Historical Overview of Bovine Tuberculosis in the Riding Mountain National Park Ecosystem

By

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A Thesis
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Abstract

Bovine Tuberculosis (TB) is one of the most serious animal health problems in the world. In Manitoba, especially in the Riding Mountain National Park (RMNP) region, this disease has threatened both wildlife and domestic cattle during the past 75 years.

This study provided a detailed historical overview of the status of Bovine TB in the RMNP ecosystem and the province of Manitoba. Past and present Bovine TB testing, controlling and eradication practices that included seven programs implemented by both the federal and provincial governments in Canada were documented in order to better understand Bovine TB programs in Manitoba.

Disease transmission between free ranging ungulates in the RMNP ecosystem was examined to clarify the origin of Bovine TB outbreaks. According to historical records, some 20 bison were first introduced into RMNP in 1931 from a herd at National Buffalo Park, Wainwright, Alberta. In 1937, one of the bison kept in the Bison Enclosure, RMNP, was found dead from Bovine TB. For the following 20 years efforts to eliminate Bovine TB in the RMNP area continued until the infected bison population was destroyed and replaced with Bovine TB-negative animals from Elk Island National Park in Alberta. The details of how Bovine TB may have been introduced into the free ranging ungulates in the RMNP ecosystem and how this disease was dealt with by the RMNP & National Park Bureau were documented. Three plausible explanations were found: 1) cattle transmitted the disease to the elk population once they contacted each other through different ways; 2) Bovine TB disease was transferred to the released elk from the bison herd, although staff did not have access to these animals as readily for testing as for the bison herd in the Bison Enclosure, RMNP ecosystem; 3) confinement of over-populated wildlife in a small area increased the chance of Bovine TB spreading within the herds, and that made further diagnosis and eradication more difficult and complicated.

Acknowledgements

Starting out a Master's Degree journey was certainly a valuable opportunity for me. To fulfill my dream of experiencing western education, I left China four years ago and came to Canada to explore my future. This adventure kind of journey made me a new person in all ways from intellectual to the physical to the emotional and the spiritual. To be honest, this was not an easy experience for a foreigner like me to go through. But luckily I made my dream come true with all the support and love I have received from many many people through the every moment of past four years. Thus, I would like to acknowledge these people here.

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Chapter 1 Tuberculosis in General

1.1 Introduction

Tuberculosis (TB) has been documented as a distinctive clinical disease of humans and other animals for about 400 years. However, the cause of the disease was unknown until 1882, when Robert Koch reported his discovery of the "tubercle bacillus". As a serious disease, TB is caused by several bacteria of the *Mycobacterium* tuberculosis complex. The disease in humans and animals mainly affects the respiratory system. In animals, the *Mycobacterium avium* complex also causes disease in poultry and ruminants.

Within the *M. tuberculosis* complex there are four primary bacteriological divisions of culture specimens: 1) *M. tuberculosis* commonly causes disease in humans, primates and elephants; 2) *M. bovis* is a common cause of disease in ruminants, primates, and occasionally people; 3) *M. africanum* is a classification of isolates intermediary in biological behaviour and genetic structure, and 4) *M. micricitti*, although genetically similar to the other groupings, causes disease only in rodents (WHO/EMC/ZOO/96.4).

Bovine TB or cattle TB is the least species specific of the culture isolates classified within the *M. tuberculosis* complex. *M. bovis* infects most warm-blooded animals including cattle, bison, deer, elk, goats, humans, and other species. Bovine TB is thought to spread from infected to uninfected animals through inhalation of droplets expelled by coughing and sneezing, by ingestion of food or water contaminated with the bacterium, or from mother to offspring either through the placenta or through contaminated milk. It is also thought that stress in animals may exacerbate clinical signs and the risk for rapid transmission. Most of this opinion is anecdotal and based on the epidemiological evidence of *M. tuberculosis* in human populations being strongly associated with poverty, inadequate nutrition and other social stress factors (Phillips et al. 2003).

M. bovis causes a disease which can be maintained with a wildlife population and transmitted to domesticated animals raised as a food source (BTB Research Project 1998, Clifton-Hadley and Wilesmith 1991, Environmental Assessment Panel 1990, The Task Group for TB 2002).

Commonly, animals that become infected may live and potentially spread the disease for several years. Although Bovine TB is a slow debilitating type of disease that has a long incubation period, it can be fatal since it can affect the respiratory, digestive, urinary, nervous, skeletal, and reproductive systems, and therefore can weaken animals and make them more susceptible to predation, and reduce fertility in sexually mature animals (Environmental Assessment Panel 1990 and The Task Group for TB 2002).

Technically all warm-blooded mammals are potentially susceptible to Bovine TB. However, the disease has a relatively narrow range of primary or preferred hosts such as cattle and cattle-like species. Domestic cattle and bison (buffalo) (*Bison bison*) in North America, as primary hosts, are the major species affected by this disease and exhibit the same characteristic features (Tessaro 1992). In addition, infection has been recognized in a number of other species. In New Zealand, Bovine TB is widely identified within brushtail possums (*Trichosurus vulpecula*) and red deer (*Cervus ephalus ephalus*). As well, non-cattle-like exceptions have been confirmed as primary hosts. In fact, primary hosts are not the only unit for causing the problem (Coleman and Cooke 2001, Lugton et al. 1998, Tessaro 1992). Secondary or "satellite" hosts (animals which contract Bovine TB from infected primary hosts) are also dangerous for disease transmission. They would not normally perpetuate the disease under natural conditions because Bovine TB usually disappears once the disease is eliminated from the primary host population (Tessaro 1992). For example, predator and scavenger species have been considered to be secondary hosts of Bovine TB, becoming infected by consuming infected prey or carrion and having limited capacity to transmit infection to other members of their species

(Coleman and Cooke 2001, Environmental Assessment Panel 1990, Tessaro 1992).

TB caused by infection with M. *bovis* has one of the broadest host ranges of all known pathogens and the organism has been isolated from most domesticated and wild animals (O'Reilly and Daborn 1995). In general, this disease is more prevalent among captive cervids than in free-ranging animals. At present, TB in wildlife has been diagnosed in North American elk (*Cervus elaphus nelsoni*), bison, red deer, white-tailed deer (*Odocoileus virginianus*), and fallow deer (*Dama dama*). Related reports of TB are rare in moose (*Alces alces*), mule deer (*O. hemionus*) and black-tailed deer (*O. hemionus columbianus*) (Rodwell et al. 2001). No doubt these and other free-ranging wild ruminants are susceptible to the Bovine TB, but in varying degrees. Bovine TB has also been found in brushtail possum, hedgehogs (*Erinaceus europaeus*), pig, feral cats (*Felis domesticus*), ferrets (*Mustela furo*), sheep, and deer in New Zealand, and in wild buffalo (*Syncerus caffer*) in South Africa (Coleman & Cooke 2001, Rodwell et al. 2001, Tessaro 1986).

TB is difficult to eradicate from domestic animal populations due to the lack of sensitivity and specificity in tests applied to individual animals. To attempt to eradicate TB from infected domestic herds, the approach adopted by most developed countries is based on a test-and-slaughter and abattoir inspection program. These policies and regulations are essential for the development of import and export schedules for food products and live animal translocation. However, these programs have not been as successful as expected because wild animals act as vectors of the disease to livestock (Coleman and Cooke 2001, Tessaro 1986). Pressure to monitor and manage Bovine TB in wildlife is increasing as a result of concerns for the health of infected wildlife populations (Joly et al. 1998), and because of the risks these populations pose to domestic animals and to humans (Brown et al. 1994, Krebs et al. 1998). Until recently there is no practical treatment existing for Bovine TB in domestic or wildlife species, and no effective

vaccines are available for use in animals. Also it is important to note that there may be limited spread of TB within TB positive wildlife populations. However, there is no convincing evidence that individual wild animals are able to resolve the disease naturally (Griffin & Mackintosh 2000, Rodwell et al. 2001).

Bovine TB is of considerable significance throughout the world because of its effect on the health of animals, including humans, and its impact on agriculture trade and economics. All developed countries, and many developing nations, have policies to eradicate or control Bovine TB and to prevent the importation of this disease.

In Canada, the bison is the only native species of wildlife that can act as a true primary host for Bovine TB. In bison and cattle, the pathogenesis and epidemiology of Bovine tuberculosis are the same.

1.2 Worldwide Incidence of Bovine TB

Bovine TB has been described by the New Zealand Ministry of Research, Science and Technology as the greatest challenge facing New Zealand science. Bovine TB occurs in cattle and farmed deer herds at relatively high incidences by international standards (Barlow 1994). Even taking the test-and-slaughter programs within the framework of disease control policy, many herds still have failed to be clear of this disease. The reason is the involvement of wildlife infected with TB (Coleman and Cooke 2001). In New Zealand, brushtail possums are believed to be the main species responsible for maintaining the wildlife cycle of TB (Morris and Pfeiffer 1995), although it is difficult to test this hypothesis. Some research findings support the hypotheses that the prevalence of TB in wild deer, domestic cattle and farmed deer in New Zealand is high due to transmission of infection from possums, and that in the absence of an infected possum population, the prevalence of tuberculosis in deer is likely to be low, and spatially patchy (Lugton et al. 1998, Lugton et al. 1997). As such, the possum plays a role analogous to

that played by Eurasian badgers (*Meles meles*) in the maintenance of TB in livestock in England and Ireland (Coleman and Cooke 2001).

Based on the consideration that most TB problems in cattle herds initially appeared to be associated with the presence of possums, there have been a series of mathematical and GIS modeling efforts contributing to the understanding and controlling Bovine TB. Several GIS models provided a useful means of displaying possum TB risk information at different scales and have been used in a strategic way to help display the infection situation, assess effectiveness and develop future control options (Barlow 1994, McKenzie et al. 1998).

African buffalo have also been identified as a significant large wildlife species that can act as a reservoir of Bovine TB. This disease has been reported in African buffalo in Queen Elizabeth and Ruwenzori National Parks in Uganda (Guibride et al. 1963) and Kruger National Park (KNP) in South Africa (Bengis et al. 1996). The first detected case of Bovine TB in KNP was diagnosed in a single African buffalo in 1990 after a large eradication of Bovine TB from the domestic animal populations surrounding KNP by the late 1980's (Kloeck 1998).

Based on statistical accounts, the prevalence had increased significantly from 1991 to 1998, especially in the southern and central zones of KNP. Subsequent postmortem examinations and surveys of prevalence indicate that *M. bovis* was likely spread via the aerosol route in Bovine TB-infected buffalo, and the highly social nature of buffalo facilitated infection (Keet et al. 1996). Furthermore intra-herd and inter-herd transmission of Bovine TB are likely to be important factors in the ecology of this disease in KNP. Bovine TB does not appear to affect the fertility or lactation rates of female African buffalo in KNP, but there is an indication that adult African buffalo were underrepresented as an age class in infected herds (Rodwell et al. 2001). In this specific

research, bacterial culture and pathology were combined to detect the Bovine TB infection that proved to be useful (Rodwell et al. 2001).

1.3 Bovine TB in the United States (US) and Canada

In the US, Bovine TB is a severe disease issue. In 1984, a major outbreak was identified in captive bison in two herds in South Dakota. Epidemiologic investigations found that the bison herd had been exposed in 1982 to tuberculous ranch elk that were depopulated. Over 370 potentially infected bison were shipped to 87 herds in 20 states exposing over 2,450 additional bison and approximately 4,190 cattle. Eighteen bison herds were considered infected and control measures were being taken, including payment of indemnity afterwards (Essey and Stumpff 1985).

In 1992, a Mycobacterium bovis-infected herd of captive Elk in Colorado was depopulated after lesions of Bovine TB were confirmed in 8 of 10 tuberculin skin test reactors. Of the 43 animals over 1 year of age, 26 had gross lesions suggestive of tuberculosis, 24 had microscopic lesions of tuberculosis, and 23 had acid-fast bacilli associated with the lesions (Rhyan et al. 1992). Meanwhile a similar situation happened in Montana and a naturally occurring outbreak of Bovine TB in captive wild elk was confirmed (Thoen et al. 1992).

The presence of Bovine TB in Michigan's white-tailed deer is a serious problem. Approximately 50 years ago, Michigan led the United States in the number of cattle testing positive for Bovine tuberculosis with 30% of the national total (Frye 1995). In 1979 Michigan was declared TB free following the implementation of a Bovine TB eradication program that started from 1917. However, in November 1994, a free-ranging 4.5-yr-old male white-tailed deer was found TB positive on private land in the northeast portion of Michigan's lower peninsula. Based on historical data, it was thought possible that the 1994 M. *bovis* infected deer was associated with TB infected livestock (Schmitt

et al. 1997). In 1995, Michigan Department of Agriculture and the USDA tested all livestock within a 16 km radius of the 1994 positive deer. No Bovine TB positive livestock was found. Unfortunately, Bovine TB positive free-ranging white-tailed deer were detected every year from 1994 to 2003, at which the number infected was 449.

In Canada, Bovine TB was brought under the mantle of official notification and a federally directed disease eradication program in the early years of the 1900's. It remains today as a "reportable disease" under the Health of Animals. Every occurrence of this disease must be reported to Agriculture Canada by law. Several historical programs designed to control Bovine TB including Herd Program, Free Tuberculin to Practitioners, British Columbia TB Control Program, Municipal Tuberculosis Order, Supervised Herd Plan, Accredited Herd Plan, Restricted Area Plan, and recent Surveillance & Eradication Plan were established starting from the beginning of the last century. Bovine TB is rare in wildlife in Canada being identified once in one free-ranging white-tailed deer in Ontario in 1958 (Belli 1962).

In heavily managed heritage wildlife Bovine TB has been a longstanding problem. A total 12,005 head of bison were killed in Buffalo National Park (BNP), Wainwright, Alberta (In 1940 BNP became CFB Wainwright and ceased being a National Park; Wood Buffalo National Park [WBNP] is a separate National Park in the Northwest Territories) between 1923 – 1939 and 6,450 of them were infected with Bovine TB, representing 53.73% reaction rate (Hadwen 1942). In addition, gross lesions of Bovine TB were observed in 73 of 1,329 elk, 6 of 107 moose, and 2 of 242 mule deer killed near Wainwright, Alberta, in 1939 and 1940 (Hadwen op cit). After that, bison and elk have been considered the important reservoirs of Bovine TB.

From the 1950's until 1998, the bison in and around WBNP were considered as the only wildlife reservoir of Bovine TB in Canada. The disease prevalence was over 50% in the WBNP bison herd. The park bison population has declined from an estimated high of

12 to 15 thousand in the late 1940's to approximately 5,000 animals at the present time (Joly et al. 1998).

In 1992, *M. bovis* was found in lesions of an elk killed in RMNP, Manitoba; further surveillance has identified that this ecosystem is another wild reservoir of Bovine TB in Canada.

1.4 Bovine TB in the Riding Mountain National Park Ecosystem

The study area, Riding Mountain National Park, is a 2,978 square kilometer island of forest surrounded by the agriculture lands and developed areas, located in west-central Manitoba. The vegetation in RMNP is predominately boreal mixed-wood and aspen-oak forest with extensive interspersions of grasslands, sedge meadows and black spruce bogs. RMNP is divided into three "ecological zones" that afford protection to the plants and animals from the radical changes within the whole ecosystem (RMNP Web Page 2003). Large herds of elk gather in sedge meadows while wolf packs congregate in nearby forests of western and southern aspen parkland eco-zones.

In 1920, the whole Riding Mountain Area started to test for Bovine TB under the Tuberculosis Restricted Area Plan. Until the 1950s livestock in all the municipalities around the RMNP were tested for Bovine TB by the federal government. Prevalence of disease was very low. However, Bovine TB has apparently occurred in cattle surrounding the RMNP area after the 1960s (The Task Group for TB 2002). Two wolves (*Canis lupis*) with Bovine TB died in the park in the autumn of 1978. These deaths were attributed to emaciation secondary to Bovine TB, which was confirmed from tissue cultures (B. Lewis personal communication). According to Carbyn (1982), TB will affect all age classes of wolves, but it is generally thought to be more deleterious to older animals.

In 1986, the Canadian government declared the province TB disease-free. However, since the early 1990's, Manitoba has experienced several outbreaks of Bovine TB in

cattle around the area of RMNP. The infection has been detected on three separate occasions from a total of eight cattle herds in the Rossburn and Grandview areas. In 1998, TB was found in the Virden area and potentially exposed over 1050 animals. Forty-five farms in the R.M. of Wallace were affected. This outbreak of Bovine TB has roots in an outbreak in the Rossburn area in 1991. In the late 1990's an increasing number of elk were also discovered with TB in the same area. Those elk are currently implicated as wildlife hosts of Bovine TB and as sources of infection for domestic livestock, especially farmed cattle. Bovine TB transmission is significantly enhanced by face-to-face contact or by sharing of a common feeding source by wild elk and farmed cattle (The Task Group for TB 2002, Copeland 2002). During 2000-2001 the Canadian Food Inspection Agency (CFIA) collected and analyzed 700 tissue and organ samples from wild game animals shot during the hunting season in the Riding Mountain-Duck Mountain Provincial Parks area. Five elk were culture positive for Bovine TB. From 1997 to September 2002, nine elk and one white-tailed deer have tested culture positive for Bovine TB in the Riding Mountain area, mainly in the area north of the Town of Rossburn and south of the Town of Grandview near the RMNP boundary. The cattle herds have been tested repeatedly in that area (Manitoba Conservation Website 2003).

Retrospect to 1924, the year right after the first Bovine TB outbreak in BNP, Canadian veterinary researchers isolated two strains of tubercle bacilli from Bovine TB lesions found in bison carcasses (Hilton 1924b). But unfortunately no further study results were documented. Until recently, a research conducted by CFIA and Parks Canada Agency practiced the spoligotyping (a polymerase chain reaction-based rapid typing method) technology to isolate the *M. bovis* found in RMNP ecosystem during the period of 1990 to early 2003. The research result indicated that there were two strains of *M. bovis* and they are called type MB-1 and MB-2, respectively (Lutze-Wallace et al. 2005). Meanwhile, the researchers conducted a spoligotyping procedure again to isolate

Bovine TB pattern from tissue sample generated from two dead wolves found in 1978, RMNP. It was proven that one wolf had the same Bovine TB pattern MB-1 as other infected elk, white-tailed deer and cattle in RMNP ecosystem since 1990 (Lutze-Wallace et al. 2005). The result of this research pointed out one important fact that Bovine TB was introduced into the RMNP ecosystem a long time ago, even earlier than 1978.

From 1975 to 1978, the average elk population in RMNP was 3,500, or 1.2 elk per km^2 (Carbyn, unpublished). Based on the latest surveys, there are 2,785 elk in the park. According to the statistical accounts of the Department of Agriculture and Agri-Food, there are approximately 50,000 cattle in the areas adjacent to RMNP, which equates to one percent of all Canadian cattle and 10 percent of Manitoban cattle. Many of the landowners around RMNP earn a substantial portion of their livelihood from cattle production. The export of livestock to the United States is very important to the agricultural economy of Manitoba. Therefore, the prevalence of Bovine TB around RMNP has already put cattle producers at significant risk and threatened the cattle export ultimately.

The United States Department of Agriculture (USDA) downgraded Canada's TB free status in 2002 since a cow exported from Canada to US was found TB positive when slaughtered. This cow was believed to originate from a cattle herd around the RMNP (Document of Department of Agriculture and Agri-Food 2002). This activity could erode the confidence of those who buy Manitoba cattle and yield more severe economic loss in the future. Under the regulation of USDA, Manitoba will not regain TB free status until no more TB cases in cattle occurs during the next five years.

A management group founded by Parks Canada (RMNP), Manitoba Conservation (MC), the Canadian Food Inspection Agency (CFIA), and Manitoba Agriculture and Food (MA&F) is addressing Bovine TB issue around the RMNP. The specific activities

for individual government departments are undertaken according to an annual management program (The Task Group for Bovine TB 2002).

All the above descriptions pose Bovine TB control and management on farmed cattle and wildlife in the RMNP ecosystem as a severe issue. Without explicit historical understanding of the disease's background in the RMNP ecosystem, the recent management program to manage this disease could be more and even lead to broader infections or threats to wildlife. Therefore the purpose of my study is to document and investigate the historical occurrence and prevalence of Bovine TB in farmed cattle and wildlife in the RMNP ecosystem.

1.5 Research Objectives

The specific objectives of my study were:

1. To provide a detailed historical overview of the status of Bovine TB in the Riding Mountain National Park ecosystem.
2. To document past and present Bovine TB testing, control and eradication practices implemented by both the Federal and Provincial Government in Canada.
3. To document historical land use issues, timber cutting and livestock grazing practices in the RMNP ecosystem.
4. To make recommendations on best management practices for wildlife managers that would minimize the risk of a wildlife operation becoming infected with Bovine TB.

1.6 Methodology

To accomplish the above objectives, I used both quantitative and qualitative paradigms to analyze collected data. I collected data using two methods: literature review and geographic information system (GIS). The literature review was carried out by examining various books, journal articles, public records, internet websites and

government documents. For example, I looked through books and journal articles in both of the National and University libraries, checked related government documents from the government departments such as National Archives in Ottawa, Manitoba Agriculture, the CFIA, and Provincial Archives, and browsed the TB website.

Since the most of historical documents for my research were likely found in the National Archives and National Library, I decided to go to Ottawa and look through the government files. Thus, I visited Ottawa twice in 2004 to collect the data that I needed. The first visit was between March 14th – 19th. Because of the uncertainty of data type and how much information was there, I briefly recorded file names and basic description of data that I found in some 30 pages report. The data listed in the report was valuable for my thesis research and can basic cover up most of chapters with my thesis research.

On the second visiting in May, I photocopied the documents found in March. Dr. Terry Whiting from Manitoba Agriculture accompanied me and helped to look through the historical document in last three days. Surprisingly more valuable documents were found in both Archives and Library. Those two field trips to Ottawa were successful and worthy. Letters and memos between government bureaus, reports, and colored maps etc. that we found provided adequate material for Chapters 2, 5, 6 and 7 of my thesis.

I also examined records in the Provincial Archives in Winnipeg. Although not much information was there, I was able to prepare the material contained in Chapters 3 and 4.

I have reached most of Rural Municipalities around the RMNP ecosystem in several other field trips. Those trips made me know more about the geographic background of the entire ecosystem.

With the rapid development of geographic information system (GIS) technology, this powerful tool is able to document according to geographical distribution and thereby enhance analysis and management options. The output generated by GIS in map format has the particular advantage of allowing implicit representation of spatial dependence

relationships in an intuitive manner. In this context, I compiled some historical maps I have found from different sources within the GIS to help identify the historical status for Bovine TB in the RMNP ecosystem. It displayed old data more efficiently and legibly.

Chapter 2 Early History of Bovine TB Eradication in Canada 1890-1930

2.1 Introduction

A number of active Bovine TB control and eradication programs have been initiated in Canada prior to and since Bovine TB became a disease of public concern (McEachran 1893). Disease control became a possibility with the development of an individual animal test. The initial test for Bovine TB in Canada involved recording animal temperature by rectal thermometer before and after a large volume tuberculin subcutaneous injection; the technique was first described in 1894 (Bryce 1894, Makenzie 1894) [Appendix 1]. An Order in Council passed in 1894 required that breeding cattle held in import quarantine be tested for tuberculosis using the subcutaneous tuberculin challenge (Dominion of Canada 1895). The first abattoir based surveillance project for tuberculosis in Canada was conducted in 1895 in abattoirs in Quebec, New Brunswick and Nova Scotia. Prevalence of characteristic lesions was evident in less then 2% of 4877 pairs of lungs examined (McEachran 1896).

Bovine TB testing, free of charge by Dominion veterinary inspectors, was introduced in 1898. Under this program farmers made application to the government for this service and became a "Supervised Herd" (McEachran 1898). Canada and the United States (US) simultaneously implemented restrictions on breeding cattle movement between the countries to individuals negative to the tuberculin test in 1901 (McEachran 1902a). In February 1901 a bilateral trade agreement was made between the US and Canadian Departments of Agriculture that all export testing for cattle destined for the US must be done by full time government employed veterinarians (McEachran 1902b); this was the same year the first Chief Veterinary Officer for Canada, J. G. Rutherford was appointed (Rutherford 1903).

By 1903, although tuberculin reactor cattle were not destroyed, the Dominion had adopted a policy of permanent identification of individual reactors by cutting a capital T-shaped hole in the right ear (Rutherford 1904) [Appendix 2]. The official policy of marking became a regulation in 1904 (Rutherford 1909) although the method of marking was not stipulated in regulation. Nationally testing levels remained low in the early years of the 1900's. For example for the 18 months from November 1, 1904 to March 31, 1906 import, export and private request Bovine TB testing resulted in only 2873 total tests (217 positive) for the entire country (Torrance 1906).

Two theoretical models of Bovine TB control based on international experience had emerged by 1908. One was the "Bang System" which was a herd based test and segregation system to control Bovine TB within a herd (Edwards 1904) and the other was the "Manchester Model" which was a geographic based system where Bovine TB was eradicated from certain farms. This work was gradually extended to include all the cattle in small districts (Rutherford 1908). No significant change in Bovine TB control or adoption of progressive programs occurred in Canada between 1902 and 1914. In 1909 the American Veterinary Medical Association appointed an International Commission on the Control of Bovine TB consisting of five Canadians including J.G. Rutherford as chair and seven Americans. In the 1911 report of this International Commission, it was recommended that national veterinary services implemented compulsory notification of herds that contained animals that have reacted positively to the tuberculin test (Rutherford 1911).

British Columbia (BC) developed and delivered a provincial based Bovine TB control program with compensation for reactors for several years. In 1913 the Dominion approved by Order in Council a regulation to require cattle moving into BC to be tested for Bovine TB. The Dominion veterinary service provided this testing free of charge (Torrance 1913). Also during this time municipal bylaws regarding the sale milk into

urban populations were being written to control Bovine TB in dairy cattle herds. The city of Winnipeg passed a series of Bovine TB control bylaws under the authority of public health protection between 1903 and 1912 (McKay 2005).

The Municipal Tuberculosis Order (MTO) was passed in 1914, and provided for federal assistance in licensing, dairy farm operations tuberculin testing by Dominion veterinarians, and compensation up to one half the values of the infected cattle. Herds containing reactor cattle could only sell dairy products if pasteurization was provided (Torrance 1916) [Appendix 3]. Participation in the program was restricted to herds and producers having fairly high building and hygiene standards. Saskatoon was the only municipality to meet the program standards in the first year of operation.

In 1916 intra-dermal eyelid tuberculin testing was begun (Torrance 1917). The subcutaneous testing program consumed large quantities of tuberculin, between 2.5 and 3.5 ml of product (40-60 minims in original literature, a minim is an Imperial Apothecary measure, 10ml=168.9minims) placing a heavy resource demand on the federal laboratory system providing tuberculin. It was demanding on human resources as temperatures had to be taken by rectal thermometer hours prior to testing and periodically subsequent to injection for 24-36 hours (Rutherford 1909) [Appendix 1].

In 1917 the United States Bureau of Animal Industry (USBAI) adopted an accredited herd system modeled after the "Bangs System" in Europe and was directed at decreasing the prevalence of disease in specific herds that sold breeding stock to other herds (Torrance 1921). This US industry initiative put pressure on Canadian purebred cattle producers to meet the same standard or lose access to the US market. A regulatory framework to parallel the USBAI was implemented by order in Council in 1919 (Torrance 1921) [Appendix 4]. The program was restricted to purebred cattle herds. The subcutaneous test method was identified as an approved individual animal test in the regulations or any other method applied by regularly employed veterinary inspectors of

the Health of Animals Branch, of the federal Department of Agriculture. The wording of the regulation enshrined the provision of testing services by the Federal Department of Agriculture.

The Restricted Area Plan was introduced by regulation in late 1922 (Agriculture Canada 1940) [Appendix 5]. The first area created by this regulation was the Carman District in Manitoba where a complete area test of 16,550 head identified 992 reactors (5.57%) (Hilton 1924b). By 1922-1923 the shift from subcutaneous to intradermal (the caudal tail fold test) was well underway. Of the 482,102 tuberculin tests administered in the 2-year period ending March 31, 1924, 48% were intradermal, 41% were ophthalmic and 11% were subcutaneous (Hilton op cit).

2.2 Program Performance

The control of Bovine TB was an evolving government agriculture, public health and industry program that was novel and responsive to changing scientific knowledge and technical developments and a significant component of mis-information in the early years. For instance it was not proven until 1933 that TB lesions in swine were caused by an avian strain not by the Bovine strain (Mitchell et al.1934). The TB lesions in milk fed swine were a major justification for early tuberculosis control programs (Torrence 1918). Some programs proved to be superior or more cost effective than others and were pursued while others were considered counterproductive and discontinued [Table 1].

The *Supervised Herd Plan* (1905) was in essence a pilot project initiated in October 1894 to supply tuberculin testing to individuals wishing to have their cattle tested. The Federal Laboratory was in the process of manufacturing and standardizing tuberculin, a service that continues to this day. In 1897 the Federal Government allocated $20,000.00 for the tuberculosis prevention and control program (Dominion of Canada 1919). Under this program farmers could enter their herd into a program where the Dominion

Veterinarian tested and re-tested the herd periodically at no cost to the farmer. However, by 1915 less than 50 farmers had taken advantage of this offer; permanent marking of the reactors, isolation from the rest of the herd and removal from dairy production was a requirement of the agreement (Dominion of Canada 1919).

The *Municipal Tuberculosis Order* (1914) (MTO) was a public health regulation limited to milking cows. Municipalities experienced difficulties in passing by-laws to comply with its provisions. Many of the provisions such as the size of windows were not science-based and proved expensive to implement in existing dairy farms. The presence of infected and untested herds in the municipalities and the provision of animal movement between herds based on an individual animal test prevented progress in control of the disease. The cost of compensation for reacting cattle tended to increase yearly in municipalities under the MTO. In October 1923 it was decided not to accept any more municipalities under the MTO, but to continue rendering service to the municipalities that had already been accepted at that time. Upon Restricted Areas being established, municipalities located within these areas withdrew from the MTO (Hilton 1924a). On July 15th 1933, the municipalities that had been receiving assistance were notified that no further testing would be conducted under the program (Hilton 1934a). In 1933, there were 22 municipalities in Canada under the MTO, 8 of the 22 were in Manitoba including Brandon, Minnedosa, Virden, Winnipeg, Dauphin, Selkirk, Oak Lake and Souris (Hilton 1934b).

