ENVIRONMENTAL GUIDELINES

FOR CFB SHILO, MANITOBA

by

W. E. Stevens,- Edmonton

J. Carreiro - Winnipeg

A Report to the Department of National
Defence from the
Canadian Wildlife Service

Edmonton, Alberta
June 1973

ENVIRONMENTAL GUIDELINES FOR CFB SHILO

Canadian Forces Base Shilo, which is situated near Brandon, Manitoba contains 14,400 acres of federally owned land and 83,200 acres of leased provincial Crown land. The leased land represents the majority of the training area and, because the terms of the lease are to be renegotiated in 1974, it is important that guidelines be produced before that time to contain or minimize environmental damage therein. Those guidelines must take into account an increase in training activity that may involve tanks and self-propelled artillery and must reconcile that activity with the increasing public demand that scarce wild-lands be preserved.

In a letter from National Defence Headquarters, dated 21 November, 1972, the Canadian Wildlife Service was asked to investigate the ecological and topographical conservation of the training area of CFB Shilo in order to support the lease negotiations with the province of Manitoba. The information and the recommendations that follow are based upon available sources of data, and upon discussions with provincial authorities and military personnel at Winnipeg and Shilo. Refinement of the guidelines will be possible after further study, and after their testing under operational training conditions.

History of the Area

Geologically, the present military reserve sits upon what is known as the upper Assiniboine Delta, as described by Erlich et al. (1957) and Halstead (1959). That delta was formed at a time when

the Assiniboine River flowed into glacial Lake Agassiz at a point near the present city of Brandon. Since then the deltaic sands have been sorted and shifted by the forces of wind and water but generally the whole aspect of the old delta is that of a level and undulating plain with both active and stabilized sand dunes.

Early settlers must have been impressed by the beauty and the unique characteristics of the region because from among them emerged such famous naturalists as E. T. Seton who settled at Carberry in 1880, and Norman Criddle, whose family established at Treesbank in 1882. At about that period there was an abundance of moisture that allowed agriculture to become established, even on the sandy plains, but thereafter the return to normal dry conditions caused most of the farms to be abandoned by the start of the present century. By 1930, Bird (1961) found most traces of agricultural activity to be extinguished in the area.

The Spruce Woods Forest Reserve was established in 1895 in deference to the opinion that the land was more useful for forestry than for agriculture, but over the years the level of forestry practiced has been superficial because of the sparse nature of the tree growth.

In 1910 the Canadian Army began using the southwestern portion of the forest reserve for training, and in 1933 became established at Shilo, as Waldon (1972) has recorded. Most of the forest reserve east of provincial highway 258 connecting Carberry and Glenborn has

recently been established as the Spruce Woods Provincial Park and there are public pressures to add thereto those portions of the military reserve containing the active sand dunes; the Bald Head Hills. Certainly the sand dunes are more scenic than functional from a military standpoint, and for some years military activity therein has been restricted to the use of light patrol vehicles. The building of provincial highway 258 opened up the area to easy public access, and as a consequence, damage to the scenic values of the dunes now is being caused by thoughtless citizens on dune buggies, motorcycles and snowmobiles. To date military patrolling has been too sporadic to exclude such intrusions.

Climate

The climate of the Spruce Woods area is continental in nature with hot dry summers and cold winters. The annual precipitation is less than 20 inches of which nearly half falls as rain during the months of May, June and July. Locally the nature of the topography has a marked effect on climatic conditions at ground level, north and east slopes of stabilized dunes being cooler and more humid than other exposures, or the level plains. This variation in micro-relief has promoted a varied vegetational complex, as will be detailed subsequently.

Soils

Erlich et al. (1957) provided a report of the soils of the Carberry map area, and the Canada Land Inventory Map (1966) of the

agricultural capability of the Brandon area soils drew extensively upon his data.

As explained earlier, the parent materials for the soils of the military reserve are mostly deltaic sands and sandy outwash deposits. Erlich classified the deltaic materials as loamy sands belonging to the Stockton Association of soils. He also described the area of Miniota sands to the south and east of Shilo that intrudes into the reserve along its western edge (Photo 1). They derive from glacio-fluvial outwash on level or slightly undulating terrain. All those soils are well drained and subject to wind erosion if the native mixed prairie vegetation is disturbed or broken. They are low in fertility with a weakly developed structure and rate very low, even for grazing use, on the 1966 agricultural capability map.

