to low sea levels during the last ice age. Subsequent population growth and settlement within the FMP area occurred during the fur trade (ca. 1780s) and most recently, in the last century, with agricultural and forest fringe settlement associated with European immigrants. The significant number of sites of archaeological, heritage and cultural significance within the FMP area is indicative of the long history of human presence and settlement in the area. A number of these sites (Figure 6.89) (wagon trails, portage routes, cabin sites, etc.) are of continued significance to local communities.

Figure 6.89 An old cabin site

Over 300 sites of heritage significance have been identified in the Mistik FMP area (Map 20 – Heritage Sites, Appendix E) including many pre-contact sites (Table 6.3 Important cultural and historical sites within the Mistik FMP area). Pre-contact refers to the time before Europeans had arrived in the region. Table 6.3 shows these sites classified by site type, period, the culture to which the site is attributed and the numbers of similar sites within the FMP area. The terms "Euro-Canadian", "Métis", "Indian" and

[8] ISO 14001 (2004) / CSA Z809-08 (2005) / FSC (2006)

"Dene" refer to the period after the arrival of Europeans to the area. The other cultures are archaeological descriptions largely based on the style of projectile points. Sites that list more than one culture have been occupied by different cultures over time. Mistik had worked closely with Western Heritage Services Inc. of Saskatoon in assessing forestry plans for impacts to archaeological and heritage resources. Western Heritage Services Inc. has assisted several of the First Nations in the Mistik FMP area in locating, assessing and interpreting sites of heritage significance. Mistik, in partnership with Western Heritage, has completed archaeological studies in the FMP area since 1992 until 2011.

Table 6.3 Important cultural and historical sites within the Mistik FMP area

Site Type	Period/Affiliation	Culture	Total Sites
Artifact find	Precontact		112
Artifact find	Precontact	Middle Precontact - McKean Complex	1
Artifact find	Precontact	Middle Precontact	2
Artifact find	Precontact	Late Precontact	2
Artifact find	Postcontact	European	2
Artifact find	Postcontact	Historic First Nations	1
Artifact scatter	Precontact		75
Artifact scatter	Precontact	Early Precontact - Late Palaeo, Late Precontact - Early Talthelei	1
Artifact scatter	Precontact	Middle Precontact - McKean Complex	1
Artifact scatter	Precontact	Middle Precontact - Pelican Lake, Late Precontact - Besant	1
Artifact scatter	Precontact	Late Precontact	12
Artifact scatter	Precontact	Late Precontact - Besant	1
Artifact scatter	Precontact	Late Precontact - Selkirk	1
Artifact scatter	Precontact and Postcontact	Late Precontact, Postcontact	1
Artifact scatter	Precontact and Postcontact	Late Precontact, Historic First Nations	2
Artifact scatter	Postcontact		4
Artifact scatter	Postcontact	Historic First Nations	1
Burial or suspected burial	Precontact		1
Burial or suspected burial	Postcontact	Historic First Nations	2
Burial or suspected burial	Postcontact		2
Artifacts and features	Precontact		11
Artifacts and features	Precontact	Late Precontact	12
Artifacts and features	Precontact and Postcontact		2
Artifacts and features	Precontact and Postcontact	Precontact, European	2
Artifacts and	Precontact and	Precontact, Historic First Nations	1

Site Type	Period/Affiliation	Culture	Total Sites
features	Postcontact		
Artifacts and features	Precontact and Postcontact	Precontact, Metis	1
Artifacts and features	Precontact and Postcontact	Late Precontact, Historic First Nations	2
Artifacts and features	Precontact and Postcontact	Late Precontact, Postcontact	1
Artifacts and features	Postcontact	European	7
Artifacts and features	Postcontact	Historic First Nations	1
Artifacts and features	Postcontact		1
Features	Precontact		2
Features	Precontact and Postcontact		1
Features	Postcontact	Historic First Nations	8
Traditional Cultural Locations	Postcontact	Historic First Nations	3

Source: Saskatchewan Culture, Youth and Recreation. Heritage Resources Branch

In Saskatchewan, heritage resources are addressed under the *Heritage Property Act*. The objectives of the *Act* are to encourage the preservation of Saskatchewan's heritage. Specifically, the *Act* states:

> *63 (1) Notwithstanding any other Act, where the minister is of the opinion that any operation or activity which may be undertaken by a person is likely to result in the alteration, damage or destruction of heritage property, he may require that person to:*
>
> *(a) carry out an assessment to determine the effect of the proposed operation or activity on that heritage property;*
>
> *(b) prepare and submit to the minister a report containing the assessment mentioned in clause (a); and*
>
> *(c) undertake any salvage, preservation or protective measures, or any other action, that the minister may specify.*

Several examples of heritage sites on the Mistik FMP area include:

Burness Road

The Burness Road site (FkOa-1) was encountered on an existing forestry road. Additional forestry disturbance was planned for the location of the site as a timber stockpile location. This was a particularly large heritage site and is the single largest heritage-related excavation within the FMP area. A Pelican Lake point (Figure 6.90) was found on the surface of the fresh road cut while a Besant Point was found at a later time during the excavation (~ 1,500 to 2,000 yrs before present).

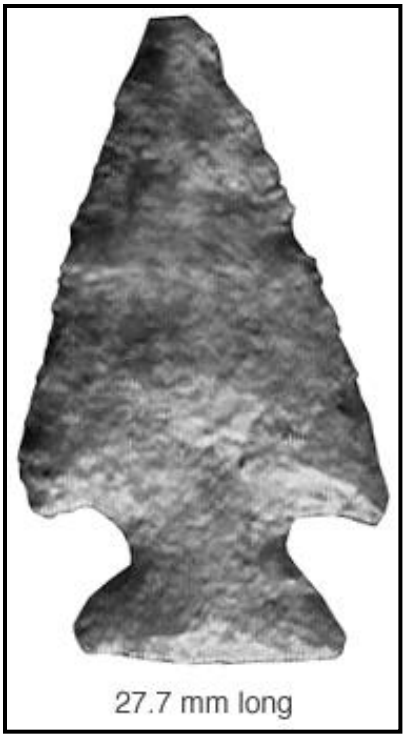


Figure 6.90 A Pelican Lake point

Kenny Site

The Kenny Site (GbOf-27) is located on the north side of the Beaver River. The site was located on an existing road bed (non-Mistik). Mistik was intending to use the existing access infrastructure to harvest mistletoe-infected jack pine. A short segment of the road bed was excavated (Figure 6.91). Four projectile points (Figure 6.92) were recovered all of which fit within the McKean assemblage (~ 3,000 to 4,000 yrs before present) of points. Mistik re-routed their access to avoid impact to the site.

Figure 6.91 The Kenny site

Figure 6.92 McKean points found at the Kenny site

Alcott Creek

The Alcott Creek Site (FlOb-3) (Figure 6.93) was located on a proposed forestry road where it was to cross Alcott Creek. Shovel tests and surface mapping were completed and on the basis of the findings, the road was relocated. A Besant point was located here.

Figure 6.93 Evidence of a hearth found at the Alcott Creek site

Tatukose Creek

The Tatukose Road #1 Site (GdOk-5) was discovered in an existing road cut associated with construction of the Tatukose Road on July 26, 1994. This was a small lithic reduction work site. No diagnostic artifacts were recovered.

Upper Cumins

The Upper Cumins site (GiOf-1) was located near Highway 903 on the west bank of an unnamed tributary of Cumins Lake. This site was found during an examination of an upgraded creek crossing of this access road. This was also a lithic reduction work site.

Table 6.4 provides a brief description of the characteristics of each of the pre-contact cultures for which there are artifacts or historic sites.

Table 6.4 Descriptions of Aboriginal cultures

Culture	Age	Comment
Clearwater Lake	600-300 years BP*	Defined by Clearwater lake pottery, thought to be ancestors of Cree peoples.
Taltheilei	2600 BP to Historic	Ancestors of modern day Dene
Besant	2000 to 1150 BP	Predominantly a plains culture
Pelican Lake	3300-1850 BP	Predominantly a plains culture
McKean	4100-3100 BP	Predominantly a plains culture, possible origins within Great Basin region
Late Paleo-Indian	8800-7500 BP	End of the Paleo-Indian period, characterized by a number of spear point styles

*BP=Before Present
Source: Saskatchewan Culture, Youth and Recreation. Heritage Resources Branch.

The fur trade has been an important part of the history of the Mistik FMP area since the first Europeans arrived in the area. A number of historical fur trading posts existed in the Mistik FMP area and were originally established as early as 1775 (Table 6.5).

Table 6.5 Recorded fur trading posts within the Mistik FMP area

Borden Number	Site Name	Affiliation	Dates
GiNx-5	Gregory-McLeod Post	Independent	1775-1787
GiNx-6	Frobisher-Pond Post	North West Company	1776-1791
GiNx-1	Fidler's Post	Hudson's Bay Company	1809-1812
GiNx-2	Fort Superior	Hudson's Bay Company	1820-1843 or 46
GiNw-1	Fort Black	XY Company	1800-1805+
GlOe-1	Old Fort Point	HBC and NWC	1790-1791

Source: Saskatchewan Culture, Youth and Recreation. Heritage Resources Branch.

6.12 PROVINCIAL PARKS

There are a number of provincial parks within the region of the Mistik FMP area. There are three provincial parks in the vicinity of the Mistik FMP area: Clearwater River Provincial Park, Makwa Lake Provincial Park and Meadow Lake Provincial Park. Steele Narrows National Historic Site is also in the area. These three provincial parks are in the North West Parks Region that also includes Bronson Forest Recreation Site, Chitek Lake Recreation Site, West Boreal Recreation Site, Makwa Area Recreation Site and Chitek Area Recreation Site. These recreation areas are also not within the Mistik FMP area, but are near enough to have some effect on the economy of the area.

Clearwater River Provincial Park is a natural environment park located to the north of the Mistik FMP area that provides opportunities for hiking, fishing, picnicking and canoeing. There are limited facilities at this park due to its remote location. Makwa Lake Provincial Park is less remote than Clearwater River and provides many recreation facilities including more than 250 campsites. Facilities for boating, fishing, cross-country skiing, golf and other activities are located in the park. Meadow Lake Provincial Park is the most popular provincial park in the area. The park encompasses more than 1,600 square km in area and has more than 20 lakes. There are more than 900 campsites in 12 public campgrounds. There are an additional 200 sites at nearby private campgrounds. The park has facilities for a wide variety of recreational pursuits such as fishing, golf, hiking, snowmobiling, swimming, golf, horseback riding, etc.

The parks and recreation areas of the North West Parks Region had an estimated 412,835 visitors (15% of the total visits to provincial parks) in 2003. Throughout the provincial park system there were 2,675,661 visitors in 2003.[9] Of the 412,835 visitors, 237,793 are considered tourist visitors because they traveled more than 80 km to reach the park. Expenditures by park visitors in the North West Region were $14 million in 2003, yielding a GDP impact of $6.4 million. Almost 200 full-time equivalent jobs were created by this recreation activity.[10] The expenditures by park visitors in the North West Parks Region accounted for 32% of total visitor expenditures in provincial parks in 2003. Most of the $14 million in expenditures in the region were for visits to Meadow Lake Provincial Park.

6.13 ABORIGINAL HUNTING

Hunting is both an important source of food and an important cultural and social activity for Aboriginal people within the Mistik FMP area. A Mistik FMP area-related study by Dosman *et al.* (2001) included interviews with a sample of trappers and hunters (many interviewees participated in both activities) in the FMP area.[11] The number of Aboriginal hunters in each community was estimated based on the number of trappers determined from Saskatchewan Ministry of Environment statistics. The number of hunters was estimated by multiplying the number of trappers in each community by a factor of 3-4.[12] Based on this, the estimate of the number of Aboriginal hunters in selected FMP area communities is given in Table 6.6. In Dosman *et al.* (2001), they point out that the number of trappers in the area has declined over time but there has not been a corresponding decline in the number of Aboriginal hunters.

---

[9] Derek Murray Consulting Associates. August, 2004. Economic and Social Impact Assessment of Saskatchewan's Provincial Parks. Prepared for Saskatchewan Environment.

[10] Ibid.

[11] Dosman *et al.* 2001. *Assessing Impacts of Environmental Change on Aboriginal People: An Economic Examination of Subsistence Resource Use and Value*. Project Report #02-01. Department of Rural Economy, University of Alberta.

[12] Based on personal communication between Dosman and McKay from Saskatchewan Environment.

Table 6.6 Estimated number of Aboriginal hunters in selected FMP area communities (1999)

Community	Number of Aboriginal Hunters
Green Lake	48-64
Beauval	78-104
Waterhen	60-80[13]
Canoe Narrows region	96-128
Dillon	33-44
TOTAL	**315-420**

Mistik has been unable to obtain updated information for the 2017 20-Yr Forest Management plan submission.

Of the harvesters surveyed in Dosman *et al.* 2001, moose was the most popular species with 96% of respondents indicating that they harvest moose. Over 92% of respondents harvest deer, 41% harvest elk and 25% harvest woodland caribou. The average number of animals harvested per hunter did not vary much between 1995 and 1999, but there were large differences between the average numbers harvested among the communities in the survey (Table 6.7).

Table 6.7 Average number of animals harvested per harvester (n=124) and highest and lowest community averages

		Year				
Species	**Ranking**	**1995**	**1996**	**1997**	**1998**	**1999**
Moose	Average	1.31	1.31	1.4	1.3	1.1
	Highest	2.67	2.74	3.17	3.0	2.42
	Lowest	0.63	0.73	0.70	0.57	0.37
Deer	Average	1.99	2.04	2.16	2.27	2.23
	Highest	6.11	6.11	6.33	6.22	6.33
	Lowest	1.00	1.07	1.37	1.37	1.41
Caribou	Average	0.073	0.008	0	0.008	0.024
	Highest	0.31	0.2	0	0.2	0.22
	Lowest	0	0	0	0	0
Elk	Average	0.032	0.024	0.024	0.024	0.024
	Highest	0.15	0.083	0.083	0.33	0.33
	Lowest	0	0	0	0	0
Bear	Average	0.081	0.11	0.13	0.15	0.15
	Highest	0.21	0.2	0.31	0.42	0.42
	Lowest	0	0.033	0	0.05	0

Source: Dosman *et al.* 2001. Assessing Impacts of Environmental Change on Aboriginal People: An Economic Examination of Subsistence Resource Use and Value. Project Report #02-01. Department of Rural Economy, University of Alberta.
Mistik has been unable to obtain updated information for the 2017 20-Yr Forest Management plan submission.

Deer was the most harvested animal with an average of 2.42 animals taken per hunter in 1999. Moose was second with an average of 1.1 animals per hunter. Bear, caribou and elk had much lower harvesting rates of 0.15, 0.024 and 0.024 animals per hunter respectively. Multiplying the average number of moose per harvester, and the estimated number of hunters in the selected FMP area communities, the number of moose harvested in 1999 by Aboriginal hunters from those communities would be between 346 and 462 animals. The number of deer harvested would be between 762 and 1,016, bear would be between 47 and 63, and caribou and elk would be between 7 and 10 each.

[13] Norman Martel (Waterhen Lake band member) has indicated that the actual number of hunters from Waterhen is significantly higher than that indicated in the Dosman *et al.* 2001 study.

The value of moose to the hunters can be estimated by using the replacement cost technique. Based on the estimated value of beef (the replacement product) a 25% reduction in moose harvest would be valued by hunters at $800 per year (Dosman *et al.* 2001). Therefore, a 25% reduction in the moose harvest by Aboriginal hunters in the FMP area would be a loss to those hunters of between $252,000 and $336,000 per year. In another study eliciting attitudes towards game resources, the researchers found that people living in the Mistik FMP area would be willing to pay about $10 each for a 5% increase in the moose population in the area and about $13 each for a 5% increase in the population of caribou (Shapansky, 2001).[14] Extrapolating these figures to the regional population of people 20 years and older, the value of a 5% increase in the moose population is about $159,000. For caribou, the value is about $206,000.

6.14 SPORT HUNTING

There is a longstanding culture of sport hunting among the non-Aboriginal residents of the Mistik FMP area and there is a substantial industry directed towards non-resident hunters from other parts of Canada and from the United States. The primary species sought after for sport hunting are white-tailed deer and moose. Black bear and elk are also sought by sport hunters. Game birds including water fowl and grouse are also pursued by sport hunters in the area but compared to the big game animals, the effort and expenditures related to sport hunting of birds is negligible. The most important species in terms of hunter effort and number of animals harvested is white-tailed deer. Commercial outfitting is also a source of employment and income in the Mistik FMP area. In 2005 there were approximately 55 registered bear and 70 white-tailed deer outfitters operating within the Mistik FMP area.

In 2003, there were an estimated 1,867 Saskatchewan resident white-tailed deer hunters who spent a total of 11,050 hunter days (5.9 days/hunter) active in the vicinity of the Mistik FMP area[15]. In 1996 the average expenditure per hunter was estimated to be $45 (~ $50 in 2003 when adjusted for inflation) per hunter day.[16] This figure was based on average provincial expenditure per hunter day. Using the $50/hunter day figure, Saskatchewan resident hunter expenditures on white-tailed deer hunting within the vicinity of the Mistik FMP area amounted to about $552,500 in 2003.

In 2003, there were an estimated 1,587 non-resident (guided) white-tailed deer hunters who spent a total of 6,009 hunter days (3.8 days/hunter) active in the vicinity of the Mistik FMP area. Non-resident hunters are reported to pay as much as $500 to $1,000/hunter day for guided hunting[17]. Based on an average expenditure of $750/hunter day, non-resident hunter expenditures on white-tailed deer hunting within the vicinity of the Mistik FMP area amounted to about $4.5 million in 2003. In summary, approximately $5 million was spent hunting white-tailed deer in the vicinity of the Mistik FMP area in 2003.

In 2003, there were an estimated 205 Saskatchewan resident bear hunters who spent a total of 782 hunter days (3.8 days/hunter) active in the vicinity of the Mistik FMP area[18]. Using the $50/hunter day figure, Saskatchewan resident hunter expenditures on bear hunting within the vicinity of the Mistik FMP area amounted to about $39,100 in 2003.

[14] Shapansky, B., W. Adamowicz and P. Boxall. 2001. Measuring Forest Resource Values: An assessment of choice experiments and preference construction methods as public involvement tools. Project Report -2-03. Dept. of Rural Economy (Agricultural and Resource Economics), University of Alberta. Edmonton, Alberta. 36 pp.

[15] Al Arsenault, Provincial Ungulate Population Biologist, Saskatchewan Environment.

[16] Environment Canada: Economic benefits of nature-related activities for residents of Saskatchewan (1996). (http://www.environment.gov.sk.ca/Default.aspx?DN=2e16e8a2-93d2-4bcb-9d5a-c5987a6c4681)

[17] Based on communication with local white tailed deer outfitters and guides

[18] Al Arsenault, Provincial Ungulate Population Biologist, Saskatchewan Environment.

In 2003, there were an estimated 816 non-resident (guided) bear hunters who spent a total of 3,018 hunter days (3.7 days/hunter) active in the vicinity of the Mistik FMP area. Based on an average expenditure of $750/hunter day, non-resident hunter expenditures on bear hunting within the vicinity of the Mistik FMP area amounted to about $2.3 million in 2003. In summary, approximately $2.3 million was spent hunting bear in the vicinity of the Mistik FMP area in 2003.
Moose is the second most important sport hunting species in terms of hunter days in the vicinity of the Mistik FMP area. In 2003, there were an estimated 1,198 Saskatchewan resident white-tailed deer hunters who spent a total of 5,572 hunter days (4.6 days/hunter) active in the vicinity of the Mistik FMP area. Using the $50/hunter day figure, Saskatchewan resident hunter expenditures on moose hunting within the vicinity of the Mistik FMP area amounted to about $278,600 in 2003.

The southern part of the FMP area provides the majority of the sport hunting opportunities for moose and deer. Sport-hunting related expenditures are significant within the vicinity of the Mistik FMP area and totaled ~ $7.3 million in 2003.
Mistik has been unable to obtain updated information for the 2017 20-Yr Forest Management plan submission.

6.15 WILD FUR HARVESTING

In 1946, northern Saskatchewan was divided into 89 Fur Conservation Areas (FCAs) for the purposes of recovering the beaver population and managing and administering trapping lines in a manner that would reduce conflicts and maintain the commercial viability of trapping.[19] Of these 89 FCAs, 17 of the FCAs have some overlap with the Mistik FMP area. In 2013, ~ 6,510 pelts were harvested[20] from these FCAs worth a total cash value of ~ $305,524 which is equivalent to an average price per pelt of ~ $48.00. Trapping is still a major cultural and commercial activity within the Mistik FMP area. Table 6.8 shows the estimated number of trappers in several communities within the FMP area for the years 2009-2012.[21]

Table 6.8 Estimated number of trappers in selected communities

Community	2009	2010	2011	2012
Green Lake	16	13	20	13
Beauval	26	27	25	12
Waterhen	8	9	14	5
Canoe Narrows Region	34	36	29	24
Dillon	8	11	12	4
TOTAL	**92**	**96**	**100**	**58**

Source: Saskatchewan Ministry of Environment.

The revenue from trapping during the period 2009-2013 for trappers in the FMP area ranged from $104 thousand in 2009 up to $306 thousand in 2013 (Table 6.9). The average annual revenue per trapper from 2009 to 2013 was ~ $1,971.00.

Table 6.9 Number of pelts, values, and price per pelt in FCAs associated with the Mistik FMP area from 2009-2013

Statistic	2009	2010	2011	2012	2013
# of Pelts	7,081	5,382	9,040	7,183	6,510

[19] *Saskatchewan Fur Program: Summary of Regulations, Policy and Associated Programs*. Saskatchewan Environment. http://publications.gov.sk.ca/documents/66/76577-15f85859-9ba5-40a5-b448-244f4cfd7998.pdf) Accessed 30/09/05

[20] Refer to Figure 6.49

[21] This table is based on Saskatchewan Environment & Resource Management data

Statistic	2009	2010	2011	2012	2013
# of Trappers	93	97	131	126	155
Value	104,379	145,136	330,660	394,744	305,524
Price per Pelt	15	27	37	55	48
Revenue per Trapper	1,122	1,496	2,524	3,133	1,971

Source: Saskatchewan Ministry of Environment & Resource Management

Animals trapped in the region include beaver, coyote, fisher, fox, lynx, mink, muskrat, otter, weasel, squirrel and wolf. The average number of each species trapped per trapper varies from year to year and the range of the average for each species among communities is large. Of the trappers surveyed in Dosman *et al.* 2001, muskrats had the highest average trapping rate per trapper and wolves had the lowest. Beaver was the second most trapped species (Table 6.10). Trapping rates tend to fluctuate more than hunting rates due to changes in the price of pelts. The figures represent the average for all communities in the study.

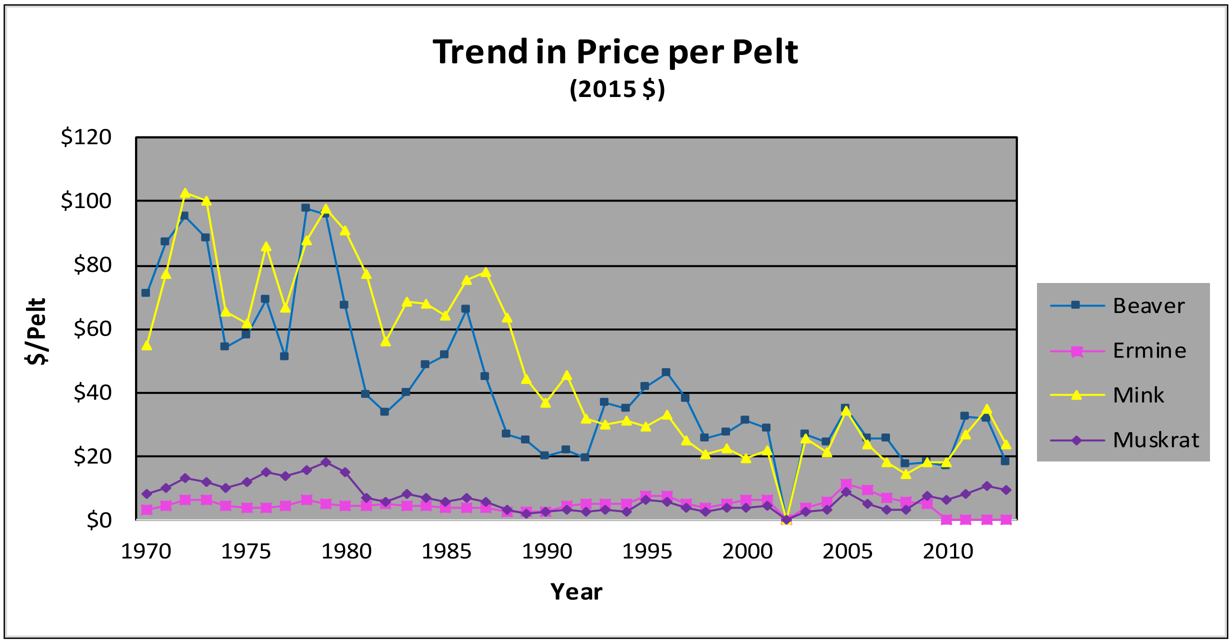
Table 6.10 Average number of animals trapped per trapper[a] (based on interviews)

Species		2009	2010	2011	2012	2013
Beaver	Average	19.03	12.99	13.16	12.77	8.93
	Highest	51.83	34.25	43.33	48.33	21.20
	Lowest	2.00	0.00	0.66	0.00	0.53
Coyote	Average	7.97	6.42	6.81	8.00	8.81
	Highest	29.33	36.67	26.67	48.67	68.00
	Lowest	0.00	0.00	0.00	0.00	0.00
Fisher	Average	3.54	3.25	4.50	3.55	5.17
	Highest	9.00	9.83	9.05	7.33	12.50
	Lowest	0.00	0.00	2.00	0.00	1.00
Fox	Average	0.45	0.66	0.83	0.83	0.47
	Highest	1.67	2.25	3.13	3.67	1.48
	Lowest	0.00	0.00	0.00	0.00	0.00
Lynx	Average	0.55	1.38	2.10	2.17	2.30
	Highest	3.50	6.50	11.95	6.72	6.50
	Lowest	0.00	0.00	0.00	0.00	0.00
Mink	Average	2.26	1.57	1.21	1.18	1.07
	Highest	8.45	9.67	5.27	7.46	3.50
	Lowest	0.00	0.00	0.00	0.00	0.00
Muskrat	Average	29.56	11.02	21.47	14.45	14.56
	Highest	110.00	46.33	64.11	73.46	48.00
	Lowest	0.40	0.00	0.00	0.00	0.00
Otter	Average	0.84	0.90	1.23	0.55	1.11
	Highest	2.33	1.61	3.00	2.33	4.00
	Lowest	0.00	0.25	0.00	0.00	0.00
Weasel	Average	2.52	2.02	1.91	1.46	2.32
	Highest	13.83	9.83	9.73	5.50	11.60
	Lowest	0.00	0.00	0.00	0.00	0.00
Wolf	Average	0.70	0.39	0.34	0.17	0.42
	Highest	2.33	2.00	1.37	1.40	2.50
	Lowest	0.00	0.00	0.00	0.00	0.00

[a]Based on a sample of 88 trappers interviewed

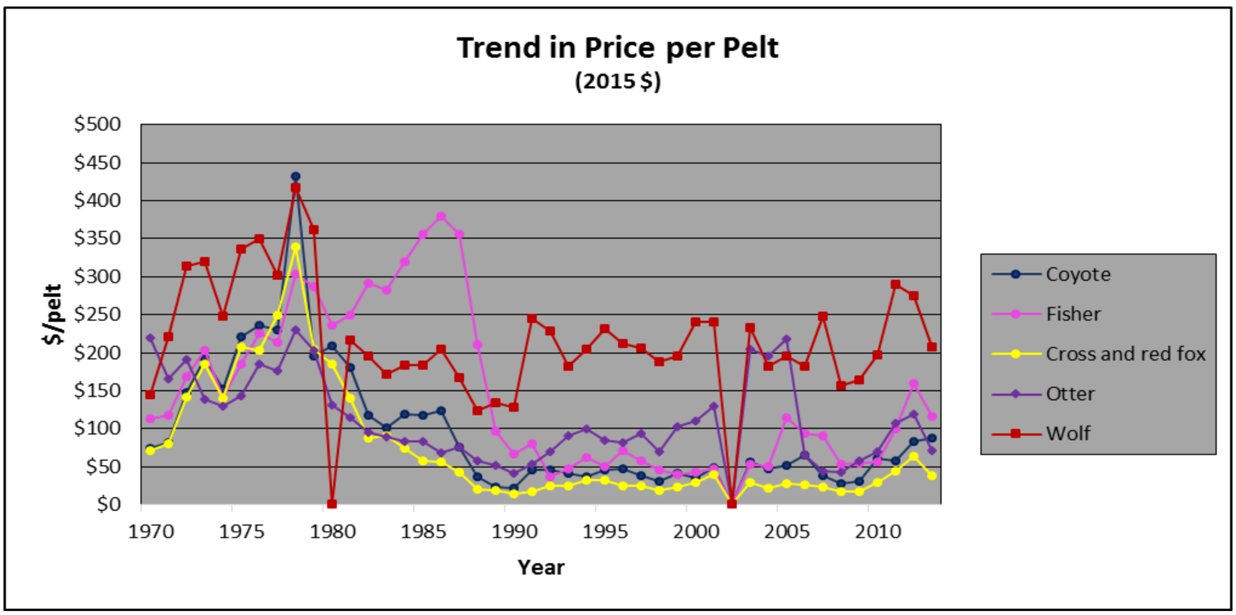
Prices for pelts vary widely among species and from year to year. For example, the price for wolf pelts was $26.97 in 1996 and $114.17 in 1997. Prices are influenced by a number of supply and demand factors. Changing societal values has also influenced the demand for furs.

Figure 6.94 to Figure 6.96 show the price per pelt for important species in Saskatchewan in 2015 dollars. The prices are generally lower today in real terms than in the 1970s and 1980s. A notable exception to this is the price for wolf pelts which increased from $103 per pelt in 1990 to $208 per pelt in 1991 (Figure 6.95). The price stayed within the $150-$200 range for the rest of the 1990s.



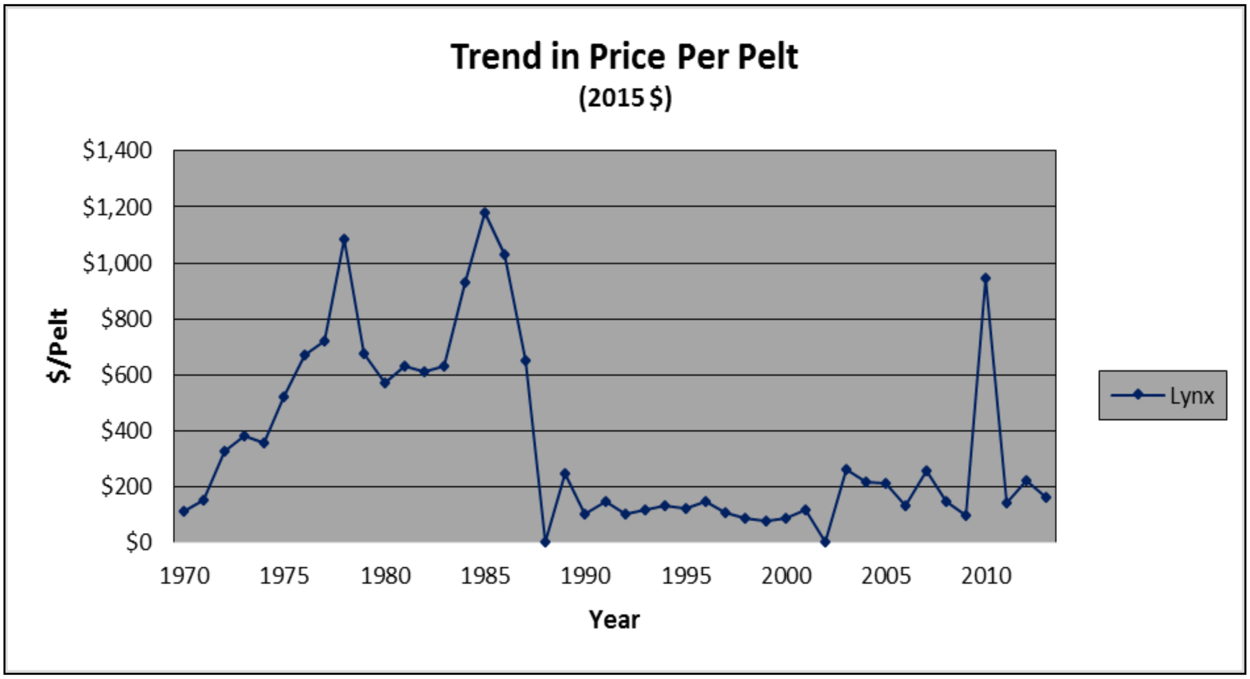
Source: Statistics Canada CANSIM Table 003-0013

Figure 6.94 Price per pelt in Saskatchewan for selected species ($2015)



Source: Statistics Canada CANSIM Table 003-0013

Figure 6.95 Price per pelt in Saskatchewan for selected species ($2015)



Source: Statistics Canada CANSIM Table 003-0013

Figure 6.96 Price per pelt in Saskatchewan for selected species ($2015)

6.16 NON-TIMBER FOREST PRODUCTS

Aside from timber, the forest is important to FMP area residents for food, spiritual and cultural purposes. Dosman *et al.* 2001 report that in their study of several of the northern communities associated with the Mistik FMP area, almost ninety percent of hunters surveyed identify the forest as important for food and over eighty-five percent felt it was important for cultural purposes. Over half responded that it was also important for spiritual purposes but only one fifth felt it was important for recreational activities. The importance of the forest is partly due to the non-timber forest products that it produces.

There are a number of non-timber forest products used by residents within the FMP area. These include medicinal plants, berries, mushrooms and wild rice. Some are more important or more widely harvested than others. Dosman *et al.* 2001 report that over 87% of surveyed individuals make use of berries while less than one percent harvest conifer cones (likely associated with Mistik's infrequent conifer seed collection program). Three-quarters of respondents harvest firewood from their areas and more than half of the interviewees indicate harvesting forest products for medicinal use. Harvest of mushrooms and wild rice is also fairly prevalent with about 30% of interviewees making use of those nontimber resources.

6.17 BERRIES

Blueberries and other forest-related foods are important foodstuffs for residents within the Mistik FMP area. There is not much data on the quantity of berry consumption for subsistence use within the FMP area but one estimate is 11,400 kg/year.[22] The total estimated harvest of wild berries in Saskatchewan in 1990 was 21,600 kg, providing income to berry pickers of between $82,000 and $96,000.[23] According to data gathered for the Pinehouse Planning Project, berries represent approximately 3.5% of Aboriginal subsistence diet with per capita consumption of approximately 4 kg/year.[24]

6.18 WILD RICE

Wild rice (Z*izania palustris*) is a non-native plant that has been introduced into a number of the lakes and waterways of the Mistik FMP area. Wild rice production has recently become an important source of income for FMP area residents. Wild rice can be considered an organic foodstuff because in Canada it is grown and processed without the use of chemical fertilizers or pesticides. Nutritionally, wild rice is unusual among cereals in that it is high in protein and the amino acid lysine. It is also high in fibre and starch as well as riboflavin and niacin.[25]

Harvest in the Mistik FMP area was very low in 2004 at only 106,000 kilograms. In 2003 the harvest was 597,000 kilograms and the ten-year average was 429,000 kilograms. The number of wild rice producers in the region has averaged 87 over the period 1991-2001 with the highest being 138 in 1999 (Table 6.11). This corresponded with the highest output over the period from 1995-2004 with production of 838,000 kilograms and with the highest recorded output per producer over that time period at 6,075 kg/producer. 1999 was not a high-price year with a producer price of $1.54/kg. The average producer price for the period 1995-2004 was $1.57/kg (Table 6.12). The production from Saskatchewan and the Mistik FMP area region is a significant proportion of Canadian production and so it is possible that there is some market power in that high production from the area will reduce the national price (Table 6.13). In 2000, the Western wild rice producing region of Saskatchewan that corresponds closely with the Mistik FMP area, accounted for 37% of Canada’s wild rice production and 55% of Saskatchewan’s production. The lowest proportion of production from the Western region compared to Saskatchewan came in 2002 with only 28% of the provincial total. The lowest proportion of production compared to the national production came in 1996 and 1997, with only 18% of the national total. The average proportion of Western Saskatchewan production to the provincial production is 38% and the average proportion of national production is 26%. Historically, about half of Canada’s wild rice production is exported with about 80% of the exports going to the United States. Germany receives about 8% of the exports and Denmark and the Netherlands about 3% each with the rest going to other countries.[26]

[22] G. Ivanochko. Saskatchewan Agriculture and Food.

[23] Canada-Saskatchewan Partnership Agreement in Forestry. State of the Resource Report: Province of Saskatchewan Integrated Forest Resources Management Plan. 1993. p.86-90

[24] Pinehouse Planning Project. Bush harvest surveys. Pinehouse planning project Technical Appendix 1. 1987. Pinehouse, Saskatchewan. 111p.

[25] https://naldc.nal.usda.gov/download/29993/PDF.

[26] Ibid

Table 6.11 Number of wild rice producers in Saskatchewan by region 1991-2001

Year	Western*	Central	Eastern	Total
1991	96	53	67	216
1992	103	42	63	208
1993	95	37	25	157
1994	91	35	19	145
1995	101	28	33	162
1996	76	29	57	162
1997	55	19	42	116
1998	115	38	60	213
1999	138	47	66	251
2000	NA	NA	NA	NA
2001	94	28	46	168
Average	87	33	43	163

*The Western region corresponds closely with the boundaries of the Mistik FMA. Mistik has been unable to obtain updated information from the province of Saskatchewan for the 2017 20-Yr Forest Management plan submission.
Source: Saskatchewan Agriculture and Food

Table 6.12 Wild rice harvest in the vicinity of the Mistik FMP area 1995-2004

Year	Production (kg)	Number of Producers	Production per Producer (kg/producer)	Producer Price ($/kg)	Value of Production ($)
1995	424,875	101	4,207	$1.65	$701,044
1996	275,612	76	3,626	$1.43	$394,125
1997	223,014	55	4,055	$1.65	$367,973
1998	638,782	115	5,555	$1.69	$1,079,542
1999	838,338	138	6,075	$1.54	$1,291,041
2000	298,438	NA	NA	$1.54	$459,595
2001	361,758	94	3,848	$1.54	$557,107
2002	558,260	NA	NA	$1.54	$859,720
2003	298,438	NA	NA	$1.54	$459,595
2004	361,758	NA	NA	$1.54	$557,107
Average	**427,927**	**97**	**4,561**	**$1.57**	**$671,845**

Source: Saskatchewan Agriculture and Food. Mistik has been unable to obtain updated information from the province of Saskatchewan for the 2017 20-Yr Forest Management plan submission.

Table 6.13 Saskatchewan Western Region* wild rice production compared to Saskatchewan and Canada production 1995-2004

Year	Saskatchewan ('000 kg)	% of Saskatchewan	Canada ('000 kg)	% of Canada
1995	1,170	36	2,068	21
1996	876	31	1,517	18
1997	483	46	1,255	18
1998	1,591	40	1,977	32
1999	1,984	41	2,636	31
2000	575	55	847	37
2001	997	36	1,360	27
2002	2,002	28	2,682	21
2003	1,519	38	2,200	26
2004	330	32	425	25

Year	Saskatchewan ('000 kg)	% of Saskatchewan	Canada ('000 kg)	% of Canada
Average	**1,153**	**38**	**1,697**	**26**

*The Western Region defined by Saskatchewan Agriculture and Food closely approximates the boundaries of the Mistik FMP area.
Source: Saskatchewan Agriculture and Food. Mistik has been unable to obtain updated information from the province of Saskatchewan for the 2017 20-Yr Forest Management plan submission.

6.19 WILD MUSHROOMS

Wild mushrooms are another of the natural foods consumed for subsistence purposes or picked for sale by residents associated with the Mistik FMP area. Species harvested for commercial sale include morels, chanterelles and pine mushrooms. The quantity of morel mushrooms harvested varies greatly from year to year depending on the weather and the forest fire situation. Morels will grow well and the harvest can be potentially large the year after a forest fire. There was no morel crop in 2001 and 2002 due to the lack of forest fires but it has rebounded somewhat in the following years although the 2004 harvest of 18,200 kg in 2004 was only one third of the 2000 harvest of 56,000 kg. 1999 saw a large morel harvest as well because of a large area of burned forest in 1998. In 1999 and 2000, morels were harvested almost exclusively in the Western region, which corresponds closely to the Mistik FMP area. The harvest in the Western Region since 2000 has been negligible due to the lack of forest fires and otherwise unfavourable weather conditions. The value of the morel harvest to pickers ranged from zero in 2001 and 2002 to $950,000 in 1999. The price per kilogram for pickers was reasonably steady with a high of $13/kg in 2000 to a low of $9/kg in 2003. Wholesale value is estimated to be three times that of the picker price (Table 6.14).

Table 6.14 Saskatchewan morel mushroom harvest 1999-2004

Year	Volume (kg)	Picker Value	Price per kg	Wholesale Value
1999	86,000	$950,000	$11	$2,850,000
2000	56,000	$702,400	$13	$2,107,200
2001	0	$0	$0	$0
2002	0	$0	$0	$0
2003	16,000	$140,000	$9	$420,000
2004	18,000	$200,000	$11	$600,000

Source: Saskatchewan Agriculture and Food. Mistik has been unable to obtain updated information from the province of Saskatchewan for the 2017 20-Yr Forest Management plan submission.

The other two wild mushrooms of commercial significance in northern Saskatchewan are chanterelles and pine mushrooms. These two species are harvested almost exclusively in the Central Region of the province and therefore the harvest from the Western Region is negligible. Chanterelles are not as sensitive to environmental factors as morels and so the potential harvest is more constant. The picker value of chanterelles ranged from $79,500 in 2004 to $258,700 in 2000. Picker price ranged from $7/kg in 2004 to $13/kg in 2002 and 2003.

Pine mushrooms have in the past had the highest price of the three commercial wild mushroom species in Saskatchewan. The volume harvested has been significantly lower than that of morels or chanterelles with a peak harvest during the period 1999-2004 of 6,800kg in 2002. The lowest harvest during that period was 230 kg in 1999 and 2004. Picker value ranged from $2,000 in 2004 to $90,000 in 2002. The picker price per kilogram varied more than that of the other two species with a low of $9/kg in 2004 to a high of $22/kg in 1999.

The market price of the species of wild mushrooms harvested in Saskatchewan is largely set by the harvest levels in British Columbia which has a much larger harvest of morels and chanterelles. The majority of these mushrooms are exported to Japan where retail price for pine mushrooms has reached $400/kg in the past. Prices are much lower now, particularly for the pickers. The variability of the yield of the mushroom crop from year to year plus the cost of travel to picking locations affect pickers. Thus, in periods of poor yield or high fuel prices, pickers must have alternate activities to provide income.[27]

6.20 OIL AND GAS

There are currently 38 active gas wells within the Mistik FMP area. In 1995 there were 109 active gas wells within the area. Drilling activity has increased greatly in the area up to 2008 but the removal of the Bronson Management Unit in 2002 from the Mistik FMP area reduced the number of wells falling within the FMP area.

In addition to the active wells, there are 85 abandoned gas wells, 2 abandoned oil wells, 46 abandoned stratigraphic test wells, 3 cased gas wells, 11 completed gas wells, 2 abandoned downhole gas wells and 7 suspended gas wells.

6.21 RANGELAND AND FORAGE PRODUCTION

Agricultural producers in the forest fringe area of the Mistik FMP area use Crown land for grazing cattle as well as for some forage production. In 2005, there were 610 tonnes of forage produced within the Mistik FMP area compared to 1,725 tonnes for the provincial forest as a whole. The production of forage from the Mistik FMP area represented 35% of the provincial forest total. Total forage production from Crown forest land has decreased sharply from a peak of 5,538 tonnes in 2002 to 1,725 tonnes in 2005. Production of forage from the Mistik FMP area has also declined since 2002 but this was the result of the removal of the Bronson and Green Lake Management Units from the FMP area.

The Crown collects dues for the right to harvest forage from provincial forest. The rate has been $1/tonne for the Mistik FMP area. The Crown dues collected in 2005 for the Mistik FMP area was $610. In 2005 there were approximately 800 head of cattle grazing within the Mistik FMP area. The removal of the Bronson and Green Lake Management Units from the Mistik FMP area has reduced the number of head of cattle grazing within the FMP area considerably.

The Crown charges agricultural producers a fee based on the number and type of animals they are grazing. The vast majority of the animals are cows and cow/calf pairs, but there are also some yearlings, bulls and horses. The average fee paid per head over the period 1996-2005 for the Mistik FMP area was $4.99/head. The highest fee per head in the Mistik FMP area was $6.08/head in 1996 and the lowest was $3.74/head in 2003. The total dues collected for the Mistik FMP area was approximately $3 thousand in 2005.

6.22 MINING AND MINERAL RESOURCES

Saskatchewan is rich in mineral resources with large deposits of potash, uranium and other minerals. There is no known mineral extraction within the Mistik FMP area. However, within the Mistik FMP area, there are large tracts of peatlands that could be extracted for commercial use. Peat has traditionally been used as an energy source and in horticultural applications as a soil amendment. While there is currently no

[27] Non-Timber Forest Products: Economic Development While Sustaining Our Northern Forests. 2002. Saskatchewan Environmental Society.

commercial extraction of peat from the Mistik FMP area, peat is being exported to the US, Japan and Europe from other parts of Canada. As of 2002, there were 74 peat extracting establishments in Canada employing 1,528 people and with revenues of $271 million.[28]

6.23 COMMERCIAL FISHING

There is a significant commercial fishery within several of the large lakes and waterways within, and adjacent to, the Mistik FMP area. Refer to Section 5.1 Fish Values for data about lakes, fish species and kilograms of harvest.

6.24 SPORT FISHING

There is a significant amount of sport fishing activity within the Mistik FMP area. The province is broken down into three different Fisheries Management Zones (FMZs): South, Central and North. The FMZs are further broken down into survey areas and the Mistik FMP area overlaps three of these survey areas: Southwest Central, Northwest Central and North Central. There are large areas within these fisheries survey areas that are not within the Mistik FMP area but data specifically for lakes and rivers within the FMP area are not available.

In terms of angling effort, the three survey areas combined accounted for 32% of total angling effort in the province, 29% of resident angling effort and 53% of non-resident angling effort (Table 6.15).

Table 6.15 Number of angler-days expended by active adult anglers for Mistik FMA fisheries survey areas and province

Survey Area	Resident			Non-resident			Total
	Licensed	Senior	Total	Canadian	Other	Total	
North Central	188,059	15,967	204,026	40,019	35,188	75,207	279,233
Northwest Central	89,063	8,561	97,624	38,022	1,594	39,616	137,240
Southwest Central	200,460	20,794	221,254	29,097	1,912	31,009	252,263
Subtotal	477,582	45,322	522,904	107,138	38,694	145,832	668,736
Province	1,629,880	159,419	1,789,299	162,059	113,118	275,177	2,064,476

Source: Saskatchewan Ministry of Environment 2000 Survey of Sport Fishing in Saskatchewan. Mistik has been unable to obtain updated information from the province of Saskatchewan for the 2017 20-Yr Forest Management plan submission.

Approximately 22% of the adult angler-days within the three survey areas were contributed by non-resident anglers, of which 16% were Canadian. 71% of the angler-days were by licensed resident anglers and 7% were senior resident anglers. Total angling effort has decreased in the North Central survey area since 1980 but in the Northwest and Southwest Central survey areas, the angling effort increased until 1990 and decreased thereafter (Table 6.16). Overall angling effort has decreased since 1980.

Table 6.16 Angler-days for the Mistik FMP area and province and as a percentage of provincial angling effort 1980-2000

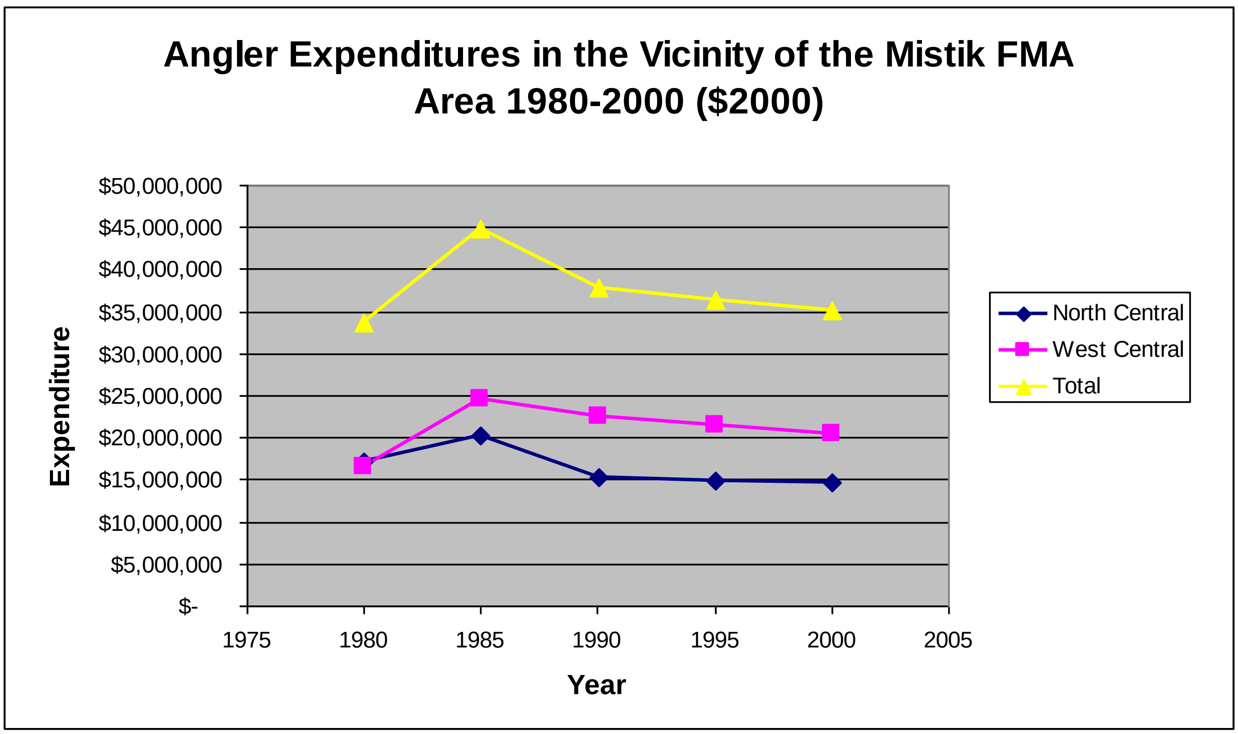
Fishing Area	1980	1985	1990	1995	2000
North Central	399,477	365,679	329,033	317,886	279,234
West Central*	382,200	445,632	485,385	462,145	389,504
Subtotal	781,677	811,311	814,418	780,031	668,738

[28] CANSIM Table 152-0005 Principal Statistics of Mineral Industries by North American Industrial Classification System (NAICS). NAICS code 212397.

Fishing Area	1980	1985	1990	1995	2000
Province	2,071,685	1,946,043	2,317,681	2,234,248	2,064,476

*Comprised of Southwest and Northwest Survey Areas. Mistik has been unable to obtain updated information from the province of Saskatchewan for the 2017 20-Yr Forest Management plan submission.
Source: Saskatchewan Ministry of Environment 2000 Survey of Sport Fishing in Saskatchewan

Expenditures by sport fishers are directly related to angling effort and in 2000, total expenditures province-wide on sport fishing were $108 million. The total number of angler days in 2000 was 2,064,476 for a daily average expenditure of $52.39. On a yearly basis, the amount spent per angler varies widely based on the category of license the angler holds. Resident anglers spent an average of $439 per year on sport fishing related expenses including food and lodging, transportation, guides, supplies and boats. Non-Canadian, non-resident anglers spent an average of $1,807 per year on sport fishing in Saskatchewan. Multiplying the number of angler-days in the survey areas in which the Mistik FMP area is located by the average daily expenditure gives a total expenditure on sport fishing within the Mistik FMP area and adjacent areas of $35 million in 2000. In 2000, resident anglers spent an average of 13.8 days fishing while Canadian non-resident anglers spent 7.6 days. Other non-resident anglers (primarily Americans) spent an average of 5.5 days fishing. Based on this information, the number of resident anglers was about 38,000 in 2000, the number of Canadian non-resident anglers was about 14,000 and the number of other non-resident anglers was about 7,000. Using the average annual expenditures of the different types of anglers, resident anglers spent $16.6 million in the three fishing survey areas in 2000, Canadian non-resident anglers spent $9.1 million and other non-resident anglers spent $12.7 million for a total of $38.4 million. In real terms, angler expenditures peaked in 1985 and have declined slowly since that time (Figure 6.97).



Source: Saskatchewan Ministry of Environment 2000 Survey of Sport Fishing in Saskatchewan

Figure 6.97 Angler expenditures in the vicinity of the Mistik FMA area

6.25 ROADS

6.25.1 ROAD CONSTRUCTION

Approximately 7,246 km of road have been built within the Mistik FMP area (Figure 6.98) from 1988 to 2016 (an average of 250 km per year). From 1997 to 2016, approximately 4,550 km of road (an average of 261 km per year) have been built. For the ten-year period 2007 to 2016, approximately 1,650 km was built. The peak road building year occurred in 1999 with 477 km of road built.

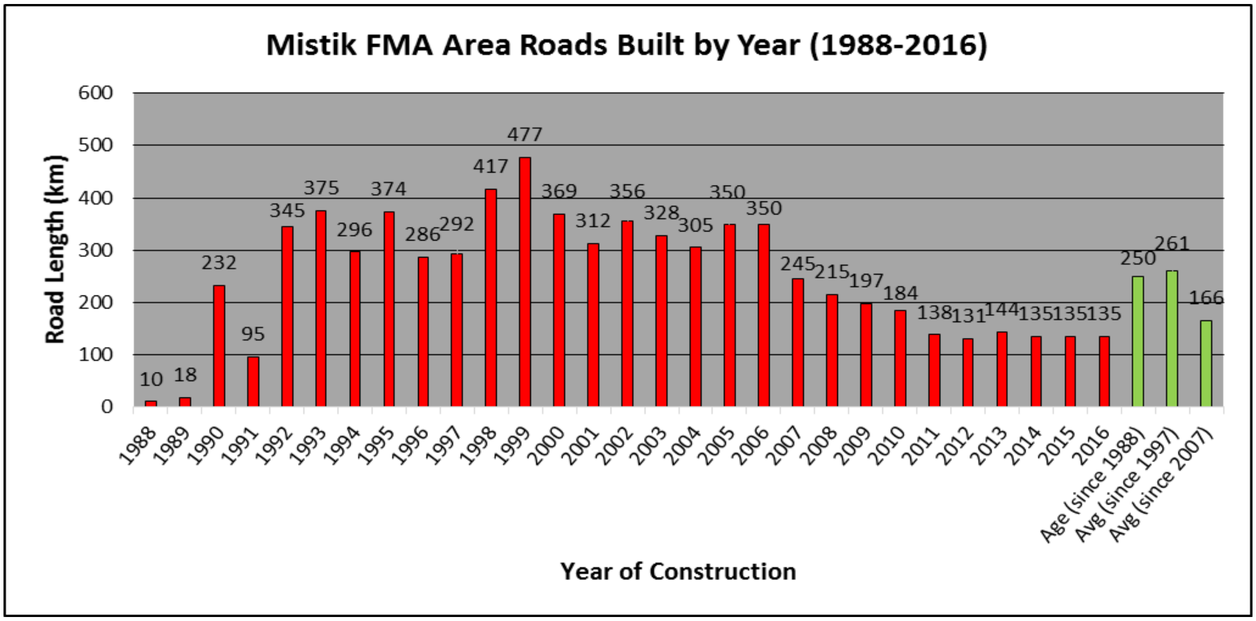


Figure 6.98 Road length by year for the Mistik FMA area for the period 1988 to 2016 (years 2014 to 2016 are estimates)

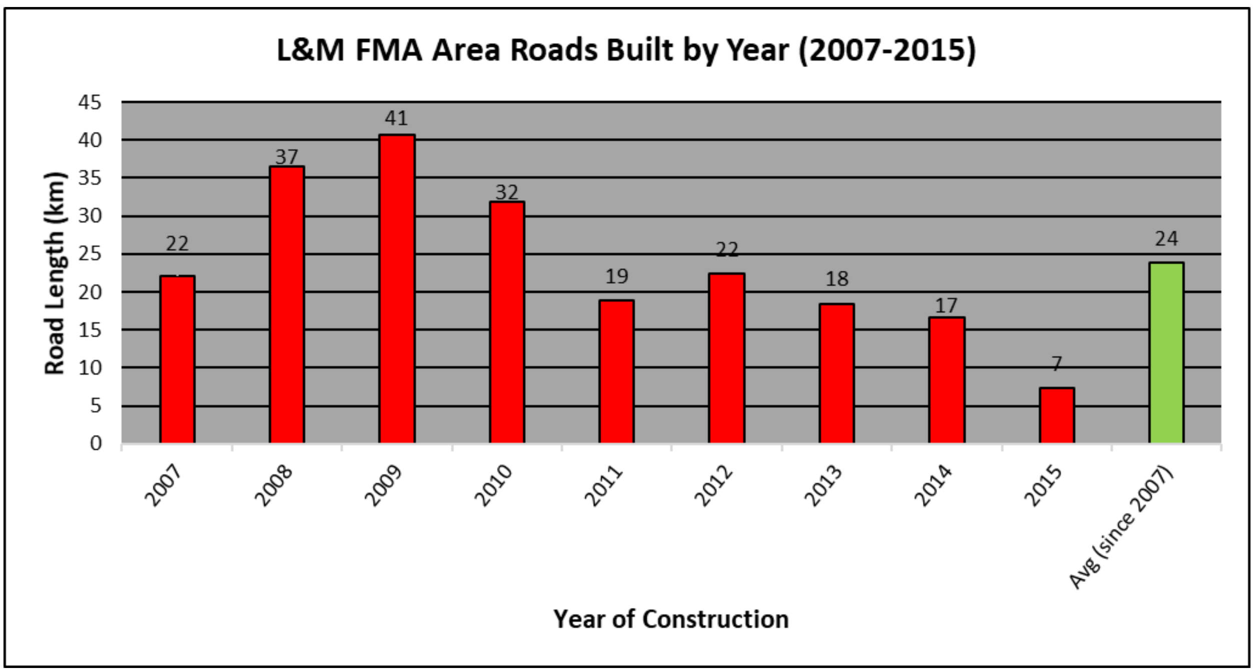


Figure 6.99 Road length by year for the L&M FMA area for the period 2007 to 2015

Figure 6.100 shows the total length of road constructed by management unit for the period 1988 to 2016. The least amount of road building activity has occurred in the 20-Beaver River, 09-Ile a la Crosse and 21-Peter Pond management units. The most road building activity has occurred in the 01-Divide, 04-Waterhen and 02-Pierceland management units.