The *Accredited Herd Plan* (1919) was limited to purebred herds with at least 5 registered cattle one of which had to be the herd sire and certification was based on annual herd test (Hilton 1927) [Appendix 3]. This plan allowed for Canada-US trade in accredited cattle without test or quarantine at the border. In 1927 there were approximately 2,980 fully accredited TB-free herds with an average of thirty animals per herd, or approximately 89,400 fully accredited cattle. Approximately 300,000 cattle have

Table 1. Bovine TB Control and Eradication Programs in Canada

Name	Start Date	Sunset Date	Description
Free Tuberculin to Practitioners	1903	Ongoing	Basic practice for Bovine TB disease test.
Herd Program , Supervised Herd Plan	1897	1914	Individuals applied to the minister to put their herds under supervision. No Compensation
British Columbia TB Control Program	1906	1919	BC operated a compensation driven disease control program. In 1913 feds agreed to test all purebred livestock moving into BC at no charge.
Municipal Tuberculosis Order	1914	1933	Peaked in 1922 with 30 municipalities. Applied in four Provinces including Ontario, Manitoba, Saskatchewan and Alberta. No new applications accepted after 1923.
Accredited Herd Plan	1919	1950's	Originally applied to purebred cattle producers to parallel the US plan and allow for market access.
Restricted Area Plan	1922	1985	The most popular program prevalent between 1922-1960 in Canada.

been tested under this plan and over 39,000 reactors have been slaughtered at the compensation cost of nearly $2,900,000 (Hilton 1927). This program appeared to be a success and facilitated implementation of the Restricted Area Plan.

The *Restricted Area Plan* (1922) was a significant change in approach. It required a request from the Provincial Minister of Agriculture and local industry support at a geographic level as a prerequisite to establishing an area [Appendix 4]. This approach was the most cost efficient of the policies. Between 1922 and 1925 three complete herd tests of the Carman district (all cattle in the Area) were completed. In the first Area test of 16,550 animals, the compensation cost for reactors per head tested was $1.99. In 1923, the compensation cost for reactors per head tested was $0.42, and in 1924 the Area test compensation cost was $0.13 while the cattle numbers in the Area had increased to 17,021 cattle (Hilton 1925). In comparison the compensation cost for reactor removal under the Accredited Herd Plan circa 1927 was $8.00 per head tested for the initial test and $0.38 on the 60-day retest (Hilton 1927).

By 1925 the various TB control programs had gathered momentum and were competing for veterinary resources [Table 2]. The allocation of resources at the federal level was not keeping pace. In the Veterinary Director General Report of 1926 there is a call for greater provincial involvement in testing to maintain restricted areas and for municipalities to assume some responsibility for the MTO (Hilton 1926).

In 1927 US Congress passed "The United States Federal Milk Import Act" which requires certain levels of inspection and veterinary certification of freedom from TB of Canadian milk exporters' dairy herds. The Act also required federal endorsement of those certificates. As no federal funds were available for this work, the Veterinary Director General facilitated the accreditation of private practitioners in Ontario and Quebec to provide this export certification and inspection service (Hilton 1928). This program involved 9,500 producers shipping milk or cream to 108 plants (85 in Quebec, 23 in

Ontario) exporting to the US (Hilton 1929).

A strong call for increased provincial involvement in the expanding tuberculosis program was made in the 1930 report of the Veterinary Director General:

> It is consequently also particularly important, from a commercial viewpoint to make rapid progress in the control of this disease in the Dominion, and the time is now undoubtedly ripe for the mustering of all available forces in a united co-operative campaign of control. I am, therefore, of the opinion that the provincial authorities should now be approached, with a view to arranging for a co-operative plan of procedure in each province-a plan by which the provinces would assume responsibility for more active participation in this work by providing a share of the necessary funds, and veterinary and other assistance. Such an agreement would permit of the employment of accredited veterinary practitioners, which is essential in an extensive campaign, but which has not been considered advisable under plans financed solely by a Federal Government maintaining a veterinary sanitary organization.
> I am further of the opinion that until a province is in a position to enter into a co-operative plan of control with this department all areas and herds, in which the percentage of infection has been reduced to one-half of one cent or less, should be turned over to the authorities of the province in which they are located for future attention. This procedure would transfer the responsibility for maintaining these area's and herds as free as practicable from infection to the authorities more intimately concerned, would release mangy our officers for initial testing, and in this way enable your department to make much greater progress in controlling this infection (Hilton 1930).

No provincial participation to the level suggested was ever achieved.

2.3 Conclusion

Six Bovine TB control and eradication programs were practiced in the early history of Canada. Although each program had specific focus to deal with this serious disease, some of them were considered more efficient and less cost than others. The Restricted Area Plan was proved as the most productive program to test the largest number of cattle in the entire country. Programs such as MTO and Supervised Herd Plan discontinued after a period of counterproductive practices. It was indicated that cooperatively involving federal, provincial governments and industry in the Bovine TB control and eradication was the more effective way to conduct the program performance.

Table 2. Comparative Status of the Four Bovine TB Control Programs circa 1927 (Hilton 1928)

Plan	Year Adopted	Number Involved	Cattle Numbers	Compensation
Supervised Herd Plan	1905	1,105 Herds	12,130	No
Municipal Tuberculosis Order	1914	30 Municipalities	61,892	Yes
Accredited Herd Plan	1919	2,850 Herds	85,500	Yes
Restricted Area Plan	1922	6 Areas	320,000	Yes

Chapter 3 Bovine TB Eradication Programs in Manitoba

3.1 Introduction

The Bovine TB Programs in Manitoba started in an effective and progressive way in 1922 with the establishment of the Carman Restricted Area (Hilton 1924a). Previous programs did little to either estimate the prevalence of Bovine TB in the general cattle population or to restrict the spread of Bovine TB in the cattle population.

The Restricted Area Plan was designed and directed by the Health of Animals Branch, Dominion Department of Agriculture, with some support from the Manitoba Department of Agriculture of primarily in the area of extension and nurturing public support for the program; it was a shared responsibility. The Dominion assumed complete responsibility for the direction of the fieldwork and employed all of the veterinary inspectors who conducted the tuberculin tests on cattle. The formation of restricted areas usually one municipality at a time, required the support and cooperation of producers. The genesis of a Bovine TB Restricted Area started with a census of the cattle population in the municipality and petition of support signed by 75% of cattle producers submitted to, and approved by, the Minister of Agriculture for Manitoba. The provincial minister would request the establishment of a new Bovine TB restricted area a legal entity designated by federal Order in Council. If federal resources were available, the complete area testing was initiated. Salaries and related costs were borne by the Dominion and transportation costs incurred by the inspectors while making the tests were paid by the province as described in legislation [Chapter 2, Appendix 5, Part 1 and 2]. As part of the agreement; owners (when requested) were required to furnish meals and bed for the inspector while conducting the test [Chapter 2, Appendix 5, Part 5]. The program was in effect a Federal-Provincial-Industry cost shared program with the majority of the cost attributed

to the Federal partner.

In 1922, the Free Accredited Herds Plan was piloted in the Manitoba Rural Municipalities of Dufferin, Roland and Thompson and the Town of Carman (Carman Area, first Area test April 1923) (Hilton 1924a) and Quebec (Huntingdon Area, first Area Test 1924) (Hilton 1925). In 1925, the contiguous Municipalities of Grey was added to the Carman restricted Area, Stanley to the south and Portage la Prairie to the north joined in 1929, and Rhineland and Pembina in 1930 [Figure 1]. Reactor rates on first test were generally low but higher than subsequent tests [Table 3].

3.2 Bovine TB Restricted Area Plan in RMNP Ecosystem

The number of municipalities under the Bovine TB Restricted Area Plan in Manitoba continued to grow from 1930 to reach 74 primarily in the southern more heavily populated areas of the province. The number of restricted areas remained at 74 from 1943 to 1945 during the last three years of the Second World War because of the lack of staff and resources to support the domestic activities of the Federal Health of Animals Branch. Between 1946 and 1949 the Health of Animal Division was significantly resourced and the Restricted Area Plan was pursued in all provinces (Barker 1946).

In 1950, the Manitoba Cattle Breeders' Association unanimously passed a resolution requesting that the Provincial Minister of Agriculture and Immigration attempt to have the entire province of Manitoba designated as a single Bovine TB restricted area. At this time, over 81% of the farms in the province were either tested or awaiting test, and since many of the remaining farms were still in unorganized area, the problem of securing proper petitions was very difficult.

Table 3. Bovine TB Testing Restricted Area Plan, 1929

Area	Tested Cattle	Number of Reactors	Reactor Percentage	Compensation
Original Area	20,750	272	1.3%	$ 8,660.33
Portage La Prairie*	11,464	939	8.2%	$ 31,014.00
Stanley*	8,545	231	2.6%	$ 7,677.66
Total	40,759	1,442	3.5%	$47,351.99

Note: *represents the first test data.

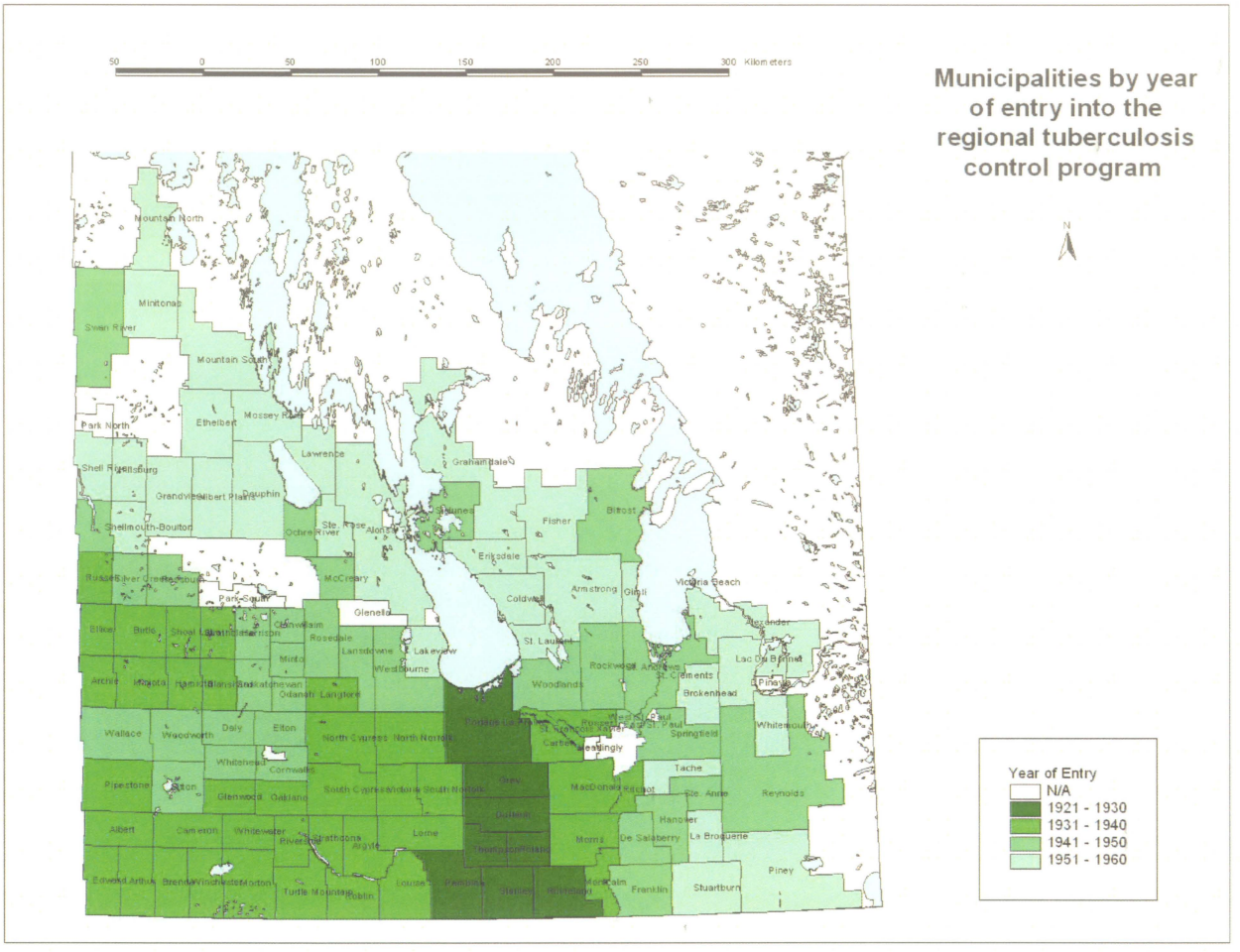


Figure 1. Recruitment of Manitoba Municipalities into the Restricted Area Plan by Decade, 1922 to 1960 (Barker 1946).

(Note: By 1930, the geographic central core of Manitoba, from Lake Manitoba to the US border (dark green municipalities) was a contiguous control area. The municipalities surrounding RMNP were not designated as Control Areas until much later primarily after the Second world war from 1946-1960.)

In 1951, the resolution was accepted by Order-in-Council on March 13th (Childs 1953). The granting of this request made the province of Manitoba the first in Canada to be so considered. In 1922, the Rural Municipality of Dufferin was the first TB Restricted Area in the British Empire. The Manitoba TB Free Area would guarantee the instituting of the area tests in many of the outlying section of the province but, decreased the participation of the provincial government in the program as the extension functions and bolstering of public support inherent in the municipality based petition process were no longer required. Nationally it was estimated that about 6.8 of the nation's 8.5 million cattle were under a Bovine TB control program (Childs 1953).

A slight reduction of Bovine TB Testing occurred in 1952 because of the outbreak of foot and mouth disease in Saskatchewan (Sellers and Daggupaty 1990). In order to respond to this outbreak, many federal veterinarians were recalled from the TB Testing work. On November 25, 1955, the entire province of Manitoba that had earlier been established as a restricted area finally completed the initial tuberculin test of all cattle in the Province (Wells 1956). Although the carrying out of the tests was the sole responsibility of the Health of Animals Division, Canada Department of Agriculture, assistance was also provided by the provincial Livestock Branch to cover all the transportation costs of the inspectors engaged in making the general cattle tests in the area and the first sixty-day retest of infected herds following the general test.

Canada became a restricted area for the eradication of Bovine TB under each provincial Restricted Area Plan, with the inclusion of Alberta on September 24, 1953 (OIC P.C. 1460) (Childs 1954).

Table 4. Bovine TB Testing Restricted Area Plan in Municipalities in the Vicinity of RMNP - First General Test and Subsequent Area Tests (Wells 1969)

Area Clockwise	Tested Cattle	Year	Number of Reactors	Reactor Percentage
Dauphin	11802	1951	18	0.15
	16610	1963	0	Acc
Ochre River	4447	1950	54	1.2
	6248	1954	11	0.17
	10545	1964	0	Acc
St. Rose	4977	1951	162	3.25
	7548	1955	5	0.06
	9148	1966	0	Acc
McCreary	4744	1950	59	1.20
	5952	1955	7	0.11
	7525	1965	0	Acc
Rosedale	5824	1950	111	1.90
	7469	1953	7	0.09
	10951	1964	0	Acc
Clanwilliam	3340	1950	6	0.17
	4632	1961	0	Acc
Park-South[1]		1953		
Rossburn	9272	1947	51	0.55
	8750	1954	14	0.16
	11557	1965	0	Acc
Silver Creek	5277	1947	31	0.58
	5806	1954	15	0.25
	6997	1966	0	Acc
Shellmouth	5037	1950	21	0.41
	7359	1956	1	0.01
	7948	1966	0	Acc
Boulton	3664	1951	4	0.10
	5876	1960	0	Acc
Grandview	7741	1953	47	0.60
	8285	1958	0	0.00
	8324	1968	0	Acc
Gilbert Plains	6984	1951	28	0.04
	8363	1955	10	0.11
	10169	1965	0	Acc

(Note: Park-South never became an individual eradication area, was included in the

provincial eradication area in 1953. Acc = Accredited tuberculosis free, defined as less than 0.2% of cattle in the population are reactors to the caudal tail fold tuberculin test.)

3.3 Prevalence of Bovine TB in Cattle in Manitoba

The nature of the Restricted Area Plan allowed for both an inventory of all cattle in the area and a complete area test usually within a short period of time. The goal of the Plan was to achieve an Accredited Free status. Accredited status would be issued for 3 years if the prevalence (the percentage of number of reactor animals/total tested animals) was identified as less than 0.5%, and status would be issued for 6 years if the prevalence was less than 0.2%. Several municipalities in Manitoba achieved accredited free status on the first area test [Figure 2], while the majority was accredited free on the second municipal test [Figure 3]. The Rural Municipality of Grandview has missing data in the official statistics related to the 1958 area test, whereon reactors are reported but accreditation was not awarded. However, Grandview was accredited free on the third test in 1968 with no reactors identified.

The initial reactor rates varied considerably by municipality as identified in the First Area test [Figure 4]. This difference reflected the higher TB prevalence in dairy herds.

The prevalence of Bovine TB in Manitoba continually decreased from 1953-1965 under the area control programs, slaughterhouse surveillance and traceback and testing [Table 5].

Manitoba was declared Bovine TB free in 1986 (that the disease was considered eradicated from the geographic region in all livestock). Manitoba maintained that status until the mid-1990's. However, since the early 1990's, Manitoba has experienced several outbreaks of Bovine TB, and most of them occurred in the vicinity of RMNP. The infection has been detected on three separate occasions from a total of eight cattle herds in the Rossburn and Grandview areas. In 1998, Bovine TB was found in the Virden area and potentially exposed over 1050 animals. Forty-five farms in the Rural Municipality of Wallace were affected.

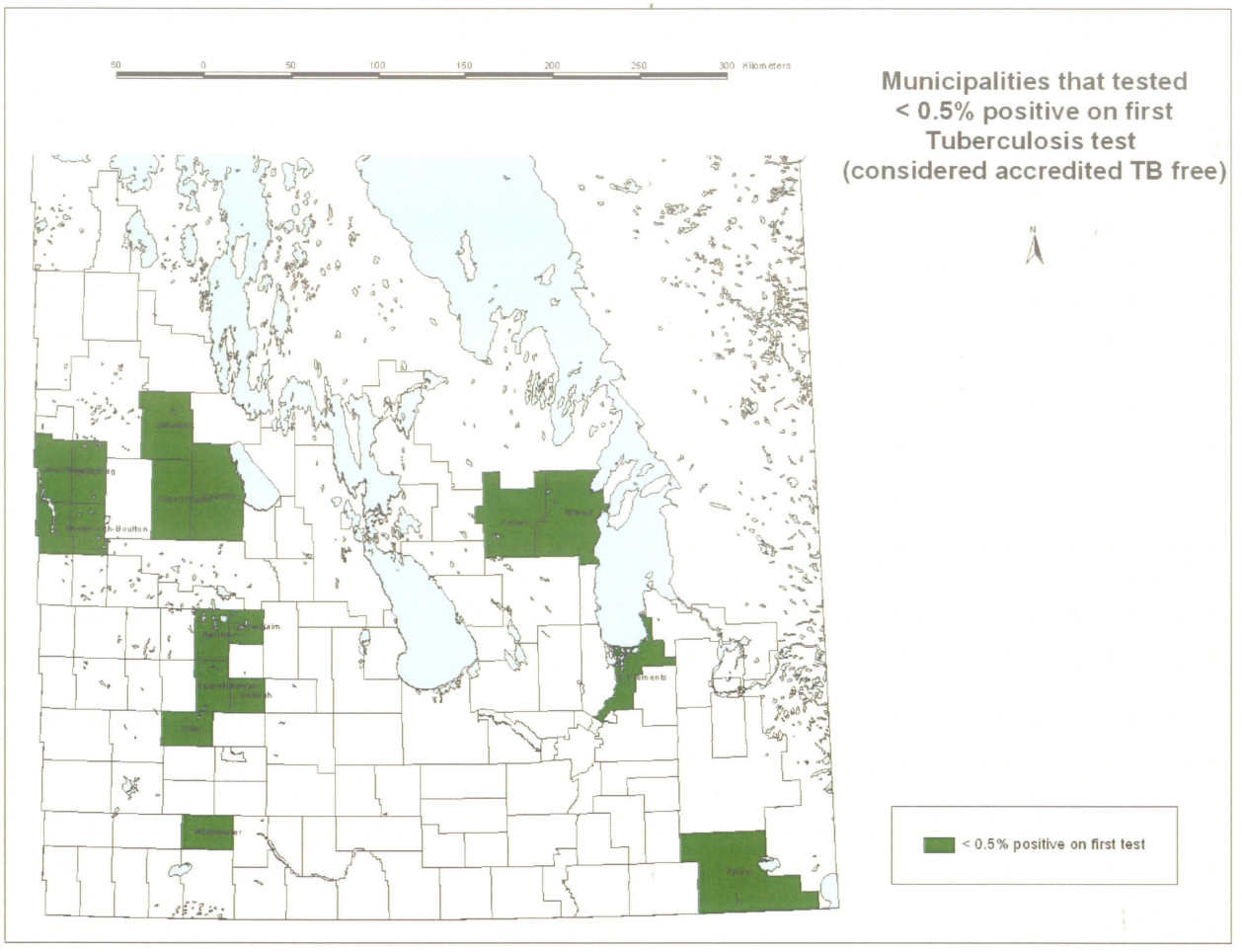


Figure 2. Municipalities Accredited Tuberculosis Free on the Initial Area Test (Wells 1955).

(Note: Several areas adjoining the RMNP were very low prevalence on initial test.)

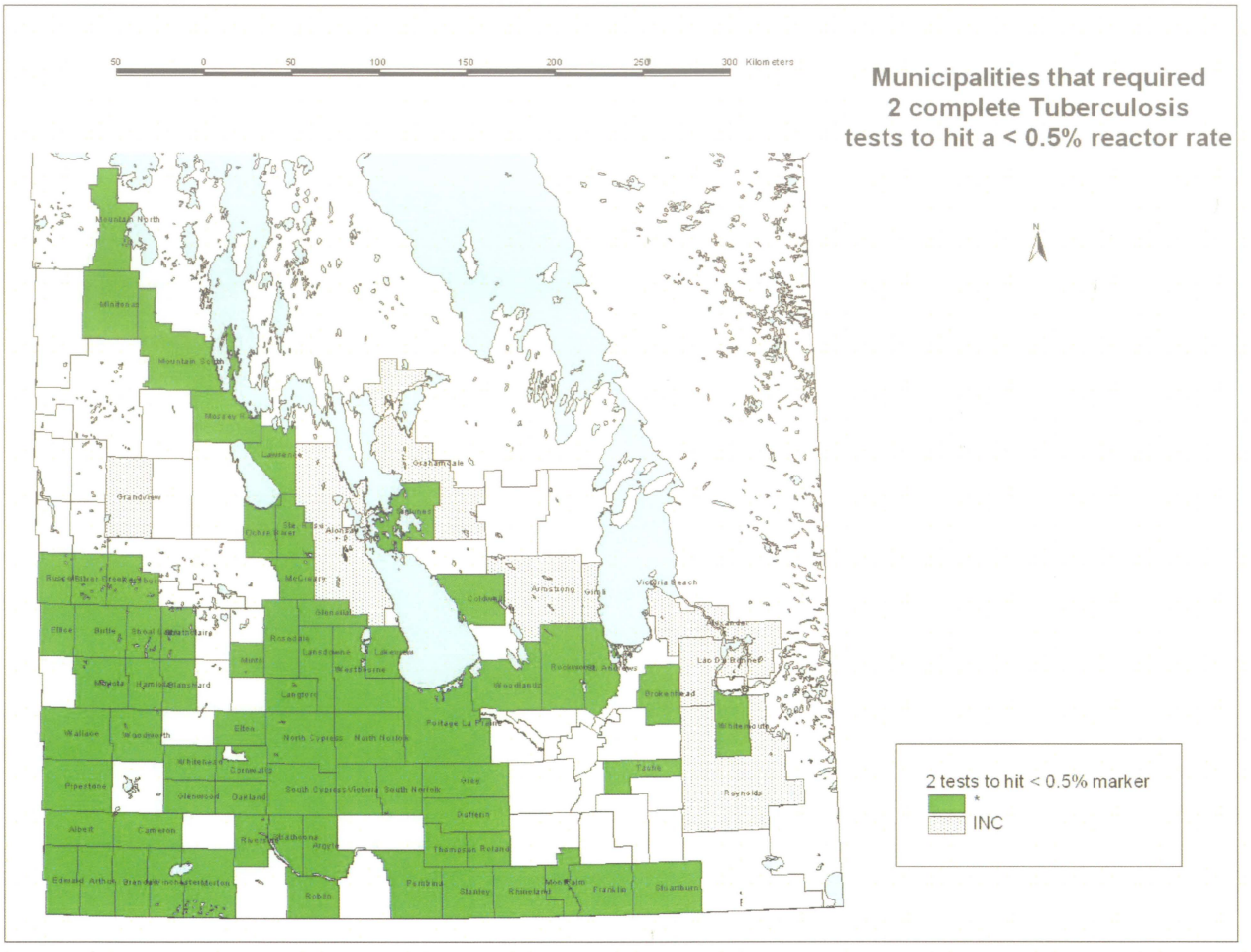


Figure 3. Municipalities Accredited Tuberculosis Free on the Second Area Test (Wells 1955).

Table 5. Tuberculosis Area Testing, Manitoba from 1953 to 1965 (Childs 1954, Wells 1955 and 1969)

Year Ending March 31	No. of Tested Cattle	No. of Reactors	Reactor Rate	Percentage of National Cattle Herd Tested
1953	118,322	1,774	1.49%[1]	79.2
1954	193,456	942	0.52%	84.4
1955	168,790	465	0.27%	82.2[2]
1956	215,307	602	0.27%	84.1
1957[3]	144,728	319	0.22%	85.5
1958	238,435	911	0.32%	89.2
1959	89,499	106	0.11%	91.5
1960	96,538	98	0.10%	92.1
1961	83,928	82	0.09%	95.9
1962	61,369	57	0.09%	96.2
1963[4]	197,768	78	0.03%	96.4
1964	135,363	57	0.04%	97.8
1965	145,883	125	0.10%	95.5

Notes:

1. For this year 80,130 of the cattle tested (67.7%) were first area tests.
2. Annual agricultural census put the cattle population in Canada at 9,488,000 giving the appearance of a lower percentage of cattle under control.
3. In 1957 the reporting table was changed to record only tests applied not animals tested.
4. Start of the Second general (Provincial) area test for tuberculosis.

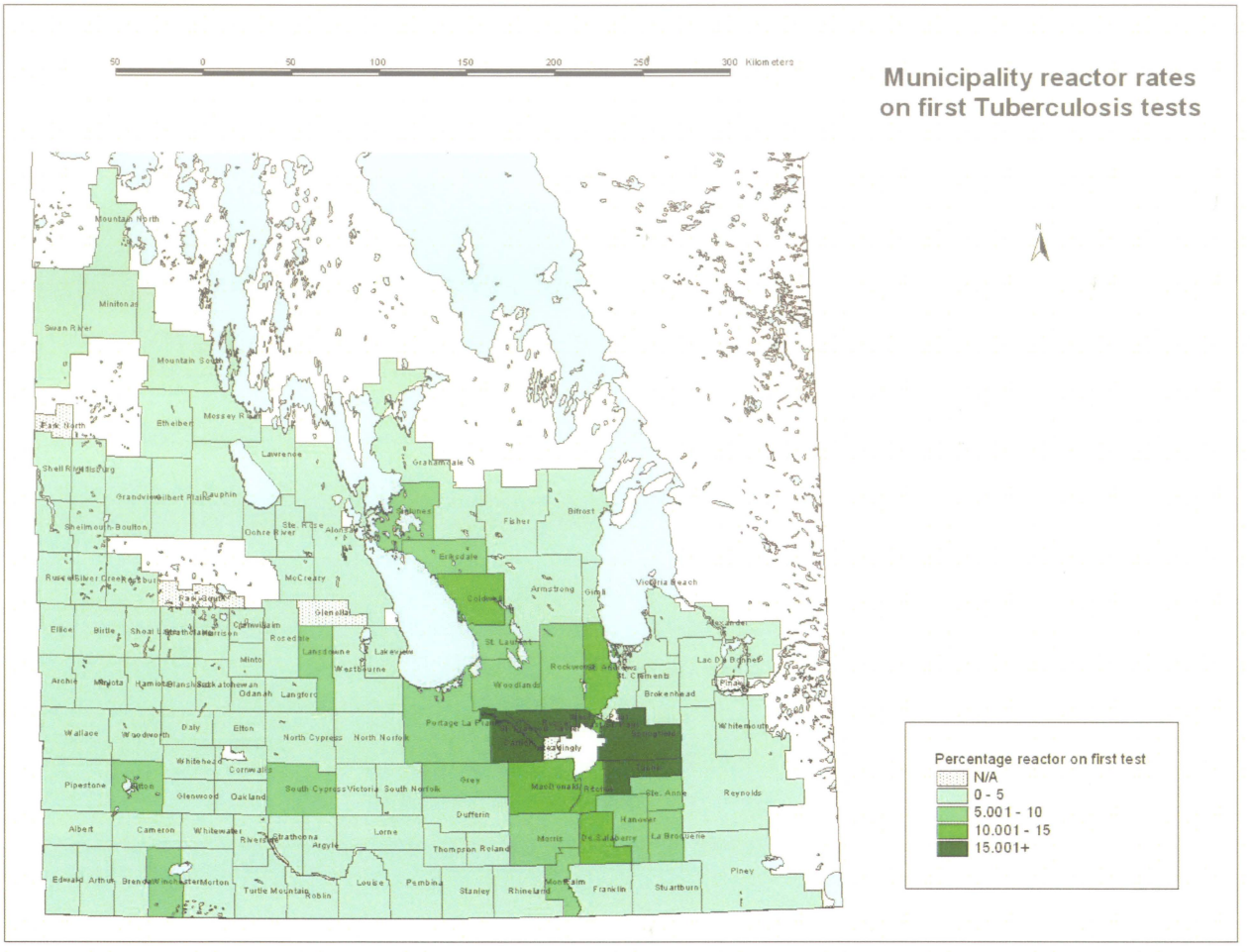


Figure 4. Initial Reactor Rates as Identified on the First Area Test (Hilton 1925).

(Note: Areas of Manitoba with concentrated urban development such as Winnipeg and Brandon would have be geocentric to a milk production area during the years 1930-1960 when the initial area testing was completed. These municipalities had high reactor rates presumably because a high proportion of the cattle were dairy type in the locale and a higher rate of infection in dairy cattle. Manitoba Urban Municipalities had also experimented with the Municipal Tuberculosis Order (MTO). In 1925 of 30 municipalities under the MTO in Canada 10 were in the Province of Manitoba, most significantly Brandon (3,037 cows), Portage La Prairie (1,371 cows), Winnipeg (7,301 cows) and Dauphin (804 cows).

This outbreak of Bovine TB has roots in an outbreak in the Rossburn area in 1991. In the 1990's an increasing number of elk were also discovered with Bovine TB in the RMNP Ecosystem. Those elk are currently implicated as wildlife hosts of Bovine TB and as sources of infection for those farmed cattle [Table 6].