Large and extensive dunes have developed on the fine textured Stockton loamy sands, and active dunes and soil blow-outs are much in evidence, especially toward the east side of the reserve (Photos 3,4).

An interesting anomaly is the area of indifferentiated peat that lies in the valley of Epinette Creek on the northeast side of the reserve and surrounds Sewell Lake. Because there is no present military use of the area it need not be included in a management plan except incidentally as a buffer zone. Eventually much of the peat zone will be covered over by infringing sand, but that probably will not happen within the present century (Photo 2).

Photo # 1. Open Sand Plain Intended as a Site for Tank Training on the Shilo Military Reserve, Manitoba.

Photo # 2. Sand Dunes Encroaching on the Peat Soils of Zone 3, Shilo Military Reserve, Manitoba.

Photo # 3. Active Sand Dunes in the Bald Head Hills of Zone 4, Shilo Military Reserve, Manitoba.

Photo # 4. Stabilized Sand Dunes in the Bald Head Hills of Zone 4, Shilo Military Reserve, Manitoba.

Vegetation

The vegetation to be found within the military reserve is about equally divided between grassland, aspen parkland and a white spruce - aspen - bur oak complex. Each vegetation type is associated with particular soil and topographic conditions (Map Figure 1).

The grasslands on the sand plains were described by Bird (1961) as being in a practically primeval condition, and to that date little disturbed by past military activity. The predominant grasses are needle grasses Stipa comata and S. spartea, wiregrass Andropogon scoparius, and grama grass Bouteloua gracilis. Associated with those grasses is a variety of such typical prairie herbs as prairie crocus, vetches, sage, goldenrod and spikemoss. Locally, where sand mounds and depressions provide a suitable micro-habitat, clumps of snowberry Symphoricarpos occidentalis, aspen Populus tremuloides and silver-berry Eleagnus commutata may be found.

The aspen represents a transitional stage of vegetation between the grassland and the mixed spruce forest and, historically, it has continued to encroach upon the grasslands of that portion of Manitoba. Associated with aspen are several shrub species that include juniper Juniperus horizontalis, bearberry Arctostaphylos uva-ursi, and sand cherry Prunus pumila. Aspen parkland is extensive across western Canada and its advance or retreat into the prairie grasslands has been dominated by such factors as fire, grazing and drought.

In southwestern Manitoba the aspen has been infiltrated by bur oak Quercus macrocarpa and exists as a mixed wood stand with white

spruce Picea glauca on the rougher country that represents the stabilized sand dunes.

A special habitat in the Bald Head Hills is the active dune area that covers three or four square miles on the eastern edge of the military reserve. Here the sand is piled into rippled mounds that are slowly advancing southeastward before the prevailing winds. That advance, however, is checked by pioneer plant communities that interrupt soil drift and create a microclimate suitable for the growth of other plants that further reduce wind velocity and bind the fragile soils. Predominant in that role are wild rye Elymus canadensis, skeleton weed Lygodesmia juncea, sand dock Rumex venosus, silverberry and willow Salix interior. The Bald Head Hills represent a scenic and unique habitat in Manitoba that easily lends itself to nature study and nature interpretation.

The presence of white spruce on the sand hills of southwestern Manitoba is most interesting to botanists. Most white spruce forest now is found far to the northward and this relict stand has been able to persist because of the favourable local conditions. Bird (1961) was of the opinion that fire and snowshoe hares have combined to keep the spruce growth from advancing farther into the prairie grassland community. He noted that there was an advance of the spruce forest after the establishment of the Spruce Woods Forest Reserve provided the justification for active fire control. Spruce is more vulnerable to fires than is aspen, and aspen more vulnerable than grasslands. Fire, then, may be one of the chief influences in

maintaining the patchwork pattern of habitat types displayed on Map Figure 1. The extensive understory of horizontal juniper and bearberry, being resistant to burning, no doubt reduce the incidence of fires that otherwise would remove the spruce and aspen forest.