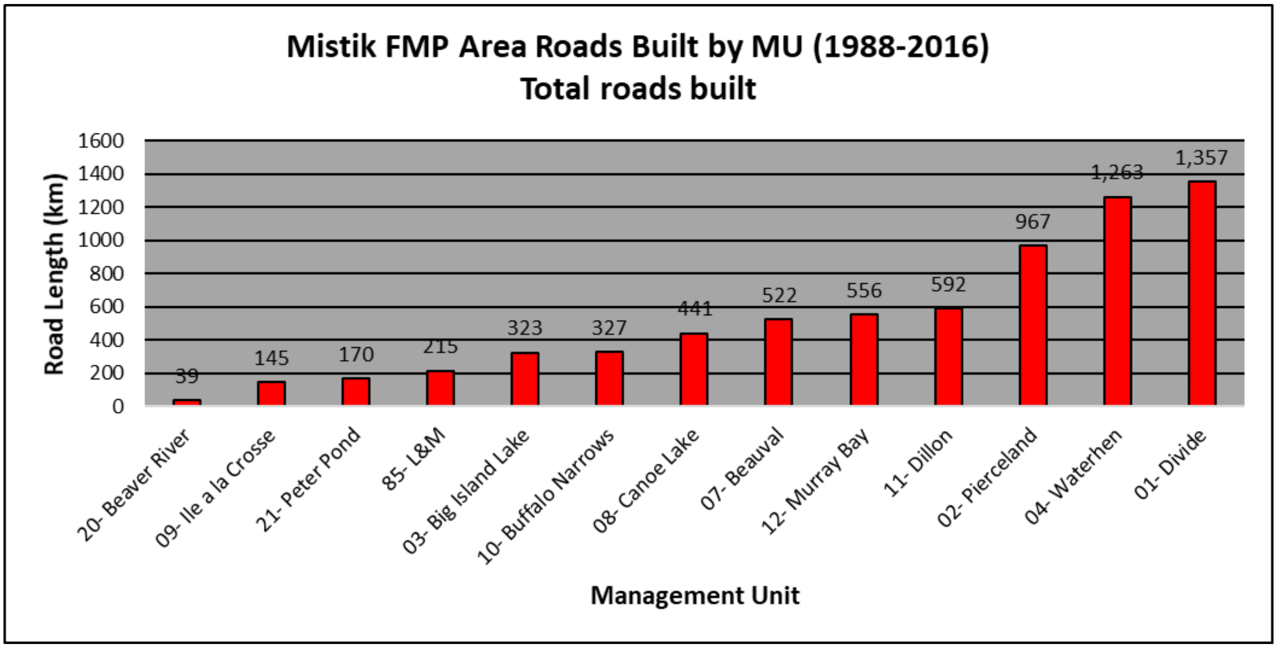


Figure 6.100 Road length built by MU for the Mistik FMP area for the period 1988 to 2016 (estimated for years 2014 to 2016)

There is a significant difference between the length of road forecast to be built on an annual basis for the period 2007 to 2016[29] and the actual road built for the same period (Figure 6.101). The total length of road forecast (~ 2500 km) for construction in the 1997 plan is almost twice the length of road actually built (~ 1,600 km) for the period 2007 to 2016. Over 90% of the actual roads built (on a km basis) by Mistik from 2007 to 2014 were Class 3 forestry roads (Figure 6.102 and Table 6.17). Class 1 and Class 2 forestry roads collectively comprise a small portion (< 10%) of Mistik's road network at 1% and 8%, respectively. The amount of Class 1 and 3 roads actually built during the period 1997 to 2016 was very close to the proposed road development for the same period. The outstanding difference between proposed and actual road construction, for 2007 to 2016, was in relation to Class 2 roads. Only a small fraction of the proposed amount of Class 2 road was actually built.

[29] Table 19. New road construction requirements for the NorSask Forest, pg. 60, Volume 1 (Part A), The NorSask Forest Management Project

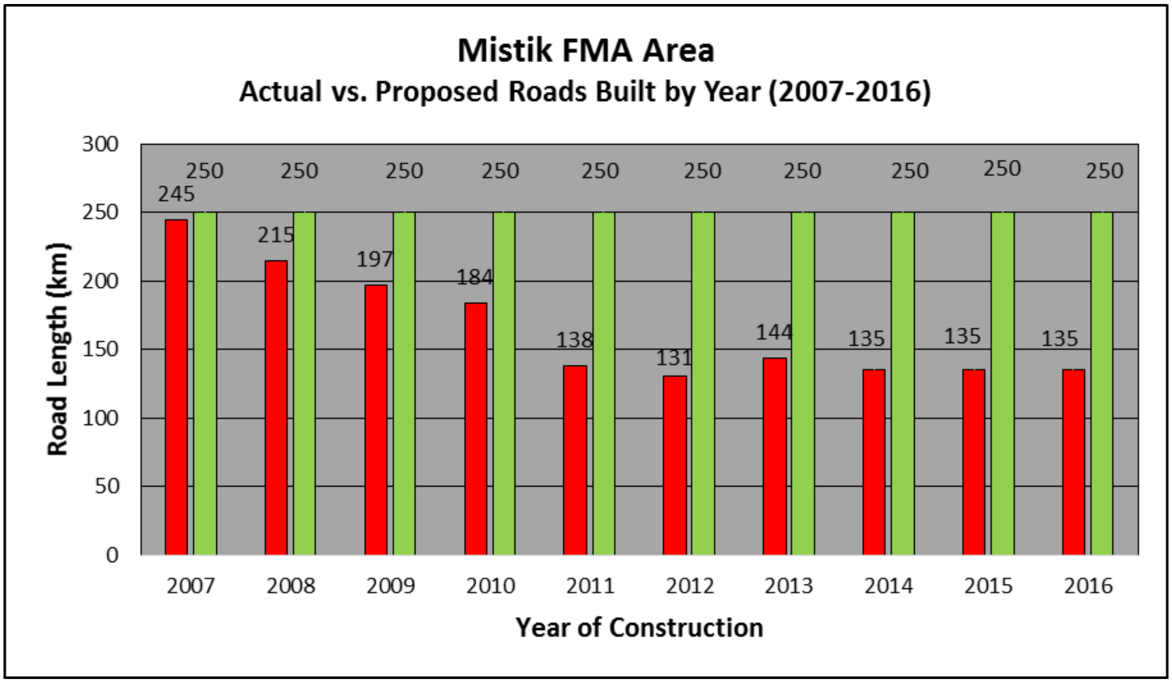


Figure 6.101 Actual (green) vs. proposed (red) road construction by year for the Mistik FMA area for the period 1997 to 2016 (values for 2014 to 2016 are estimates)

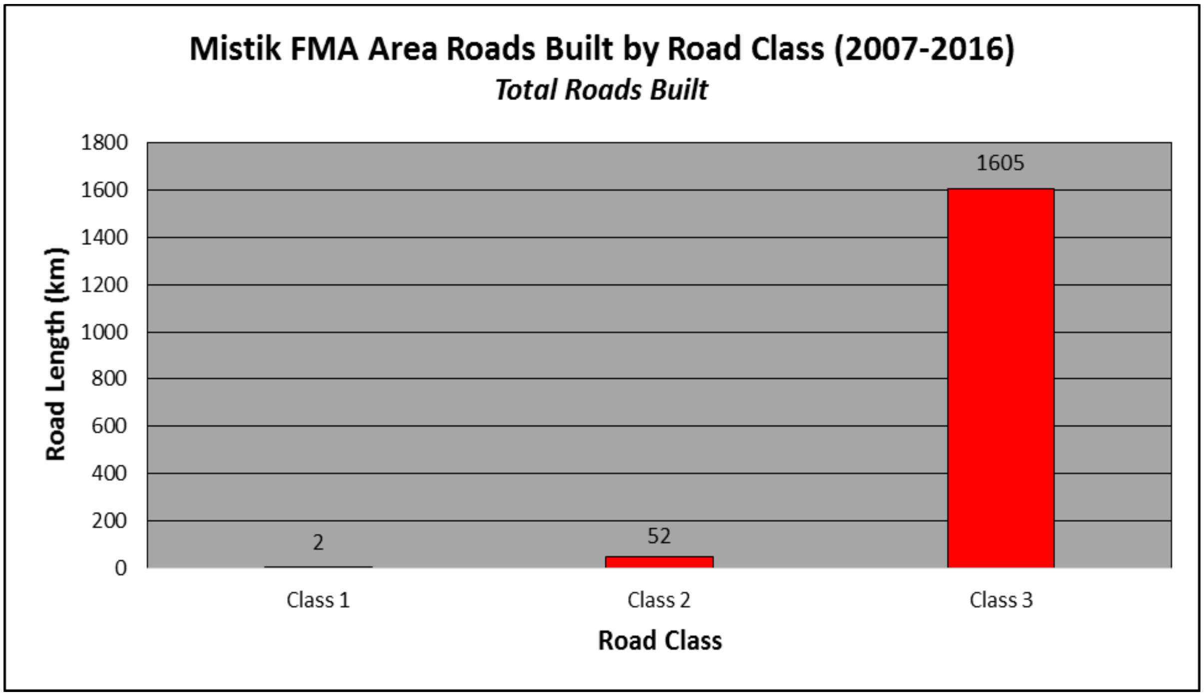


Figure 6.102 Mistik FMA Area Roads built by road class (values included for years 2014 to 2016 are estimates)

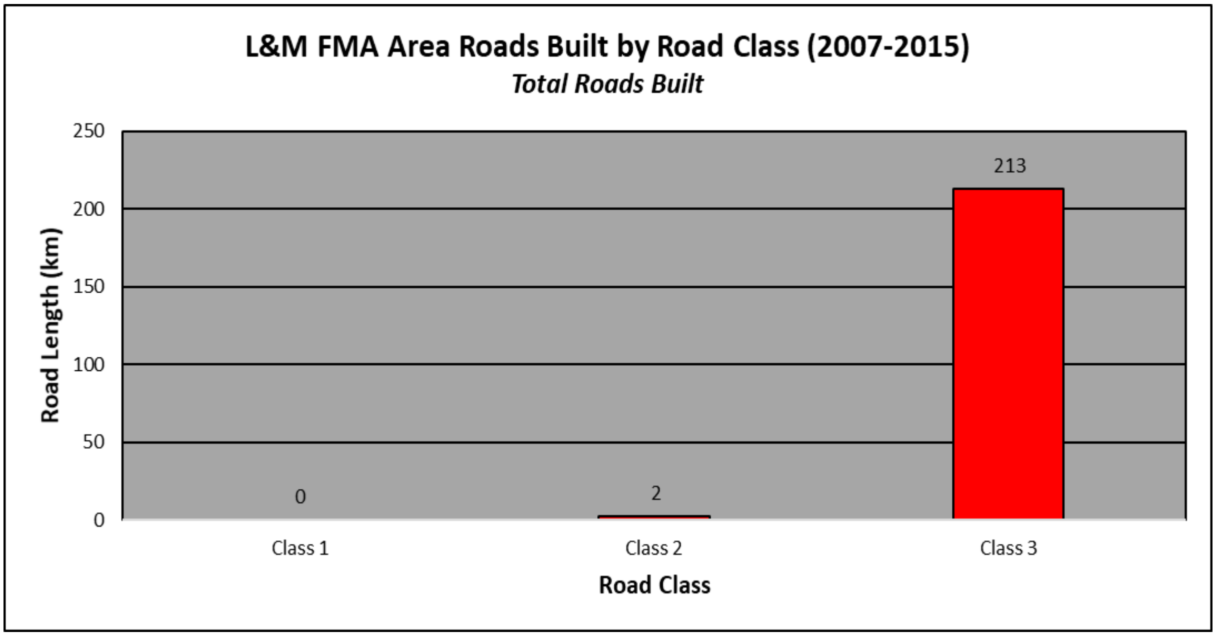


Figure 6.103 L&M FMA Area Roads built by road class

Table 6.17 Actual vs. proposed road length built by road class for the Mistik FMP area for the period 1997 to 2016 (values for 2014 to 2016 are estimates)

Provincial Road Class	Actual (km)	Proposed (km)	Difference (Actual – Proposed) (km)
Class 1	41	30	11 (divide)
Class 2	294	3,395	(3,101)
Class 3	3,226	3,105	121
Grand Total	3,561	6,530	(2,969)

6.25.2 ROAD RECLAMATION

Approximately 3,780 km of road (provincial Class 3) was reclaimed within the Mistik FMP area for the period 1988 to 2016. Approximately 1,900 km of provincial Class 3 road was reclaimed for the ten-year period 2006 to 2016 (Figure 6.104). The peak road reclamation year occurred in 2004 with 413 km of road reclaimed.

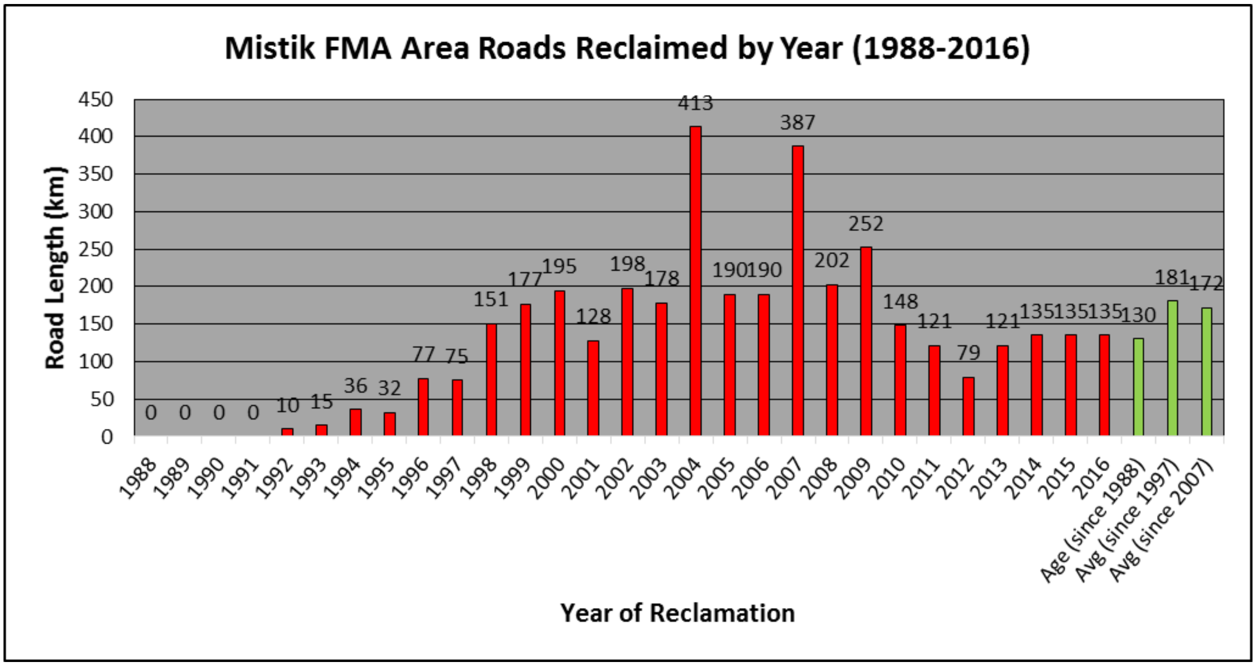


Figure 6.104 Road length reclaimed in the Mistik FMA area for the period 1988 to 2016 (values for 2014 to 2016 are estimates)

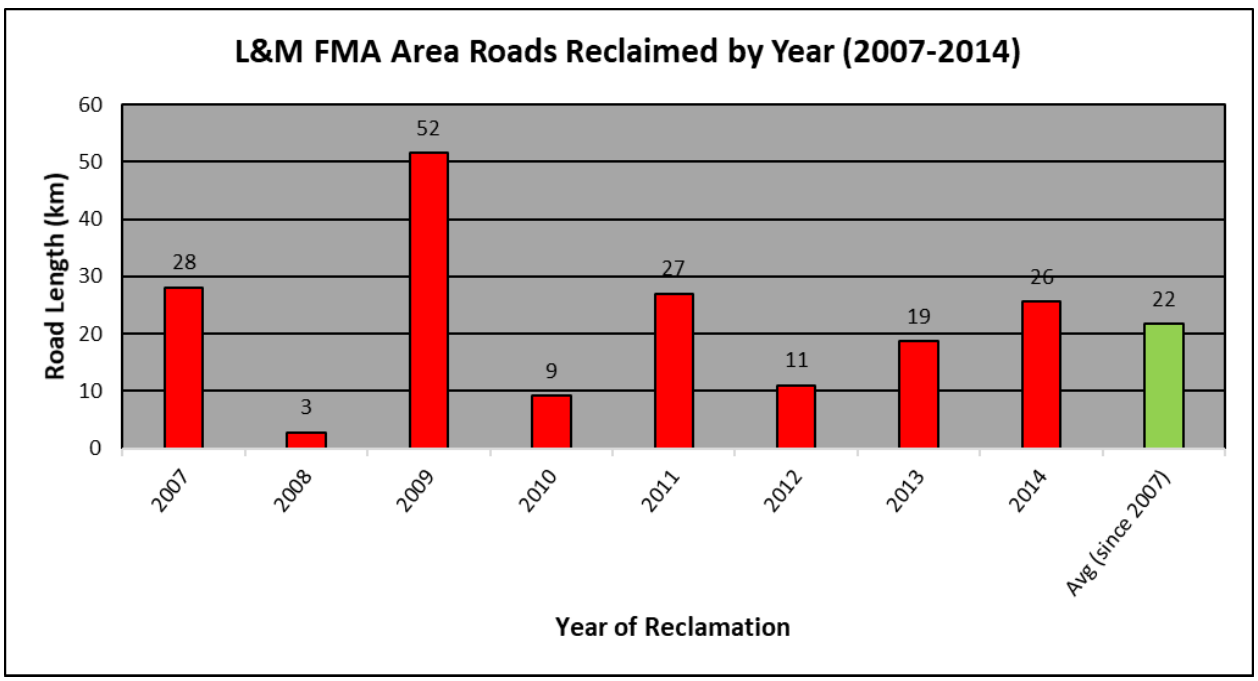


Figure 6.105 Road length reclaimed in the L&M FMA area for the period 2007 to 2014

Figure 6.106 shows the total length of road reclaimed by management unit for the period 1988 to 2016. The least amount of road reclamation activity has occurred in the 20-Beaver River, 21-Peter Pond and 09-Ile a la Crosse management units. The most road reclamation activity has occurred in the 01-Divide, 07-Beauval and 04-Waterhen management units.

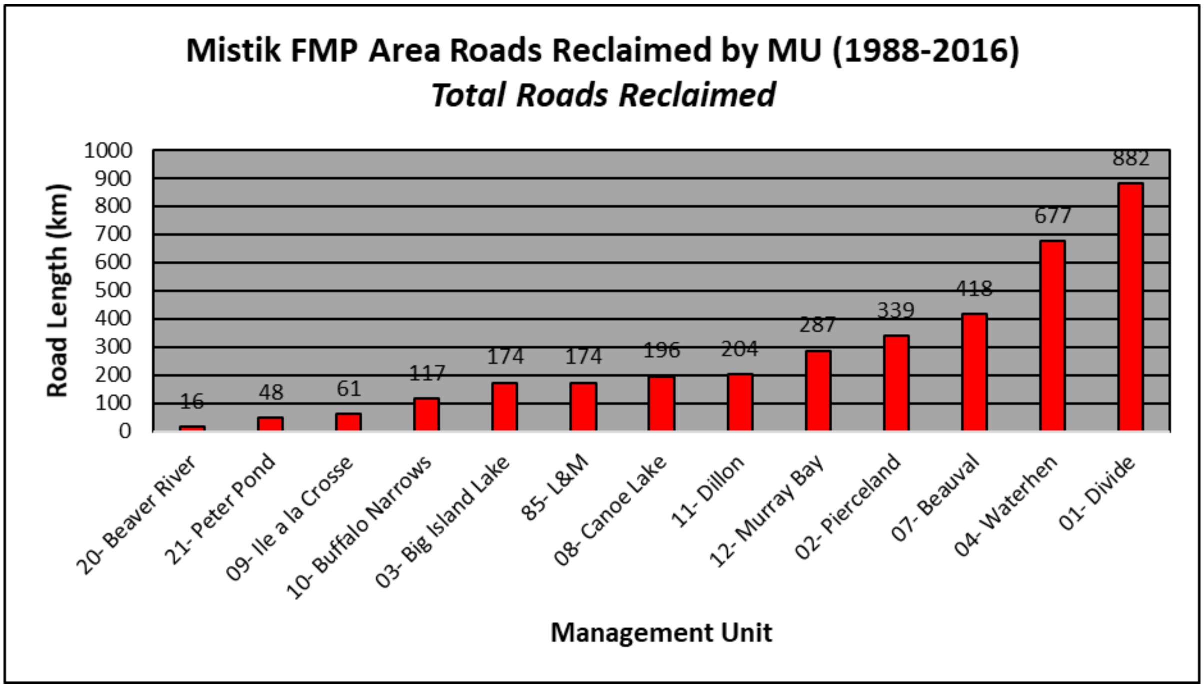


Figure 6.106 Road length reclaimed by MU in the Mistik FMP area for the period 1988 to 2016 (values included for 2014 to 2016 are estimates for Mistik management units)

6.26 WATERCOURSE CROSSING STRUCTURES

Mistik utilized approximately 1,300 watercourse crossing structures within its existing road network (this equates to ~ 1 watercourse structure per 4 km of road). The majority (79%) of crossing types are culverts (Figure 6.107).

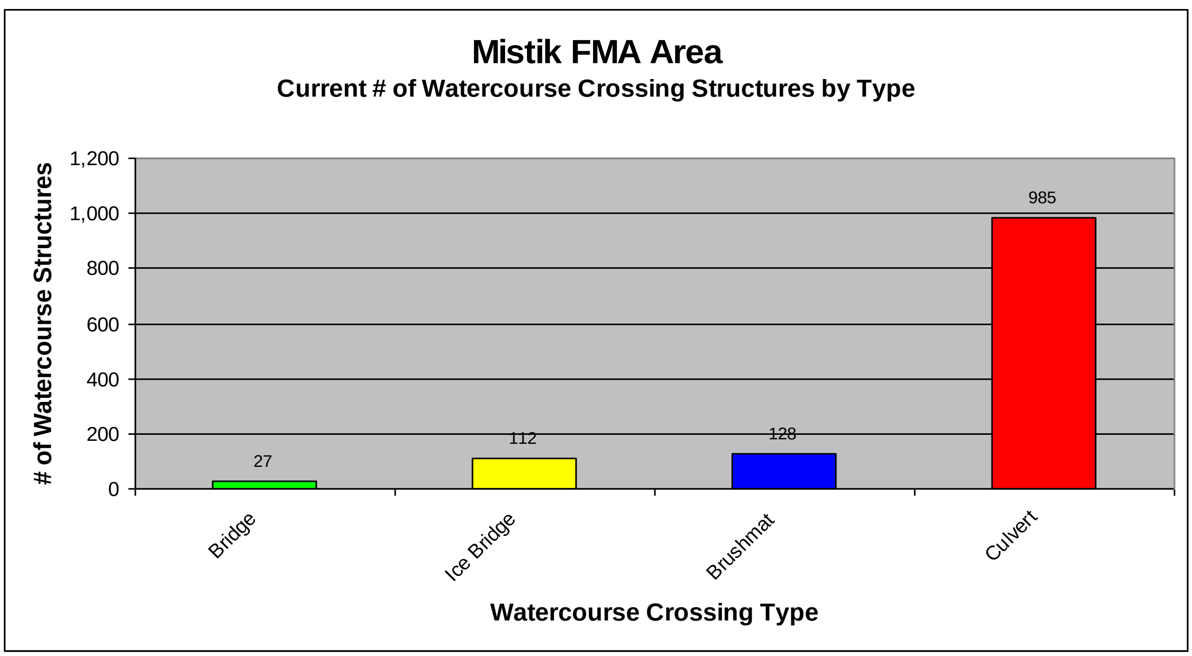


Figure 6.107 Current # of existing watercourse crossing structures in the Mistik FMA area

Figure 6.108 shows the total number of existing watercourse crossing structures by management unit. The least amount of watercourse crossing structures has been installed in the 20-Beaver River, 09-Ile a la Crosse and 07-Beauval management units. The most amount of watercourse crossing structures have been installed in the 02-Pierceland, 01-Divide and 11-Dillon management units.

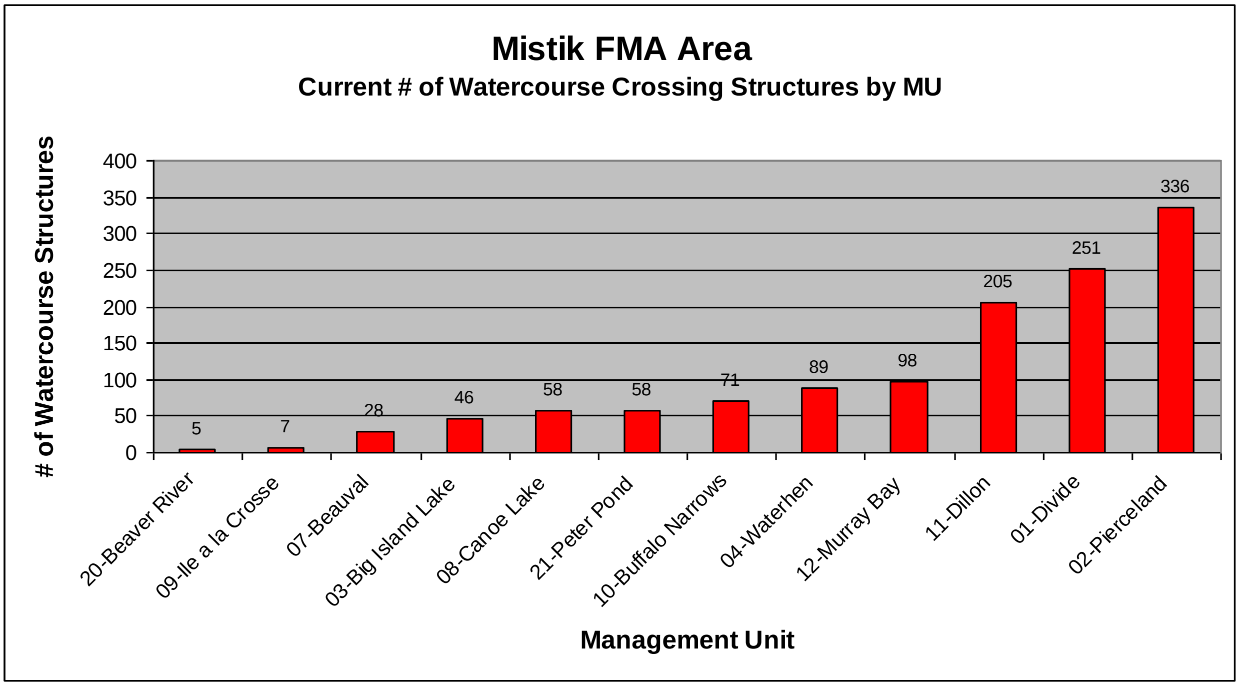


Figure 6.108 Current # of existing watercourse crossing structures by MU in the Mistik FMA area

7 COMMUNITY AND SOCIAL PROFILE

Approximately 30 communities exist within or adjacent to the Mistik FMP area (Figure 7.1, Map 3 – Communities and Infrastructure, Appendix E). Approximately half of these communities are comprised of First Nation and Métis populations. The FMP area is relatively well-roaded. Ten provincial highways occur within the limits of the FMP area (Highways # 155, 165, 903, 904, 908, 919, 925, 941, 965 and 165). Additionally, Mistik has constructed several provincial forestry Class 1 roads including the East/West Road, Stewart Lake Road, Upper Cummins Road and the Vermette Road. Rail service to Meadow Lake has been discontinued. Oil and gas infrastructure occurs on the west side of the FMP area but is most dominant in the area immediately to the south of the Cold Lake Air Weapons Range.

7.1 HISTORY OF HUMAN SETTLEMENT IN THE MISTIK FMP AREA

It is believed that North and South America became populated up to twenty-seven millennia ago by people traveling from northeast Asia over the Bering Strait. It is possible that low sea levels revealed a land bridge spanning the 90 km gap that exists today between Alaska and Asia. It is also possible that this stretch of water was frozen for a time, allowing people and animals to cross. Most scientists think that migration to North America occurred ten to twelve millennia ago. In 1492, when Columbus sighted the present day island of San Salvador in the Bahamas, archaeologist Alice Kehoe of Marquette University estimates that there were already fifty million people living in North America.[30]

Eight thousand years ago, the last ice age had passed and the climate was milder than it is today. At that time, the prairie and parkland ecosystems extended as far north as Buffalo Narrows. Today, the parkland ecosystem extends only as far north as Glaslyn and the area that was once prairie and parkland is now boreal forest. At that time, the grassland people that subsisted on bison would have occupied the area. Since that time, as the boreal forest moved south and the bison population diminished, subsistence has shifted towards other food stuffs.

The region was and is inhabited by two main Aboriginal groups - the Cree and Dene. The Cree populations are concentrated in the south and the Dene populations occupy the northern portions of the region. Métis populations, or people of mixed Aboriginal and European ancestry (specifically French) have also inhabited the region since the arrival of European fur traders and settlers in the 1700s.

The first European fur trading post in the area was established by Peter Pond in 1778. This represented the beginning of the current interaction between First Nations people and European fur traders and settlers that would form the basis of their relationship for more than one hundred years.

7.2 AGREEMENTS WITH FIRST NATIONS

The Government of Canada negotiated a number of treaties with First Nations across Canada during the 1800s and early 1900s. In the region encompassing the Mistik FMP area, First Nations are covered under Treaties Six, Eight and Ten. First Nations included in Treaty Six include Cold Lake First Nation, Flying Dust First Nation, Island Lake First Nation, Makwa Sahgaiehcan First Nation, Onion Lake First Nation, Pelican Lake First Nation and Thunderchild First Nation. Treaty Eight includes only Clearwater River Dene Nation. The First Nations covered under Treaty Ten are Big Island Lake Cree Nation (formerly Joseph Bighead

[30] *The Norsask Forest Story.* 1996. Mistik Management. Meadow Lake, Saskatchewan.

First Nation), Birch Narrows First Nation, Buffalo River Dene Nation, Canoe Lake Cree First Nation, English River First Nation and Waterhen Lake First Nation.

Treaty Six was negotiated in 1876 and covers the central area of Alberta and Saskatchewan. The inhabitants of the treaty area were primarily Cree with some Assiniboine, Saulteaux, and Dene.[31] Treaty Six contains the same central features of the other numbered treaties in that it calls for full cession to the Crown of Aboriginal title to the land within the treaty area but maintains the right of the people to hunt and fish in the traditional manner.

Treaty Eight was negotiated in 1899. The treaty area covers 841,487 square kilometres of northern Alberta, northeast British Columbia, the northwest corner of Saskatchewan and the area south of Hay River and Great Slave Lake. When the treaty was negotiated, there were people from two major language groups in the area: Cree and Athapaskan, also known as Dene 32. These groups included Dene, Beaver, Slavey, Dogrib and Yellowknife people. The eastern part of the treaty area was primarily inhabited by Dene people. Treaty Eight was negotiated more than twenty years after Treaty Six in part because the lands covered by the treaty were not deemed necessary for settlement.[33] Mineral discoveries in the area in the latter part of the 19th century prompted the initiation of negotiations between the federal government and native peoples.[34] The only First Nation associated with the Mistik FMP area within Treaty Eight is the Clearwater Dene Nation.

Treaty Ten was negotiated in 1906 and encompasses 220,000 square km in northern Saskatchewan and Alberta. As with Treaty Eight, the federal government did not feel that the lands covered by the treaty were suitable for agriculture and settlement. Negotiations regarding Treaty Ten did not take place until after the turn of the century.[35]

The treaties affecting First Nations within the Mistik Management FMP area are similar in that they call for the ceding of land title to the Crown while still allowing for use of the land for traditional activities such as trapping, hunting and fishing. The treaties also set aside reserves for Aboriginal people. Another similarity among these treaties is that there was some misunderstanding on the part of the Aboriginal people as to what the treaty commissioners meant by ceding, or extinguishment of title to the land within the treaty area. This has caused ongoing controversy in the relationship between Aboriginal people and the federal and provincial governments.[36]

7.3 DESCRIPTION OF COMMUNITIES WITHIN THE MISTIK FMP AREA

Publicly available, concise and descriptive reference material pertaining to the historical, cultural and economic characteristics of the various communities situated within the vicinity of the Mistik FMP area is generally lacking. The following web links provide some reference information pertaining to FMP area-associated communities:

http://career.kcdc.ca/

[31] Taylor, John, Leonard. *Treaty Research Report: Treaty Six.* Treaties and Historical Research Centre. Indian and Northern Affairs Canada. 1985. (https://www.aadnc-aandc.gc.ca/eng/1100100028706/1100100028708) Accessed 03/08/17.

[32] Madill, Dennis, F.K. *Treaty Research Report: Treaty Eight*. Treaties and Historical Research Centre. Indian and Northern Affairs Canada. 1986. (https://www.aadnc-aandc.gc.ca/eng/1100100028809/1100100028811) Accessed 03/08/17.

[33] Daniel, *Treaties of the Northwest, 1871-1930*, p. 10.

[34] René Fumoleau, *As Long As this Land Shall Last: A History of Treaty 8 and Treaty 11, 1870-1939* (Toronto, 1975).

[35] Treaty Guide to Treaty No. 10 (1906) (http://www.aadnc-aandc.gc.ca/eng/1100100028866/1100100028868) Accessed 03/08/17

[36] Historic Treaty Information, Indian and Northern Affairs Canada (https://www.aadnc-aandc.gc.ca/eng/1100100028574/1100100028578) Accessed 03/08/17

http://www.kayas.ca/communities.html

http://www.sicc.sk.ca/archive/bands/index-2.html

http://www.irccanada.ca/members?field_province_tid=13

http://www.mn-s.ca/

http://www.mltc.net/

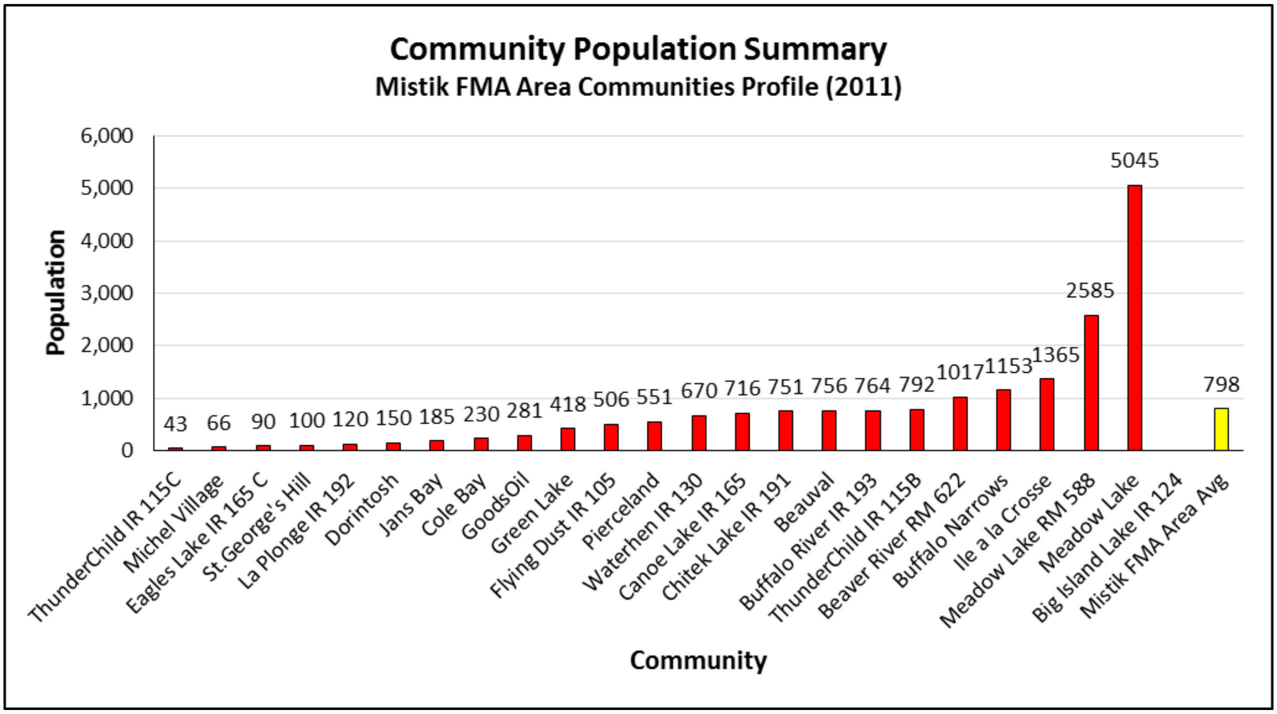
The following documentation provides socioeconomic profiles of twenty-four FMP area-associated communities (based primarily on geographic proximity to the Mistik FMP area). The community profiles are based on the most recent Statistics Canada Census (2011)[37]. Seven key socioeconomic indicators are profiled. The seven indicators were selected based on their particular relevance with respect to forest management activities and include:

1. Total population of each community;
2. % of the population of each community claiming Aboriginal ancestry;
3. Median age of each community;
4. % of community population under the age of 20;
5. % of community population aged 20 to 64 with post-secondary education;
6. Average annual earnings for all individuals reporting income;
7. Unemployment rate.

Refer to Section 9.0 for a description of employment and economic contributions made to local communities through the forest sector.

The population associated with the twenty-four FMP area-related communities in 2011 was approximately 18,000 people. Other than the city of Meadow Lake and the Rural Municipality of Meadow Lake, the population of all of the FMP area communities was below 1,500 (Figure 7.1) in 2011. On average, FMP area communities tend to be small (~ 798 residents/community) and widely dispersed throughout the vicinity of the FMP area (Map 3 Communities and Infrastructure, Appendix E). This has implications for planning and implementation of forest management activities in relation to public consultation, local forestry contractor development and equitable distribution of forestry benefits.

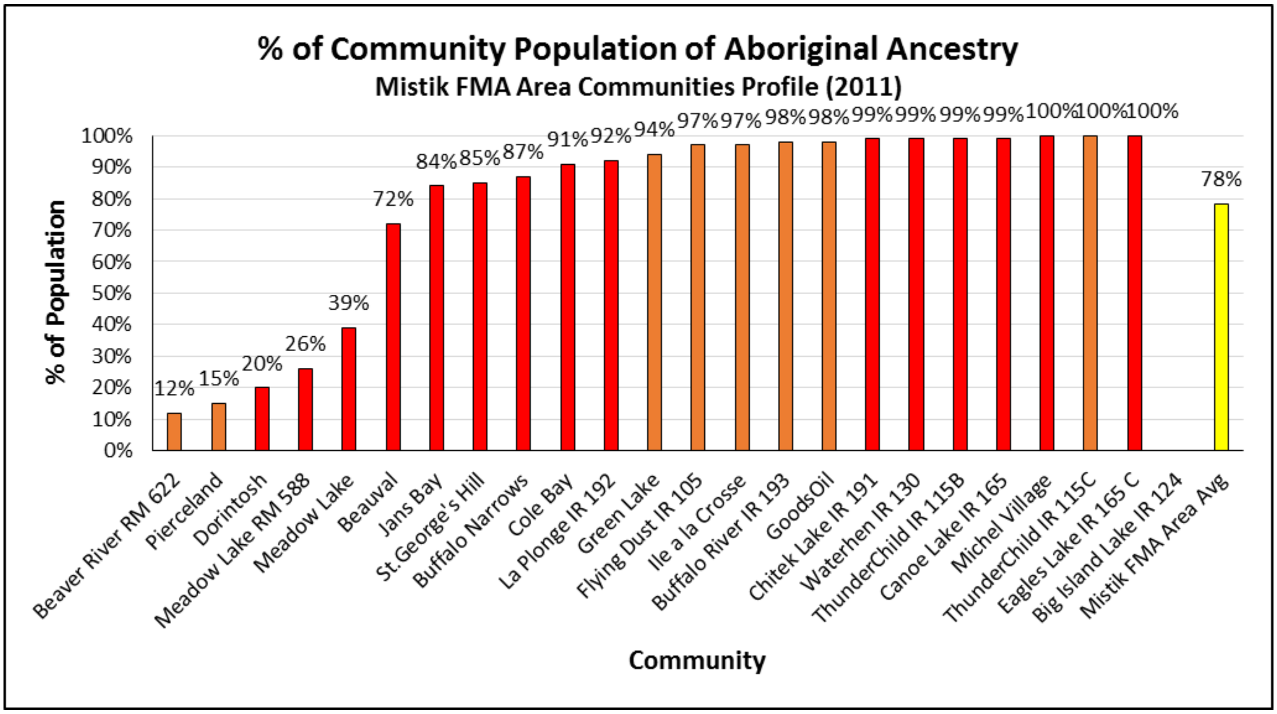
[37] Statistics Canada 2011 Census (2011 Community Profiles): http://www12.statcan.ca/census-recensement/index-eng.cfm



*Red bars indicate 2011 data.

Figure 7.1 Population of FMP area communities 2011

Approximately 80% of the population associated with the twenty-four communities in the FMP area in 2011 was of Aboriginal ancestry (Figure 7.2). This was significantly higher than the Saskatchewan provincial average of 15%. The majority of communities exhibited an Aboriginal population of over 90%. The relatively high proportion of Aboriginal people associated with the FMP area has implications related to planning and implementation of forest management activities in terms of respect for the unique rights of Aboriginal people and the maintenance of traditional forest use values. Additionally, the Aboriginal population should have the opportunity to be included in, and be beneficiaries of, the locally-derived forestry-related benefits (employment, income, etc.).



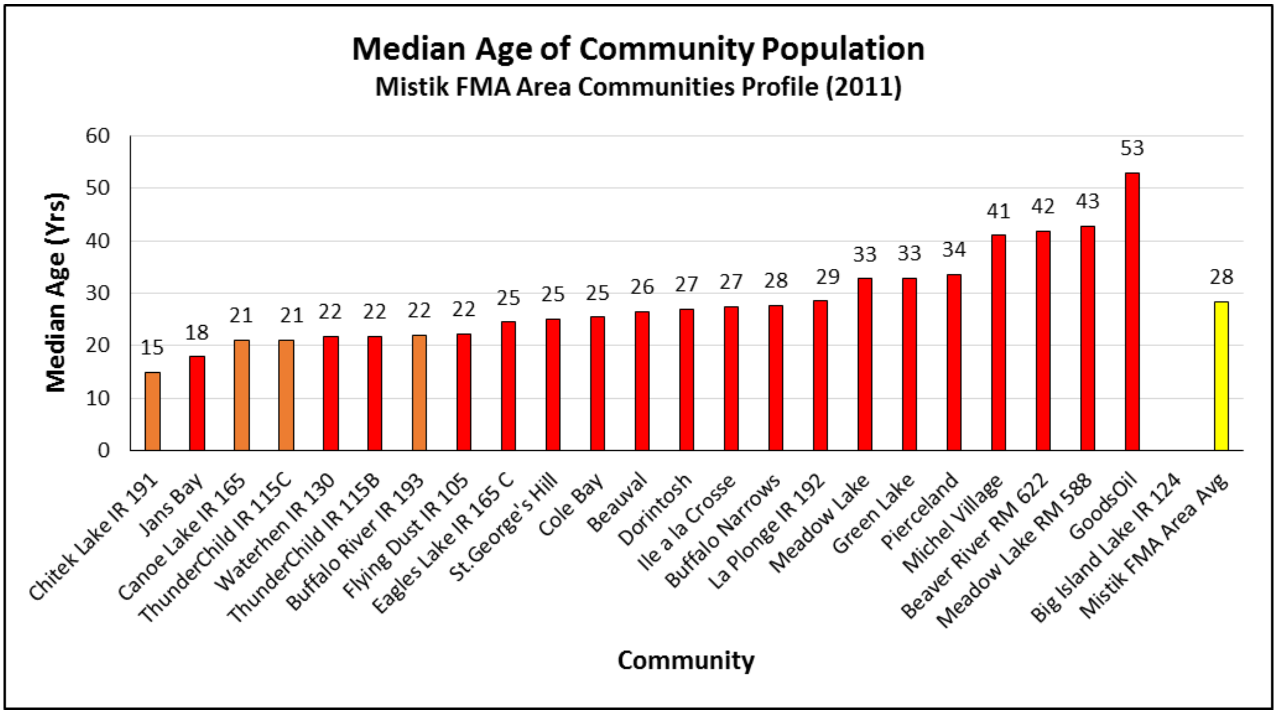
*Red bars indicate 2011 data; orange bars indicate 2001 data.

Figure 7.2 % of community population of Aboriginal ancestry in 2011

The FMP area communities exhibited a wide range in median age[38] from 18 to 53 years of age (Figure 7.3) in 2011. The average (30 years) for all FMP area communities was significantly less than the Saskatchewan average of 38 years. Two-thirds of the FMP area communities exhibited median ages of less than the average of 28 years. A lower median age for most of the communities, relative to the provincial average, implies there will likely be higher than average future requirements of increased public services related to health care, housing and education and future local employment opportunities.

---

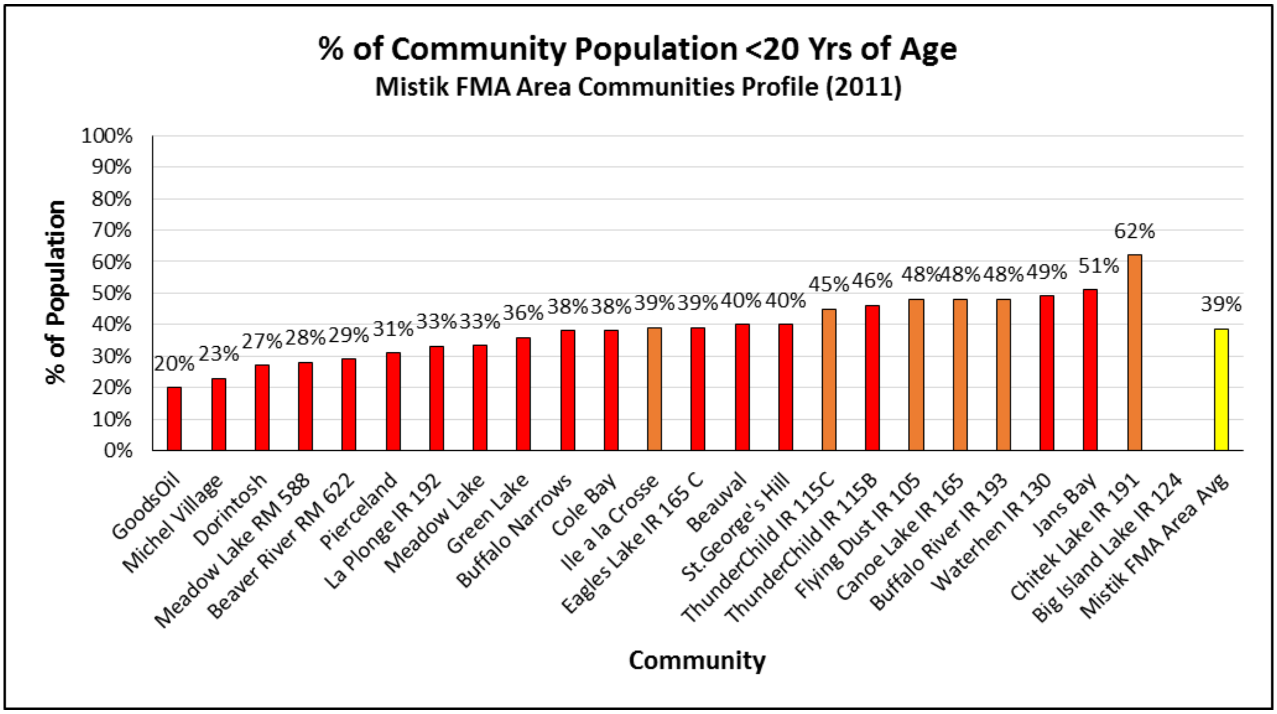
[38] Median age = half of the total community population is over the indicated median age and half of the population is below the indicated median age.



*Red bars indicate 2011 data; orange bars indicate 2001 data.

Figure 7.3 Median age of community population in 2011

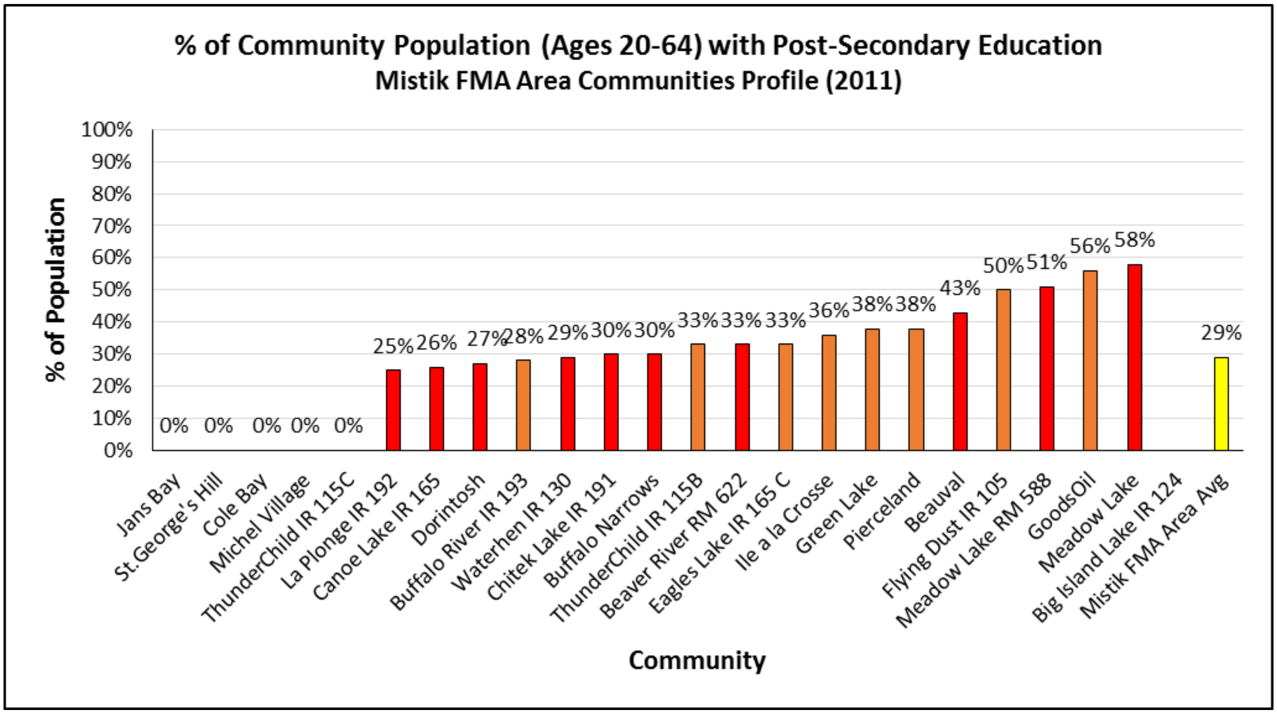
One indicator in which many communities within the FMP area differ markedly from the provincial average is the proportion of the population that is under 20 years of age (Figure 7.4). The provincial statistic for the population less than 20 years of age in 2011 was 26% whereas the average for the FMP area communities was 39%. Only three communities, Dorintosh, Goodsoil and Pierceland were below the provincial average in 2011. Again, a high proportion of young people within a community, relative to the provincial average, implies there will likely be higher than average future requirements of increased public services related to health care, housing and education and future local employment opportunities.



*Red bars indicate 2011 data; orange bars indicate 2001 data.

Figure 7.4 Percent of population under 20 years of age in 2011

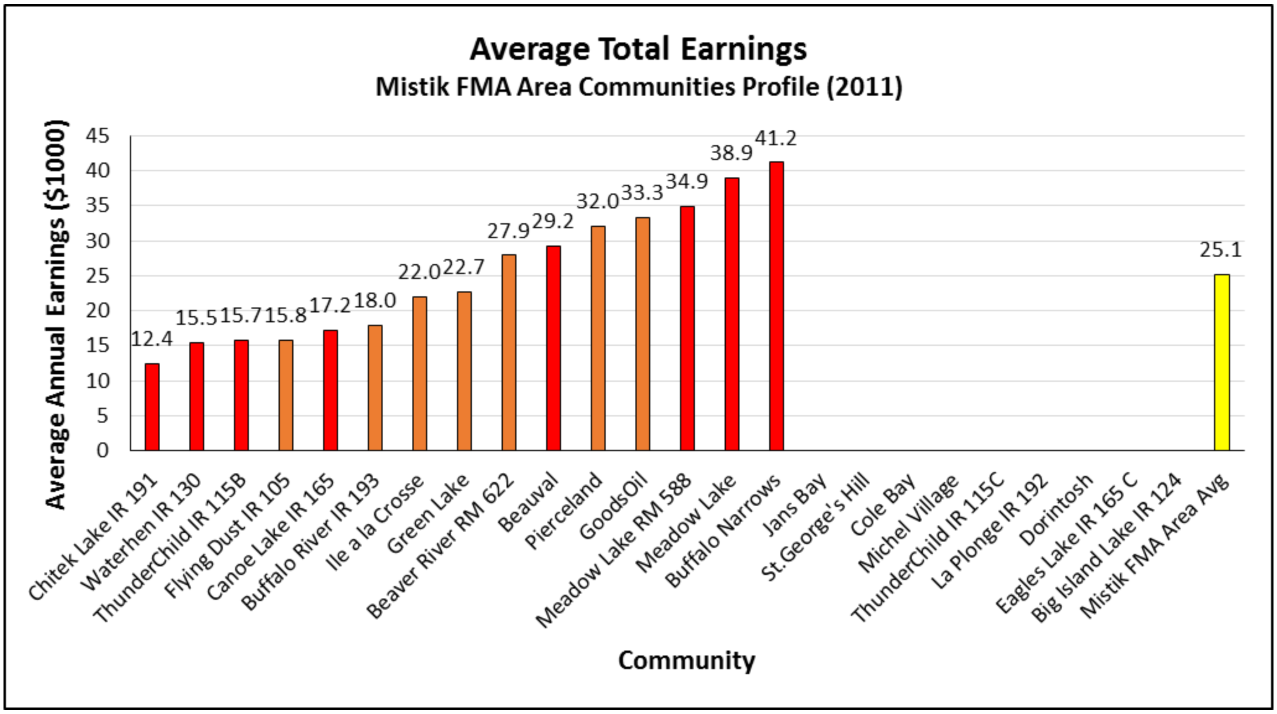
The proportion of the population with post-secondary qualifications (Figure 7.5) is an indicator of the overall education level of the population and is often correlated with employment and income levels. Approximately 48% of the population (ages 20 to 64) in the province of Saskatchewan had some sort of post-secondary qualifications (trades diploma, college diploma or university degree) in 2011. For the FMP area the proportion was 29%. Only two communities within the FMP area had a proportion of the population, aged 20 to 64, with post-secondary qualifications higher than the provincial average. The implication of this indicator is that there is the potential for a greater proportion of the workforce to receive post-secondary training which might result in increased employment, income and reduced unemployment statistics.



*Red bars indicate 2011 data; orange bars indicate 2001 data.