The 1991 and 1997 Bovine TB reacted cattle were first identified through slaughter surveillance in Canada and in the US respectively, and were confirmed through subsequent trace-back investigations. In 1996 a single infected cow was detected via an individual animal test for export to the US and the origin was in Carmen area. This sample was not typed and it is unknown if the isolate is related to the RMNP type. The other infected herds were identified as a result of Canadian Food Inspection Agency's on-farm area testing program. The 1992, 1998, 1999, 2000, and 2001 herds were tested because they were in the 10 km radius area to the TB-positive elk and deer in RMNP. The 2003 herds were tested as a part of the Riding Mountain Eradication Area herd testing program.

In order to manage those Bovine TB outbreaks, a management group was founded by Parks Canada, Manitoba Conservation (MC), the Canadian Food Inspection Agency (CFIA), and Manitoba Agriculture and Food (MA&F) to address this issue around the RMNP ecosystem. The specific activities for individual government department were taken according to the drafted implication plan of this management program (The Task Group for Bovine TB 2002). While each agency and group is governed by its particular mandate, they have gathered their resources to implement disease control and prevention measures directed at Bovine TB in both cattle and wildlife. All disease tests in last ten years were implemented by the CFIA.

Through many years' sustained efforts and several program changes, Bovine TB was basically under control in Manitoba after 1960 until the recent outbreaks in cattle herds. The Province's TB status was downgraded by United States Department of Agriculture

(USDA) in August 2002 from TB-Free to TB-Accredited Advanced. In response to this situation, a multifaceted Bovine TB Management Program was prepared by the Task Group for Bovine TB, which represented a new manner of disease control and eradication taken by the Federal and Provincial Government.

Table 6. Manitoba Bovine TB Cattle Testing January 1, 1991 through June 30, 2003 (Blaine Thompson Personal Communication)

Year	Recipient/ Exposed/Perimeter Herd-Regular Kill	Recipient/Exposed/Perimeter Herd-Infected Herd	Area Surveillance Test	Total Cattle
1991	385	173	6,043	6,601
1992	66	388	2,033	2,487
1993	549	151	-	700
1994	67	29	-	96
1995	-	-	-	-
1996	-	1,004	-	1,004
1997	2,221	357	-	2,578
1998	2,473	4,161	550	7,184
1999	-	2,209	-	2,209
2000	-	1,103	-	1,103
2001	-	1,195	873	2,068
2002	N/A	3,933	32,735	36,668
2003	N/A	855	11,590	12,445

Note:

1. The statistic data of 1991 just included five months records.
2. The statistic data of 1992 did not include the records of February.
3. The statistic data of 2003 ended on June 30th.
4. The data in the second column indicate the cattle number of suspicious lesions at slaughter-initial lab reports also suspicious-herd of original testing. The third column is infected cattle number in herd-perimeter testing allowed in 10 km radius. The forth column is cattle number including both general surveillance testing around the positive elk and retesting.

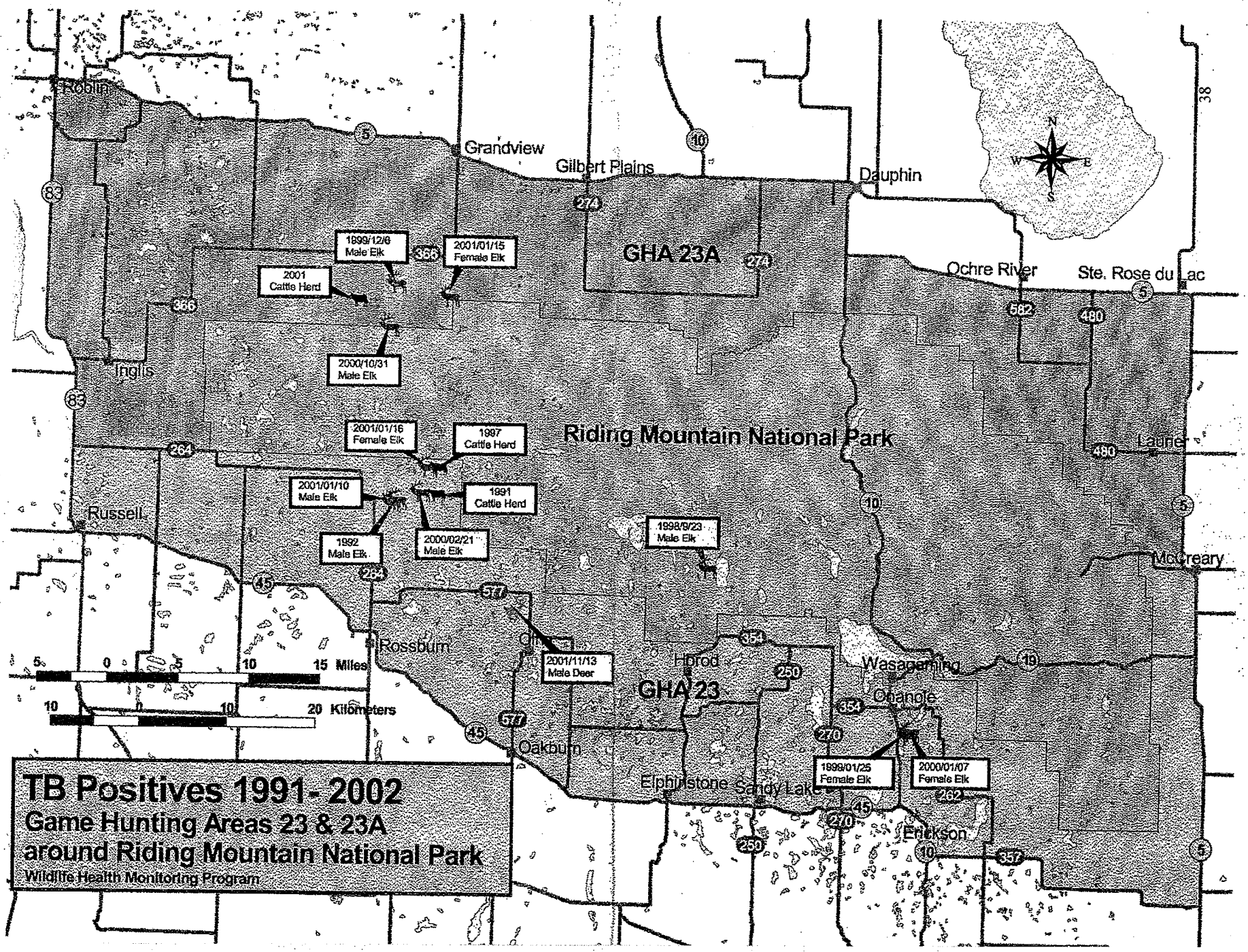

Roblin
Grandview
Gilbert Plains
Dauphin
GHA 23A
1999/12/6
Male Elk
2001/01/15
Female Elk
2001
Cattle Herd
2000/10/31
Male Elk
Ochre River
Ste. Rose du Lac
Inglis
Riding Mountain National Park
2001/01/16
Female Elk
1997
Cattle Herd
2001/01/10
Male Elk
1991
Cattle Herd
1992
Male Elk
2000/02/21
Male Elk
1998/9/23
Male Elk
Russell
Laurier
McCreary
Rossburn
2001/11/13
Male Deer
Hpod
Wasagaming
GHA 23
Ohanole
Oakburn
Elphinstone
Sandy Lake
1999/01/25
Female Elk
2000/01/07
Female Elk
Erickson
5 0 5 10 15 Miles
10 0 10 20 Kilometers
TB Positives 1991- 2002
Game Hunting Areas 23 & 23A
around Riding Mountain National Park
Wildlife Health Monitoring Program

Figure 5. Bovine TB Positives in Wildlife and Domestic Cattle 1991-2002 around the RMNP (Blaine Thompson Personal Communication).

Chapter 4 Bovine TB Situation around the Riding Mountain National Park Ecosystem

4.1 Introduction

There are fifteen municipalities in the immediate Riding Mountain Geographic Area, which include Boulton, Clanwilliam, Dauphin, Gilbert Plains, Grandview, Harrison, McCreary, Ochre River, Rosedale, Rossburn, Straithclair, Shellmouth, Silver Creek, Shoal Lake, and Ste. Rose [Figures 6 and 7]. In 1916 a research report written by the Department of the Interior Forestry Branch attempted to evaluate the terrain of the then Riding Mountain Forestry Reserve as summer grazing land for cattle. As part of that evaluation a local census of cattle and other grazing livestock was taken (Smith 1916). The forest reserve encompassed significantly more geographical area than the current Riding Mountain National Park [Figures 6 and 7]

4.2 Bovine TB Tests under the Restricted Area Plan (1916-1960)

In addition to the 1916 cattle census taken by the Forestry Branch, each municipality was required to take a census at the time of application to the provincial minister for the establishment of a Bovine TB Control Area [Figure 8]. The rate of reactors identified on First Area herd test is provided in Figure 9.

Between 1916 – 1960, all the municipalities in the Riding Mountain ecosystem were tested for Bovine TB under the Restricted Area Plan. Shoal Lake was the only municipality that Bovine TB testing was conducted three times in 1940, 1943, and 1950 respectively. Twice Bovine TB testing were conducted in both Rossburn and Riding Mountain Area.

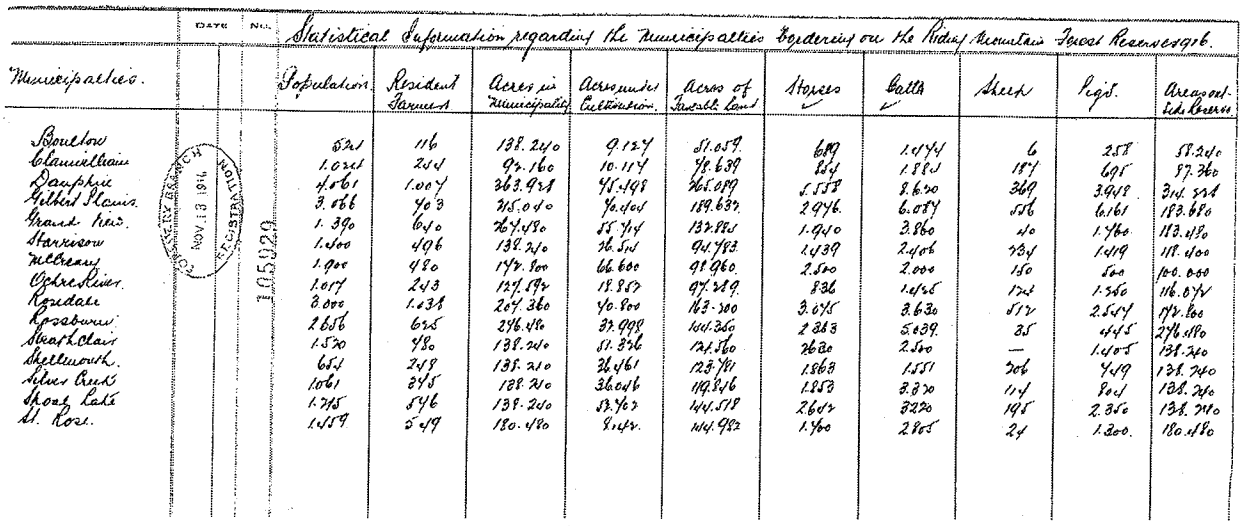
In 1916, there was no record of any cattle grazing in the Riding Mountain Area.

Although it did not become a National Park until 1931, cattle grazing within the RMNP was still permitted. In 1940, the first Bovine TB testing was carried on in RMNP as a Municipality, and a total 3,142 head were tested, and no reactor was identified. The retest was provided by the federal inspectors in this area after Manitoba became a single Restricted Area under the Restricted Area Plan. A total 4,176 head of cattle were tested and only 6 of them were found as reactors, 0.14% of reaction rate [Table 8] (Harkness and Wells 1959).

4.3 Conclusion

Although Bovine TB testing in most municipalities around the Park area was applied just once, the reaction rate in eight municipalities and grazing area in RMNP was very low and lower than 0.5% on the first Bovine TB test. The highest reacting rates in this area came from the Municipality of Ste Rose in 1951 as 3.25%. Based on this low incidence of TB, it appears that the possibility of Bovine TB transmission from cattle to free ranging ungulates in the RMNP was extremely low.

Table 7. Statistical Evaluation Regarding the Municipalities Bordering on the RMFR (Image Reproduced from Smith 1916)



DATE No.

Statistical Information regarding the Municipalities Bordering on the Rocky Mountain Forest Reserve 1916.

Municipalities.	Population	Resident Farmers	Acres in Municipality	Acres under Cultivation	Acres of Timber Land	Horses	Cattle	Sheep	Pigs.	Area of Ind. Reserves
Bowlesow	521	116	138.240	9.127	81.059	689	1.014	6	258	58.240
Clarenbain	1.021	254	92.160	10.114	79.639	854	1.880	184	695	57.360
Dauphin	4.061	1.004	363.921	45.498	365.089	5.558	8.630	369	3.948	314.518
Gilbert Plains	3.066	903	215.040	30.105	189.634	2.946	6.084	556	6.161	183.680
Grand View	1.390	640	264.480	85.714	137.895	1.940	3.860	40	1.760	113.280
Harrison	1.500	496	138.240	26.515	94.783	1.439	2.406	734	1.419	118.400
McCreary	1.900	480	147.800	66.600	91.960	2.500	2.000	150	500	100.000
Ochre River	1.017	243	127.592	18.857	97.289	836	1.425	124	1.360	116.074
Rosedale	3.000	1.031	264.360	30.800	163.300	3.075	3.630	517	2.564	174.800
Rossburn	2.856	625	276.480	37.998	166.360	2.383	5.039	35	445	276.480
Shoal Lake	1.530	480	138.240	81.376	121.560	2620	2.500	—	1.405	138.240
Shellmouth	654	248	138.240	26.461	123.781	1.868	1.551	306	749	138.240
Silver Creek	1061	248	138.240	36.046	119.836	1.858	3.830	114	804	138.240
Stony Lake	1.715	546	138.240	53.763	144.518	2647	3220	195	2.356	138.240
Ste. Rose.	1.559	549	180.480	8.448.	144.982	1.760	2.805	24	1.200.	180.480

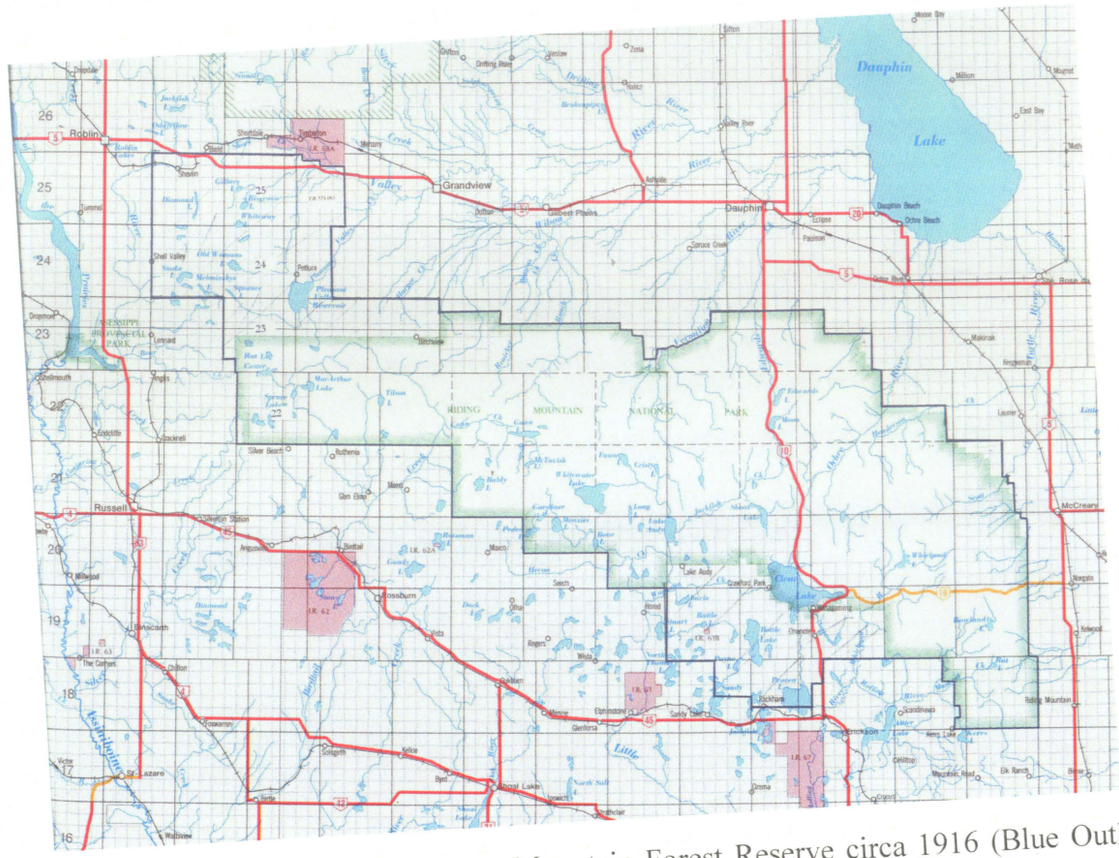


Figure 6. Footprint of the Riding Mountain Forest Reserve circa 1916 (Blue Outline) (Smith 1916)

(Note: Superimposed on the current established area of RMNP (thick shaded green line). Background image is an excerpt from Province of Manitoba (Map), Surveys and Mapping Branch, 1977. The blue line is hand drawn from R.M. 42-2, Reference No. 93924.)

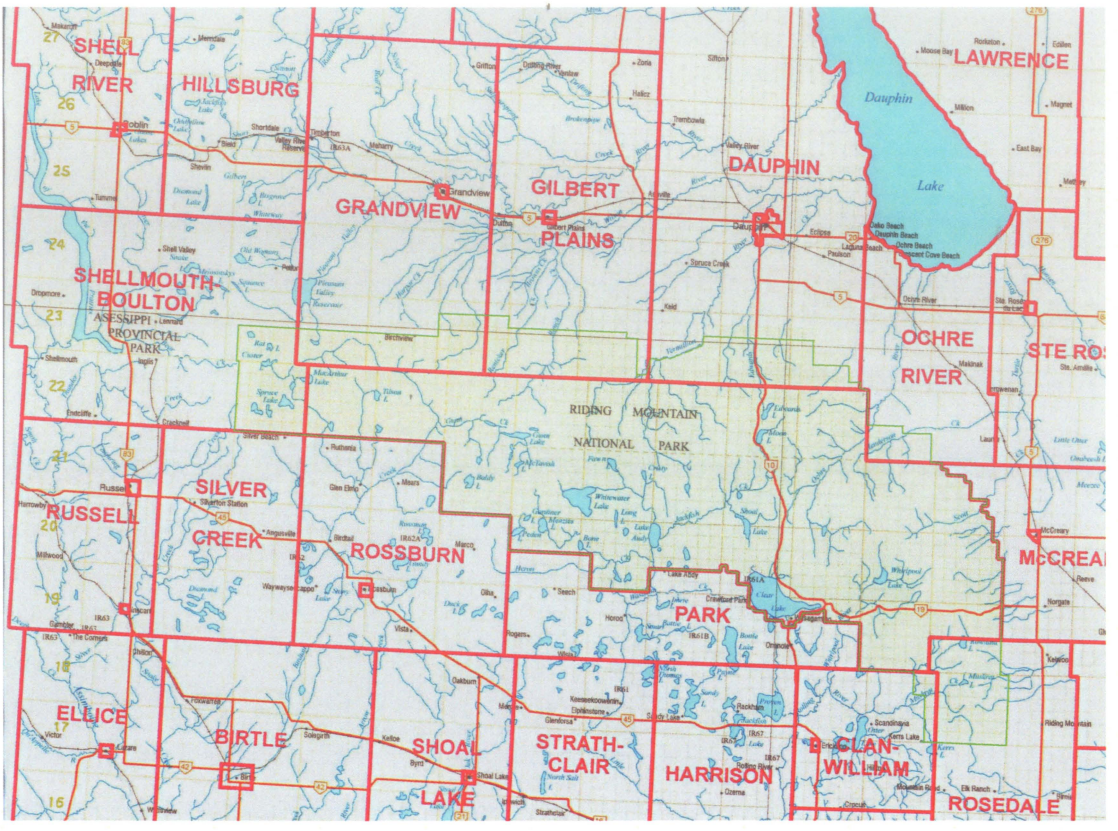


Figure 7. Current Footprints of RMNP (Green Line) and Bordering Municipalities.

(Note: In 1916 the municipality of Park was largely within the forest reserve as were significant areas in the municipalities of Boulton Grandview and Hillsburg. Boulton consisted of the eastern portion of the current municipality of Shellmouth-Boulton. The R.M. of Shellmouth-Boulton was formed on January 1st, 1999 by the amalgamation of the R.M's of Shellmouth (incorporated in 1907) and Boulton (incorporated in 1884). Image is excerpt from Municipalities and Local Government Districts 1999 (Map), Manitoba Conservation, Land Management Division.)

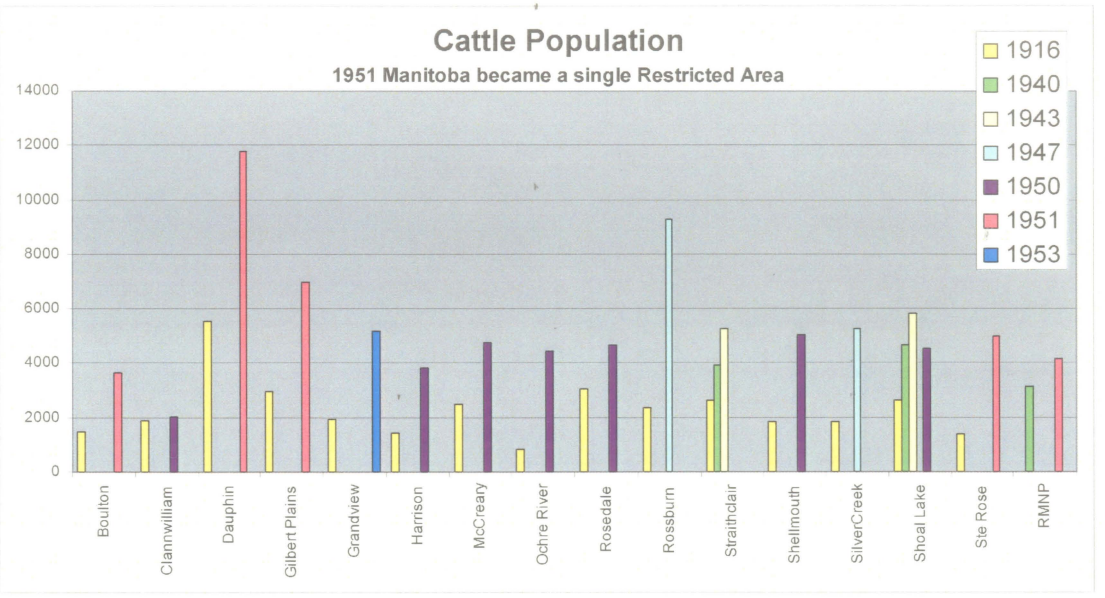


Figure 8. Growth of the Cattle Population from 1916-1953 (Harkness and Wells 1959).

Table 8. Statistical Evaluation of Bovine TB Testing in the Riding Mountain Ecosystem between 1916 - 1960

Municipality	Cattle Number							TB Positive Cattle					
	1916	1940	1943	1947	1950	1951	1953	Number of Reactors			Reaction Rate (%)		
Boulton	1,417					3,664		4			0.11		
Clanwillian	1,884				2,084			6			0.29		
Dauphin	5,588					11,802		18			0.15		
Gilbert Plains	2,976				6,984			28			0.4		
Grandview	1,940						5,197	21			0.4		
Harrison	1,439				3,812			10			0.26		
McCreary	2,500				4,744			59			1.24		
Ochre River	836				4,447			54			1.21		
Rosedale	3,045				4,653			104			2.24		
Rossburn	2,363		9,272					51			0.55		
Strathclair	2,630	3,920	5,277					40	11		1.02	0.21	
Shellmouth	1,863				5,037			21			0.42		
Silver Creek	1,853			5,277				31			0.59		
Shoal Lake	2,642	4,655	5,800		4,535			104	16	8	2.23	0.28	0.18
Ste Rose	1,400					4,977		162			3.25		
Riding Mountain Area	--	3,142				4,176		0	6		0	0.14	

Note: -- means the data are unknown.

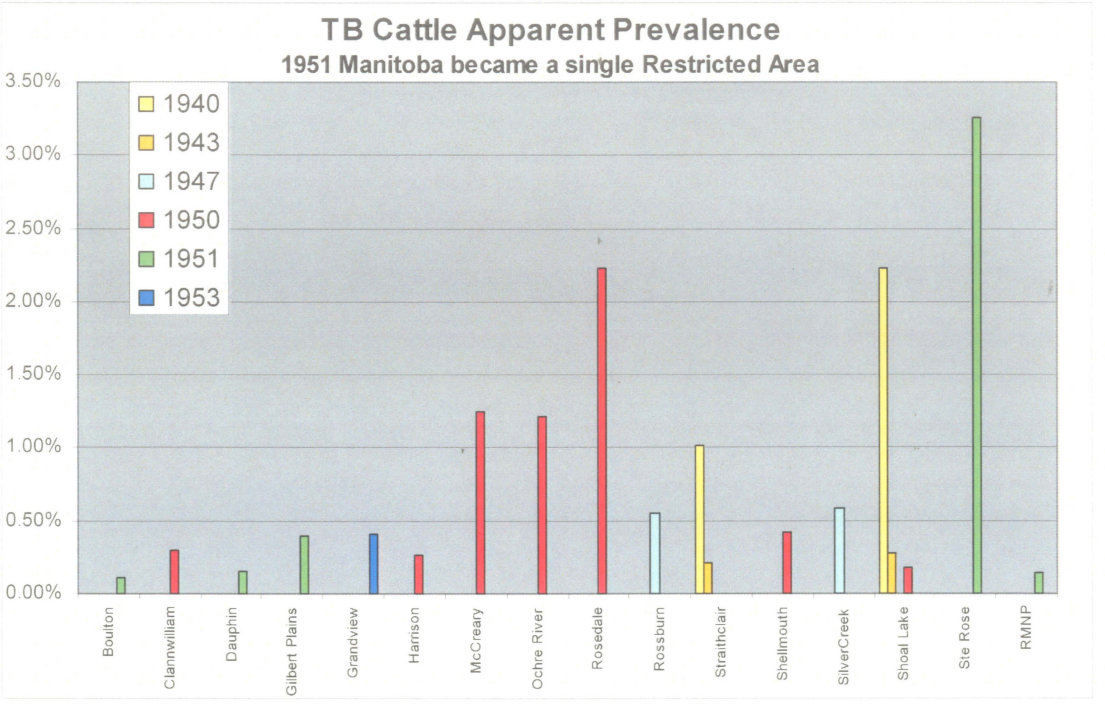


Figure 9. Bovine TB Reactor Rate on First and Subsequent Tests of Municipalities around the RMNP Ecosystem (1916-1953) (Harkness and Wells 1959).

(Note: Most municipalities in this area became restricted areas quite late in the provincial program. Shoal Lake and Straithclair entered in 1940 and Grandview had its first area test in 1953. Only Shoal Lake and Straithclair had a second area test prior to the province becoming a single eradication area.)

Chapter 5 Bovine TB Transmission Between Free Ranging Ungulates in RMNP

5.1 Introduction

From 1923 to 1965, Bovine TB retests in cattle in Manitoba were limited to restricted areas where milking cows were farmed. Milking cows generally had a lower level of infection in all the cattle population. The disease outbreak within the cattle herds was just part of fact. Twenty bison were first introduced in 1931 from a herd in Buffalo National Park (BNP), Wainwright, Alberta, into RMNP. In 1937, one of the bison kept in the Bison Enclosure, RMNP was found dead and at necropsy Bovine TB was diagnosed. Since then the efforts of eliminating Bovine TB in the Park area lasted 20 years until the infected bison population was destroyed and replaced with Bovine TB-negative animals from Elk Island National Park (EINP) in Alberta.

This chapter summarizes the details of how Bovine TB may have been introduced into the free ranging ungulates in the RMNP Ecosystem and how this disease was dealt with by the RMNP.

5.2 History of Bovine TB in the RMNP Ecosystem

5.2.1 1930-1936

During the 1930s, the protection of bison was a big concern for both the Federal and Provincial Governments in Canada. The federal government emphasized the procurement of large herds at Wood Buffalo National Park (WBNP), Wainwright and EINP to insure the perpetuation of this species, which fundamentally prevented the possibility of extermination of the bison in Canada (R.M.232, pt 1, Memorandum, September 5, 1930). Meanwhile, a large amount of money was spent on fenced bison enclosures in Wood

Buffalo, Elk Island, and Banff National Parks (R.M.232, pt 1, Memorandum, September 8, 1930). In 1930, approximately 6,600 bison were located at Wainwright, between 700 and 800 bison were located at EINP (East of Edmonton); and approximately 12,000 were located at WBNP (South of Fort Smith, N.W.T). In addition, there was a small exhibition herd of 27 bison maintained at Banff National Park (R.M.232, pt 1, Memorandum, September 8, 1930). Under this circumstance, it seemed that creating an exhibition bison herd in Manitoba would be another useful action to fulfill the intention of bison protection by the federal government. Of course creating another bison exhibit would definitely be a great attraction to visitors in Manitoba. Comparing the situation in other Parks, likewise RMNP was chosen by the National Parks Bureau and The Hon. Thos. Murphy, Minister of the Interior as the location for the bison herd (R.M.232, pt 1, Memorandum, September 5, 1930; R.M.232, pt 1, Memorandum, September 8, 1930). There was much discussion about the possibility and feasibility (R.M.232, pt 1, Memorandum, September 8, 1930). Many questions such as 1) how many head of bison would be appropriate; 2) where would be the best location; 3) how much money should be spent on bison transportation, initial fencing and the subsequent cost of the maintenance of the herd; and 4) who would pay for those expenditures were figured out and put on the table. Thus J. Smart, the Active Superintendent of RMNP was asked to submit an investigation report to The Minister and National Parks Bureau (R.M.232, pt 1, Memorandum, September 5, 1930).

