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REVIEW OF MAMMAL POPULATIONS

ON LEASE NO. 17 AND VICINITY

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HABITAT

Wildlife habitat on and in the vicinity of Lease 17 has been variously described by Syncrude Canada Ltd. (1973), Penner (1976) and others. Both Syncrude and Penner recognize 12 discrete habitat types however the reports differ considerably with respect to classification and characterization of habitat units. More recently, Peterson and Levinsohn (1977) provide an excellent description of seven major vegetation types present in the west half of Lease 17. Following is a brief review of the principal habitat units present on the lease prior to development, based mainly on the abovementioned reports and supported by a review of other pertinent references (Stringer 1976, Moss 1953, Sharp et al. 1975, Shell Canada Ltd. 1975).

(1) Deciduous Forest

Primary components of this habitat type are the aspen-birch and balsam-poplar vegetation types described by Peterson and Levinsohn (1977). In the former type, stands of *Populus tremuloides* and *Betula papyrifera* occur in association with a dispersion of small muskeg areas. The shrub understory consists principally of sapling trees, *Salix* spp. *Alnus crispa* and *Ledum groenlandicum*. *Populus balsamifera* occurs predominantly in association with *Alnus tenuifolia* along the Mackay River valley and along portions of the west bank of the Athabasca River. Together these types covered approximately 10% of the lease.

(2) White Spruce

Pure stands of *Picea glauca* occur only in the Athabasca River valley, east and north of Horseshoe Lake (Syncrude Canada Ltd. 1973). They amount to less than 2% of the habitat on the lease.

(3) Pine

Mixed stands of *Pinus banksiana* and *Pinus contorta* were restricted to sandy, upland areas north and east of Mildred Lake and in the southeastern corner of the lease. Pine forests covered less than 2% of the lease.

(4) Mixedwood

This habitat unit includes the aspen-white spruce and white-spruce aspen vegetation types described by Peterson and Levinsohn (1977). It also includes much of the area classified as trembling aspen by Penner (1976). The aspen-white spruce type is dominated by *Populus tremuloides*, however the abundance of *Picea glauca* in the understory distinguishes its value for wildlife from pure aspen stands. Aspen dominated mixedwood contains a well-developed shrub layer of *Rosa acicularis*, *Salix* spp., *Shepherdia canadensis* and *Alnus crispa* along with an abundance of forbs in the ground cover. White spruce dominated stands are characterized by a sparse shrub layer and a dense cover of feathermosses. This was the most important habitat unit on the lease, amounting to 40-50% of the total area.

(5) Black Spruce Muskeg

Poorly drained areas supporting treed muskeg occurred extensively throughout the lease. They contain varying densities of *Picea mariana* along with occasional *Larix laricina*, *Pinus banksiana* and *Populus tremuloides*. The shrub layers are dominated by *Ledum groenlandicum* and *Vaccinium vitis-idaea* while the ground cover consists of a dense mat of *Sphagnum* spp. and other bryophytes and lichens. Black spruce muskeg habitat was present over 30 - 40% of the entire lease.

(6) Riparian

Riparian habitat includes the band of shrub and herb communities along the margins of streams, lakes and open bogs. It was particularly common along the various drainage channels associated with Beaver Creek. The shrubs consist of *Salix* spp., *Alnus crispa*, *Betula pumila* and *Cornus stolonifera*. *Calamagrostis canadensis* and *Equisetum* spp. are usually prominent in the herb layer. This habitat occupied less than 5% of the lease area.

(7) Shrub

This habitat refers to willow and alder communities not associated with open water. Like riparian habitat, it is important to certain species of mammals but was of limited (<5%) distribution on the lease.