Figure 7.5 % of the population with post-secondary education in 2011 (0% indicates no data available)

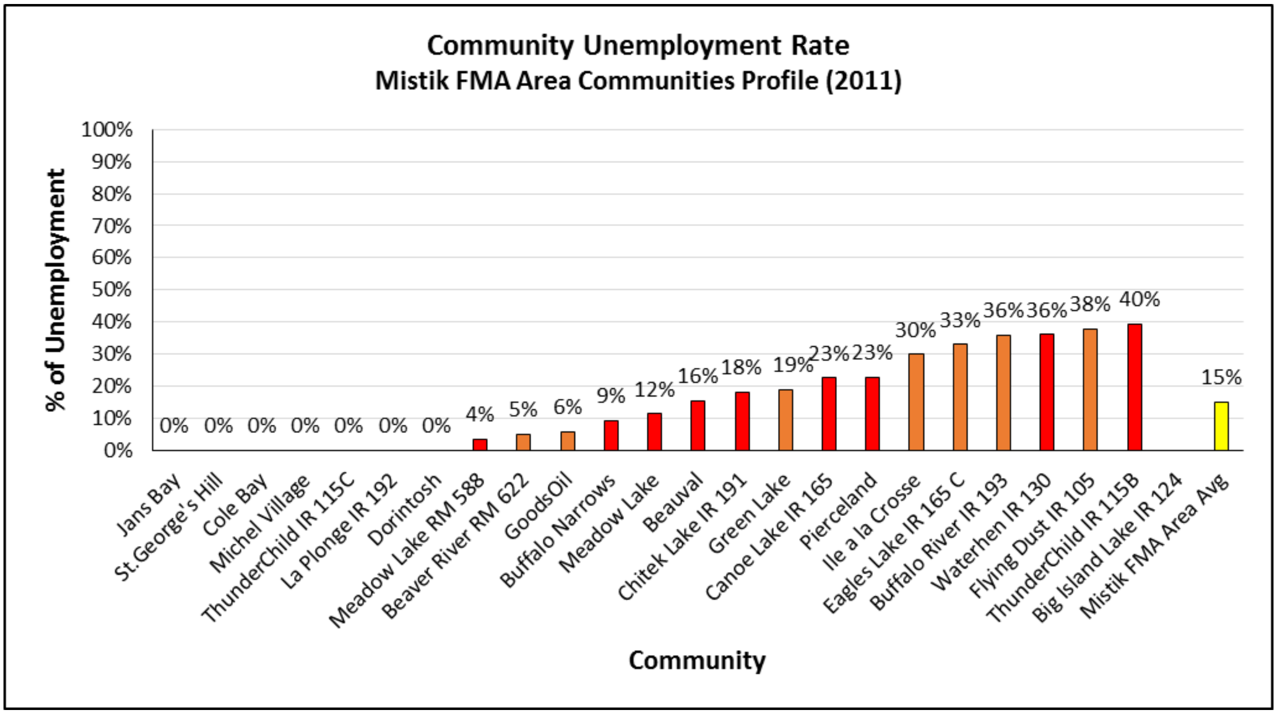
Employment income is a good indicator of economic health. There was a wide range in average annual employment income (12,443 to $41,181) among communities in the FMP area in 2011 (Figure 7.6). Six communities (Meadow Lake RM 588, Beaver River RM 622, Beauval, Meadow Lake, Pierceland and Goodsoil) had average employment incomes higher than the provincial average. The average annual employment income for all FMP area communities was slightly lower than the provincial average of $25,691 at ~$21,000. There was a significant number of communities with average annual employment less than the FMP area average and the provincial average. The implication of this indicator is that there is a significant need and opportunity for economic development among FMP area communities.



*Red bars indicate 2011 data; orange bars indicate 2001 data.

Figure 7.6 Average annual total earnings in 2011 (no value indicates no data available)

One area where most FMP area communities lagged significantly behind the province average as a whole was in relation to the unemployment rate (Figure 7.7). The provincial unemployment rate in 2011 was 5.9%. For communities within the FMP area, the unemployment rate was 15%. The majority of communities reported unemployment rates well above the FMP area average and the provincial average. Considering the large proportion of the population in the region that is under 20 years of age, it is possible that the unemployment rate in many communities could increase significantly as the under-fifteen-year-old age class begins to be counted in the labour force. Again, the implication of this indicator is that there is a significant need and opportunity for economic development among FMP area communities.



*Red bars indicate 2011 data; orange bars indicate 2001 data.

Figure 7.7 Unemployment rate (persons over 15 years of age) in 2011 (0% indicates no data available)

8 LICENCE HOLDER DESCRIPTION

8.1 NORSASK FOREST PRODUCTS INC.

In 1971 the New York firm of Parsons & Whittemore (also the owners of Prince Albert Pulp at the time) built the Meadow Lake Sawmill. In 1981 the Province of Saskatchewan acquired all of the wood product mill assets of Parsons & Whittemore. In 1984, the Prince Albert pulp mill was sold to Weyerhaeuser. Ownership of the Meadow Lake sawmill was retained by the Province of Saskatchewan. In 1987, the employees of Meadow Lake sawmill and the Meadow Lake Tribal Council formed a consortium and bought the sawmill. The consortium negotiated a Forest Management License Agreement (FMLA) with the province and commenced operation under the name Norsask Forest Products. In early 1998, the Meadow Lake Tribal Council became sole owner of NorSask (Figure 8.1) becoming the largest First-Nations forest products company in Canada. Currently, the mill has doubled its 1988 production with premium lumber shipped across North America. NorSask utilizes ~ 500,000 m^3 of softwood timber to produce ~ 140,000,000 fbm of lumber annually. Woodchip byproduct (~ 66,000 oven-dry-tonnes annually) is delivered to Meadow Lake Mechanical Pulp and Alberta Pacific Industries Limited (AlPac). Today, portions of the mill's production facilities are aging such as the log infeed section. Some mill sections have been updated over the term of the last FMP (e.g. kilns and the finishing/packaging line). Plans are being madefor consideration of capital investment/secondary industries and cooperative management agreements with northern communities will ensure that the mill's activities will benefit all northerners.

Figure 8.1 NorSask sawmill (Meadow Lake)

8.2 MEADOW LAKE MECHANICAL PULP INC

In 1988, when Norsask Forest Products. negotiated the FMLA with the provincial government, a condition of the agreement was that a user be found for the deciduous component of the boreal mixedwood forest from which NorSask harvested the coniferous (spruce, pine) component. In 1989, Millar Western Pulp Ltd., a company that makes pulp from aspen, agreed to build a pulp mill in the vicinity of Meadow Lake. The two-line, state-of-the-art BCTMP (bleached-chemo-thermal-mechanical pulp) mill began operating in 1992 as the world’s first successful zero-effluent market pulp mill (Figure 8.2). The mill can produce up to 400,000 ADMT (air-dry-metric-tonnes) annually, well above its initial design capacity of 240,000 ADMT, and uses approximately 650,000 cubic meters of aspen timber per year (2/3 fibre requirement) with 1/3 of its fibre requirement being satisfied by softwood chips. The Meadow Lake mill produces hardwood and/or hardwood/softwood pulp blends. Currently 100% of the mill production is shipped to markets in Asia. Ownership of the mill changed when Paper Excellence Canada purchased the mill from the province of Saskatchewan which had acquired the rights to the "Millar Western" pulp mill. These changes in ownership structure took place through 2006 to 2007.

Figure 8.2 Meadow Lake Mechanical Pulp pulp mill

8.3 MISTIK MANAGEMENT LTD.

Mistik Management Ltd. (Mistik) was formed in 1990 as a forest management company wholly-owned and directed by Norsask Forest Products. and Meadow Lake Pulp Limited Partnership. Each mill has a 50% ownership stake in Mistik. Mistik is governed by an eight-member Board of Directors with equal representation appointed from both mills.

8.4 L&M WOOD PRODUCTS

L&M Wood Products, pictured above, is a long term family owned wood processing facility located in Glaslyn, Saskatchewan. The L&M FMA is comprised of 69,000 hectares with a HVS of 86,000 m^3 softwood and 44,000 m^3 hardwood. L&M Wood Products specializes in the production of treated posts, rails and solid wood products. L&M's treatment plant is certified to national standards. Mistik and L&M have a mutually beneficial relationship in that Mistik provides the majority of L&M's forest management requirements (i.e. certification, GIS, operational planning and 20-Year Forest Management Planning.). Mistik, through a separate business arrangement, purchases the hardwood from the L&M FMA for delivery to MLMP.

9 FOREST MANAGEMENT PRINCIPLES AND CERTIFICATION

9.1 2007-2016 PUBLIC ISSUES AND CONCERNS PERTAINING TO THE MISTIK FMP AREA

A register (Appendix B) of public issues and concerns has been maintained for the period of the 2007 20-Year FMP (2007-2016). The intent of the register is to document topics requiring ongoing discussion. There are currently sixteen topic areas that have been dealt with in the registry. A new register will be initiated for the 2017 20-Year FMP.

9.2 MANDATE

Mistik's mandate since its inception has been to:

1. provide wood fiber to both mill facilities;

2. work with local communities within the FMP area in providing employment and business opportunities related to harvesting and forest renewal-related activities;

3. consult and cooperate with other stakeholders and forest-users with interests in the Mistik FMP area;

4. consider wildlife and other ecosystem values in planning and implementing forest use activities.

Mistik's corporate vision is to be respective and innovative stewards of the forest.

9.3 FOREST MANAGEMENT PRINCIPLES

Mistik seeks to plan and conduct all of its forest-use activities within the FMP area based on the following principles:

1. to KNOW the land base and the people;

2. to UNDERSTAND forest ecosystem processes;

3. to PROTECT sensitive forest ecosystem attributes;

4. to MAINTAIN forest ecosystem integrity;

5. to MINIMIZE impacts;

6. to MITIGATE negative impacts.

9.4 VOLUNTARY FOREST CERTIFICATION

In August 2004, Mistik achieved certification (and has been subsequently recertified) of its environmental management system (EMS) to the ISO 14001 standard. ISO 14001 is an internationally recognized EMS standard that provides a highly effective, globally accepted framework for establishing and continually improving applicable management system processes. In August 2005, Mistik achieved certification of its forest management practices to the CAN/CSA Z809-02 Sustainable Forest Management standard.

Subsequently Mistik was recertified to the CAN/CSA Z809-08 Sustainable Forest Management Standard. The ISO 14001 and CAN/CSA Z809 certification provides Mistik and its two shareholders – Norsask Forest Products. and Meadow Lake Pulp Inc. – with internationally recognized environmental and sustainable forest management accountability standards.

In 2005, Mistik received a corporate mandate from its shareholders to address the sustainable forest management requirements of the Forest Stewardship Council (FSC) National Boreal Standard. Certification to the (FSC) 2004 Boreal Standard was achieved in 2006 and through recertification efforts FSC certification has been maintained to the present.

Achieving and maintaining these standards demonstrates to customers and the public that Mistik's forestry activities and related impacts are effectively managed, continually improving and part of the corporate management system.

9.5 ENVIRONMENTAL AND SUSTAINABLE FOREST MANAGEMENT POLICY

Mistik Management Ltd. is a forestry company dedicated to the sustainable use and stewardship of 1.9 million hectares of forest in northwestern Saskatchewan on behalf of Norsask Forest Products., Meadow Lake Mechanical Pulp. and L&M Wood Products. Our mission is to plan and practice forestry that balances all forest values, involves local communities in decision making and our forestry activities and builds on our experiences in a cost-effective manner.

We are committed to:

1. Achieving and maintaining sustainable forest management standards;

2. Continually improving our sustainable forest management performance;

3. Improving our knowledge and understanding of forests by monitoring advances in sustainable forest management science and technology in order to continually improve our operating procedures and minimize environmental impacts;

4. Preventing environmental pollution;

5. Complying with environmental legislation, regulations, policies and other requirements as well as honoring agreements and conventions, to which Canada is a signatory, that apply to our forestry activities;

6. Providing for public participation in our forestry plans and activities;

7. Respecting Aboriginal and treaty rights and providing participation opportunities for Aboriginal peoples with respect to their rights and interests in our forestry activities;

8. Providing the necessary knowledge and safeguards to facilitate a safe environment for forestry workers and the public;

9. Continually monitoring and improving our environmental and sustainable forest management performance through the establishment of environmental and forest management objectives and targets, regular evaluations and initiation of action plans where required.

Environmental and forest stewardship is both a corporate and individual responsibility. We will provide the tools and training to promote employee and contractor understanding and achievement of our environmental and sustainable forest management policy.

9.6 LINKAGE AND HIERARCHY OF VOLUNTARY CERTIFICATION PROGRAMS AND REGULATORY REQUIREMENTS

The indicators identified in voluntary certification programs are a combination of required compliance-based indicators (i.e., provincial forestry standards) and optional or voluntary socio-economic and environmental indicators. Figure 9.1 identifies the linkage and hierarchy between various regulatory-requirements and voluntary certification programs associated with Mistik's operations.

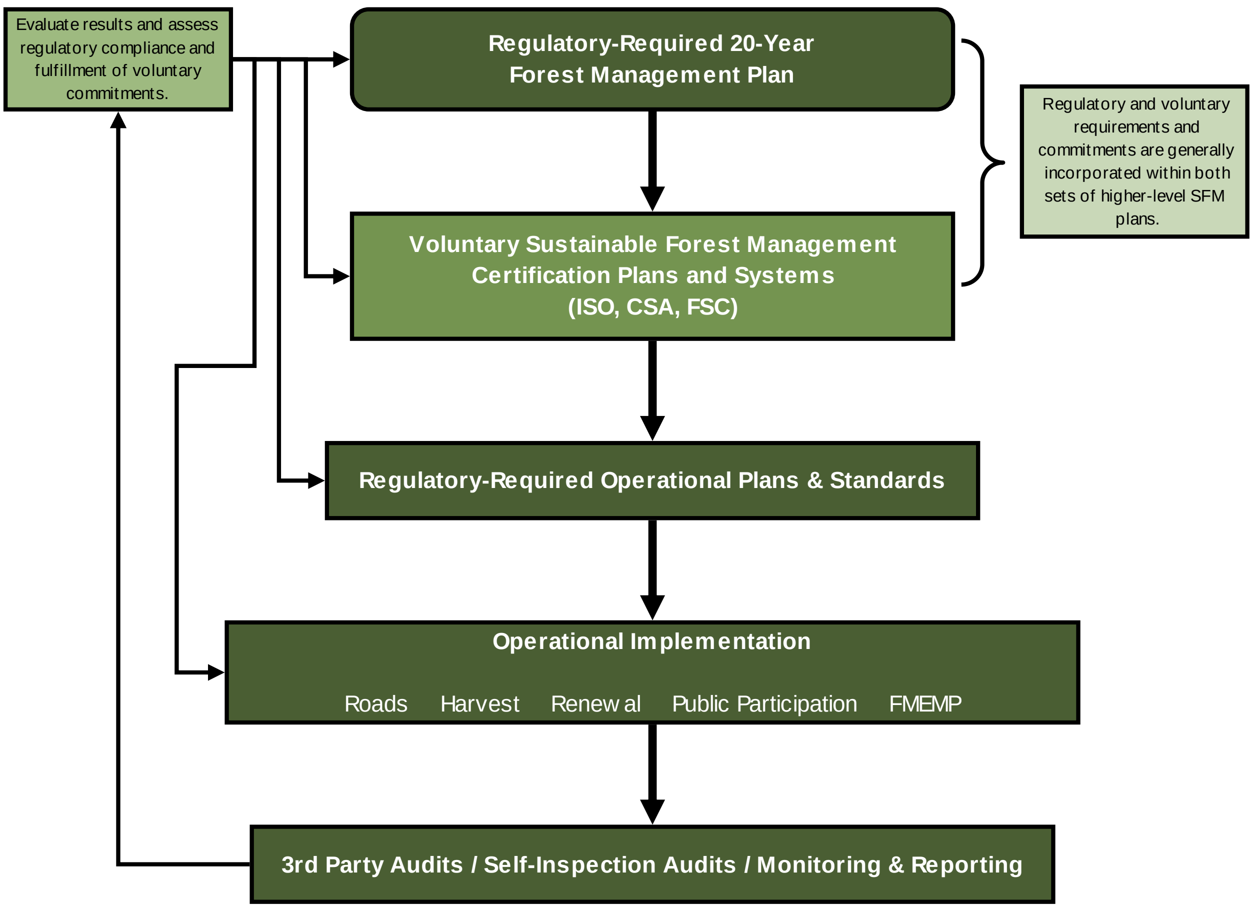


Figure 9.1 Linkage and hierarchy of regulatory and voluntary certification processes

Mistik's 20-Year Forest Management Plan provides the key planning integration between regulatory requirements (provincial forestry standards) and voluntary sustainable forest management (SFM) certification plans and systems (ISO, CSA, FSC). Voluntary SFM certification systems are integrated into all levels of regulatory-required higher-level and operational planning processes. For example, the ISO 14001 Environmental Management System that Mistik has implemented has explicit reference to regulatory requirements and compliance with provincial and federal law. Additionally, Mistik has a comprehensive set of FMP area-specific VOITS (Values, Objectives, Indicators and Targets). The VOITs are a focal point of the SFM (CAN/CSA Z809 and FSC) certification plans.

Annual monitoring and reporting through self-inspection processes and independent 3rd party audits ensures a transparent continuous improvement process at all levels of the organization.

10 ECONOMIC PROFILE

10.1 CURRENT HARVEST VOLUME SCHEDULE AND COMMITMENTS FROM THE MISTIK FMP AREA

Table 10.1 to Table 10.3 are based on Mistik's 2002 Forest Management Agreement. Specifically, Schedules 'C' and 'D' provide information related to the current harvest volume schedule and volume exclusions to independent operators.

Table 10.1 Current harvest volume schedule for the Mistik FMP area (Schedules 'C' and 'D' Mistik 2002 Forest Management Agreement)

Area	Hardwood (primarily aspen)	Softwood (primarily white spruce and jack pine)	Total
Mistik FMP area (excluding Peter Pond MU)	686,690 m^3	479,000 m^3	1,175,690 m^3
Peter Pond Management Unit	108,000 m^3	123,000 m^3	231,000 m^3
Total	**804,690 m^3**	**602,000 m^3**	**1,406,690 m^3**

S

Table 10.2 Current independent operator volume exclusions for the Mistik FMP area (Schedule 'D' Mistik 2002 Forest Management Agreement)

Area	Hardwood (primarily aspen)	Softwood (primarily white spruce and jack pine)	Total
Mistik FMP area (excluding Peter Pond MU)	4,800 m^3	10,500 m^3	15,300 m^3
Peter Pond Management Unit	Nil	12,000 m^3	12,000 m^3
Total	**4,800 m^3**	**22,500 m^3**	**27,300 m^3**

Table 10.3 Current harvest volume available for Mistik-related mills from the Mistik FMP area*

Area	Hardwood (primarily aspen)	Softwood (primarily white spruce and jack pine)	Total
Mistik FMP area (excluding Peter Pond MU)	691,890 m^3	200,000 m^3	891,890 m^3
Peter Pond Management Unit	108,000 m^3	50,000 m^3	158,000 m^3
Total	**799,890 m^3**	**250,000 m^3**	**1,049,890 m^3**

*The softwood volume shown in Tables 9-2 and 9-3 do not add up to Table 9-1 because an estimated 100,000 to 200,000 m^3 is located in predominantly low-merchantable volume not economically feasible to access black spruce forest types. In summary, with the NorSask mill configuration and prevailing market conditions, Mistik is of the opinion that only 250,000 m3 of softwood is currently operationally and economically feasible to access.

The approved 2007 20-Yr FMP defined a harvest volume schedule (HVS) of 581,250 m3 of softwood and 911,400 m3 of hardwood for the Mistik FMA. The existing, approved L&M Wood Supply Analysis for the L&M FMA defined the HVS as 125,100 m3 softwood for the 2000-01 to 2009-10 time period and 82,420 m3 softqwood for the 2011-12 to 2019-20 time period. The L&M FMA hardwood HVS is 42,620 m3.

10.2 CURRENT MILL VOLUME REQUIREMENTS AND HISTORIC DELIVERY TO MILLS

Table 10.4 identifies the timber volume requirements for Norsask Forest Products. and Meadow Lake Mechanical Pulp. A comparison of Table 10.1 through Table 10.4 indicates that fibre from the Mistik FMP area can satisfy pulp mill hardwood requirements while an additional 250,000 m^3 of softwood is required to meet NorSask requirements.

Table 10.4 Current timber volume requirements by mill

Area	Hardwood (primarily aspen)	Softwood (primarily white spruce and jack pine)	Total
Norsask Forest Products.	- -	500,000 m^3	500,000 m^3
Meadow Lake Mechanical Pulp.	700,000 m^3	*350,000* m^3	1,050,000 m^3
L&M Wood products	--	120,000 m3	120.000 m3
Total	**700,000 m^3**	**970,000 m^3**	**1,670,000 m^3**

*softwood wood chip equivalent to 350,000 m^3 roundwood

Table 9-4 demonstrates the changing dynamics of Saskatchewan's forest sector as Meadow Lake Mechanical Pulp., a facility originally designed for 100% hardwood consumption, now uses softwood chips for approximately one third of its fibre requirements.

Historic timber volume deliveries to Mistik-related mills are shown in Figure 10.1, Figure 10.2 and Table 10.5. An average of 395,133 m^3 of softwood sawlogs has been delivered to Norsask Forest Products. related sawmills for the period 1997 to 2016. An average of 775,997 m^3 of hardwood pulpwood has been delivered to Meadow Lake Mechanical Pulp. over the same period. For the last 5 to 6 years Figure 10.1 and Figure 10.2 plus Table 10.5 also demonstrate the changing dynamics in fibre procurement/supply areas as more fibre is delivered to the mills from their allocations on the Sakaw (former Prince Albert) FMA.

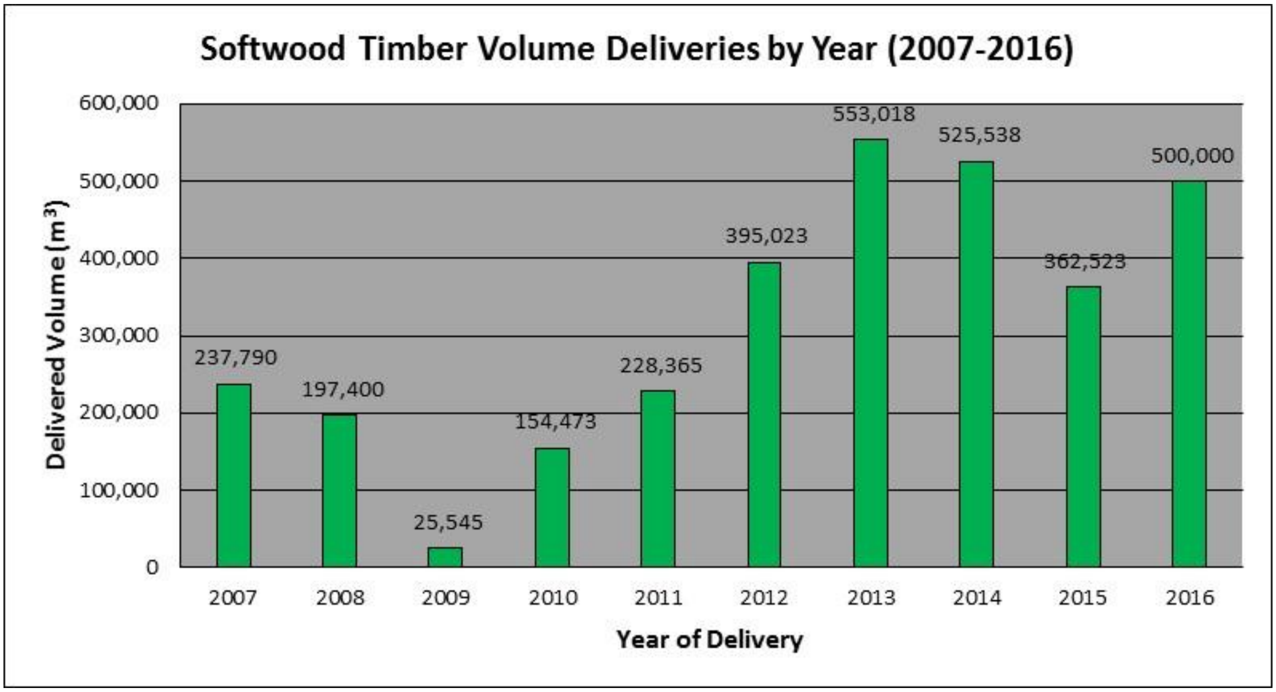


Figure 10.1 Softwood deliveries to Norsask Forest Products. sawmills for the period 1997 to 2016 (2016 is an estimate)

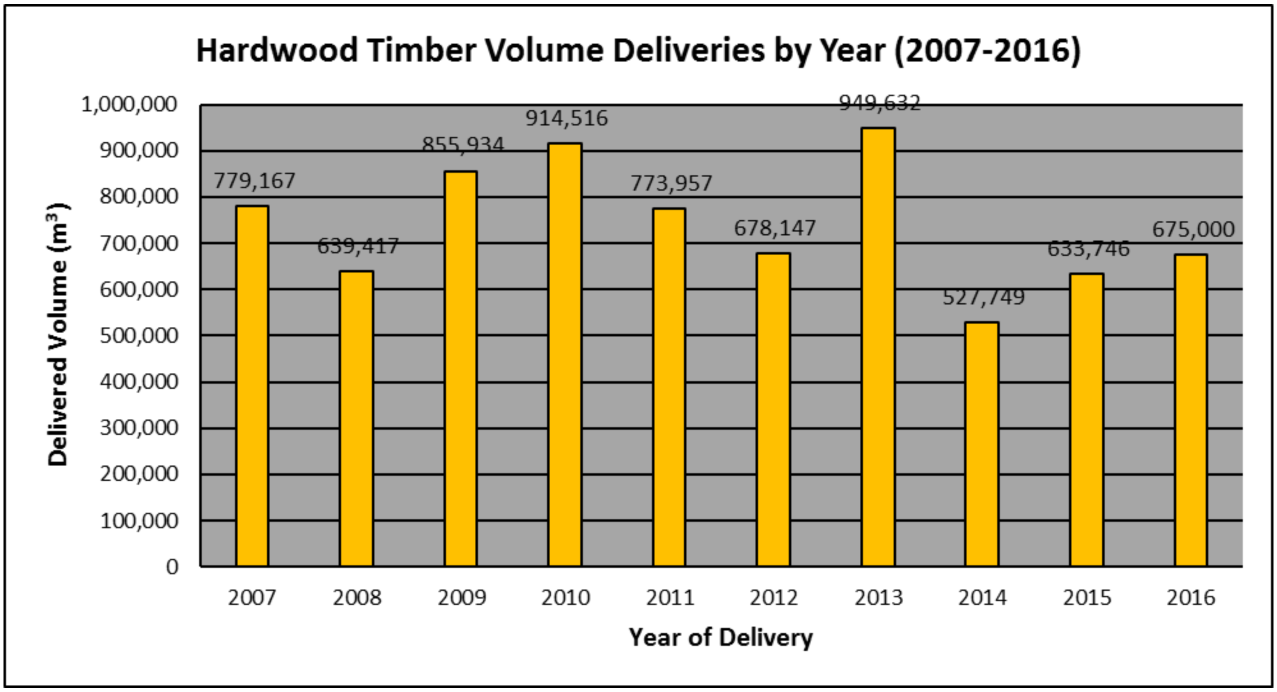


Figure 10.2 Hardwood deliveries to Meadow Lake Mechanical Pulp. for the period 1997 to 2016 (2016 is an estimate)

Table 10.5 Wood delivery summary (1997 to 2016) (2016 value is an estimate)

Year	Softwood[39] Mistik FMP area	Softwood Non-FMP area	Softwood Total	Hardwood[40] Mistik FMP area	Hardwood Non-FMP area	Hardwood Total	Grand Total
1997	388,626	37,460	**426,086**	704,182	66,797	**770,979**	**1,197,065**
1998	405,391	121,864	**527,255**	645,487	77,658	**723,145**	**1,250,400**
1999	429,103	102,836	**531,939**	829,131	191,783	**1,020,914**	**1,552,853**
2000	478,146	34,424	**512,570**	719,006	80,949	**799,955**	**1,312,525**
2001	471,418	29,980	**501,398**	584,703	40,571	**625,274**	**1,126,672**
2002	394,054	50,962	**445,016**	745,347	91,414	**836,761**	**1,281,777**
2003	384,380	11,830	**396,210**	709,126	82,830	**791,956**	**1,188,166**
2004	360,066	11,410	**371,476**	663,088	99,715	**762,803**	**1,134,279**
2005	320,810	85,846	**406,656**	684,810	196,431	**881,241**	**1,287,897**
2006	529,905	74,481	**604,386**	749,162	130,487	**879,649**	**1,484,035**
2007	228,090	9,700	**237,790**	710,346	68,821	**779,167**	**1,016,957**
2008	152,274	45,126	**197,400**	471,954	167,463	**639,417**	**836,817**
2009	27,078	3,467	**25,545**	769,678	86,256	**855,934**	**881,479**
2010	120,891	43,582	**154,473**	680,637	233,879	**914,516**	**1,068,989**
2011	95,674	132,691	**228,365**	521,941	252,016	**773,957**	**1,002,322**
2012	100,947	294,076	**395,023**	343,927	334,220	**678,147**	**1,073,170**
2013	184,197	368,821	**553,018**	590,909	358,723	**946,632**	**1,502,650**
2014	110,554	414,948	**525,538**	393,404	134,345	**527,749**	**1,053,247**
2015	143,204	219,319	**362,523**	450,060	183,686	**633,746**	**996,269**
2016	160,000	340,000	**500,000**	485,000	190,000	**675,000**	**1,175,000**
Mean	**273,490**	**121,643**	**395,133**	**622,595**	**153,402**	**775,997**	**1,171,130S**

[40] All deliveries of hardwood have been made to the Meadow Lake Pulp Mill.

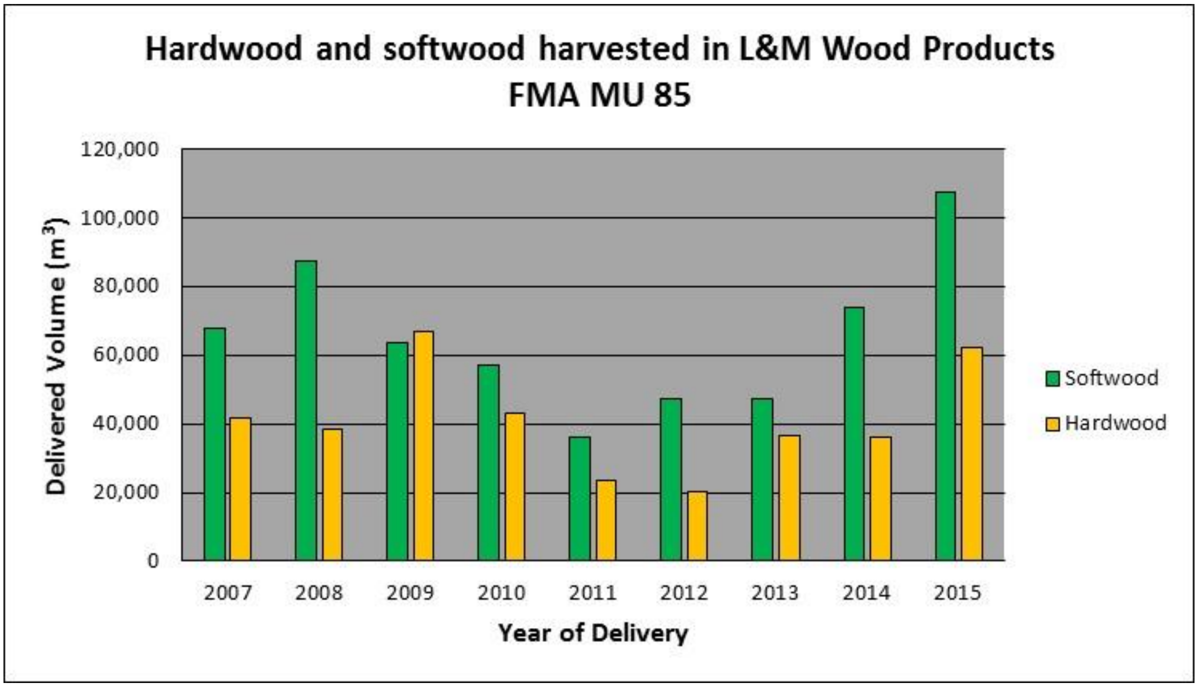


Figure 10.3 Hardwood and softwood harvested in L&M Wood Products FMA MU 85

11 COMMITMENTS IN THE FOREST MANAGEMENT PLAN

11.1 SUMMARY OF CURRENT 2007-20-YEAR FOREST MANAGEMENT PLAN AND ENVIRONMENTAL IMPACT STATEMENT (1997) COMMITMENTS AND CONDITIONS OF APPROVAL

There were no Ministerial Approval Conditions associated with Mistik's 2007 20-Year Forest Management plan.

There have been no amendments to the Mistik FMA during the duration of Mistik's 2007 20-Year Forest Management Plan and thus no documentation regarding "Change In Development" (The Environmental Assessment Act – Section 16) is required.

With changes to the Forest Resources Management Act approval of Mistik's 2017 20-Year Forest Management Plan by the Ministry of Environment, Forest Service Branch will suffice to fulfill environmental impact assessment requirements.

Mistik has consulted with the Environmental Assessment (EA) Branch to determine if any outstanding Environmental Impact Statement (EIS) commitments from previously approved EISs apply to the Mistik FMP area. The only EIS applicable to the Mistik FMP area was approved by the Province of Saskatchewan on May 13, 1997. In the context of the 2007 20-Year FMP Mistik has satisfied all EIS commitments. The "Summary of Mistik Commitments and Approval Conditions" from Appendix A of Volume I Background Information Document of the 2007 20-Year FMP is included for reference purposes.

12 CURRENT FOREST CONDITION

12.1 MISTIK FMP AREA LAND SUMMARY

The Mistik FMP area encompasses an area of ~ 1.9 million ha. A diversity of land classification types occurs on the Mistik FMP area (Map 21 – Land Classification, Appendix E). One of the outstanding ecological features of the Mistik FMP area is the extensive (33%) area of open and treed (primarily black spruce and tamarack larch) peatland (Table 12.1 and Figure 12.1). Although these areas are of significant ecological value, trees of merchantable value do not typically grow in these peatland environments. Lakes and waterways comprise 4% of the FMP area. In the past 10 years, extensive fires within the FMP area have contributed to ~ 3% of the land base dominated with brush or grass species. Most of this area is likely treed but the trees are not of a sufficient size as to be distinguishable from 1:15,000 scale aerial photographs. In terms of timber values, approximately 56% of the FMP area is considered potentially productive with respect to the growth of merchantable size trees.

Table 12.1 Mistik FMP area land summary

Mistik FMP area Land Summary		
Land Classification Type*	**Crown Land (ha)**	**Percent Total Area (%)**
Treed wetland	408,607	22
Open wetland	207,699	11
Brush and alder	53,651	3
Rock	0	0
Grass	3,784	0
Water	74,758	4
Agricultural Land	1,034	0
Unclassified[41]	15,540	1
Other[42]	56,341	3
Total non-productive forest and nonforested area	**821,415**	**44**
Potentially productive forest[43]	**1,057,085**	**56**
Total[44]	**1,878,499**	**100**

[41] Unclassified: Non-forested areas which are man-made (roads, railroads, mines, utility corridors, gravel pits, etc.).
[42] Other: A "catch all" code for all polygons that don't fit into any other category.
[43] Provincial forest types are calculated based on the potentially productive forest area.
[44] This 'total' value shown in Table 13-1 does include timber reserves and recreation areas within the FMP area

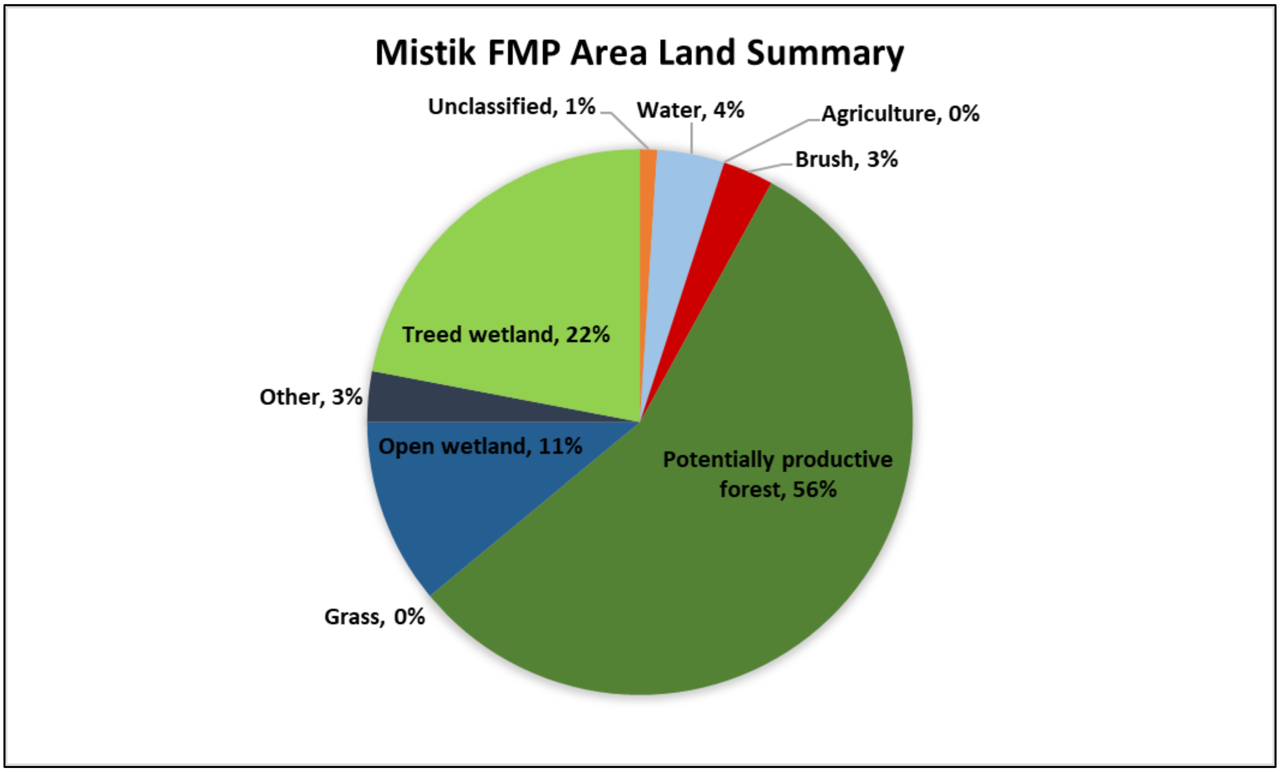


Figure 12.1 Mistik FMP area land summary

12.2 PROVINCIAL FOREST TYPES AND SERAL STAGES

There are approximately 1,057,000 ha of potentially productive provincial forest types (Figure 12.2 and Table 12.2) within the Mistik FMP area. Hardwood-leading (primarily trembling aspen) forests are the dominant (32%) forest types within the potentially productive forest land base of the Mistik FMP area (Figure 12.3). Jack pine-dominated forest stands are the next most extensive followed by black spruce-leading forest types. Cumulatively, mixedwood forests comprise approximately 18% of the potentially productive forest land base of the FMP area. The least abundant forest types are other hardwoods (primarily balsam poplar) and white spruce forest types. In terms of age (Figure 12.4), a third (36%) of the provincial forest types are dominated by mature or old stands. The location and extent of the provincial forest types (Map 22 – Provincial Forest Types) and seral stages (Map 23 – Seral Stages) within the FMP area can be found in Appendix E.

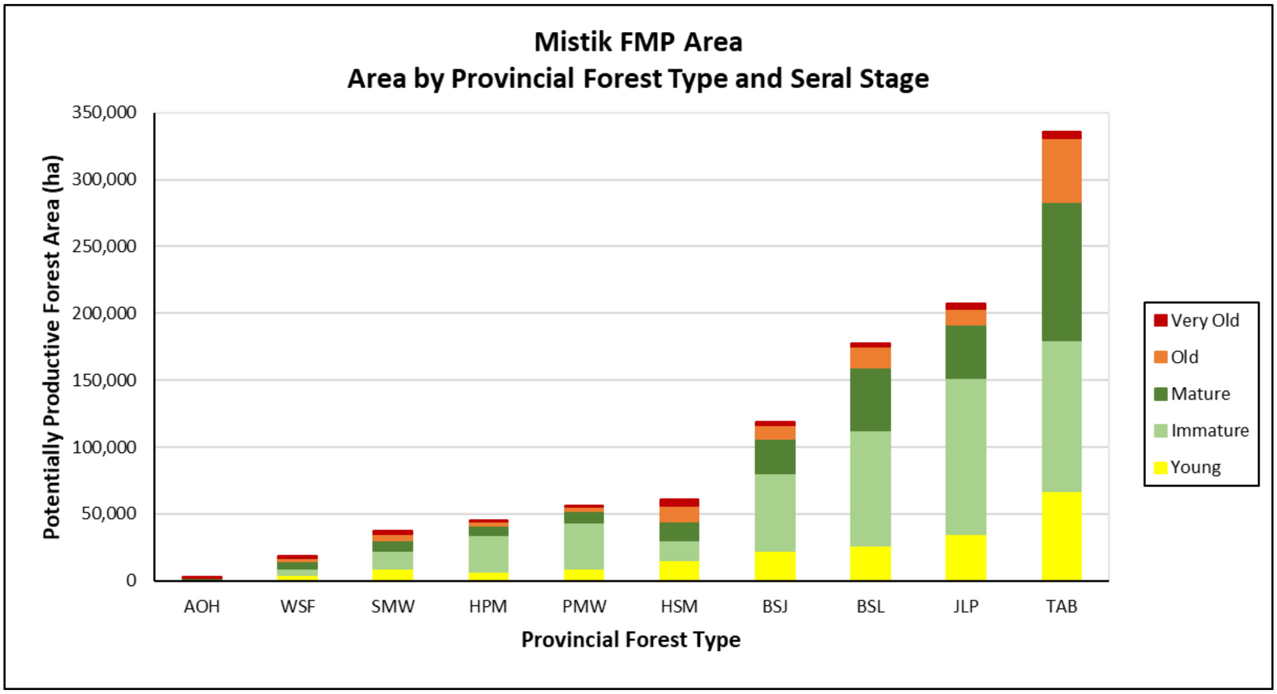


Figure 12.2 Area of provincial forest types and seral stages within the potentially productive forest land base of the Mistik FMP area

Table 12.2 Provincial forest type and seral stage area

Provincial Forest Type	Seral Stage					
	Young	Immature	Mature	Old	Very Old	Total
AOH (another other hardwood expect TAB)	141	1,413	470	190	9	**2,223**
WSF (white spruce, balsam fir)	4,397	5,100	4,820	2,402	1,905	**18,624**
SMW (spruce dominated mixedwood)	8,859	13,263	7,933	4,738	2,392	**37,185**
HPM (hardwood with Pine Mixedwood)	6,715	27,218	7,672	2,678	113	**44,396**
PMW (Pine dominated mixedwood)	9,337	34,198	8,867	2,595	760	**55,757**
HSM (Hardwood with spruce mixedwood)	15,358	14,835	14,331	11,904	4,008	**60,436**
BSJ (Black	22,330	58,278	25,729	9,832	2,297	**118,466**

Provincial Forest Type	Seral Stage					
	Young	Immature	Mature	Old	Very Old	Total
spruce, jack pine)						
BSL (Black spruce, larch)	26,741	85,834	46,984	15,435	2,607	**177,601**
JLP (Jack pine, lodgepole pine)	35,317	116,707	39,251	12,121	3,559	**206,955**
TAB (Trembling Aspen, white birch)	67,434	112,605	102,783	48,100	4,520	**335,442**
Grand Total	**196,629**	**469,451**	**258,839**	**109,994**	**22,172**	**1,057,085**

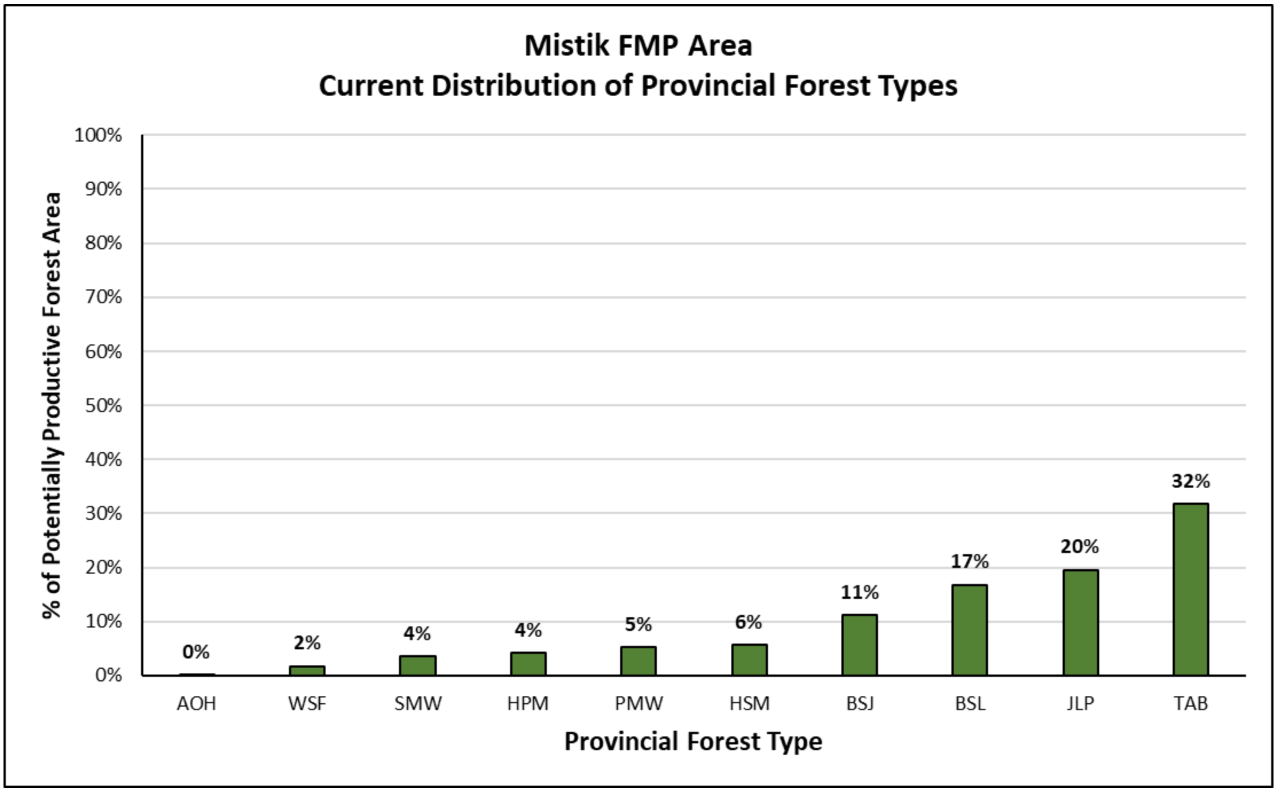


Figure 12.3 Relative occurrence of provincial forest types within the potentially productive forest land base of the Mistik FMP area

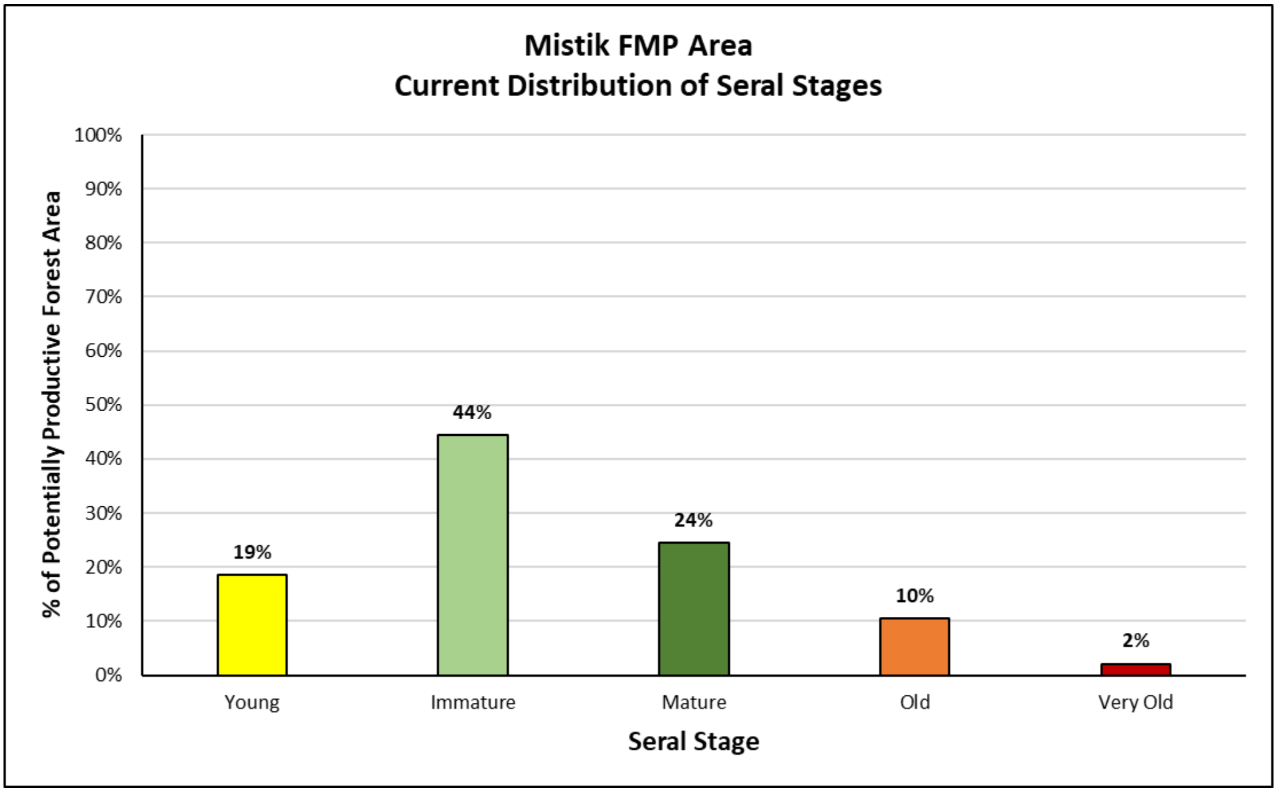


Figure 12.4 Relative occurrence of seral stages within the potentially productive forest land base of the Mistik FMP area

13 NATURAL DISTURBANCES

13.1 DESCRIPTION OF NATURAL DISTURBANCES AND FOREST HEALTH ISSUES

Natural disturbances are an ongoing process within the Mistik FMP area. Table 13.1 summarizes the extent of natural disturbances within the FMP area from 1997 to 2016.

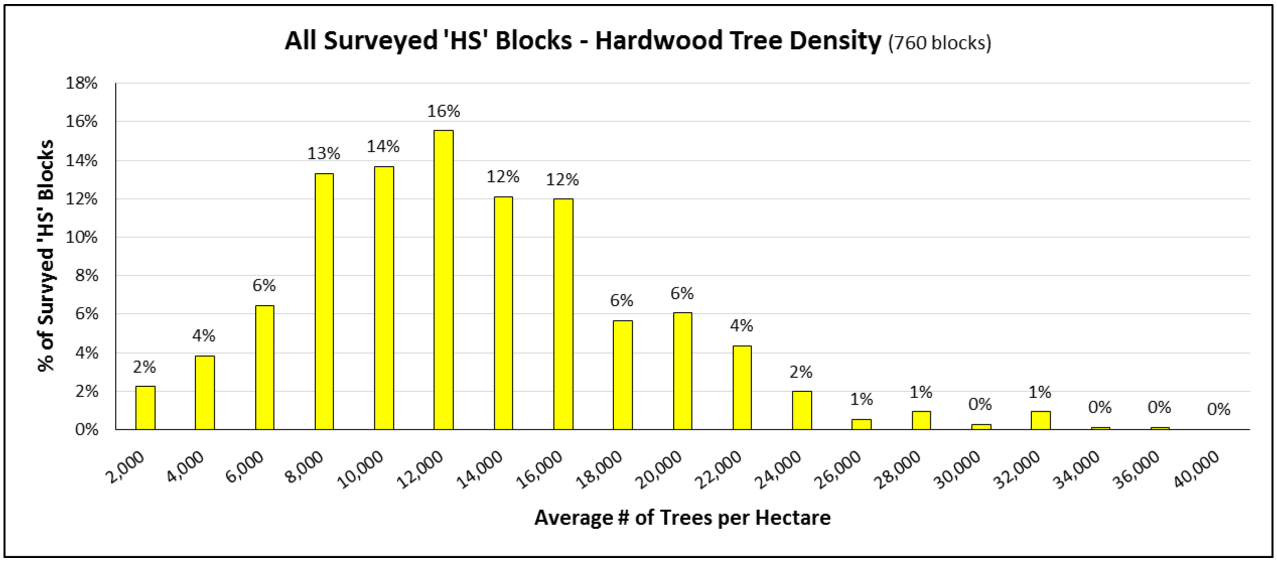
Table 13.1 Natural disturbance impact by provincial forest type (1997 to 2015)

		Area Affected (ha)				
Provincial Forest Type	**Seral Class**	**Fire**	**Insect**	**Disease**	**Other**	**Total**
WSF	Young	-	-	-	-	-
	Immature	291	135	2	29	458
	Mature	289	291	7	12	598
	Old	367	181	-	14	562
	Very Old	576	229	-	4	808
WSF Total		**1,523**	**835**	**9**	**59**	**2,426**
HPM	Young	315	0	-	-	316
	Immature	5,418	190	257	18	5,883
	Mature	962	73	166	31	1,230
	Old	456	78	26	23	582
	Very Old	15	18	-	-	34
HPM Total		**7,166**	**358**	**448**	**72**	**8,045**
SMW	Young	-	-	-	-	-
	Immature	1,644	401	55	12	2,112
	Mature	1,002	311	34	15	1,362
	Old	1,010	233	6	49	1,299
	Very Old	618	369	0	8	995
SMW Total		**4,274**	**1,314**	**96**	**84**	**5,767**
PMW	Young	648	-	-	-	648
	Immature	6,518	173	629	41	7,361
	Mature	1,307	127	318	10	1,761
	Old	819	198	94	3	1,114
	Very Old	286	23	58	3	369
PMW Total		**9,578**	**520**	**1,098**	**57**	**11,253**
HSM	Young	-	-	-	-	-
	Immature	1,391	537	25	15	1,968
	Mature	965	345	62	50	1,421
	Old	2,092	907	10	141	3,149
	Very Old	952	255	-	30	1,237
HSM Total		**5,400**	**2,044**	**96**	**236**	**7,776**
BSJ	Young	4	-	-	-	4
	Immature	10,360	741	900	120	12,121
	Mature	7,195	526	571	86	8,378
	Old	3,597	211	288	20	4,115
	Very Old	938	55	154	2	1,149
BSJ Total		**22,094**	**1,534**	**1,912**	**227**	**25,767**

		Area Affected (ha)				
Provincial Forest Type	**Seral Class**	**Fire**	**Insect**	**Disease**	**Other**	**Total**
TAB	Young	305	-	-	-	305
	Immature	8,243	3,034	164	194	11,635
	Mature	5,634	2,085	133	188	8,039
	Old	5,276	1,272	65	149	6,762
	Very Old	985	168	-	37	1,190
TAB Total		**20,443**	**6,559**	**363**	**567**	**27,932**
BSL	Young	-	-	-	-	-
	Immature	13,382	1,357	140	101	14,980
	Mature	9,621	790	147	95	10,652
	Old	4,038	347	44	63	4,493
	Very Old	818	84	-	3	905
BSL Total		**27,859**	**2,578**	**330**	**262**	**31,030**
JLP	Young	567	2	-	-	569
	Immature	17,826	377	6,795	350	25,349
	Mature	6,184	361	2,564	147	9,256
	Old	2,416	339	1,851	35	4,641
	Very Old	809	287	727	11	1,833
JLP Total		**27,802**	**1,366**	**11,937**	**543**	**41,649**
Grand Total		**126,163**	**17,167**	**16,291**	**2,107**	**161,727**

The value of managing for mixedwood forests in the boreal is well-documented[45]. It is Mistik's goal that, within the harvested land base, the regenerating pure hardwood land base does not increase relative to that which was harvested (refer to Figues 14-1 to 14-3). Most harvested sites on the Mistik FMP area regenerate to aspen (by default as long as there is some component of hardwood pre-harvest). Mistik's forest renewal program ensures that a significant softwood complement is added to many harvested forest sites to allow for prompt development of diverse forest ecosystem types following diverse forest successional pathways

[45] For example, Comeau, P.G., R. Kabzems, J. McClarnon and J.L. Heineman. 2005. Implications of selected approaches for regenerating and managing western boreal mixedwoods. For. Chron. 81(4). 559-574.