J. B. Harkin, the Commissioner of National Parks and the Minister both suggested that twenty or so animals similar to the size of the exhibition bison herd in Banff National Park be ideal for RMNP (R.M.232, pt 1, Memorandum, September 8, 1930 & R.M.232, pt 1, Letter, October 22, 1930). One of the basic considerations behind this suggestion was that the larger the herd the greater the cost proportionately as a result of the additional fencing, fodder and attendants required, but a small herd would prove of

interest without taxing the present grazing facilities that were needed to maintain the elk and the present domestic cattle there (R.M.232, pt 1, Memorandum, September 5, 1930). In fact this number was also addressed by the investigation report from J. Smart. The elk population was estimated around 2,000 in 1930. The number of elk or the number of cattle grazing in the Park during that time would not in any way interfere with the grazing required by a small herd of 20 bison. In addition, the quality of the grazing would be about the same as that for the exhibition herd at Banff (R.M.232, pt 1, Letter, October 22, 1930).

As to the suitable location for a Bison Enclosure, J. B. Harkin thought it would be necessary to locate and make an enclosure somewhere in the west half of the park, which was mostly open country in comparison with the east portion that is thickly wooded. However, if the herd was located in the open, west section, it could not be seen well from the road since no road went through this area. J. Smart mentioned that there were many good grazing areas for the accommodation of a herd of bison and sufficient hay and slough-grass which could be harvested for their keep even without the technical official report on grazing in the park. The small exhibition herd could possibly be accommodated on a half-section of land closer to the traveled road. After comparing several possible locations, J. Smart reported that the logical location could be on the Lake Audy Plains, through which the Lake Audy and Strathclair roads pass, and where there was a warden station. This area while called the Lake Audy Plains was, in reality, a series of openings and runs in the bush, of various sizes, on which there is a heavy prairie grass and herbaceous growth (R.M.232, pt 1, Letter, October 22, 1930).

According to a statement from the Professor Jackson, the University of Manitoba, the grass growth of the Lake Audy Plains was the original bison grass. Lake Audy Plains was considered the heart of the elk range, particularly during the winter months and in the spring, and during that period many hundreds of elk were seen on these plains and in their

vicinity. This would lead one to believe that the range would be very suitable for bison (R.M.232, pt 1, Letter, October 22, 1930).

In order to protect this exhibition herd, the range was enclosed in a high, strong, woven wire fence and the building of such a fence costs a very considerable amount. On the other hand, bison migrate and if unfenced they would stray from the park and damage crops and other property and even be a menace to human life. Thus, it was definitely necessary to fence the bison range. According to J. Smart's report, approximately "six to eight miles" of fencing would be required. The area enclosed was approximately three sections of lands, which was sufficient for an exhibition herd of 20 bison. Fencing at approximately "$1,100 per mile" would be required whether the introduced herd was large or small (R.M.232, pt 1, Letter, October 22, 1930; R.M.232, Letter, October 28, 1930; R.M.232, pt 1, Letter, February 10, 1931). Meanwhile J. Smart consulted the Deputy Commissioner Williamson as to this fencing issue. Commissioner Williamson expressed his concern that this would be better if it would take "four miles of fencing" to enclose the area selected since the natural condition of Lake Audy area appears great and the drinking places for animals can be left outside of fenced area. In doing so, a small herd of about 20 animals would require the enclosure of a half-section of lands, the fencing of which, with regular bison fencing, would cost approximately $4,500.00 (R.M.232, Letter, October 28, 1930). The other initial costs from J. Smart's estimate report included construction of a building for a bison herd, the feeding, salary for hiring local people and caretaker, and other possible expenditure. Thus the sum of $10,000 was estimated to cover the exhibition bison herd for RMNP (R.M.232, pt 1, Memorandum, December 10, 19, and 29, 1930; R.M.232, pt 1, Letter, February 10, 1931).

Fencing of Bison Range	**$4,500**
Caretaker and Buildings for Exhibition Bison Herd	**$2,500**
Feed for Bison	**$500**
To Provide for Salary and Cabin for Indian	**$1,500**
Miscellaneous	**$1,000**
Total	**$10,000**

This estimate was finally approved by the Minister and he promised to help provide the money for this purpose (R.M.232, pt 1, Memorandum, October 1, 1930; R.M.232, pt 1, Letter, February 10, 1931).

The next step for both RMNP and the federal government was to arrange the bison herd selection and transportation. The Minister and J. B. Harkin considered the large bison herd at Wainwright to be a good source of stock. Therefore the Hon. Thos. Murphy, Minister of the Interior, arranged for the transfer of about 20 bison from the national herd at Wainwright to the Park so that visitors to the new RMNP that officially opened in 1931 would have an opportunity of seeing good examples of this magnificent native species living under approximately natural conditions (R.M.232, pt 1, Letter, October 8, 1930; R.M.232, pt 1, Memorandum, October 7, 1931). Following this decision Sir Henry W. Thornton, Chairman of the Board of Directors and President offered free transportation of 20 bison from Wainwright to RMNP that was located along the National Railway (R.M.232, pt 1, Letters of October 6 and 7, 1931).

In September, 1931 the preparation work for the proposed shipment of an exhibition herd of bison from Wainwright to RMNP had started. Transfer of bison herd by truck from the siding to the Park was arranged since there was no railroad siding running into or near the Bison Enclosure at RMNP. As to the feeding issue, the letter from J. Smart to Commission of National Parks of Canada mentioned that Park would provide 150 tons of

hay to put up for the use of bison and to help carry them over the winter months. Meanwhile, a caretaker who has had experience in the handling of bison at Buffalo National Park was necessary to look after the shipped bison herd (R.M.232, pt 1, Letter, October 22; R.M.232. Letter of October 26, 1931; R.M.232, pt 1, Letter of October 29, 1931). Under the arrangement of National Parks Bureau, Warden Cotton from Wainwright was the person accompanying the bison to RMNP. But Warden Cotton just stayed a short time in the park and gave several days instruction (R.M. 232, pt 1, Memorandum, November 3, 1931).

After one month, 20 bison including 4 bison bulls and 16 young cows from BNP were corralled at Wainwright, Alberta and conditioned for the coming shipment (R.M.232, pt 1, Memorandum, November 3, 1931).

Before the shipment of bison, the Superintendent of RMNP provided another suggestion to the Commissioner of National Parks--"since placing the bison in the enclosure we have also transferred two moose and two elk to the enclosure. We had hoped that we would get a number of the wild elk in the enclosure during the final construction of the fence". But he guaranteed the woven wire was used on all the portions of fence that were on dry land, and the gap was entirely in the portion on Lake Audy (R.M.232, pt 1, Letter, November 12, 1931).

In November 1931, the 20 bison eventually arrived at their new location Lake Audy in RMNP without any trouble. Warden Cotton also instructed Park people to take care of the bison herd until they settled down. The bison herd did very well in 1932 (R.M.232, pt 1, Memorandum, November 3, 1931).

In 1933, the Bison Enclosure, which comprised 1.4 square kilometers at Lake Audy, became a Bison Viewing Area to attract tourists to come to RMNP (R.M.232, pt 1, Letter, October 24, 1933). Since this viewing area was just 40 kilometers away from Wasagaming, the commercial centre of RMNP, the visitors could easily make a motor

trip to see those animals (R.M.232, pt 1, Memorandum, June 15, 1933). During this year there were 33 bison, 32 elk, 2 moose, 1 whitetail deer and 1 mule deer in this enclosure (R.M.232, pt 1, Letter, October 24, 1933). The enclosure area seemed to be inadequate space for the total 69 animals. In addition both bison and elk prefer the natural grazing rather than being fed hay to keep them in good shape. Therefore the Superintendent of the Park asked permission from J. B. Harkin to construct an additional area to the Bison Enclosure located at Lake Audy. With this additional enclosure, the exhibition herd would get better care for the next a few years (R.M.232, pt 1, Letter, October 24, 1933).

Another advantage to having the enclosure was that the Park could change the range of the exhibition animals, giving sections of the range a rest. The following maps [Figures 10 and 11] showed the location of the new grazing area in the Bison Enclosure at Lake Audy (R.M. 232, pt 1, Letter with attached Map, October 26, 1933).

The new enclosure had an area of 1.84 square kilometers, which included in some excellent grazing land, also some good winter shelter for the game (R.M.232, pt 1, Letter, October 24, 1933). Although there was no further information regarding this application for increasing the Bison Enclosure, it was assumed that both the Minister and the Commissioner of National Parks Bureau finally approved this project.

In February 1934 Superintendent G. Champion, on behalf of the Public Parks Board and of the City of Winnipeg (Winnipeg Zoo) donated 5 male whitetail deer (including one 4-year old buck, one 2-year old buck and three 3-year old ones) to RMNP. These animals were put into the Bison Enclosure at Lake Audy. This donation brought the number of whitetail deer in the Bison Enclosure up to 7 (R.M.217, pt 2, Letter, February 21, 1934; R.M. 217, pt 2, Letter, March 9, 1934).

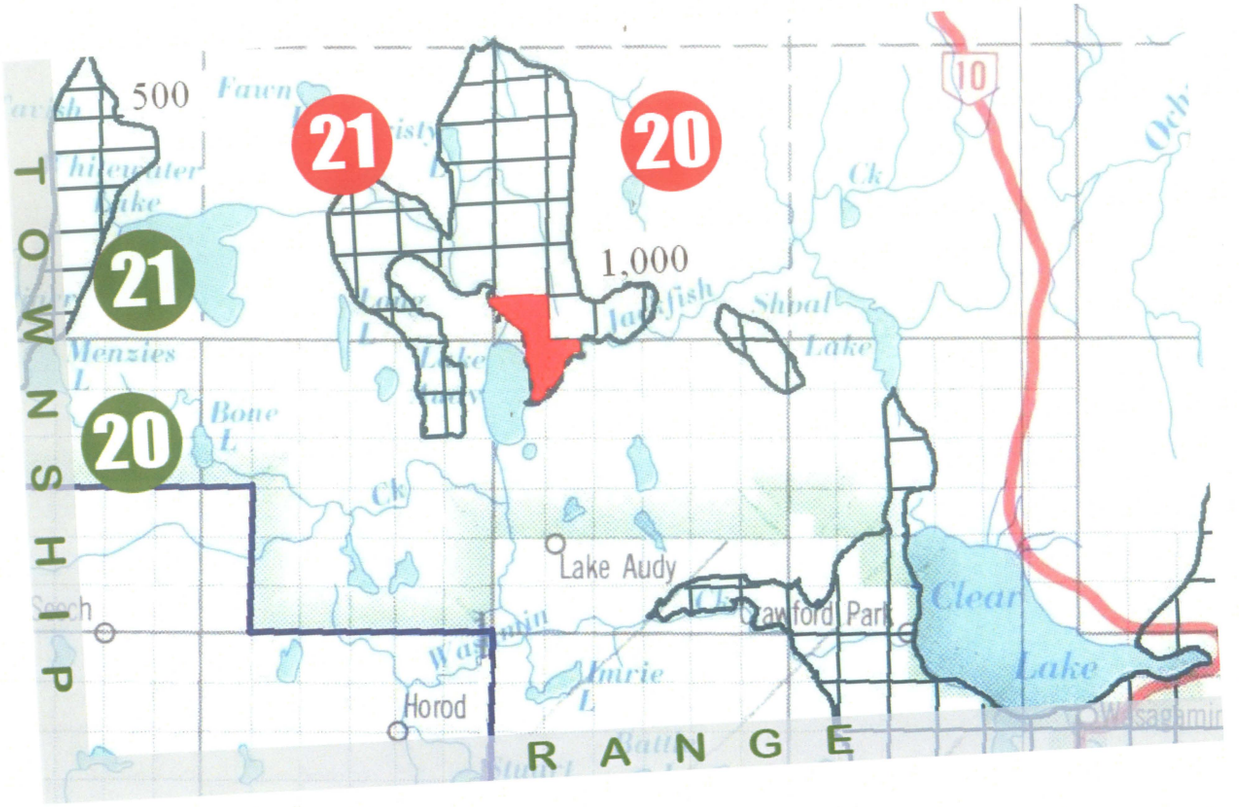


Figure 10. Bison Compound Area (1933) Superimposed on the 1916 Grazing Development Plan Map (Parks Canada, Map 105929)

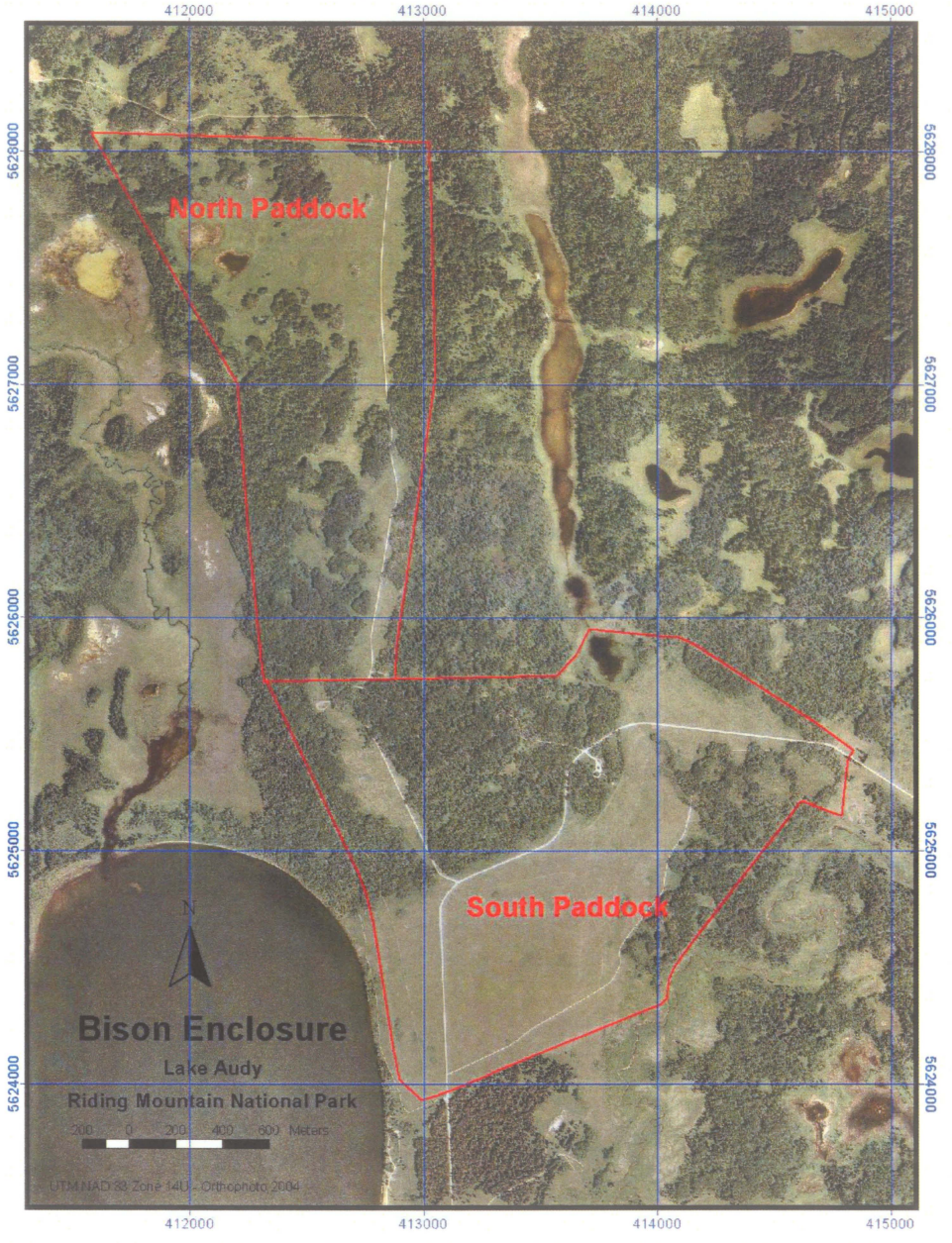


Figure 11. Aerial Topographic Photograph of the Area of the Bison Enclosure circa 1942 (Doug Bergeson Personal Communication)

Table 9. The Exhibition Herd Composition in 1931 (Bison Enclosure)

Bison	20
Elk	2
Moose	2
Total	24

Table 10. The Bison Herd Composition in 1933 (Bison Enclosure)

Bison (33)	Male	Female
A Year Old and Over	9	18
Calves	2	4
Total	11	22

Table 11. The Exhibition Herd Composition in 1933 (Bison Enclosure)

Bison	33
Elk	32
Moose	2
White-Tailed Deer	1
Mule Deer	1
Total	69

Note: Data for Tables 9, 10 and 11 are from R.M.232, pt 1, Letter, November 17, 1933

5.2.2 1937-1952

In March 1937, RMNP reported that a five-year old bison cow was found dead in the Bison Enclosure (R.M.210-1, pt 1, Letter, March 10, 1937). "A tumour was found under the hide along the neck", but the cause of the death of the animal was unknown. Acting Chief Pathologist Chas Mitchell wrote a letter to National Parks Bureau stating that "if a sample is immediately placed in 10 percent formalin and forwarded to the laboratory in Animal Disease Research Institute (ADRI), its (tumour's) nature will be determined" (R.M.210-1, pt 1, Letter, March 12, 1937; Letter, March 17, 1937; Letter, March 18, 1937). At the same time, the Superintendent of RMNP was instructed to have a veterinary inspector hold a post-mortem examination of the animals in question to find out the reason of sudden death. However, to hold a post-mortem examination of the carcass was not practicable for the Park. Therefore the sample was shipped in formalin to ADRI, Department of Agriculture, Hull, Quebec for examination (R.M. 299, pt 1, Letter, April 1, 1937). On April 6, 1937 the ADRI sent the Disease Laboratory Examination reported to O. E. Heaslip, the Superintendent of RMNP—"the animal in question is affected with Tuberculosis" since "smears made from the specimen revealed the presence of numerous acid fast bacilli" and "the appearance of the growth itself suggests that it was taken from a tuberculous animal" (R.M.299, pt 1, Report on Specimen No. L 6795, Department of Agriculture-Health of Animals Branch, April 6, 1937).

In response to the Bovine TB issue, 21 animals in the Bison Enclosure were slaughtered in November 1937, which included 8 sterile cows and all of them belonging to the original 20 animal from Wainwright (R.M.299-2, pt 1, Memorandum, August 22, 1940). The inspector stated that 2 bison were condemned on account of Bovine TB. Seven heads showed calcified retro pharyngeal lymph nodes, some slight, and other extensive (R.M.299-2, pt 1, December 4, 1937, Report on Meat Inspection of Bison at Buffalo Park, Riding Mountain, Manitoba).

In the fall of 1938, 16 surplus bison including 4 males and 12 females were slaughtered at RMNP (R.M.299-2, pt 1, Memorandum, August 22, 1940; R.M. 299-2, pt 1, October 18, 1938, Letter; R.M.299-2, pt 1, Letter, December 23, 1938). Inspector Saint attended at the slaughter and a post-mortem examination was made of all the slaughtered animals (R.M.299, pt 1, Letter, December 10, 1938). He then submitted an inspection report to the National Parks Bureau and indicated that Bovine TB was found in 2 animals: a slight lung lesion in a yearling male and lesions in the retropharangeal glands of an aged bull. Portions of both carcasses were condemned and destroyed by burning. Evidence of slight infections was noted on one animal. A small number of worm parasites were found in the peritoneal cavity of an aged animal, but those infections were slight and unimportant. Those slightly infected evidences were forwarded to the parasitologist at the University of Manitoba for further identification. The 11 young animals slaughtered including 6 males and 5 females showed the good condition. The condition of 5 older animals was far below satisfactory (R.M.299-2, pt 1, Report of Inspector, November 25, 1938).

Before the slaughter there were 76 animals in the bison herd including 18 calves. Inspector Saint thought that the Bovine TB was introduced with the original stock (16 cows and 4 bulls) seven years earlier. Therefore he recommended that Bovine TB can be controlled by keeping young breeding stock. Inspector Saint also mentioned that some cows were sterile, but there was no direct evidence indicating that the sterility came from an outbreak of Bovine TB within the bison herd. The inspector also suggested the provision should be made for closer confinement and observation just prior to slaughter if slaughter of animals was to become a regular yearly event, so that non-breeding cows or possibly diseased conditions could be more readily detected. At the end of his report, he recommended better sanitary conditions than slaughtering in the open should be provided in the future slaughter. But he did not recommend a tuberculin test (R.M.299-2, pt 1,

Report, November 25, 1938).

On December 22, 1938, inspector Saint submitted a further report to the District Veterinary Inspector, Winnipeg on the bison slaughter at RNMP as to the improvement of the herd in which Bovine TB has been demonstrated in the last two years of slaughter. He addressed the recommendation of providing the close confinement of the herd before the next slaughter in order to detect non-breeding cows and diseased animals for elimination (R.M.299-2, pt 1, Report of Inspector, December 22, 1938; R.M.299-2, pt 1, Memorandum, January 5, 1939).

Subsequently O. E. Heaslip, the new Superintendent of RMNP, did respond to all the recommendations in inspector Saint's report (R.M.299-2, pt 1, Letter, January 17, 1939). He considered that the value of an exhibition herd of bison would be lost if breeding with young stock. The value of an exhibition bison herd depended on the most attractive feature that was the large massive male. The male bison usually attain its full size by 8 or 9 years of age. During that time there was only one of the original 4 males left with the herd, and this one would be forced out by next season, which means that none of the breeding stock on the male side would be over eight years of age. As to the recommendation of "slaughter house", it was not required since the slaughter during the previous two year were very successful and no serious sanitary conditions should be worried about under the system of that time (R.M.299-2, pt 1, Letter, January 17, 1939).

In November 1939 the killing of 18 bison (7 males and 11 females, 6 one-year old and 6 two-year old and 6 mature) was carried out in RMNP (R.M.299-2, pt 1, Letter, December 4, 1939). Inspector Thompson from the Division attended this slaughter (R.M.299-2, pt 1, Report of Inspector, November 30, 1939). In his report he stated that of this number, 2 bison were found to have Bovine TB in the submaxillary glands, another 2 had Bovine TB in the bronchial and mediastinal glands and also in the lung tissue. Another bison was found to be suffering from generalized Bovine TB which existed in

the submaxillary, retropharyngeal, bronchial, mediastinal, portal, mesenteric, prescapular and popliteal glands and also in the spleen, lungs, liver and pleura. In all there were two heads, two hearts and one carcass condemned, all for Bovine TB. In total 5 bison were infected with Bovine TB; all of them were part of the original herd from Wainwright (R.M.299-2, pt 1, Report of Inspector, November 30, 1939). Inspector Thompson considered that it would be good idea if all of the original animals from Wainwright be disposed of at the next annual slaughter as it was quite possible that some of them were "spreaders" as was the one bison condemned (R.M.299-2, pt 1, Report of Inspector, November 30, 1939). After this slaughter, the consideration of constructing a stockade in the Bison Enclosure that was suitable for the close confinement of the bison for the tuberculin test was finally adopted by the Superintendent of the Park (R.M.299-2, pt 1, Letter, December 7, 1939).

In August 1940, the National Parks Bureau was asking for a statement including information such as sex and age to clarify the situation of surplus bison, elk, moose and deer in the Bison Enclosure (R.M.299-2, pt 1, Memorandum, August 15, 1940). The Superintendent of the RMNP subsequently reported that the adult population of bison was 19 males and 41 females, and 16 calves were coming in that season. The Superintendent recommended that 16 bison should have been killed in that fall including 5 males and 11 females, and those animals be of all ages from the year-olds up. The bison for elimination would be selected as unhealthy or scrubby ones until the whole herd had a tuberculin test in order to keep the herd down to 60 head. As to elk, the population had dramatically increased to 124 head without counting the natural increase of the year. This number was too large for the enclosure, and, considering the existence of Bovine TB in the bison herd, the Superintendent suggested that the Controller of the National Parks Bureau Lloyd should release some of elk (approximate 150 head) out of the Bison Enclosure to outside areas as they did three years ago (some 150 head were released)

(R.M.232, pt 1, Letter, October 28, 1937) or let those elk be hunted and slaughtered if the first recommendation was not desirable by the National Parks Bureau (R.M.299, pt 1, Letter, August 25, 1940; R.M.299, pt 1, Memorandum, August 28, 1940). Controller Lloyd believed that this would be dangerous because elk have perhaps contracted disease from the bison and if elk were released at large outside the Bison Enclosure they might have communicated the disease to the wild herd. Therefore he suggested that it would be a better idea instead of releasing any of these animals to have a slaughter of elk, making an examination of the carcasses and turning over the meat to Indians in the locality (R.M.299, pt 1, Memorandum, September 11, 1940).

As to other wild animals in Bison Enclosure including 7 white tail deer, 8 mule deer and 3 moose, the population remained the same as before and there was no need for them to be killed (R.M.299, pt 1, Letter, August 25, 1940).

With respect to the destiny of surplus elk in Bison Enclosure, several related recommendations were reviewed and discussed (R.M.299, pt 1, Letter, August 25; Letter, August 27; Memorandum, September 9). One of them would have been releasing picked animals from the enclosure to the Park area, which was the most inexpensive method. Before doing this, the Park should have slaughtered 3 of the poorest looking elk and have Bovine TB tests made. The reasons for the Park choosing this method were: 1) where elk were exposed to Bovine TB the incidence was low and most of the animals look fine and healthy; and 2) there also were plenty of elk in the park at large and nothing would be gained by releasing suspect animals. There also were some opposing views. First of all, the slaughter of a small sample would not prove anything one way or another about the condition of the elk herd. Secondly, the elk may have contracted Bovine TB by association with the bison herds. Although there was no information as to the condition of health of the elk in the Park, officials were assuming that some of them showed signs of disease the same as a certain percentage of the elk at Wainwright, and while there never

was an inspection of elk, they were suspect and not suitable for release. Therefore the second method of the disposal of the elk was recommended based on potential but obvious risk of disease contracting and prevalence, which was a large sample (100 animals), should have to be slaughtered even if the possibilities of infection were not great. The meat and hides could be used for Indian relief and the remaining animals could be retained until next year. The last method would be taking the elk herd from the Park as a donation and liberating them in some other area in the province of Manitoba where elk were extinct if the provincial government were not concerned about the health of the elk. The government would pay all costs of rounding up, loading and transportation (R.M.299, pt 1, Letter, August 25; Letter, August 27; Memorandum, September 9; Memorandum, September 11; Memorandum, November 9; Memorandum, November 20, 1940).

Surprisingly the last recommendation was supported by both Park people and the provincial authorities (J. S. McDiarmid, the Minister of Mines and Natural Resources for Manitoba). Under the provincial regulation it was illegal to shoot elk in Manitoba. Therefore J. S. McDiarmid questioned the desirability of the surplus elk in the enclosure being reduced by slaughter. Unless RMNP was confirmed that the animals were afflicted with Bovine TB he would prefer that the elk be turned loose outside the fence. The officials of Department of Mines and Resources subsequently did a preliminary investigation on the possible transfer of elk from the RMNP to the provincial areas with a view to placing a rather large area under development for fur as well as big game in October 1940, and they considered that this plan could be implemented during the early summer of 1941 if the outcome of the investigation appeared to be feasible (R.M.299, pt 1, Memorandum, September 11; Letter, September 20, 1940).

The supportive opinion from R. A. Gibson, the Director of Wild Life Division of National Parks addressed that RMNP was going to provide related help such as costs of round-up and shipment once the provincial authorities could make the decision of

transferring any elk to the provincial areas although the provincial regulations would not apply to animals in a National Park (R.M.299, pt 1, Letter, October 25, 1940). Unfortunately, no further information in the records as to the actual disposal (if it occurred at all) of the elk herd in the Bison Enclosure was found.

The annual slaughter of surplus bison was eventually carried out as usual by Scrase Brothers of Dauphin, Manitoba at the RMNP in November 1940. Sixteen bison was selected out this time as arranged before (R.M.299-2, pt 1, Letter, November, 1940). After the slaughter of 16 surplus bison in this year, the size of herd would be under 60 as a balanced situation for the exhibition herd (R.M.299-2, pt 1, Memorandum, August 15, 1940).

In May 1941, Superintendent Heaslip reported to the Acting Controller of National Parks Bureau J. Smart about a heavy mortality of the elk both inside and outside of the Bison Enclosure due to the past severe winter conditions. The animal loss in the enclosure was 20 percent and outside, the large area was 10 percent based on the result of observation and interview. The reduction was of old animals and calves. The other species were not seriously affected. Controller Smart suggested that the park wardens should have recorded sex and age of those dead animals as many as they could. And if any animals in the enclosure or at large area were hardly recovering from that harsh winter period, shooting those weak animals and looking for specific reasons such as disease would be necessary (R.M.210-1, pt 2, Letter, May 14, 1941; R.M.210-1, pt 2, Letter, May 21, 1941).

In 1941 17 bison including 14 males and 3 females in Bison Enclosure were slaughtered. Surprisingly all of the carcasses were clean. The remaining members of the herd all appeared to be in excellent conditions (R.M.299, pt 1, Letter, December 4, 1941).

Park people arranged for slaughter of 17 surplus bison at RMNP in 1942 (R.M.299-2, pt 1, Letter, October 29, 1942). The slaughter was carried on in the open by a local

butcher as in previous several years since there was no abattoir in the Park. In the following year, arrangement was made by M. Barker, Acting Veterinary Director General to provide inspection of 20 surplus bison to be slaughtered at RMNP (R.M.299-2, pt 1, Letters, November 13 and 16, 1943).

In October 1944 the both Superintendents of EINP and RMNP discussed the possibility of shipping 4 young bison from EINP to the Bison Enclosure of RMNP during the spring of 1945 as the new blood for the exhibition herd. After one month the National Parks Bureau proposed to slaughter 19 surplus bison at RMNP (R.M.299-2, pt 1, Letter, November 14, 1944). With the arrangement made by the Superintendent of RMNP, R. H. Lay, District Veterinary Inspector provided veterinary inspection for the bison meat at the Park (R.M.299-2, pt 1, Letter, November 16, 1944). Since 1937 RMNP had sent out a "call for Tenders" to nine butchers in the vicinity of the Park. Only one butcher has tendered every year, namely, Scrase Brothers of Dauphin, Manitoba. Without exception, the Scrases were taking the position of this years' tender again (R.M.299, pt 1, Letter, October 7, 1944).

Within the same year, the Superintendent of RMNP recommended to the National Parks Bureau that from 25 to 35 elk in the Bison Enclosure should be slaughtered and the meat be used in some camp during the winter. This recommendation was eventually approved by Controller J. Smart; 28 female elk were slaughtered on November 25, 1944. The first 9 animals were examined by the Federal Veterinary Inspector Craig and none of them were infected with Bovine TB or other disease (R.M.299, pt 1, Letter, November 27, 1944).