(8) Aquatic

The principal aquatic habitat units on the lease were those associated with Mildred Lake, Horseshoe Lake, Beaver Creek, the MacKay River and that portion of the Athabasca River adjacent to the east side of the lease. Of importance to mammals are the emergent and fen communities associated with the various water bodies. Emergent communities consisting of *Typha latifolia*, *Eleocharis palustris* and *Scirpus validus* were well developed around Horseshoe Lake and to a less extent Mildred Lake (Syncrude Canada Ltd. 1973). Smaller wetlands and fens are typically characterized by *Carex* spp. - *Calamagrostis canadensis* communities. Together these habitat units covered approximately 5% of the lease.

SHREWS

Five species of shrews are thought to occur in the vicinity of Lease 17. The area offers suitable habitat for each species but in most cases their actual abundance and distribution are not known.

The American saddle-backed shrew (*Sorex arcticus arcticus* Kerr) is generally found in mixedwood forests, muskegs and along the margins of lakes and streams (Soper 1964). Several were livetrapped in a disturbed muskeg on Lease 17 during 1977, however none were found in mixedwood forest (Westworth pers comm).

The common cinereous shrew (*Sorex cinereus cinereus* Kerr) occupies deciduous and coniferous forests, shrublands and margins of lakes, streams and muskegs (Soper 1964). During 1977 the cinereous shrew was abundant in undisturbed mixedwood forests on the lease with minimum known densities ranging from 4 - 17 per ha (Westworth and Skinner 1977). Like the saddle-backed shrew, the cinereous shrew may undergo cyclic changes in abundance (Soper 1964).

The dusky mountain shrew (*Sorex vagrans obscurus* Merriam) inhabits mixedwood forests, meadows, grasslands and stream margins (Soper 1964). The lease area lies along the eastern limit of its known range (ibid.); it is therefore thought to be scarce.

The American water shrew (*Sorex palustris palustris* Richardson) is found along the wet margins of lakes, streams and muskegs throughout the boreal mixedwood forest region (Soper 1964). It has been reported in the lease area (Sharp et al 1975) and, although its abundance is not known, it is probably common in areas of suitable habitat.

The northern pigmy shrew (*Microsorex hoyi intervectus* Jackson) exhibits habitat preferences similar to those of the cinereous shrew (Soper 1964). It has been reported from Fort McMurray and Wood Buffalo Park (ibid.) and may be common in the lease area.

BATS

Five species of bats are believed to occur in the oil sands region, although quantitative information on their abundance is completely lacking. Wintering areas are not known in this region, consequently all are considered seasonal residents (Schowalter pers comm, Schowalter and Cole 1976).

Little brown bats (*Myotis lucifugus lucifugus* Le Conte) breed throughout the boreal forest region of northern Alberta, preferring coniferous and deciduous forests containing an abundance of streams and forest openings (Soper 1964). They are believed to be abundant summer residents of the lease area on the basis of their documented abundance in the Wood Buffalo National Park and St. Paul regions (Schowalter pers comm).

Big brown bats (*Eptesicus fuscus pallidus* Young) are distributed throughout northeastern Alberta, including Wood Buffalo National Park (Soper 1964), although they are presently thought to be scarce in the vicinity of the lease (Schowalter pers comm).

The hoary bat (*Lasiurus cinereus cinereus* Beauvois), along with the silver-haired bat (*Lasionycteris noctivagans* Le Conte), are tree dwellers occupying coniferous and deciduous forests (Soper 1964). Only the females migrate to Alberta with males remaining closer to the wintering areas, which in the case of the hoary bat, are believed to be

in southern United States and Mexico (Schowalter 1978, Schowalter et al. 1978). Hoary bats are considered scarce in the vicinity of Lease 17 while silver-haired bats are believed to be fairly common (Schowalter pers comm).

The Keen's bat (*Myotis keenii*), which was only identified in Alberta in 1976, occupies most boreal forest habitats and is thought to be common in the area of Lease 17 (ibid.).