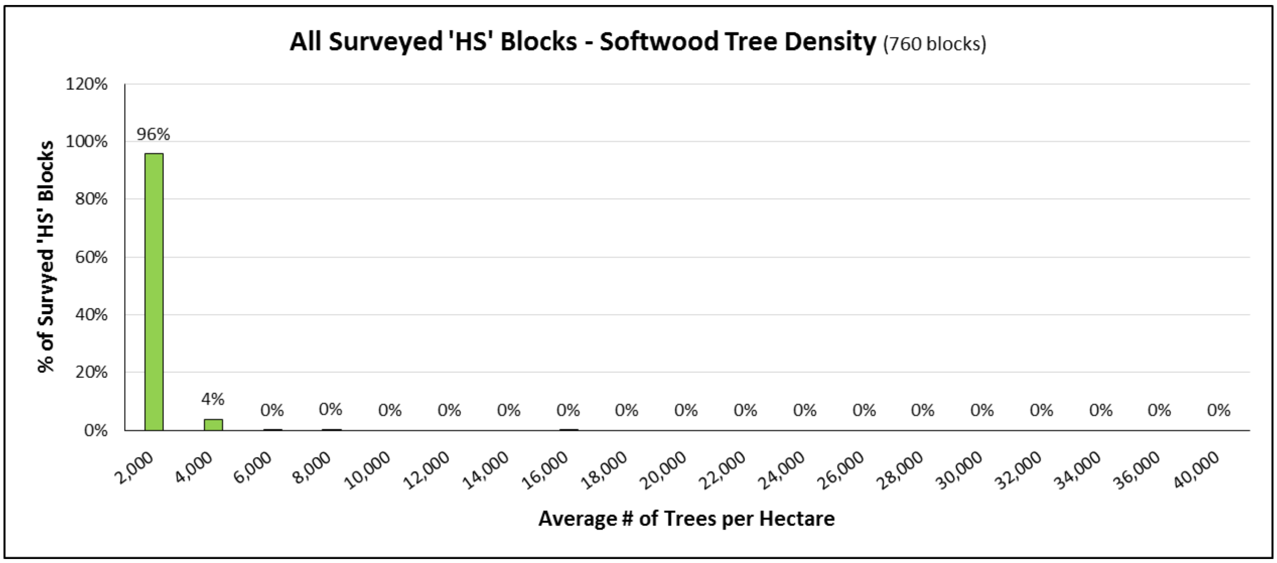
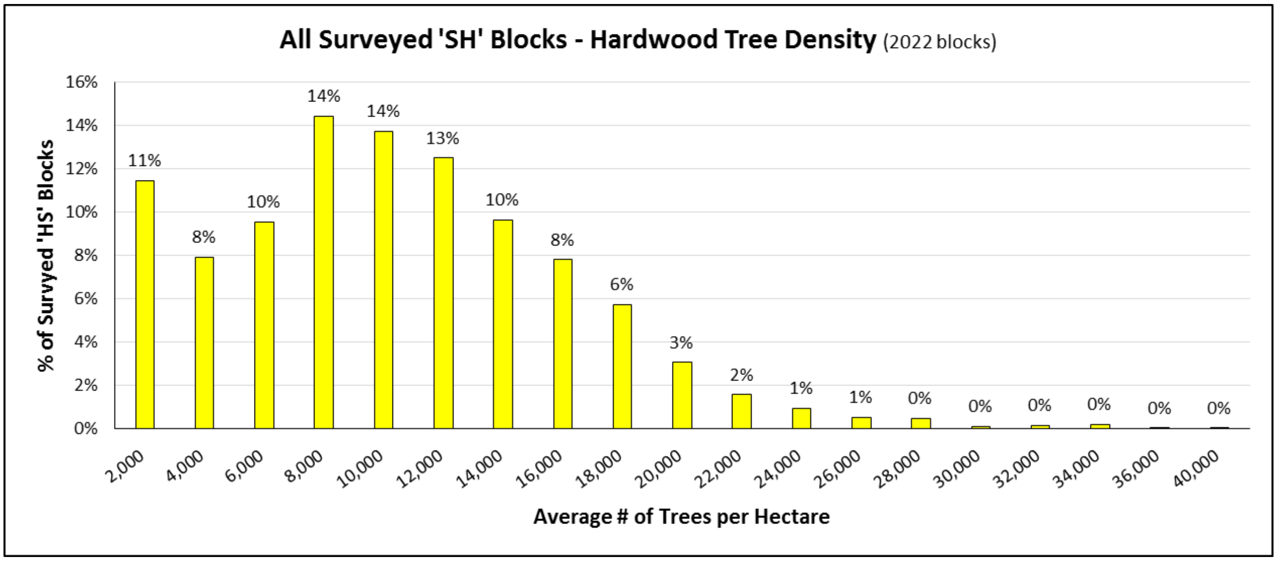


Figure 13.1 Current distribution of deciduous (top panel) and coniferous (bottom panel) tree densities for all surveyed hardwood-leading mixedwood potential (HS) blocks in the Mistik FMP area



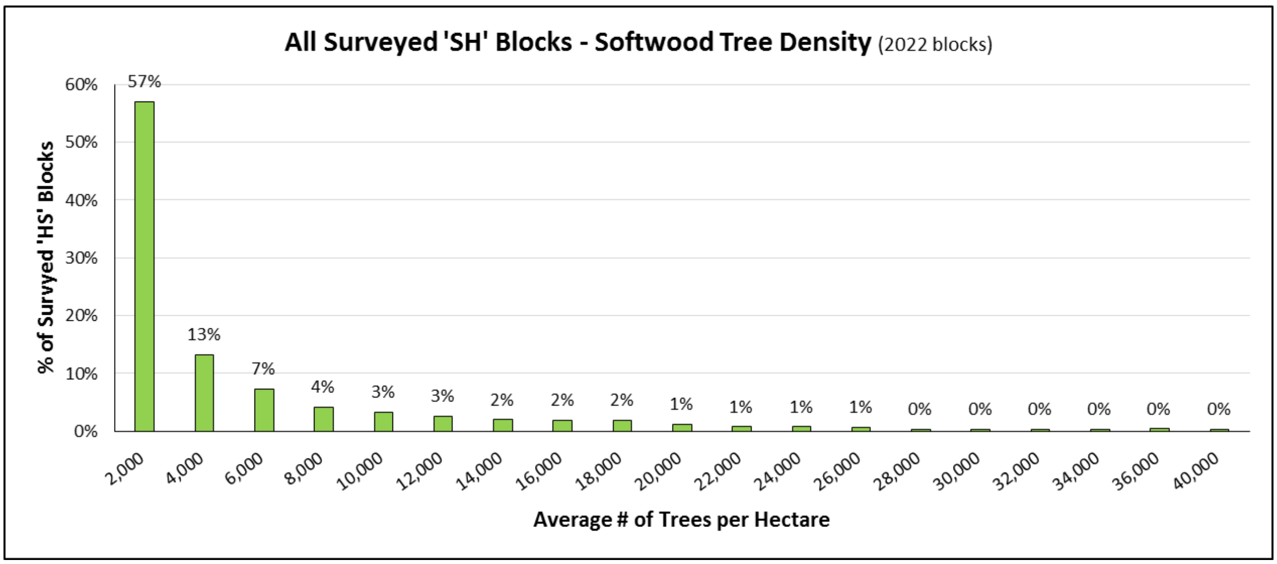


Figure 13.2 Current distribution of deciduous (top panel) and coniferous (bottom panel) tree densities for all surveyed softwood-leading mixedwood potential (SH) blocks in the Mistik FMP area.

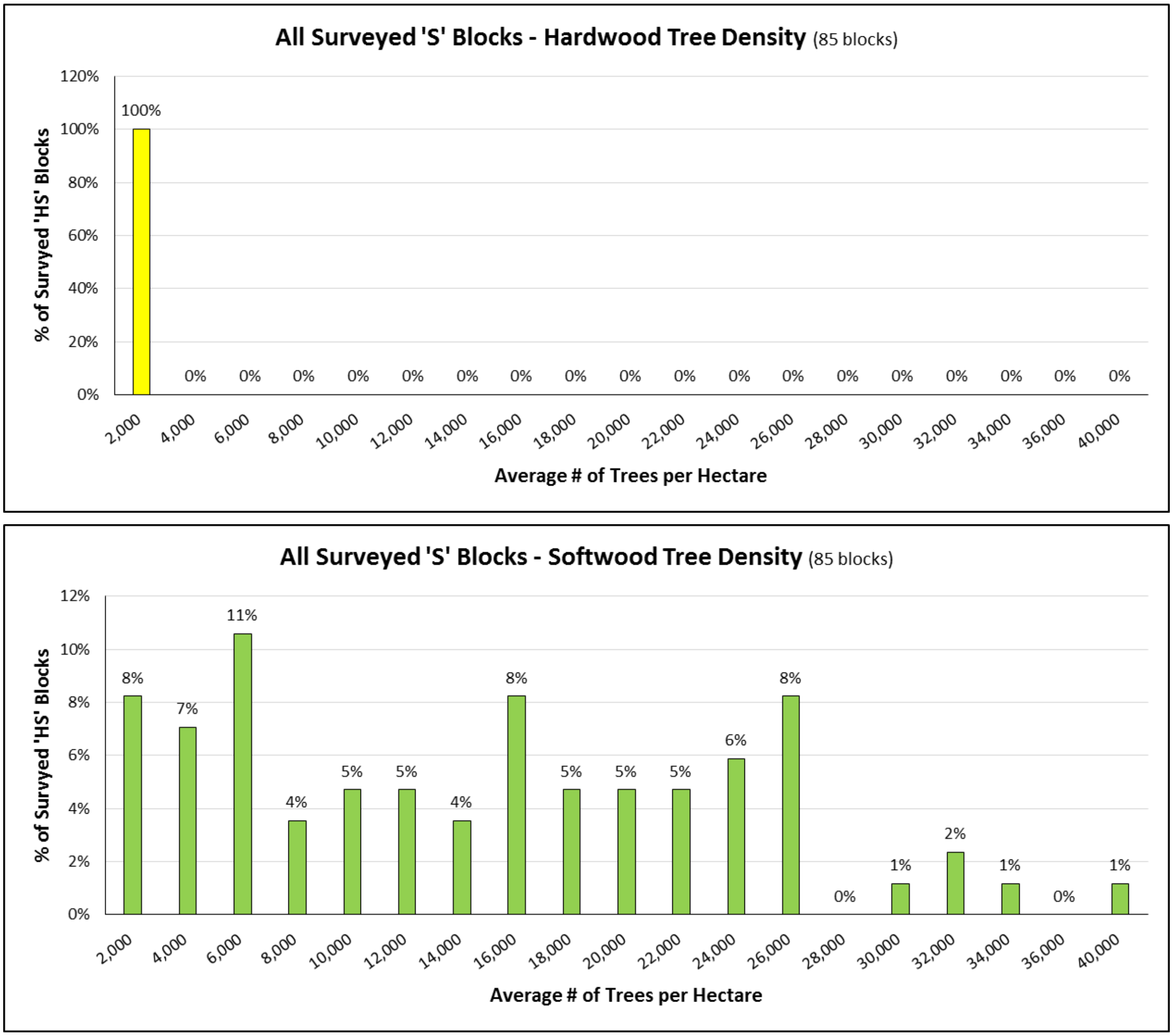


Figure 13.3 Current distribution of deciduous (top panel) and coniferous (bottom panel) tree densities for all surveyed softwood-leading potential (S) blocks in the Mistik FMP area.

Figure 14-4 demonstrates that, of the harvested area surveyed to date (shown in red), a significant amount of pre-harvest hardwood (H) forest types[46] now have the potential to develop into mixedwood (SH) forest types (shown in green). Figure 14-4 provides a measure of success of Mistik's forest renewal program in maintaining the presence of softwood tree species in the regeneration harvested landbase.

---

[46] H < 20% softwood stocking
HS >= 20% and < 50% softwood stocking
SH >= 50% and < 80% softwood stocking
S >= 80% softwood stocking.

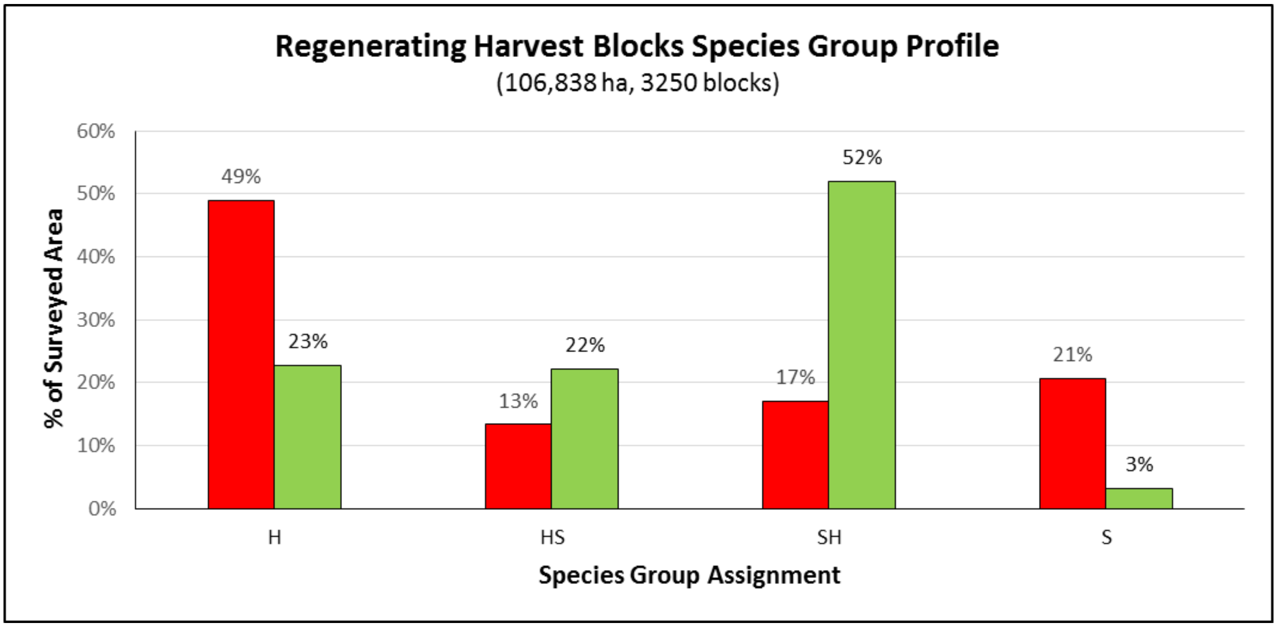


Figure 13.4: 2016 comparison of all surveyed harvested blocks in the Mistik FMP area comparing pre-harvest species group designation (red) and establishment survey species group designation (green)

Mistik's renewal program ensures that an increasing proportion of the harvested forest land base has the potential to develop into a full spectrum of diverse mixedwood forest types. In (Figure 13.4) the pre-harvest softwood types (S) appear to be 'losing ground' relative the regenerating land base based on the establishment survey results. The reason for this is that many harvested softwood stands contain some component of hardwood pre-harvest. The hardwood expresses itself vigorously early in stand development and thus these 'S' types end up as 'SH' types in the establishment survey. It is Mistik's contention that many of these 'SH' types will develop into 'S' types as the 'SH' stands mature and age. In the absence of Mistik's forest renewal program, the proportions shown (in green) would be significantly skewed to 'H' forest types with very little representation in the mixedwood species groups (HS and SH). Based on the forest renewal information provided above, Mistik has clearly addressed basic forest renewal goals including:

- The establishment and successful regeneration of boreal tree species (Figure 13.1 to Figure 13.3) on harvested forest sites;
- The maintenance of the range (H, HS, SH and S) of natural diversity of boreal forest types (including the prompt and vigorous enhancement of softwood regeneration) (Figure 13.4).

Successful management of mixedwood forests in the boreal has been, and continues to be, a topic of considerable research and discussion among forestry researchers, regulators and practitioners [47]. Specifically, the projection of boreal forest growth and stand dynamics is a matter of significant interest to

[47] Stelfox, J.B. (editor) 1995. Relationships between stand age, stand structure and biodiversity in aspen mixedwood forests in Alberta. Alberta Environmental Centre (AECV95-R1), Vegreville, Alberta and Canadian Forest Service (Project # 0001A), Edmonton, Alberta. 308 pp.
Pitt, D.G. and F. W. Bell. 2005. Juvenile response to conifer release alternatives on aspen-white spruce boreal mixedwood sites. Part 1: Stand structure and composition. For. Chron. 81 (4). 538-547.
Greifenhagen, S., D.G. Pitt, M.C. Wester and F. W. Bell. 2005. Juvenile response to conifer release alternatives on aspen-white spruce boreal mixedwood sites. Part 1: Quality of aspen regeneration. For. Chron. 81 (4). 538-558.
Comeau, P.G., R. Kabzems, J. McClarnon and J.L. Heineman. 2005. Implications of selected approaches for regenerating and managing western boreal mixedwoods. For. Chron. 81(4). 559-574.

both forestry practitioners and forest researchers. The relative rate of growth of regenerating boreal forest mixedwood stands and of individual trees species assemblages within stands is complex and dependent on a number of site-specific factors. Various brushing treatments (manual, mechanical and chemical), targeted at deciduous tree species, early (< 15 yrs post-harvest) in mixedwood stand development have been utilized extensively, across Canada, to encourage the growth of softwood tree species. The early seral stage interventionist approach may yield cost-effective benefits under some conditions. For a number of reasons, this approach is not practical in the Mistik FMP area. Instead of an active, 'interventionist' approach early in stand development, Mistik prefers a more patient 'wait and see' approach that:

- maximizes future flexibility in terms of forest management options;
- maximizes total timber volume accumulation of all species over time;
- allows for natural ecosystem successional processes to dominate stand development to rotation age.

This approach is the most pragmatic in the boreal ecosystems of the Mistik FMP area. The one key management option available under this 'wait and see' mixedwood management regime is modification of rotation age. For some mixedwood forest types, rotation ages may be lengthened to allow for the development of diverse forest structure and tree species composition objectives. Longer rotation ages will generally allow for the softwood component of mixedwood stands to contribute proportionately more to stand composition. Mistik's approach has received widespread support from FMP area community advisory and co-management groups, public advisory group, forest certification auditors and environmental organizations. The approach is consistent with the known attributes of mixedwood forest stand dynamics and is also consistent with ecosystem-based management.

13.1.1 FREE TO GROW SURVEY RESULTS

There have been no free to grow surveys implemented on the Mistik FMP area to date. The provincial free to grow standard became effective as of 2004. All sites harvested from 2004 onwards will be required to have a free to grow assessment undertaken. The earliest date that free to grow surveys will be implemented on the Mistik FMP area is 2018.

13.2 FIRE DISTURBANCE

Fires (Map 24 – Forest Fires, Appendix E) have had a significant impact on the Mistik FMP area since the inception (1988) of the FMP area (Figure 13.5 and Figure 13.6). A total area of approximately 460,950 ha has burned within the FMP area between 1988 and 2015 [48]. 228,346 ha have burned during the current term (2007 to present) of the existing 20-Year Forest Management Plan. Of the 129,720 ha burned from 2004 to 2015, 130,155 ha of provincial forest types burned (Figure 13.7). Black spruce, jack pine and aspen forest types were the most commonly burned provincial forest types (Figure 13.8). Immature seral stages were most frequently burned (Figure 13.9). Management units 21-Peter Pond, 11-Dillon and 08-Canoe Lake were the most impacted by wildfires (Figure 13.10). Of the total area burned, there are 4,551 ha of previously harvested and regenerating harvest blocks that have been burned by wildfire (Figure 13.11). The majority of the harvested-regenerated-and-burned areas area is found in the 04-Waterhen, 07-Beauval and 21-Peter Pond management units (Map 25 – Harvested-Regenerated-Burned, Appendix E).

---

[48] Based primarily on Saskatchewan Forest Vegetation Inventory interpretation. The data shown in Figure 14-5 differ from the data shown in Map 24 – Forest Fires. Map 24 – Forest Fires is based on a coarser resolution of fire mapping that does not reflect unburnt areas within the fire polygons and actual fire perimeters. The data in Figure 14-5 does not reflect overlapping burn areas. The area of recent fires (2002 to present) is based on Saskatchewan Environment fire polygons. The total area includes all land base classification types (brush, open and treed wetlands, grasslands, etc.)

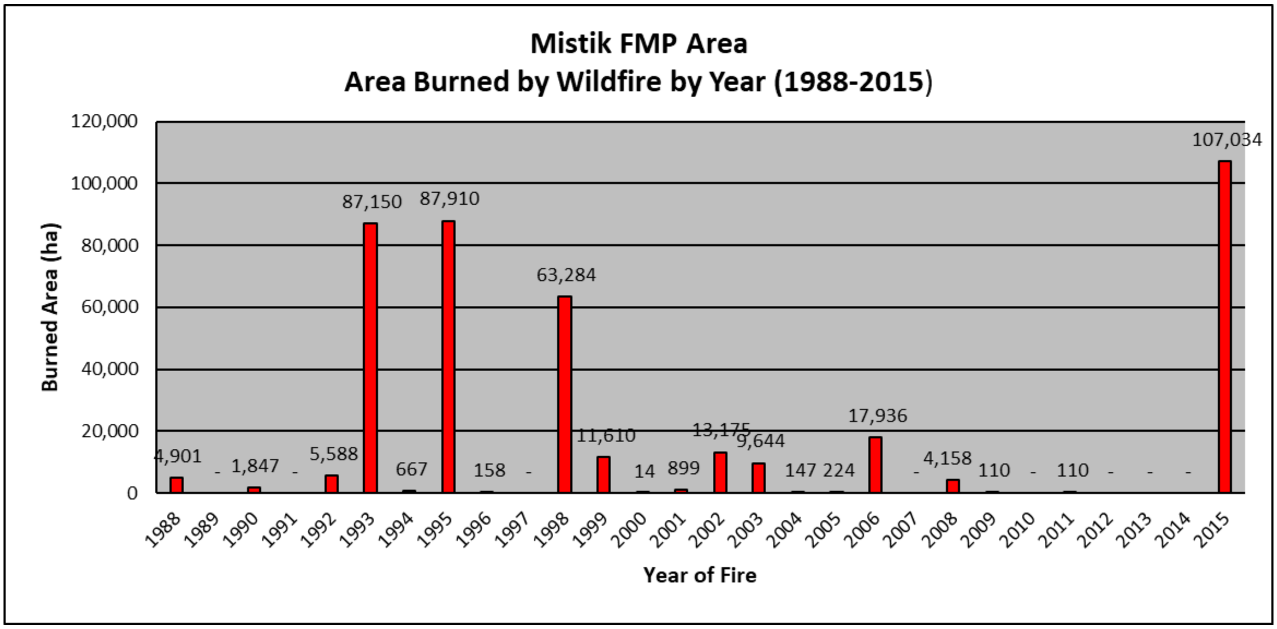


Figure 13.5 Area burnt between 1988 and 2015 within the Mistik FMP area

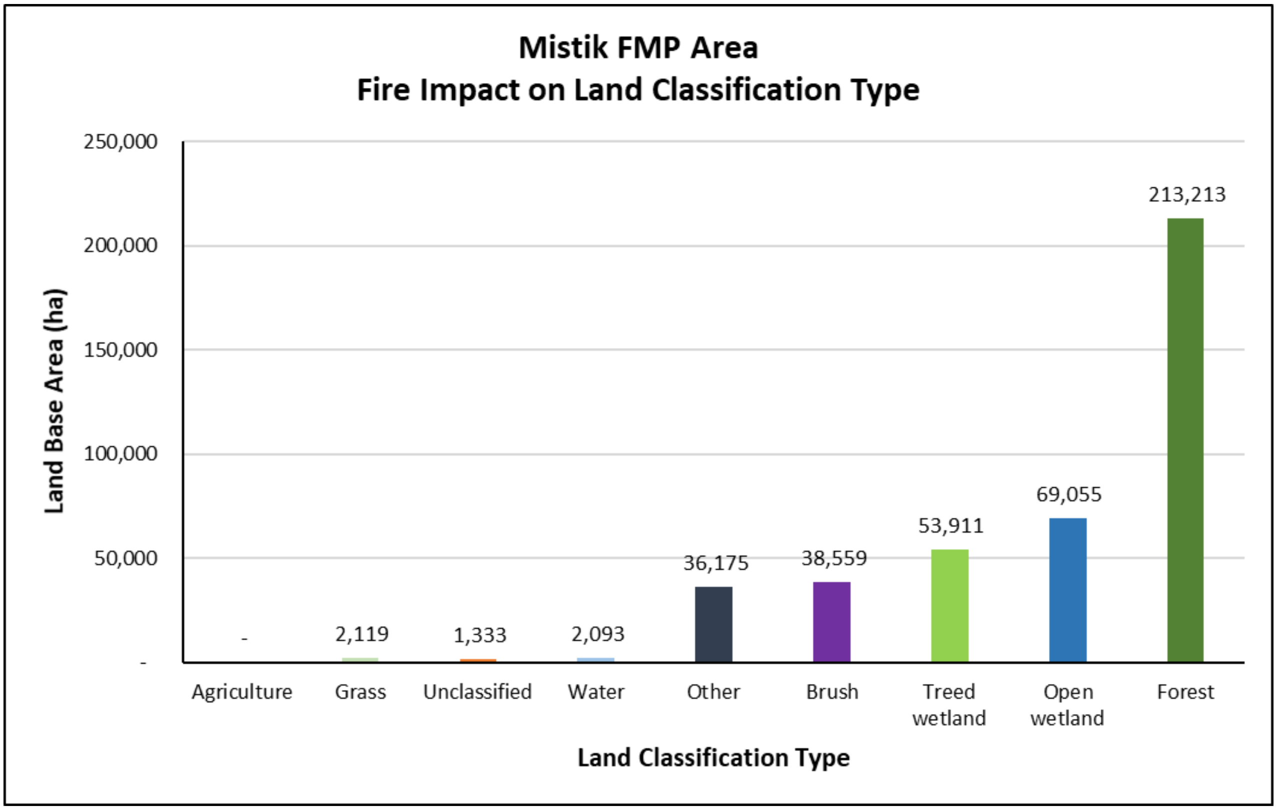


Figure 13.6 Land classification type impacted by fire within the Mistik FMP area since 1988

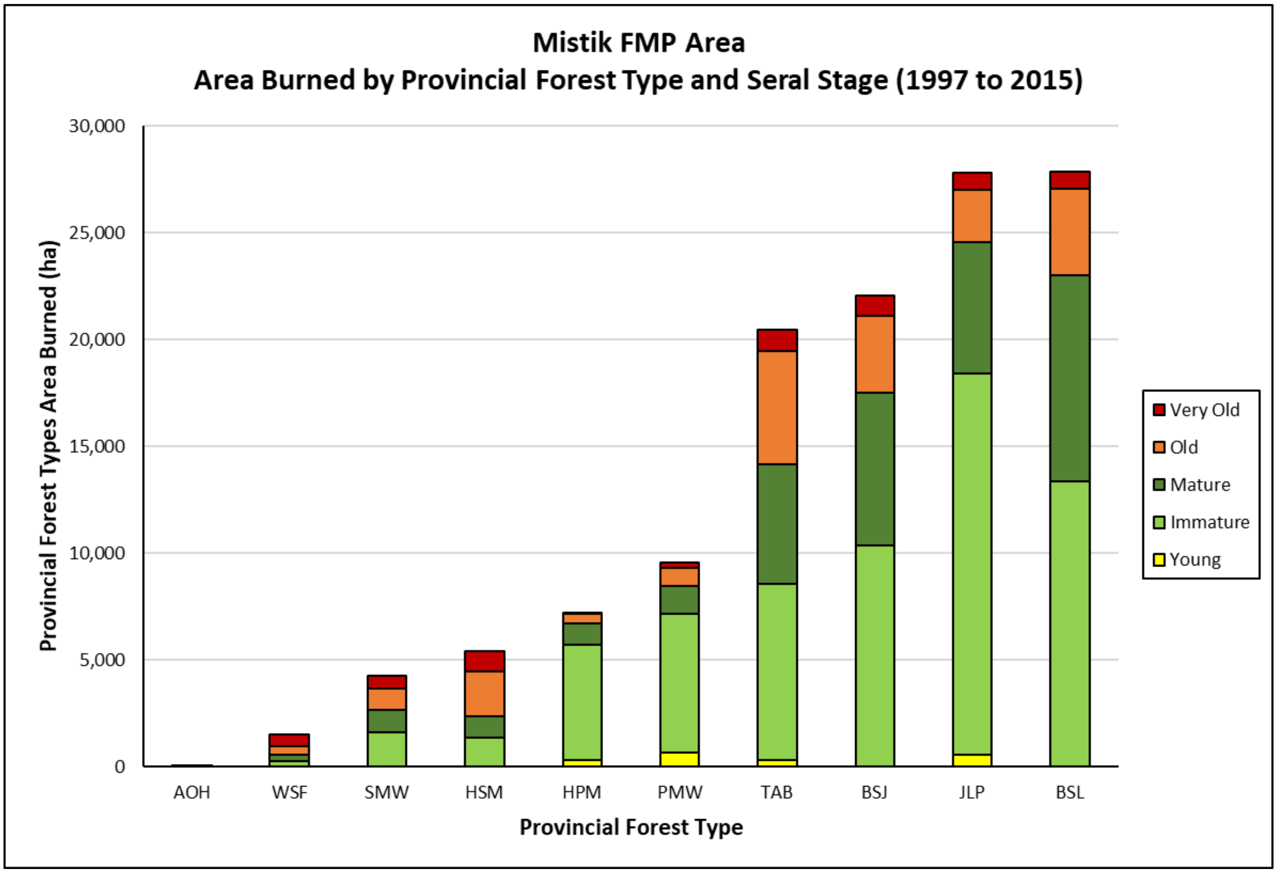


Figure 13.7 Area of provincial forest types and seral stage burned within the Mistik FMP area between 1997 and 2015

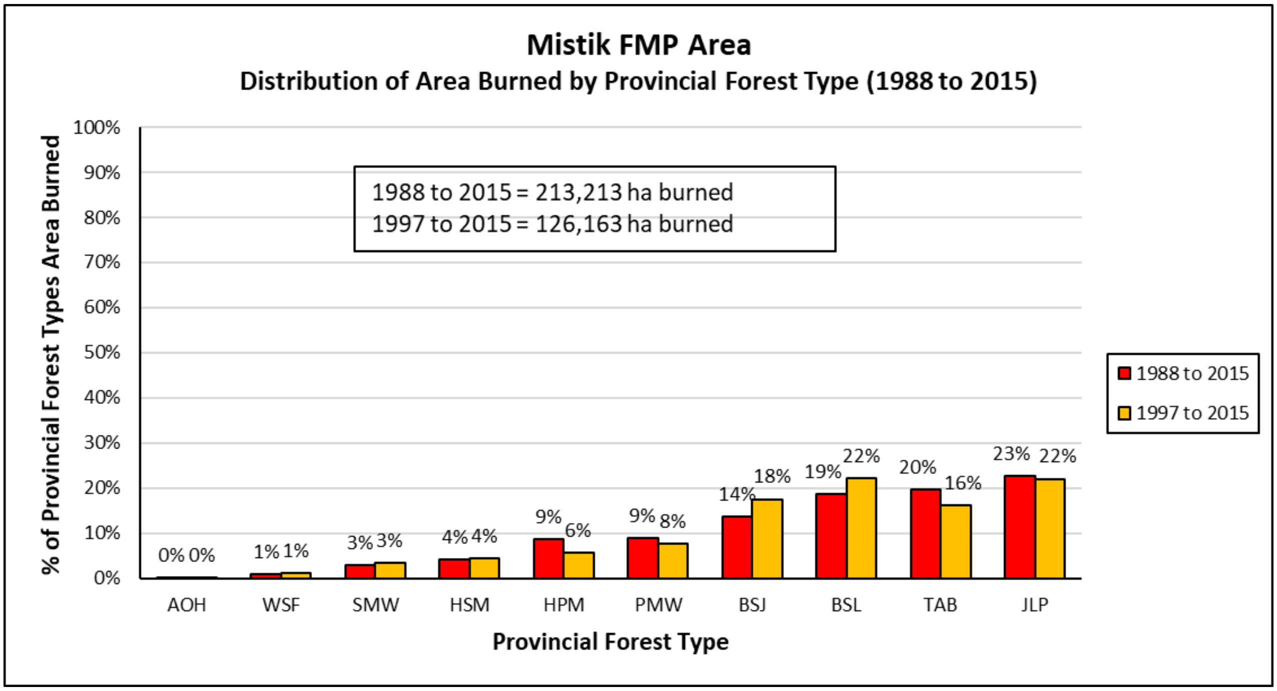


Figure 13.8 Proportion of provincial forest types area burned within the Mistik FMP area between 1988 and 2015

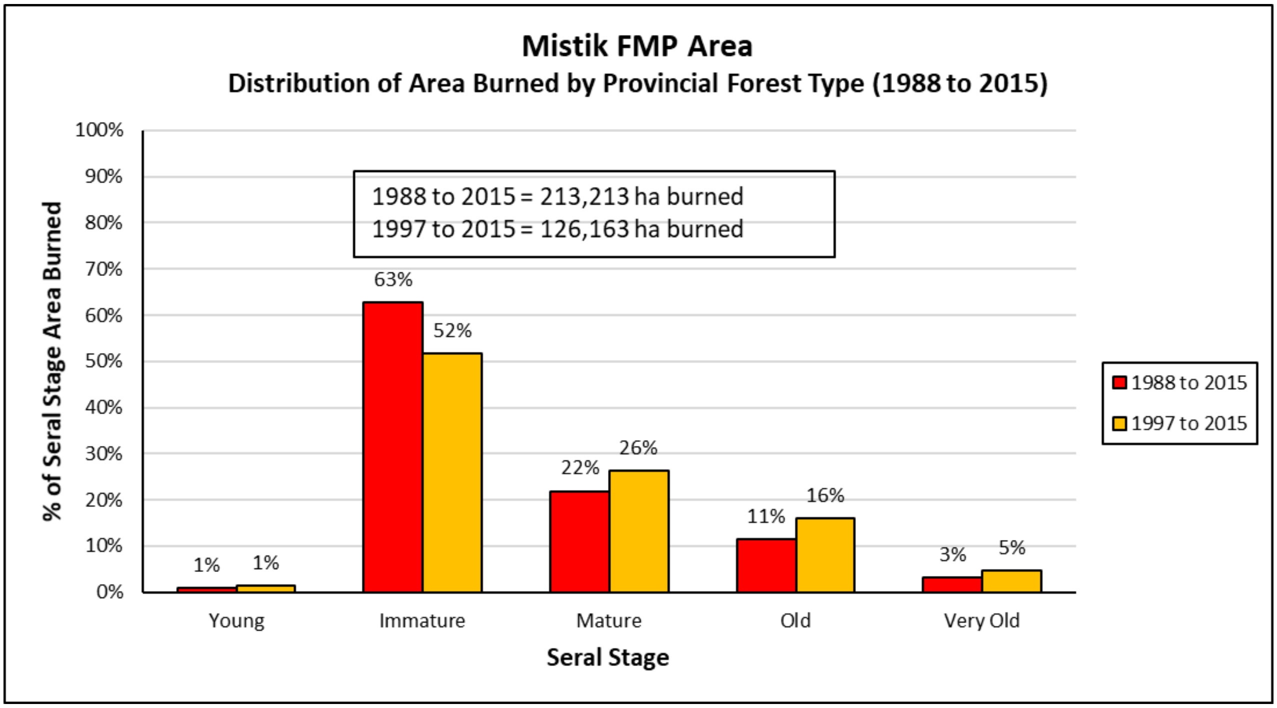


Figure 13.9 Proportion of provincial forest type seral stages area burned within the Mistik FMP area between 1988 and 2015

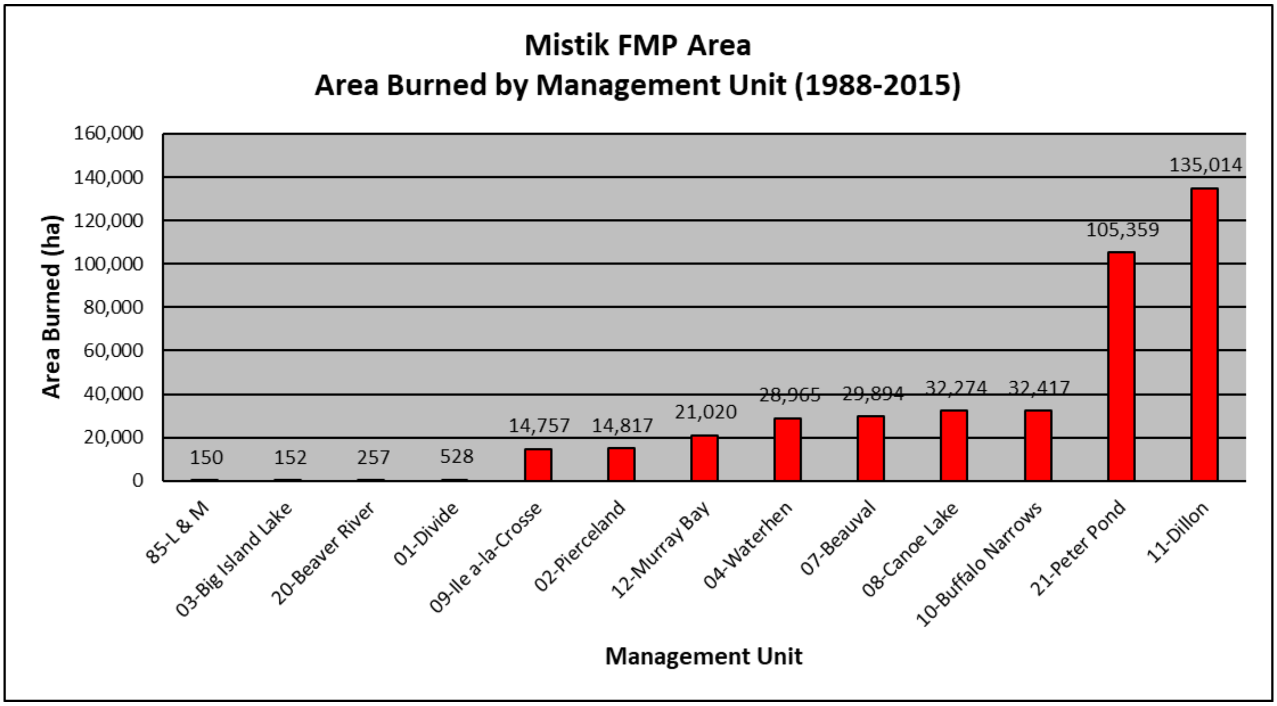


Figure 13.10 Distribution of provincial forest types area burned by management unit between 1988 and 2015 within the Mistik FMP area

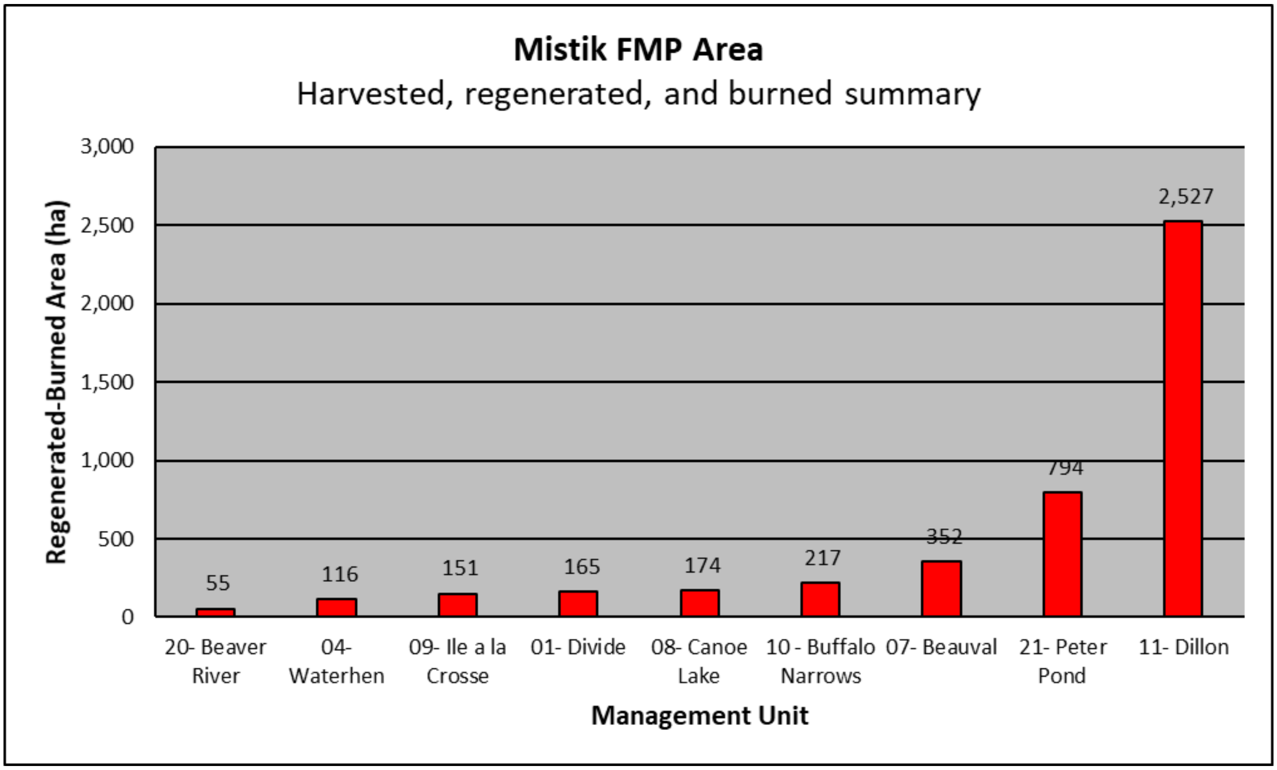


Figure 13.11 Area by management unit within the Mistik FMP area that has been harvested, regenerated and burned

13.3 INSECT DISTURBANCE

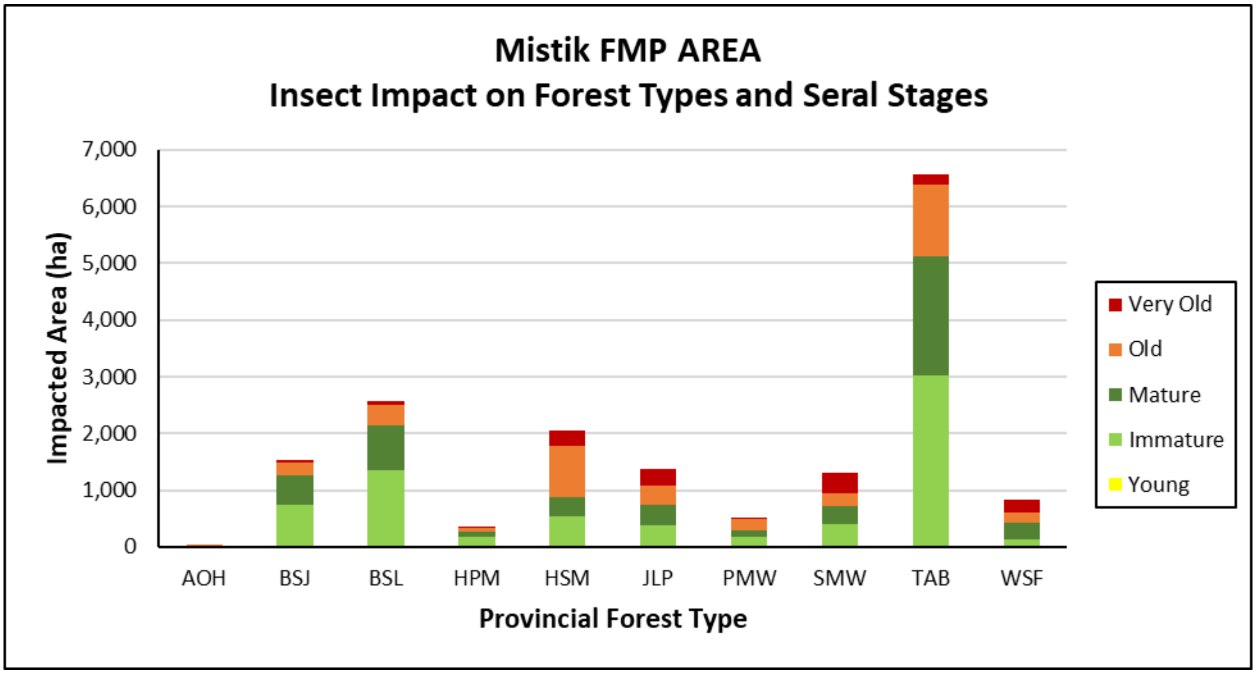


Figure 13.12 Area by provincial forest type and seral stage impacted by insect damage

13.4 DISEASE DISTURBANCE

Dwarf mistletoe (*Arceuthobium americanum* Nutt. Ex Engelm.), a parasitic plant, is the most serious and extensive forest health issue affecting forest productivity within the FMP area. Cumulatively, approximately 43,000 ha (Figure 13.13) of jack pine associated forest stands have been significantly impacted by the parasitic plant over the last number of decades[49] (Map 26 – Dwarf Mistletoe, Appendix E). The majority (78%) of forest stands severely impacted by dwarf mistletoe are associated with pure jack pine stands (Figure 13.14). In terms of age, 73% of the severely impacted jack pine area occurs in the immature seral stage (Figure 13.15). Mistik estimates that an additional 175,000 ha of jack pine-associated forest stands have a high likelihood of moderate levels (not detectable from air photo interpretation or aerial surveys) of dwarf mistletoe incidence[50].

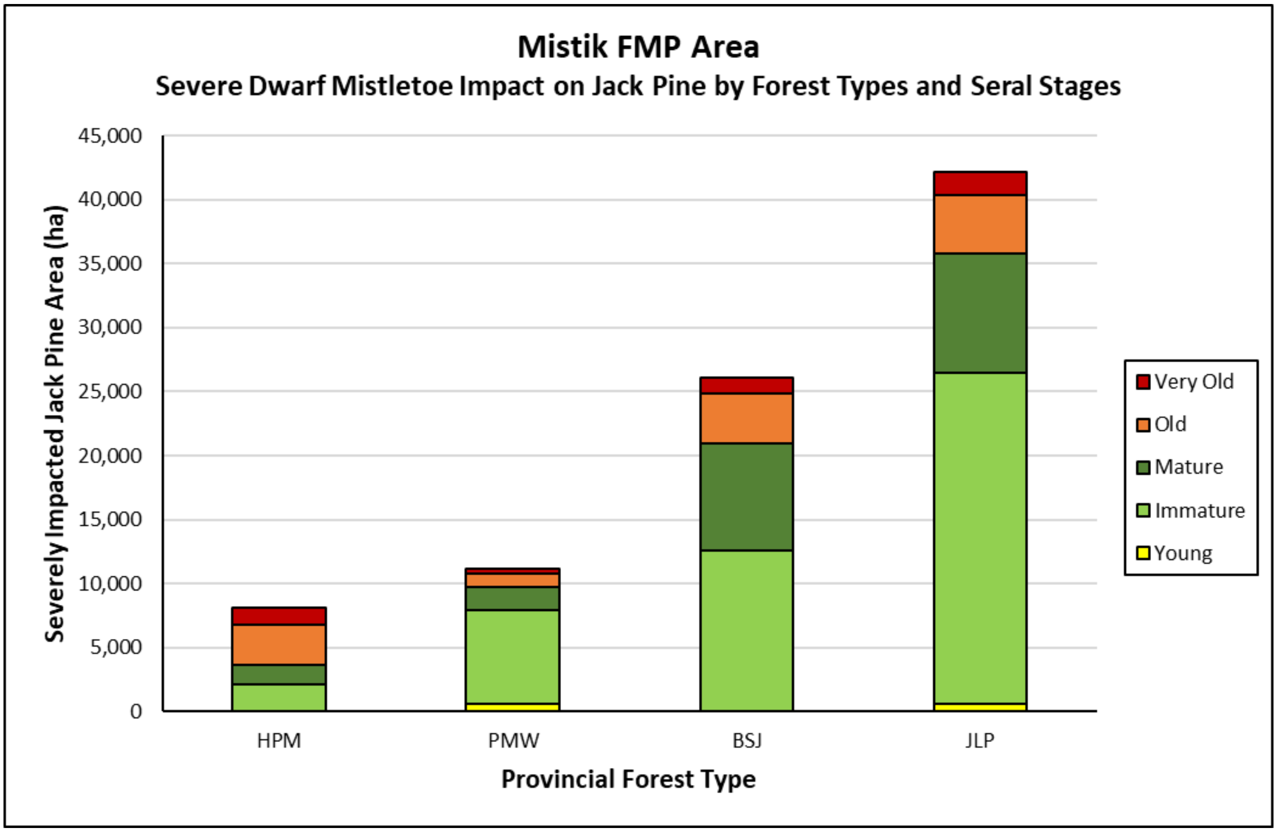


Figure 13.13 Area of jack pine-associated provincial forest types and seral stages severely impacted by dwarf mistletoe within the Mistik FMP area

---

[49] Based on a combination of Mistik's Saskatchewan Forest Vegetation Inventory (1999-2006) (SFVI) disease modifier attributes and Canadian Forest Service (CFS) aerial surveys between 1984 and 1996 described in 'Distribution of Severe Dwarf Mistletoe Damage in West-Central Canada (Brandt *et al.* 1998, Canadian Forest Service) and limited ground truthing by Mistik and Saskatchewan Environment staff.

[50] This is based on field observations by Mistik staff and the following SFVI assumptions: All stands with greater than or equal to 30% jack pine composition and greater than or equal to 60 years of age have a high likelihood of dwarf mistletoe incidence.

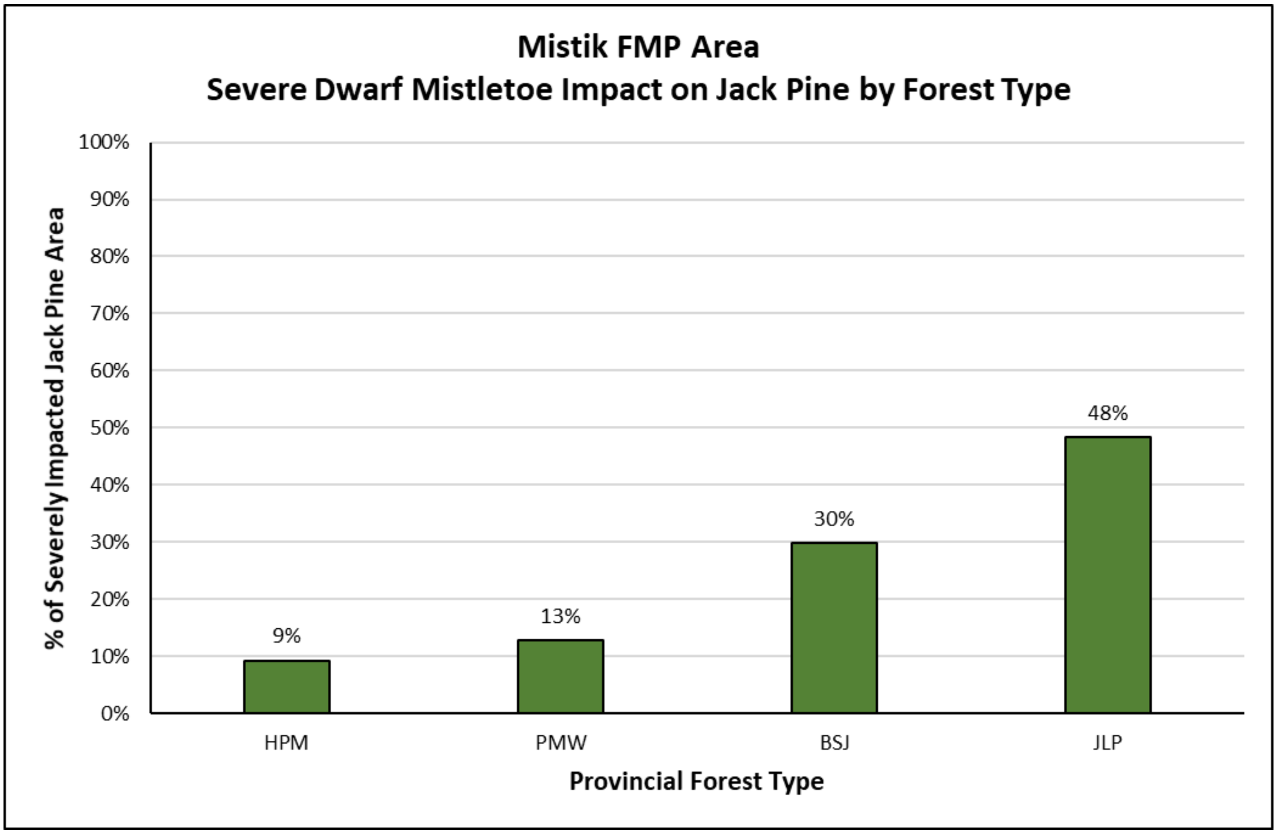


Figure 13.14 Relative occurrence of severe dwarf mistletoe impact within jack pine-associated provincial forest types of the Mistik FMP area

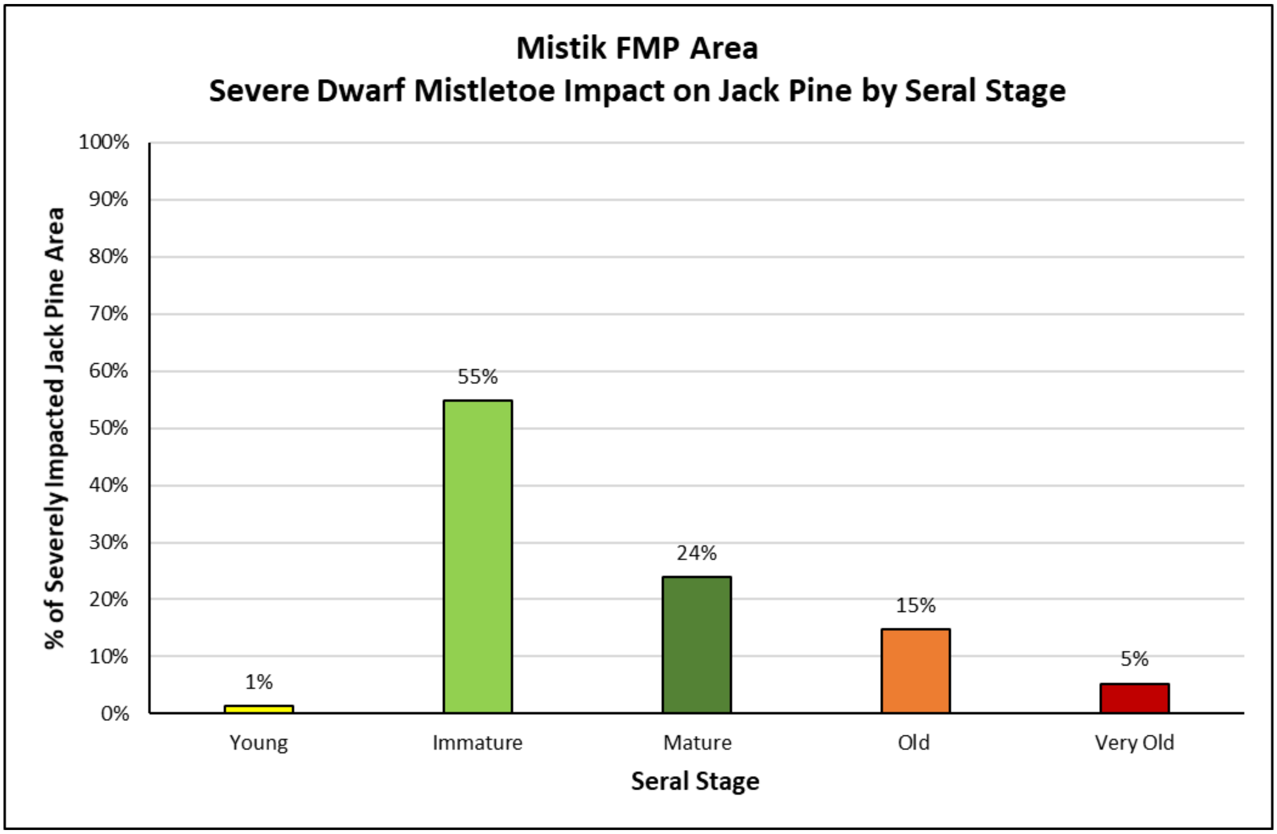


Figure 13.15 Relative occurrence of severe dwarf mistletoe impact within jack pine-associated seral stages of the Mistik FMP area

13.5 WIND DISTURBANCE

In July 2002, a major windstorm impacted approximately 16,000 ha of the Waterhen Management Unit. During the last decade approximately an additional 1,500 ha of forested (including treed wetland) area (predominantly younger stands of aspen) was significantly damaged (Figure 13.16 to Figure 13.19, Map 27 - Windthrow, Appendix E).