In January 1945, B. I. Love, the Superintendent of EINP visited the RMNP to inspect the bison herd in the enclosure (R.M.299, pt 1, Report on Bison at RMNP, January 30, 1945). In his report he stated that there were 60 head of bison and the entire herd was sexually well-balanced, in good flesh and well cared for. The winter feed was of

good quality hay and well distributed over the feed area. The water supply was also good in quality. Until then, there were two enclosures comprising 9.3 square kilometers as ideal bison grazing areas. Although the living condition for the bison herd was well contained, the enclosures were not as good as it should be—there were no records of post mortem examination of the bison herd. As to the elk herd in the Bison Enclosure, it was quite possible that they were infected with the Bovine TB since they were in frequent contact with the diseased bison herd. Considering this situation, B. I. Love made some suggestions: 1) all exhibition animals, both bison and elk, should be confined to one of the two enclosures, and the left one should be kept vacant until June 1946; 2) the entire herd of bison and entire exhibition herd of elk should be slaughtered in the fall of 1946; 3) one or two carload of bison should be transferred from Elk Island Park in June 1946 and then liberated in the enclosure which has been held vacant; 4) a separate enclosure should be created in the future for an exhibition herd of elk. He also mentioned that the alternative in cleaning up the disease would be the application of the Bovine TB test and the slaughter of the reactors, which would be "a long drawn out process in the case of bison and would be likely to create unfavorable publicity". Since B. I. Love was in charge of introducing the new blood into the Bison Enclosure, he personally preferred to take the first recommendation. The plan of creating an isolated area and replacing the present herd with healthy animals was also supported by the Superintendent of RMNP as the best way of eradicating the Bovine TB in the bison and elk herd (R.M.299, pt 1, Report on Bison at RMNP, January 30, 1945).

After receiving inspector Love's report, the Controller of the National Parks Bureau, J. Smart, consulted Barker, Veterinary Director-General of Department of Agriculture to ask his professional opinion about this issue (R.M. 299, pt 1, Letter, March 26, 1945; R.M.299, pt 1, Letter, April 3, 1945). Director Barker believed that the bison herd at the RMNP was extensively infected with Bovine TB. The slaughter of this herd would

eliminate the disease. It would also be necessary to thoroughly clean the place by collecting and burning all manure and litter within the enclosure and disinfect all buildings. If one of the enclosures was maintained vacant for one year, then this enclosure would be safe for healthy animals. He also was concerned about the health of young animals from EINP. Giving tuberculin test to those young animals would be the priority before the shipment (R.M.299, pt 1, Letter, April 3, 1945). The succeeding letter from B. I. Love clarified this concern that all bison, for transfer or export from Elk Island Park, were Tuberculin tested before shipment. This explained the reason why he did not incorporate this important fact in his report and why the post mortem examination did not reveal the presence of Bovine TB in the Elk Island Herd. He believed that if his recommendations were carried out together with the slaughter of the enclosed elk herd, and a separate enclosure created for an exhibition herd of elk, the Bovine TB free herd of bison would be maintained at RMNP as well as at Elk Island Park (R.M.299, pt 1, Letter, April 14, 1945).

Ultimately RMNP carried out some of B.I. Love's recommendations for the bison and elk exhibition herds. The vacant enclosure was thoroughly cleaned; all manure and litter were collected and burned with special sterilizing methods. Precautions were taken to insure no domestic fowl or stock was permitted to enter the enclosure (R.M.299, pt 1, Letter to The Superintendent, RMNP, Wasagaming, Manitoba, May 11, 1945).

Meanwhile RMNP planned to slaughter 80 bison once they cleared all the animals out of the small enclosure (1.6 square kilometers) and moved the bison herd into the large enclosure (about 7.7 square kilometers in size). Building a corral would be necessary before the slaughter so that a small herd of 15 or 20 bison could be allowed to drift into the corral. Those 80 bison were slaughtered separately as several small herds to keep the whole bison herd balanced. As to the elk and deer herds, they presented a real problem since the Park needed to spend the entire winter to remove them out of the enclosure. The

Park Superintendent suggested that a fenced enclosure between 1.6 - 2 square kilometers within the present large one be built so that the large enclosure would contain all animals until 1946. Both the present 1.6 square kilometers small enclosure and the suggested new one could be used in the future as bison range. The elk herd would be reduced and remained in the rest part of the large enclosure. Thus there would be no danger of disease infection between new bison herd and elk herd inside the Bison Enclosure. This better plan (a smaller enclosure within the large enclosure) without mixing different species would protect the new bison herd from elk and other wildlife. The new third enclosure would bring the bison herd in proximity to the animal-keeper's cabin and assure closer attention to the bison herd (R.M.230, pt 1, Letter, June 14, 1945).

By June 1945, it was decided that the best plan would be to create a smaller enclosure and place about 10 of the best bison in this new enclosure. RMNP was to slaughter the remainder in the fall of 1945, and kept these 10 bison in that enclosure until they could be disposed of later. The small enclosure would have to be cleaned up and kept dormant for new Bovine TB free animals introduced from EINP. This plan would insure the RMNP with bison for any period of time (R.M.230, pt 1, Letter, June 20, 1945).

The specific procedure for the plan was: 1) the 1.6 square kilometers enclosure as the enclosure No.1 should have been held vacant since the winter of 1944 and would remain so until the spring of 1946 when it would be safe to receive the new herd from EINP; 2) the large enclosure would be divided by the construction of a fence on the south side of the road from the warden cabin to the corner of the enclosure No.1. This portion of the large enclosure, together with the enclosure No. 1, would constitute a 3.3 square kilometers area and become the permanent bison enclosure. All elk and other animals would have remained on the north side of road; 3) the new fenced enclosure would remain vacant for one year and be thoroughly cleaned before it could be opened to the

selected bison herd; 4) it was proposed to make a corral within the new enclosure that could be used at the time of slaughter. A drift fence of approximately 400 meters would shape this corral. All buildings in the vacant enclosure to which the animals have had access were to be thoroughly disinfected. To complete the new enclosure and the corral, 4 kilometers of high fence was required (R.M.230, pt 1, Letter, July 3, 1945).

During the fall of 1945, there was 76 head of bison in Bison Enclosure. The status of those animals was examined by B. I. Love again. After all the examination, he made some recommendations which included 1) the present herd should have been slaughtered; 2) those enclosures for future bison herds should have been thoroughly cleaned and held vacant areas for one year; 3) the enclosure No.1 would be prepared for the new bison herd from the EINP; 4) the RMNP should have been built strict observation in isolation in relation to domestic stock and fowl (R.M.230 pt 1& R.M.299 pt 1, Letter, October 24, 1945). Meanwhile H. F. Lewis provided some detailed concerns to the Controller of National Parks Bureau after he discussed the bison situation with the Superintendent of RMNP: 1) the RMNP kept a fenced area of 1.6 square kilometers southwest of the road near Lake Audy where no hoofed animals of any kind has been allowed since the spring of 1944; 2) the Superintendent of RMNP has desired to receive new stock of bison with Bovine TB Test from EINP early the summer of 1946 and to place these animals in this 1.6 square kilometers area, which would then have been vacant for more than a year; 3) other fenced areas, on each side of this area, could be added to the 1.6 square kilometers area after they have been left vacant for more than a year, thus making a total fenced area for bison of 3.3 square kilometers. These additions could probably be made in the late autumn of 1946 or the early winter of 1946-1947; 4) no deer or elk in the area occupied by the bison; 5) the Park should have kept deer and elk in the remaining fenced enclosure north-east of the road near Lake Audy and no bison in this area; 6) all bison in the enclosure at RMNP should have been slaughtered in the fall of 1945. Retrospect to the

first report provided by B. I. Love in January 1945 suggesting that "the entire herd of bison and entire exhibition herd of Elk should be slaughtered the fall of 1946", the realistic situation in RMNP made the eradication of all the elk and deer impossible. Therefore H. F. Lewis suggested that whether or not all the elk within the existing enclosure were to be slaughtered as well as the bison should be definitely decided by the National Parks Bureau. He also recommended that a revised program should be submitted to the Veterinary Director General (R.M.230, pt 1, Letter, October 10, 1945).

After comparing the different opinions of B. I. Love and H. F. Lewis, J. Smart, the Controller of the National Park Bureau, believed that there was no need to slaughter all deer and elk in the fenced enclosure if the plan from the Superintendent of RMNP would be followed since all bison would henceforth be kept separate from deer and elk, and confined to the other side of road. The Controller Smart expressed this concern to M. Barker, the Veterinary Director-General (R.M.230, pt 1, Letter, October 15, 1945). M. Barker eventually agreed that the whole procedure in controlling of Bovine TB in the bison herd without too much concern with the elk and deer herds would be more practical (R.M.230, pt 1, Letter, October 19, 1945).

In October the Department finally approved the slaughter of 51 head of bison in Bison Enclosure (R.M.299, pt 1, October 29, 1946, Letter; R.M.299-2, pt 1, November 17, 1945, Letter). Park officials were in charge of the animal selection. The remaining stock would be placed in the large enclosure with the elk and deer, and slaughtered in next fall after the new stock of bison arrived. The department also decided that the new herd of bison would be placed in enclosure No.1 that was totally clean (R.M.299-2, pt 1, Letter, November 17, 1945).

According to the report dated on November 28, 1945 from Inspector H. W. Craig, 16 bison carcesses showed Bovine TB lesions after those 51 bison were slaughtered (31.37% of reaction rate). Thirteen of them showed Bovine TB lesions in

retro-pharyngeal gland; the fourteenth showed Bovine TB lesion in both retro-pharyngeal gland and mesenteric glands; the fifteenth showed Bovine TB lesion in both retro-pharyngeal and bronchial glands; the last one showed Bovine TB lesion in retro-pharyngeal, mesenteric and bronchial glands (R.M.299-2, pt 1, November 28, 1945, Report of Inspector; R.M.299-2, pt 1, December 13, 1945, Letter).

On April 1 1946, 20 head of bison consisting of 4 males and 16 females from EINP were shipped by train to RMNP without serious injury. Warden Cotton from Wainwright was again in charge of this shipment. Before this shipment, all 20 bison were tested for Bovine TB as negative. In the fall (1946) the Department of Agriculture proposed to slaughter 32 surplus bison at RMNP (R.M. 299, pt 1, November 18, 1946, Letter; R.M.299, pt 1, November 23, 1951, Memorandum; R.M.299, pt 1, November 19, 1951, Memorandum).

In order to reduce the overpopulation of elk and to encourage vegetative regeneration in the RMNP, National Park Bureau authorized a reduction slaughter of 200 elk outside of the Bison Enclosure in the autumn of 1947 (R.M.299-2, pt 1, Letter, September 30, 1947). The elk was going to be slaughtered in the Morgate road, Dauphin road and Audy Road Districts. This slaughter was to be non-selective with no preference shown to age or sex (R.M.299, pt 1, Reply Letter, September 30, 1947). However, Superintendent Heaslip discussed with the Minister about the postponing of the slaughter inside the park since the open elk hunting season permitted by the Provincial Government (Greater Winnipeg Game and Fish Association) was conducted outside of Park during that time (R.M.299. pt 1, Memorandum, December 26, 1947). There were about 1,200 or 1,500 elk hunting licenses sold by the Provincial Government and it was reported that around 100 elk were killed in the vicinity of the Park area (R.M.299, pt 1, Letter, January 5, 1948). Since the elk number would definitely be reduced after the hunting season, Superintendent Heaslip recommended that further elk slaughters should have not been

considered for the following 12 months on account of possible public opinion against further slaughter in this year (R.M.299. pt 1, Memorandum, December 26, 1947). As to this issue, the response from H. F. Lewis stressed that the elk herd (outside of Bison Enclosure) supported by the Park was far in excess of the carry capacity of the vegetation and if the prescribed management steps were not taken the typical irruptive cycle of the grazing condition would continue (R.M.299, pt 1, Letter, January 5, 1948).

At the beginning of December 1951, RMNP slaughtered 27 head of bison, and the slaughter was supervised by an invited inspector Reek (R.M.299, pt 1, Letter, November 27, 1951; R.M. 299, pt 1, Memorandum, September 3, 1952).

In 1952, the overgrazed situation appeared in the Bison Enclosure (R.M. 299, pt 1, Memorandum, September 3, 1952; R.M.299, pt 1, Letter, September 9, 1952). In December, 24 bison were slaughtered at RMNP, and B. I. Love attended this process as an examiner (R.M.299, pt 1, Letter, December 13, 1952; R.M.299, pt 1, Memorandum, December 22, 1952). After slaughtering, B. I. Love reported that the post mortem of all the killed animals revealed no trace of disease or parasite infection, which means all the bison in this herd were in good condition (R.M.299, pt 1, Letter, December 13, 1952).

Table 12 summarizes the bison slaughter between 1933 -1952 in Bison Enclosure at the RMNP.

Table 12. The Bison Slaughter in Bison Enclosure at RMNP (1933-1952)

Year	Total No. of Bison	No. of Slaughtered Bison	No. of Bovine TB Reactors
1933	33	0	0
1934	42	0	0
1935	54	0	0
1936	65	0	0
1937	81	21	3
1938	76	16	2
1939	---	18	5
1940	76	16	---
1941	---	17	0
1942	---	17	---
1943	----	20	---
1944	---	19	---
1945	----	51	16
1946	---	32	0
1947	---	0	---
1948	---	0	---
1949	---	---	---
1950	---	---	---
1951	87	27	---
1952	74	24	0

Note: --- means the data are unknown.

5.2.3 1953-1956

In both April 1953 and July 1954, mammalogist J. Tener visited RMNP to investigate the wildlife situation including the status of wolves, elk, elk depredation, possible curtailment of grazing and haying permits in the Park and the need for a further bison slaughter. Most of his information was obtained from park wardens since it was so difficult to observe the status of ungulate and predator population in such a short visiting time. All the wardens reported a scarcity of elk although an overpopulation of elk existed in the Park for previous several years. Also, open hunting seasons outside of the Park during 1950, 1951 and 1952 had removed several thousands of elk, mainly cows, yearling and calves. This selective hunting considerably reduced the number of cows available to produce offspring. It would have taken the elk population several years to resume its normal composition. Therefore J. Tener suggested that the hunting season of 1953 should have been a short one rather than the long one as two or three months. The poaching in RMNP presented another serious issue. The long hunting season permitted in the previous years made law enforcement very difficult in the Park. Nearly 300 cases were brought to court (R.M.300, pt 1, Analysis of the Wardens' Wildlife Cards, RMNP, April 6, 1953; R.M.300, pt 1, Letter, April 28, 1954; R.M.300, pt 1, Wildlife Investigation, RMNP, August 12, 1954; R.M.300, pt 1, Letter, August 26, 1954).

Regarding grazing and haying in the Park, the neighboring farmers were granted permission to remove forage available to the elk population by either haying or grazing domestic livestock, which interfered with the winter food supply for elk herds in some degree. It was possible that this reduction in the amount of available food for elk may have made elk leave the Park during the winter months. In 1953 a total of 102 grazing permits and 96 haying permits were issued by the Park. In 1954 there were 83 grazing permits and 37 haying permits issued until August. Although the permits number was lower than 1953, J. Tener figured that it was helpful if the number of haying and grazing

permits could have been reduced by refusing to issue such permits to both new permittees and the original permittees who had given up their rights by not obtaining the permits in consecutive years until cattle grazing and hay cutting could be finally eliminated from the Park (R.M.300, pt 1, Analysis of the Wardens' Wildlife Cards, RMNP, April 6, 1953; R.M.300, pt 1, Letter, April 28, 1954; R.M.300, pt 1, Wildlife Investigation, RMNP, August 12, 1954; R.M.300, pt 1, Letter, August 26, 1954).

Until 1954, 62 head of bison including 17 calves, 14 males and 31 females stayed within the northern part of summer range of the Bison Enclosure at the RMNP. The southern portion of the bison range (around 1.1 square kilometers) was heavily overgrazed. This was the possible result of too many animals and too early grazing occurred in the spring. J. Tener, therefore, recommended that the Park should have reduced the size of the bison herd to make the number not more than 25 or leave the overgrazed portion of summer range vacant for several years until the good forage could be provided (R.M.300, pt 1, Analysis of the Wardens' Wildlife Cards, RMNP, April 6, 1953; R.M.300, pt 1, Letter, April 28, 1954; R.M.300, pt 1, Wildlife Investigation, RMNP, August 12, 1954; R.M.300, pt 1, Letter, August 26, 1954).

Superintendent Heaslip of RMNP expressed his concerns to Tener's report. Because the bison herd in Bison Enclosure was primarily an exhibition herd to attract tourist to visit, he believed that "a count of visitors who have to drive at least fifty miles from the townsite to see those animals shows that during days the numbers often reach into hundreds, and on weekends they have had as many as 1,500 people go through the gates". He considered that an exhibition herd should have been seen in a natural surrounding instead of a cultivated, disked and seeded field. Clearly Superintendent Heaslip showed the opposite attitude regarding the slaughter of certain number of bison since 25 bison would be invisible in this 4.9 square kilometers enclosure (R.M.300, pt 1, Letter, November 30, 1954).

On March 1955, Chief Mammalogist A.W. F. Banfield of Canadian Wildlife Service visited the RMNP and interviewed new Superintendent Mitchell and Chief Warden Allen regarding to the wildlife situation specially elk in the Park. From the point of view of Warden Allen, the elk population in the Park had dramatically declined in previous several years because of the heavy killing occurred outside of the park and the poaching inside of the park. He estimated that the total population of elk was around 2,000-3,000. Chief Banfield was accompanied by Warden Allen to examine the situation in the Bison Enclosure. They both considered that some actions should have been taken to improve the situation of the overgrazing in the enclosures such as a one-way disc that could help clean the shrubby cinquefoil and plant new seeds of good grass. Although Chief Banfield and the Superintendent Mitchell agreed that the elk in the larger enclosure (south part of Bison Enclosure) [Figure 11] should have been released, Warden Allen also was concerned about the potential disease risk that the elk posed. Therefore the further specimen examination was needed to clarify the risk (R.M.300, pt 1, Aerial Surveys of Big Game RMNP, March 1955; R.M.300, pt 1, Letter, May 11, 1955; R.M.300, pt 1, Memorandum for the Chief-Game conditions, Riding Mountain Park, May 20, 1955).

In 1955, an aerial survey of big game in the RMNP was carried out. This survey covered six percent of the Park Area, and indicated that the main herd of elk could be found in the Lake Audy area (R.M.300, pt 1, Memorandum-Aerial Survey of Big Game RMNP, 1955, April 22, 1955).

In 1956, the aerial survey of big game searched the entire RMNP through covering the only half of the transect. The estimate of the elk population was 5,200, representing a density of 1.76 elk per square kilometer of the transect area. This population showed 100% increase over that obtained in 1953. Most elk herds were congregated around the fringes of the Park and within a distance of approximately 8 kilometers of the boundary. There were very few elk in the central area of the Park. Therefore this population estimate

was questionable since the elk observation in the area of transects to the Park should have been fully covered rather than only half of them. Lack of funding was the main obstacle to fly all transects as in the previous year. However there was no sign of elk or moose shortage in the RMNP (R.M.300, pt 1, Memorandum for The Director - Big Game Survey - RMNP, February 12, 1956; R.M.300, pt 1, Aerial Survey of Big Game, RMNP, March, 1953; R.M.300, pt 1, Letter, April 9, 1956).

5.3 Conclusion

The historical records regarding the bison and elk slaughter for Bovine TB in the RMNP were ended in 1956. It was assumed that exhibited bison and elk herds were respectively maintained in the north part (small enclosure) and south part (large enclosure) of Bison Enclosure [Figure 11]. Unfortunately no historical records were found that would identify the ending date of the exhibition of both bison and elk herds in the Bison Enclosure. As a hypothesis, it was considered that Bovine TB did not threaten those free ranging ungulates in the Park any more until the recent outbreaks in 1990's.

Table 13. Estimated Elk Population in RMNP between 1950-1956

Year	1950	1951	1952	1953	1955	1956
Elk/Sq. Kilometer	1.60	1.60	1.54	0.82	0.39	1.76
Estimated Population	4700	4700	4500	2500	1100	5200

Note: The estimates for the years 1950 to 1953 were based on a sample of 224.6 square miles and the years 1955 and 1956 are based on a sample of 71.2 square miles.

Chapter 6 Land Use Issues in RMNP Ecosystem

6.1 Introduction

RMNP was created from the larger Riding Mountain Forest Reserve (RMFR). After it was officially opened in 1931, RMNP went through three revisions of boundaries. However, RMNP remained the same size (2,960 square kilometers) from 1931 to 1954.

6.2 The Phase of Riding Mountain Forest Reserve (RMFR) (1913-1930)

The original RMFR occupied an area of over 80 kilometers in length from East to West and varying from 19 to 38 kilometers in width from North to South, containing about 2,000 square kilometers of territory (R.M.2, pt 2, The Brochure of The Advantages of the RMFR as a National Park for Manitoba, January 30, 1928). In 1921, some lands were recommended to be reserved for addition to the RMFR (R.M.2, pt 1, Letter, October 28, 1921). Prior to that, these areas were not included in the RMFR since all of the lands were withdrawn from the Forest Reserve for purposes of soldier settlement in 1919. Through later examination, those withdrawn areas lying along the south shore of Clear Lake on either side were deemed not to be suitable for settlement purposes but good for summer resort camp and recreational purposes. Therefore those lands were approved to re-include to the RMFR under the October 12th, 1921 Order in Council (R.M.2, pt 1, Order in Council, October 10, 1921; R.M.2, pt 1, Letter, October 28, 1921).

Following is the detailed list of re-included lands.

In Township 19, Range 19 W.P.M

Those portions of the N.½ of Section 29, the N.E.¼ of Section 30, the S.E. ¼ of Section 31, and the S. ½ of Section 32 lying south of the south shore of Clear Lake.

In Township 19, Range 19 W.P.M

That portion of Section 25, lying south of the south shore of Clear Lake, that portion of Section 26 not included in Clear Lake, those portions of the N. ½ of Section 27, and the S.W. ¼ of Section 34, lying south of the south shore of Clear Lake and that portion of the E.½ of Section 33 lying west of the west shore of Clear Lake.

In Township 20, Range 19 W.P.M

That portion of the E. ½ of Section 4 lying west of the west shore of Clear Lake.

The RMFR accordingly became a new territory.

In 1928, W. J. Word (M. P.), J. A. Clen (M. P.), and Robert Milne (M. P.), recommended the establishment of the entire RMFR as a Dominion Park to the Federal Government. They all advocated that the smallest area would protect the scenic features. W. J. Word also suggested the boundary to the Minister, which should be extended easterly to protect the possible golf course layout at the northeast corner of Clear Lake. This idea of creating a National Park was adopted by the Minister of Interior and the details related to the establishment were initiated (R.M.2-1, pt 1, Memorandum, August 24, 1928).

In response to the Minister's request, on February 1929, R. W. Cautley (District Land Surveyor) recommended the boundaries of the proposed RMNP. He described the details in his statement: Sections 28, 29, 30, 31, 32, and 33 in Township 19, Range 17; all those portions of Township 19, in Range 18 and 19 lying within the RMFR; the west half of the Township 20, Range 17; the whole of Township 20, Range 18; all that part of Township 20 in Range 19 lying within the RMFR; all of which above lands are situated West of the Principle Meridian and comprise 280 square kilometers more or less. Most important to the success of the Minister's plan was that all factional sections along the south shore of Clear Lake shall be secured and included within the above described area (R.M.2, pt 2, Letter, February 11, 1929). The Minister of Interior subsequently

constructed a plan for the formation of a national recreational area that accepted R. W. Cautley's suggestion for the arrangement of the boundaries (R.M.2, pt 2, Letter, February 11, 1929).

At the same time, this recommendation of the establishment of a National Park was affirmatively supported by the public, municipalities and Boards of Trade in Manitoba. But some details stated in the Minister's plan, unfortunately, were not fully agreed to by all of the public. They believed that the area designated by the Minister of Interior would not fulfill the purposes of establishing a National Park because 1) only 280 square kilometers of territory was not sufficiently large to provide a game sanctuary, to permit of the construction of motor drives or to prove an attraction to tourists; 2) the boundaries of the proposed territory designated by the Minister did not include some splendid camping sites and many points of scenic beauty existing in the RMFR. Therefore local municipalities such as Dauphin, Rosedale, Grandview, Russell, Ste Rose and Swan River and Boards of Trade such as Gladstone and Pilot Mound in Manitoba jointly submitted a resolution to the Minister. They suggested in their resolution that 1) the RMFR as a whole should be converted into a National Park and administered and developed as so; 2) the RMFR should be retained as a Forest Reserve so that the rigid protection of game within its boundaries could be achieved; 3) recreational features should be recognized and developed such as motor drives, a standard trunk highway through the Reserve from north to south, and camping sites, golf courses and so on to attract tourists; 4) more staff should be assigned to regulate and control the recreational activities in addition to the regular forestry staff (R.M.2, pt 2, Grandview Meeting File, March 30, 1929; R.M.2, pt 2, Swan River Meeting File, April 2, 1929; R.M.2, pt 2, Reeve & Rosedale Meeting File, April 3, 1929; R.M.2, pt 2, Russell Meeting File, April 5, 1929; R.M.2, pt 2, Gladstone Meeting File, April 8, 1929; R.M.2, pt 2, Dauphin Meeting File, April 1929;).

Notwithstanding the lack of records on further events, it was assumed that the

resolution advocated by the broad public bodies was accepted by the Department of Interior and the entire RMFR was added into the area of National Park.

Under the Authority of Order in Council of the 28 December 1929, P.C. 2510, the land comprising RMFR were by proclamation, designated a Dominion Park to be known as Riding Mountain National Park (R.M.2-1, pt 1, Order in Council, December 28, 1929).

6.3 The Creation of RMNP

On July 1931 the Minister of Interior made a suggestion to National Parks Branch that the Dominion release the west end of RMNP, provided the Province would arrange for the inclusion of a strip of land to the south of Clear Lake (R.M.2-1, pt 1, Memorandum, July 27, 1931). The proposed area contributed by the Province covered the portion of the Park from Range 22 to the westerly boundary. To explain the feasibility of this suggestion, meanwhile, the Minister of Interior demanded that the National Parks Branch prepare an investigation report for all involved parts. One month later, a detailed report was successfully accomplished by Chief Engineer Wardle of National Parks Branch (R.M.2-1, pt 1, Letter-Proposed Boundary Revision, Riding Mountain Park, August 7, 1931; R.M.2-1, pt 1, Memorandum, October 30, 1931).

First of all, he explained the several reasons why those two proposed areas needed to be exchanged. The main reasons for the exclusion of the western section of the Park included: 1) the land was suitable for agriculture purposes and had similar characteristics to that successfully cultivated outside the Park; 2) there was not enough first-class or merchantable timber in the area to justify conservation, even the reproduction of spruce in this area was not at all promising; 3) the value of the area as an attraction for tourists is practically nil; 4) its administration presented certain difficulties. The first two statements were based on Evan's report. In 1923 the Land Classification Division of the Survey's Branch, Department of the Interior, made a land classification survey of land now in the

Park from range 20 to the western extremity of the Park. The survey report from Evans mentioned the soil and timber conditions in this area (R.M.2-1, pt 1, Letter-Proposed Boundary Revision, Riding Mountain Park, August 7, 1931).

The main reasons for extending the Park's southern boundary in the vicinity of the Clear Lake subdivision, Clear Beach included: 1) the extended subdivision was, and would always be the centre of activity and development. Obviously the existing boundary would cramp the future expansion and prevent full use of natural facilities; 2) with the southern boundary so near to the present centre, private interest can develop enterprises close enough to the Park townsite to compete with businesses in the Park and still be outside the control of Parks regulations; 3) the present southern boundary was restricted the Park entrance which was too close to the townsite or subdivision, and created a wrong impressions as to the size and scope of the Park.

As to the certain lands adjacent to the southern Boundary of the Park in the Vicinity of Clear Lake, he presented two possibilities for a revised plan: 1) the boundary would embrace an ample area for all park purposes and an extension to the south of about one mile would be achieved; 2) the boundary would embrace a slightly smaller area which might be regarded as a minimum for park purposes and an extension to the south would be one-half mile. With both possibilities of the extension, the Park secured the southwest quarter of Section 18, Township 20, Range 19, West of the Principle Meridian (W.P.M), which lies to the northwest of Clear Lake. The south boundary might be straightened out which means eliminating all of Township 18, Range 16, W.P.M, the easterly portion of township 18, Range 17, W.P.M., and the southerly portion of Township 20 Range 21. In addition, the irregular north-east boundary of the Park would also be straightened out, that helped the Park simplify related matters (R.M.2-1, pt 1, Letter-Proposed Boundary Revision, Riding Mountain Park, August 7, 1931; R.M.2-1, pt 1, Memorandum, October 30, 1931).

Specifically, the Province would obtain roughly 1,130 square kilometers, in exchange for 20 square kilometers if taking the first possible option as large extension. The Park people agreed that a large area would be more appropriate and better for Park's development. But in any case, it seemed that the value of the western area as farmland was greater than the total value of the small improved area required from the Province. Furthermore, once the exchange took place, the certain homesteads in the Clear Lake area would be cancelled by the Province under the regulations. No doubt the Province would pay out actual cash for compensation prior to receiving any moneys for homesteads in the released area. So the attitude of the Province would largely govern the boundary lines to be adopted (R.M.2-1, pt 1, Letter-Proposed Boundary Revision, Riding Mountain Park, August 7, 1931; R.M.2-1, pt 1, Memorandum, October 30, 1931).

Moreover, Engineer Wardle indicated that the land of South Clear Lake to be acquired for parks purposes was by no means superior in agriculture possibilities to the western portion being excluded from the Park. Although excluding the western boundary would make wild animals drift east during the hunting season, no serious loss to park game would result.

Wardle's report truly convinced the National Parks Branch that the westerly portion of the park might reasonably be eliminated as its chief value from a park's point of view was as a game preserve. Therefore the Controller of National Parks suggested the negotiations might be opened with the Province to see if an adjustment of the boundaries along the lines suggested by Wardle could be carried out (R.M.2-1, pt 1, Letter-Proposed Boundary Revision, Riding Mountain Park, August 7, 1931; R.M.2-1, pt 1, Memorandum, October 30, 1931).

At the same time, Commissioner Harkin of National Parks Branch, recommended the above suggestion to the Superintendent of RMNP. Since Wardle's report did not provide valuation figures for the buildings and improvements on the proposed south

extension, Superintendent Smart of RMNP was asked for collecting such information as further reference for the Province and the Minister of Interior (R.M.2-1, pt 1, Letter, September 1, 1931; R.M.2-1, pt 1, Letter, September 9, 1931).

