## 13.7 Wildlife and Wildlife Habitat

### 13.7.1 Baseline Setting

The Project area crosses a relatively limited range of habitat types that are suitable for most wildlife species. There are four Broad Ecosystem Inventory (BEI) units within the Project area: boreal white spruce-lodgepole pine, white spruce-balsam poplar riparian, black spruce bog and sphagnum bog (Resource Inventory Committee [RIC] 1998). The forested types are generally less than 140 years old but there are some patches of older forest. Wetland types dominate the eastern two-thirds of the proposed route. Habitat capability information based on BEI units is available for a limited number of wildlife species in this area[1]. Of those, the best habitat capability in the Project area is for woodland caribou (MELP 1995[2]).

The proposed Project area is within the Fort Nelson planning area. The objective for wildlife management in this area is to achieve the following goals (Fort Nelson LRMP Working Group 1997):

- maintain the diversity and abundance of wildlife
- maintain the integrity and diversity of existing habitats and ecosystems (including functional large predator-prey systems)
- maintain threatened and endangered habitats, and habitats of rare and endangered species
- pursue resource management alternatives that favour ecological integrity
- protect life and property from wildlife
- provide for recreational use such as viewing, hunting and appreciation of wildlife

Where there is a significant risk that wildlife may suffer an unacceptable level of negative impact, access may be limited, restricted, or on a site-specific basis, prohibited (Fort Nelson LRMP Working Group 1997). The intent of this strategy is to allow development to proceed while mitigating impacts on significant resource values (e.g., critical wildlife habitat) (Fort Nelson LRMP Working Group 1997).

Few wildlife studies or inventories have been conducted in the region, with none in the immediate Project area (e.g., Prophet River - Poole and Stanley 1998; Shekille River-Zeues Lake area - AXYS 1998; Zama Lakes-Rainbow Lake area - AXYS 1995a; Kahntah River - AXYS 1995b). Incidental wildlife observations were recorded during reconnaissance

[1] **Moose, woodland caribou, grizzly bear, marten, fisher, beaver, bay-breasted warbler, Cape May warbler, and Philadelphia vireo.**
[2] Four classes of habitat capability recognized based on potential of the habitat to support a particular species relative to the provincial benchmark (‘best’): high = 100-76%, moderate = 75-26%, low = 25-1%, nil = 0% (RIC 1999).

level overflights of the proposed pipeline route in October and December 2002, and systematic wildlife habitat assessment and breeding bird surveys are scheduled for the spring 2003.

There are approximately 45 mammal, 200 bird and two amphibian species that may occur within the proposed Project area. From this list of species, 21 wildlife species were identified as potential species of concern with respect to the proposed Project (Appendix 13H-1) based on federal and provincial (British Columbia and Alberta) conservation status, ecological importance, economic and/or public profile value, and vulnerability to project effects (see Section 13.1.1.7). The following wildlife group summaries focus on these 21 potential key species and include current conservation status, local and regional information on distribution and abundance, an overview of habitat conditions along the proposed route, incidental information recorded during reconnaissance surveys in October and December 2002, and traditional knowledge for the region.

#### 13.7.1.1 Ungulates

Three ungulate species are resident in the Project area: woodland caribou (*Rangifer tarandus caribou*), moose (*Alces alces*) and mule deer (*Odocoileus hemionus*). A population of wood bison (*Bison bison athabascae*) found near Zama Lake in Alberta may sometimes move into the Project area along the Hay River (Shackleton 1999).

Of the resident species, caribou are an obvious species of concern regarding any proposed development because of the sensitivity of their population on a regional scale and local area concerns related to the maintenance of foraging and wintering habitat. Moose and mule deer are considered less vulnerable to oil and gas development as their populations and habitats are considered relatively secure and well distributed in British Columbia. However, at times they may require special management to address concerns related to low populations and particular habitat requirements (e.g., winter range).

Caribou and moose were selected as potential key species because of, respectively, their special conservation status and regional socio-economic importance.

##### 13.7.1.1.1 Woodland Caribou

The boreal ecotype of the woodland caribou is resident along the proposed route. This ecotype is blue-listed in British Columbia and considered threatened federally (Appendix 13H-1). They are found at low density throughout the Project area – the entire British Columbia population is less than 800 (Shackleton 1999). Caribou sign was occasionally recorded during a reconnaissance survey along the proposed route in October 2002.

Woodland caribou habitat in northern boreal mixed-wood forests is predominantly peatland characterized by black spruce-tamarack fen complexes and lowland bogs in proximity to mature spruce forests (Bradshaw et al. 1995; Stuart-Smith et al. 1997; Vitt et al. 1998).

Where snow depths and wind conditions are not considered extreme, boreal woodland caribou show little tendency to seasonally migrate from lowland habitats (Stuart-Smith et al. 1997). Predation by wolves appears to be one of the main factors limiting woodland caribou populations (Bergerud 1988; Edmonds 1988; Cumming 1992; Rettie et al. 1998). Caribou may select habitat to avoid moose and thereby decrease their predation risk (Bergerud and Ballard 1988; Rettie 1998; Seip 1992).