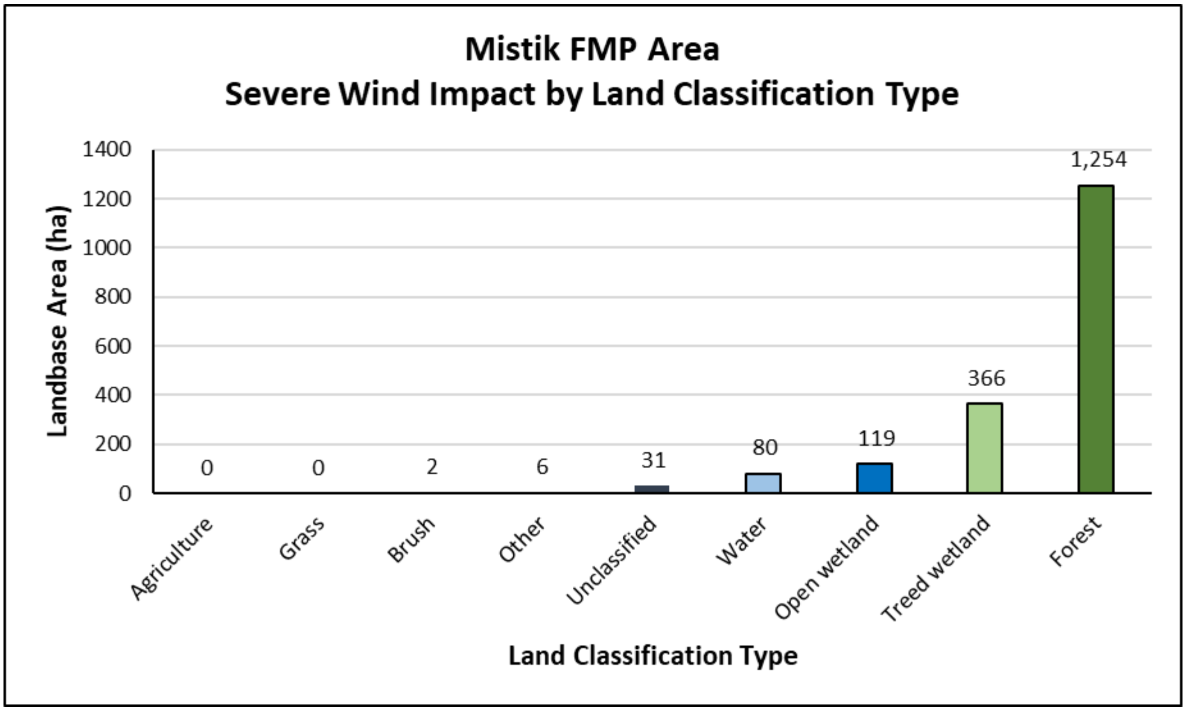


Figure 13.16 Land classification type impacted by severe wind within the Mistik FMP area (2006-2015)

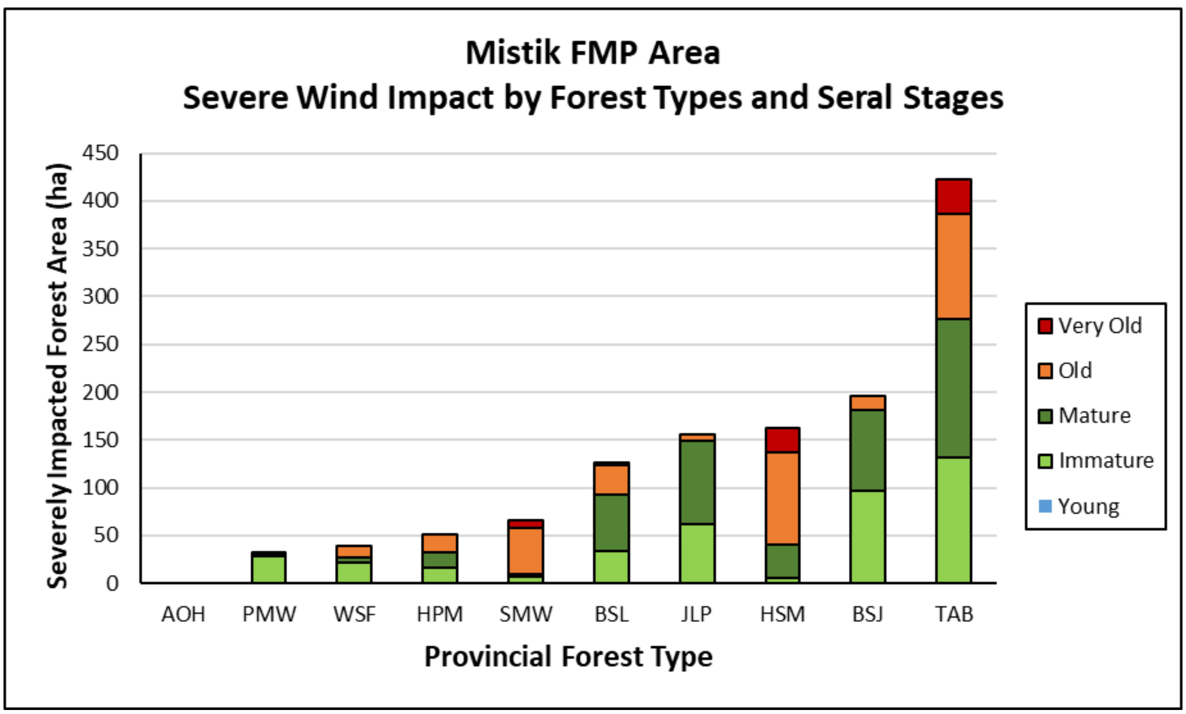


Figure 13.17 Area of provincial forest types and seral stages impacted by wind within the Mistik FMP area (2006-2015)

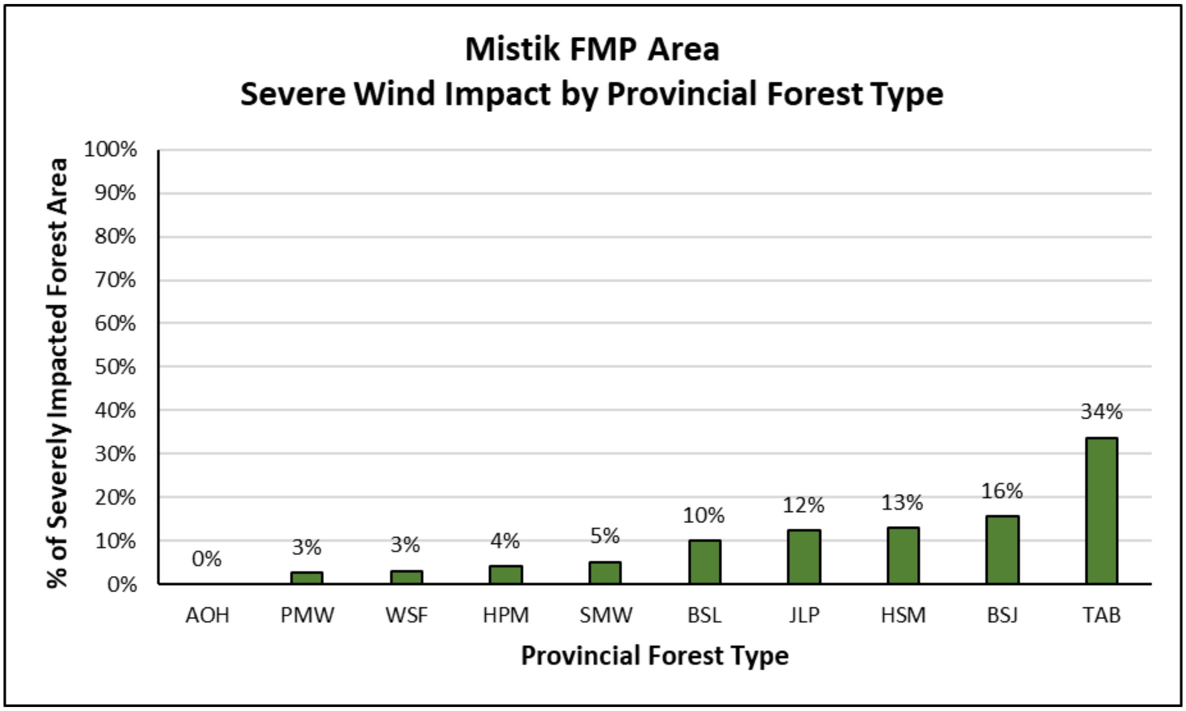


Figure 13.18 Relative occurrence of severe wind impact by provincial forest types in the Mistik FMP area (2006-2015)

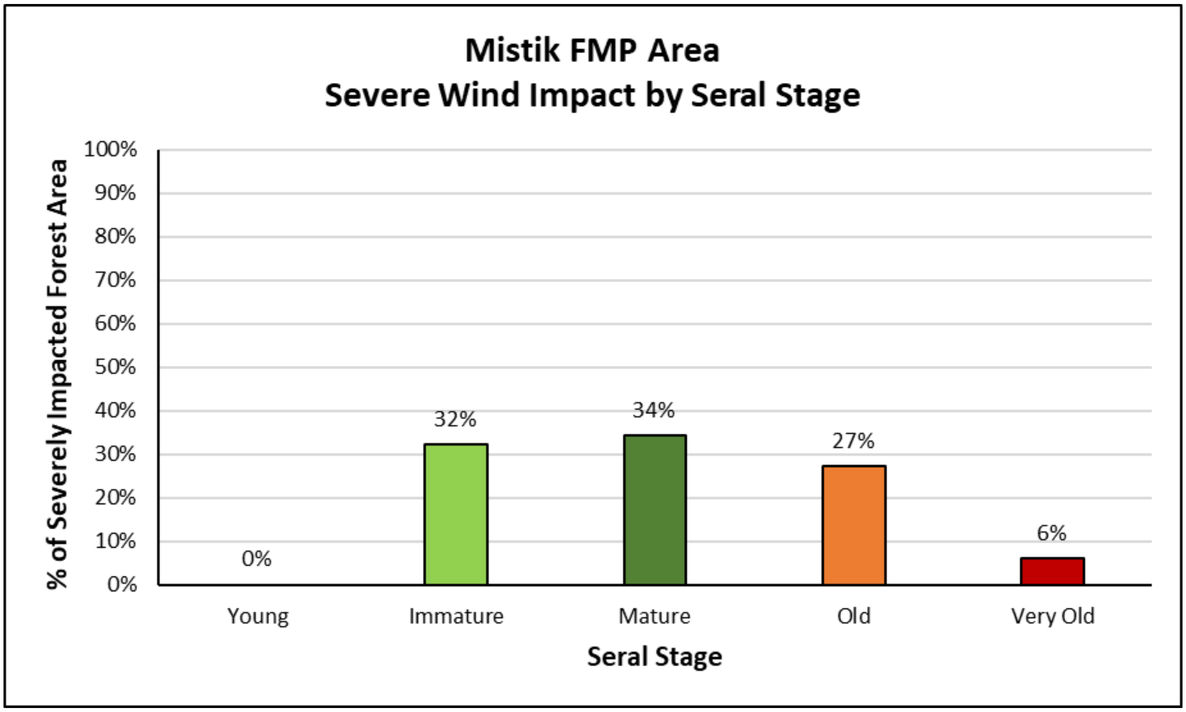


Figure 13.19 Relative occurrence of severe wind impact by seral stages in the Mistik FMP area (2006-2015)

13.6 HARVEST

Based on revised interim harvest volume calculations approved by the Province of Saskatchewan in 2002[51], the Mistik FMP area supported an annually approved harvest volume of 445,000 m^3 of softwood and 805,000 m^3 of hardwood. The approved 2007 20-Yr FMP defined a harvest volume schedule (HVS) of 581,250 m3 of softwood and 911,400 m3 of hardwood for the Mistik FMA. The approved 20-Yr FMP for the L&M FMA currently defines the HVS as 82,240 m3 softwood and 42,620 m3 hardwood. Since 1988, Mistik has harvested approximately 4,782 ha (Figure 13.20) of forest area on an annual basis. Mistik has deviated from the planned location of harvest activity, as described in the 1997 20-Year Forest Management Plan (Figure 13.21 and Figure 13.22), in order to enhance equitable distribution of forest-related benefits among FMP area-associated communities. The distribution of harvest location and relative volume of Mistik's harvest activities since 1997 reflects the relative contribution of each management unit to the total FMA-wide harvest volume and the desire of local FMP area communities to benefit from employment and economic benefits associated with forestry.

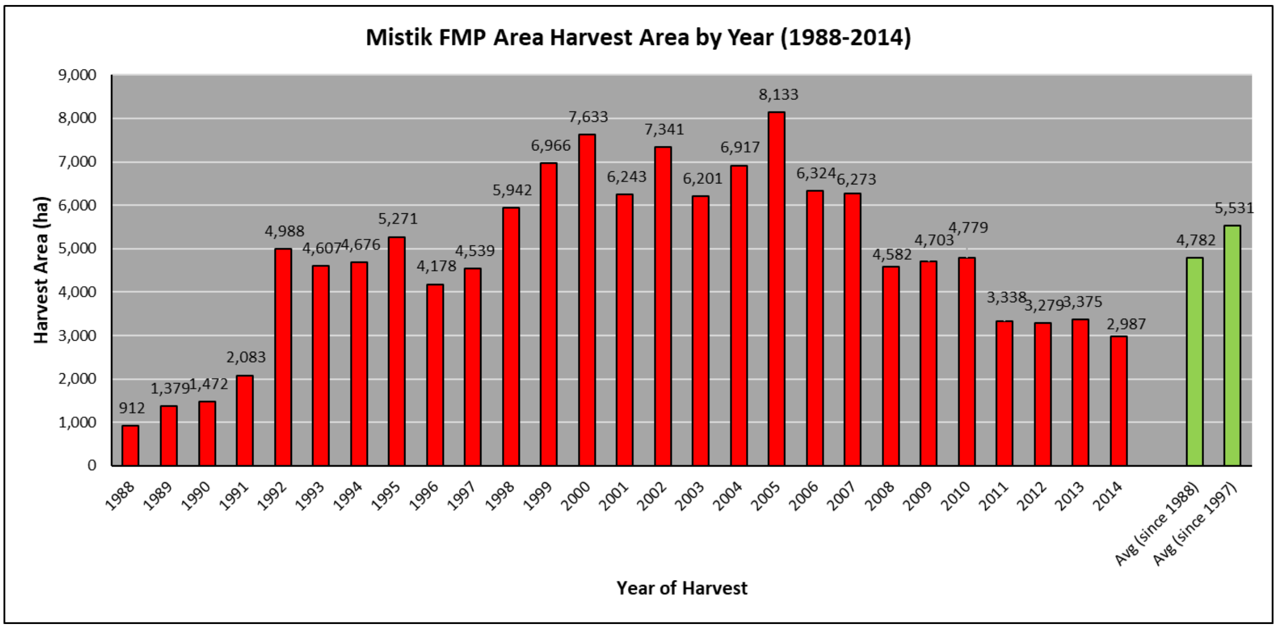


Figure 13.20 Harvested area by year for the Mistik FMP area for the period 1988 to 2014

[51]The original (1997 20-Year Forest Management Plan) approved harvest volumes for Mistik's FMP area were 514,000 m^3 of softwood and 825,000 m^3 of hardwood.

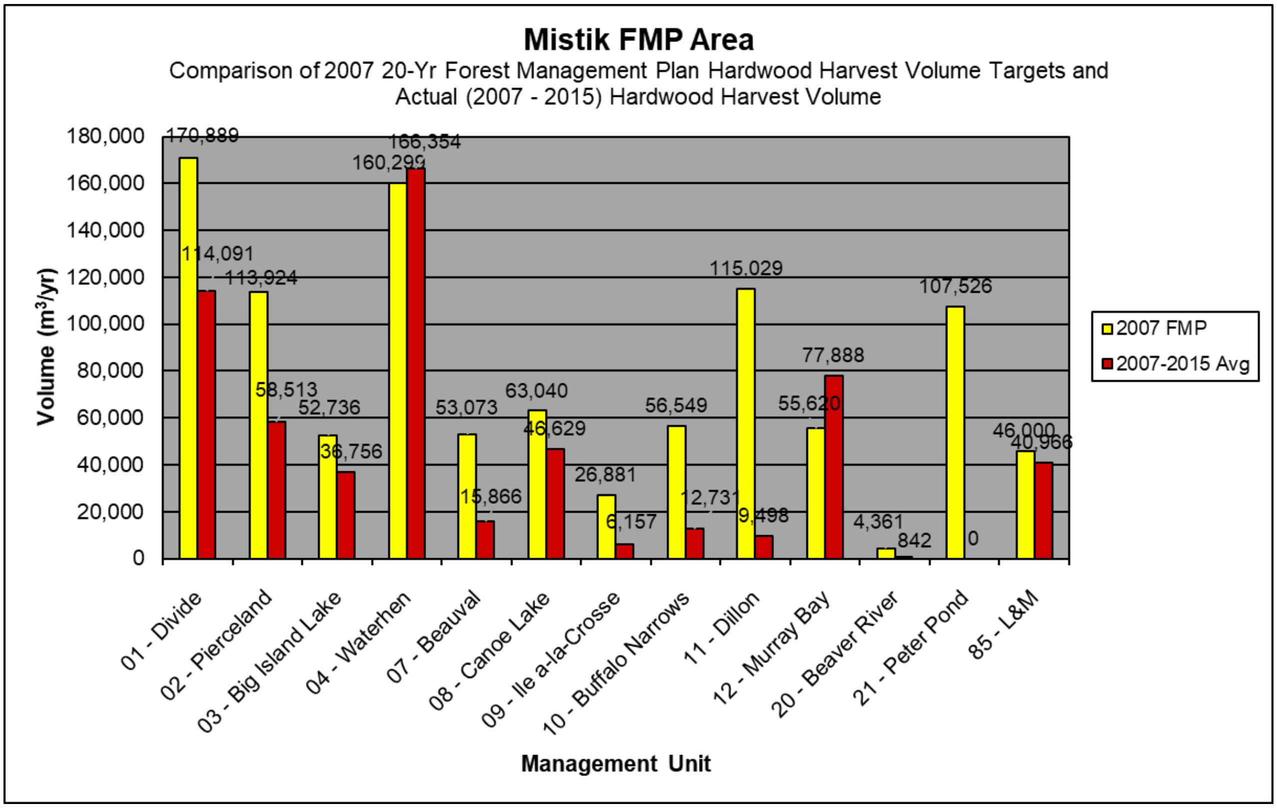


Figure 13.21 2007 20-Year FMP planned spatial hardwood harvest volume targets vs. actual (2007 to 2015) hardwood harvest volume

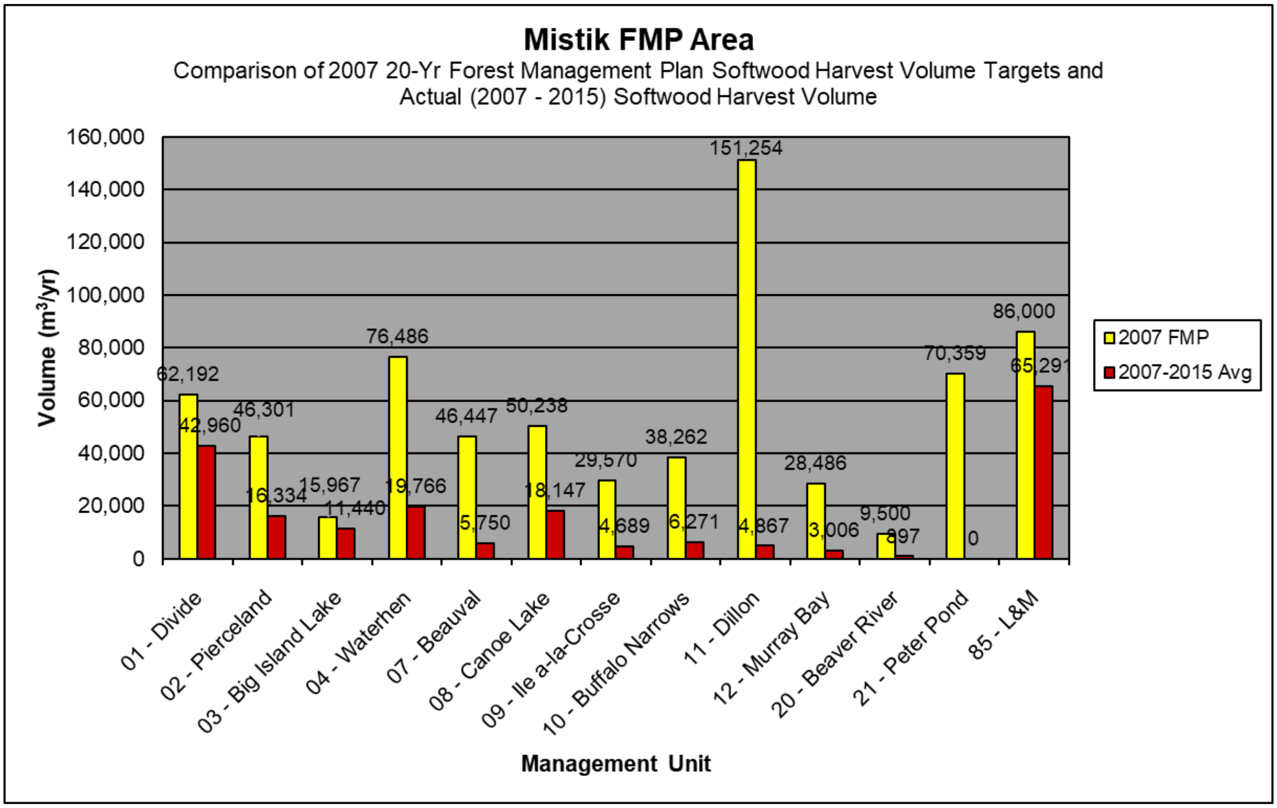


Figure 13.22 2007 20-Year FMP planned spatial softwood harvest volume targets vs. actual (2007 to 2015) softwood harvest volume

Since 2007, Mistik has harvested an average of 121,643 m³ of softwood and 541,786 m³ of hardwood from the Mistik FMP area.

Specific communities within the FMP area have historic and traditional use ties with several of the management units. In these cases, the management units are considered ‘community forest areas’. In collaboration with the communities, and based on the sustainable harvest volume identified for each ‘community forest area’, Mistik has facilitated the development of a viable local forestry contractor workforce (harvesting, skidding, processing, road building, hauling and silviculture).

There has been strong public preference in the northern communities of the Mistik FMP area for forest harvesting systems that are low productivity, labor-intensive and low-capital cost. Mistik has attempted to work within the context of this strong community preference insofar as human safety considerations are addressed and productivity and cost constraints are reasonable. Based on 2003 statistics, twenty-one (68%) of Mistik’s thirty-one harvest contractors were semi-mechanized ‘hand crews’ (chainsaw and line skidder operations) and harvested approximately 21% of the total harvest volume from the Mistik FMP area (Figure 13.23 and Figure 13.24). However, due to safety and operational issues, Mistik encouraged the gr phasing out of ‘hand crews’ which was accomplished by 2006. As a replacement to the ‘hand crews’, and still attempting to promote low-capital cost opportunities, Mistik encouraged contractors to move into fully mechanized but single-phase harvest operations.

Figure 13.23 A Mistik contractor hand falling timber

As planned in the 1997 20-Year Forest Management Plan, Mistik has implemented single-pass harvesting systems throughout the FMP area. However, significant wildfire impact over the last sixty years, and particularly during the past several decades (Figure 13.25), has had a profound influence on the location of Mistik's forest harvesting activity within the FMP area.

Figure 13.24 A Mistik contractor and his line skidder

Figure 13.25 1993 Deer Fire (Dillon Management Unit)

In some management units (Dillon as an example), historic wildfire disturbance severely limits the harvest location options available to Mistik. Additionally, due to significant natural catastrophic disturbance events (wildfire and wind) (Figure 13.26 and Figure 13.27) occurring during the past several decades, Mistik has conducted approximately 5,000 ha of salvage harvesting throughout the FMP area.

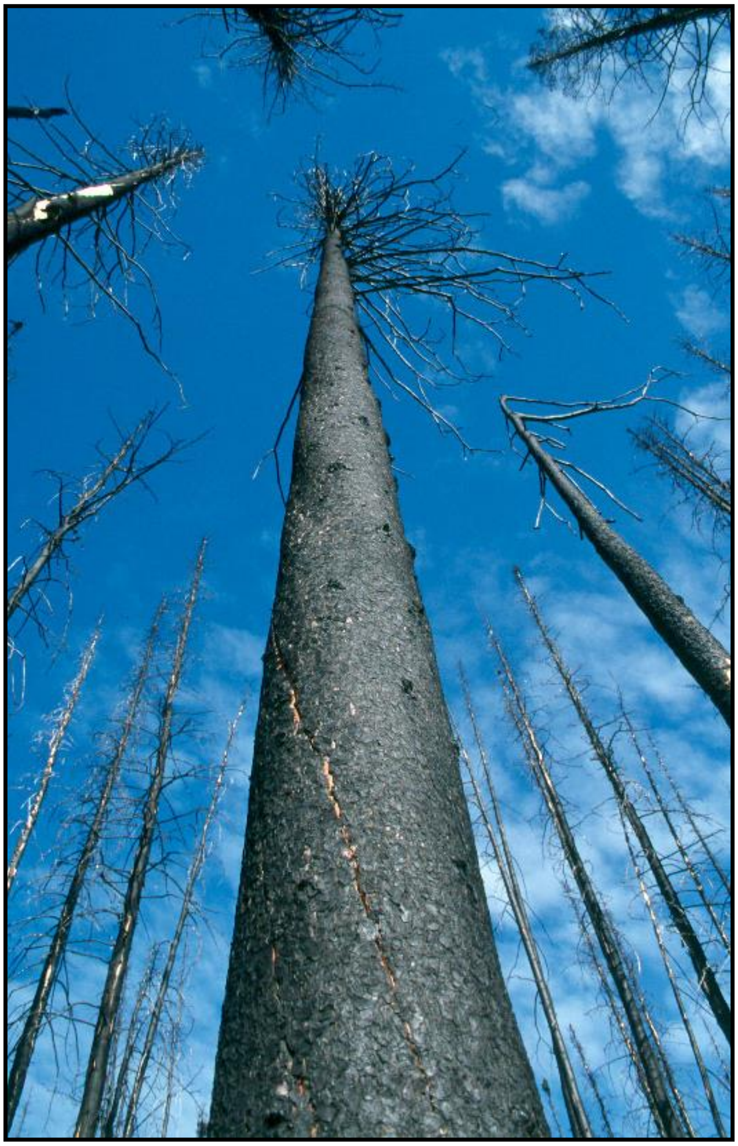


Figure 13.26 Burnt timber in the Mistik FMP area

Figure 13.27 Windthrow-damaged timber in the Waterhen Management Unit

There is a growing incidence of wildfires burning previously harvested and regenerating forest stands. Approximately 3,500 ha of young regenerating harvest blocks have been burnt by wildfire within the FMP area. Mistik has responded to the extensive areas (approximately 17,000 ha) of severely impacted dwarf mistletoe-infected jack pine (Figure 13.28) throughout the FMP area north of Meadow Lake by harvesting infected jack pine stands that exhibit some merchantable value. Most of the dwarf mistletoe-infected jack pine harvesting in the past decade has occurred in the Beauval and Ile a la Crosse Management Units.

Figure 13.28 Dwarf mistletoe-infected jack pine timber on the Mistik FMP area

13.7 ACCESS

Since 1988, a significant forest access network has been developed (~ 250 km per year and 7246 km total) in support of forestry-related activities. The access network consists of main haul roads (provincial forestry class ‘1’), secondary haul roads (provincial forestry class ‘2’) and tertiary haul roads (provincial forestry class ‘3’). Mistik’s goal regarding road access planning and construction is to establish a road network that is efficient, safe and minimizes impact to the environment. To date, Mistik’s permanent road infrastructure network comprises approximately 1% of the total FMP area. Mistik adheres to provincial standards in relation to road construction, closure and reclamation. From 1997 to 2016, approximately 4,550 km of road (an average of 261 km per year) have been built. For the ten-year period 2007 to 2016, approximately 1,650 km was built. The 1,650 km of roads that were built are comprised of 2 km of Class 1, 52 km of Class 2 and 1605 km of Class 3 (refer Figure 5-101). The peak road building year occurred in 1999 with 477 km of road built.

During the previous decade Mistik mostly completed the construction of its Class ‘1’ road infrastructure. Significant investment was made in the development of Mistik’s East/West Road (Figure 13.29), Stewart Lake Road, Upper Cummins Road and Vermette Road. Mistik’s Class ‘1’ roads and provincial highway system provide the core access network for the Mistik FMP area. The permanent Class ‘1’ access network is designed to maximize safety and hauling efficiencies throughout the FMP area.

There is a total length of 235 km of Class ‘1’ road constructed by Mistik within the FMP area.

Figure 13.29 A Mistik Class 1 road (East/West Road)

Mistik has designed its Class ‘2’ access network based on maximizing timber volume per kilometer of road built and minimizing watercourse crossings. Mistik’s permanent Class ‘2’ access network (Figure 13.30) provides a vital link between harvest areas and main haul roads. There is currently a total of 486 km of Class ‘2’ (Improved Bush Road) road in the Mistik FMP area.

Figure 13.30 A Mistik Class 2 road

Class ‘3’ roads are used primarily for inblock access (processing, decking, loading and haul of harvested timber) and as access between neighboring harvest blocks. Most Class ‘3’ roads are temporary and are reclaimed. Since 2002, there has been a provincial forestry requirement that all inblock roads are to be reclaimed. Since 1988, Mistik has constructed a total of 4,173 km of Class ‘3’ road. Approximately 1,700 km of road (primarily Class ‘3’ roads) have been reclaimed.

13.8 SASKATCHEWAN FOREST VEGETATION INVENTORY

Since its inception, Mistik has relied on the provincial ‘UTM’ provincial forest inventory that was undertaken by Saskatchewan Ministry of Environment in the early 1980s. The ‘UTM’ inventory was originally mylar-based but has been transferred into a digital raster-based format (by the province) and into a digital vector-based format (by Mistik) in the 1990s. The Mistik vector-based inventory has been Mistik’s official forest inventory data source since the mid-1990s. In the late 1990s, the Province of Saskatchewan placed the responsibility for conducting forest inventory on FMA licensees. In collaboration with Land Data Technologies Inc. and Silvacom Ltd. of Edmonton, Alberta, Mistik commenced re-inventory of the FMP area to the Saskatchewan Forest Vegetation Inventory (SFVI) standard in 1998. The eight year-long project was completed in 2006. The new forest inventory represents a significant investment, both financial and logistic, by Mistik and its shareholders in current, high-quality information related to forest productivity, determination of sustainable timber harvest levels, location of preferred wildlife habitat and other timber and non-timber forest values.

13.9 GROWTH AND YIELD

Due to the high cost of implementing and maintaining a formal growth and yield program and the high risk of loss due to natural disturbance, Mistik has not implemented a growth and yield program. Mistik's approach to measuring forest productivity is to ensure that a high-quality and statistically-robust temporary sample plot (TSP) network is established within the FMP area on a periodic basis. Mistik has completed one of the most comprehensive TSP programs in western Canada with over 171 UTM mapsheets, 1,019 forest stands, 5,442 plots and over 80,000 individual trees sampled.

13.10 TREE IMPROVEMENT PROGRAM

Tree improvement programs are generally established to select trees with superior growth attributes for the purposes of enhanced timber production. Mistik has not implemented a tree improvement program for a number of reasons:

- Establishing and maintaining a tree improvement program is costly;
- Due to frequent natural disturbances (fire) occurring within the FMP area, it is not prudent to invest significant resources into plantation programs that have a high likelihood of burning prior to rotation age;
- Mistik is philosophically committed to maintaining the natural productive capacity of the forest and the natural genetic variability of planted conifer trees. Based on this premise, Mistik has no current need for 'improving' on nature.

14 INDEPENDENT OPERATORS

In the time period since Mistik's 2007 Forest Management Plan (FMP) was approved, the Third Party Operator Program has evolved. In 2007 when Mistik's first FMP was approved, the Third Party Operator Program was managed through an allocation system. Under that system a volume of timber was set aside for specific third party operators, and the balance of the remaining volume was available to other applicants on a first-come, first-serviced basis. In 2015, the allocation system is no longer in place. Currently third party operators are licensed through either a one-year, non-recurring Forest Products Permit (FPP) or a five-year, volume-based Term Supply Licence (TSL). The TSL sets aside a specified volume allocation for the licensee for the period of their TSL. In contrast, FPP's are reviewed and approved on a first-come-first-served basis and expire on March 31 following the date of issue or sooner if specified in the permit. The objective of the Third Party Operator Program remains unchanged; to supply small operators with a volume of crown timber that they can process in their own processing facilities.

At this time, Turtle Lake Wood Products Ltd. has the only approved volume-based TSL on the Mistik FMP area. Turtle Lake Wood Products uses the volume from its TSL to saw, plane and dry their wood for use in specialty home building products such as tongue and groove flooring. In addition, they produce firewood and other products for sale to a wide variety of customers. The five-year term of Turtle Lake Wood Product's first TSL was 2009-2014. Their TSL was renewed for a second term from April 1, 2014-March 31, 2019.

The total available volume for Third Party Operators on the Mistik FMA is described in Table 14.1. As identified in Mistik's 2007 FMP, the province committed to allocating 10,000m^3 of the 12,000m^3 available in the Peter Pond Management Unit to a larger third party operator. This volume was unused during the 2007 FMP period and currently remains unallocated. The available volume in the Peter Pond Management Unit, and in the Third Party volume exclusions, is under review as updates to Mistik's 2017 FMP and timber supply develop.

Table 14.1 Third party available volume on the Mistik Management FMA

Licence Type	Softwood Volume (m^3/year) Peter Pond Management Unit only	Softwood Volume (m^3/year) Mistik FMA	Hardwood Volume (m^3/year) Mistik FMA	Total Volume (m^3/year)
All (TSL and FPP)	12,000	10,500	4,800	27,300
Turtle Lake Wood Products TSL (TSL term 2014-2019)	0	1,500	3,000	4,500
Remaining Available Volume	12,000	9,000	1,800	22,800

Table 14.2 summarizes total harvest by Third Party operators in the Mistik FMA over the period of the 2007 FMP. The unused portion of the available third party volume reverts back to Mistik Management as the FMA holder, at the end of the 2007 FMP term. Table 14.3 summarizes total harvest by Third Party operators in the L&M FMA over the period of the 2007 FMP.

Table 14.2 Summary of third party operator available actual and remaining harvest volume on the Mistik Management FMA (excluding Peter Pond MU).

Year of Harvest	Third Party Volume (m^3)					
	Softwood			Hardwood		
	Available for Harvest	Total Softwood Harvested	Softwood Remaining	Hardwood for Available	Total Hardwood Harvested	Hardwood Remaining
2007-08	10,500	4,710	5,790	4,800	6,298	-1,498
2008-09	10,500	1,887	8,613	4,800	2,623	2,177
2009-10	10,500	2,785	7,715	4,800	2,496	2,304
2010-11	10,500	659	9,841	4,800	2,037	2,763
2011-12	10,500	2,172	8,328	4,800	282	4,518
2012-13	10,500	1,363	9,137	4,800	1,056	3,744
2013-14	10,500	1,277	9,223	4,800	1,658	3,142
2014-15	10,500	982	9,518	4,800	166	4,634
2015-16	10,500	752	9,748	4,800	254	4,546
Total	**94,500**	**16,587**	**77,913**	**43,200**	**16,870**	**26,330**

Table 14.3 Summary of third party operator harvested volume on the L&M FMA.

Year of Harvest	Third Party Volume (m^3)	
	Softwood	Hardwood
2006-07	0	0
2007-08	0	0
2008-09	1	0
2009-10	0	0
2010-11	196	0
2011-12	0	0
2012-13	0	0
2013-14	0	0
2014-15	473	0
2015-16	0	24
Total	670	24

15 SIGNIFICANT CHANGES EXPECTED TO AFFECT WOOD SUPPLY AND FOREST MANAGEMENT PRACTICES

There are several extraordinary FMP area-specific factors that may have an impact on the determination of sustainable harvest levels for the Mistik FMP area:

15.1 NATURAL DISTURBANCE EMULATION

Incorporation of natural disturbance emulation targets at the stand-level, meso-scale and landscape level may have a limiting impact on currently available standing timber. Mistik will be addressing the impact of incorporating natural disturbance emulation targets on the harvest level determination within the context of the 2017 20-Year Forest Management Plan.

15.2 UNCERTAINTY REALTED TO FMP AREA BOUNDARY

Uncertainty associated with mill sale and closure announcements, etc. in Saskatchewan and neighboring provinces may result in changes to Mistik's existing FMP area boundary. Current forest licensing and timber allocation to mill facilities may change significantly in the future and may have an impact on harvest level determination.

15.3 HARVEST SCHEDULE BASED ON MANAGEMENT UNITS

Although highly preferred from a socioeconomic standpoint, management unit-based harvesting may impose significant constraints on optimal harvest sequencing within the FMP area. Additionally, Mistik requires flexibility in response to potential seasonal access constraints, cost constraints, climate change impact constraints, contractor viability and community-based land use issues. Mistik will be addressing the impact of management unit-based harvesting within the context of the 2017 20-Year Forest Management Plan with the introduction of sustainable harvest levels for 'districts'.

15.4 ENCHANCED TIMBER UTILIZATION

Mistik, in collaboration with Norsask Forest Products. and Meadow Lake Mechanical Pulp., is rapidly converting its contractor harvesting equipment to technologies that allow for greater utilization of a smaller diameter log profile while maximizing log quality (Figure 15.1). This change in technology may provide greater harvest access to historically marginal forest types. Mistik will assess the impact of varying levels of utilization on the harvest level determination within the context of the 2017 20-Year Forest Management Plan and on an ongoing basis.

Figure 15.1 A new cut-to-length processor operating within the Mistik FMP area

15.5 IMPROVED FOREST INVENTORY AND ESTIMATES OF FOREST PRODUCTIVITY

As of April 2006, Mistik, in collaboration with Silvacom Ltd. (an Edmonton, Alberta based forestry consulting firm), completed a complete re-inventory of its FMP area to the new Saskatchewan Forest Vegetation Inventory (SFVI) standard. In addition, Mistik completed an intensive temporary sample plot program in order to derive yield curves and other estimates of forest timber productivity. The impact of the new forest inventory and associated estimates of forest productivity on harvest level determination formed the basis of the 2007 20-Year Forest Management Plan and will continue in the 2017 20-Year Forest Management Plan.

15.6 SPECIES AT RISK

Maintenance of preferred habitat for woodland caribou (a federally recognized 'species at risk') and avoidance of 'critical' habitat areas may have a limiting impact on currently available standing timber (Figure 15.2). Mistik will be addressing the impact of maintaining preferred habitat and minimizing impact to critical habitat for species at risk or of concern on harvest level determination within the context of the 2017 20-Year Forest Management Plan.

Figure 15.2 Preferred habitat for woodland caribou in the Mistik FMP area

16 HISTORICAL REVIEW OF THE LICENCE AREA

16.1 HISTORY OF BOUNDARY CHANGES

The boundary of the Mistik FMP area was initially established on June 17, 1988 upon Norsask Forest Products. (NorSask) and the Province of Saskatchewan entering into a Forest Management License Agreement (FMLA). The 1988 FMLA area included 'the FMLA Core Area' comprised of the:

1. Bronson Timber Supply Area;
2. Meadow Lake Timber Supply Area;
3. Vermette Timber Supply Area.

With the exception of a small volume of timber for independent operators, NorSask was granted exclusive timber harvesting rights within the 'FMLA Core Area'. An additional timber reserve area, to the north of the 'Core Area', was also part of the FMLA. The 'FMLA Reserve Area' was comprised of a single area:

1. Turnor Lake Reserve Timber Supply Area.

Harvesting rights in the Turnor Lake Reserve Timber Supply Area were not exclusive to NorSask. However, NorSask, or any independent operator, was generally granted authorization to harvest timber in the Turnor Lake Reserve Timber Supply Area upon submission of a harvest plan. The total area of the original NorSask FMLA area was 3.3 million ha.

On April 24, 1998, the NorSask FMLA was assigned to Mistik Management Ltd. With the enactment of the *Forest Resources Management Act (1999)*, Mistik's FMLA was officially changed to a Forest Management Agreement (FMA).

In November 2002, a major amendment to Mistik's FMA was completed. The amendment resulted in the removal of the Turnor Lake Timber Supply Area, the assignment of the Green Lake, Sled Lake and Bronson Management Units to Meadow Lake OSB (effectively removing these three management units from the Mistik FMP area) and the addition of the Peter Pond Management Unit (formerly part of the Turnor Lake Timber Supply Area) to the Mistik FMP area (Map 4 – Boundary Changes, Appendix E).

16.2 FOREST MANAGEMENT AGREEMENT AMENDMENTS AND CHANGES TO LICENSE AREA

In November 2002, Mistik and the Province finalized a significant amendment to Mistik's FMA (1998). The Turnor Reserve (with the exception of the Peter Pond Management Unit), Bronson, Green Lake and Sled Lake Management Units were effectively removed from the Mistik FMP area (Table 16.1 and Map 4 – Boundary Changes, Appendix E).

Table 16.1 Summary of license area changes due to amendments

Management Unit	Gross Area (ha)	% of 1988 Area
1988 Mistik FMLA Gross Area	**3,300,000**	**100%**
Turnor Lake Reserve Timber Supply Area (other than Peter Pond and Churchill)	(1,073,094)	

Management Unit	Gross Area (ha)	% of 1988 Area
Churchill	(170,445)	
Green Lake	(57,923)	
Sled Lake	(35,133)	
Bronson	(131,441)	
2002 Amending Agreement Total Land Area Removal	**(1,468,036)**	**(44%)**
20-Beaver River	13,711	
03-Big Island Lake	37,924	
12-Murray Bay	62,551	
02-Pierceland	119,714	
09-Ile a la Crosse	120,909	
10-Buffalo Narrows	125,827	
07-Beauval	156,018	
01-Divide	160,024	
04-Waterhen	188,136	
08-Canoe Lake	206,397	
21-Peter Pond	284,839	
11-Dillon	355,914	
2002 Mistik FMP area (2002)	**1,831,964**	**56%**
2015 Boundary Change		
20-Beaver River	13,722	
03-Big Island Lake	37,995	
12-Murray Bay	62,412	
02-Pierceland	120,228	
09-Ile a la Crosse	112,446	
10-Buffalo Narrows	125,716	
07-Beauval	149,216	
01-Divide	160,311	
04-Waterhen	186,622	
08-Canoe Lake	189,658	
21-Peter Pond	283,980	
11-Dillon	355,746	
2015 Mistik FMP area	**1,798,052**	**54%**

Amendments were made to the FMA on the following dates:

1. February 2, 1989: A minor amendment was made to Schedule ‘F’ by adjusting the volumes of timber available to independent operators in the Meadow Lake and Bronson Supply Areas, and to Schedule ‘M’ by the inclusion of a Treaty Land Entitlement selection by Flying Dust First Nation;

2. August 18, 1989: A minor amendment was made to Schedule 'B' by the listing of 13, B Flying Dust Band as a Reserve Area, and to Schedule 'M' by the removal of Flying Dust First Nation as a Treaty Land Entitlement Selection.

3. June 27, 1990: A minor amendment was made to the requirement of the licensee to develop a use for the hardwood on the license area.

4. April 24, 1998: The FMLA was transferred from NorSask to Mistik. Amendments were made which required the licensee to supply seedlings for renewal operations. Changes were also made to the termination provisions of the agreement, reflecting the fact that Mistik had no wood processing facilities, but instead supplied timber to such facilities.

5. November 1, 2002: Significant amendments were made to the license:

    a. With the passage of new legislation, *The Forest Resources Management Act and Regulations*, the license was updated; and

    b. Certain areas were withdrawn; a small area was added and certain areas were assigned to Meadow Lake OSB Limited Partnership, a new hardwood user in the Meadow Lake area.

16.3 OVERVIEW OF THE KEY LEGAL AGREEMENTS ASSOCIATED WITH THE MISTIK FMP AREA

16.3.1 SUMMARY OF LEGAL AGREEMENTS OR LICENSES BETWEEN MISTIK AND THE PROVINCE OF SASKATCHEWAN RELATING TO THE MISTIK FMP AREA

There are four legal agreements between Mistik and the Province of Saskatchewan:

16.3.1.1 FOREST MANGEMENT AGREEMENT (FMA) (1988)

The agreement was made on June 17, 1988 between Norsask Forest Products. and the Province of Saskatchewan. The agreement was transferred from Norsask Forest Products. to Mistik Management Ltd. on April 24, 1998. Thereafter the agreement became the Mistik Forest Management Agreement (FMA). The Mistik FMA then underwent significant amendment in November of 2002 as a result of the passing of new forest legislation – *The Forest Resources Management Act and Regulations* and to address changes triggered by the 'use it or lose it process' associated with the 5-year renewal date of the FMA. Also, at that time, a portion of the FMP area was transferred absolutely to the Meadow Lake OSB Limited Partnership. This agreement, between Mistik and the Province of Saskatchewan, authorizes Mistik to carry out on an exclusive basis forest management activities over 1.8 million hectares of Crown land in northwest Saskatchewan. The term of the agreement is expressed to be for a period of 20 years, but contains provisions for renewal every 5 years.

16.3.1.2 ROADS AND TRANSPORTATION AGREEMENT (1988)

The agreement was made on June 17, 1988 between Norsask Forest Products. and the Province of Saskatchewan. The agreement established the responsibilities and standards for construction of provincial highways within the license area and the conditions for use of provincial highways within, and adjacent to, the FMP area. The agreement was transferred to Mistik Management Ltd. on April 24, 1998. The term of this agreement is the same as the FMA.

16.3.1.3 ROAD MAINTENANCE AGREEMENT (1988)

The agreement was made on June 17, 1988 between Norsask Forest Products. and the Province of Saskatchewan. The agreement established the responsibilities and standards for maintenance of provincial highways within the license area. The agreement was transferred to Mistik Management Ltd. on April 24, 1998. The term of this agreement is the same as the FMA.

16.3.1.4 ASSIGNMENT AGREEMENT (2002)

This agreement (effective November 1, 2002) made between Mistik, the Province of Saskatchewan and Meadow Lake OSB Limited Partnership provided for the assignment of a portion of the Mistik FMA to Meadow Lake OSB.

In this agreement, the area assigned to Meadow Lake OSB is referred to as the "OSB Lands" and paragraph 6.1 transferred all of Mistik's rights and responsibilities over this land to Meadow Lake OSB.

As of November 1, 2002 Mistik has no rights, responsibilities, obligations or duties of any kind with respect to the OSB Lands.

There is one past agreement involving Mistik and the Province of Saskatchewan. This particular agreement is no longer in effect between Mistik and the Province of Saskatchewan.

16.3.2 GREEN LAKE WOOD SUPPLY AGREEMENT (1997)

The Province of Saskatchewan, Norsask Forest Products., Mistik Management Ltd. and the Northern Village of Green Lake entered into a Wood Supply Agreement on October 9, 1997. The Agreement assigned Green Lake the right to harvest softwood timber from the Green Lake Fur Conservation Area portion of the NorSask Forest Management Agreement License (subsequently assigned to Mistik and changed to an FMA) area under certain conditions. The Green Lake Fur Conservation Area falls entirely within lands assigned to Meadow Lake OSB under the Assignment Agreement dated November 1, 2002.

NorSask's obligations under the Green Lake Wood Supply Agreement ended on April 24, 1998 being the date that Mistik (with the consent of the Province) assumed all of the obligations of NorSask under that agreement.

Mistik's obligations under the Green Lake Wood Supply Agreement ended on November 1, 2002 being the date on which Meadow Lake OSB (with the consent of the Province) assumed all of the obligations of Mistik under that agreement. In consenting to this latter assignment, the Province acknowledged that Mistik had, to the date of the assignment, carried out all of its responsibilities both for renewal and to the Minister with respect to the area covered by the agreement.

16.3.3 SUMMARY OF PROVISIONS OF THE FOREST MANAGEMENT AGREEMENT

Some of the main provisions of the current Mistik FMA are as follows:

a. Term: The term of the FMA is 20 years, but every 5 years the term is renewed back to its full 20-year term - upon such terms as the Province reasonably requires;

b. Exclusive Right: During the term, Mistik has the exclusive right to harvest the timber on the land, subject to a number of provisos, namely:

- a small volume of timber is set aside for small independent operators;
- if Mistik fails to fully harvest the timber volume as planned, on a 5-year rolling basis, then the Province has provisions for either assigning the shortfall timber to others or removing the volume from the FMA.

c. Removal of Volume or Area: If the Province does remove either timber volume or timber area during the term, then the Province must provide the licensee with either additional timber or area (of similar value) or compensation must be paid to the licensee.

d. Fire: The licensee's liability for firefighting is limited to $100,000.00.

e. Licensee Obligations: The licensee is required to carry out a number of normal forest management obligations including;

- preparation and approval of an operating plan (submitted on a yearly basis) and 20-year forest management plans (submitted every 10 years);
- sample scaling of timber;
- renewing all harvested or disturbed areas;
- paying stumpage and renewal fees; and

- a duty for engagement with the public and with the residents of the FMP area.

16.4 DESCRIPTION OF MISTIK AND MILL-RELATED ECONOMIC AND EMPLOYMENT CONTRIBUTIONS

16.4.1 EMPLOYMENT CONTRIBUTIONS

There are three categories of direct forestry-related employment associated with the Mistik FMP area:

- mill-related employment (generally salaried).
- forest management-related (regulatory compliance, planning, supervision) employment (generally salaried);
- forestry-related (road-building, harvest, haul, forest renewal) employment (generally contract);

16.4.2 MILL EMPLOYMENT

Since 2005, the wood processing facilities associated with the Mistik FMP area have contributed to a substantial employment base of approximately 313 person-years (313 full time equivalent jobs) of employment annually (Table 16.2). Mill employment benefits are relatively evenly distributed between Meadow Lake Mechanical Pulp. (~ 42% of the mill-related employment) and the NorSask-Forest Products Inc. (~ 58% of the mill-related employment). Due to mill and infrastructure location, the majority of the mill jobs are associated with the community of Meadow Lake.

Table 16.2 Person-years of mill employment (2016 value is estimated)

	Year													
Mill Name	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Mean**	**Total**
Meadow Lake Mechanical Pulp	169	169	153	164	168	169	161	164	175	184	195	195	172	2,066
NorSask	144	144	149	101	84	55	103	115	191	251	205	145	141	1,687
L&M	86	80	88	89	91	37	70	86	80	82	81	78	79	948
Total	399	393	390	354	343	261	334	365	446	517	481	418	392	4,701

16.4.3 WOODLANDS EMPLOYMENT

Forestry-related activity, associated with the Mistik FMP area, supports significant employment and income generation. Since 2005, the woodlands activities associated with timber procurement/harvesting (harvesting, skidding, processing, loading, hauling, road building, etc.) forest renewal and forest operations supervision, management and planning within the Mistik FMP area have contributed to an employment base of approximately 246 person-years (246 full time equivalent jobs) of employment annually (Table 16.3). Approximately 87% (generally contract employment) of the woodlands-related employment benefits are associated with timber procurement and harvesting operations. Forest renewal employment represents only 7% (generally contract employment) of the total woodlands employment. Employment related to administration and supervision of forestry operations and forest management and planning represents 7% (generally salaried employment) of the woodlands employment base.

Table 16.3 Person-years of woodlands employment

	Year											
Activity Type	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**Mean**	**Total**
Harvesting	228	228	228	210	210	210	210	210	210	210	215	2154
Forest Renewal	17	17	17	17	10	10	20	20	17	17	16	162
Mistik Management Ltd.	25	25	17	12	11	11	11	11	11	11	15	145
L&M-Renewal	4	4	4	4	4	4	4	3	3	3	3.7	37
L&M-Harvesting	41	41	38	38	36	30	32	28	26	26	34	336
Total	315	315	304	281	271	265	277	272	267	267	283	2834

16.4.4 INDIRECT EMPLOYMENT

The method for calculating indirect employment involves the use of an employment multiplier which varies depending on sector. In this case, there are two relevant multipliers, one for the forestry sector and one for the mill-related sector. These multipliers are used by Statistics Canada in their input-output model for Saskatchewan. It is not possible to determine where exactly indirect jobs will be created but it can be assumed that the majority of them will be within Saskatchewan.

The multiplier for the forestry sector in Saskatchewan is 2.07. This implies that for every direct job in forestry in the province, there will be 2.07 indirect jobs created elsewhere. The multiplier for the mill sector is 0.74. For every job in the saw mill and pulp mill, there will be 0.74 indirect jobs created elsewhere. Based on the employment figures presented above, Mistik's forestry activities provided 267 full time equivalent jobs in the forestry sector in 2014. Applying the 2.07 forest sector multiplier to the 267 full time forestry jobs results in additional 553 full time indirect jobs in 2014. 512 of these jobs are associated with the mills (**Table 15.2**). This leaves a total of 41 other indirect jobs associated with the forestry sector.

The average employment income for communities in the vicinity of the FMP area was $22,416 in 2001[52]. Using $22,416 as the average employment income, the indirect jobs resulting from forestry activity, not including the employment at the two mills, equated to over $900 thousand in indirect employment income in 2014.

16.4.5 TOTAL EMPLOYMENT

The sum of direct employment and indirect employment as a result of the forestry operations of Mistik, NorSask and Meadow Lake Pulp Limited Partnership are significant to the region. In 2014, the direct employment amounted to 11 full time positions at Mistik, 227 full time equivalent contract forestry workers, 251 NorSask-related employees and 195 Meadow Lake Mechanical Pulp. employees resulting in a total of 694 direct jobs. There were 58 indirect jobs related to these activities. The total full time direct and indirect employment provided by the forestry, saw mill and pulp mill operations in the Mistik FMP area in 2014 amounted to 752 jobs. According to Statistics Canada, the number of employed persons aged 15 years and older in communities in the area[53] was 8,170 in 2001. The direct employment provided by the wood products industry associated with the Mistik FMP area can be estimated in the 9% range of total employment in the area in 2014. This is a significant percentage of total employment in the area. The continued viability of forestry-related operations in northwest Saskatchewan is important for maintaining employment and income in a region that has a reported unemployment rate more than four times that of the province as a whole[54].

16.4.6 INPUT-OUTPUT MODEL ANALYSIS

It is possible to estimate the economic impact on a variety of sectors of the Saskatchewan economy in relation to changes in the economic activity of the forest products sector. The Statistics Canada Input-Output Model for Saskatchewan provides multipliers that can be used to estimate the effect of an increase in the level of economic activity for NorSask Forest Products Ltd. Statistics Canada does not release the multipliers for the pulp industry for Saskatchewan because of confidentiality requirements. However, based on Statistics Canada data[55], for every $1 million increase in the revenue of NorSask, there will be a

---

52 Statistics Canada Census 2001

53 Based on the 24 communities identified in **Section 7**

54 Statistics Canada Census 2001

55 2000 Interprovincial Open Input-Output Model. Statistics Canada. Input-Output Division.

$260,000 increase in wages and salaries, a $50,000 increase in supplementary labor income, a $20,000 increase in mixed income, a $290,000 increase in other operating surplus, a $10,000 increase in indirect taxes on products and a $10,000 increase in indirect taxes on production within Saskatchewan. An increase in activity of $1 million will also increase employment by 8.27 jobs. It is not possible to determine the effects only within the FMP area as the models only work at the provincial and national level.

16.4.7 MILL-RELATED PAYROLL

Since 2005 till present the wood processing facilities associated with the Mistik FMP area have contributed to a substantial payroll income base of approximately $27 million annually (Table 16.4).

Table 16.4 Annual mill-related payroll ($1,000s)(2016 value is estimated)

	Year												
Mill	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Mean**	**Total**
Meadow Lake Mechanical Pulp	14,552	13,643	15,674	15,672	17,350	17,577	17,313	17,655	19,427	20,340	21,812	17,323	17,323	207,878
NorSask	8,172	8,665	7,071	4,438	3,164	3,222	4,793	6,251	9,286	11,627	10,436	7,159	7,158	85,905
L&M	2,475	2,454	2,561	2,670	2,842	1,151	2,177	2,945	3,238	3,480	3,436	3,306	2,728	32,735

16.5 MILL PRODUCTION AND SALES

Both the Meadow Lake Mechanical Pulp mill and Norsask Forest Products sawmill produce wood products (Table 16.5) that are sold (Table 16.6) into international commodity markets. Originally built to produce approximately 240,000 air-dry-metric-tons (ADMT), the Meadow Lake Mechanical Pulp mill has steadily increased production to over 361,000 ADMT in 2015. Since 2005, NorSask has produced an average of approximately 77,000 MFBM (1,000 foot-board-measure) annually.