On February 1932 the Provincial Game Commissioner advised the Provincial Department of Mines and Natural Resources to make the western boundary area of RMNP lying the west of Range twenty-one (21) into a public shooting ground. McKenzie, Minister of Mine and Natural Resources for the Province of Manitoba referred this request to Superintendent Smart. The Superintendent indicated that the only premise of making this request was that this portion of area withdraws from RMNP and turn over to the Province of Manitoba. Otherwise the public shooting ground cannot be opened as long as this area was part of RMNP (R.M.2-1, pt 1, Letter, February 18, 1932; R.M.2-1, pt 1, Memorandum, March 16, 1932). In October, the Minister of Interior wrote new Minister McDiarmid of Mines and Natural Resources for the Province of Manitoba a letter to suggest the plan of exchanging land between the Province and RMNP. As a reply, McDiarmid presented his opinion on February 1933. He stated that the Province would be glad to transfer all the lands lying within the proposed additional area that were owned by the Provincial Government free of cost. In regard to buying out the privately owned lands in the proposed southern extension, McDiarmid advised "..the Province unfortunately is not in a position at the present time to assist in assuming any part of the financial responsibility." He also advised the Minister that "I prefer to leave this matter open at present to be taken up again at a time mutually convenient". At the end of his letter, McDiarmid attached a list of owners of land in proposed areas South of Clear Lake for assistance in the Park's future decision making in case it might be possible to obtain the necessary funds to purchase the lands required for the Park extension.

Based on the list organized by McDiarmid, Superintendent J. Smart developed a detailed evaluation report of all the Sections that would be for sale to the Province for the

Park's southern boundary extension. He reported in May 1933 that pending the acquiring of the lands within either the small or large extension, the Park could possibly be satisfied with acquiring the N.W. ¼ 19-19-18 W.P.M and the N.E. ¼ 24-19-19 W.P.M. This would put the park boundary half mile further south of Wasagaming townsite and would stop private individual from starting undesirable enterprises near it.

Both these quarter sections were patented--the parcel N.W. 19-19-18 (North West Quarter of Section 19, Range 19, Township 18) W.P.M (West of the Principle Meridian) was owned by Pollon. Superintendent Smart valuated this section at $1,473; the Parcel N.W. 24-19-19 W.P.M was owned by Dean. Since it was bush land, the Superintendent valuated the total 647,520 square meters at $800 (R.M.2-1, pt 1, Memorandum, July 19, 1934).

There were another two sections including Parcel S.E. 30-19-18 W.P.M and Parcel S½ and N½ of S½ 29-19-18 W.P.M that were within the small extension boundary and fitting Park's satisfaction. Parcel S.E. 30-19-18 W.P.M was transferred to the province of Manitoba as natural resources. Parcel of S½ and N½ of S½ 29-19-18 W.P.M was undisposed school lands according to a report from the Province dated the November 1931. The Province undoubtedly would transfer it to the Dominion free of charge, if so requested (R.M.2-1, pt 1, Memorandum, July 19, 1934).

Except the preceding four parcels of land, Superintendent Smart also evaluated both the small and large South Clear Lake extension. A total 12 parcels of land were valuated for future government expropriation compensation in small extension and a total 24 parcels of land including an additional 12 sections were valued in the large extension (R.M.2-1, pt 1, Memorandum, July 19, 1934).

According to J. Smart's statement, three of parcels within the small extension boundary and three additional parcels within the large extension boundary were patented to the Soldier Settlement of Canada at the request of the settler in accordance with the

provisions of the Order in Council of the 4 June, 1921, in order that the settler might sell the property if so desired. One parcel within the small extension boundary and three additional parcels within the large extension boundary were soldier reservations, which, if they were not required for the park extension, would be transferred to the Soldier Settlement of Canada for the benefit of the settlers. However, those soldier settlers signed contracts with the Soldier Settlement of Canada for the land owning and the Park should treat them like ordinary private landowners if their lands need to be expropriated by Park Extension (R.M.2-1, pt 1, Memorandum, July 19, 1934).

Although great efforts were put into this Land Exchange matter by the National Parks Branch, no further progress was actually achieved until 1934. On March 1934, the owner of the parcel N.W. 19-19-18, W.P.M agreed to accept $2,200 as full compensation for expropriation of his land (0.65 square kilometers) and buildings under the authority of Order in Council. As to the Parcel N.W. 24-19-19 W.P.M, the owner Dean was trying to ask for $3,260 as the compensation for expropriation of his land (0.65 square kilometers). However this was much higher than the price of $1,100 offered as appraised by the National Parks Branch. Thus no further agreement was reached between the owner Dean and the Park (R.M.2-1, pt 1, Committee Meeting File, March 29, 1934; Memorandum, July 23, 1934; Memorandum, July 25, 1934; Memorandum, August 24, 1934; Letter, September 14, 1934; Memorandum, November 1, 1934).

Surprisingly National Parks Branch and the Province both were keeping silent to this proposed land extension plan in succeeding years. It seems they were waiting for a better occasion to open this topic again. The opportunity finally came in 1940.

In May 1940, District Forest Officer George Tunstell submitted a report to Department of Mines and Resources that recommended that an Order-in-Council be passed to prohibit the removal of sawn timber west of the Strathclair Road (R.M.2, pt 3, Letter, May 2, 1940). The Director of Department noted that the view of the

Superintendent of RMNP should be asked for before this proposal was submitted to the Minister. The Superintendent agreed that it would be helpful if the cutting of white spruce west of the Strathclair Road be prohibited by an Order-in-Council. He also stated this area should have been closed entirely to grazing, hay permits or timber cutting of any kind, which was the only means of saving this area from repeated burning and final reduction to grass land and barren. But from the standpoint of Park, this area did not have too much value for Park purposes under existing conditions although the region was the main breeding ground for elk. The Superintendent considered this as a good chance to bring up the exchange land negotiation between RMNP and Provincial Government again. Giving the portion of land back to Provincial Government as other usage such as Provincial Forest Reserve would help the Park eliminate a considerable annual expenditure for fighting wildfires (R.M.2, pt 3, Letter, May 13, 1940).

The Director of Department conveyed the Superintendent's opinion to McDiarmid, Minister of Mines and Natural Resources for the Province of Manitoba and asked for his thoughts about whether the Province would agree to the withdrawal and establishment of the Provincial Forest Reserve. A map showing this tentatively changed boundary of RMNP was also provided for Mcdiarmid (R.M.2, pt 3, Letter, May 18, 1940) [Figure 12].

Meanwhile, the discovery of manganese in the Birdtail Valley was drawing attention to the west end of the RMNP. It was thought that if the discovery was of commercial interest, the Province would desire to have control of the area so that it would be available for mineral development. Therefore the Director of National Parks Branch also addressed this advantage to McDiarmid in his letter to convince the potential feasibility of land exchange (R.M.2, pt 3, Memorandum, May 30, 1940; Memorandum, May 31, 1940).

Minister McDiarmid expressed his thoughts to the Director after a personal discussion in June. Although withdrawal a large area from RMNP was considered to be a

good thing for the Provincial Government since a considerable amount of the land would be useful for farming and there was also the possibility of valuable manganese deposit in mentioned area, he still did not think it was advisable to bring it up at this time (R.M.2, pt 3, Memorandum, August 14, 1940). No further progress appeared to have been made in regard to this exchange and the matter was allowed to remain in abeyance once again.

On September 1945 the representatives from the municipality of Russell expressed a request to have Fish Lake (or Silver Beach) included in RMNP lands subject to Park regulations so that cabins, picnic grounds, etc., could be built and create a playground and summer resort for residents of that portion of Manitoba and of Saskatchewan too far removed from Wasagaming. Through preliminary consideration, the Park Superintendent regarded this application as practical. Just about same time, the Manitoba Federation of Game and Fish Associations submitted to the Minister of Interior a resolution plan of eliminating Township 22 and 23 in Ranges 23, 25 and 26, west of the Principle Meridian from RMNP, and transferring this area to the Province of Manitoba. The purpose of doing this was to establish a public shooting area for the hunting of elk. This occasion made people recall the similar situation that happened fourteen years previously (1931)--the land exchange between RMNP and the Province Government. Since this request would make RMNP lose a larger portion of area, the Controller of National Parks Bureau did not accept the request. The only possibility of accepting this request was that the area of South Clear Lake would be added to the exchange plan as negotiated fourteen years ago (R.M.2, pt 3, Memorandum, September 9, 1940; Memorandum, September 12, 1940).

In 1953 two farmers Alex and Peter Glushka submitted a letter to the Superintendent of RMNP asking if Park was interested in the quarter section of their land since that part was inside of Park area. This quarter section was located in Section 22, Township 20, Range 22, west of the 1st Meridian and total 0.32 square kilometers broken. They asked for a price of $4,000 for this piece of land (R.M.2, pt 4, Letter, April 16, 1953; Letter,

May 20, 1953). The opinion of the park was that the top price for this quarter section should be $2,500 (R.M.2, pt 4, Memorandum, June 5, 1953; Letter, June 10, 1953). Therefore an appraisal for this quarter would be necessary (R.M.2, pt 4, Letter, June 12, 1953). In July the Regional Supervisor of Department of Veterans Affairs did the appraisal for Park and he marked the total value of this quarter section including land and buildings at $4,200. At the beginning of 1954, the two farmers agreed to sale their land to RMNP for $2,000 and the Park finally gained a piece of addition area (R.M.2, pt 4, Field Report, July 9, 1953).

Until 1954 the RMNP was still the same area as when it was created in 1931.

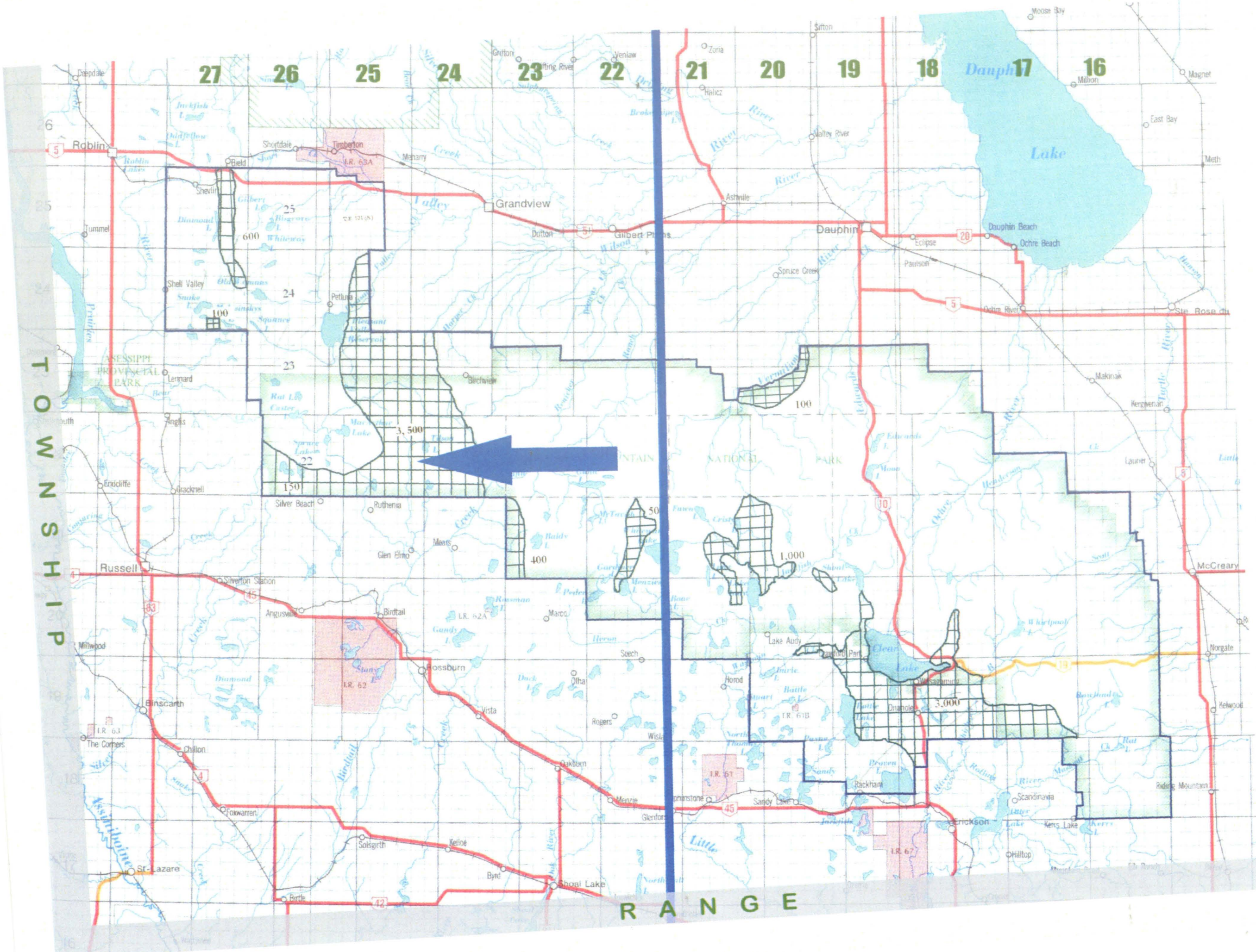


Figure 12. Map for Land Exchange between RMNP and the Provincial Government, Manitoba
(Note: Parks Canada wanted to trade all the land west of range 22 in 1931. Data from Parks Canada Map 105929)

Chapter 7 Livestock Grazing in RMNP

7.1 Introduction

This chapter describes the administration of grazing and timber cutting practice under RMFP and RMNP regulations. The detailed description covers the period from 1916 to 1934. Unfortunately what happened after 1934 cannot be provided because archival records were destroyed or unavailable.

7.2 Practice of Livestock Grazing

7.2.1 Part 1: The Phase of RMFR (1916-1930)

Before 1916, grazing seldom occurred in RMFR. Only about 600 head of cattle were grazed on the Reserve land in 1915 (R.M.35, Letter, October 27, 1916). At the beginning of 1916, Supervisor Smith of Forest Reserve presented a statement to describe the potential grazing possibilities in RMFR. He estimated that there were around 486-506 square kilometers of good grazing land, concentrated on the south side of the reserve with a good supply of water. The conservative estimate of the capacity of the entire grazing area would be 10,000 head of cattle. Although there were potential risks of grazing cattle in the Forest Reserve (the elk numbers would decrease somewhat because the original habitat would be occupied by cattle and there would be no space for big game), the Supervisor believed that the problem could be fixed in time. In addition, the Supervisor provided an approximate description of 10 Units as the possible grazing areas in the Forest Reserve. The details of all the units were showed on the Figure 13 (R.M.35, Letter, February 25, 1916).

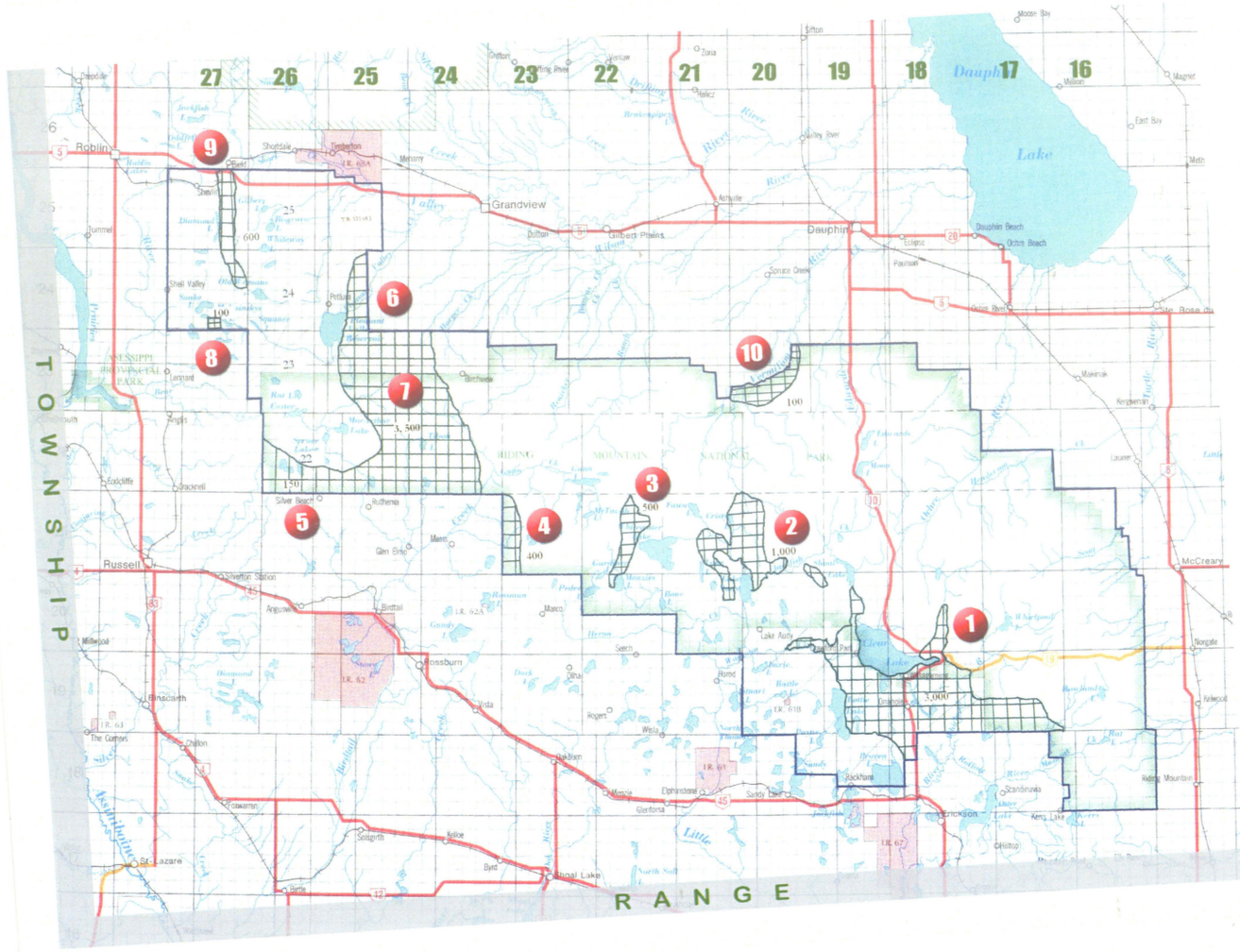


Figure 13. Map of Grazing Area in RMFR 1916

(Note: This map was redrawn based on Parks Canada Map 105929)

Clear Lake Unit (In Township 21, Range 20 & 21) - 1

The grazing area in this unit was about 156 square kilometers and 3,000 head could be contained based on estimation. The sod was quiet heavy in this area, especially the south and west part from the Lake. About 500 head of cattle were grazed in the summer of 1915 between Clear Lake and Bottle Lake.

Lake Audy Unit (In Township 21, Range 21 & 20) - 2

Lake Audy was another ideal grazing unit having an area of about 40.5 square kilometers and can contain 1,000 head of cattle. The sod was well established and grass was in very good quality. This unit was considered as one of the best areas in RMFR.

Menzie Lake Unit (In Township 21, Range 22) - 3

This was a good grazing area of 18 square kilometers that could support 500 head of cattle.

Township 21 Range 23 - 4

This area was a different type of pasture area compared to the Lake Audy and Clear Lake unit-a range of hills on the west side of the township with growing grass and pea vine after being burned by fires, and was not as good of grazing land as other units. The total 18 square kilometers could contain 400 head of cattle.

Township 22 Range 26 - 5

The prairie condition was improving after repeated fire burning of all timber growth. The southwest corner of this prairie land was as good as the Lake Audy and Clear Lake area. The total 32 square kilometers of pastureland could support 450 head of cattle.

Township 24 Range 25 - 6

The pea vine was thickly growing in parts of the grazing land in this township. Approximately 18 square kilometers could support 350 head of cattle.

Birdtail Unit (In Township 22 & 23, Range 24 & 25) - 7

The largest grazing unit on the RM Forest Reserve could contain 3,500 head of

cattle in a total 182 square kilometers. Stewarts Ranch and Tillson's Ranch were located in the valley because of the good grazing qualities. Even the bottom of the valley was occupied by an excellent growth of grazing grass.

Bluewing Lake (In Township 24, Range 27) - 8

A small grazing unit around 4 square kilometers near Bluewing Lake could contain 100 head of cattle. Grazing area was coved by pea vine and grass.

Roblin Unit (In Township 24 & 25, Range 27) - 9

Around 24 square kilometers on the prairie land near the Roblin Ranger Station should have a capacity of 600 head of cattle. A drift fence was needed because one bad muskeg near the upper end of this unit affected the safety of local cattle herd. With those estimates, the Supervisor Smith considered the possibility of over-stocking would not be able to happen within these grazing areas until the 1930s' (R.M.35, Letter, February 25, 1916).

Vermillion River Unit (In Township 23, Range 20) - 10

The grazing area in this unit was about 12 square kilometers and 100 head of cattle could be grazed in this area. The sod was not very heavy after the land had been burned over by repeated fires in previous years. Therefore the grazing land could not be heavily grazed at that time.

Meanwhile, Supervisor Smith investigated the status of the cattle industry around the Forest Reserve. He found that 8,120 farmers resided in 15 municipalities outside the RMFR grazing 49,812 head of cattle on 9,689 square kilometers of land, representing an average of 0.2 square kilometes to 1 head of cattle. Thus, the grazing opportunities outside the Reserve were undeveloped and there was little chance of settlers requiring grazing land on the Forest Reserve. However, the RMFR still wanted to serve the grazing area even facing this adverse competition (R.M.35, Letter, October 27, 1916). Both the Supervisor of the Forest Reserve and the District Inspector of Forest Reserves agreed to

advertise the grazing land to encourage people to get involved in the cattle industry. Settlers in the vicinity of the Forest Reserve would be granted permits for grazing on the land near the Reserve borders; even speculators or non-resident settlers who wished to graze cattle on Reserve land would also be given permission of grazing cattle on the land near the centre of the Reserve (R.M.35, Letter, November 7, 1916). In addition, unlimited quantities of straw, rough grain for winter feeding, summer pasturage supplied by Forest Reserve were all addressed in their advertisements to encourage settlers to increase their herds, and attract people with capital to start their cattle business (R.M.35, Letter, October 27, 1916; R.M.35, Letter, November 7, 1916).

All of the administration of the grazing service would be under the control of Permit Systems that were built based on Forest Reserves Regulations. The actual settlers who were living in the vicinity of the Forest Reserve were to be preferentially issued grazing permits. To prevent the creation of monopolies, the grazing permits were only offered to those large cattle producers who were willing to reduce the cattle number by 20% from year to year until they were brought down to the general average for the district. One exception suggested by the Supervisor was that the Forest Reserve would allow large stockholders use other stockholders' grazing areas under their own grazing permit. But the premise was that those grazing lands were unused by their stockholders for a while. This suggestion certainly provided more advantage for large stockholders (R.M.35, Memorandum, November 21, 1916; R.M.35, Letter, November 27, 1916).

Moreover, the Forest Reserve required that permittees either put in a drift fence in connection with grazing areas or construct fences around a small enclosure for pasture purposes. The RMFR Service and the permittees reached an agreement. The permittees as individuals or as part of an association could erect fences if necessary. They were also required to undertake the tasks of fence erecting and take care of the stock themselves. The fences would be the property of the Crown. Before erecting the fences, a permit

would be issued, and the permit fee would be 25 cents but must be renewed from year to year. Once the fences became the property of the Crown, a free permit would be granted by the Reserve. Under this agreement the stock would be charged a rate of dues fixed by the sub-section 1 of section 40 of the Forest Reserve Regulations. If someone wanted to use the existing enclosure to stock their cattle, the grazing permits would also be required as well as the fee charge. No objection was put on building shelters for stock or for herders after they obtained the building permit and timber cutting permits to do so, but no permanent occupation in Reserve would be allowed (R.M.35, Letter, November 27, 1916).

After reviewing all the recommendations of the RMFR, the Minister of Department of Interior stated that RMFR should have "taken action to develop the use of grazing as far as possible" (R.M.35, Letter, November 27, 1916).

In 1920, a grazing association called "Tamerisk Stockmen's Association of Grandview, Man." was organized under the Act rules and regulation prepared by the RMFR. With gradual development, 15 members were involved in this Association until 1926. RMFR granted each member a grazing permit and each member needed to pay the annual membership fee of $2.00 to the Association & etc. As the grazing practice, a ranch was constructed by this Association on the Reserve land, north part of Park but without exact location. The ranch occupied approximately 30 square kilometers of good pasture land with ample water resource and fenced with 22 kilometers of two strands barbed wire. In 1925, there were 283 head of mixed cattle in the ranch, and per head was charged $1.50 for pasturing. Similarly another two associations respectively constructed on the north and the south side of Reserve achieved grazing permits from the Forest Service and followed the related regulations (R.M.35, Letter, March 31, 1926).

7.2.2 Part 2: The Phase of RMNP (1931-1934)

On July 1930, the RMFR was transferred to the RMNP. Along with the change of jurisdiction, grazing, hay, fencing, cabin permits and other fees in connection with grazing on the park area were taken over by the Parks Service (R.M.35, Memorandum, February 26, 1931).

During the period of transfer, the charging of a grazing fee became disordered. The main reason was that the management came under a different federal agency. The practice under the Forestry Regulation was to allow people to graze their stock on the reserve in the winter and feed them hay cut on areas near where cattle had grazed during the summer season. The Forest Regulation charged a low price for the grazing fee—10 cents per head per month with a minimum charge of 25 cents. One dollar was charged as an office fee. In accordance with the Park Regulations, the adjoining farmers who wish to graze their cattle on the parks lands could pay the regular permit fee of $ 1.00 per head person for stock over six months old. No fee was charged where stock was corralled in the Park during the winter and fed from hay cut during the summer. Comparing these two rates, there would be very little difference under the two regulations for the cattle grazed in the park throughout the season. Many grazing permits were issued under the Reserve Regulation before 1931, but the necessary grazing fees were not collected as expected. The Forest Reserve apparently did not stress the point sufficiently in regard to the collection of grazing revenue (R.M.35, Memorandum, February 26, 1931; Memorandum, June 25, 1931).

With regard to fencing permits, any permits which were issued in 1931 for fences were renewals of permits issued in former years and were issued prior to July 1 when the Parks Branch was responsible for RMNP. As to cabin permits that were connected with wood cutting operations on the park, no permits were issued in 1931. RMNP also decided whether new cabin permits would be issued with the understanding that this would be

good for people who were in the business of cutting fuel wood (R.M.35, Memorandum, June 25, 1931).

Comparing the Forest Reserve Regulations to the Park Regulations, there was not too much difference on the grazing fees. However fees were hardly collected from local settlers, especially from farmers in the Russell District on the west end of the park. In 1934, the reports from Park Wardens stated that those farmers have flatly refused to pay the dues and were openly defying the Department to charge grazing dues on the national park lands. To solve this difficulty, the Park Superintendent decided to impound those cattle herds until the owners paid the fee. In addition, an impounding fee was also charged at the rate of 30 cents for the first head and 15 cents for each additional head. This action cleared up the situation and all the 350 head of cattle in this neighborhood were covered grazing permits. The impounding of stock served as an example for all the other districts. The Park Superintendent promised that RMNP would definitely provide a certain protection for those settlers who were issued grazing permits for certain areas in the Park and willing to pay for the related fees, which will also help RMNP effectively arrange the grazing territory and prevent potential over-grazing in some specific areas (R.M.35, Letter, June 20, 1934).

Regarding grazing and hay permits, however, the local people still wanted to take the same advantage under the National Park's administration as they have received before under the Forest Reserve Regulations. Some residents in the vicinity of park area sent petitions to the National Parks Branch and asked for reduction of the grazing rate and even asked for free grazing privileges. This was considered impossible since the principles behind national parks were quite different from that of the forest reserves. The forest reserves put the priority on the commercial production such as timber and cattle business. Contrarily the parks put the priority on the conservation and the perpetuation of natural conditions. Thus RMNP would follow the same rules as other national parks

without any exception. The Park Superintendent mentioned that "it certainly would not be fair to those who are now running stock on the park and have paid the grazing fee to allow other persons to come in free of charge". But the Park would not cancel the privileges granted to stockowners who resided close to the parklands or on adjoining farms since those people were more or less depending on the parkland for the grazing of stock (R.M.35, Memorandum, April 27, 1934; R.M.35, Letter, June 20, 1934).

As to the rates of cutting of hay, 10 cents would be charged per ton without any office fee under the Parks Regulation. Under the Forest Service Regulation, the settlers in the district were always used to paying at the rate of 25 cents per ton with the department offices of $1.00 in addition. The new rate of hay cutting was definitely lower. But no more permits would be issued if Parks found the settlers weren't using the hay for their own stock but were selling it instead (R.M.35, Letter, June 20, 1934).

The negative effects of cattle grazing on Parklands were recognized. First of all, the very low rate of grazing and hay cutting caused overgrazing and damage the forage conditions for wildlife. What happened for several years in RMNP was that the hay cut by settlers was either stocked in the meadow where it was cut and hauled out in the winter, or hauled out shortly after cut and placed on the private land. No doubt elk left the park in the winter months and ate feed on private land. Secondly the wildlife habitat issue was raised again. Some stockowners received permits to graze their cattle on parklands with excellent condition, for example the Lake Audy area that was the one of the best natural ranges for the wild elk (R.M.35, Letter, June 20, 1934).

In order to control over-grazing in Park Lands, RMNP decided to adopt a program of confining the grazing to "Class I Permittee" who would be the owners of stock residing close to the Parklands or on adjoining farms (within a distance of 4.8 kilometers) and more or less depending on the parklands for the grazing of stock. In addition RMNP was going to remove the grazing permittee from such area to another position and the natural

feeding ground of elk herds could be finally reserved (R.M.35, Letter, June 20, 1934).

To avoid further conflicts of cattle grazing on parklands, the Superintendent presented some suggestions to Commissioner Harkin of National Park Branch. Firstly, the Park should adopt the rates that were in force when the park area was under the Forest Reserve. The rate of 10 cents per head per month with a minimum charge of 25 cents was more desirable by settlers since they were used to it for a long time. The Superintendent also supported "an on and off range" grazing permit issued under the Forest Reserve, which covered the cases where a permittee had his own grazing land adjoining the Reserve boundary, and the cattle were partially grazed on government land and privately owned or leased land outside the boundary. Since this policy possibly made the stockowners fence in certain areas on parklands, the Superintendent suggested that the Park should keep providing those permits at the original cost. Apparently the settlers who grazed cattle on Park lands only for short periods of time (three or four months) were satisfied with this fee and the Park achieved more revenue (R.M.35, Memorandum, April 27, 1934; R.M.35, Letter, June 20, 1934).