The proposed route crosses large areas of caribou foraging habitat (i.e., lowland muskeg) but there is limited winter habitat within the Project area. Using coarse scale maps, caribou habitat capability is generally rated as moderate in the Project area with only limited areas of low capability at the west end of the route (MELP 1995). Using finer scale mapping in the Project study area, caribou habitat suitability is even more limited (see the following EIA section).

Woodland caribou may be exposed to increased wolf predation as a result of industry-related disturbances (such as facilitated predator access along linear corridors), but also due to an increase in early successional habitats that support higher densities of moose and deer, which in turn, support an increased density of wolves (Rettie and Messier 1998; Rettie 1998). Caribou tend to avoid roads and seismic lines (Jalkotzy et al. 1997; Dyer 1999) and this avoidance seems to be greatest in late winter (Dyer 1999). Buried pipeline ROWs did not appear to be a barrier to caribou movements, although some avoidance was observed (Jalkotzy et al. 1997). Habitat fragmentation may also negatively affect caribou. For example, caribou avoided recently fragmented (by logging) areas in west central Alberta by average distances of 1.2 km (Smith et al. 2000). In contrast, caribou winter range use in the northern Cariboo Mountains of British Columbia was not affected negatively by logging activities (Terry et al. 2000). Much of the work examining the impacts of oil and gas development on barren-ground caribou may also have application to the woodland caribou.

#### 13.7.1.1.2 Moose

Moose are not a species at risk in British Columbia nor are they listed federally. They occur at low density in much of the northeastern Taiga Plains (Shackleton 1999). There are some areas of moderate density along the proposed route associated with the Kotcho and Hay River corridors (Shackleton 1999). There is a perception that moose populations have been decreasing in northeastern British Columbia, and a survey in the southeast corner of the Prophet River Territory in January 1998 suggested that the local population may have been lower than in the recent past (Poole et al. 1998). During overflights along the proposed route, eleven moose (four bulls, one cow, one calf, five unclassified) were observed in October 2002, and two adult moose and two cow-calf pairs were observed between KP 63 and KP 64 (approximately 5 km east of the Hay River) in December 2002.

Moose use relatively open habitats with a productive shrub layer from early spring into late fall. Preferred habitats include wet meadows, shrub flats, riparian areas, muskeg, upland deciduous stands, and regenerating burns and clearcuts (Mytton and Keith 1981; Nietfeld et al. 1984; Pierce and Peek 1984; Risenhoover 1989). A mosaic of vegetation types in which foraging and security cover habitats are available in close proximity to each other is critical (Hamilton et al. 1980; Quinlan et al. 1990). Under deep or crusted snow conditions, moose prefer areas that support both high browse-yield habitats and mature coniferous forests offering thermal cover and reduced snow depths (Doerr 1983; Nietfeld et al. 1984; Pierce and Peek 1984; Telfer 1984).

Moose habitat capability along the proposed route is generally low although there is some moderate capability habitat along the Hay River (MELP 1995). To the northeast of the Project area past surveys indicate that snow accumulation may be a limiting factor for moose distribution in winter (AXYS 1998).

Moose habitat use near roads associated with oil and gas development may be significantly reduced (Jalkotzy et al. 1997). In central Alberta, moose were located farther from roads than expected between November and January, and they avoided well-traveled roads approximately one-third more often than less-traveled roads (Rolley and Keith 1980). Linear corridors have also been shown to increase wolf predation on moose (James 1999). Alternately, these developments may sometimes enhance moose habitat as linear corridors through a closed forest will open the canopy, create edges, encourage shrub growth, and facilitate moose movements (Jalkotzy et al. 1997). Several studies have found that pipelines affect moose movement patterns. Buried pipelines without berms were not a barrier; however, elevated pipelines or berms did result in deflection or avoidance (Jalkotzy et al. 1997). Other factors that might influence moose crossings of pipelines include snow accumulation and clearing; human activity; and sex and reproductive status (Fraker and Green 1994).

### 13.7.1.2 Large Carnivores

Three large carnivore species are resident in the Project area: grizzly bear (*Ursus arctos*), black bear (*Ursus americanus*) and wolf (*Canis lupus*). Black bears are more common in this region than grizzly bears. However, the grizzly bear was selected as a potential key species because of its conservation status and high profile, and the availability of proven analytical techniques for testing the effects of different development scenarios on habitat availability and core security habitat.

#### 13.7.1.2.1 Grizzly Bear

The grizzly bear is blue-listed in British Columbia and federally designated as a species of special concern (Appendix 13H-1). Grizzly bears are sparsely distributed in most of the Taiga Plains. Poole et al. (1999) estimates a density of 0.2 bears per 1000 km$^2$ for the Fort Nelson Lowlands section of the BWBSmw2 (in contrast to 28.4 bears per 1000 km$^2$ for the Muskwa Plateau section of the same BEC variant). Bear sign observed to the northeast of the Project area (AXYS 1998) and recorded during limited ground visitations along the proposed route in October 2002 is most likely from black bears.