Table 16.5 Quantity of product produced (2016 value is estimated)

		Year													
Mill	**Product**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Mean**	**Total**
Meadow Lake Mechanical Pulp	BCTMP Pulp (ADMT[56])	315,536	306,168	325,183	327,909	342,570	364,006	348,848	261,288	370,651	347,561	361,670	397,650	339,087	4,069,040
NorSask	Stud Lumber (MFBM[57])	104,591	89,216	99,777	85,325	53,378	24,098	20,090	56,755	70,636	94,989	122,256	105,767	77,240	926,878

[56] Air-dry-metric-tonnes
[57] 1,000 foot-board-measure (1 board foot = 12 in x 12 in x 1 in)

NorSask	Chips (ODT[58])	65,442	51,836	56,132	51,148	22,827	10,588	9,404	28,841	37,476	49,618	68,769	58,741	42,569	510,822
L&M	Lumber (MFBM)	13,236	12,617	11,969	12,531	15,916	4,647	16,880	19,673	21,093	19,076	16,974	15,922	15,045	180,534
L&M	Posts (pieces)	284,000	315,110	297,452	710,210	630,020	435,322	375,305	388,461	621,015	480,216	647,354	647,354	472,896	5,674,753
L&M	Chips & Residue (ODT)	15,320	14,943	12,222	15,944	17,300	5,823	18,223	21,288	23,113	19,547	18,620	18,620	16,572	198,868
L&M	Firewood (M^3)	1,000	2,000	2,000	2,150	2,933	3,200	3,312	4,950	4,950	8,500	10,127	10,127	4,317	51,805

Table 16.6 Quantity of product sold (2016 value is estimated)

		Year													
Mill	**Product**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Mean**	**Total**
Meadow Lake Mechanical Pulp	BCTMP Pulp (ADMT[59])	315,857	311,688	271,841	312,911	363,663	359,920	343,021	261,628	368,557	358,569	355,012	397,656	335,027	4,020,323
NorSask	Stud Lumber (MFBM[60])	102,501	95,633	92,787	93,235	47,563	36,976	26,754	54,894	64,605	93,251	118,591	97,342	77,011	924,132
NorSask	Chips (ODT[61])	65,442	41,222	43,248	51,148	22,827	10,588	9,404	28,841	37,476	5,448	68,769	58,741	36,930	443,154
L&M	Lumber (MFBM)	16,850	15,422	13,646	12,112	15,928	11,448	14,574	18,210	18,268	18,416	15,950	14,725	15,462	185,549
L&M	Posts (pieces)	197,600	282,800	356,120	798,220	590,671	473,323	374,532	401,750	470,250	449,500	504,522	592,750	457,670	5,492,038
L&M	Chips & Residue (ODT)	14,934	14,228	10,034	16,360	25,658	5,711	16,045	21,969	22,613	20,762	19,233	17,096	17,096	205,147
L&M	Firewood (M^3)	1,000	2,000	2,000	2,150	2,930	2,275	3,422	3,266	5,104	8,438	7,604	4,231	4,231	50,772

Prices have fluctuated significantly for both pulp and solid wood products due to a number of market factors. Sales from Meadow Lake Mechanical Pulp have averaged approximately $190 million annually while NorSask sales have averaged approximately $26 million (Table 17.8).

58 Oven-dry-tonnes

59 Air-dry-metric-tonnes

60 1,000 foot-board-measure (1 board foot = 12 in x 12 in x 1 in)

61 Oven-dry-tonnes

Meadow Lake Mechanical Pulp operates in a highly-competitive international pulp commodity market. Pulp prices have been stagnant for most of the period from 2005 onward. Low-cost pulp producers in other parts of the world are capturing increasing market share. Production costs associated with these low-cost mills are significantly lower than Canadian mills[62]. Canadian softwood lumber producers with shipments into the United States are always affected, either in a positive or negative way, by currency exchange rates and U.S. housing starts. As is evident in Table 16.6, Table 16.7, Table 16.8, Table 16.9, and Table 16.10 there has been much volatility in the softwood lumber market over the last decade. Meadow Lake Mechanical Pulp operates in different international commodity markets from NorSask and is not subject to punitive tariffs and other barriers to trade as exist in the softwood lumber industry. Shipments of pulp have generally increased in volume and value over the period 1997-2015.

Table 16.7 Value of product sold (CAN$1,000) (2016 value is estimated)

		Year													
Mill	**Product**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Mean**	**Total**
Meadow Lake Mechanical Pulp	BCTMP Pulp (C$1,000)	184,245	187,555	159,163	209,950	165,454	228,330	189,141	192,919	208,302	210,962	203,203	146,303	190,461	2,285,527
NorSask	Stud Lumber (C$1,000)	38,171	31,500	26,593	20,723	11,456	8,532	6,869	13,619	21,096	32,096	44,593	32,931	24,015	288,179
NorSask	Chips (C$1,000)	3,393	2,101	1,548	2,012	1,297	741	696	2,114	2,223	340	5,414	4,549	2,202	26,428
L&M	Lumber (C$1,000)	9,267	8,867	6,823	6,524	6,690	4,236	5,538	7,466	7,764	7,827	6,779	5,700	6,957	83,481
L&M	Posts (C$1,000)	494	707	890	2,394	2,068	1,420	1,498	1,607	1,881	1,798	2,018	2,371	1,596	19,146
L&M	Chips & Residue (C$1,000)	597	569	401	818	975	217	706	832	995	913	577	528	677	8,128
L&M	Firewood (C$1,000)	10	20	20	43	88	91	154	147	245	405	365	508	175	2096

[62] Roberts, Don. March 14, 2005. Changes in the Global Forest Products Industry. CIBC World Markets Inc. Equity Research Industry Update. Toronto, Ontario, Canada.

Table 16.8 Quantity of product exported (2016 value is estimated)

		Year													
Mill	Product	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Mean	Total
Meadow Lake Mechanical Pulp	BCTMP Pulp (ADMT)	Not Available	Not Available	271,841	312,911	363,421	359,920	343,021	261,628	368,557	358,569	354,969	397,646	349,248	3,492,483
NorSask	Stud Lumber (MFBM)	52,940	43,978	51,642	46,803	23,722	17,302	14,165	33,299	45,424	54,889	49,982	47,450	40,133	481,596
NorSask	Chips (ODT)	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 16.9 Volume and value of lumber shipments for NorSask to market destination

Year	Volume to U.S. (MFBM*)	Volume to Canada (MFBM)	Total Volume (MFBM)	Percentage to U.S.	Value to U.S. ($C)	Value to Canada ($C)	Total Value ($C)	Percentage Value to U.S.
2005	52,940	49,561	102,501	52%	18,927,127	19,243,975	38,171,102	50%
2006	43,978	51,655	95,633	46%	15,771,330	15,782,806	31,500,136	50%
2007	51,642	41,145	92,787	56%	14,844041	11,748,672	26,592,713	56%
2008	46,803	46,432	93,235	50%	12,710,241	8,012,678	20,722,919	61%
2009	23,722	23,841	47,563	50%	5,993,043	5,463,427	11,456,470	52%
2009	17,302	19,674	36,976	47%	3,990,331	4,631,531	8,531,862	46%
2010	14,165	12,589	26,754	53%	4,281,906	2,586,604	6,868,510	62%
2011	33,299	21,595	54,894	61%	8,989,075	4,629,495	13,618,570	66%
2012	45,424	19,181	64,605	70%	15,230,632	5,865,689	21,096,321	72%
2013	54,889	38,362	93,251	59%	19,300,059	12,795,624	32,095,683	60%
2014	49,982	68,609	118,591	42%	18,130,695	26,462,786	44,593,481	41%
2015	47,450	49,892	97,342	49%	16,388,904	17,232,355	33,621,259	49%

Table 17-10 serves to illustrate the volatility associated with the softwood lumber market over the last decade. Since 2007 almost 100% of Meadow Lake Mechanical Pulp production has gone to Asia (Table 16.10).

Table 16.10 Volume and value of pulp shipments from Meadow Lake Mechanical Pulp to market destination (2016 values are estimated)

Year	Volume to N. and S. America	Volume to Europe	Volume to Asia	Total Volume	% Volume to N. and S. America	% Volume to Europe	% Volume to Asia	Total Value ($C)
2005	24,637	106,128	185,092	315,857	7.80%	33.60%	58.60%	128,375,598
2006	24,312	104,727	182,649	311,688	7.80%	33.60%	58.60%	187,554,750
2007			271,841	271,841	0.00%	0.00%	100.00%	159,163,507
2008			312,911	312,911	0.00%	0.00%	100.00%	209,950,270
2009	243		363,421	363,663	0.07%	0.00%	99.93%	165,453,705
2010			359,920	359,920	0.00%	0.00%	100.00%	228,330,486
2011	421		342,600	343,021	0.12%	0.00%	99.88%	189,140,536
2012	250		256,679	256,929	0.10%	0.00%	99.90%	192,919,406
2013	713		367,794	368,507	0.19%	0.00%	99.81%	208,301,591
2014	1,412		357,157	358,569	0.39%	0.00%	99.61%	210,962,072
2015	544		354,468	355,012	0.15%	0.00%	99.85%	203,203,122
2016			397,646	397,646	0.00%	0.00%	100.00%	146,303,736

16.6 CROWN DUES PAID

As shown in Table 16.11, payment of crown dues (stumpage) from the Mistik FMA to the Province of Saskatchewan can fluctuate considerably based on commodity market prices, international market demand/access and changes in dues rates. On an annual average, since 2007 the mills have contributed a total of $679 thousand in crown dues to the Province of Saskatchewan.

Table 16.11 Crown dues paid (values for 2016 are estimates)

		Year										
Mill	**Product**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**
Meadow Lake Mechanical Pulp	Dues hardwood pulpwood (C$)	$431,759	$416,408	$249,949	$437,952	$387,962	$297,507	$244,049	$434,529	$189,573	$200,000	$3,289,689
NorSask	Dues softwood sawlogs (C$)	$781,012	$427,325	$330,285	48,762$	114,393	$185,691	$294,935	$513,771	$206,992	$600,000	$3,502,909
L&M	(C$)	$195,418	$214,408	$205,845	$100,799	$143,207	$259,340	$217,541	$216,785	$219,634	$195,202	$1,952,020
Total		$1,408,189	$1,058,141	$786,079	$538,751	$645,562	$742,538	$756,525	$1,165,085	$616,199	$995,202	$8,744,618

16.7 PUBLIC PARTICIPATION/CONSULATION/COLLABORATION

Mistik is committed to a public consultation process that occurs on a regular basis as part of its annual operations planning and implementation (Figure 16.1). Specifically, Mistik is part of a consultation process with many of the local communities within the FMP area. These local ‘forest co-management’ or ‘forest advisory’ boards are comprised of representatives from various stakeholder groups (i.e., trappers, First Nations, outfitters, wild rice growers, cabin owners, etc.) from within each of the management units (MUs) comprising the Mistik FMP area. Membership on these boards is determined by local communities and interest groups.

Figure 16.1 A meeting with members from the Canoe Lake Traditional Resource Users Board

Mistik has eight (8) existing co-management / advisory boards that provide ongoing input into operational plans. Mistik also has significant communication with a range of other stakeholder groups including outfitters, trappers, traditional use, grazing permittees, wild rice growers, cabin owners (Figure 16.2), etc. in, and immediately surrounding, the Mistik FMP area. Mistik staff regularly attend co-management/advisory board meetings. Operational updates are provided by Mistik staff and feedback is solicited from board memberships regarding future harvest and renewal plans. Forest information workshops and field tours (Figure 16.3) that include local community people, not involved directly with the boards, are also undertaken as joint ventures between individual boards and Mistik staff.

Over the last 10 years L&M has been certified within Mistik’s IOS/EMS and CSA/SFM schemes. As such they have been members of and participated within Mistik’s Public Advisory Group (PAG). Two 2017 20-Yr FMP public engagement meetings were sponsored by L&M in Glaslyn. L&M conducts its own independent operating plan public engagement activities through annual mailings (e.g. stakeholder letters), an annual open house meetingsand one on one engagement with any stakeholders who so wish to be engaged.

Figure 16.2 Individual consultation with a cabin owner and trapper from the community of St. George's Hill

Figure 16.3 A tour with the Pierceland / Goodsoil Forest Advisory Board

In order to specifically meet the public participation process requirements of CAN/CSA Z809-02 Sustainable Forest Management Standard and the requirements of the Saskatchewan 20-Year Forest

Management Planning Standards, Mistik formed one Public Advisory Group (Figure 16.4) with representation solicited from all the major stakeholder groups (Table 16.12) associated with, or who have an interest in, the Mistik FMP area.

Figure 16.4 Mistik's Public Advisory Group (November 2004)

Table 16.12 Mistik FMP area stakeholder groups and description

Stakeholder Group	Stakeholder Group Description
1. Advisory / co-management boards	Local community-based groups representing a broad spectrum of stakeholder interests including cabin owners, recreational users, environmental groups, outfitters, trappers, elders, contractors, local gov't. officials, wild rice growers, municipalities and traditional resource users. 1. Divide Forest Advisory Corporation 2. Waterhen Lake Land and Resources Board 3. Buffalo Narrows Co-management Board 4. Sakitawak Resource Management Inc. (ILX) 5. DeneSuline Co-management Board (Dillon) 6. Canoe Lake Traditional Resource Users Board 7. Beauval Co-management Board Inc. 8. Big Island Lake Cree Nation (not yet a formal co-management board but periodic meetings are held with the Band)
2. Trapping	Zone 8 trappers - northern trappers are represented on each of the co-management boards.
3. Outfitting	A large, loosely organized group (Saskatchewan Outfitters Association) with significant interest in the provincial forests of Saskatchewan - they have a designated 'forestry' representative.
4. Commercial fishing	There are a number of commercial fishing co-operatives within the Mistik FMP area. Commercial fishing is a significant economic activity in the local area.
5. Small volume timber harvesters (MoE is main	Some representation on advisory boards but no official or

Stakeholder Group	Stakeholder Group Description
contact)	organized representative body.
6. Meadow Lake Pulp employees	All clerical, technical, management and operations staff at the Meadow Lake Pulp Limited Partnership pulp mill.
7. NorSask management staff	All clerical, technical, management and operations staff at the NorSask Forest Product's sawmill.
8. NorSask unionized staff	All mill workers at NorSask Forest Products sawmill.
9. Meadow Lake Tribal Council	Represents the leadership of nine of the First Nations in northwest Saskatchewan (in and around the Mistik FMP area).
10. Regulatory agency	Represents the local regulatory (provincial government) agencies responsible for administrating forestry and other activities on behalf of the province of Saskatchewan.
11. Urban municipality	Meadow Lake is the primary service center in northwest Saskatchewan and home to most of the employees of Meadow Lake Pulp Limited Partnership, NorSask and Mistik.
12. Rural municipality	Rural Municipality (RM) of Meadow Lake #588 has some overlap with the Mistik FMP area (Divide and Beaver River MUs).
13. Environmental non-governmental organizations	Represent the interests of the hunting, fishing and trapping public as well as environmental sustainability issues - habitat protection, conservation and environmental quality enhancement.
14. Snowmobile association (recreation)	The Northern Lights Snowmobile Club has an extensive network of trails throughout portions of the Mistik FMP area.
15. Grazing permittees	Portions of the Mistik FMP area are allocated to grazing permits.
16. Forest workers	Mistik undertakes its activities through a significant # of local contractors.

Where local advisory or co-management boards do not exist, Mistik strives for one-on-one consultation with local land users prior to submission of plans to Saskatchewan Ministry of Environment for final approval.

Mistik has undertaken significant work regarding the identification and location of other timber and non-timber forest-use activities within the Mistik FMP area. The groups consulted include, but are not limited to, the following:

- Hunting - sport and domestic use;
- Fishing - sport, domestic and commercial use;
- Trapping - commercial and traditional use;
- Outfitting - fishing, hunting, canoeing, hiking, camping, horse trail riding;
- Gathering - berry and mushroom picking, medicinal plants;
- Wild rice – cultivation;
- Archaeological resource - investigation, identification and protection.

The locations of many site-specific features of environmental, cultural, personal, archaeological (Figure 16.5) and economic significance have been tabulated and entered into Mistik's non-timber values database.

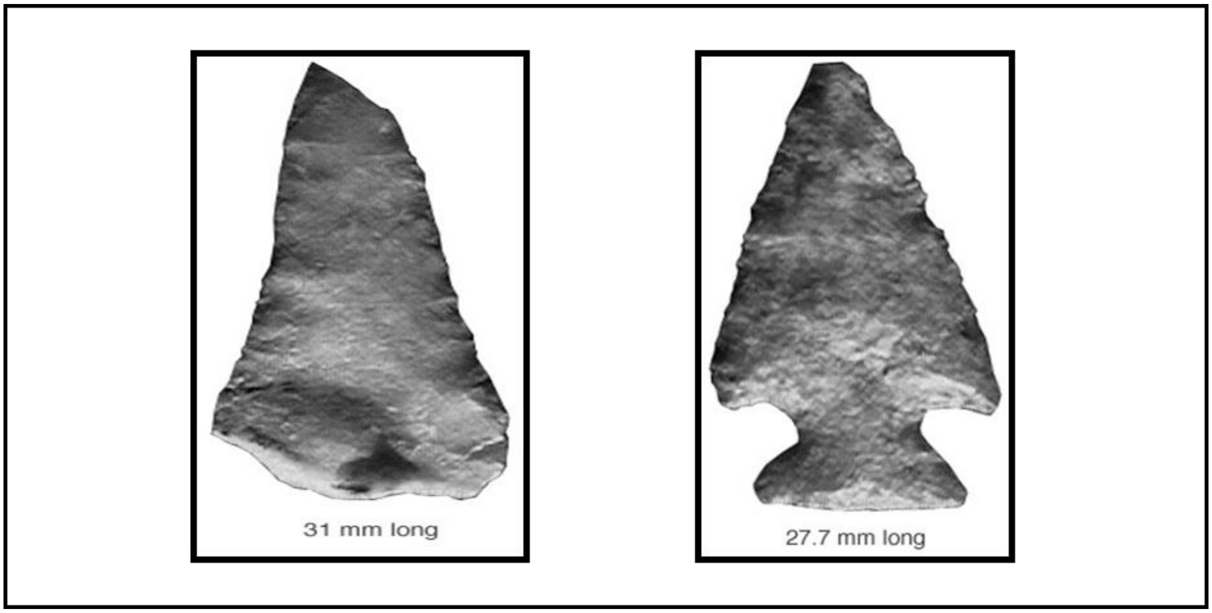


Figure 16.5 Two artifacts (a 'drill' in the lower left and a 'projectile point' in the lower right) recovered from sites of archaeological significance (~ 2,000 yrs old) in the Divide Management Unit.

Assessment of the effects of timber harvesting and forest renewal operations in relation to site-specific features occurs on an ongoing basis with the involvement of local stakeholders and government agencies.

Mistik conducts its operations in a unique social and economic environment. There is very high value placed on local distribution of employment by communities associated with the Mistik FMP area. Individuals from local communities are prepared to work for a very small 'piece of the pie'. Mistik has chosen to work within this context, to the extent possible, given the economic reality of staying competitive in the forest industry. Mistik utilizes contractors in conducting its forestry activities than its average forest industry peer. The lower ratio of work volume to contractor demonstrates Mistik's unique commitment to maximizing contract employment opportunities for communities in the Mistik FMP area.

Due to strong public preference, Mistik has managed the FMP area as twelve (12) separate 'community forests' (these mirror the fur conservation area boundaries from the mid-1940s that have since turned into multi-resource use management zones). Employment opportunities have been created within the context of these community forest areas. Distribution of forestry-related socio-economic benefits has occurred through a variety of means. Most economic benefits have flowed back to local communities through employment or contract-related activities. A unique approach that Mistik's shareholders have taken to contribute economic benefits back to local communities is to pay to co-management boards a per cubic meter fee for timber harvested within each community forest (forest management unit) associated with each local co-management board. These funds are 'unfettered' in that they can be used for whatever purpose the co-management board deems worthy. There are currently seven co-management boards that may benefit from co-management payments. Mistik provides financial assistance to two advisory boards in order to facilitate administration and basic functions of the advisory groups.

17 FMP REGISTRY

17.1 ENVIRONMENT ASSESSMENT ACT APPROVAL ADMINISTRATION

Table 17.1 summarizes the administration of the Environmental Assessment Act approval conditions and processes to date.

Table 17.1 Summary of Environmental Assessment Act approval administration

Date	EIS Administration Detail
November, 1995	Submission of the *NorSask 20-Year Forest Management Plan* and related *Environmental Impact Statement*, plus associated documents, collectively referred to as the *NorSask Forest Management Project* to the Province of Saskatchewan for approval.
May 13, 1997	Ministerial approval of the *NorSask 20-Year Forest Management Plan* and related *Environmental Impact Statement*, plus associated documents, collectively referred to as the *NorSask Forest Management Project*.
November 1, 2002	In November 2002, a major amendment to Mistik's Forest Management Agreement was completed. The amendment resulted in the assignment of the Green Lake, Sled Lake and Bronson Management Units to Meadow Lake OSB (effectively removing these three management units from the Mistik FMP area) and the addition of the Peter Pond Management Unit to the Mistik Forest Management Agreement area. There is recognition by both Mistik Management Ltd. and the Province of Saskatchewan that the changes to the Mistik Forest Management Agreement area would require assessment under the *Environmental Assessment Act* in the context of developing the 2007 20-Year Forest Management Plan.
April 4, 2005	Telephone discussion between Al Balisky (Planning Manager, Mistik Management Ltd.) and Brent Bitter (Project Manager, Saskatchewan Ministry of Environment, Environmental Assessment Branch) regarding the process to be undertaken in addressing the requirements of the *Environmental Assessment Act* in relation to Mistik's 2007 20-Year Forest Management Plan. Brent Bitter suggests that the 2007 20-Year Forest Management Plan and associated amendment requirements falls under *Section 16* ('change in development') of the *Environmental Assessment Act*.
June 2, 2005	Brent Bitter attends Mistik's 2007 20-Year Forest Management Plan Planning Team meeting and provides guidance regarding *Environmental Assessment Act* requirements.
July 12, 2005	Mistik Management Ltd. sends a letter of 'notification of change' pertaining to the Mistik Forest Management Agreement area and request for clarification of requirements under the *Environmental Assessment Act* to Larry Lechner, Environmental Assessment Branch. A comprehensive summary of the current status of Mistik's current forest management commitments and Ministerial Approval conditions under the *Environmental Assessment Act* accompanied the letter.

Date	EIS Administration Detail
August 30 and 31, 2005	Brent Bitter attends Mistik's 2007 20-Year Forest Management Plan Planning Team meeting (and associated field tour) and provides guidance regarding *Environmental Assessment Act* requirements.
October 26, 2005	Letter of response from the Environmental Assessment Branch issued to Mistik Management Ltd.'s July 12, 2005 letter. The letter indicates that Mistik's 2007 20-Year Forest Management Plan process and associated amendments will be assessed under *Section 16* ('change in development') of the *Environmental Assessment Act*. The letter indicates that the project has been entered into the provincial environmental assessment tracking system.
November 24, 2005	Brent Bitter attends Mistik's 2007 20-Year Forest Management Plan Planning Team meeting and provides guidance regarding *Environmental Assessment Act* requirements.
May 24, 2006	Brent Bitter attends Mistik's 2007 20-Year Forest Management Plan Planning Team meeting and provides guidance regarding *Environmental Assessment Act* requirements.

17.2 1997-20-YEAR FOREST MANAGEMENT PLAN ADMINISTRATION

Table 17.2 summarizes the administration of the 1997 20-Year Forest Management Plan processes to date.

Table 17.2 Summary of 1997 20-Year Forest Management Plan administration

Date	FMP Administration Detail
November, 1995	Submission of the *NorSask 20-Year Forest Management Plan* and related *Environmental Impact Statement*, plus associated documents, collectively referred to as the *NorSask Forest Management Project*.
May 13, 1997	Ministerial approval of the *NorSask 20-Year Forest Management Plan* and related *Environmental Impact Statement*, plus associated documents, collectively referred to as the *NorSask Forest Management Project*.
April 1, 1999	Mistik Management Ltd. receives 'Use It or Lose It' letter from the Province of Saskatchewan. Mistik Management Ltd. is given until March 31, 2000 to submit a plan showing full utilization of the timber resource in the Mistik FMP area.
April 9, 1999	A meeting was held at Mistik Management Ltd.'s office in Meadow Lake to discuss the need for, and the specific issues related to, a revision of the 1997 *NorSask Forest Management Project*.
April 28, 1999	Notification by Mistik Management Ltd. to the Province of Saskatchewan of formal initiation of amendment to the *NorSask Forest Management Project*.
May 31, 1999	Letter of response from Saskatchewan Ministry of Environment acknowledging the commencement of the amendment to the *NorSask Forest Management Project*.
Mistik's 20-Year Forest Management Plan amendment process turns into a process devoted solely to addressing the issues and requirements identified in the April 1,	

Date	FMP Administration Detail
1999 'use it or lose it' letter from the Province of Saskatchewan.	
March 31, 2000	'Sustainable Forest – Sustainable Enterprise (Timber Utilization Plan' for the Mistik Forest Management Agreement Area)' is submitted to the Province of Saskatchewan.
June 13, 2000	Two letters received from the Province of Saskatchewan responding to the Timber Utilization Plan for the Mistik Forest Management Agreement Area. The Province of Saskatchewan concludes that there is a surplus of hardwood beyond existing and historical requirements. The letters indicate that Mistik and its shareholders are failing to maximize economic development opportunities in the northwest related to softwood.
July 31, 2000	'Building Together – Forest Development Joint Venture Preliminary Business Proposal' submitted by NorSask Forest Products Limited Partnership, Millar Western Pulp (Meadow Lake) Ltd., Meadow Lake Tribal Council, Mistik Management Ltd. and Tolko Industries Ltd. in a response to the provincial decision regarding underutilized hardwood on the Mistik FMP area. The main feature of the proposal is the development of an OSB facility in the Meadow Lake area capable of using 900,000 m^3 of hardwood.
February 14, 2001	Letter of response from Saskatchewan Ministry of Environment regarding the submitted plan 'Building Together – Forest Development Joint Venture Preliminary Business Proposal'. Various area and volume additions and deletions to the Mistik FMP area are described.
November 1, 2002	As a result of provincial forest industry development initiatives by the Province of Saskatchewan, a major amendment to Mistik's Forest Management Agreement was completed. The amendment resulted in the assignment of the Green Lake, Sled Lake and Bronson Management Units to Meadow Lake OSB (effectively removing these three management units from the Mistik FMP area) and the addition of the Peter Pond Management Unit to the Mistik Forest Management Agreement area. There is recognition by both Mistik Management Ltd. and the Province of Saskatchewan that the impact of the changes to the Mistik Forest Management Agreement area will be carefully assessed in the context of developing the 2007 20-Year Forest Management Plan.
July 12 – 16, 2004	Independent Sustainable Forest Management Audit (Section 35 and 36 Regulatory Audit) conducted by KPMG Performance Registrar Inc. The audit findings identify deficiencies in Mistik's 1997 20-Year Forest Management Plan. There is recognition by both Mistik Management Ltd. and the Province of Saskatchewan that the audit findings pertaining to the 1997 20-Year Forest Management Plan will be used as reference material to guide the development of the 2007 20-Year Forest Management Plan.
March 18, 2005	Staff from the Province of Saskatchewan and Mistik Management Ltd. meet at the Mistik Management Ltd. office in Meadow Lake initiating the development of Mistik's 2007 20-Year Forest Management Plan.

APPENDIX A – MISTIK'S 20-YEAR FOREST MANAGEMENT PLAN AND ENVIRONMENTAL IMPACT STATEMENT COMMITMENTS AND MINISTERIAL APPROVAL CONDITIONS

SUMMARY OF MISTIK COMMITMENTS AND APPROVAL CONDITIONS

20-Year Forest Management Plan and Environmental Impact Statement

NorSask Forest Management Project

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
1	Role of Objectives	To maintain public confidence and commitment, the integrity of the linkages will be ensured between the FMP and forest management (FM) operations and their effects.	Objectives include specific measurable levels over a specified time period which allows actual forest resource supplies to be compared to predicted supplies.	Mistik is committed to identifying and achieving specific, measurable objectives for a variety of forest attributes. However, several specific objectives identified in the 20-Yr FMP are not readily measurable. In other cases, Mistik has no means of influencing the specified supply levels of a forest resource (i.e., wildlife population numbers and wildlife harvest levels are completely out Mistik's control). ***Action:*** *Mistik needs to redefine the quantitative objectives of the 20-Yr FMP in a manner that is operationally attainable. Mistik proposes that this be implemented in the context of the 2007 – 2027 20-Yr FMP. In the interim, a key set of measurable indicators and targets, within the context of the CCFM Criterion and Indicators (CSA SFM Z809-02), are being identified.*	Vol. IB: p. 3
2	Wildlife Habitat Objectives	Adequate habitat will be available to support target carrying capacities and harvests.	Actual wildlife populations and annual harvest are subject to management factors beyond control of Mistik.	Wildlife habitat supply objectives have been set for moose, white-tailed deer, woodland caribou and fisher. However, the objectives for wildlife habitat in the 20-Yr FMP are expressed in terms of derived statistics such as 'carrying capacity' and 'annual sustainable harvest by hunters'. These 'derived' or 'implied' statistics or objectives are unclear and can be misleading as they are not directly measurable. In summary, the current status of wildlife populations and available annual wildlife harvest levels are beyond the control of Mistik. ***Action:*** *Mistik needs to redefine its wildlife habitat objectives in geographic (spatially-explicit) terms with reference to specific wildlife populations of concern. The habitat requirements of specific wildlife species of concern (particularly during times of high potential mortality) need to be addressed in the context of the current landscape patterns of forest ecosystems within Mistik's FMP area. Mistik will use new knowledge gained since the submission of the 20-Yr FMP to identify specific, key habitat areas for species at risk (particularly resident caribou herds and known calving and winter habitat areas). These key habitat areas will be spatially identified and carefully managed to minimize impact on resident wildlife populations of concern. For example, Mistik has deferred road building and harvest activity in operating areas within the Buffalo Narrows and Dillon Management Unit due to the presence of a small, resident herd of caribou. To maintain general wildlife biodiversity, maintenance of forest structural*	Vol. IB: p. 7

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
				diversity (keeping all the pieces) and habitat connectivity at all scales of forest use will assist in maintaining a broad range of habitat across the harvested land base. Forest attributes such as age class distribution and tree species type distribution can be readily measured and spatially portrayed. The latest paradigm in forest use management is to undertake forest use activities within the context of the 'natural range of variability'. Mistik wishes to maintain forest attributes (age class, tree species composition, etc.) at the landscape level such that they remain within the 'range of natural variability'. The newly emerging scientific consensus is that if the forest remains within the 'range of natural variability', the ecological integrity of the forest will be maintained, including habitat requirements for the full range of wildlife populations existing within the forest. Mistik proposes that these themes be implemented in the context of the 2007 – 2027 20-Yr FMP. Upon recommendation of Mistik's Public Advisory Group, Mistik will acquire data and report on trapping success, recreational hunting success and outfitting success statistics generated by Saskatchewan Ministry of Environment by August 15, 2005.	
3	Timber Supply Targets	Softwood sawlog and hardwood pulp supply targets (m^3/yr) will be used to guide the detailed planning of FM operations.	Presented in figure and tabular format.	At the FMP area-wide level, softwood and hardwood timber supply objectives, as specified in the 20-Yr FMP, are generally being achieved. However, the detailed timber supply objectives, by forest type, specified for each management unit in the 20-Yr FMP are unrealistic and are not operationally attainable. Key assumptions in the 20-Yr FMP related to timber supply analysis and the distribution of economic benefits throughout the Mistik FMP area resulted in harvest level objectives, at a management unit level, that are operationally unachievable and ecologically and socially unacceptable. ***Action:*** *In 2000, Mistik completed a re-assessment of the timber supply available from the FMP area in response to a request from the Minister of Saskatchewan Ministry of Environment (MoE). A subsequent review of the Mistik timber supply analysis by MoE staff indicated that the yield curves used in the analysis were overly conservative. MoE's timber supply estimates for the Mistik FMP area significantly exceed those indicated in both the original 20-Yr FMP and the new Mistik timber supply analysis. Mistik continues to have significant concerns related to the assignment of extensive areas of transitional black spruce stands to the productive land base. The assignment of incidental softwood volume in the hardwood land base is too high (a function of the location of the MoE 3P plots). Additionally, the impact of dwarf mistletoe on jack pine stands has not been accounted for. Extensive areas of jack pine in the northern 2/3rds of the Mistik FMP area are in various stages of decline due to the impact of dwarf mistletoe. At best, timber supply estimates are uncertain at the moment. Additionally, in 2002, a significant amendment to Mistik's FMA was completed. The Bronson, Green Lake and Sled Lake Management Units were removed from the Mistik FMP area and assigned to the new Meadow*	Vol. IB: "MU-name" - p. 10, 11

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
				Lake OSB plant. The Peter Pond Management Unit was added to the Mistik FMP area. The 2002 Amending Agreement specifies a harvest of 602,000 m^3 of softwood and 805,000 m^3 of hardwood annually. Due to the uncertainty around timber supply, Mistik targets 400,000 m^3 of softwood and 800,000 m^3 of hardwood from the FMP area. Mistik, in collaboration with MoE staff, is nearing completion of a complete re-inventory of its FMP area. The new inventory data and associated volume sampling data will be used to generate an updated timber supply forecast within the context of the provincial 20-year forest management planning process for the Mistik FMP area. Mistik proposes that this new timber supply information be implemented in the context of the 2007 – 2027 20-Yr FMP.	
4	Ecosystem Supply Targets	Forest class structure targets will be used to guide the detailed planning of FM operations.	Presented in figure and tabular format.	The ecosystem supply targets specified in the 20-Yr FMP are tightly coupled with the timber supply forecasts for each management unit (i.e., yield curves and harvest levels). If the harvest levels are not achieved and the assumptions related to subsequent forest renewal are not met or implemented then the ecosystem supply targets as specified will not be met. Attempts (1999) by Mistik at re-aggregating the forest stand types into the ecosystem types identified in the 20-Yr FMP were unsuccessful (we were unable to recreate the same area of ecosystem types). Moreover, MoE growth and yield staff have indicated to Mistik that the aggregation of ecosystem types used in the 20-Yr FMP (and attendant yield curve development) is unacceptable. As a result, Mistik is unable to report on the status of the forest in terms of the original ecosystem types specified in the 20-Yr FMP. ***Action:*** *In collaboration with MoE, and in the context of the 20-year forest management planning process, Mistik has initiated redefining the aggregation of forest types for yield curve development and timber supply analysis. Mistik will be soliciting the input of forest ecology experts in relation to implementing harvest patterns that reflect historical fire patterns and resulting age class distributions. State of the art timber supply analysis that incorporates spatially-explicit modeling of harvest forecasts will be used to ensure maintenance of specified seral stages etc. on the land base. Mistik proposes that this work be implemented in the context of the 2007 – 2027 20-Yr FMP.*	Vol. IB: "MU-name" - p. 12
5	Wildlife Harvest Targets	Harvest and population size targets for moose, white-tailed deer and fisher will be used to guide the detailed planning of FM operations.	Presented in figure and tabular format.	The comments made in relation to #2 above pertain to this commitment. Mistik has no means of reasonably measuring wildlife population numbers or ensuring that the target harvest levels are available. ***Action*** *None required.*	Vol. IB: "MU-name" - p. 13, 14, 15
6	Blueberry Harvest Targets	Annual blueberry harvest (kg) targets will be used to guide the	Presented in figure and tabular format.	The comments made in relation to #2 above pertain to this commitment. Mistik has no means of reasonably measuring blueberry production or ensuring that the target harvest levels are available.	Vol. IB: "MU-name" - p. 16

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
		detailed planning of FM operations.		***Action*** *None required.*	
7	Integrated Resource Management (IRM) Commitment	All forest resources will be balanced through ongoing FM planning and implementation.	FM objectives reflect Mistik's and SE's interpretation of IRM for the NorSask Forest.	Mistik is committed to undertaking all its forest use activities within the context of integrated resource management. Mistik strives to achieve a balance between the ecological, social and economic realities present within the Mistik FMP area. Mistik works closely with regulatory agencies, environmental groups, outfitters, trappers, wild rice growers and local First Nation and Métis communities in the preparation of annual plans. Mistik recognizes that the forest provides a wide range of services including environmental and recreation services, sustenance, cultural and heritage opportunities, wildlife habitat, raw material for sawmills and pulp mills, etc. Mistik continues to seek and gain local knowledge in order to more fully accommodate and promote the multiple benefits of the forests comprising the Mistik FMP area. ***Action*** *None required.*	Vol. IIA: p. 2-16
8	Adaptive Management (AM)	Six specific essential elements will be implemented to ensure adaptive management.	Mistik is committed to implement a carefully structured AM system which includes a comprehensive database, etc..	1. a comprehensive database 2. quantitative cause/effect relationships 3. integrated analytical system - Mistik Forest Management Model (MFMM) 4. a means to implement MFMM output 5. monitoring actual effects 6. feedback system The six items listed above summarize Mistik's adaptive management process. Specifically, Mistik has in place a constantly evolving, up-to-date, comprehensive GIS database. The cause and effect' relationships specified in the 20-Yr FMP have not been useful in terms of adaptive management because many of the cause and effect relationships are simply not empirically quantifiable. The 'integrated analytical system' (Mistik Forest Management Model) has never been used. A new version of the MFMM called DSS-F (Decision Support System – Forestry) was developed and completed in 1999. However, the new model was unable to reproduce the results of the original MFMM as reported in the 20-Yr FMP. This created a significant issue related to using the new model to measure the acceptability of planned activities in relation to those specified in the 20-Yr FMP. Moreover, the perceived 'black box' nature of optimization models such as MFMM and DSS-F has limited their acceptance as a useful planning tool by the operational staff at Mistik. As a result, operational planning and implementation is occurring without reference to the specific objectives in the 20-Yr Plan or in reference to the output of an 'integrated analytical model'. As a surrogate process, Mistik has maintained an active research program with the assistance of its own Scientific Advisory Board. Mistik has also been an active participant in various projects undertaken by the NCE-SFM network. Mistik is an active member of the provincial Forest Ecosystems Monitoring Task Force.	Vol. IIA: p. 2-20, 22

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
				Action *In the context of the 2007-2027 20-Yr Forest Management Plan, Mistik will redefine the 'adaptive management' process in a manner that is operationally relevant and consistent with generally accepted forest management objectives and analyses.*	
9	Monitoring Commitments	Ongoing monitoring and research will be followed to improve knowledge of forest ecosystems and to put in place an effective FM system.		For several years, Mistik maintained an active research program with the assistance of its Scientific Advisory Board. Mistik has also collaborated with project teams from the NCE-SFM network. Mistik is an active member on the provincial Forest Ecosystems Monitoring Task Force. ***Action*** *In the context of the 2007-2027 20-Yr Forest Management Plan, Mistik will redefine the 'monitoring commitments 'in a manner that is operationally relevant and consistent with generally accepted forest management objectives and analyses.*	Vol. IIA: p. 2-21
10	Public Consultation	FM activities will fairly reflect the public interest.	Co-management is a key component to fulfilling this commitment.	Mistik is committed to a shared-decision making process where a full range of public interests can be accommodated. Since the submission of the 20-Yr FMP, a number of advisory and co-management boards have been established in local communities as a forum for information exchange. These boards, which meet on an ongoing monthly basis, provide the opportunity for forest users to participate directly in forest management decisions. Mistik also attempts to make contact with individual stakeholders who may be affected by Mistik's forest use activities. ***Action*** *None required.*	Vol. IIA: p. 2-22
11	Public Consultation	Co-management boards and forest advisory committees will play an active and direct decision-making role in the detailed design, implementation and monitoring of FM objectives.	Mistik is required to facilitate continued dialogue and increasing awareness among local interests and communities.	Mistik is committed to a shared-decision making process where a full range of public interests can be accommodated. Since the submission of the 20-Yr FMP, a number of advisory and co-management boards have been established in local communities as a forum for information exchange. These boards, which meet on an ongoing monthly basis, provide the opportunity for forest users to participate directly in forest management decisions. Mistik also attempts to make contact with individual stakeholders who may be affected by Mistik's forest use activities. ***Action*** *None required.*	Vol. IIA: p. 3-4
12	Public Participation	Meaningful public participation will be followed as required on a regular ongoing basis.	Meaningful public consultation is identified as a critical element to successful implementation of the FMP.	Mistik is committed to a shared-decision making process where a full range of public interests can be accommodated. Since the submission of the 20-Yr FMP, a number of advisory and co-management boards have been established in local communities as a forum for information exchange. These boards, which meet on an ongoing monthly basis, provide the opportunity for forest users to participate directly in forest management decisions. Mistik also attempts to make contact with individual stakeholders who may be affected by Mistik's forest use activities. ***Action*** *None required.*	Vol. IIA: p. 3-21

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
13	Access Road Planning	Access roads will be planned to satisfy multiple objectives consistent with Mistik's IRM philosophy.	This commitment is recognized as likely to result in increased road construction and maintenance costs. These costs need to be fairly borne by MoE and will be decided during detailed planning negotiations.	Mistik has assisted local First Nation and Métis business interests in providing year round access to remote lakes. Mistik is currently assisting the community of Dillon in planning an all-season road on the south end of Vermette Lake. This road will reduce travel time to the community healing lodge. Both of these examples demonstrate Mistik's attempts to reasonably assist with satisfying multiple objectives in relation to access development within the FMP area. ***Action*** *None required.*	Vol. IIA: p. 8-10
14	Access Road Use Strategies	Use management strategies will be followed for forest access roads to enhance positive impacts and to minimize negative impacts.	Use management strategies for forest access roads, in particular new forest access roads, will be developed to mitigate negative impacts on fish and wildlife.	Mistik works closely with MoE and co-management boards in determining road use. The primary consideration is limiting vehicle traffic into operating areas. Mistik uses a number of road closure techniques to limit access. Mistik adheres to the provincial road closure standard. ***Action*** *None required.*	Vol. IIA: p. 8-10
15	Environmental Surveys of Water Crossings	An effective inventory and monitoring of aquatic resources for water crossing suitable for road design purposes will be undertaken.	SE, DFO and the local co-management boards are all recognized as having a role to play.	Mistik undertakes the necessary field work and requests the necessary permits from the appropriate regulatory agencies for all watercourse crossings. However, Mistik does not submit 'stream crossing designs to the co-management boards' for review on an annual basis. ***Action*** *None required.*	Vol. IIA: p. 8-13
16	Large-scale Forest Landscape Patterns	A high priority will be placed on developing improved guidelines and monitoring systems to guide harvest planning.	The emphasis includes providing practical guidance to harvest designers.	Where operationally feasible, Mistik has fully implemented the large-scale, natural disturbance-emulating, harvest design patterns described in the 20-Yr FMP. The 'Mistohay Project', harvest commencing in 2001 and ending in 2003, is the single largest 'green-tree' harvest-related disturbance in the Mistik FMP area. Mistik's current harvest design is best described as 'clear-cut' with 'partial overstorey retention' in the context of a 'single-pass' harvest system. ***Action*** *None required.*	Vol. IIA: p. 8-17
17	Environmental Surveys of New Access Corridors	Biophysical and cultural heritage surveys will be conducted for new access corridors not previously inventoried.	This commitment compensates for the lack of detailed biophysical and cultural heritage data for all parts of the NorSask Forest. These data need only be collected when a site is potentially being	Mistik has in place an ongoing annual contract with Western Heritage Services Inc. of Saskatoon, SK. to undertake a significant amount of archaeological surveys related to new harvest-related developments (roads, harvest units, stream crossings, etc.). Avoidance and/or mitigative measures are recommended by Western Heritage Services Inc. which are then implemented by Mistik. Mistik undertakes reconnaissance surveys of road locations prior to harvest commencing. ***Action*** *None required.*	Vol. IIA: p. 8-12

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
			impacted.		
18	Long-term Ecological Monitoring Program	A long-term ecological monitoring program will be implemented to provide early warning of ecological problems arising from forest management.		Mistik is an active member of the provincial forest ecosystem monitoring task force and has implemented the provincial Forest Management Effects Monitoring Program protocols since 2001. ***Action*** *None required.*	Vol. IIA: p. 8-19
19	Monitoring of Forest Ecosystem and Landscape Management Manual (FELMM) Prescription	The effectiveness of structural diversity prescriptions in the FELMM will be monitored as part of the long-term ecological monitoring program.	This commitment identifies a strong connection between the FELMM and the design of the monitoring program.	Mistik is strongly committed to ensuring the maintenance of structural diversity at the stand level. Mistik utilizes a 'clearcut' harvest system with 'partial overstorey retention'. Residual patches of mature forest are retained throughout harvest units. Mistik has completed several years of sampling related to patch retention. On average ~ 7% of gross block volume is retained onsite post-harvest. Considerable anecdotal evidence has been heard regarding the wildlife use of these residual forest patches. There is annual monitoring of residual forest patches through the protocols in the provincial Forest Management Effects Monitoring Program. ***Action*** *None required.*	Vol. IIA: p. 8-23
20	Maintenance of Natural Forest Structure	Forest management actions will be designed to maintain a forest structure comparable to that which is expected to naturally occur.		In terms of general landscape-level themes, Mistik is fully committed to maintaining the diversity of forest ecosystem types and the spatial diversity of the forested landscape. Since the submission of the 20-Yr FMP, the growing consensus among ecologists is that landscape-level forest structure (i.e., age class distribution and species distribution) should be maintained within the 'natural range of variability'. This new paradigm differs from that described in the 20-Yr FMP. The 'desired future forest' structure described in the 20-Yr FMP is the 'inverse-J' curve. Mistik's current harvest practices do not follow those specified in the 20-Yr FMP that, if followed for 200 years, would result in an age class distribution approximating the 'inverse-J' curve. ***Action*** *Mistik will redefine the desired future forest structure in the context of the 'natural range of variability'. Mistik proposes that this work be implemented in the context of the 2007-2027 FMP.*	Vol. IIA: p. 8-27
21	Management By Objective	An integrated set of FM objectives will be used to guide the design and implementation of FM activities.	FM actions need to be designed to satisfy multiple objectives.	Mistik is committed to the general concept of 'management by objective'. However, some of the key objectives specified in the 20-Yr FMP are operationally not achievable. For example, a very minimal (300 ha/yr) tree planting program is to be undertaken prior to 2006. After 2006, 7,000 ha/yr is prescribed for planting. ***Action*** *Mistik will redefine its forest management objectives in terms that are operationally relevant. Mistik proposes that this work be implemented in the context of the 2007-2027 FMP.*	Vol. IIA: p. 8-30
22	Environmental	An environmental	The inventory will be	Mistik is in a continuous process of updating its 'site-specific' mapping	Vol. IIA: p. 8-

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
	Inventory	inventory for the NorSask Forest will be continually updated and revised.	kept up to date through information provided by knowledgeable local residents and Mistik staff and studies.	themes. All known archaeological sites within the FMP area are currently mapped, as are a range of other cultural and biophysical site-specific attributes. ***Action*** *None required.*	36
23	Post-operations Monitoring of Site Degradation	Post operations monitoring will be conducted for select sites to determine the level of site degradation and the effectiveness of prevention and mitigation measures.	Site-specific prescriptions are recognized as being critical to the level of site degradation experienced.	Mistik routinely curtails harvest operations when weather conditions become too extreme (i.e., excessive rainfall). Areas of the Mistik FMP area with soil types prone to compaction and rutting are generally scheduled for winter harvesting (i.e., Divide Management Unit). Where excessive site degradation has occurred (Alcott Operating Area, 1999), site rehabilitation measures are implemented to ensure the regeneration of a healthy forest. As part of the new provincial monitoring and self-inspection protocols, Mistik will be implementing post-harvest assessments of a sample of harvest units to determine the incidence and level of site degradation. ***Action*** *None required.*	Vol. IIA: p. 8-38
24	Effectiveness of Riparian Buffer Strips	The effectiveness of riparian buffer strips prescriptions will be determined as part of the ecological monitoring program and through reviews of the scientific literature.	A critical question to be determined is the optimum buffer width.	Mistik, with assistance from its Scientific Advisory Board, submitted to MoE a document entitled 'Management of riparian habitat areas'. This document addresses the commitments made in the 20-Yr FMP. ***Action*** *None required.*	Vol. IIA: p. 8-38
25	Pre-Operation Surveys	Pre-operation surveys of all FM operations will be conducted to determine the presence of site-specific features requiring special attention.	This commitment is made to compensate for the lack of detailed biophysical and cultural heritage data for all parts of the NorSask Forest. These data need only be collected when a site is potentially being impacted.	Pre-harvest site prescriptions (PHSPs) are a provincial requirement. ***Action*** *None required.*	Vol. IIA: p. 8-36
26	Prevention and Mitigation of Site Degradation	Site degradation due to harvesting will be avoided where possible and will be monitored and rehabilitated as appropriate.	The specifics as to how site degradation will be managed are provided in the FELMM.	Mistik routinely curtails harvest operations when weather conditions become too extreme (i.e., excessive rainfall). Areas of the Mistik FMP area with soil types prone to compaction and rutting are generally scheduled for winter harvesting (i.e., Divide Management Unit). Where excessive site degradation has occurred (Alcott Operating Area, 1999), site rehabilitation measures are implemented to ensure the regeneration of a healthy forest. As part of the new provincial monitoring and self-inspection protocols, Mistik will be implementing post-harvest assessments of a sample of harvest units to determine the incidence and level of site degradation.	Vol. IIA: p. 8-38

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
				Action *None required.*	
27	Site Degradation Annual Operations Plans	Annual operations plans will set out the steps to be undertaken to minimize site degradation.		Pre-harvest site prescriptions (PHSPs) are a provincial requirement and identify steps to be undertaken to minimize site degradation. ***Action*** *None required.*	Vol. IIA: p. 8-38
28	Cultural Heritage Resource Protection	Continued consultation with local communities re sensitive cultural sites and pre-operations surveys will be conducted to gain improved knowledge of the location and nature of sensitive cultural heritage sites.		Mistik is in a continuous process of updating its 'site-specific' mapping themes. All known archaeological sites within the FMP area are currently mapped, as are a range of other cultural and biophysical site-specific attributes. ***Action*** *None required.*	Vol. IIA: p. 8-39
29	Visual Design Guidelines	Visual design guidelines will be developed for application during cutblock design.	These guidelines are to be part of the FELMM	Mistik's approach to fulfilling the commitment of 'developing visual design guidelines' has been to fully implement the harvest design features described in the FELMM. The visual impact of harvested areas has been considerably 'softened' by the use of 'partial overstorey retention' within all harvested areas. Roadside buffer strips have been eliminated allowing the public to view the variety of harvest operations being implemented in the Mistik FMP area. Moreover, the strategic placement of tree patches throughout harvest units fulfills a number of ecological functions as well as mitigating negative visual impact. The general aesthetic quality of the harvest unit is significantly enhanced with incorporation of patches. Comments received from the public have been very favorable regarding the use of inblock patches. Mistik adheres to the provincial forestry standard related to visual resource management. ***Action*** *None required.*	Vol. IIA: p. 8-39
30	Improved Public Awareness of Forest Management	Improved public awareness of forest ecology and the role of FM will be facilitated through public communication initiatives.	The co-management boards have a key role to play in this process.	Mistik staff meet regularly with co-management and advisory boards throughout the FMP area. Openhouses, workshops and field trips are also scheduled with the co-management and advisory boards throughout the year. ***Action*** *None required.*	Vol. IIA: p. 8-39
31	Maintenance of Genetic Diversity	Planting stock from similar boreal forest conditions will be used to maintain genetic diversity and the natural	This commitment is of the "best effort" variety.	Mistik uses 'wild' seed collected from forest stands within the Mid-Boreal Upland Ecoregion for all tree planting within the FMP area. ***Action*** *None required.*	Vol. IIA: p. 8-44

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
		gene pool.			
32	Refinement of Renewal Practices	The scientific literature will be regularly reviewed and renewal practices modified to maintain forest genetic diversity and ecosystem composition and function.	This commitment is part of Mistik's AM strategy.	The 20-Yr FMP prescribed a very small amount of planting of mixedwood tA/wS sites. Natural regeneration was the preferred management strategy for these sites. Mistik has modified this prescription and plants over 4,000,000 seedlings annually. Mistik also attempts to protect understorey wS during harvest operations. Jack pine stands are regularly planted where the incidence of dwarf mistletoe has been so severe as to compromise cone and seed production. ***Action*** *None required.*	Vol. IIA: p. 8-44
33	Site Preparation Impacts on Archaeological Sites	Pre-operations surveys (including cultural heritage features) will be undertaken prior to site preparation operations.		Mistik has in place an ongoing annual contract with Western Heritage Services Inc. of Saskatoon, SK. to undertake archaeological surveys related to silvicultural activities that may have an impact on archaeological resources. Avoidance and/or mitigative measures are recommended by Western Heritage Services Inc. The recommendations are implemented by Mistik. ***Action*** *None required.*	Vol. IIA: p. 8-46
34	Site Preparation Impacts on Archaeological Sites	Predictive tools will be developed and used to identify high probability archaeological sites.	This reference is quite vague.	Western Heritage Services Inc., in collaboration with the provincial Heritage Branch, has developed a modeling tool to predict the occurrence of archaeological sites based on a variety of biophysical attributes. This predictive tool is routinely used for initial 'screening' of proposed harvest, road and silviculture-related developments. ***Action*** *None required.*	Vol. IIA: p. 8-46
35	Site Preparation Impacts on Archaeological Sites	A GIS environmental inventory will be kept up to date and used to record the location of all known cultural heritage sites.		Mistik has in place an ongoing annual contract with Western Heritage Services Inc. of Saskatoon, SK. to undertake archaeological surveys. Western Heritage maintains a GIS database of archaeological sites within the Mistik FMP area. ***Action*** *None required.*	Vol. IIA: p. 8-46
36	Tending Policy	Mechanical release techniques will only be used to tend stands. Chemical herbicides will not be used.		Use of herbicides for brush control or manual brushing does not occur within the Mistik FMP area. ***Action*** *None required.*	Vol. IIA: p. 8-47
37	Forest Management Objectives	Forest management objectives which prescribe the minimum level of positive environmental impacts to result from forest management will guide the implementation of	Forest management objectives are the primary point of accountability with the public.	Mistik is committed to identifying and achieving specific, measurable objectives for a variety of forest attributes. However, several specific objectives identified in the 20-Yr FMP are not readily measurable. In other cases, Mistik has no means of influencing the specified supply levels of a forest resource (i.e., wildlife population and wildlife harvest levels are completely out Mistik's control). ***Action:*** *Mistik needs to redefine the quantitative objectives of the 20-Yr FMP in a*	Vol. IIA: p. 9-2

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
		FM operations.		*manner that is operationally attainable. Mistik proposes that this be implemented in the context of the 2007 – 2027 20-Yr FMP. In the interim, a key set of measurable indicators and targets, within the context of the CCFM Criterion and Indicators (CSA SFM Z809-02), are being identified.*	
38	Forest Ecosystems Landscape Management Manual (FELMM)	The FELMM will be followed to ensure the maximum acceptable negative environmental impacts are not exceeded.	FELMM is the primary point of accountability with the public regarding site-specific impacts.	The FELMM is essentially Mistik's 'standard operating procedures'. The 'heart' of this document is being implemented. However, a number of the specific details contained in the document are not being followed due to changes in Mistik's organizational structure, inadequate information, the realities of current operational considerations, etc. ***Action*** *Mistik will default to provincial forestry standards. Most of the procedures described in the FELMM are addressed in the new provincial forestry standards.*	Vol. IIA: p. 9-2
39	Implementation Planning Process	Forest management activities must be planned according to the approved annual planning process.	Following this process avoids the need for additional Environmental Impact Statements (EISs) for individual FM activities.	Mistik does not follow all the steps detailed for the planning process. ***Action*** *Mistik will continue to meet the commonly accepted planning requirements of regulatory agencies.*	Vol. IIA: p. 9-3
40	Public Review of Access Design	Co-management boards and forest advisory committees will review and comment on the acceptability of access route alignment and engineering design.	The public is to be provided with an opportunity to review detailed access development proposals.	Co-management and advisory boards review all proposed roads during the annual planning process. The comments generated from these reviews are very useful. The end result is often a superior final placement for proposed roads. ***Action*** *None required.*	Vol. IIA: p. 9-4
41	Evaluation of Harvesting Impacts	The environmental impacts of annual harvesting operations will be evaluated using MFMM.	A forest-level context is provided to evaluate proposed annual harvesting operations.	The 'integrated analytical system' (Mistik Forest Management Model) has never been used. A new version of the MFMM called DSS-F (Decision Support System – Forestry) was developed and completed in 1999. However, the new model was unable to reproduce the results of the original MFMM as reported in the 20-Yr FMP. This created a significant issue related to using the new model to measure the acceptability of planned activities in relation to those specified in the 20-Yr FMP. Moreover, the perceived 'black box' nature of optimization models such as MFMM and DSS-F has limited their acceptance as a useful planning tool by the operational staff at Mistik. As a result, operational planning and implementation is occurring without reference to the specific objectives in the 20-Yr Plan or in reference to the output of an 'integrated analytical model'. As a surrogate process, Mistik has maintained an active research program with the assistance of its own Scientific Advisory Board. Mistik has also been an active participant in various projects undertaken by the NCE-SFM network. Mistik is an active member of the provincial Forest Ecosystems Monitoring Task Force. ***Action***	Vol. IIA: p. 9-4