CARNIVORES

Northwestern Coyote (*Canis latrans incolatus* Hall)

The coyote is successful in a broad spectrum of habitat types, although it prefers agricultural fringe areas (Boyd 1977). In Alberta, it consequently becomes less abundant in heavily forested areas north of 57° N latitude (ibid.). Coyote populations fluctuate widely in response to the population dynamics of the snowshoe hare (*Lepus americanus*) (Nellis and Keith 1976, Todd 1977). At Rochester, Alberta estimated densities increased from 17 animals per 100 sq km during 1965-66 to 59 in 1966-67. Trapping returns, however, suggest that populations in the Fort McMurray region are much lower than those in central Alberta (Boyd 1977). Todd (1976) considers the coyote common but in low densities in the AOSERP area.

Northern Timber Wolf (*Canis lupus occidentalis* Richardson) and Saskatchewan Timber Wolf (*Canis lupus griseoalbus* Baird)

Fort McMurray lies along the subspecific limit separating the northern timber wolf from the Saskatchewan timber wolf (Soper 1964). Wolves demonstrate little preference for specific habitat types (Banfield 1974), although Penner (1976) noted that they generally avoided coniferous

cover during the winter. Wolf populations generally vary in relation to the abundance and distribution of ungulate prey species (Parker 1973, Carbyn 1975). Wolves are presently considered common in the AOSERP region (Todd 1976) with densities of approximately 1 per 100 sq km reported for 1976-77 (Fuller and Keith 1977).

British Columbia Red Fox (*Vulpes fulva abietorum* Merriam)

The red fox occupies both grassland and mixedwood forest habitats and is particularly common in semi-open country such as agricultural areas, lakeshores, river valleys and natural forest clearings (Soper 1964). Between 1970-75, northeastern Alberta was the most productive area of the province in terms of red fox fur returns (Boyd 1977). In this region, 0.69 animals were captured per 100 sq km trapped (57 sq mi per animal *sic*) as compared to the provincial average of 0.06 animals per 100 sq km (605.6 sq mi per animal *sic*). Todd (1976) classified red foxes as common in the AOSERP area.

American Black Bear (*Euarctos americanus americanus* Pallas)

The black bear is generally considered an "edge" species which is usually associated with mixedwood habitats, valley bottoms and other areas offering suitable combinations of food (berries, rodents, insects) and dense cover (Webb 1959, Tompa 1977). Black bear densities appear to remain relatively stable from year to year. Kemp (1976) found that between 1968 and 1970, the density only ranged from 34 animals per 100 sq km to 43 per 100 sq km (71 per 207 sq km to 94 per 207 sq km *sic*) in the Cold Lake area of Alberta. Black bear are abundant in the AOSERP region with densities estimated at 25 to 50 animals per 100 sq km (1 per 2-4 sq km *sic*) (Fuller and Keith 1977).

Hudson Bay Marten (*Martes americana abieticola* Preble) and Alaska Marten (*Martes americana actiosa* Osgood)

Both the Hudson Bay marten and the Alaska marten are possible residents of the lease area (Soper 1964). Marten exhibit a preference for mature, mesic, spruce-dominated forests (Koehler et al 1975, Lensink 1953). The sparsity of this habitat type in the area probably accounts for the absence of any marten reported in fur returns for the Fort McMurray area between 1970 and 1975 (Boyd 1977). Both Todd (1977) and Penner (1976) regard marten as uncommon to rare in the Fort McMurray region.

British Columbia Fisher (*Martes pennanti columbiana* Goldman)

The fisher typically inhabits climax coniferous and mixedwood forests and is usually found in the vicinity of water courses (Soper 1964, Banfield 1974). Trapping returns from the Fort McMurray region show a capture of 0.43 fisher per 100 sq km trapped (1 per 90.5 sq mi *sic*), however, reports of its abundance in the region are conflicting (Todd 1976, Penner 1976) and its status must be regarded as uncertain.