Animal Life

For a number of years there was a Department of Agriculture Entomological Research Station at Aweme, five miles north of Treebank, Manitoba. Norman Criddle worked there and made extensive studies not only as an entomologist but also as a naturalist. He, and his brother Stuart Criddle, contributed much to our knowledge of southwestern Manitoba. The writings of E. T. Seton (1909) and J. D. Soper (1961) about the mammals of Manitoba also are well known.

Bison, pronghorn antelope, grizzly bear, black bear and the mule deer, no longer are found in the sand hills; although moose have maintained themselves in the muskeg area along Epinette Creek, and elk have survived in the spruce aspen forest, protected by restricted access and provincial game regulations. The mule deer have been replaced by white-tailed deer and the latter have been hunted as game within the military reserve for the past few years. The preliminary Canada Land Inventory ungulate capability maps (1972) show the area to have limitations of moisture and soil fertility, which probably means that the existing populations of wild ungulates will not increase appreciably in the future because of those restrictions. Ruffed grouse and sharp-tailed grouse also are hunted in the area but the hunting pressure is low because of restricted access.

It is the less conspicuous animal species that are more characteristic of the sand hill country, and some of them are found nowhere else in Canada. The northern prairie skink, a kind of lizard, is thought to be restricted to the Spruce Woods sand hills of Manitoba. The plains spadefoot toad also is adapted to living in a semi-arid environment and has been found in the military reserve just east of Shilo. It shares that habitat with the western hognose snake, which though not confined to Manitoba, is not abundant anywhere in Canada.

Shifting sands are home for a number of species of tiger beetles that have earned their name because of their predacious habits. They share the sand hills with an abundant fauna of grasshoppers that feeds on the hardy plant life, and with bee flies and blister beetles that feed on the grasshoppers.

The bird life of the region is not particularly distinctive although, because of the variety of habitats, the list of species is long. Of particular interest are such uncommon species as ferruginous and merlin hawks, and the introduced wild turkeys, whose present status is in doubt. Greater prairie chickens at one time were found there but like the bison they have gone from the sandy prairies. As long as the military reserve remains in a reasonably natural state most of the present bird life will be able to persist. Such activities as ranching or farming would prove much more distruptive to the bird life than the present level of military activity.

Problems in Use for Tank Training

The Map Figure 2 provides information about soil types and their ability to withstand surface abrasion without damage. Because all the soils are sandy there is a high risk of mechanical removal of the surface vegetation that binds the soil together. Wind is the main erosive force and because most of the soils are fine sands they are subject to blowing. In addition, sand dune and sand blow-out areas are characterized by rolling to abrupt terrain which can make the use of vehicular traffic even more damaging to the soil surface. Basically, the Shilo military reserve will not lend itself to the kind of tank and artillery training being practiced at Suffield, Alberta without special precautions being taken.

Recently Kjearsgaard (1973) described the close relationship that exists between soil texture, soil moisture and topography in gauging the ability of various oil types to withstand vehicular traffic. He used that information to establish a trafficability rating.

That portion of the Shilo reserve comprising the Stockton loamy sands has been judged to have very low trafficability (Appendix A). The use of heavy tanks and self propelled artillery across those soils should be discouraged, or should be confined to existing roadways.

The mixed grasslands of the reserve grow on the glacial outwash deposits known as the Miniota sands. For the most part those sand deposits are less subject to wind erosion and thus dune formation has

been less prevalent. Because terrain is level and forest growth is minimal, both visibility and trafficability are superior to any other areas of CFB Shilo. It is on these grasslands that the tank battle runs have been proposed, and they are the only feasible areas to use, if such training is to be undertaken. Two serious drawbacks to activity in those areas are their relatively small size, which concentrates terrain damage, and their low resistance to damage, which makes rehabilitation more difficult. As a general comparison, similar terrain and soil conditions at CFB Suffield were judged unsuitable for use by tracked vehicles except on existing roadways. At Suffield, however, there were good to poor areas to choose from; at Shilo the choice is restricted to poor and worse.