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
				In the context of the 2007-2027 20-Yr Forest Management Plan, Mistik will evaluate the environmental impacts of harvest operations in a manner that is operationally relevant and consistent with generally accepted forest management objectives and analyses.	
42	Public Review of Planned Harvesting Operations	The acceptability of proposed harvest cutblocks will be reviewed by the co-management boards and forest advisory committees.	The public is to be provided with an opportunity to review planned harvesting operations.	Co-management and advisory boards review all proposed harvesting during the annual planning process. The comments generated from these reviews are very useful. The end result is often a superior harvest plan. ***Action*** *None required.*	Vol. IIA: p. 9-4
43	Access Design and Development	The level of mitigation prescribed in the FELMM will be increased above the approved minimum as local circumstances dictate.		Mistik has demonstrated a commitment to mitigative measures related to access development that exceed the minimum requirements. The fish enhancement project at the Dennis Ck. bridge site, the use of bridges instead of large culverts (several examples on the Upper Cummins Road), erosion control measures, stream bank stabilization, etc. are all examples of mitigative measures related to access development. ***Action*** *Mistik will continue to improve its environmental performance related to mitigation of adverse impacts related to forestry activities.*	Vol. IIA: p. 9-4
44	Renewal Operations	Design details of renewal operations will be included in annual plans.	This commitment allows the public an opportunity to review planned renewal operations.	Co-management and advisory boards review all proposed forest renewal-related activities during the annual planning process. Most of the renewal work is undertaken by local community members. ***Action*** *None required.*	Vol. IIA: p. 9-5
45	Tending Rationale	The ultimate desired forest structure for a site and how proposed tending will contribute to achieving the desired structure will be set out in annual operations plans.	This rationale allows tending operations to be tied back to the FM objectives.	Mistik undertakes no stand tending activities – there is no need to assess tending operations in the context of 20-Yr FMP objectives. ***Action*** *None required.*	Vol. IIA: p. 9-5
46	Public Review of Disease Control Projects	The acceptability of planned disease control projects will be reviewed by the co-management boards and forest advisory committees.	The public is to be provided with an opportunity to review the details of disease control projects.	The only major 'disease' control that Mistik has undertaken is in relation to salvage harvesting of jack pine stands severely infected by dwarf mistletoe. Mistik staff, in collaboration with MoE personnel, describe the rationale for harvesting mistletoe-infected stands. Field trips, workshops and monthly co-management and advisory board meetings all provide a forum for public review of disease control projects. ***Action*** *None required.*	Vol. IIA: p. 9-6
47	Annual Documentation Requirements - FM Objectives	A direct comparison of actual and predicted results of FM will be	This requirement is designed to provide public accountability for	An explicit, 'head-to-head' planned vs. actual comparison of activities in the context of the strategic forest management level objectives has been assessed in general terms. The assessment (conducted in 1998 and 1999)	Vol. IIA: p. 9-8

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
		undertaken.	the effects of FM operations.	promptly led to a decision to forego the prescribed forest management actions due to significant operational, social and ecological issues. Mistik submits detailed completion reports and maps of all activities completed in the previous operating year to MoE as well as all co-management boards on an annual basis. Mistik's forest inventory database is also always maintained up-to-date to reflect the most recent harvest-related and natural disturbances. ***Action*** *Mistik will base the 2007-2027 20 Yr FMP on operationally relevant assumptions that are socially, economically and ecologically acceptable. The implementation of the CSA SFM plan requires a monitoring program and assessment of actual vs. predicted outcomes related to SFM indicators and targets.*	
48	Annual Documentation Requirements - Expanded Contents	The current standard content requirements in annual operations plans will be expanded to fulfill the requirements of IRM.	The expanded documentation requirements are set out in Vol. IV.	Mistik is currently not following the additional content requirements of the Annual Operating Plan. The detailed format as described in the 20-Yr FMP is not adhered to. ***Action*** *Mistik will continue to meet the commonly accepted planning and documentation requirements of regulatory agencies.*	Vol. IIA: p.9-8
49	Annual Documentation Requirements - Public Comments	Formal responses will be prepared for all key concerns raised by the public.	This requirement ensures that public comments are acknowledged and responded to. This requirement is also an important part of Mistik's improved public communication and awareness initiative.	Depending on the nature of the public concerns raised, Mistik may or may not respond by way of a formal written response. Any formal responses have not been included in 'Appendix 6' of the Annual Operating Plan. The operational reality of most of the public consultation and discussion is that this process is an ongoing dialogue. The same concerns and issues are discussed over and over again. It is the nature of the First Nation and Métis peoples to consider an issue thoughtfully (sometimes for years). Many issues will never be conclusively reconciled or resolved simply by issuing a well-written response to the individual(s). More is gained through a trust-building process, through relationship building, through ongoing dialogue. Key issues identified by the public are documented in Mistik's Operating Area Summaries contained within the operating plan. ***Action*** *None required.*	Vol. IIA: p. 9-8
50	Implementation Review	Commitments made in the Operations Procedure Manual and the FMP will be monitored at the local management unit level.	This commitment is designed to improve public confidence and co-operation during plan implementation.	Mistik uses 'management units' as one of the functional units to assess and report on all activities. Mistik's 'management units' reflect previous 'furblocks'. These 'furblocks' have evolved into community-based multiple resource management zones. An MU-based monitoring and reporting system has proven very effective. ***Action*** *None required.*	Vol. IIA: p. 9-9
51	Pre-operations Surveys	Extensive pre-operations surveys will be conducted to locate and document		Reconnaissance walkthroughs, pre-harvest site prescriptions (PHSPs) and layout activities are regularly conducted to assess for site specific values. ***Action*** *None required.*	Vol. IIA: p. 9-10

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
		significant natural and cultural heritage features.			
52	Updating of Environmental Inventory	The environmental inventory will be updated formally and informally on a routine basis.		Mistik is in a continuous process of updating its 'site-specific' mapping themes. A range of cultural and biophysical site-specific attributes are mapped. ***Action*** *None required.*	Vol. IIA: p. 9-10
53	FM Monitoring	Regular annual monitoring of forest management operations will be conducted and focused on access and harvesting impacts.	The results of this monitoring provides vital feedback to determine the effects of forest management and to implement the system.	Mistik is an active participant in the provincial Forest Management Effects Monitoring Program. Mistik has implemented the required monitoring protocols since 2001. Mistik is in the process of developing a 'self-inspection' process to assess compliance with provincial forestry standards. ***Action*** *None required.*	Vol. IIA: p. 9-10
54	Report of Past Forest Operations	An annual report of past forest operations will be prepared and will include a review of the results of the monitoring program.		Mistik reports annually on all completed harvesting, renewal and monitoring/research activities. ***Action*** *None required.*	Vol. IIA: p. 9-11
55	Ongoing Research	Regular procedures to review and award research projects will be used.	Specific criteria is provided to evaluate research proposals.	Mistik's 'inhouse' research program and Science Advisory Board was discontinued in 2001 due to costs. The commitments regarding the process of research project selection are not relevant any more. ***Action*** *None required.*	Vol. IIA: p. 9-11
56	Compliance with Management Objectives	Compliance with the approved FMP will be assessed based on all FM objectives, not simply wood supply.	This commitment requires MoE to modify their annual practices and to evaluate Mistik's FM proposals using the procedures set out in the NorSask Project documentation.	First, Mistik currently is not and has not been able to comply with a number of its stated management objectives contained in the 20-Yr FMP. Secondly, Mistik cannot 'require' MoE to modify their regulatory practices and procedures in order to assess Mistik's performance. ***Action*** *Mistik needs to revise its FMP objectives and avoid inappropriate statements related to 'requiring' MoE to change their regulatory practices. Mistik will do this in the context of the next 20-Yr FMP submission.*	Vol. IIA: p. 9-12
57	Public Review of Research Program	The acceptability of planned research project will be reviewed by the co-management boards and forest advisory committees.	The public is allowed an opportunity to review the details of research projects.	Mistik has not solicited public review of its planned research program. Mistik's 'inhouse' research program and Science Advisory Board was discontinued in 2001 due to costs. The commitments regarding the process of research project review by public advisory boards are not relevant any more. ***Action*** *None required.*	Vol. IIA: p. 9-12
58	Interpretation of Deviation Limits	FM activities will be planned to satisfy all short and long-term	Design of the FM activities includes compliance at all times	Mistik has not been able, and currently is not able, to conduct its operations within the context of many of the key objectives of the 20-Yr FMP. Thus, staying within the stated deviation limits for each objective is irrelevant.	Vol. IIA: p. 9-17

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
		deviation limits at the local and NorSask Forest level.	with the short and long-term requirements (i.e., FM objectives) at both the local and NorSask Forest levels.	***Action*** *Mistik will revise its key forest management objectives and commitments in the context of the next 20-Yr FMP.*	
59	Approval of FMP Amendments	Formal government approval will be undertaken as required for any amendment changes to the FMP requiring an amendment.	This includes assurance to the public that the FMP cannot be modified without due process.	Mistik's Forest Management Agreement (FMA) was amended in 2002 through a process initiated by the province. The amendment involved significant changes to the Mistik FMP area and timber supply. No amendment to the FMP was undertaken as a result of these changes. It was agreed by Mistik and the province to defer changes to the FMP until submission of the next 20-Yr FMP in 2007. ***Action*** *None required.*	Vol. IIA: p. 9-21
60	Documentation Requirements for an FMP Amendment	Documentation comparable to that provided in support of the original approval of the FMP will be followed for proposed amendments.	The scope of the documentation depends on the scope of the amendment. The documentation must be designed to be compatible with the project evaluation framework on which the EIS is based.	No formal amendments to the FMP have been made to date. ***Action*** *None required.*	Vol. IIA: p. 9-21
61	Contingency Plans	Contingency plans will be deployed only when factors outside Mistik's control lead to unavoidable delays in approval of an annual operations plan.	Contingency plans are to be used as a last resort measure to deal with uncontrollable and unforeseeable events.	Due to extreme weather events (excessive rainfall), fire and/or due to unforeseen environmental concerns (presence of caribou herds), Mistik has had to commence harvesting areas scheduled for future years other than the current year. However, the process described in the 20-Yr FMP for contingency plan implementation has not been followed. Mistik has always received regulatory approval for any operating plan changes. ***Action*** *None required.*	Vol. IIA: p. 9-22
62	Environmental Acceptability of FM Activities - Forest-level Effects	Achieving or exceeding the prescribed FM objectives will be sufficient evidence that environmental obligations to manage forest-level environmental effects have been satisfied.	By approving the NorSask Project and its associated documentation, MoE has agreed to this commitment.	Mistik has not been able, and currently is not able, to conduct its operations within the context of many of the key objectives of the 20-Yr FMP. However, Mistik is not exceeding allowable harvest levels, is conducting its annual operations within the context of generally accepted forestry practices and maintains an active public consultation process. The absence of a sound strategic plan is a significant issue and will be rectified with the completion of the next 20-Yr FMP. ***Action*** *Mistik will revise its key forest management objectives and commitments within the context of the next 20-Yr FMP.*	Vol. IIA: p. 10-2
63	Environmental Acceptability of FM Activities - Site-specific	Reasonably carrying out the operational planning procedures set out in	By approving the NorSask Project and its associated	Mistik has not been able, and currently is not able, to conduct its operations within the context of many of the key objectives of the 20-Yr FMP. However, Mistik is not exceeding allowable harvest levels, is conducting its	Vol. IIA: p. 10-2

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
	Effects	the EIS and the Forest Management Plan, including regular ongoing effective public consultation and the reasonable application of the enhancement and mitigation measures prescribed in the Forest Ecosystems and Landscape Management Manual, will be sufficient evidence that environmental obligations to manage site-specific environmental effects have been satisfied.	documentation, MoE has agreed to this commitment.	annual operations within the context of generally accepted forestry practices and maintains an active public consultation process. The absence of a sound strategic plan is a significant issue and will be rectified with the completion of the next 20-Yr FMP. ***Action*** *Mistik will revise its key forest management objectives and commitments within the context of the next 20-Yr FMP.*	
64	Forest Management Objectives	FM objectives will be undertaken to achieve specific quantified levels of positive environmental and social effects.		Mistik has not been able, and currently is not able, to conduct its operations within the context of many of the key objectives of the 20-Yr FMP. However, Mistik is not exceeding allowable harvest levels, is conducting its annual operations within the context of generally accepted forestry practices and maintains an active public consultation process. The absence of a sound strategic plan is a significant issue and will be rectified with the completion of the next 20-Yr FMP. ***Action*** *Mistik will revise its key forest management objectives and commitments within the context of the next 20-Yr FMP.*	Vol. IIA: p. 10-2
65	Notification of Non-compliance	SE and the local co-management board of forest advisory committee in the effect area will be notified immediately when an approved forest management objective is not reasonably expected to be achieved.	This commitment requires Mistik to inform both MoE and local residents as soon as it is reasonably likely an approved FM objective will not be achieved.	Mistik issued a letter to MoE in 1999 detailing the rationale for a plan amendment. Issues regarding the existing plan have been discussed with the various advisory and co-management boards as well. It is generally recognized by Mistik, the province and local advisory boards that many of the commitments in the existing 20-Yr FMP are unworkable and that Mistik is in non-compliance with many of the commitments. A formal 3rd party audit of Mistik's forestry activities was conducted in July 2004. The results of this audit will be made public in 2005. The audit report will summarize key areas of non-compliance. ***Action*** *No action.*	Vol. IIA: p. 10-3
66	Initiation of Plan Amendment Procedure	The approved plan amendment procedure will be initiated as soon as an approved FM objective is not	This commitment requires Mistik to initiate the plan amendment procedure as soon as it is reasonably likely an	The plan amendment process was started in 1999 but due to changing circumstances it was agreed by Mistik and the province to defer changes to the FMP until submission of the next 20-Yr FMP in 2007. ***Action*** *None required.*	Vol. IIA: p. 10-3

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
		reasonably expected to be achieved.	approved FM objective will not be achieved.		
67	Annual Planning Procedures	FM activities will be planned, reviewed and approved according to the procedures set out in the Operational Procedures Manual.	By approving the NorSask Project and its associated documentation, MoE has agreed to this commitment.	Mistik does not follow all the steps detailed for the planning process. ***Action*** *Mistik will continue to meet the commonly accepted planning requirements of regulatory agencies.*	Vol. IIA: p. 10-3
68	Environmental Planning for Individual FM Activities	The planning, design and implementation of individual forest management activities will be carried out in accordance with the Forest Ecosystems and Landscape Management Manual.	By approving the NorSask Project and its associated documentation, MoE has agreed to this commitment.	The FELMM is essentially Mistik's 'standard operating procedures'. The 'heart' of this document is being implemented. However, a number of the specific details contained in the document are not being followed due to changes in Mistik's organizational structure, inadequate information, the realities of current operational considerations, etc. ***Action*** *Mistik will default to provincial forestry standards. Most of the procedures described in the FELMM are addressed in the new provincial forestry standards.*	Vol. IIA: p. 10-3
69	Ongoing Public Participation	Forest management activities will be planned and reviewed according to the public consultation process described in the Forest Management Plan and the Operational Procedures Manual.	By approving the NorSask Project and its associated documentation, MoE has agreed to this commitment.	Mistik has not adhered to some of the public consultation details specified in the 20-Yr FMP. Mistik's public consultation processes have been successfully maintained in spite of deviating from the prescribed procedures. ***Action*** *None required.*	Vol. IIA: p. 10-3
70	Research and Monitoring	The research and monitoring program specified in the Forest Management Plan will be carried out on a continuous ongoing and regular basis.	By approving the NorSask Project and its associated documentation, MoE has agreed to this commitment.	Mistik's 'inhouse' research program and Science Advisory Board was discontinued in 2001 due to costs. The commitments regarding the process of research project selection is not relevant any more. ***Action*** *None required.*	Vol. IIA: p. 10-4
71	Plan Amendment Requirements	All amendments to forest management objectives, planning procedures, implementation manuals and operations plans will be carried out according to the procedures set out in the Forest Management Plan and the	By approving the NorSask Project and its associated documentation, MoE has agreed to this commitment.	The plan amendment process was started in 1999 but due to changing circumstances it was agreed by Mistik and the province to defer changes to the FMP until submission of the next 20-Yr FMP in 2007. ***Action*** *None required.*	Vol. IIA: p. 10-4

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
		Operational Procedures Manual.			
72	Term of Approval	Forest management in the NorSask forest will be carried out according to these conditions for the next twenty years. Approval of planned forest management activities and procedures will be reviewed ten years following the date of issuance of the Minister's final decision on the NorSask Project.	By approving the NorSask Project and its associated documentation, MoE has agreed to this commitment.	Mistik has commenced work on the next 20-Yr FMP due in 2007 (existing FMP received Ministerial approval May 1997). ***Action*** *Complete and have approval of new 20-Yr FMP by March 31, 2007.*	Vol. IIA: p. 10-4
73	Annual Planning Procedure - Objectives	The existing plan approval process will be followed while simultaneously ensuring objectives of Environmental Assessment Act are integrated in decision-making process.		Mistik does not follow all the steps detailed for the planning approval process. ***Action*** *Mistik will continue to meet the commonly accepted planning approval requirements of regulatory agencies.*	Vol. IV: p. 1-1
74	Forest Management - Goals and Objectives	SE will be notified if objectives cannot be achieved through planned forest management activities and will develop and implement the appropriate plan amendment procedure (Chapter 5 OPM).		The plan amendment process was started in 1999 but due to changing circumstances it was agreed by Mistik and the province to defer changes to the FMP until submission of the next 20-Yr FMP in 2007. ***Action*** *None required.*	Vol. IV: p. 1-2
75	Five-year Operations Plan	Mandatory components included in the five-year operations plans will be undertaken pursuant to this approval.		Mistik does not follow all the steps detailed for the planning process. ***Action*** *Mistik will continue to meet the commonly accepted planning requirements of regulatory agencies.*	Vol. IV: p. 1-3
76	Planning Teams	All operations plans will be developed by a planning team of Mistik staff.		Due to significant changes in the staffing structure at Mistik since submission of the 20-Yr FMP, the 'planning teams' specified in the Operational Procedures Manual do not exist. However, Mistik does have in place a formal planning process and designated staff which fulfills the	Vol. IV: p. 1-4

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
				functions envisioned of the original 'planning teams'. ***Action*** *None required.*	
77	Public Consultation Process	A regular public consultation process will be followed as part of the ongoing operation planning procedure.		Mistik meets periodically with each co-management and advisory board. Each board is given the opportunity to review and comment on all proposed Annual Five-Yr Operating Plans for each management unit. ***Action*** *None required.*	Vol. IV: p. 1-4
78	Co-management Consulting Process	Forest management activities will be planned and reviewed according to the public consultation process (Vol. II).		Mistik performs its public consultation through co-management and advisory boards as well as through individual stakeholder consultation – the process described in Vol IV is generally followed. ***Action*** *None required.*	Vol. IV: p. 1-4
79	Annual Planning Process	Eighteen key steps of the annual planning process will be followed according to the prescribed milestone dates.	The steps are set out and grouped according to the milestone dates.	Mistik does not follow the eighteen step procedure for developing its Annual Five-Yr Operating Plan. Many of the specific details related to process and content pertaining to each step have also not been followed. However, the planning process, as currently implemented, does meet the requirements of the public, regulatory agencies and Mistik. ***Action*** *None required.*	Vol. IV: p. 1-5 to 7
80	Planning Teams - Responsibilities	The planning team will be responsible for 1) scheduling forest management activities that are consistent with the timber and non-timber objectives in FMP, 2) implementing the FELMM, and 3) following the planning process set out in the Operational Procedures Manual. Planning teams will be established for each of the 13 forest management units (FMUs).		Due to significant changes in the staffing structure at Mistik since submission of the 20-Yr FMP, the 'planning teams' specified in the Operational Procedures Manual do not exist. However, Mistik does have in place a formal planning process and designated staff which fulfills the functions envisioned of the original 'planning teams'. Mistik does not follow the eighteen step procedure for developing its Annual Five-Yr Operating Plan. Many of the specific details related to process and content pertaining to each step have also not been followed. However, the planning process, as currently implemented, does meet the requirements of the public, regulatory agencies and Mistik. ***Action*** *None required.*	Vol. IV: p. 2-1, 2
81	Co-management Boards and Forest Advisory Committee	A local public advisory group will be developed for each FMU.		Mistik meets regularly with nine local public advisory groups. ***Action*** *None required.*	Vol. IV: p. 2-2, 3
82	Regional Advisory Committee - Make-up	Members will be convened and	This committee will provide advice to Mistik	A regional public advisory group was created in 2004 to meet the requirements of the CSA SFM Z809-02 process and provincial 20-Yr FMP	Vol. IV: p. 2-4

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
		appointed to a regional advisory committee within two years following approval of the FMP.	and will review and mediate local MU resource conflicts.	process. ***Action*** *None required.*	
83	Regional Advisory Committee - Make-up	Committee will be co-chaired during first year of operation by the president of Mistik and the regional director of MoE.		The regional public advisory group is facilitated by Terry Lamon – a local Meadow Lake businessman who has significant experience with northern communities and issues. ***Action*** *None required.*	Vol. IV: p. 2-4
84	Regional Advisory Committee - Mandate	Advice will be provided to Mistik in terms of appropriateness of forest management objectives and review and mediate resource conflicts involving local MUs.		The general mandate of the regional public advisory group is to provide input into the manner in which Mistik undertakes its activities. The function of the group does not include conflict mediation among MU-based advisory / co-management boards. ***Action*** *None required.*	Vol. IV: p. 2-4
85	Public Consultation - Objectives	The public will be informed of planned forest activities and provide public opportunity to comment.		Mistik meets periodically with each co-management and advisory board. Each board is given the opportunity to review and comment on all proposed Annual Five-Yr Operating Plans for each management unit. ***Action*** *None required.*	Vol. IV: p. 2-5
86	Analysis of Public Comments	Public review comments will be compiled according to relevant categories and written responses to each review comment will be provided.		Depending on the nature of the public concerns raised, Mistik may or may not respond by way of a formal written response. Any formal responses have not been included in 'Appendix 6' of the Annual Operating Plan. The operational reality of most of the public consultation and discussion is that this process is an ongoing dialogue. The same concerns and issues are discussed over and over again. It is the nature of the First Nation and Métis peoples to consider an issue thoughtfully (sometimes for years). Many issues will never be conclusively reconciled or resolved simply by issuing a well-written response to the individual(s). More is gained through a trust-building process, through relationship building, through ongoing dialogue. Key issues identified by the public are documented in Mistik's Operating Area Summaries contained within the operating plan. ***Action*** *None required.*	Vol. IV: p. 2-5
87	Operations Plan Process	The prescribed steps will be followed in preparation and approval of operations plan.	Close adherence to this planning process will ensure that all approved forest management activities are consistent with the FMP intent.	Mistik does not follow all the steps detailed for the planning process. ***Action*** *Mistik will continue to meet the commonly accepted planning requirements of regulatory agencies.*	Vol. IV: p. 2-6, 7, 8, 9, 10

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
88	Criteria for Approval	The prescribed approval criteria will be satisfied for each 5-year operations plan.	The key criteria that each 5-year operations plan must satisfy are set out.	Due to the fact that many of the steps required to prepare the Annual Five-Yr Operating Plan have not been followed, by default, the prescribed approval criteria have also not been adhered to. ***Action*** *Mistik will continue to meet the commonly accepted planning requirements of regulatory agencies.*	Vol. IV: p. 2-10, 11, 12
89	Sufficient Monitoring and Research Criteria	Certain monitoring and research initiatives will be set out in each 5-year plan.		Mistik's 'inhouse' research program and Science Advisory Board was discontinued in 2001 due to costs. The commitments regarding the process of research project selection is not relevant any more. Mistik is an active participant in the provincial Forest Management Effects Monitoring Program. Mistik has implemented the required monitoring protocols since 2001. Mistik is in the process of developing a 'self-inspection' process to assess compliance with provincial forestry standards. ***Action*** *None required.*	Vol. IV: p. 2-12
90	Forest Operating Strategy	The strategy for each MU will be developed by each planning team and submitted to SE, co-management boards and forest advisory committees by April 15th of each year.	The strategy encompasses first 9 steps of broad planning sequence identified in Section 2.5.	Mistik does not follow all the steps detailed for the planning process. ***Action*** *Mistik will continue to meet the commonly accepted planning requirements of regulatory agencies.*	Vol. IV: p. 3-1
91	Woodland and Mill Operating Costs	Production costs will be updated annually and used to prepare each annual operations plan.		Mistik prepares its annual operating plan prior to preparing its annual budget. ***Action*** *None required.*	Vol. IV: p 3-2
92	Forest Inventory	Harvest and burn areas will be estimated from field observation to update the forest inventory from the previous operating period.		Mistik acquires new imagery of the land base to update for harvest operations. Mistik relies on information generated from MoE to update areas impacted by fire. ***Action*** *None required.*	Vol. IV: p. 3-3
93	Forest Inventory	Regular cruising and silviculture survey programs will be carried out.	Accurate assessments of stand types, forest ecosystem characteristics and timber volumes is to be provided.	Mistik is currently undertaking a re-inventory and volume sampling of its FMP area. Mistik undertakes regeneration surveys on all areas harvested. ***Action*** *None required.*	Vol. IV: p. 3-3
94	Forest Inventory	A forest inventory steering committee will be established to		Mistik has been part of a collaborative effort led by MoE to develop new forest inventory standards. The Saskatchewan Forest Vegetation Inventory (SFVI) standards are currently being used as the standard for forest re-	Vol. IV: p. 3-3

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
		address standards, policies and procedures.		inventory in the province. ***Action*** *None required.*	
95	Forest Management Objectives for Non-timber	Supply targets for non-timber values will be determined for each FMU and set as minimum requirements to be attained.	The objectives for wildlife, blueberries and biodiversity approved in FMP will be set as constraints in operations strategy development.	Mistik has not been able, and currently is not able, to conduct its operations within the context of many of the key objectives of the 20-Yr FMP. Mistik has significant issues with many of the assumptions upon which the 20-Yr FMP objectives are based. ***Action*** *Mistik will revise its key forest management objectives and commitments within the context of the next 20-Yr FMP.*	Vol. IV: p. 3-4
96	Wood Supply Constraints	Maximum wood supply requirements of the BCTMP mill and sawmill will be determined for each year of 5-year plan. Milling requirements for independent operators will be identified for each year of 5-year plan and each FMU. Aggregate wood supply requirements for CTMP mill, sawmills and independent operators will be set.		Timber requirements for the sawmill and pulp mill and independent operator timber allocations are specified in each of Mistik's annual operating plans. ***Action*** *None required.*	Vol. IV: p. 3-4
97	Compilation of Updated Information	All updated information set out in Sections 3.1.1 to 3.1.6 will be compiled.		Mistik more or less adheres to the requirements as described in Sections 3.1.1 to 3.1.6. ***Action*** *None required.*	Vol. IV: p. 3-5
98	Prioritize Monitoring and Research	Candidate monitoring and research programs will be prioritized according to specific categories, for inclusion in operations strategy report.	Programs will be identified according to specific categories.	Mistik's 'inhouse' research program and Science Advisory Board was discontinued in 2001 due to costs. The commitments regarding the process of research project selection is not relevant any more. Mistik is an active participant in the provincial Forest Management Effects Monitoring Program. Mistik has implemented the required monitoring protocols since 2001. Mistik is in the process of developing a 'self-inspection' process to assess compliance with provincial forestry standards. ***Action*** *None required.*	Vol. IV: p. 3-5
99	Submission of Initial Forest Operations Strategy Report	The initial forest operation strategy report will be prepared and submitted to SE, co-management boards	A list of specific content requirements is included.	Mistik does not follow all the steps detailed for the planning process. ***Action*** *Mistik will continue to meet the commonly accepted planning requirements of regulatory agencies.*	Vol. IV: p. 3-5, 6

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
		and forest advisory committee by April 15th of each operating year.			
100	Analysis of Pre-disturbance Baseline Data	Additional baseline data will be collected as required to address comments received following review of operations strategy.		Mistik does not follow all the steps detailed for the planning process. ***Action*** *Mistik will continue to meet the commonly accepted planning requirements of regulatory agencies.*	Vol. IV: p. 3-7
101	Detailed Design of Operations	A detailed design of forest operations will be provided for the first year of the 5-year planning period.	Planning team will develop the detailed design of operations and sets out by a list of specific components.	Mistik does not follow all the steps detailed for the planning process. ***Action*** *Mistik will continue to meet the commonly accepted planning requirements of regulatory agencies.*	Vol. IV: p. 3-8
102	Operations Schedule	An operations schedule will be developed for all proposed forest management activities.	The schedule will identify road and harvesting operations by season and contractor for the first year and any seasonal constraints for year 2 to 5.	Mistik does not follow all the steps detailed for the planning process. ***Action*** *Mistik will continue to meet the commonly accepted planning requirements of regulatory agencies.*	Vol. IV: p. 3-9
103	Draft 5-year Operations Plan	The mandatory components will be included in all 5-year operations plans.		Mistik does not follow all the steps detailed for the planning process. ***Action*** *Mistik will continue to meet the commonly accepted planning requirements of regulatory agencies.*	Vol. IV: p. 3-10, 11
104	Draft 5-year Operations Plan Submission	A draft plan will be submitted to SE, co-management boards and forest advisory committee by December 1st of each operating year.	Will include a summary of comments provided during review of operations strategy.	Mistik does not follow all the steps detailed for the planning process. ***Action*** *Mistik will continue to meet the commonly accepted planning requirements of regulatory agencies.*	Vol. IV: p. 3-11
105	Draft 5-year Operations Plan Submission	The area planner and one of co-chairs for each MU will present draft operations plan.		Mistik does not follow all the steps detailed for the planning process. ***Action*** *Mistik will continue to meet the commonly accepted planning requirements of regulatory agencies.*	Vol. IV: p. 3-11
106	Modification of Draft 5-year Operations Plan	The planning team will finalize operations plan based on comments received from the reviewing parties.		Mistik does not follow all the steps detailed for the planning process. ***Action*** *Mistik will continue to meet the commonly accepted planning requirements of regulatory agencies.*	Vol. IV: p. 3-11

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
107	Modification of Draft 5-year Operations Plan	The regional director of MoE will be notified if the approved terms and conditions cannot be reasonably incorporated into the annual planning process.		Mistik does not follow all the steps detailed for the planning process. ***Action*** *Mistik will continue to meet the commonly accepted planning requirements of regulatory agencies.*	Vol. IV: p. 3-11
108	Public Review	Following incorporation of all required necessary modifications, a final draft plan will be made available for public review from Jan. 15 to Feb. 15 of each operating year.	Notices will be placed in library, communities and local papers.	Mistik does not follow all the steps detailed for the planning process. ***Action*** *Mistik will continue to meet the commonly accepted planning requirements of regulatory agencies.*	Vol. IV: p. 3-12
109	Final Approval	Final approval will be issued by March 1 of each operating year if the 5-year plan conforms to the planning procedures set out in the OPM and is forecast to satisfy the forest management objectives in the FMP.		Mistik and MoE do not follow all the steps detailed for the planning/approval process. ***Action*** *Mistik will continue to meet the commonly accepted planning requirements of regulatory agencies.*	Vol. IV: p. 3-12
110	Report of Past Forest Operations	Twelve specific components will be included in each past operations report.	The twelve requirements are set out in the OPM.	Mistik does not follow all the steps detailed for the reporting process. ***Action*** *Mistik will continue to meet the commonly accepted reporting requirements of regulatory agencies.*	Vol. IV: p. 3-12, 13
111	Forest Management Goals and Objectives	The operations plan will include a statement of the quantifiable objectives for each MU, an explanation of the forest management alternatives considered, and the rationale for the preferred set of planned forest management activities.		The processes described in this section have never been implemented. It is not clear exactly what is required. ***Action*** *Mistik will continue to meet the commonly accepted planning and reporting requirements of regulatory agencies.*	Vol. IV: p. 4-1
112	Legislative and	All proposed forest	These statutes include	Mistik has in place an ISO 14001-certified environmental management	Vol. IV: p. 4-

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
	Regulatory Environmental Standards	management plan activities will meet the minimum regulatory standard as specified through various statutes enacted within the Province of Saskatchewan.	individual acts and regulations specific to natural and heritage resources and numerous binding agreements related to them.	system (EMS). The EMS has a rigorous system to address regulatory compliance issues. ***Action*** *None required.*	2
113	Roads and Transportation Agreement	The parties will meet at a minimum every 5 years to review, revise and update.		Mistik meets on an 'as-needed' basis with the Dept. of Highways to discuss road issues. ***Action*** *None required.*	Vol. IV: p. 4-2
114	Reserves and Withdrawals	The location, area and purpose of all existing permanent and non-permanent reserves including withdrawals and site-specific protection measures will be identified.		Mistik tracks all withdrawals from its FMP area. ***Action*** *None required.*	Vol. IV: p. 4-2
115	New Proposal for Withdrawals	New proposals for withdrawals will be reviewed prior to finalization.		Mistik and MoE are generally the only two entities involved in reviewing new proposals for withdrawal. Co-management boards are not necessarily part of the review process. ***Action*** *None required.*	Vol. IV: p. 4-2
116	Co-management Agreement	The approved principles of co-management will be embodied in all operations plans.		The principles of co-management are generally addressed in all operations plans. ***Action*** *None required.*	Vol. IV: p. 4-3
117	Local management Agreement	The local co-management agreement between NorSask, MoE and northern people will be reviewed every 5 years.		Co-management agreements have not been reviewed every five years with each board. There appears to be a sufficient level of trust between Mistik and FMA-area communities that makes formal co-management agreements obsolete. ***Action*** *None required.*	Vol. IV: p. 4-3
118	Supply of Biodiversity Objectives	The minimum total area required for each forest ecosystem will be maintained.	The supply is expressed as the area and age class distribution of 11 ecosystem types.	Mistik is currently unable to measure the forest landscape in terms of the original eleven ecosystem types. Thus, it is not possible to provide a quantitative measure of the total area within each specified ecosystem type. ***Action*** *Mistik will revise its key forest management objectives and commitments within the context of the next 20-Yr FMP.*	Vol. IV: p. 4-3
119	Cultural and Heritage Resources	The planning procedures identified in FELMM will be followed		Mistik works with Western Heritage Services Inc. of Saskatoon, SK. in ensuring that cultural and heritage resources are identified and protected. ***Action***	Vol. IV: p. 4-4

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
		to manage potential impacts on cultural and heritage resources.		*None required.*	
120	Trapping and Outfitting Areas	Local trappers and outfitters within or immediately adjacent to areas proposed for FM operations will be contacted a minimum of 30 days prior to finalization of operations plans to identify local concerns.		Mistik seeks to contact all trappers and outfitters whose areas may be affected by harvest operations. Mistik sends a letter to all potentially affected individuals when preparing each annual operating plan. Letters are followed by phone calls or visits to the bush with the affected stakeholder. ***Action*** *None required.*	Vol. IV: p.4-5
121	Trapping and Outfitting Areas	Management prescriptions will be jointly developed by Mistik and the affected trapper for areas of concerns.		Mistik staff generally seek to accommodate site-specific needs of trappers and outfitters in relation to areas targeted for harvest. For example, a buffer was provided for Trevor Vause's cabin in Green Lake. A portion of a harvest unit in the Watt Lake Operating Area was left undisturbed to accommodate Barry Samson's desire to maintain a deer stand in the area. ***Action*** *None required.*	Vol. IV: p. 4-5
122	Wildlife Habitat	Critical habitat for woodland caribou and great grey owl will be identified in each operations plan. Mistik will consult with regional wildlife biologist of MoE prior to finalization of any management prescription for forestry operations.		Mistik staff work closely with the regional MoE biologist to address caribou habitat issues. Mistik has set aside two operating areas specifically to address habitat issues for a small herd of caribou known to exist between Niska Lake and Cummins Lake. To date, Mistik has not specifically considered the habitat needs of the Great Grey Owl (although individuals of this species are commonly sighted throughout the FMP area). ***Action*** *Mistik will continue to work collaboratively with MoE in addressing the habitat needs of woodland caribou. Through Mistik's CSA SFM plan, Mistik will be developing a spatially explicit woodland caribou protection plan.*	Vol. IV: p. 4-5
123	Primary Forest Access Roads	Design guidelines will be followed in the development of the primary access network for NorSask Forest.		Mistik does not follow all the methods described for development of primary access roads. ***Action*** *None required.*	Vol. IV: p. 4-5, 6
124	Secondary Forest Access Roads	Design guidelines will be followed in the development of the secondary access network for NorSask Forest.		Mistik does not follow all the methods described for development of secondary access roads. ***Action*** *None required.*	Vol. IV: p. 4-6
125	Water Crossings	Design guidelines will		Mistik submits a separate 'water crossing plan' and request for an Aquatic	Vol. IV: p. 4-

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
		be followed where water crossings are necessary.		Habitat Protection Permit from MoE. This submission is included in the annual plan submission. ***Action*** *None required.*	6
126	Harvesting and Renewal	Harvesting and renewal locations will be selected following the prescribed process.		MFMM is not used for harvest and renewal strategy development. The MFMM has never been a functional aspect of Mistik's operations. Specific location of harvest areas is dictated by a range of factors. Salvage harvesting of burn areas has been a major factor dictating harvest location throughout the 1990s. There is a very serious 'disconnect' between the 20-Yr FMP and operational plans. ***Action*** *Mistik will revise its key forest management objectives and commitments within the context of the next 20-Yr FMP and undertake spatial modeling of forecast harvest volumes to ensure consistency between the 20-Yr FMP and operational plans.*	Vol. IV: p. 4-7
127	Harvesting and Renewal - Adaptive Management - Strategy	Specific information will be collected for each treatment area (e.g., cutblock).		Pre-harvest site prescriptions (PHSPs) are a provincial requirement. ***Action*** *None required.*	Vol. IV: p. 4-7
128	Prioritization of Tending Operations	Priority for tending programs will be given first to maintaining biodiversity objectives.		Mistik does not conduct any stand tending or chemical brushing treatments. ***Action*** *None required.*	Vol. IV: p. 4-8
129	Chemical Tending Operations	Advanced public notice will be provided and will include the proposed location of treatments, the prescribed review period and the deadline for submission of review comments.		Mistik does not conduct any stand tending or chemical brushing treatments. ***Action*** *None required.*	Vol. IV: p. 4-8
130	Protection Priority	Priority for protection programs will be to control the spread of insects and diseases.		Other than salvage harvesting of dwarf mistletoe-infected jack pine stands and some funding assistance to MoE for spruce budworm control with BT, Mistik has not conducted major insect and disease abatement programs. ***Action*** *None required.*	Vol. IV: p. 4-8
131	Research and Data Collection Programs	Research and data collection programs will be prioritized according to 8 specific criteria.		Mistik's 'inhouse' research program and Science Advisory Board was discontinued in 2001 due to costs. The commitments regarding the process of research project selection are not relevant any more. ***Action*** *None required.*	Vol. IV: p. 4-8
132	Research and Data Collection Requirements	Research and data collection requirements will be established		Mistik's 'inhouse' research program and Science Advisory Board was discontinued in 2001 due to costs. The commitments regarding the process of research project selection are not relevant any more.	Vol. IV: p. 4-9

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
		jointly.		***Action*** *None required.*	
133	Industrial Users Integration	All industrial users whose activities affect long-term FMP objectives will be addressed in annual operations plans.		The integration of other industrial users whose activities may affect the long-term FMP objectives has not occurred. Some independent operators within the FMP area operate outside of the regulatory process, oil and gas developments are not jointly reviewed by SE, Mistik and co-management boards, and grazing plans are not jointly reviewed by SE, Mistik and co-management boards. ***Action*** *None required.*	Vol. IV: p. 4-9
134	Oil and Gas	Oil and gas development proposals will be reviewed by Mistik, SE, co-management board and forest advisory committees.		Oil and gas development proposal review occurs between MoE and the oil and gas company. ***Action*** *None required.*	Vol. IV: p. 4-9
135	Agriculture	Short and long-term grazing plans will be jointly reviewed.		Grazing plan proposal review occurs between MoE and the grazing permit applicant. ***Action*** *None required.*	Vol. IV: p. 4-9
136	Plan Amendment Process - Key Requirements	The specified requirements will be satisfied to secure approval of an amendment to the existing approval of the FMP.	The requirements are set out and include description of proposed revisions, rationale for modifications, public consultation, MoE approval, risk and uncertainty, and contingency plans.	Mistik's Forest Management Agreement (FMA) was amended in 2002 through a process initiated by the province. The amendment involved significant changes to the Mistik FMP area and timber supply. No amendment to the FMP was undertaken as a result of these changes. It was agreed by Mistik and the province to defer changes to the FMP until submission of the next 20-Yr FMP in 2007. ***Action*** *None required.*	Vol. IV: p. 5-1 to 5-4
137	Plan Amendment Process - Contingency Plans	Once approval of operational plan amendment is received, Mistik will terminate all operations being carried out under a contingency plan and will implement the approved plan.		Mistik has not had to invoke a contingency plan due to an FMP amendment process. The outcome of this present process will likely require a formal 'contingency plan'. ***Action*** *None required.*	Vol. IV: p. 5-3
138	Plan Amendment Process - Contingency Plans Procedure	Five key steps describing the contingency planning procedure will be followed only as an emergency backstop.	The key steps are set out and provide for an orderly uninterrupted continuity of forest management activities.	Mistik has not had to invoke a contingency plan due to an FMP amendment process. The outcome of this present process will likely require a formal 'contingency plan'. ***Action*** *None required.*	Vol. IV: p. 5-4

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
139	FMP and EIS Public Consultation Commitment	Extensive public consultation will be continued.	It is hoped that extensive public involvement can diffuse 'not-in-my-backyard' (NIMBY) type responses to FM operations.	Mistik, through its involvement with co-management and advisory boards, openhouses and workshops, etc. continues with extensive public consultation. ***Action*** *None required.*	Vol. VIIA: p. 2-2
141	Northern Residents Public Consultation Process	Consulting with northern residents will be continued.		Mistik, through its involvement with co-management and advisory boards, openhouses and workshops, etc. continues with extensive public consultation. ***Action*** *None required.*	Vol. VIIA: p. 2-2
142	Public Consultation Program Objectives	Public consultation will serve four specific purposes.	These are listed.	Mistik, through its involvement with co-management and advisory boards, openhouses and workshops, etc. continues with extensive public consultation. ***Action*** *None required.*	Vol. VIIA: p. 2-3
143	Shared Decision-making	Responsibilities for forest management will be shared with local people and government of Saskatchewan.		Mistik, as the licensee, is the primary entity responsible for forest management within the Mistik FMP area. Local community residents undertake most of the forestry work. MoE provides regulatory administration of forestry activities. ***Action*** *None required.*	Vol. VIIA: p. 3-28
144	Waterhen First Nation	Concerns from a meeting with the Waterhen First Nation were carefully recorded, addressed in the FMP and will be addressed through the implementation of the plan.		Most of the issues identified have been addressed. Waterhen Lake First Nation is one of the largest forestry contractors in the Mistik FMP area. ***Action*** *None required.*	Vol. VIIA: p. 4-3, 4, 5
145	Forest Values	New information will be gathered and forest management activities will be monitored to improve the knowledge base of local forest values.	Public dialogue on key issues will be fostered and Mistik will attempt to respond to diverse public demands.	Mistik is constantly updating its information base in relation to site specific values. ***Action*** *None required.*	Vol. VIIA: p. 4-20
146	Five-year Operations Plan Objectives	A specific objective of each five-year operations plan will be to receive feedback from public regarding		Mistik solicits public input into the development of its Annual 5-Yr Plan. ***Action*** *None required.*	Vol. VIIA: p. 6-5

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
		proposed forest management activities.			
147	Analysis of Results	All public comments will be recorded and categorized.		Mistik documents the concerns of the potentially affected stakeholders in the annual operating plan summaries for each active operating area. ***Action*** *None required.*	Vol. VIIA: p. 6-5
148	Schedule	The schedule of dates by which public consultation events will occur will be followed.		Mistik does not follow the annual planning schedule as described in the 20-Yr FMP. ***Action*** *None required.*	Vol. VIIA: p. 6-5
149		Conform to all prescribed aspects of the plan.		Mistik has chosen not to conform to all prescribed aspects of the plan due to significant adverse economic, social and ecological impacts. ***Action*** *None required.*	May 13, 1997 Ministerial Approval
150		Comply with all laws and regulations of the Province of Saskatchewan pertaining to the implementation of the plan.		Mistik has reasonably complied with all required laws and regulations. ***Action*** *None required.*	May 13, 1997 Ministerial Approval
151		Monitor and test the results of applying the analytical model (MFMM) for the purpose of determining whether applying the model results in the maintenance of ecosystem integrity.		Mistik attempted to re-run MFMM and was unsuccessful. Additionally, Mistik determined that there were significant negative implications of implementation of the forest management actions prescribed by the model. ***Action*** *None required.*	May 13, 1997 Ministerial Approval
152		To report the results of activities and monitoring programs identified in #151 to the Minister within seven years of the date of approval (May 2004).		Mistik undertook a Sustainable Forest Management Audit in July 2004 that meets the requirements of this condition. The results of the audit and associated action plans have been reported to the Minister and will be made public by July 2005. ***Action*** *None required.*	May 13, 1997 Ministerial Approval

#	General Description	Specifics	Comments	Comments Regarding Current Status	Reference
153		Mistik shall participate in a provincial forest ecosystem monitoring task force and implement associated monitoring protocols.		Mistik has been an active participant of this process and has implemented the provincial Forest Management Effects Monitoring Program since 2001. ***Action*** *None required.*	May 13, 1997 Ministerial Approval
154		Based on the results of #153, undertake additional studies and implement mitigative measures where necessary.		Mistik has not undertaken any additional studies to date but does implement mitigative measures as required (i.e., erosion control, etc.). ***Action*** *None required.*	May 13, 1997 Ministerial Approval
155		Mistik shall undertake a revised classification of non-productive forest types to identify important woodland caribou habitat and submit a report for approval to the Minister, including any special management approaches to be used to maintain the quality of the habitat within two years of the date of plan approval (May 1999).		Mistik is still in the process of re-inventorying the entire FMP area – the new SFVI provides significantly more detail related to non-productive forest types than the existing UTM inventory. With the implementation of this CSA SFM plan, Mistik will be formalizing special management approaches in order to maintain high-quality woodland caribou habitat (within the context of the provincial Woodland Caribou Recovery Strategy). ***Action*** *None required.*	May 13, 1997 Ministerial Approval
156		Mistik shall consult with the Minister with respect to road planning and road retirement.		Mistik receives regulatory approval of all road construction, reclamation and closure. ***Action*** *None required.*	May 13, 1997 Ministerial Approval
157		Mistik shall prepare and submit to the Minister a riparian habitat management plan within two years of the date of plan approval (May 1999).		Mistik prepared and submitted a riparian habitat management plan to the Minister on February 2, 2001. ***Action*** *None required.*	May 13, 1997 Ministerial Approval

APPENDIX B – REGISTER OF PUBLIC ISSUES AND CONCERNS PERTAINING TO THE MISTIK FMP AREA FOR THE PERIOD 2007 TO 2015

Mistik 2007 20-Year Forest Management Plan

Register of Issues and Concerns Related to the Mistik FMP area

#	Name of Individual	Organization Affiliation	Community Affiliation	Forum	Date of Communication	Issue	Mistik Response and Proposed Action	Completion Date of Proposed Action	Other Comments
1	Don Dill	Saskatchewan Watershed Authority (SWA)	Province of Saskatchewan	Telephone	26-Sep-05	SWA is under the impression that Mistik, in undertaking its forestry activities, can 'turn the water tap on and off' across the forest landscape. SWA has the impression that site preparation activities cause major drainage changes in overland flow and natural water flow is completely disrupted over large areas of the forest landscape.	Mistik has scheduled a field trip with Don Dill and other SWA members on October 18, 2005 to discuss and demonstrate to them the low impact of forestry activities on water production and overland flow. Mistik's CAN/CSA Z809-02 SFM Plan and applicable indicators will be discussed with and provided to SWA.	Mistik staff met with Don Dill and Frank Fox (SWA) on October 18 from 10 AM to 3 PM. SWA assisted Mistik in determining the appropriate watershed sub-basin to use the FMP process. The discussions and field tour resulted in the consensus that forest harvesting impact on water quantity and discharge is likely not distinguishable within the range of natural variability. The opportunity exists in the future to operationally	Keep Don Dill updated with FMP documentation related to hydrology on the Mistik FMP area. **2011/12 update** No further action

Mistik 2007 20-Year Forest Management Plan

Register of Issues and Concerns Related to the Mistik FMP area

#	Name of Individual	Organization Affiliation	Community Affiliation	Forum	Date of Communication	Issue	Mistik Response and Proposed Action	Completion Date of Proposed Action	Other Comments
								assess this assumption based on the metering sites at the sub sub sub basin level - refer to map.	
2	Debbie Lalond, Steve Cooper, Albert Montgrand	Friends of the Forest	Buffalo Narrows (and apparently other FMP area communities?)	Meeting at Mistik office	27-Oct-05	'Friends of the Forest' is a new group in the early stages of formation who feel that there is a need for a 'citizens group' that serves as a 'watchdog' regarding forestry activities that also represents the broad interests of forest users and forest values in northwest Saskatchewan. Expressed concern that there will be no 'old' forest left	Mistik described to the group the recent formation of the Mistik Public Advisory Group that does attempt to address local issues through representation from a broad cross-section of the local citizenry in northwest Saskatchewan other provincially-based groups in Saskatchewan. Mistik identified to the group that the 20-Yr FMP process would be a great venue for engaging both Mistik and the public regarding issues of concern.	Letter of invitation and CSA SFM Plan sent on October 28, 2005 via Steve Cooper. Mistik established an 'Unique Tree Registry' for the Mistik FMP area on October 28, 2005 (one jP tree in the Redmond Lake Operating Area has been identified).	Concerns related to forestry will be compiled by 'Friends of the Forest' and dealt with in the context of PAG meetings. **2011/12 update** No further action

Mistik 2007 20-Year Forest Management Plan

Register of Issues and Concerns Related to the Mistik FMP area

#	Name of Individual	Organization Affiliation	Community Affiliation	Forum	Date of Communication	Issue	Mistik Response and Proposed Action	Completion Date of Proposed Action	Other Comments
						in the future, that the values of the Aboriginal communities are not being upheld or addressed and the need for an 'unique tree registry' for the Mistik FMP area.	Mistik will send a letter to 'Friends of the Forest' formally inviting them to participate in Mistik's Public Advisory Group and give them a copy of Mistik's recent CSA SFM Plan. Mistik will create an 'Unique Tree Registry' for the Mistik FMP area.		
3	Steve Cooper	Safaris North Outfitters	n/a	Bush tour of Redmond Lake Operating Area	28-Oct-05	Steve Cooper (outfitter) has the smallest outfitting area in the Mistik FMP area in the Redmond Lake Operating Area. He expressed his concern as to the future harvest sequencing in his outfitting area. He has some high value bait sites	On October 28, 2005, Mistik staff spent three hours with Steve Cooper in his outfitting area viewing each of his bait sites. Mistik agreed to defer harvest activities for a 10-year period in the northwest corner of the Redmond Lake Operating Area to accommodate his concerns. If, in the interim, other areas of the operating	On October 28, 2005, Mistik entered into its 'Special Places' GIS layer the location of the deferred harvest area related to Steve Cooper's concerns.	Steve Cooper and Mistik will maintain periodic communication related to the integration of outfitting and forestry activities. **2011/12 update**

Mistik 2007 20-Year Forest Management Plan

Register of Issues and Concerns Related to the Mistik FMP area

#	Name of Individual	Organization Affiliation	Community Affiliation	Forum	Date of Communication	Issue	Mistik Response and Proposed Action	Completion Date of Proposed Action	Other Comments
						in this area and would like to maintain these high quality sites.	area offer better hunting opportunity - Steve will notify Mistik that he has moved out of the northwest corner and Mistik will sequence the area for harvest.		No further action
4	Don Kostiuk (on behalf of Louis Chanalquay - Chief, Buffalo River Dene First Nation and Council)	Buffalo River Dene First Nation	Dillon	Meeting at Mistik office	Nov 7 and 8, 2005	Don Kostiuk speaking on behalf of BRDFN – BRDFN wants complete control of all governmental, industrial and recreational activities within its traditional territory (including MUs #11-Dillon and 21-Peter Pond). BRDFN wants to assume 100%	Mistik desires to work with BRDFN to accommodate their objectives insofar as they are compatible with Mistik's corporate mandate to its shareholders and Mistik's legal requirements to the Crown under its Forest Management Agreement. Mistik will develop both short and long-term strategies to implement the objectives of both parties. Mistik will request a date for a field trip with	Ongoing	**2008/09 update** Change in BRDN band council / administration – Don Kostiuk no longer involved with the band. Mistik's forestry activities significantly curtailed due to negative community response to forestry and

Mistik 2007 20-Year Forest Management Plan

Register of Issues and Concerns Related to the Mistik FMP area

#	Name of Individual	Organization Affiliation	Community Affiliation	Forum	Date of Communication	Issue	Mistik Response and Proposed Action	Completion Date of Proposed Action	Other Comments
						control of all forestry activities currently undertaken by Mistik including initial forestry planning, public consultation, harvest and access planning, all harvesting and renewal activities, supervision, mapping, etc. BRDFN requests that Mistik sign a 'User Access License' in the near future and abide the conditions of the license. One of the conditions of the license will be payment of a royalty applied to all	BRDFN Chief and Council and Don Kostiuk to discuss their immediate forestry concerns (tentatively scheduled for December 1, 2005 but dependent on BRDFN staff schedules – as of January 11, 2006 no field trip has occurred – the Band indicates that they are still interested but don't have the time to undertake this event in the near future). Meetings will be ongoing between Mistik and BRDFN to discuss their objectives. Mistik is not aware of any burial sites in		due to the global economic downturn. Mistik attempting to keep northern forestry contractors 'alive' in other locations of the Mistik FMP area. **2011/12 update** No forestry activity in the Dillon or Peter

Mistik 2007 20-Year Forest Management Plan

Register of Issues and Concerns Related to the Mistik FMP area

#	Name of Individual	Organization Affiliation	Community Affiliation	Forum	Date of Communication	Issue	Mistik Response and Proposed Action	Completion Date of Proposed Action	Other Comments
						timber harvested in MUs #11 and 21 to BRDFN equal to the provincial stumpage rates. In terms of impact to Mistik's existing and future planning and certification initiatives, regulatory responsibilities, etc. and the maintenance of such programs - the impact is unknown at this point. Additionally, BRDFN has indicated that harvesting must be dispersed (instead of aggregated, unharvested buffers must be	MUs #11 and 21 (in spite of extensive consultation with local community members). Mistik is aware of one instance where a riparian buffer was accidentally harvested in the 11-84 Millennium OA.		Pond MUs from 2009/10.

Mistik 2007 20-Year Forest Management Plan

Register of Issues and Concerns Related to the Mistik FMP area

#	Name of Individual	Organization Affiliation	Community Affiliation	Forum	Date of Communication	Issue	Mistik Response and Proposed Action	Completion Date of Proposed Action	Other Comments
						applied to all roads (inblock and interblock) and that BRDFN will not be dictated to by outside agencies in relation to planning or conducting their forestry activities. BRDFN claim that burial sites have been disturbed by harvest activities in MUs #11 and #21 and that riparian buffers are routinely not left adjacent to lakes.			
5	Jim Jodouin (on behalf of Colleen Sandfly – Chief, Big Island Lake Cree Nation	Big Island Lake Cree Nation	Big Island Lake Cree Nation	Meeting at Big Island Lake Cree Nation Band office	22-Nov-05	Big Island Lake Cree Nation has initiated legal action against a number of	It is Mistik's desire to resolve this issue. Mistik attempts to minimize impact to non-timber values throughout the	Ongoing	**2008/09 update**

Mistik 2007 20-Year Forest Management Plan

Register of Issues and Concerns Related to the Mistik FMP area

#	Name of Individual	Organization Affiliation	Community Affiliation	Forum	Date of Communication	Issue	Mistik Response and Proposed Action	Completion Date of Proposed Action	Other Comments
	and Council					existing private, provincial and federal government interests that occur in the area that they consider their traditional territory. Mistik Management Ltd. is named as one of the defendants in the law suit. Big Island Lake Cree Nation has specifically requested a moratorium on all forestry activities (and all outfitting and oil and gas activity) in the area that they consider to be their traditional territory (this includes the Pierceland, Big Island Lake,	Mistik FMP area. It is Mistik's opinion that forestry activities and non-timber forest uses can be integrated resulting in both timber and non-timber values being realized. Mistik attempts to understand community and stakeholder concerns and values related to the forest. The moratorium requested by Big Island Lake Cree Nation is not consistent with provincial forest use legislation and Mistik's Forest Management Agreement with the Province of Saskatchewan. Mistik will continue to attempt to understand the		Mistik continues ongoing efforts to maintain a relationship with BILCN. Mistik has, on its own initiative, avoided harvesting in the Big Island Lake Management Unit for the fourth year in a row. However, at some point in the near future, Mistik will commence operations in the Big Island Lake management unit. **2009/10**

Mistik 2007 20-Year Forest Management Plan

Register of Issues and Concerns Related to the Mistik FMP area

#	Name of Individual	Organization Affiliation	Community Affiliation	Forum	Date of Communication	Issue	Mistik Response and Proposed Action	Completion Date of Proposed Action	Other Comments
						Murray Bay and Beaver River and a portion of the Dillon, Canoe Lake and Waterhen Management Units).	desires of Big Island Lake Cree Nation. Mistik will maintain communication with the community and continue to demonstrate that forestry activities can be integrated into the forest landscape without unduly disrupting other non-timber forest values. Mistik needs continued access to all portions of its FMP area in order to fulfill its responsibility to its shareholders and obligations as a licensee with the Province of Saskatchewan.		**update** Some communication with Big Island Lake members regarding the provision of logs for building an elders lodge – mills agreed to provide logs but BILCN did not follow up. **2011/12 update** Ongoing meetings and dialogue and a field trip with helicopter flight

Mistik 2007 20-Year Forest Management Plan

Register of Issues and Concerns Related to the Mistik FMP area

#	Name of Individual	Organization Affiliation	Community Affiliation	Forum	Date of Communication	Issue	Mistik Response and Proposed Action	Completion Date of Proposed Action	Other Comments
6	Jim Jodouin (on behalf of Colleen Sandfly – Chief, Big Island Lake Cree Nation and Council	Big Island Lake Cree Nation	Big Island Lake Cree Nation	Meeting at Big Island Lake Cree Nation Band office	22-Nov-05	Big Island Lake Cree Nation has requested that Mistik provide the entirety of its new digital SFVI data to Herb Hammond (Big Island Lake's forestry consultant) for use in analysis of Mistik's operational plans and activities and 2007 20-Year FMP development processes. It is Mistik's understanding that Herb Hammond (based on a previous discussion with Herb Hammond at Big Island	Mistik has repeatedly indicated to Big Island Lake Cree Nation that they need to be part of the existing provincial and local processes in place to address their concerns related to operational planning and 20-Year FMP processes related to the Mistik FMP area. Mistik invited (this has been done repeatedly over the last 12 months) Big Island Lake to designate a representative to attend Mistik's Public Advisory Group meetings (next one scheduled for January 2006). Mistik indicated that this particular request for raw	Ongoing	**2011/12 update** Mistik has given all of its digital forest inventory information to BILCN – for free – no further action. **2014/15 update** New Chief and Council and advisor (Dan Osvat) a number of letters sent to the Province and Mistik – request for a

Mistik 2007 20-Year Forest Management Plan

Register of Issues and Concerns Related to the Mistik FMP area

#	Name of Individual	Organization Affiliation	Community Affiliation	Forum	Date of Communication	Issue	Mistik Response and Proposed Action	Completion Date of Proposed Action	Other Comments
						Lake) wishes to complete his own 'shadow analysis' or a completely parallel 20-Year FMP based on a more enlightened approach to forestry than that identified by Saskatchewan Environment and the public of Saskatchewan.	SFVI-related data was extraordinary and that Mistik does not generally 'hand out' raw SFVI data to the public. Mistik indicated that it has also not finalized a data licensing agreement related to data sharing. As an alternative, Mistik invited Big Island Lake to send a representative to the Mistik office in Meadow Lake to review the veracity of the SFVI data collection and compilation processes. Mistik indicated that the 2007 20-Year FMP process is one of transparency and openness. Mistik recommended that the existing		moratorium on harvesting

Mistik 2007 20-Year Forest Management Plan

Register of Issues and Concerns Related to the Mistik FMP area

#	Name of Individual	Organization Affiliation	Community Affiliation	Forum	Date of Communication	Issue	Mistik Response and Proposed Action	Completion Date of Proposed Action	Other Comments
							provincial forestry planning processes be fully utilized before attempting 'sideline' processes. As of February 1, 2006, Mistik has offered to Big Island Lake Cree Nation several options: 1. Mistik will provide forestry maps (hardcopy or digital) for a nominal charge. 2. Mistik will provide access to a web-based GIS viewer so that the SFVI data and forestry activity layers can be viewed. There is a monthly fee for		

Mistik 2007 20-Year Forest Management Plan

Register of Issues and Concerns Related to the Mistik FMP area

#	Name of Individual	Organization Affiliation	Community Affiliation	Forum	Date of Communication	Issue	Mistik Response and Proposed Action	Completion Date of Proposed Action	Other Comments
							this service that BILCN would have to pay. Sell the SFVI data and forestry activity data (to date) to BILCN. The data will be sold on a mapsheet basis. The cost per mapsheet will reflect the market value of acquiring the data.		
7	Philip Chartier	Northwest Métis Council	Buffalo Narrows	Telephone	28-Mar-06	The Northwest Métis Council would like to be considered as a separate entity (distinct from the communities) with respect to Mistik's 20-Yr FMP consultation processes. Philip Chartier is the Regional Director for the Clearwater / Clear Lake	Mistik will invite the Northwest Métis Council to participate in Mistik's Public Advisory Group as a member. Mistik will forward existing 20-Yr FMP documentation to Philip Chartier and George Smith.	March 31, 2006	**2011/12 update** No further action on this matter has occurred.