Richardson Weasel (*Mustela erminea richardsoni* Bonaparte) and Least Weasel (*Mustela rixosa rixosa* Bangs)

Both species of weasel are known to occur on the lease (Westworth and Skinner 1977). Richardson weasels typically prefer the edges of lakes, marshes and mixedwood forest habitat where small mammals are abundant (D. Wooley pers comm). In similar habitats near Heart Lake, Northwest Territories, Wooley (ibid.) found densities of approximately one female per sq km with males occupying somewhat larger areas. Track counts conducted in 1975 suggest that weasels were common in forested

parts of the lease (Penner 1976). The habitat of the least weasel is similar to that of the Richardson weasel or ermine (Soper 1964). Their abundance on the lease is not known, however Soper (ibid.) notes that, in relation to ermine, least weasels are usually "rare and of spotty occurrence".

Hudson Bay Mink (*Mustela vison lacustris* Preble)

Mink occur in riparian habitats along the margins of streams, ponds and lakes, where they are well adapted to exploiting the diversity of prey species found in the wetland-forest ecotone (Burns 1964). Trapping success for mink in the Fort McMurray region between 1970-75 was approximately twice the provincial average (Boyd 1977). Penner (1976) similarly reported that the abundance of mink on the lease, based on track counts, was greater than that recorded in other boreal forest regions. Todd (1976) recorded mink as being common in the AOSERP area during his 1975-76 study.

American Wolverine (*Gulo luscus luscus* Linnaeus)

The wolverine exhibits diverse habitat and food preferences although it is usually restricted to remote, heavily forested areas (Rausch and Pearson 1972, Soper 1973, van Zyll de Jong 1975). Penner (1976) reported that wolverine were relatively abundant on the lease in comparison to other areas in Alberta. His track counts indicated a ratio of wolves to wolverines of 11.7 to 1. Based on the above data and the estimated wolf density for the region (Fuller and Keith 1977), the density of wolverines in Fort McMurray area can be tentatively estimated at 0.08 individuals per 100 sq km. Todd (1976) classifies wolverines as uncommon to rare in the AOSERP area.

Northern Plains Skunk (*Mephitis mephitis hudsonica* Richardson)

The skunk prefers areas containing a diversity of habitat types that include the margins of streams and sloughs (Gunson pers comm). In Alberta their abundance appears to be affected by the availability of old buildings for wintering sites (ibid.). In parkland areas densities range from approximately 40 to 100 individuals per 100 sq km. Although data are not available on their status on or near the lease, Gunson (ibid.) suggests a lack of suitable habitat can be expected to result in very low densities.

Mackenzie Otter (*Lutra canadensis preblei* Goldman)

Otter are largely restricted to the riparian habitats associated with rivers, streams, lakes and ponds (Soper 1964). Although the otter occurs uncommonly in Alberta, the northeast portion of the province has the highest production of otter in terms of fur returns. Of 25 areas with otter returns, the Fort McMurray region ranked third with a return of 0.17 animals per 100 sq km trapped (1 per 228 sq mi *sic*) (Boyd 1977). Penner (1976) regarded otters as one of the rarest fur bearers on the lease. However, Noton (pers comm) observed two adult and two juvenile otters on the Beaver Creek Reservoir on August 6, 1977. Todd (1976) regarded otter as common but of low density in the AOSERP area in 1975-76.

Canada Lynx (*Lynx canadensis canadensis* Kerr)

The Canada lynx prefers climax boreal forest areas (Banfield 1974) but its distribution is greatly influenced by that of the preferred prey species, the snowshoe hare (Soper 1964, Westworth and Archibald 1977). Studies conducted at Rochester, Alberta have demon-

strated that fluctuations in the lynx population lag those of the snowshoe hare by one year (Brand et al. 1976). In this region, lynx populations fluctuated from 2.3 lynx per 100 sq km in 1966 to 10.0 in 1972. Fur returns from 1970 to 1975 showed a capture of 1.7 lynx per 100 sq km (4.3 per 100 sq mi *sic*) of trapping at Fort McMurray compared to 4.8 at Rochester (12.5 per 100 sq mi *sic*) (Boyd 1977). If trapping returns are indicative of relative population size, lynx in the Fort McMurray area exist at lower population levels than those of the Rochester region.