The use of explosive and tracer ammunition brings with it the sharply increased danger of grass and forest fires. It has been observed in the past that there is a direct relationship between the incidence of fires on the military reserve and the use of heavy artillery. There is no doubt that with increased military activity the number of fires will increase. Those fires will pose a serious administrative problem and adequate counter-measures will have to be developed.

A third problem in using CFB Shilo for NATO training exercises is the amount of public sentiment that has been built up against such use. Most of that sentiment is directed toward the dune areas, specifically the Bald Head Hills on the east side of the reserve. Increased public access was provided by the construction of the highway from Carberry,

and increased public appreciation of the sand dunes has grown in proportion. The area has been called Canada's only true desert, and such organizations as the Manitoba Naturalists Society have championed its protection and preservation. In addition a major portion of the open dune country has been proposed for preservation as a terrestrial community under the International Biological Programme. That program, supported by the International Council of Scientific Unions, is world wide and its aims have widespread acceptance among the scientific community. Another I.B.P. site of about two square miles has been chosen on the mixed grass prairie along the western edge of the military reserve, and an alternative site of larger size along the southeastern boundary. Those proposed reserves are intended to maintain under natural conditions a portion of the vegetative community of the dry sand plains.

Obviously there are conflicting interests among the agencies involved with the Military Reserve, and those conflicts might be reconciled by zoning the land surface to allow some areas for training, and free others from the disturbance caused by military activities.

Zoning of the Military Reservation

The following zones and uses are presented for consideration in the knowledge that, while such a course will localize terrain damage, it will not eliminate it. From the outset major consideration will have to be given to the rehabilitation of the badly affected areas.

Zone 1

Those areas of Miniota sands on the west side of the reserve, shown on Map Figure 1 as grassland and on Map Figure 2 as 5L, may be used for tank battle runs because they are the most stable areas available (see Appendix A for a traffic-ability rating).

Zone 2

Those portions of the reserve on Stockton loamy sands designated as white spruce - aspen - oak, and aspen parkland on Map Figure 1, and on Map Figure 2 as 2VL, will comprise the target impact areas. In order to reduce surface erosion the activities of tracked vehicles and heavy wheeled vehicles should be confined therein to existing trails and roadways. It is anticipated that this zone will be at greatest risk from forest and grass fires, and that special precautions will have to be taken to prevent and control such fires.

Zone 3

So far as is possible the treed muskeg areas on either side of Epinette Creek, shown on Map Figure 2 as 3VL, should remain outside the influence of military activity.

Zone 4

Those areas of open sand, designated on Map Figure 1 as active sand dunes and on Map Figure 2 as 1EL, should have

complete protection, with any military activity being confined to patrolling and to fire suppression. The eastern portion of that zone, referred to throughout as the Bald Head Hills, should remain as a natural area inside the military reservation so that it may serve as a buffer zone between the military activity in Zone 2 and the public recreational areas in the Spruce Woods Provincial Park. Because the Bald Head Hills do represent a unique land form in Manitoba and because they are of public and scientific interest they should be given protection by the present lessee, the Department of National Defence. Such protection will require better patrolling of the eastern boundary of the military reserve and the enforcement of entry permits for the area. With the increase in military activity that is proposed, it will be necessary in any case to curtail public access to the Bald Head Hills and to rigidly exclude such recreational vehicles as motorcycles and dune buggies.

Zone 5

On Map Figure 2 there are eroded channels and steep slopes designated as 4VL. Those areas lead down to the flood-plain of the Assiniboine River and the topographic restrictions there should prevent their use for military purposes.

The lease of most of the military reservation is to be renewed in 1974. Prior to the time that negotiations are undertaken for that lease, the province of Manitoba should be encouraged to reveal what long term plans it has for the Spruce Woods Forest Reserve and the Spruce Woods Provincial Park. Armed with that knowledge, the planning for military activity within the leased portion of the forest reserve could be tailored to give some thought to future uses of the area. That is important, not only for the areas proposed I.B.P. sites, but also for those portions of the reserve no longer required for military purposes that could be excluded from the renewed lease.

Activities such as livestock grazing and hunting that have been allowed in the past might be continued in future as a gesture to public good will, if they do not interfere with military activity. Scientific investigations and guided tours of the Bald Head Hills under military supervision serve a very useful purpose and could be actively encouraged in future. Joint funding and supervision of guided tours on specified dates might be worked out between the responsible provincial agency and the Department of National Defence.