Mistik 2007 20-Year Forest Management Plan

Register of Issues and Concerns Related to the Mistik FMP area

#	Name of Individual	Organization Affiliation	Community Affiliation	Forum	Date of Communication	Issue	Mistik Response and Proposed Action	Completion Date of Proposed Action	Other Comments
						Region and George Smith is the Regional Director for the Ile A La Crosse / Pinehouse Region. They serve as co-chairs for the Northwest Métis Council.			
8	Pat Mackasey	Saskatchewan Environment	Prince Albert	Letter	April 28, 2006 (SE)	Mistik Management Ltd. (Mistik) requests clarification of Item #2 in your letter of April 28, 2006. Item #2 states: *'2. …Based on the criteria, appropriate non-merchantable stands can be excluded from*	May 3, 2006 (Mistik response) May 4, 2006 (SE – John Thompson) May 5, 2006 (Mistik call to Larry Stanley) Based on May 5, 2006 call to Larry Stanley, it was agreed to identify this pronouncement by SE in the Register of Issues and Concerns pertaining to the	This matter was addressed in the latter stages of completion of Mistik's 2007 20-Yr FMP.	**2011/12 update** This matter is now closed

Mistik 2007 20-Year Forest Management Plan

Register of Issues and Concerns Related to the Mistik FMP area

#	Name of Individual	Organization Affiliation	Community Affiliation	Forum	Date of Communication	Issue	Mistik Response and Proposed Action	Completion Date of Proposed Action	Other Comments
						the net land base. ***Please note however, that the Forest Service may allocate some of these areas to other licensees if Mistik elects to exclude them from their net land base.***' Mistik requests clarification of the last sentence (shown in bolded text) in Item #2 above. We are perplexed with the apparent contradiction with various specific	Mistik 2007 20-Yr FMP. There is need for significant clarification of SE's statement with respect to the draft Forest Management Planning Document.		

Mistik 2007 20-Year Forest Management Plan

Register of Issues and Concerns Related to the Mistik FMP area

#	Name of Individual	Organization Affiliation	Community Affiliation	Forum	Date of Communication	Issue	Mistik Response and Proposed Action	Completion Date of Proposed Action	Other Comments
						portions and the intent of the draft Forest Management Planning Document. For example, Pg. 1 of the Forest Management Planning Document states: *'Once the forest estate model prepares a selected management strategy, the FMP is finalized for a term of up to 20 years.'* Mistik requests clarification as			

Mistik 2007 20-Year Forest Management Plan

Register of Issues and Concerns Related to the Mistik FMP area

#	Name of Individual	Organization Affiliation	Community Affiliation	Forum	Date of Communication	Issue	Mistik Response and Proposed Action	Completion Date of Proposed Action	Other Comments
						to the provincial planning processes and legislative authorities under which the Forest Service intends to allocate areas from the Mistik FMP area to other licensees once Mistik's 2007 20-Year Forest Management Plan is approved. Mistik, Mistik's Public Advisory Group and associated co-management boards anticipate your response.			
9	Rodney and Cordell Cross	Trapper and outfitter	Meadow Lake	Numerous face-to-face discussions	Numerous times throughout 2008/09	Rodney and Cordell Cross conduct trapping and outfitting	Mistik, along with Ministry of Environment (MOE) staff, have spent many hours	Ongoing	**2008/09 update**

Mistik 2007 20-Year Forest Management Plan

Register of Issues and Concerns Related to the Mistik FMP area

#	Name of Individual	Organization Affiliation	Community Affiliation	Forum	Date of Communication	Issue	Mistik Response and Proposed Action	Completion Date of Proposed Action	Other Comments
						operations in a large area located approximately in the northwest corner of the Divide Management Unit. The primary concern in the impact of Mistik's forest harvesting and road building activities on their trapping and outfitting activities.	discussing the topic with the Rodney and Cordell Cross. Mistik, with the approval of MOE, has modified its tactical plan significantly in order to better address their concerns.		There is not a perfect resolution to this matter. Rodney and Cordell continue to be unsupportive of Mistik's forest harvesting plans. However, the relationship between Cross's and Mistik is cordial and Mistik values their ongoing input regarding forest harvest plans in the area. **2011/12**

Mistik 2007 20-Year Forest Management Plan

Register of Issues and Concerns Related to the Mistik FMP area

#	Name of Individual	Organization Affiliation	Community Affiliation	Forum	Date of Communication	Issue	Mistik Response and Proposed Action	Completion Date of Proposed Action	Other Comments
									update No further action
10	Jimmy Hanson	Buffalo Narrows Co-Management Board	Buffalo Narrows	Buffalo Narrows Co-Management Board meetings	January 23, 2009	Jimmy Hanson is opposed to any forest harvesting occurring on the east side of Niska Lake in the 10-17 Jeannotte Lake Operating Area.	Mistik needs continued access to all portions of its FMP area in order to fulfill its responsibility to its shareholders and obligations as a licensee with the Province of Saskatchewan. Mistik can accommodate deferrals of harvest areas but not no-harvest zones. Mistik has already identified an	Ongoing	**2008/09 update** Mistik has deferred harvest operations in this operating area for the near term. **2011/12 update** There has been no harvesting in this area since

Mistik 2007 20-Year Forest Management Plan

Register of Issues and Concerns Related to the Mistik FMP area

#	Name of Individual	Organization Affiliation	Community Affiliation	Forum	Date of Communication	Issue	Mistik Response and Proposed Action	Completion Date of Proposed Action	Other Comments
							extensive High Conservation Value (HCV) area along Niska Lake and McCusker River		2009/10
2009/10 update - no major issues or concerns recorded for 2009/10									
11	Joe / Henry Fleury	n/a	Waterhen	Phone call and Mistik office discussion	February 11, 2011	Harvesting in the Watt Lake Operating Area on the opposite side of Fleury's approach to their cabin site onto Hwy 903 considered 'ugly' and that no notification was made by Mistik.	Harvesting area was ~ 1 km from Fleury's cabin site. The matter was referred to Ministry of Environment. MOE reviewed the matter and determined that issue was a matter of aesthetics. Prior to operations commencing, Mistik had made several attempts to contact Joe and/or David regarding the harvest operations both in person and by phone. Unknown	March 31, 2011	

Mistik 2007 20-Year Forest Management Plan

Register of Issues and Concerns Related to the Mistik FMP area

#	Name of Individual	Organization Affiliation	Community Affiliation	Forum	Date of Communication	Issue	Mistik Response and Proposed Action	Completion Date of Proposed Action	Other Comments
							to Mistik, Fleury's had moved to Eagle's Lake reserve and thus no contact was made. The matter was eventually discussed in detail and diffused. No further action necessary.		
12	ILX residents	n/a	Ile a la Crosse	Via Ministry of Environment	October 2010	Local residents concerned that Mistik watercourse crossing activities on the Kazan River was negatively affecting water quality in Kazan Lake.	Together with MOE, Mistik flew the complete Kazan River watercourse and found no abnormal issues. The Mistik winter crossing site is completely reclaimed with no impairment to waterflow. Only 3 beaver dams were encountered on the river system – very little activity. No further action.	March 31, 2011	

Mistik 2007 20-Year Forest Management Plan

Register of Issues and Concerns Related to the Mistik FMP area

#	Name of Individual	Organization Affiliation	Community Affiliation	Forum	Date of Communication	Issue	Mistik Response and Proposed Action	Completion Date of Proposed Action	Other Comments
13	Brenda Nightingale	n/a	Meadow Lake	Email / phone call and Mistik office discussion	November 14, 2011	Harvest operations in Hunting Lake North Operating Area – concern about noise and harvest activity near to their residence on the provincial forest boundary. Also want to ensure that the 'wedge' north of the powerline is left undisturbed by forest operations as it is used for recreational pursuits by local residents.	Numerous discussions, invitation (and acceptance) to join DFACC and deferral of harvest operations in the 'wedge'. Mistik had designated this area a 'special place' in 2006. Harvest operations south of the 'wedge' continued to completion of planned activities – no further action.	March 31, 2011	

Mistik 2007 20-Year Forest Management Plan

Register of Issues and Concerns Related to the Mistik FMP area

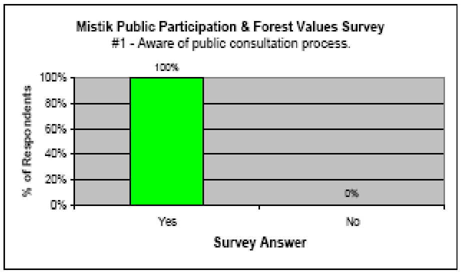
#	Name of Individual	Organization Affiliation	Community Affiliation	Forum	Date of Communication	Issue	Mistik Response and Proposed Action	Completion Date of Proposed Action	Other Comments
14	Dan Dillabough	Recreational huntings	North Battleford	Email / phone call and Mistik office discussion	Throughout December 2011 and January 2012	Lack of access to historic trails and access in the Divide Forest and possible destruction of heritage survey mounds (~ 1880s).	Mistik adheres to Provincial Standards and Guidelines with respect to access construction and reclamation and access control. Matter referred to Ministry of Environment. Mistik took no action to remove road closures or undertake any other measures (upon direction from MOE).	March 31, 2012	
15	Waterhen Land and Resources Board Canoe Lake Co-management Board Buffalo Narrows Co-management	Northern communities	Northern communities	Meetings and letters and emails	2012/13	Request for increase in co-management fee from $0.50/m3 to something closer to $1.00/m3	This matter has been deferred to Mistik's Board of Directors for resolution. This is a cost to Mistik's two shareholder mills and Mistik does not have decision-making ability regarding this topic. Mistik's board will be meeting on June 26/14 to discuss	September 30, 2014	Co-management fee has been increased and linked to market conditions – significant 'upside' benefit for the communities.

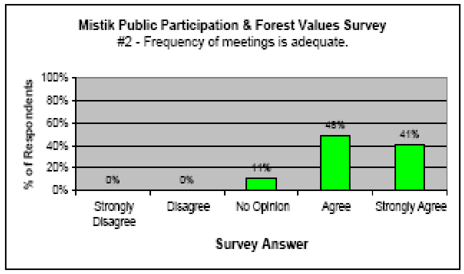
Mistik 2007 20-Year Forest Management Plan

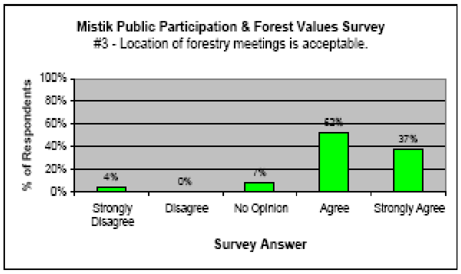
Register of Issues and Concerns Related to the Mistik FMP area

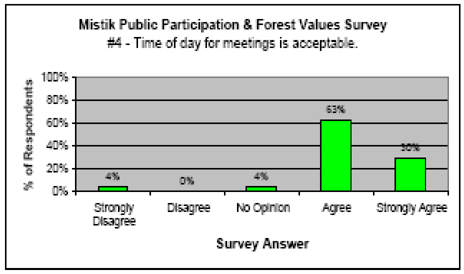
#	Name of Individual	Organization Affiliation	Community Affiliation	Forum	Date of Communication	Issue	Mistik Response and Proposed Action	Completion Date of Proposed Action	Other Comments
	Board Dillon / St. George's Hill / Michel Village						potential resolutions to this request.		

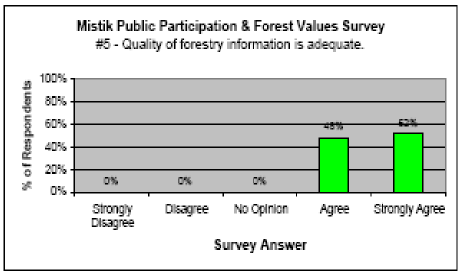
APPENDIX C – MISTIK PUBLIC PARTICIPATION AND FOREST VALUES SURVEY RESULTS SUMMARY

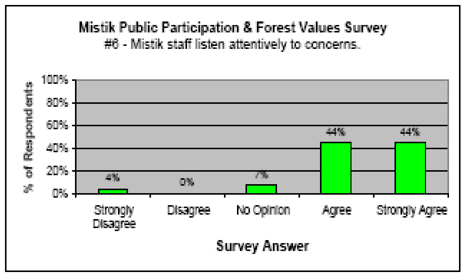

Mistik Public Participation & Forest Values Survey
#1 - Aware of public consultation process.
% of Respondents
100%
0%
Yes
No
Survey Answer

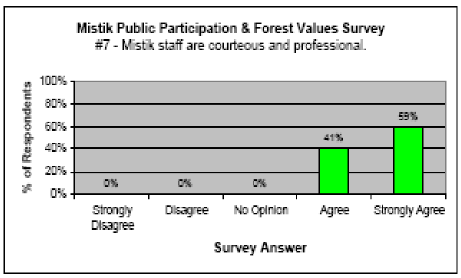

Mistik Public Participation & Forest Values Survey
#2 - Frequency of meetings is adequate.
% of Respondents
0%
0%
11%
49%
41%
Strongly Disagree
Disagree
No Opinion
Agree
Strongly Agree
Survey Answer

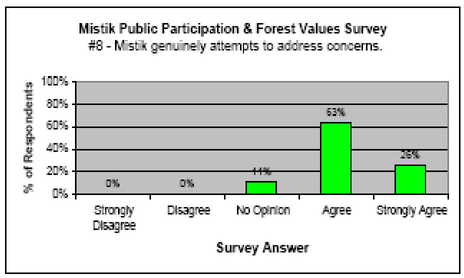

Mistik Public Participation & Forest Values Survey
#3 - Location of forestry meetings is acceptable.
% of Respondents
4%
0%
7%
52%
37%
Strongly Disagree
Disagree
No Opinion
Agree
Strongly Agree
Survey Answer

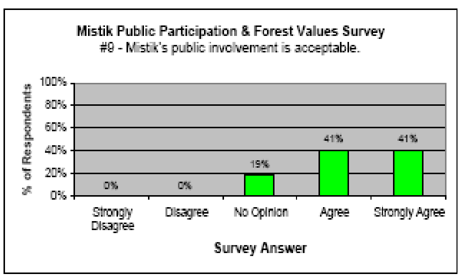

Mistik Public Participation & Forest Values Survey
#4 - Time of day for meetings is acceptable.
% of Respondents
4%
0%
4%
63%
30%
Strongly Disagree
Disagree
No Opinion
Agree
Strongly Agree
Survey Answer

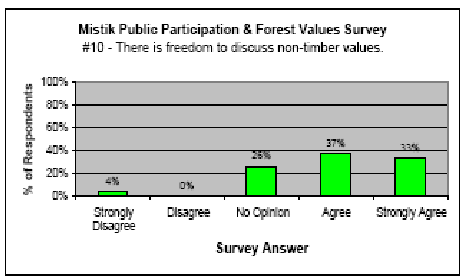

Mistik Public Participation & Forest Values Survey
#5 - Quality of forestry information is adequate.
% of Respondents
0%
0%
0%
48%
52%
Strongly Disagree
Disagree
No Opinion
Agree
Strongly Agree
Survey Answer

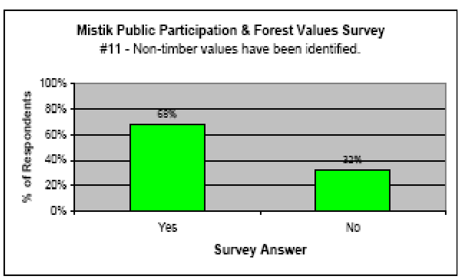

Mistik Public Participation & Forest Values Survey
#6 - Mistik staff listen attentively to concerns.
% of Respondents
4%
0%
7%
44%
44%
Strongly Disagree
Disagree
No Opinion
Agree
Strongly Agree
Survey Answer

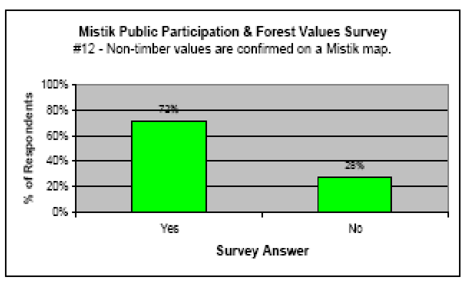

Mistik Public Participation & Forest Values Survey
#7 - Mistik staff are courteous and professional.
% of Respondents
0%
0%
0%
41%
59%
Strongly Disagree
Disagree
No Opinion
Agree
Strongly Agree
Survey Answer

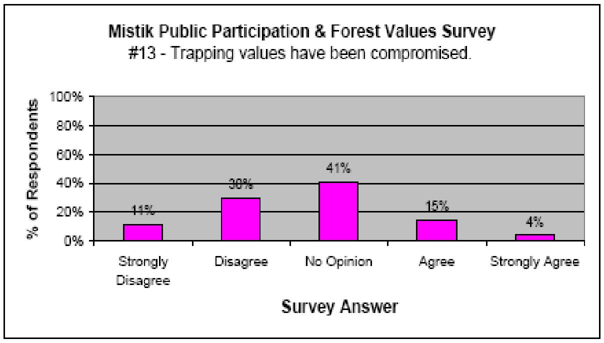

Mistik Public Participation & Forest Values Survey
#8 - Mistik genuinely attempts to address concerns.
% of Respondents
0%
0%
11%
63%
26%
Strongly Disagree
Disagree
No Opinion
Agree
Strongly Agree
Survey Answer

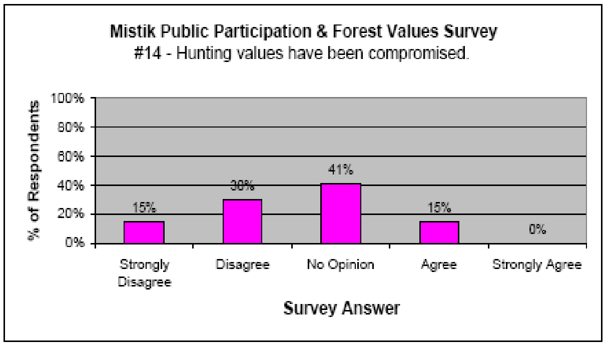

Mistik Public Participation & Forest Values Survey
#9 - Mistik's public involvement is acceptable.
% of Respondents
0%
0%
19%
41%
41%
Strongly Disagree
Disagree
No Opinion
Agree
Strongly Agree
Survey Answer

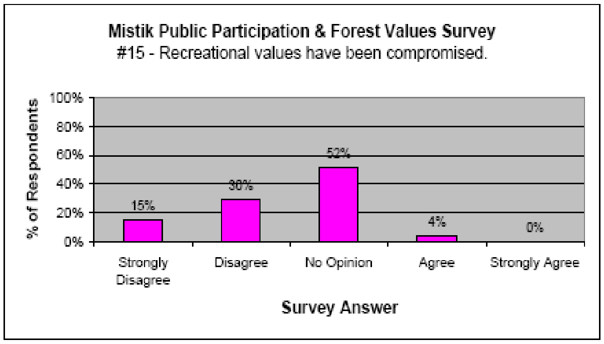

Mistik Public Participation & Forest Values Survey
#10 - There is freedom to discuss non-timber values.
% of Respondents
4%
0%
26%
37%
33%
Strongly Disagree
Disagree
No Opinion
Agree
Strongly Agree
Survey Answer

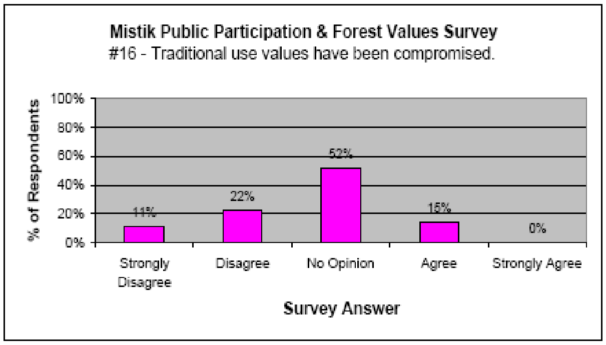

Mistik Public Participation & Forest Values Survey
#11 - Non-timber values have been identified.
% of Respondents
68%
32%
Yes
No
Survey Answer

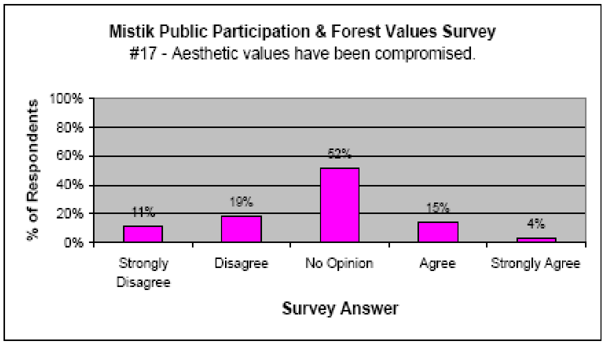

Mistik Public Participation & Forest Values Survey
#12 - Non-timber values are confirmed on a Mistik map.
% of Respondents
72%
28%
Yes
No
Survey Answer


Mistik Public Participation & Forest Values Survey
#13 - Trapping values have been compromised.
% of Respondents
100%
80%
60%
40%
20%
0%
11%
30%
41%
15%
4%
Strongly Disagree
Disagree
No Opinion
Agree
Strongly Agree
Survey Answer


Mistik Public Participation & Forest Values Survey
#14 - Hunting values have been compromised.
% of Respondents
100%
80%
60%
40%
20%
0%
15%
30%
41%
15%
0%
Strongly Disagree
Disagree
No Opinion
Agree
Strongly Agree
Survey Answer


Mistik Public Participation & Forest Values Survey
#15 - Recreational values have been compromised.
% of Respondents
100%
80%
60%
40%
20%
0%
15%
30%
52%
4%
0%
Strongly Disagree
Disagree
No Opinion
Agree
Strongly Agree
Survey Answer


Mistik Public Participation & Forest Values Survey
#16 - Traditional use values have been compromised.
% of Respondents
100%
80%
60%
40%
20%
0%
11%
22%
52%
15%
0%
Strongly Disagree
Disagree
No Opinion
Agree
Strongly Agree
Survey Answer


Mistik Public Participation & Forest Values Survey
#17 - Aesthetic values have been compromised.
% of Respondents
100%
80%
60%
40%
20%
0%
11%
19%
52%
15%
4%
Strongly Disagree
Disagree
No Opinion
Agree
Strongly Agree
Survey Answer

APPENDIX D – MISTIK ADVERTISEMENT REQUESTING PUBLIC INPUT REGARDING FORESTRY OPERATIONS

Mistik Management Ltd. is a woodlands management company based out of Meadow Lake, Saskatchewan providing timber procurement and forestry services to **Norsask Forest Products.** and **Meadow Lake Pulp Limited Partnership**. Mistik is dedicated to the sustainable use and stewardship of 1.8 million hectares of boreal forest in northwest Saskatchewan.

HOW IS OUR PERFORMANCE?

Mistik is constantly striving to improve its forest management performance. The public is encouraged to report to Mistik any forestry activities that may be perceived to be in non-compliance with Saskatchewan's laws and regulations or threaten environmental or other values.

If you wish to contact Mistik or have any questions about Mistik's Environmental Management System (EMS) please contact **Steve Hankey** at:

tel: (306) 236-4431

fax: (306) 236-4426

email: steve.hankey@mistik.ca

APPENDIX E – MAPS

Table 17.3 Maps Submitted with this Document

Map #	Map Name
1	Location of the Mistik FMP area
2	Management Units
3	Communities and Infrastructure
4	Boundary Changes
5	SFVI Photography
6	Parent Material
7	Topography
8	Slope Class
9	Soils
10	Ecoregions
11	Watersheds
12	Wildlife Management Zones
13	Deer Outfitting Areas
14	Bear Outfitting Areas
15	Fur Conservation Areas
16	Riparian No-Harvest Areas
17	Protected Areas
18	Special Places
19	Visually Sensitive Areas
20	Heritage Sites
21	Land Classification
22	Provincial Forest Types
23	Seral Stages
24	Forest Fires
25	Harvested-Regenerated-Burned
26	Dwarf Mistletoe
27	Windthrow
28	Harvest
29	Salvage Harvest
30	Forest Renewal
31	Establishment Survey

APPENDIX F – OTHER RELEVENT REPORTS AND INFORMATION PERTAINING TO FOREST MANAGEMENT ON THE MISTIK FMP AREA

Since its inception in 1990, Mistik Management Ltd. has placed high value on ensuring that its forest management activities are conducted in accordance with the most current scientific understanding of the ecological, economic and social values and functions of the boreal forest. In order to continuously improve Mistik's knowledge and understanding of advances in sustainable forest management science, Mistik has commissioned a number of studies related to its forest management activities. The following list of document references identifies all the forest management-related publications pertaining to Mistik's FMP area and associated forest management activities to date.

Landscape Ecology

Andison, D.W. 1998. Age-class Distributions and Fire Cycles on the Mistik FMLA: A Preliminary Analysis. Bandaloop Landscape-Ecosystems, Belcarra, British Columbia, Canada.12 pp.

Andison, D.W. 1999. Validating Forest Age Data on the Mistik FMLA. Bandaloop Landscape-Ecosystems, Belcarra, British Columbia, Canada. 28 pp.

Andison, D. W. 1999. Historical Disturbance Pattern and Process Research on the Mistik Management FMLA. Bandaloop Landscape-Ecosystems, Belcarra, British Columbia, Canada. 9 pp.

Andison, D.W., R. **Schulz** and P. **Marshall**. 2003. Comparing Stand Origin Ages with Forest Inventory Ages on a Boreal Mixedwood Landscape. Bandaloop Landscape-Ecosystem Services. 59 pp.

Andison, D. W. 2005. Determining Island Remnants and Meso-Scale Fire Patterns in Saskatchewan. Part 1: Disturbance Event Patterns. Bandaloop Landscape-Ecosystems, Belcarra, British Columbia, Canada. 40 pp.

Andison, D. W. 2006. Determining Island Remnants and Meso-Scale Fire Patterns in Saskatchewan. Part 2: Island Remnant Patterns. Bandaloop Landscape-Ecosystems, Belcarra, British Columbia, Canada. 53 pp.

Andison, D. W. 2006. Determining Island Remnants and Meso-Scale Fire Patterns in Saskatchewan. Part 3: Event Composition and Spatial Controls. Bandaloop Landscape-Ecosystems, Belcarra, British Columbia, Canada. 67 pp.

Andison, D. W. 2006. Natural Levels of Forest Seral-Stage Variability on the Mistik Management FMP area in Saskatchewan. Bandaloop Landscape-Ecosystems, Belcarra, British Columbia, Canada. 42 pp.

Brown, E., N. Dudley, A. Lindhe, D.R. Muhtaman, C. Stewart and T. Sunnott (eds.). 2013. Common Guidance for the Identification of High Conservation Values. HCV Network. 63 pp.

Hamm, A., M. **Polet** and J. **Williamson**. 2006. Plant Biodiversity Assessment for the Mistik FMP area (Draft). Ecomark Ltd., Edmonton, Alberta, Canada. 100 pp.

Hanna, E. and M. **Martel**. 1998. Practical Integration of Landscape Ecology Principles in an Operational Forest Management Plan. DSS Management Consultants Inc., 1886 Bowler Drive, Pickering, Ontario. 27 pp.

Schulz, R. J. 2008. Predicting Time-Since-Fire from Forest Inventory Data in Saskatchewan, Canada. M.Sc. Thesis. Faculty of Forestry, University of British Columbia, Vancouver, British Columbia, Canada. 75 pp.

Wiersma, Y., P. **Duinker**, W. **Haider**, G. **Hvenegaard**, A. **Munier** and F. **Schmiegelow**. Relationships between protected areas and sustainable forest management: A preliminary synthesis – September 2008. Draft concept paper prepared by the research team leading the Sustainable Forest Management Network State-of-Knowledge project on 'Protected Areas and Sustainable Forest Management'. 32 pp.

Silviculture

Bailey, B.E. 2002. The Impacts of Disc Trenching on White Spruce Structural Root Development. M.Sc. Thesis. Department of Soil Science, University of Saskatchewan, Saskatoon, Saskatchewan, Canada. 98 pp.

Block, M.A. 2004. Fine Root Dynamics and Carbon Sequestration in Juvenile Hybrid Poplar Plantations in Saskatchewan, Canada. M.Sc. Thesis. Department of Soil Science, University of Saskatchewan, Saskatoon, Saskatchewan, Canada. 166 pp.

Hangs, R. D. 2002. Competition for Nitrogen Between Early Successional Plant Species and Outplanted White Spruce and Jack Pine Seedlings. M.Sc. Thesis, Department of Soil Science, University of Saskatchewan, Saskatoon, Saskatchewan, Canada. 169 pp.

Hudson, J.F. 2000. Root Dynamics of Jack Pine as Influenced by Slow-Release Fertilizer or Inoculation with Either *Hebeloma Cylindrosporum* or *Burkholderia Cepacia*. M.Sc. Thesis, Department of Soil Science, University of Saskatchewan, Saskatoon, Saskatchewan, Canada. 135 pp.

Johnston, M. 2005. Carbon Budget Analysis of Herbicide Control of Deciduous Tree Species. Saskatchewan Research Council, Saskatoon, Saskatchewan, Canada. 14 pp.

Navratil, S. 1998. Density Trends in Aspen Regeneration and Aspen Juvenile Stands: A Review for Operational Application. Silfor Consulting, Hinton, Alberta, Canada. 27 pp.

Navratil, S. 2000. Strategies for the Renewal Phase of Aspen-White Spruce Types. Silfor Consulting, Hinton, Alberta, Canada. 113 pp.

Sasktel Max Media (digital movie file). 2012. Alcott Demonstration Forest (a brief overview of the Alcott Demo Forest featuring Wendy Soulsby and Georgina Umpherville from Mistik Management Ltd.).

Scagel, R., 1996. Silvicultural Planting Window Interpretation of Long-Term Climate for Northwestern Saskatchewan. Pacific Phytometric Consultants/Pacific Regeneration Technologies. Ladner, British Columbia, Canada. 45 pp.

Staples, T.E., 1998. Effect of Fertilization and Vegetation Management on the Growth and Survival of White Spruce Seedlings. M.Sc. Thesis. Department of Soil Science, University of Saskatchewan, Saskatoon, Saskatchewan, Canada. 98 pp.

Staples, T.E. and K.C.J. **Van Rees**. 2001. Wood/sludge ash effects on white spruce seedling growth. Canadian Journal of Soil Science. 81:85-92.

Natural Disturbance

Flesch, T.K. and J.D. **Wilson**. 1997. Extreme Value Analysis of Wind Gusts in Northwestern Saskatchewan. J.D. Wilson and Associates, Edmonton, Alberta, Canada. 41 pp.

Genoway, P. 1999. Regeneration Potential of Declining Aspen and Mixedwood Stands in West-Central Saskatchewan. M.Sc. Thesis. Department of Renewal Resources, University of Alberta, Edmonton, Alberta, Canada. 112 pp.

Wildlife

Proulx, G. 2006. Management Guidelines for 'Species at Risk' in the Mistik FMP area (Saskatchewan). Alpha Wildlife Research and Management Ltd., Alpha Wildlife Publications, Sherwood Park, Alberta, Canada. 135 pp.

Proulx, G. 2012. Development of a Forest Rating System to Predict Late-Winter Habitat Use by Fisher and American Marten and Survey of Mammals in Mistik's FMP area, Saskatchewan. Alpha Wildlife Research and Management Ltd., Alpha Wildlife Publications, Sherwood Park, Alberta, Canada. 26 pp.

Proulx, G. 2012. Development of a Forest Rating System to Predict Late-Winter Habitat Use by Boreal Woodland Caribou in Mistik's FMP area, Saskatchewan. Alpha Wildlife Research and Management Ltd., Alpha Wildlife Publications, Sherwood Park, Alberta, Canada. 28 pp.

Proulx, G. 2013. Late-winter Habitat Use by Boreal Woodland Caribou (*Rangifer tarandus caribou*) in Northwestern Saskatchewan. Canadian Wildlife Biology and Management. Vol 2, No 1: 11-22.

Proulx, G. 2014. Late-winter Habitat Use by the Fisher, *Pekania pennanti* (Erxleben, 1777) in the Boreal Plains Ecozone of Northwestern Saskatchewan, Canada. The Canadian Field-Naturalist. Vol 128: 272-275.

Proulx, G. 2016. Habitat of Radio-Collared Boreal Caribou in the Northwestern Region of the Mistik's FMP area, Saskatchewan. Alpha Wildlife Research and Management Ltd., Alpha Wildlife Publications, Sherwood Park, Alberta, Canada. 21 pp.

Avian

Cooke, H. A. and S.J. **Hannon**. 2010. Do aggregated harvests with structural retention conserve the cavity web of old upland forest in the boreal plains? Forest Ecology and Management. Volume 261 (2011): 662-674.

Morisette, J. 2000. The Response of Boreal Songbird Communities to Fire and Post-Fire Harvesting. M.Sc. Thesis. Department of Biology, Universty of Regina, Regina, Saskatchewan, Canada. 58 pp.

Morisette, J.L., T.P. **Cobb**, R.M. **Brigham** and P.C. **James**. 2002. The response of boreal songbird communities to fire and post-fire harvesting. Canadian Journal of Forest Research. 32:2169-2183.

Van Wilgenburg, S.L. 2004. Landscape-level Responses of Boreal Forest Bird Communities to Anthropogenic and Natural Disturbance. M.Sc. Thesis Progress Report. Department of Biology, University of Saskatchewan, Saskatoon, Saskatchewan, Canada. 38 pp.

Van Wilgenburg, S.L. and K.A. **Hobson**. 2005. Potential Impacts of Forestry Activities on Forest Bird Communities: A Review and a Proposed Modelling Methodology to Assess Management Plan Alternatives for Mistik Management Ltd.'s Forest Management Agreement Area. Canadian Wildlife Service, Saskatoon, Saskatchewan, Canada. 25 pp.

Van Wilgenburg, S.L. and K.A. **Hobson**. 2006. Assessing single-pass harvesting for meeting sustainable harvesting objectives. Canadian Wildlife Service, Saskatoon, Saskatchewan, Canada. 34 pp.

Van Wilgenburg, S.L. and K.A. **Hobson**. 2008. Landscape-scale disturbance and boreal forest birds: Can large single-pass harvest approximate fires? Forest Ecology and Management. Volume 256 (1-2 July): 136-146.

Socioeconomics

Adamowicz, W., P. **Boxall**, M. **Haener**, Y. **Zhang**, D. **Dosman** and J. **Marois**. 2004. An assessment of the impacts of forest management on Aboriginal hunters: Evidence from stated and revealed preference data. Forest Science. 50(2):139-152.

Beaver River Community Futures (digital movie file). 2009. Socioeconomic Benefit of Forest Harvesting Activities to Local Aboriginal Communities in Northwest Saskatchewan (Canoe Lake and Area Forestry Contractors). My Sky Media.

Beckley, T. and D. **Korber.** 1996. Clearcuts, Conflict and Co-Management: Experiments in Consensus Forest Management in Northwest Saskatchewan. Nat. Res. Can., Can. For. Serv., North. For. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-349. 19 pp.

Beckley, T. and F.H. **Chambers**. 2002. An Assessment of Co-Management in the NorSask Forest. University of New Brunswick, Fredericton, New Brunswick, Canada. 79 pp.

Bourke, M. 2005. Accountability and the Separation of Business and Politics in Corporate-Aboriginal Partnerships. Master of Public Policy Thesis. Faculty of Arts and Social Sciences, Simon Fraser University, Vancouver, British Columbia, Canada. ~ 200 pp.

Chambers, F.H. 1999. Co-Management of Forest Resources in the NorSask Forest Management License Area, Saskatchewan: A Case Study. M.Sc. Thesis. Faculty of Environmental Design, University of Calgary, Calgary, Alberta, Canada. 178 pp.

Chambers, F.H. 1999. The Future of Grass-Roots Co-Management in Saskatchewan. Sustainable Forest Management Network. University of Alberta, Edmonton, Alberta, Canada. 20 pp.

Chambers, F.H. 2003. Public Involvement in Canadian Forest Management: A Case Study of Mistik Management Ltd. A paper submitted to the XII World Forestry Congress, Quebec City, Canada. http://www.fao.org/DOCREP/ARTICLE/WFC/XII/0827-A5.HTM. 5 pp.

Dosman, D., M. **Haener**, W. **Adamovicz**, J. **Marois** and P. **Boxall**. 2001. Assessing Impacts of Environmental Change on Aboriginal People: An Economic Examination of Subsistence Resource Use and Value. Project Report #02-01. Department of Rural Economy, Faculty of Agriculture and Forestry and Home Economics, University of Alberta, Edmonton, Alberta, Canada. 33 pp.

Dybwad, C.L. 1999. Public Involvement in Business Planning: The Mistik Experience. Ph.D. Thesis. University of Waterloo, Waterloo, Ontario, Canada. 294 pp.

Haener, M.K., D. **Dosman**, W.L. **Adamovicz** and P.C. **Boxall**. 2001. Can stated preference methods be used to value attributes of subsistence hunting by Aboriginal peoples? A case study in northern Saskatchewan. American Journal of Agricultural Economics (Number 5): 1334-1340.

Korber, D. and T. **Beckley**. 2000. Socio-Economic Impacts of Forestry: NorSask FMLA, 1986-1996. Canadian Forest Service, Northern Forestry Centre, Edmonton, Alberta, Canada. 132 pp.

Kulshreshtha, S.N. 1998. Economic impacts of selected forestry practices on the economy of northwest Saskatchewan. The Forestry Chronicle. July/August Number 4, Vol. 74: 617-624.

Orb, J. D., 2008. The Political Economy of Public-Private Partnerships: Forestry Co-Management in Northwest Saskatchewan. M.A. Thesis. Department of Political Studies. University of Saskatchewan, Saskatoon, Saskatchewan, Canada. 106 pp.

Shapansky, B., W. **Adamowicz** and P. **Boxall**. 2001. Measuring Forest Resource Values: An assessment of choice experiments and preference construction methods as public involvement tools. Project Report -2-03. Department of Rural Economy (Agricultural and Resource Economics), University of Alberta. Edmonton, Alberta. 36 pp.

Forest Ecology

Cooke, A.M. 1996. Trembling Aspen Ecosystem Regeneration Success Versus Degree of Site Soil Degradation. B.Sc. Thesis. Faculty of Forestry and Environmental Management, University of New Brunswick, Fredericton, New Brunswick, Canada. 25 pp.

Lefebvre, N. 1999. Growth Analysis of Five-Year Old White Spruce Seedlings Naturally Established in Logged and Burned Areas of the Boreal Mixedwood Region of Saskatchewan. B.Sc. Thesis. Faculty of Forestry, University of British Columbia, Vancouver, British Columbia, Canada. 38 pp.

Hogg, E.H. and A.G. **Schwarz**. 1997. Dendrochronology of Declining Aspen Stands in the Bronson Forest. Canadian Forest Service, Edmonton, Alberta, Canada. 41 pp.

Hope, S.M. and J.P. **Kimmins**. 1999. Successional Development of Mid to Late Seral White Spruce Forests in Saskatchewan's Mid Boreal Upland Ecoregion. 80 pp.

Hope, S.M. 2001. Mature White Spruce Stands in the Mid-Boreal Upland Ecoregion of Saskatchewan. Ph.D. Thesis. Department of Forest Sciences, Faculty of Forestry, University of British Columbia, Vancouver, British Columbia. 189 pp.

Sidders, D. and T. **Keddy**. 2000. Operations Guide to Mixedwood Clearcut Harvesting with individual Tree and Patch Retention. Mistik Management Ltd., Meadow Lake, Saskatchewan, Canada. 5 pp.

Welham, C. 2000. Clearcutting, Partial Overstory Retention and Shelterwoods: Ecological, Economic and Social Implications. Prepared for Mistik Management Ltd. FORRX Consulting Inc., Belcarra, British Columbia, Canada. 28 pp.

Welham, C. 2001. Business as Usual or Understory Protection? A Comparison Using the Ecosystem Simulation Model, FORECAST. Prepared for Mistik Management Ltd. FORRX Consulting Inc., Belcarra, British Columbia, Canada. 17 pp.

Welham, C. 2001. The Utility of the Two-Pass Harvesting System in Saskatchewan Mixedwoods: A Preliminary Analysis Using the Ecosystem Simulation Model, FORECAST. Prepared for Mistik Management Ltd. FORRX Consulting Inc., Belcarra, British Columbia, Canada. 17 pp.

Welham, C., B. **Seely** and J. **Kimmins**. 2002. The utility of the two-pass harvesting system in Saskatchewan mixedwoods: An analysis using the ecosystem simulation model FORECAST. Canadian Journal of Forest Research. 32: 1071-1079.

Hybrid Poplar

Schroeder, B. and G. **Inouye**. Several reports from 2003-2005. Hybrid Poplar Plantations for Farm Diversification in Saskatchewan. Progress Report. Prairie Farm and Rehabilitation Administration, Agriculture and Agri-Food Canada, Regina, Saskatchewan, Canada. ADF Project 20010048. 23 pp.

Insects

Cobb, T.P. 2001. Disturbance and Ecological Stability of Boreal Forest Beetle Assemblages. M.Sc. Thesis. Department of Biology, University of Regina, Regina, Saskatchewan, Canada. 105 pp.

Climate Change

Hogg, E.H., J.P. **Brandt** and B. **Kochtubajda**. 2003. Climate Change Impacts on Productivity and Health of Aspen. Canadian Forest Service, Natural Resources Canada, Northern Forestry Centre, Edmonton, Alberta, Canada. 32 pp.

Johnston, M. 2016 Climate Change Impacts to Mistik Management's Forest Management Agreement Area, Saskatchewan Research Council, Saskatoon, Saskatchewan, Canada. SRC Pub. No. 13911-1C16 23 pp.

Johnston, M. 2006. Vulnerability of Saskatchewan Forests to Climate Change. Saskatchewan Research Council, Saskatoon, Saskatchewan, Canada. 14 pp.

Wheaton, E., and V. **Wittrock**. 2006. Future Climate and Fire Scenarios for the Forest Management Area of Mistik Management Ltd, Saskatchewan. Saskatchewan Research Council, Saskatoon, Saskatchewan, Canada. 14 pp.

Soils

Harman, D. and R.G. **Nesdoly**. 1996. A Cost and Productivity Comparison Between Subsoiling with a Tilth Winged Subsoiler and Subsoiling with Modified Cat D7G Rippers to Reduce Bulk Density. Mistik Management Ltd., Meadow Lake, Saskatchewan, Canada. 19 pp.

Nesdoly, R.G. and K.C.J. **Van Rees**. 1998. Redistribution of extractable nutrients following disc trenching on Luvisols and Brunisols in Saskatchewan. Canadian Journal of Soil Science. 78:367-375.

Padbury, G. and K.C.J. **Van Rees**. 2005. Soil and Water Resources of the Mistik FMP area. Department of Soil Science, University of Saskatchewan, Saskatoon, Saskatchewan, Canada. 52 pp.

Hydrology and Aquatics

Barten, P.K. 1998. Conservation of Soil, Water and Aquatic Resources of the NorSask Forest. School of Forestry and Environmental Studies, Yale University, New Haven, Connecticut, United States of America. 46 pp.

Guangul, S. G. 2006. Effects of forest disturbance on the water yield. Centre for Hydrology, University of Saskatchewan, Saskatoon, Canada. 11 pp.

Kornder, M. and C. S. Smith. 2010. A Characterization of Wetland and Waterfowl Habitat in the Mistik Forest Management Area. Ducks Unlimited Canada. Unpublished Report. 93 pp.

Mistik Science Advisory Board. 2001. Adaptive Management of Riparian Habitat in the Mistik Forest Management Area. Mistik Management Ltd., Meadow Lake, Saskatchewan. 36 pp.

Morissette, J.L., M. Kornder and C.S. Smith. 2008. A Review of Riparian Management on the Mistik Management Ltd. FMP area. Ducks Unlimited (a publication undertaken under the auspices of the Boreal Conservation Partnership). Saskatoon, Saskatchewan, Canada. 23 pp.

Terrestrial and Aquatic Environmental Managers Ltd. 1996. The Nolin Creek Watershed Project. Terrestrial and Aquatic Environmental Managers Ltd., Saskatoon, Saskatchewan, Canada. 100 pp.

Terrestrial and Aquatic Environmental Managers Ltd. 1996. Managing Aquatic Resources in the NorSask FMLA: Discussion Paper. Terrestrial and Aquatic Environmental Managers Ltd., Saskatoon, Saskatchewan, Canada. 70 pp.

Terrestrial and Aquatic Environmental Managers Ltd. 1991. Annotated Literature Review of Aquatic, Biological and Hydrological Sources of the Meadow Lake Study Area and Surrounding Districts, Saskatchewan. Terrestrial and Aquatic Environmental Managers Ltd., Saskatoon, Saskatchewan, Canada. 60 pp.

Forest Inventory/Yield/Timber Supply Analysis

Mistik Management Ltd. (Balisky) 2000. Timber Supply Analysis Summary of Mistik Management Ltd.'s Forest Management Agreement Area. Mistik Management Ltd., Meadow Lake, Saskatchewan, Canada. 31 pp.

Pearson Timberline Forestry Consultants. 1996. Bronson Forest Stand Decline Growth and Yield Analysis. Pearson Timberline Forestry Consultants, Edmonton, Alberta, Canada. 28 pp.

Pearson Timberline Forestry Consultants. 1996. Forest Stand Succession Modelling Initiative: A Report on Succession Modelling. Pearson Timberline Forestry Consultants, Edmonton, Alberta, Canada. 37 pp.

Saskatchewan Ministry of Environment. 2006. Forest Vegetation Classification Audit of the Mistik Management Ltd. FMP area. Saskatchewan Ministry of Environment, Forest Service, Prince Albert, Saskatchewan. 400 pp.

Silvacom Ltd. 2000. Mistik Management Ltd. Timber Supply Analysis. Silvacom Ltd., Edmonton, Alberta, Canada. 100 pp.

Silvacom Ltd. 2001. Intensive Cruise Program 2001 – Volume Sampling Report. Silvacom Ltd., Edmonton, Alberta, Canada. 100 pp.

Silvacom Ltd. 2006. Mistik FMP area Volume Sampling Program – Final Report. Silvacom Ltd., Edmonton, Alberta, Canada. 100 pp.

Timberline Forest Inventory Consultants Ltd. 1997. Preliminary Empirical Yield Curves for 11 Ecosystems. Timberline Forest Inventory Consultants Ltd., Edmonton, Alberta, Canada. 19 pp.

Timberline Forest Inventory Consultants Ltd. 1997. Mistik Management Ltd. Strategic Forest Management Planning Discussion Document 1A: Revised Timber Volume Yield Curves. Timberline Forest Inventory Consultants Ltd., Edmonton, Alberta, Canada. 73 pp.

Timberline Forest Inventory Consultants Ltd. 1998. Mistik Management Ltd. Strategic Forest Management Planning: Revised Timber Volume Yield Curves. Timberline Forest Inventory Consultants Ltd., Edmonton, Alberta, Canada. 105 pp.

Business/Wood Processing/Value-added Analysis

H.A. Simons Ltd. 1996. Satellite and Mill Site Chipping Study: Millar Western Pulp (Meadow Lake) Ltd., Meadow Lake, Saskatchewan. Vancouver, British Columbia, Canada. 42 pp.

Webb and Associates Consultants. 1996. A Preliminary Review of Wood Processing Technologies for the NorSask FMLA Area. Webb and Associates Consultants. Kamloops, British Columbia, Canada. 32 pp.

Mendelsohn, R. 1997. A Preliminary Assessment of Alternative Wood Processing Technologies for the NorSask FMLA. Ecosystem Management Associates and Yale Forestry and Environmental School. New Haven, Connecticut, USA. 9 pp.

Mistik Management Ltd. 1997. Wood Opportunities for the NorSask FMLA and Surrounding Area. Internal Report. Mistik Management Ltd., Meadow Lake, Saskatchewan, Canada. 68 pp.

Mistik Management Ltd. 1997. Northern Opportunities – A Plan to Develop the Forest Resource in Northern Saskatchewan. Internal Report. Mistik Management Ltd., Meadow Lake, Saskatchewan, Canada. 10 pp.

Mistik Management Ltd. (Balisky) 1999. Mistik and Mills – Forests and Fiber. Mistik Management Ltd., Meadow Lake, Saskatchewan, Canada. 75 pp.

Mistik Management Ltd. (Keddy) 2000. CTL and Mistik – A Review of the First 15 Months. Mistik Management Ltd., Meadow Lake, Saskatchewan, Canada. 42 pp.

Mistik Management Ltd. 2000. Sustainable Forest – Sustainable Enterprise: A Timber Utilization Plan for the Mistik Forest Management Agreement Area. Mistik Management Ltd., Meadow Lake, Saskatchewan, Canada. 150 pp.

MLTC Resource Development LP. 2012. Biomass Supply Analysis – Meadow Lake Tribal Council Biomass Power Plant. Mistik Management Ltd., Meadow Lake, Saskatchewan, Canada. 111 pp.

NorSask Forest Products Limited Partnership. 2000. Building Together – Forest Development Joint Venture Preliminary Business Proposal. Meadow Lake, Saskatchewan, Canada. 24 pp.

Norsask Forest Products. 2008. Preliminary Assessment of Greenhouse Gas Emissions Associated with NorSask's Beehive Burner. Meadow Lake, Saskatchewan, Canada. Xx pp.

Norsask Forest Products. 2008. Feasibility Study for a Wood Pellet Pilot Project (Draft). Meadow Lake, Saskatchewan, Canada. Xx pp.

Public Interest

Jamieson, S. 2013. Listening and Logging, Mistik Management puts the Focus on Relationships with the Expectation that Efficiencies Will Follow. Canadian Forest Industries (September/October). 30 pp.

Kryzanowski, T. 2013. Mistik Manages Growing Wood Demand. Logging and Sawmilling Journal (August/September). 30 pp.

Mistik Management Ltd. 1996. The NorSask Forest Story. Fraser Hamilton Inc., Edmonton Alberta, Canada. 172 pp.

Mistik Management Ltd. 1996. The Guide to the NorSask Project. Fraser Hamilton Inc., Edmonton Alberta, Canada. 27 pp.

The Northern Pride. 2014. Forestry in the Northwest 2014. Newspaper insert featuring a 'salute to forestry' in the Meadow Lake area.

Historical References

Town of Meadow Lake. 1995. Sawdust: A Look at Meadow Lake's Early Sawmill and Logging Days. Museum Committee of Meadow Lake. 62 pp.

Other References Citing Mistik Management Ltd.

Burton, P.J., C. **Messier**, D.W. **Smith**, W.L. **Adamowicz** (Eds.). 2003. Towards Sustainable Forest Management of the Boreal Forest. NRC Research Press, Ottawa, Ontario, Canada. 1039 pp.

Devall, B. 1993. Clearcut: The Tragedy of Industrial Forestry. Sierra Club Books and Earth Island Press, San Francisco, California, United States of America. 291 pp.

Forest Certification

Mistik Management Ltd. 2006. Background Information and Gap Analysis Related to Protected Areas for Mistik Management Ltd.'s FMP area. Mistik Management Ltd., Meadow Lake, Saskatchewan, Canada. xx pp.

Mistik Management Ltd. 2006. Background Information Related to High Conservation Value Areas for Mistik Management Ltd.'s FMP area. Mistik Management Ltd., Meadow Lake, Saskatchewan, Canada. xx pp.

Clark, T. and Riki Burkhardt. 2009. High Conservation Value Forest in the Mistik FMP area: An Assessment of Forest Values and their Conservation in the Mistik FMP area from a Global, National and

Regional Perspective based on the Forest Stewardship Council's Principle #9. Mistik Management Ltd., Meadow Lake, Saskatchewan, Canada. 104 pp.

Strategic Business Direction

Mistik Management Ltd. 2000. Sustainable Forest – Sustainable Enterprise: A Timber Utilization Plan for the Mistik Forest Management Agreement Area. Mistik Management Ltd., Meadow Lake, Saskatchewan, Canada. 150 pp.

NorSask Forest Products Limited Partnership. 2000. Building Together – Forest Development Joint Venture Preliminary Business Proposal. Meadow Lake, Saskatchewan, Canada. 24 pp.

Research Program

Since its inception in 1990, Mistik Management Ltd. has placed a very high value and priority on ensuring that its forest management activities are conducted in accordance with the most current scientific understanding of the ecological, economic and social values and functions of the boreal forest. In order to continuously improve Mistik's knowledge and understanding of advances in sustainable forest management science, Mistik formed a Science Advisory Board comprised of leading academics from across North America. Table 17.4 describes the individuals associated with Mistik's Science Advisory Board from 1996 to 2002.

Table 17.4 Mistik's Science Advisory Board (1996 to 2002)

Name	Affiliation	Academic Focus
Viktor Adamovicz	University of Alberta	Socio-economics
David Andison	Bandaloop Landscape Ecosystem Services	Landscape Ecology
Mark Ashton	Yale School of Forestry	Silviculture
Paul Barten	Yale School of Forestry	Aquatics and Hydrology
Tom Beckley	University of New Brunswick	Socio-economics
Willi Fast	Pearson Timberline Consultants	Growth and Yield and Timber Supply Analysis
Jim Flewelling	Private consultant	Applied Statistics and Biometrics
Paul James	Saskatchewan Ministry of Environment	Biodiversity
Hamish Kimmins	University of British Columbia	Forest Ecology
Dennis Krochak	Terrestrial and Aquatic Environmental Managers Ltd.	Aquatics
Bruce Larson	Yale School of Forestry	Silviculture
Robert Mendelsohn	Yale School of Forestry	Resource Economics
Stan Navratil	Canadian Forest Service	Silviculture
Oswald Schmitz	Yale School of Forestry	Wildlife Management
Ken Van Rees	University of Saskatchewan	Soils
Clive Welham	FORRX Consulting	Forest Ecology

Through its association with its Science Advisory Board, other institutions (consulting firms) and individuals (graduate students), Mistik has commissioned a number of studies related to forest management in the boreal forest.