RODENTS

Sciuridae

The Mackenzie red squirrel (*Tamiasciurus hudsonicus preblei* Howell) is found in coniferous and mixedwood habitats on the lease, however, they are generally known to exhibit a strong preference for white spruce (Brink and Dean 1966, Smith 1968). Penner (1976) recorded the highest midden densities in white spruce followed by jackpine, mixedwood and dense black spruce. On the basis of number of middens, Penner (1976) estimates the mean density of red squirrels on the lease at 1.19 per ha. This compares to reported densities of 0.17 per ha (0.42 per ac *sic*) in mixedwood forest in Wood Buffalo National Park (Wood 1967) and 0.1 - 0.3 per ha (0.1 - 0.7 per ac *sic*) in jackpine - white spruce forest in the Northwest Territories (Zirul and Fuller 1969).

The preferred habitat of the Hudson Bay flying squirrel (*Glaucomys sabrinus sabrinus* Shaw) is mature, open mixedwood forest (Soper 1964, Hampson 1965). Its status in the vicinity of Lease 17 is poorly known, however four individuals captured incidentally during a small

rodent livetrapping program (0.7 squirrels per ha) suggest the species is presently common in mixedwood habitats on the lease (Westworth and Skinner 1977).

The Canada woodchuck (*Marmota monax canadensis* Erxleben) reportedly occurs throughout the mixedwood forest region but is believed to be more abundant in agricultural areas (Soper 1964, Banfield 1974). Although it is known to occur on Lease 17 (Westworth pers comm) its status and habitat preferences are not known.

The little northern chipmunk (*Eutamias minimus borealis* Allen) occupies a variety of habitat types throughout the boreal forest but is particularly abundant along forest edges and lakeshores, in windfalls and in open jackpine stands (Banfield 1974). Smith (1973) reports widely fluctuating densities of 1.0 - 12.7 per ha in preferred white spruce - jackpine communities near Heart Lake, Northwest Territories. Comparable data are not available in the vicinity of Lease 17 although Sharp et al. (1975) regarded them as common during 1974.

Castoridae

Most studies on the Canada beaver (*Castor canadensis canadensis* Kuhl) have shown that the distribution and abundance of beaver in northern latitudes is primarily related to the availability and quality of deciduous woody vegetation in proximity to water of sufficient depth to permit access to winter food caches (Hakala 1952, Novakowski 1965, Hawley and Aleksiuik 1973 and Slough and Sadleir 1977). Preferred food types, which include aspen and balsam poplar, birch and willow were plentiful along most of the streams and lakes present on the lease.

Although densities of beaver in the oil sands region are generally known, there is a lack of information specific to Lease 17 prior to disturbance. Todd (1976) reports a density of 0.17 colonies per sq km in the area covered by mapsheet 74 D (which includes the southern portion of the lease) during 1975. This was lower than Penner's (1976) estimate of 0.38 colonies per sq km in 1975, which was derived after approximately one-third of the lease, including Beaver Creek, had been disturbed by development. Within the immediate area of Lease 17, the most productive beaver habitat prior to development was apparently associated with the Beaver Creek and MacKay River drainages, which supported approximately 100 active colonies (Penner 1976).

Cricetidae

The boreal white-footed mouse *Peromyscus maniculatus borealis* Mearns) is found in virtually all habitat types (Sharp 1965, Williams 1959) although Soper (1964) notes that it is "normally exclusive of bogs and muskegs". Summer densities in mixedwood forest habitat on the lease ranged from 2.5 - 6.5 per ha during 1977 (Westworth and Skinner 1977).

The Richardson lemming vole (*Synaptomys borealis borealis* Richardson) primarily inhabits black spruce - sphagnum communities associated with bogs or muskegs (Soper 1964, Banfield 1974). Generally it is rare but its status in the area of Lease 17 is not known.