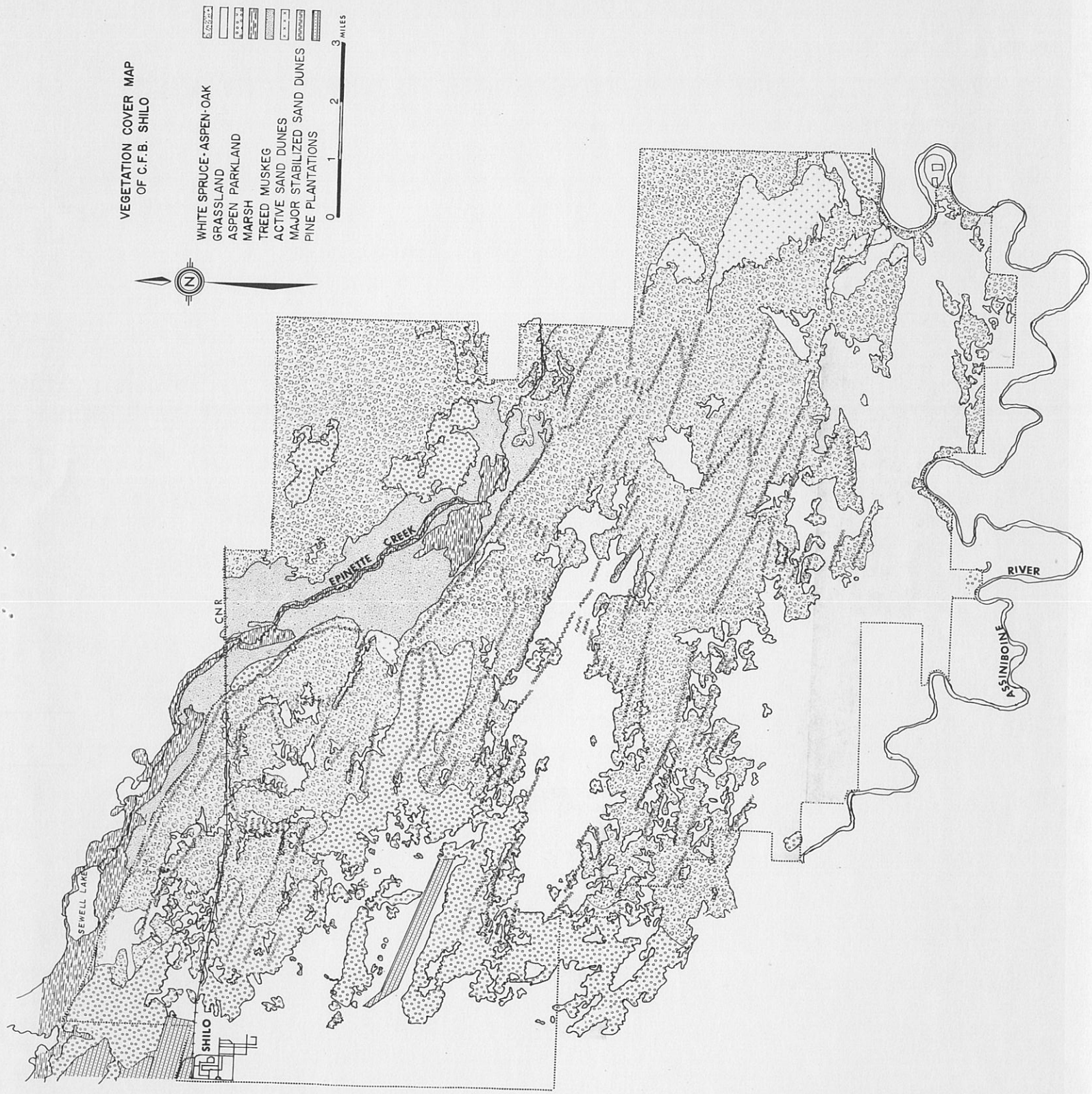
Summary of Recommendations

1. The environmental values of CFB Shilo are such that it is recommended that land use on the area remain compatible with their maintenance.
2. Because the soils are light and dry, and the vegetation generally weak and scanty, and because the capability of CFB Shilo to support