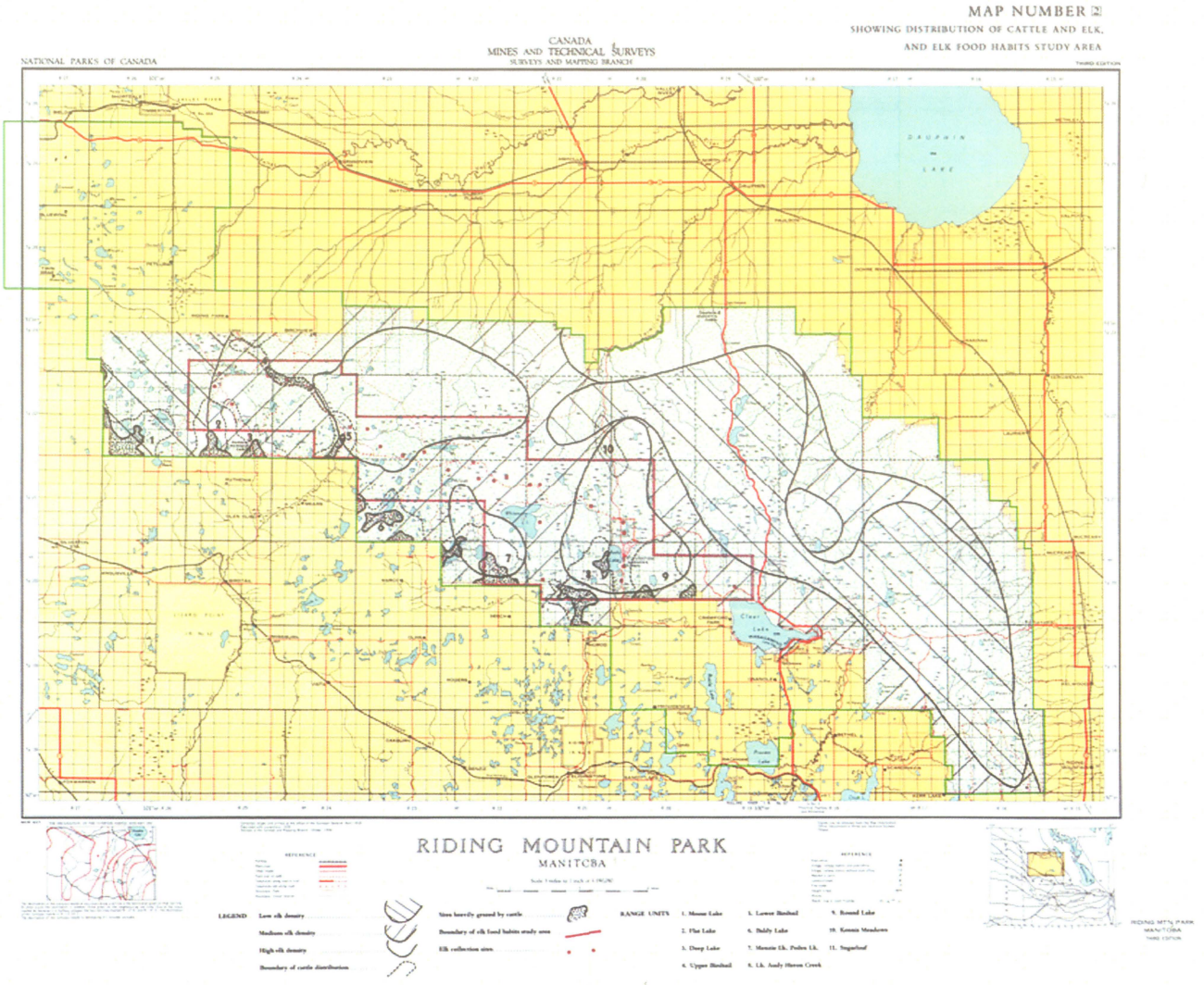


Figure 14. Map of Elk and Cattle Grazing Areas circa 1950. (Green line is the original Forestry Preserve circa 1916) (Doug Bergeson Personal Communication).

Chapter 8 General Discussion

8.1 The Origin of Bovine TB Outbreaks in the RMNP Ecosystem

The most important objective of this research was to identify the possible and most likely origin of the initial introduction of Bovine TB in the Riding Mountain Ecosystem. It is an untestable a priori assumption in this work that Bovine TB is a disease not indigenous to North American wildlife and the ecosystem was free of this pathogen prior to the mid 1800's. Through the course of this study I believe that there are three possibilities as to the origin of this infectious agent and its introduction into the free ranging ungulates in RMNP.

During the period of 1920 – 1960, Bovine TB was endemic in domestic cattle in Canada with common "spill-over" into domestic swine and rare "spill-over" into free ranging ungulates. The Bovine TB Restricted Area Plan was the only TB control policy that was comprehensively implemented around the entire RMNP ecosystem during this period. Under this program, cattle herds from all the Municipalities around the Park were tested under a near simultaneous entire municipality test program and few reactors (infected individuals) were found. Since the reaction rate of the cattle was very low, there was a concurrent low probability that Bovine TB in the Park area was transmitted from grazing cattle to wild animals, especially ungulates in the period of 1900-1960. Even so, a gap existed between the regulatory standard and the field implementation of policy. Considering the limited robustness of individual animal disease testing, lack of experienced veterinarians, lack of efficient communication, transportation issues, economics, and even the Second World War occurring during that period, etc., it is possible the Bovine TB in domestic cattle persisted at a low prevalence in cattle in this region into the early 1960's.

An important risk mitigating factor is that the Riding Mountain Forest Reserve was not a popular area for cattle grazing before the 1930's as the region was rather large to be agriculturalized. Wildlife in the RMNP ecosystem and cattle interaction can be expected to be low prior to the 1920's since the surrounding municipalities had abundant pasture land in proportion to the local cattle population and other grazing areas were probably more accessible for local residents. Forest Reserve managers as part of regional economic diversification developed programs to encourage more settlers to become active in the cattle industry in the era prior to 1920.

After RMFR became the National Park in 1931, land use priorities changed significantly. Based on the idea of attracting more visitors and marketing bison products such as bison hides and meat, 20 bison were shipped from Wainwright to the Lake Audy Plains, RMNP in 1931. The Wainwright bison herd was known to be infected with Bovine TB at the time of this animal translocation and reintroduction.

Bovine TB severely affected the original herd of bison in Buffalo National Park at Wainwright. Between 1923 to 1939, total 12,005 head of bison were killed at Wainwright as part of herd reduction exercises and 6,450 of them had Bovine TB lesions. A post mortem lesion rate was more than 50% is consistent with a very high individual animal infection rate. The first three annual herd reduction programs were directed at older and debilitated animals. This age cohort was most severe affected with evidence of Bovine TB with lesions at slaughter inspection in at least 70% of animals. The most significantly infected cohort at the beginning were old bulls, more and more calves and cows were found positive through further annual slaughters. In practice, once the reaction rate of postmortem examination was more than 50%, a much higher true individual infection rate can be assumed (Hadwen 1942).

Meanwhile other wildlife populations contained within the bison fence at Wainwright such as elk, moose and deer were also infected with Bovine TB but at a much

lower rate. For example, BNP slaughtered elk in both 1939 and 1940. Of 377 head of elk killed and subjected to inspection in 1939, only 14 of them had lesions consistent with Bovine TB, representing a 3.71% infection rate. On the second year (1940), BNP management killed 952 head of elk and 59 had tubercular lesions at necropsy, representing 6.19% confirmed infection rate. The infection situation in deer and moose were even lower than elk, not more than 5% of reaction rate (Hadwen 1942).

The BNP bison herd was assembled from various sources in the late 1800's. The majority of the stock (631 head) originated in Montana and was purchased in 1906-1907 from the Michael Pablo herd. Other small numbers of bison were assembled from different parts of Canada. According to the inspection report from Seymour Hadwen (1942), the origin of disease outbreaks may not necessarily be the Montana herd. This point was supported by the fact that Elk Island National Park in Alberta had the same source of bison (Pablo herd) and the Elk Island herd has been and remains free of Bovine TB.

Canadian-origin bison previously maintained under hobby farm or quazi-zoological conditions may have been the source of Bovine TB in the BNP herd at Wainwright. The early records explored by C. H. D Clarke (veterinary inspector) in 1939 showed that the owners of recreational and public viewing bison in the early 1900's commonly exchanged bison calves because of fear of inbreeding, and gave them milk in transit or let domestic cows feed them (Hadwen 1942). Close contact between infected and susceptible animals is known to facilitate the transmission of Bovine TB. Evidence for multiple introduction of bovine TB into the BMP is provided by the isolation of two different strains of M. *bovis* in the Alberta Laboratory and reported in the Veterinary Generals Report of 1925. Further evidence if the detailed characterization of these two strains could not be found during the archival searches.

Buffalo National Park at Wainwright was eventually closed and the bison herd was

removed with approximately 6,600 bison released into Wood Buffalo National Park (WBNP) in northern Canada between 1925 to 1929. After the release, these primarily plains bison intermingled with the indigenous wood bison. Bovine TB was likely introduced to the WBNP ecosystem at this time, and since spread throughout the bison population in the park (Environmental Assessment Panel 1990). The fact that the M. *bovis* biotype in RMNP ecosystem was different from the M. *bovis* biotype sustained in the WBNP system does not necessarily preclude the hypothesis that both pathogens originated from the same large assembled herd at BNP which had multiple culture types of M. *bovis* circulating in the early 1920's.

Bovine TB was a known disease problem within the Wainwright bison population at the time bison were sourced for the RMNP herd in 1931. Considering this risk only young healthy appearing bison were selected for translocation. With a herd infection prevalence in the 50% range there was a high possibility that one or more of those 20 head of bison destined for RMNP were infected with TB and that condition was identified only after a long incubation period until 1937 when it was first identified.

According to the Report (Animals killed for disease control purposes) in 1939 when the original animals were killed and subject to post mortem, Inspector Thompson considered some original animals brought from Wainwright were "spreaders" as the bison were condemned at slaughter with advanced TB affecting the lungs. In the years 1931-1937 the bison herd and a captive elk herd co-occupied the Bison Enclosure at Lake Audy. In 1937, RMNP management released from the Bison Enclosure some 150 elk from this known infected dual species herd into the RMNP ecosystem.

Despite several recommendations to depopulate the remaining enclosed elk herd because of the risk of Bovine TB, no record of elk slaughter could be found. During this same period detailed records were maintained related to the slaughter of bison from the same facility. As of the early 1960's elk were no longer enclosed for display purposes and

there was an effort to exclude elk from the bison compound. One must consider the release of contact elk into the ecosystem as the most likely explanation as to the disposition of this previously captive elk herd.

There is a significant risk that bison origin Bovine TB was transferred to elk during the period from 1931-1949 when both species were confined in close proximity for the purposes of display to the public. Subsequently the bison component of this herd was destroyed revealing an infection rate of about 35% and the large portion of the elk component was released into the ecosystem.

Artificially maintaining a group of bison and elk within a fenced area and supplemental feeding them in winter is considered a significant management approach that would have contributed to the spread of Bovine TB within this population. The bison herd and elk herd in Lake Audy Bison Enclosure were growing very quickly between 1931- 1937, especially the elk herd. After 1937 RMNP gradually slaughtered a number of bison every year to make a reasonable and well-balanced herd size. In 1947 all the bison were slaughtered because of the Bovine TB issue. Artificially supporting a bison herd in RMNP was an unsuccessful program with a great cost.

However, although unlikely, it is possible that the strain of Bovine TB currently circulating within the RMNP ecosystem was introduced to wildlife by direct contact with domestic cattle prior to 1960. Furthermore, cattle grazing in the Riding Mountain Area starting in the 1920's and ending in 1969 may have been a contributing factor to the transmission of Bovine TB between cattle and elk if the agent was present at a low level in the population. In Chapter 7, the utilization of grazing and hay cutting for domestic animal consumption facilitated by both Forest Reserve and National Park managers prior to the 1960's was a two-part risk for disease maintenance. Firstly over-grazing and damage to the natural forage for wildlife occurred. Also adjoining settlers cut and then stacked the hay in meadows in the summer and hauled it out of the Park in winter. Stacks

of hay both in the Park and on nearby private land were readily available sources of overwintering feed to elk and enticed them into leaving the Park in the winter months to feed on private land. The artificial congregation of elk facilitated by hay removal and storage created potential opportunities of disease transmission between elk through the nose to nose contact and herding up at a concentrated food source.

As discussed in Chapter 7, the Park provided grazing permits for local settlers to graze their cattle herd inside of Park area including Lake Audy Plain. This situation would pose high risk for those cattle grazed in the Lake Audy area to catch Bovine TB if they came into contact with animals in the Bison Enclosure and perhaps maintained a cycle of infection.

Under the jurisdiction of the Forest Reserve, the mandate of management was mainly economic-oriented. The permits system including cattle grazing, timber cutting, hay manufacture and fencing in the reserve area dominated the management practices. Less area and food sources than required to sustain viable wildlife population were provided. The management practices in the early period of the National Park were similar to that of the Forest Reserve. The cattle grazing and hay cutting permits system were still implemented largely unchanged until late of 1940's.

Three land-exchange plans (1931 – 1945) proposed between the national parks management and the Province of Manitoba strongly represented the values of park management. That ethic was to maximize the human use of a common recreational resource. Since then, the ethical basis of the management approach of the National Park has gradually transferred to conservation-oriented development. More and more attention has been focused on the protection of the entire ecosystem to maintain the sustainable natural environment. In fact the original intention of creating the Bison Enclosure in the Park was to protect bison in Manitoba. But unfortunately the succeeding outbreaks of Bovine TB suggest this is a poor way to conduct wildlife management. Concentrating

wildlife population by fences for the purpose of entertainment of tourists or even feeding alone created a lot of issues which were unhealthy for both the wild animals and their habitat. Wildlife disease such as Bovine TB is one of these problems.

Therefore it is necessary for National Parks managers to put high priority on animal health concerns in wildlife management. Another advanced solution for wildlife conservation in the National Park is to involve of landowners from neighboring areas of Park in the management practices. A positive attitude by landowners and even tourists toward wildlife is critical and their support is needed in areas such as artificial feeding of free-ranging ungulates.

From this historical study it is apparent the management of the RMNP ecosystem has progressed through three significant periods of changing values in both land value and animal management. These three value paradigms can be characterized as non-consideration, exploitation and finally respect. The first phase of non-consideration for animals and the ecosystem was during the deforestation of the Forestry Reserve which was clearly an exploitive land use paradigm. Later animals were used (exploited) as a tourist attraction from 1931-1947 in a zoo-like culture of the Lake Audy Bison Enclosure. As a parallel example of land use "value" in the 1940's, the management of the National Park was actively pursuing and willing to trade roughly half the land mass of the current RMNP to the province as a hunting preserve in exchange for a few select small parcels around the desirable camping area of Clear Lake.

Eventually both the attitude toward land use and the animals in the ecosystem achieved a semblance of respect with the prohibition of logging in the mid-1930's and the exclusion of indigenous animals from the bison enclosure in the 1950's. The persistence of the Bison Enclosure to this day is a testament to the "zoo" culture of the 1930's and the value that the National Parks Systems initially were designed to facilitate human use of outdoor spaces not the maintenance of outdoor spaces for their own sake.

8.2 Conclusions

1. The translocation and reintroduction of macrofauna has repeatedly been associated with the transmission of infectious agents. Translocation of wildlife should be exercised with extreme caution.
2. The advice of scientists is only one voice that natural resource managers are required to integrate into decisions. In the question of release of in contact elk from the bison paddock back into the ecosystem, the advice of scientists did not carry the day.
3. The values humans ascribe to land and animal use are not stable. Decisions made in current land and animal use should be made so that future generations have the opportunity to change and improve upon those values and reflect those priorities in different land and animal management decisions.
4. Options currently being considered in the management of Bovine TB in livestock and free ranging ungulates should not effectively prohibit alternate options for future generations nor put future ecosystem managers at a permanent disadvantage.

8.3 Recommendations

The early source of Bovine TB in Riding Mountain National Park apparently came from infected bison transplanted in 1931 from the then designated Buffalo National Park. The chances of infecting other wildlife such as elk and white-tailed deer inside of or near the Bison Enclosure at Lake Audy were greatly enhanced with this transplant for the next 30 years. This study was the first detailed examination of several bison transplants that occurred from Buffalo National Park to a number of other western national parks in Canada such as Wood Buffalo National Park. Parks Canada may want to examine the

history of wildlife translocation into other national parks to better understand the current situation of free-ranging ungulates management and protection from both a biodiversity and disease standpoint.

Management of public resources is a mix of science and human values. This complicated mix can only be identified by careful retrospective analysis of historical actions of managers and the support of those actions supported by society via their duly elected officials. Considering the management of Bovine TB within this single ecosystem identifies some of those scientific and political decisions and the potential weakness that may be instructive to current and future decision makers. Further studies in resource management at other Canadian National Parks during the same time period or comparison with decisions made in the management of the United States National Park system may further elucidate common decision paradigms that may place future parks managers at a disadvantage. This study is a clear example of risk inherent in translocation and re-introduction of fauna.

The research aspects of this study were much more difficult than anticipated. Sufficient time and travel should be allowed in conducting similar studies in the future since most of the archival documents will likely be found in the National Archives in Ottawa. Dealing with the information query system in the Archives and conducting specific research in a quick and productive way was difficult and should be well-planned in future studies of this nature. Furthermore, there are numerous restrictions on students accessing the archives and having sufficient time to photocopy or review documents on site. Also, in this case, archival material related to grazing permits inside of RMNP were destroyed unintentionally by Park officials not realizing that they remained a valuable resource for understanding the historical aspects of RMNP. In future studies of this nature, sources of documents should be identified in advance as to location and availability before beginning the actual research.

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Personal Communication

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Appendices

(1-8)

Appendix 1. Tuberculin in Cattle

Original Use of Tuberculin in Cattle

"As a rule the method of injection is as follows: The temperature of the animal is taken for several days before the injection three times a day then on average about 0.4 grams (6 grains) of tuberculin mixed with 5 per cent carbolic acid in injected subcutaneously in the region of the shoulder. The temperature is then taken every 2 hours until nine or ten hours after the injection, and then every hour until twenty four hours after the injection. The reaction in diseased animals usually sets in between twelve and fifteen hours after the injection and lasts for several hours. As a rule animals that show a rise of 0.8 to 1.4°C should be regarded as suspicious and should again be injected in a month time, whilst those which show a reaction above 1.4°C should be condemned and killed."

Direct Quote: J.J. MacKenzie, 1894 Diagnosis of Tuberculosis in Cattle. In: Dominion of Canada 57 Victoria Sessional Papers Volume 6 No.8 Report of the Minister of Agriculture for the Dominion of Canada for the Calendar Year 1893, Ottawa SE Dawson pp.107-111

Directions for Applying the Tuberculin Test

To obtain the normal temperature of the animal to be tested, at least four temperatures, three hours apart should be taken on the day the tuberculin is to be injected.

The requisite dose should be injected under the skin with a hypodermic syringe that has been previously sterilized. The skin at the point of the injection should be saturated with an antiseptic solution before the injection is made.

(The most convenient agents for the sterilization of the syringe and the saturation of the skin are carbolic acid or creolin in solution. The solution is made by the addition of

one part of carbolic acid or of creolin to twenty parts of water.)

The hypodermic needle should be dipped in the antiseptic solution after each injection before proceeding to again fill the syringe or inject another animal.

After injection five temperatures should be taken at intervals of three hour commencing with the *tenth* hour.

In cattle which have recently undergone a previous test the re-action frequently begins much earlier, and it is then advisable to take the first temperature not more than two hours after injection, and to continue taking temperatures every third hour thereafter up to the usual time.

Veterinarians about to apply the test should carefully study the chart on which its results are to be recorded. The hours are not fixed, as under pressure of work, these may vary.

The Veterinarian must mark, in the space for that purpose, the actual hours at which temperatures are taken, so that no misunderstanding of the record may be possible.

Attention is also directed to the note in the column for decision.

The plan at one time followed of deciding as to the health or disease of an animal tested with tuberculin, viz.: by a rise of 2°F in the temperature after injection, is no longer considered satisfactory. Under that system it was possible, where the normal temperature was low, to condemn an animal with a temperature under 103°F. On the other hand, an animal with a high normal temperature on injection might be passed as healthy, although showing a re-action approximating 105°F, which is entirely out of the normal range.

Under the system now followed animals whose temperatures after injection do not exceed 103°F are to be classed as healthy unless clinical symptoms of tuberculosis are present.

Animals showing temperatures after injection of 104°F or over are to be classed as tuberculous.

Animals whose temperatures after injection do not reach 104°F, but rise above 103°F, are to be marked suspicious, unless some extenuating circumstance accounts plainly for the rise, which event a clinical report is to be attached to the chart as indicated in the note.

Ear marking of Re-actors

Attention is especially directed to the fact that cattle reacting under any circumstances are permanently ear marked by one of the regular officers of the department, and may be dealt with as the owner sees fit, subject to the approval of the local health authorities, except that their exportation will not be permitted (Rutherford 1909).

J.G. RUTHERFORD,

Veterinary Director General

Health of Animals Branch

Department of Agriculture

Ottawa, July, 1906

Subcutaneous Tuberculin Test 1909-1927

Tuberculin was manufactured by the Federal Laboratory in Ottawa and first distributed in 1903 (2,649 tests), 1904-05 (3,145 tests), and 1906-07 (3,430 tests).

The printed circular which accompanied each shipment of tuberculin read as follows:

Dominion of Canada – Department of Agriculture- Health of Animals Branch – Bacteriological Laboratory – Tuberculin, it's Preparation and how to use it.

Preparation of Tuberculin

Tuberculin is a glycerinized extract of cultures of tubercle bacilli. During its preparation it is sterilized and contains no living germs, and therefore can not communicate disease to a healthy animal.

Action of Tuberculin

The injection of an appropriate dose of tuberculin under the skin of a tuberculosis animal is followed by a specific febrile reaction which is characteristic.

Animals that are non-tuberculous suffer no inconveniences and present no reaction.

In advanced cases, where the disease has permeated the whole system, the reaction may be very slight or altogether absent.

How to Apply the Tuberculin Test

To obtain the normal temperature of the animal to be tested, at least four temperatures, three hours apart, should be taken on the day the tuberculin is to be injected.

The requisite dose should be injected under the skin with a hypodermic syringe that has been previously sterilized. The skin at the point of injection should be saturated with an antiseptic solution before the injection is made. (The most convenient agents for the sterilization of the syringe and the saturation of the skin are carbolic acid or creolin in solution. The solution is made by the addition of one part of carbolic acid or of creolin to twenty parts of water.)

The hypodermic needle should be dipped in the antiseptic solution after each injection before proceeding to again fill the syringe or inject another animal.

After injection, five temperatures should be taken at intervals of three hours, commencing with the 10^{th} hour.

In cattle which have recently undergone a previous test the reaction begins much

earlier, and it is then advisable to take the first temperature not more than two hours after the injection and continue taking temperatures every third hour thereafter up to the usual time.

The tuberculin as sent out is diluted ready for use. Each bottle is stamped with the amount of dilute tuberculin it contains.

Sixty minims is sufficient for a full-grown animal; thirty to forty minims for a younger animal, in proportion to age.

The date on each bottle indicates the limit of the time during which the contents should be considered reliable for diagnostic purposes.

Test Interpretation

Veterinarians about to apply the test should carefully study the chart on which the results are to be recorded. The hours are not fixed as under the pressures of work these may vary.

The veterinarian must mark in the space for that purpose, the actual hours at which temperatures are taken, so that no misunderstanding of the record may be possible.

Under the system now followed (circa 1909) animals whose temperatures after injection do not exceed 103°F are to be classified as healthy unless clinical symptoms of tuberculosis are present.

Animals showing a temperature after injection of 104°F or over are to be classified as tuberculosis.

Animals whose temperatures after injection do not reach 104°F, but rise above103°F are to be marked suspicious, unless some extenuating circumstance accounts plainly for the rise, in which event a clinical report is to be attached to the chart as indicated in the note.

Appendix 2. Earmarking of Re-actors

Ear marking of cattle that reacted to the tuberculosis test was set by department policy and applied from 1903-1939. In 1939 it moved form policy to regulation and was described by order In Council of the Director General although the method of identification did not change, and is described as follows;

ORDERS ISSUED RELATED TO THE PERMANENT MARKING OF CATTLE WHICH REACT TO THE TUBERCULIN TEST

Under and by virtue of the authority conferred upon me by Orders in Council dated December 23, 1904, and November 30, 1909 under the Animal Contagious Diseases Act, Chapter 6, R.S.C., 1937, being regulations related to tuberculosis, I do hereby prescribe that,-

Cattle which have reacted to the tuberculin test shall be permanently marked by having the letter "T" punched through the right ear, in accordance with the following shape and dimensions,-

The horizontal part of the "T" consists of a figure approximately 1 3/16 inches in length, and 3/8 inch in width at the ends, and whose upper and lower sides are convex to each other. The vertical part of such letter has the form of a truncated isosceles triangle, the base and sides of which are 3/8 inch and 3/5 inch respectively. Portion of the membrane of the ear, approximately 3/8 inch width between the lower side of the horizontal excision and the upper end of the vertical excision, is not to be removed in the marking of the ear.

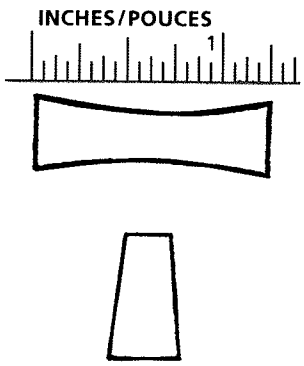

Figure 15. Specimen of "T" punch (Cameron 1940)

Note: Orders issued relating to the permanent marking of cattle which react to the tuberculin test and the Bangs test. In Report of the Veterinary Director General, Year Ending March 31, 1940. Department of Agriculture Canada, Page 14-15.

Appendix 3. Municipal Tuberculosis Order (Order in Council May 18, 1914)

WHEREAS many cities and towns of Canada are endeavoring to ensure a pure and wholesome milk supply for their inhabitants, and especially to prevent the sale of milk from tuberculosis cows;

AND WHERAS it is deemed advisable and in the public interest for the Government to assist as far as possible this work;

THEREFORE the Governor in Councils pleased to make and establish the following regulations relating to tuberculosis, and the same are hereby made and established accordingly:-

REGULATIONS RELATING TO TUBERCULOSIS

1. The aid of the Department of Agriculture, as aforesaid, will be given to such cities and towns having a population of not less than five thousand persons as shall have secured the necessary provisions under provincial legislative authority for the purpose of agreeing to the present regulations.
2. The Government of Canada will assist any city or town which shall have signified
3. in writing to the Veterinary Director General its desire to have the aid of the Department of Agriculture in controlling Bovine tuberculosis in the cows supplying milk and cream to the said city or town, provided the said city or town shall have stated in the application for the aid of the Department of Agriculture, as aforesaid, that, being thereunto duly empowered by law, it will undertake and provide that:-
    (a) Dairies in which milk or cream are produced for sale therein shall be licensed.
    (b) No license shall be issued unless the dairy conforms to the required standard.

(c) The standard shall require that the stable have an ample amount of airspace, and at least two square feet of window glass for each cow, and shall be well ventilated, drained, and kept clean and sanitary.

(d) After two years from the date of the first test of the cattle of any dairy, the sale within the said town or city, of milk or cream from any herd shall be prohibited unless the said herd shows a clean bill of health from the Veterinary Inspector.

(e) An inspector or inspectors shall be appointed and paid by the said city or town, whose duty it shall be to see that the undertakings and provisions, as aforesaid, are carried out, and that the cows are kept clean and properly fed and cared for.

4. The Veterinary Director General, on receiving notice in writing from any such municipality of its desire to have the assistance of the Department of Agriculture, as aforesaid, shall forthwith make inquiry, and if satisfied that the foregoing requirements are being carried out, shall send the Veterinary Inspectors to inspect the said cows.

5. Veterinary inspectors shall use the tuberculin test and also make a careful physical examination of the cows, in order to determine whether they are healthy or not. Dairy bulls shall also be examined and subsequently treated in the same way as cows.

6. Following the examination and test, the diseased cows and reactors shall be dealt with as follows:-

(a) Cows which in the opinion of the inspector are affected with open tuberculosis and are distributing the germs of the disease through the milk, faeces or sputum, shall be sent to an abattoir under inspection and there slaughtered as soon as conveniently be done. When no such abattoir is

within reasonable distance, the cows shall be slaughtered in the presence of the inspector, who shall direct how the carcasses shall be disposed of.

(b) Reactors to the test shall be separated from the non-reactors as efficiently as possible (suspicious animals shall be classified as reactors) and the owner shall be given the choice of disposing of them in one of the following ways:

i. Immediate slaughter

ii. Slaughter after they have been prepared for the block by drying off and feeding,

iii. Retaining them in the herd, and selling no more milk or cream until it has been pasteurized.

7. Compensation shall be paid to the owner of the herd for all cows slaughtered under these regulations, upon the following basis:-

(a) One-half the appraised value of the cow if destroyed as a case of open tuberculosis

(b) One-third the appraised value of the cow if destroyed as a reactor at the request of the owner

(c) Valuation shall be made by the inspector, and shall not exceed the maximum valuation for cattle as specified in section 6 of the Act.

8. The salvage from the carcass shall be paid to the owner of the cow in addition to the compensation, provided compensation and salvage together amount to less than the appraised value; if more, the surplus shall be paid to the Receiver General.

9. No compensation shall be paid to an owner unless, in the opinion of the Minister, he assists, as far as possible, in the eradication of the disease by following the instructions of the inspector as to disinfection, etc.

10. No milk or cream shall be sold from a herd containing reactors unless such milk and cream are properly pasteurized. The inspectors of the municipality shall see that this provision is effectively carried out.
11. Tests and examinations of the herds shall be made whenever deemed necessary by the Veterinary Director General, and after each test and examination the herd shall be dealt with in the manner aforesaid.
12. All cows bought by the owner of a herd, while under control, shall be submitted to the test and successfully pass it before being placed with healthy cows.
13. When two successive tests fail to detect any reactors in a herd it shall be deemed healthy, and the Veterinary Inspector shall, when requested, give a certificate to that effect.
14. The existing regulations respecting tuberculosis, in so far as they may be inconsistent with the present regulations, are hereby repealed.

Appendix 4. Regulation for the Establishment and maintenance of Tuberculosis-Free Accredited Herds of Cattle (At the Government House at Ottawa, September 20, 1919)

WHEREAS tuberculosis has caused a great deal of damage to the livestock industry of this country, particularly in so far as cattle are concerned, and it is therefore deemed advisable to do everything possible to eradicate this disease and to encourage the maintenance in Canada of herds of cattle that can be guaranteed free from tuberculosis.

AND WHEREAS in the United States of America, where the purebred livestock industry is very profitable one, a system of accrediting herds of cattle as being tuberculosis-free has been established and is being maintained, cattle from such herds being admitted into Canada without further test for tuberculosis.

WHEREAS the United States authorities have signified their willingness to reciprocate by admitting Canadian cattle from similarly accredited herds to the United States without further test for tuberculosis should such herds be established and maintained in this country.