The Athabasca red-backed vole (*Clethrionomys gapperi athabascaae* Preble) is known to occur in all of the forest types that are present on the lease, although it occurs in greatest numbers in mesic, mature stands (Morris 1969, Miller and Getz 1972, 1977, Martel and Radvanyi 1977).

Densities recorded in mixedwood habitat on Lease 17 during summer 1977 ranged from 9.3 - 19.1 per ha (Westworth and Skinner 1977).

The Mackenzie phenacomys vole (*Phenacomys ungava mackenzii* Preble)¹ apparently occupies a diversity of habitat types including dry, open pine and spruce forests, shrub communities and moist meadows (Banfield 1974). Although it has been reported in the area (Green 1978), its abundance and distribution are generally not known.

The Drummond meadow vole (*Microtus pennsylvanicus drummondii* Aud. and Bach.) is usually reported to inhabit moist areas abundant in grasses (Eadie 1953, Getz 1961, 1970, Hodgson 1972, Birney et al. 1976) but also apparently utilizes open aspen forest (Sharp 1965). Within the lease, it appears to be restricted to situations of poor drainage containing dense growths of graminoids (Westworth and Skinner 1977). Although populations of up to 30 per ha were recorded on disturbed sites in 1977 (ibid.), data on its prior abundance in undisturbed habitats and cyclic population trends are not available.

The chestnut-cheeked vole (*Microtus xanthognathus* Leach) is known for its scattered distribution and erratic patterns of abundance (Banfield 1974). Its habitat preferences are also variable, including mixedwood forest, grassy areas and shrubland (Soper 1964). Douglass (1974) found it particularly common along the margins of lakes. It has not been reported on or in the immediate vicinity of Lease 17.

The Hudson Bay jumping mouse (*Zapus hudsonius hudsonius* Zimmermann) occurs in mixedwood forest and moist areas bordering streams, lakes and muskegs (Soper 1964). Although its presence on the lease has

¹The systematics of this species are not clear. Soper (1964) cites it as *Phenacomys ungava mackenzii* while Banfield (1974) more recently refers to it as *P. intermedius mackenzii*.

been reported (Westworth and Skinner 1977) its overall abundance is believed to be scarce.

The basic habitat requirements of the northwestern muskrat (*Ondatra zibethicus spatulatus* Osgood) are an abundance of emergent or submerged aquatic vegetation and adequate winter water levels to ensure under-ice access to these food supplies (Westworth and Archibald 1977). The lack of suitable water bodies limits the capability of Lease 17 for muskrat production. During the winter of 1975-76, Penner (1976) counted a total of 41 muskrat lodges on the lease of which 30 were on Horseshoe Lake and 7 on Ruth Lake. However, the above study did not include an estimate of the number of muskrats using bankburrows and it was based on aerial surveys, which are known to underestimate numbers of lodges by up to 66% (Stelfox and McGillis 1977). In any event, it appears probable that the total muskrat population of the lease prior to development did not exceed 1000 animals.

Erithizontidae

The Alaska porcupine (*Erithizon dorsatum myops* Merriam) is found in both deciduous and coniferous forests (Banfield 1974). Lease 17 lies near the eastern limit of this subspecies, therefore it may intergrade with *E.d. dorsatum* (Soper 1964). Its status on or in the vicinity of the lease is not known.

HARES

The American varying hare (*Lepus americanus americanus* Erxleben) is typical of mixedwood forests, and is particularly abundant along margins of streams, muskegs and other areas providing a dense shrub

undercover (Soper 1964, Dolbeer and Clark 1975, Hansen and Flinders 1969). Varying hare populations oscillate in a ten-year cycle of abundance (Soper 1964, Keith 1973). At Rochester, Alberta, hare densities per 100 ha increased from 50 in 1966 to 1280 in 1970 before declining to 25 by 1974 (Todd 1977). Keith (1973) reports that the population in north-eastern Alberta similarly peaked around 1971. Todd (1976) classified hares as common in the AOSERP area during 1975-76.