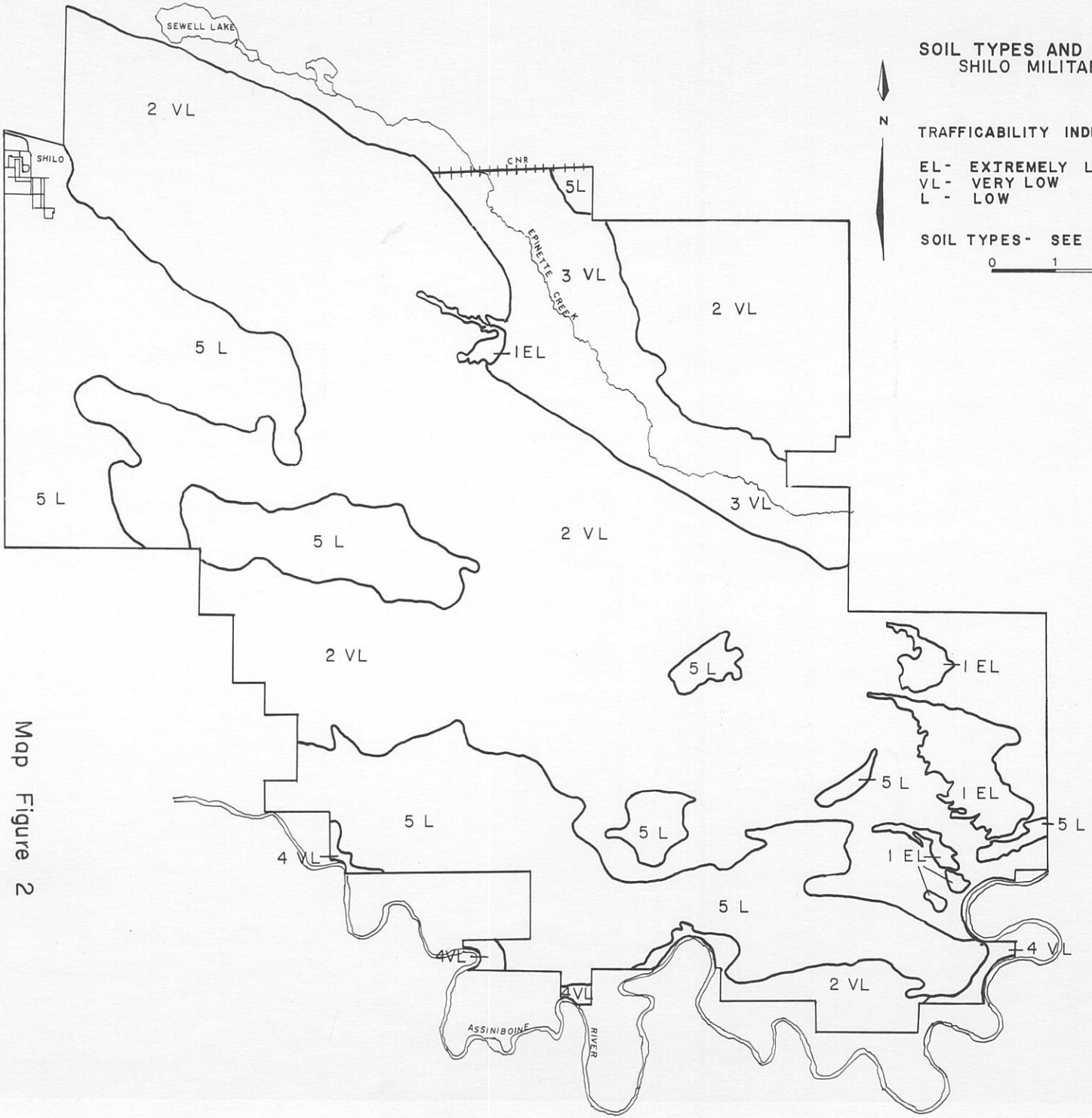
heavy vehicle traffic is therefore limited, it is recommended that tank training runs be confined to the more suitable zones and that elsewhere vehicles be confined to trails and roads.