WHEREAS it is deemed advisable and in the public interest that accredited herds of tuberculosis-free cattle should be established and maintained in Canada.

Therefore the Deputy Governor General in Council, on the recommendation of the Minister of Agriculture, is pleased to make the following regulations for the establishment and maintenance of such herds, and the same are hereby made and established accordingly:

a) A tuberculosis-free Accredited pure-bred herd is one which has been tuberculin tested by the subcutaneous method, or any other test approved by the Veterinary Director General, and applied by the regularly employed veterinary inspectors of the Health of Animals Branch of the Federal Department of Agriculture. Further it shall be a herd in which no animal affected with tuberculosis has been found

upon two annual or three semi-annual tuberculin tests, as above described, and by physical examination.

b) The entire herd, or any cattle in the herd, shall be tuberculin tested or re-tested at such time as is considered necessary by the Veterinary Director General.

c) No cattle shall be presented to the tuberculin test which have been injected with tuberculin within 60 days immediately preceding, or which have any time reacted to a tuberculin test.

d) No herd shall be classed as an accredited herd in which tuberculosis has been found by the application of the test, as referred to in paragraph 1, until such herd has been successfully subjected to two consecutive tests with tuberculin, applied at intervals of not less than six months, the first interval dating from the time of removal of the tuberculosis animals from the herd.

e) Prior to each tuberculin test satisfactory evidence of the identity of the registered animals shall be presented to inspector. Any grade cattle maintained in the herd. Or associated with animals of the herd, shall be identified by a tag or other marking satisfactory to the Veterinary Director General.

f) All removals of registered cattle from the herd, either by sale, death, or slaughter, shall be reported promptly to the said Veterinary Director General, giving the identification of the animals, and, if sold, the name and address of the person to whom transferred. If the transfer is made from the accredited herd to another accredited herd, the shipment shall be made only in properly cleaned and disinfected cars. No cattle shall be allowed to associate with the herd which have not passed a tuberculin test approved by the veterinary Director General.

g) All milk and other dairy products fed to calves shall be that produced by an accredited herd, or, if from outside or unknown sources, it shall be pasteurized by heating to not less that 15^0F for not less than 20 minutes.

h) All reasonable sanitary measures and other recommendation by the Federal authorities for the control of tuberculosis shall be complied with.

i) Cattle from an accredited herd may be shipped to the United States, accompanied by the certificate of the Veterinary Director General, without further tuberculin test for a period of one year, subject to the rules and regulations of the State of destination.

j) Strict compliance with these methods and rules shall entitle the owner of tuberculosis-free herds to a certificate, "Tuberculosis-Free Accredited Herd," to be issued by the Veterinary Director General. Said certificate shall be good for one year from date of test unless revoked at an earlier date.

k) Failure on the part of owners to comply with the letter or spirit of these methods and rule shall be considered sufficient cause for immediate cancellation of cooperation with them by the Federal Officials.

l) Whenever in carrying out this order it is necessary to slaughter an animal or animals for the eradication of tuberculosis from a herd, the animals or animals shall be valued and compensation awarded as provided in Sections 14 and 15 of the Animal Contagious Diseases Act.

Appendix 5. Regulation Relating to the Establishment and Maintenance of Restricted Areas For the Eradication of Bovine TB

By order in Council dated May 4, 1927, in virtue of the Animal Contagious Disease Act, R.S.C., 1908 and as amended September 25, 1929, and January 10, 1930, June 6, 1930, November 12, 1931, October 6, 1933, May 14, 1935, January 16, 1936, August 6,1937, March 14, 1939, June 28, 1940, and September 11, 1940.

1. Upon receipt of a request from the Government of any Province and upon compliance with the provisions of these regulations the Government of Canada will, whenever it appears desirable to Minister of Agriculture as to do, assist in the eradication of Bovine Tuberculosis from a restricted area, in the manner hereinafter provided.
2. Applications may be made to the Dominion Department of Agriculture by the Minister of Agriculture of the Provincial Government stating that the province is desirous of federal aid in the eradication of Bovine Tuberculosis from a restricted area, upon and subject to the provisions of these regulations, and stating: (a) the location and boundaries of the proposed area; (b) the approximate number of cattle within it; (c) that a majority consisting of at least two-thirds of the cattle owners in the proposed area are in favour of having their cattle tested for the eradication of tuberculosis, and (d) that the Provincial Government whenever requested by the Federal Department of Agriculture, will assist in the enforcement of these regulations by conducting prosecutions of persons accused of obstructing or refusing to assist federal inspectors engaged un the work of testing cattle, and persons who, in any way, refuse to obey the regulations made hereunder.
3. Upon the approval of the Minister of Agriculture of any such application, a proclamation may be published in the Canada Gazette constituting the proposed area

a restricted area within the meaning of these regulations, whereupon all provisions of these regulations shall apply to said restricted area.

4. The said area shall be quarantined area in so far as Bovine Tuberculosis is concerned. Cattle may only be moved into or out of the are under the following conditions:
   1) Fully accredited cattle accompanied by a certificate of a veterinary inspector may enter the area without test;
   2) Cattle from herds under the supervision of the Health of Animals Branch for the eradication of Tuberculosis may enter the area without test if accompanied by a certificate signed by a veterinary inspector showing the date of the last test.
   3) Steers and heifers of a feeder type may be admitted into the area without test under the following conditions: They shall be accompanied by a license issued by a veterinary inspector. They shall be isolated from other cattle and shall be submitted to a tuberculin test conducted by a veterinary inspector upon arrival at destination. Reactors shall be promptly removed for slaughter and no compensation shall be paid.
   4) Other cattle intended to remain within the area shall be subjected to the tuberculin test by a veterinary inspector or approved veterinarian before admittance to the area.
   5) Cattle for entry into the area for exhibition purposes or other temporary stay, not covered by section (a) and (b) shall be subjected to the tuberculin test by a veterinary inspector or approved veterinarian before admittance to the area.
   6) Cattle for immediate slaughter consigned to approved slaughtered-houses only may be brought into the area without test, but shall not be allowed to come in contact with other cattle, and shall be kept isolated on the premises until slaughtered, provided, however, that any unfinished cattle so consigned may be held for feeding purposes under the following conditions: They shall be submitted

to a tuberculin test by a veterinary inspector. Reactors shall be promptly removed for slaughter and no compensation shall be paid. Non-reactors shall be moved under licensed to approved feeding premises, where they shall be quarantined for a retest to be conducted after the expiration of a sixty-day period. Cattle in transit across the area by rail shall not be unloaded except at a point designated for that purpose where they may be kept from contact with other cattle within the area.

7) Cattle shall not be driven across the area by road unless special permission has been obtained in writing from the Veterinary Inspector in charge of the area.

5. Owners of cattle within the area will be required to assist the veterinary inspectors making the test by assembling the cattle when requested and giving whatever additional help as many be reasonably expected. Owners when requested must furnish meals and bed for the inspector while conducting the test.
6. Suitable transportation from farm to farm within the area for the officers of the Health of Animals Branch must be provided by the Provincial Government.
7. Use of syndicate or joint bulls will be permitted in herds that are equally free from disease but not otherwise. For instance, a bull from a herd that has contained reactors shall not be used in a herd that has passed a clean test.
8. All cattle within the area shall be submitted to the tuberculin test as soon as practicable by veterinary inspector, or accredited veterinarians, and shall be retested whenever deemed necessary by the Veterinary Director General.
9. Reactors to the test shall be marked for identification and shall be disposed of by slaughter under inspection forthwith.
10. Compensation for reactors slaughtered by order of a Veterinary Inspector duly authorized under the Act may be granted as provided in section 14 or 15 of the Animal Contagious Disease Act.
11. Compensation will not be paid for reacting grade bulls, or animals affected with

lumpy jaw.

12. The feeding of animals within a restricted area on by-products of cheese factories, skimming stations and butter factories is prohibited, unless the said by-products have first been sterilized by heat.
13. The Minister may order the exclusion of public stockyards and other areas for the assembling and marketing of cattle located within an established area, from the provisions of these regulations.
14. All premises and contact matter detected or suspected of being infected with tuberculosis, shall be thoroughly cleansed and disinfected by and at the expense of the owner or occupier, in a manner satisfactory to an inspector.
15. The Veterinary Director General may declare an area (country, municipality or district) an accredited area for a period of three or six years under the following conditions—
    1) When the percentage of cattle infected with tuberculosis does not exceed one-half of one percent (0.5%) the area may be accredited for three years.
    2) When the percentage of cattle infected with tuberculosis does not exceed two-tenths of one percent (0.2%) the area may be accredited for a period for six years.
    3) When the percentage of cattle infected with tuberculosis is over one-half of one percent, but not more than one per cent, the area may be accredited for a period of three years, provided the infected herds are retested and percentage of infected cattle, as a result of the retest, does not exceed one-half of one per cent (0.5%) of the total number of cattle within the area.
    4) A range of semi-range area may be accredited for a period of three years when all cattle in herds not considered range or semi-range herds have been submitted to a tuberculin test, and when in the range or semi-range herds all bulls, pure-bred breeding cattle, milch cows, home-fed cattle, and in addition, a representative

group of at least ten percent (10%) of the range or semi-range cattle, have been submitted to a tuberculin test, and the percentage of cattle infected does not exceed one-half of one per cent (0.5%), provided that when a reactor to a tuberculin test, or other evidence of tuberculosis, is found in a range or semi-range herd the entire herd shall be tested.

Note---Compensation on a pure-bred basis will not be paid for reacting animals over six months of age not registered at the commencement of tuberculin test.

Appendix 6. Historical Land Acquisitions and Exchanges for RMNP

Following were valuation details of small South Clear Lake extension.

Township 19-18 W.P.M

N.E.¼ 19. Patented to settler and apparently abandoned for some time

Building, Old Shack, Value---		nil	
Cultivated land,	10 acres	$ 200	
Bush Land,	150 acres	$750	Total $950

N.E. ¼ 28. Homestead of L. W. Beddome

Improvements		nil	
Bush Land	160 acres	$800	Total $800

S½ of N.W. ¼ 28. Homestead of B. Beddome

Building, Value		$570	
Cultivated land	7 acres	$140	
Bush Land	73 acres	$365	Total $1,075

S.E. ¼ 28, Patented to settler

Building, Value		$100	
Cultivated land		nil	
Bush land	160 acres	$800	Total $900

S.W. ¼ 28, Homestead of W. L. Burkett

Building, Value		$395	
Cultivated Land	7 acres	$140	
Bush Land	153 acres	$765	Total $1,300

Township 19-19 W.P.M

N.E. ¼ 22 Patented to S.S. of C.

Buildings, Value	$320

Cultivated land,	21 acres	$420	
Bush land	139 acres	$695	Total $1,435

Fr. N.E. ¼ 23 Homestead of J.S.Falconer

Buildings, Value		$220	
Cultivated land	1 acre	$20	
Bush land	100 acres	$500	Total $740

Fr. N.W. ¼ Unpatented Soldier Reservation

Improvements		nil	
Bush land	64 acres	$320	Total $320

N.W. ¼ 24 Homestead of C.Radick

Buildings, Value		$420	
Cultivated land	5 acres	$100	
Bush land	155 acres	$775	Total $1,295

S½ of N.E. ¼ 27 Patented to S.S.of C.

Buildings, Value		$650	
Cultivated land	9 acres	$180	
Bush land	81 acres	$405	Total $1,235

S½ of N.W. ¼ 27 Unpatented Time Sale

Improvements		nil	
Bush land	80 acres	$400	Total $400

S.E. ¼ 27 Patented to S.S of C.

Buildings, Value		$75	
Cultivated land	140 acres	$2800	
Bush land	20 acres	$100	Total $ 2975

The total value of all of 12 parcels of land was $13,425. This proposed small extension can achieve 1,535 acres.

Appendix 7. Historical Land Extension in the Clear Lake Area (RMNP)

Following are valuation details of additional 12 sections in large South Clear Lake extension.

Township 19-18 W.P.M

S.E. ¼ 19 Unpatented Soldier Reservation

No buildings

Cultivated land	18.5 acres	$370	
Bush land	141.5 acres	$707.50	Total $1,077.50

S.W. ¼ 19 Patented to S.S.of C.

Buildings, Value		$1,400	
Cultivated land	56 acres	$1,120	
Bush land	104 acres	$520	Total $3,040

Township 19-19 W.P.M

E½ of N.W. ¼ 22 Unpatented Soldier Reservation

Buildings, Value		$120	
Cultivated land	52 acres	$1,040	
Bush land	28 acres	$140	Total $1,300

W½ of N.W. ¼ 22 Patented to Settler

Building Values		$950	
Cultivated land	73 acres	$1,460	
Bush land	7 acres	$35	Total $2,445

S.E. ¼ 22 Patented to S.S. of C.

Buildings, Value		$800	
Cultivated land	93 acres	$1860	
Bush land	67 acres	$335	Total $2,995

S.W. ¼ 22 Patented to S.S. of C

Buildings, Value		$1,020	
Cultivated land	140 acres	$2,800	
Bush land	20 acres	$100	Total $ 3,920

Fr. S.E. ¼ 23 Unpatented Time sale

Buildings, Value		$100	
Cultivated land	7 acres	$140	
Bush land	84 acres	$420	Total $660

Fr. S.W. ¼ 23 Unpatented Soldier Reservation

Buildings, Value		nil	
Cultivated land	11 acres	$220	
Bush land	53 acres	$265	Total $485

S.E. ¼ 24 Patented to Settlers

Buildings, Value		$360	
Cultivated land	11 acres	$220	
Bush land	149 acres	$745	Total $1,325

S.E. ¼ 24 Patented to Settler

Buildings, Value		$100	
Cultivated land	6.5 acres	$130	
Bush land	153.5 acres	$767.5	Total $997.5

S.W. ¼ 27 Patented to Settler

Buildings, Value		$340	
Cultivated land	86 acres	$1,720	
Bush land	74 acres	$370	Total $2,430

Township 18-20 W.P.M

S.W. ¼ 19 Homestead of H.J.M. Mayor

Buildings and well, Values		$340	
Cultivated land	14 acres	$280	
Bush land	146 acres	$730	Total $1,350

The total value of additional 12 parcels of land was $22,025. This proposed larger extension would add 6,454,965 more square meters.

Appendix 8. Timber Extraction RMNP

In 1931 the area of RMFR was officially transferred to the National Park and all the administration practices were placed under the National Parks Act instead of Forest Reserve Act. The Parks Acts defined that "the Parks are hereby dedicated to the people of Canada for their benefit, education and enjoyment, subject to the Provisions of this Act and Regulations, and such Parks shall be maintained and made use of so as to leave then unimpaired for the enjoyment of future generations". Under the Park Act, the only provision regarding to timber removal is "the cutting and removal of dead or diseased timber and such green timber as may be necessary for thinning or forest protection". On the contrary, timber cutting was fully supported as an industry by the Forest Reserve Regulations as long as timber was seen as a commercial production. Under the Forest Reserve Act, sawmills were even arranged to be located on areas where a definite amount of cutting could be allowed and to advertise the concession and dispose of same by tender. The sole right to operate a mill in the districted would be offered to the successful bidder. As a real practice, the Forest Reserve priced for the logging and sawing different classes of lumber and then offered the timber permits with specific rates for settlers who were milling in their locals the owners' mills after cutting done. The settlers turned over their timber cutting permits to the mill owners who provided all the process material and the mill owners turned in the permits to the Forestry Officer. This real practice was approved by the Forest Service as "The undersigned encloses herewith the sum of ....dollars in cash, bank draft or accepted bank cheque, being the fee for the privilege of locating a sawmill on the ....of Section....Township....Range...West of the ....Meridian, for the purpose of cutting timber to be granted under settlers' permits, it being understood that the undersigned shall be permitted to log and saw a quantity of timber not exceeding one hundred thousand feet, board measure, before receiving any permits from settlers, but that

such timber shall remain the property of the Crown, and shall not be sold or disposed of otherwise than to settlers on their presenting their permits. The undersigned hereby tenders the following maximum rates to be charged by him for logging and sawing:

For Logging and Sawing

Spruce, pine, tamarack, balsam, fir, etc.....per thousand feet

Poplar.....per thousand feet

Other species.....per thousand feet

For Sawing Only

Spruce, pine, tamarack, balsam, fir, etc.....per thousand feet

Poplar.....per thousand feet

Other species.....per thousand feet."

Although the timber cutting permits were still issued to local people under the National Park Regulation, unfortunately it was impossible for the RMNP to allow the saw mill concessions to satisfy the their further requirement (R.M.35, Memorandum, July 23, 1931).

The new regulations for timber cutting on Park lands under the Park Act attempted to balance of the need of the Park and its ecology and settlers in the vicinity of the Park who depended on the wood and timer for their livelihood.

Maps 16 to 20 showed the timber cutting areas under the RMFR. The mill sites distributed on Marked Districts.

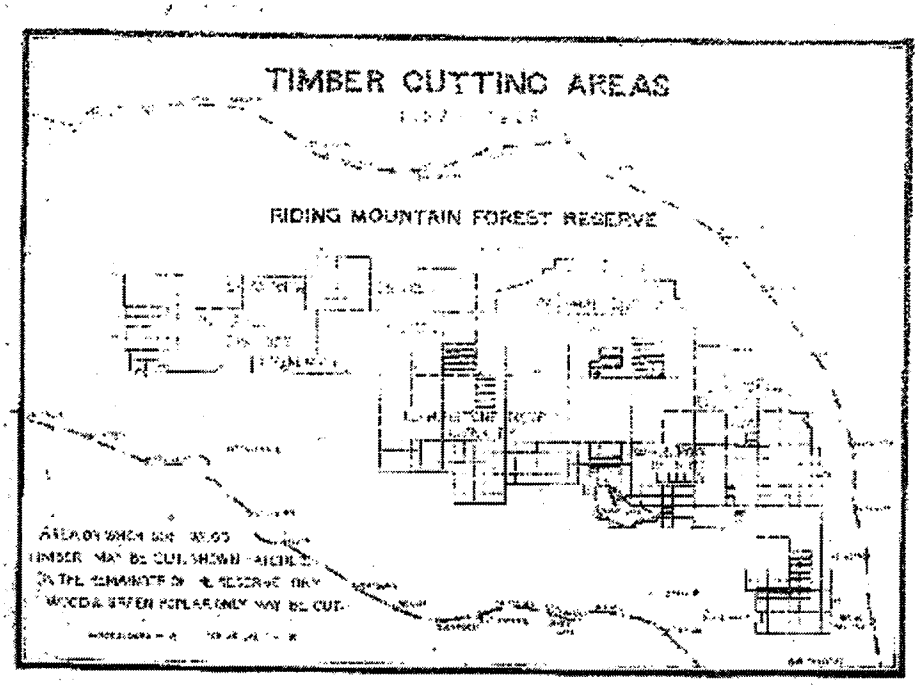

Figure 16. The Timber Cutting Areas in RMFR (1927-1928)
Note: Map from Parks Canada, RG 84, A-2-a, Volume 168, R.M.35, 1961-1934.

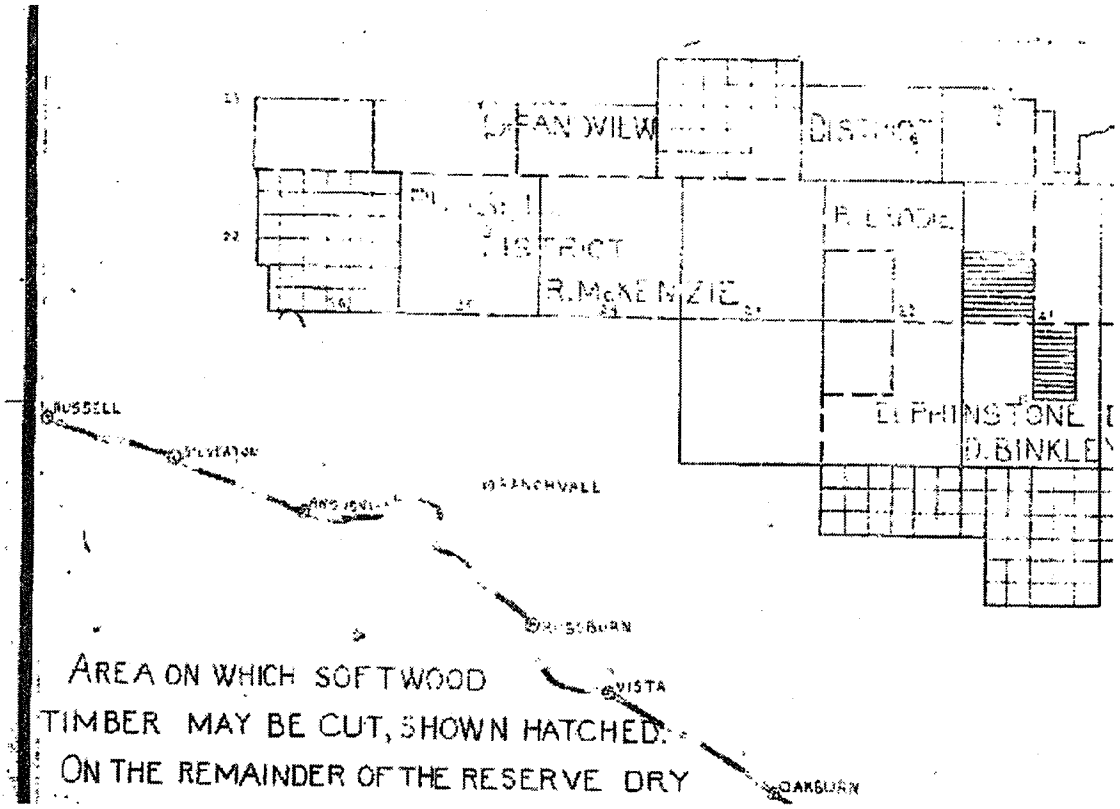

Figure 17. The Northwest Part of the Timber Cutting Areas in RMFR

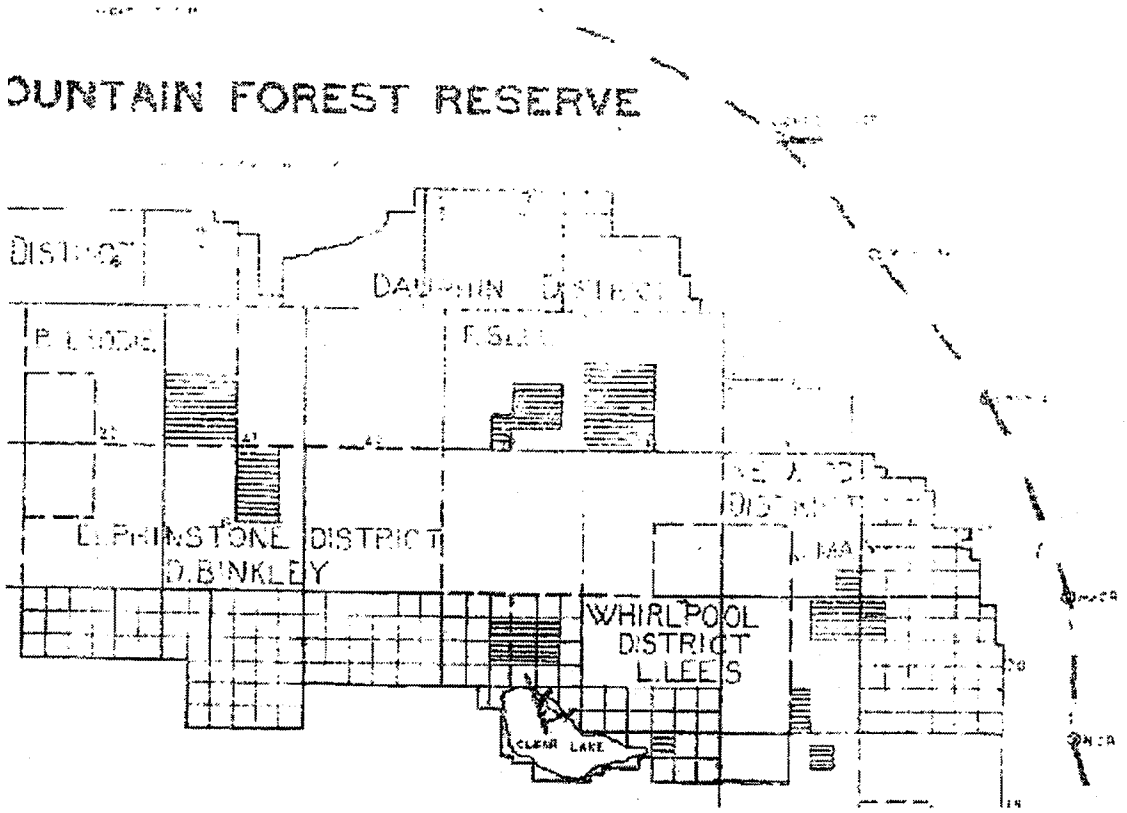

Figure 18. The Central Part of Timber Cutting Areas in RMFR

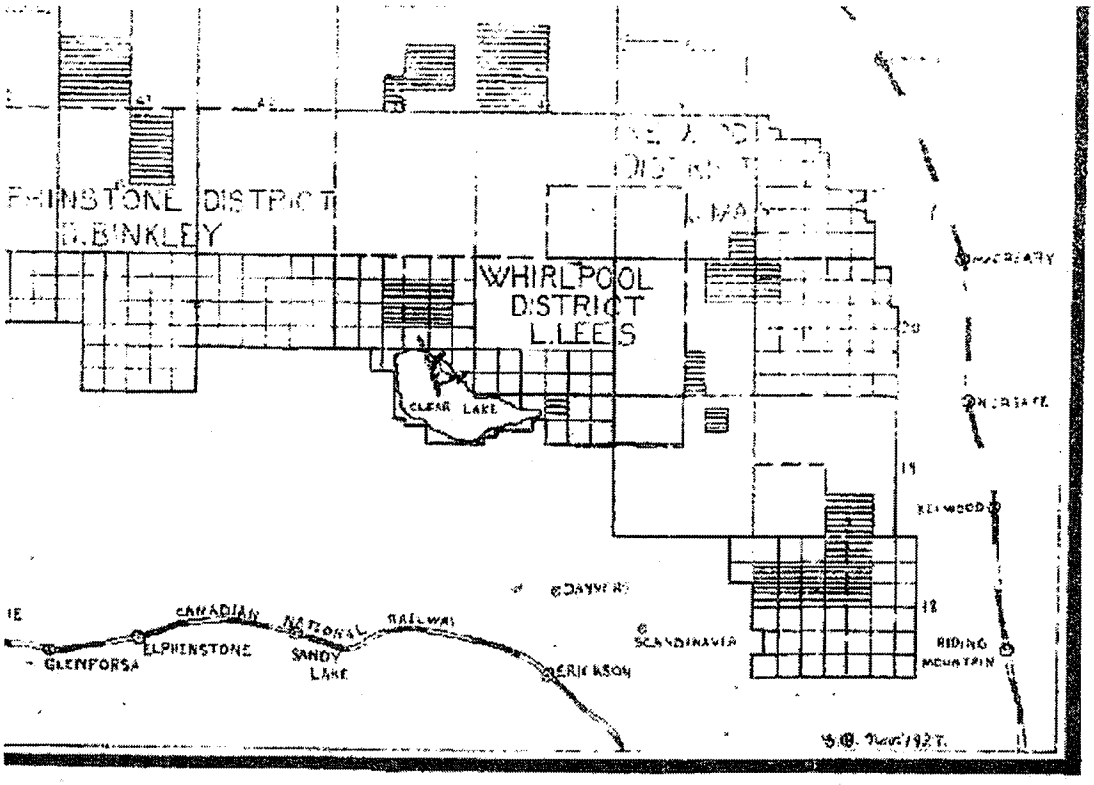

Figure 19. The East Part of Timber Cutting Areas in RMFR

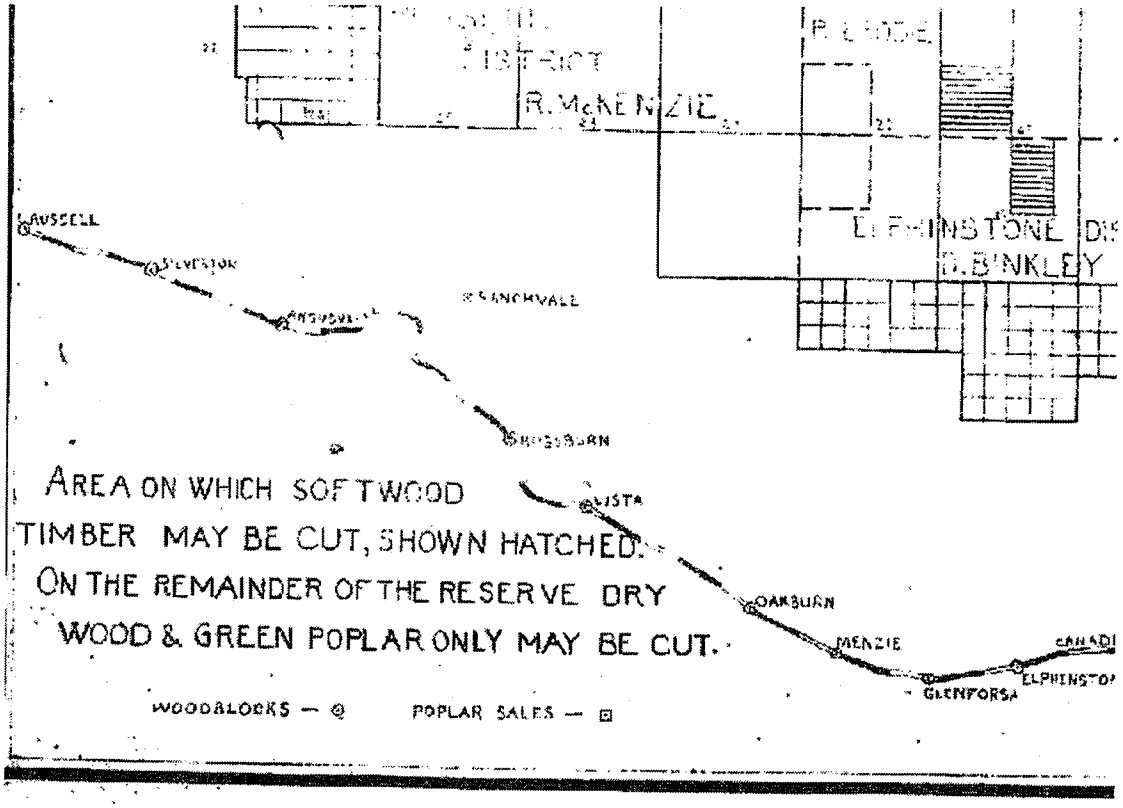

Figure 20. The Southern Part of Timber Cutting Areas in RMFR