UNGULATES

Northwestern Moose (*Alces alces andersoni* Peterson)

The northwestern moose is the most abundant and widespread ungulate species in the oil sands region. Moose exhibit seasonal shifts in habitat use, showing a preference for willow, black spruce and muskeg habitats in spring, summer and early winter before moving into aspen and mixedwood communities as winter progresses (Frokjer and Keith 1976, Keith and Frokjer 1977, Hauge and Keith 1977). Preferred winter ranges are seral forests containing an abundance of shrubs and young deciduous trees interspersed with stands of coniferous "cover" (Lynch 1973).

Aerial surveys of the area between January 12 - February 1, 1973, using fixed-wing-transect (Bibaud 1973) and helicopter-quadrat (Bibaud and Archer 1973) census methods, gave similar density estimates of 0.27 and 0.31 moose per sq km respectively (0.7 and 0.8 per sq mi *sic*). Penner (1976) reports a density of 0.23 moose per sq km over Lease 17 and the east half of Lease 22 during the winter of 1975-76. Within this general area the majority of observations occurred along the MacKay and Athabasca Rivers (Bibaud 1972, Penner 1976), both of which are considered major moose wintering areas (Lynch 1973).

Dakota White-tailed Deer (*Odocoileus virginianus dacotensis* Goldman and Kellogg)

The area lies adjacent to the limits of known white-tailed deer range in Alberta. No sightings have been reported on Lease 17, although there were reports by trappers of scattered sightings along the Athabasca River, including one at the confluence of the Athabasca and MacKay Rivers (Novak 1969).

Within the boreal mixedwood forest region this species apparently demonstrates a preference for mature aspen forest (Young 1973) although Webb (1967) notes that "woodlots, ridges, or edges of water courses with mature spruce canopies are necessary for survival in deep snow winters". Densities reported in areas of similar habitat near Rochester, Alberta between 1964 - 73 have ranged from 0.12 to 0.58 deer per sq km (0.3 to 1.5 per sq mi *sic*) (Young 1973) and 0.54 deer per sq km (1.4 deer per sq mi *sic*) have been reported near St. Paul, Alberta (Ripin and Gunderson 1975). Densities of white-tailed deer in the vicinity of Lease 17 are believed to be considerably lower, with Webb (1959, 1967) rating its abundance as "scarce" or "infrequent".

Mule Deer (*Odocoileus hemionus hemionus* Rafinesque)

Mule deer, like white-tailed deer, are a recent addition to the area (Webb 1959). Within the mixedwood forest region mule deer occupy aspen and mixedwood forest types showing preference for areas of variable topography and "edge" or ecotone zones (Burgess 1973). Wintering areas tend to be along major river valleys.

On the basis of existing aerial survey data, mule deer are scarce throughout the oil sands region. Trapper reports are limited

to scattered observations along the Athabasca and MacKay Rivers (Novak 1969). Mule deer have also been reported on Lease 17 by workmen (Syn-crude Canada Ltd. 1973).

Western Woodland Caribou (*Rangifer caribou sylvestris* Richardson)

Woodland caribou have not been reported on Lease 17, however, the area does lie close to known ranges for this species. Lynch and Pall (1973) estimate the entire population of northeastern and north-central Alberta at 1470 animals and show small herds to the west and south of the Syncrude leases. Reports by trappers and aerial survey results confirm concentrations of caribou in the Ellis River - Namur Lakes area and south of the Thickwood Hills (Novak 1969, Bibaud 1972). Caribou are most frequently observed in flat, open muskegs, however, during winter they require extensive areas of mature coniferous or mixedwood forest containing an abundance of ground lichens (Bibaud 1972, Webb 1959, Lynch and Pall 1973).

Elk (*Cervus canadensis*)

Although elk apparently occupied the area during the nineteenth century, they no longer are found within the immediate vicinity of Lease 17 (Webb 1959). Carr (1972) shows that elk occur in "dispersed" form along the Athabasca River south of Fort McMurray. This apparently reflects a northward movement of elk released in the Calling Lake and Cold Lake areas during 1953 and 1956 (Wishart 1964). While elk prefer forested habitats interspersed with open grasslands, they are apparently successfully inhabiting mixedwood forests in central Alberta, concentrating along river valleys in winter where snow conditions are favorable (Carr 1972).