3. Because the vegetation of the zones recommended as impact areas is inflammable, it is recommended that a thorough study be instituted of fire control before the use of heavy artillery is intensified.

4. Because public interest in the CFB Shilo is high, it is recommended that the military authorities accord protection to particular features such as the Bald Head Hills and I.B.P. reserves, and that elsewhere they encourage such public use as is compatible with their training objectives.


VEGETATION COVER MAP
OF C.F.B. SHILO
WHITE SPRUCE-ASPEN-OAK
GRASSLAND
ASPEN PARKLAND
MARSH
TREED MUSKEG
ACTIVE SAND DUNES
MAJOR STABILIZED SAND DUNES
PINE PLANTATIONS
0
1
2
3 MILES
N
EPINETTE CREEK
C.N.R.
SEWELL LAKE
SHILO
ASSINIBOINE
RIVER

Map Figure 1


SOIL TYPES AND TRAFFICABILITY
SHILO MILITARY RESERVE
N
TRAFFICABILITY INDEX:
EL- EXTREMELY LOW
VL- VERY LOW
L - LOW
SOIL TYPES- SEE APPENDIX A
0 1 2 3 MILES
SEWELL LAKE
SHILO
CNR
EPINETTE CREEK
ASSINIBOINE RIVER
2 VL
5L
3 VL
1EL
5 L
4 VL

Map Figure 2

Bibliography

Bird, Ralph D. 1961. Ecology of the Aspen Parkland of Western Canada in Relation to Land Use. Canada Dept. Agric. Res. Br. Public. 1066.

Canada Land Inventory. 1966. Soil Capability for Agriculture, Brandon - 62A Mapsheet, Ottawa.

Canada Land Inventory. 1972. Land Capability for Wildlife - Ungulates, Brandon - 62A Mapsheet, Ottawa (Preliminary Issue).

Erlich, W. A., E. A. Poyser and L. E. Pratt. 1957. Report of Reconnaissance Soil Survey of Carberry Map Sheet Area.

Halstead, E. C. 1959. Ground-water Resources of the Brandon Map-Area, Manitoba. Canada Dept. Mines and Tech. Surveys Geol. Survey Memoir 300.

Kjearsgaard, A. A. 1973. Soils of the Suffield Military Reserve. Alberta Institute of Pedology Report No. M-73-9.

Seton, E. T. 1909. Life Histories of Northern Animals. New York, Scribners, 2 vols.

Soper, J. D. 1961. The Mammals of Manitoba. Canada Field-Nat. 75(4): 171-219.

Waldon, R. N. 1972. The Doomed Dunelands. Zoolog. 14-23. Mam. Zool. Soc., Winnipeg.

SOIL TYPES AND THEIR TRAFFICABILITY

CFB SHILO

Soils Developed on Lacustrine Deposits
Coarse textured deposits

AREA 1

Soil:	Stockton Association - Stockton Loamy Sands Active Sand Dunes
Parent Material:	Deltaic sand
Topography:	Strongly rolling and hilly (slopes ≥ 15%)
Trafficability:	Extremely low

AREA 2

Soil:	Stockton Association - Stockton Loamy Sands Stabilized Sand Dunes
Parent Material:	Deltaic sand
Topography:	Gently undulating to moderately rolling (slopes 2-15%)
Trafficability:	Very low

Undifferentiated Muck and Peat Soils
(very poorly drained)

AREA 3

Soil	Marsh
Parent Material:	Partially decomposed shrubs, reeds and grasses under saturated anaerobic conditions
Topography:	Level to nearly level (slopes 0.0-5%)
Trafficability:	Very low

Eroded Channels and Steep Slopes

AREA 4

Soil:	Eroded slopes
Parent Material:	Complex of truncated deltaic and alluvial materials
Topography:	Steep slopes (slopes> 40%)
Trafficability:	Very low

Soils Developed on Coarse Textured Deposits
Outwash deposits of shale, limestone and granitic rock origin

AREA 5

Soil:	Mini
Parent Material:	Sar
Topography:	Le ex du
Trafficability:	Lo

Date	Name