Table 1. Relative abundance of mammals on Lease No. 17 and vicinity.

Species	Abundance	Source
SHREWS		
<i>Sorex arcticus</i>	Scarce	Westworth pers comm
<i>Sorex cinereus</i>	Abundant	Westworth and Skinner 1977
<i>Sorex vagrans</i>	Scarce	Soper 1964
<i>Sorex palustris</i>	Common	This report
<i>Microsorex hoyi</i>	Common	Soper 1964
BATS		
<i>Myotis lucifugus</i>	Abundant	Schowalter pers comm
<i>Eptesicus fuscus</i>	Scarce	Schowalter pers comm
<i>Lasiurus cinereus</i>	Scarce	Schowalter pers comm
<i>Lasiomycteris noctivagans</i>	Common	Schowalter pers comm
<i>Myotis keenii</i>	Common	Schowalter pers comm
CARNIVORES		
<i>Canis latrans</i>	Common	Todd 1976
<i>Canis lupus</i>	Common	Todd 1976 Fuller and Keith 1977
<i>Vulpes fulva</i>	Common	Todd 1976
<i>Euarctos americanus</i>	Abundant	Fuller and Keith 1977
<i>Martes americana</i>	Scarce	Todd 1977 Penner 1976
<i>Martes pennanti</i>	Scarce-Abundant	Todd 1976, Penner 1976
<i>Mustela erminea</i>	Common	Penner 1976
<i>Mustela rixosa</i>	Scarce	Soper 1964
<i>Mustela vison</i>	Common	Todd 1976, Penner 1976
<i>Gulo luscus</i>	Scarce-Abundant	Todd 1976, Penner 1976
<i>Mephitis mephitis</i>	Scarce	Gunson pers comm
<i>Lutra canadensis</i>	Common	Todd 1976
<i>Lynx canadensis</i>	Common	Todd 1976
RODENTS		
<i>Tamiasciurus hudsonicus</i>	Abundant	Penner 1976
<i>Glaucomys sabrinus</i>	Common	Westworth and Skinner 1977
<i>Marmota monax</i>	Unknown	-

Continued

Table 1 continued.

Species	Abundance	Source
RODENTS (Continued)		
<i>Eutamias minimus</i>	Common	Sharp et al. 1975
<i>Castor canadensis</i>	Abundant	Penner 1976, Todd 1976
<i>Peromyscus maniculatus</i>	Abundant	Westworth and Skinner 1977
<i>Synaptomys borealis</i>	Unknown	
<i>Clethrionomys gapperi</i>	Abundant	Westworth and Skinner 1977
<i>Phenacomys ungava</i>	Unknown	
<i>Microtus pennsylvanicus</i>	Common-Abundant	Westworth and Skinner 1977
<i>Microtus xanthognathus</i>	Unknown	
<i>Ondatra zibethidus</i>	Common	Penner 1976
<i>Zapus hudsonius</i>	Scarce	Westworth and Skinner 1977
<i>Erithizon dorsatum</i>	Unknown	
HARES		
<i>Lepus americanus</i>	Common-Abundant	Todd 1976, Keith 1973)
UNGULATES		
<i>Alces alces</i>	Abundant	Penner 1976, Bibaud 1972, Bibaud and Archer 1973
<i>Odocoileus virginianus</i>	Scarce	Novak 1969, Webb 1959, 1967
<i>Odocoileus hemionus</i>	Scarce	Novak 1969, Webb 1959
<i>Rangifer caribou</i>	Nil-Scarce	Lynch and Pail 1973, Novak 1969, Bibaud 1972
<i>Cervus canadensis</i>	Nil-Scarce	Webb 1959, Carr 1972.

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