Grizzly bears have well-defined habitat use patterns that vary spatially and temporally; however, little is known about their activities in the marginal parts of their distribution such as represented by the Project area. Typically, they use a wide variety of habitat types, with a general preference (in the interior) for semi-open, mesic habitats with minimal human intrusions (Craighead and Mitchell 1982; Interagency Grizzly Bear Committee (IGBC) 1987). In their use of different seasonal habitats, grizzly bears can range widely (e.g., from 200 $km^2$ to 2100 $km^2$ for males in Kananaskis Country) (IGBC 1987; Carr 1989).

Grizzly bear habitat capability within the Project area is mostly nil/very low with only a small amount of low capability habitat along the Hay River corridor (MELP 1995). Although, the location and protection of denning sites has been noted as a primary concern with respect to oil and gas development in grizzly bear habitat (Antoniuk 1994), it is extremely unlikely that there would be any denning activity along the proposed route, except within the more mature forests associated with the Hay River. Details on habitat suitability using finer scale mapping in the Project study area is provided in the following EIA section).

Grizzly bears are known to be affected by human and industrial activities. High levels of human activity may lead to abandonment of prime habitat, alteration of behaviour (e.g., increased nocturnal activity), or may act as a movement barrier (Hamer et al. 1977; McLellan and Shackleton 1989; Gibeau and Herrero 1998; Gibeau et al. 2002). Females with young may be particularly susceptible (IGBC 1987; Linnell et al. 2000). Grizzly bears avoided habitats within 100 m of roads, regardless of traffic volume, in a region of southern British Columbia that was under oil development (McLellan and Shackleton 1989). In contrast, some bears were attracted to linear corridors in the Bow River valley, apparently because of the abundance of berry-producing shrubs along the ROWs (Gibeau and Herrero 1998). Helicopter overflights may be a significant problem during den entrance and exit periods (fall and spring, respectively) when bears are in relatively exposed habitats (e.g., Quimby 1974).

Oil and gas activities can also lead to direct bear-human interactions. The problems that arise when bears become habituated to human food sources, such as camp garbage, are well documented (Craighead and Craighead 1970; Herrero 1989; Carr 1989; Dalle-Molle and Van Horn 1989). Additionally, roads facilitate access by poachers and hunters, the grizzly bear's only predators. Every grizzly bear mortality in Banff and Yoho National Parks from 1971-98 (Benn and Herrero 2002) and a high percentage of mortalities in all other jurisdictions in the Central Rockies Ecosystem (Benn 1998) occurred within 500 m of a high use motorized road or within 200 m of a non-motorized trail.

Access management and the maintenance of habitat corridors are two goals identified in the Fort Nelson LRMP (Fort Nelson LRMP Working Group 1997) that can have great significance for grizzly bear population and habitat management.

### 13.7.1.3 Furbearers

Trapping is socially and economically important in this region, especially among First Nations communities (Fort Nelson LRMP Working Group 1997). The Project area intersects nine British Columbia Registered Traplines. Provincial trapper harvest records indicate that 12 species[3] were taken in the Management Unit (MU 7-56) from 1985-1999. Beaver (*Castor canadensis*) and marten (*Martes americana*) were by far the most frequently trapped animal, followed by lynx (*Lynx canadensis*). Those species harvested in greatest numbers are assumed to be reasonably abundant and well distributed in and around the Project area. Winter track counts in the southeast corner of the Prophet River Territory recorded snowshoe hare (*Lepus americanus*), ermine (*Mustela erminea*), lynx, marten, red squirrel (*Tamiasciurus hudsonicus*), coyote (*Canis latrans*), and wolf in the greatest number, followed by fisher (*Martes pennanti*), mink (*Mustela vison*), red fox (*Vulpes vulpes*) and wolverine (*Gulo gulo*) at a much lower frequency (Poole and Stanley 1998).

The potential key species selected for assessment purposes for this Project were: lynx, wolverine, fisher, marten, and beaver.

#### 13.7.1.3.1 Lynx

The lynx is not listed in British Columbia nor is it considered at risk federally. However, it is designated as sensitive in Alberta. The lynx's moderate prominence in the harvest records for MU 7-56 indicates that it could be relatively abundant in and around the Project area. Lynx tracks were frequently recorded during surveys in the southeast corner of the Prophet River Territory (Poole and Stanley 1998) and in the Shekille-Zeues Lake area (AXYS 1998). A single adult lynx was observed on an existing pipeline ROW near the Sierra Gas Plant during an overflight of the route in December 2002 (J. Cabot-Blanc, pers. comm.). Lynx populations exhibit an eight to eleven year cycle of abundance, in general synchrony with snowshoe hare populations (Brand and Keith 1979; Todd 1983; Bailey et al. 1986).

Lynx habitat use patterns are closely related to the distribution and abundance of the snowshoe hare, its major prey species, which is found primarily in areas with dense shrub understorey (Soper 1964; Keith 1972; Windberg and Keith 1978; Todd 1983; Murray et al. 1994). Lynx use a variety of forest types and stand ages (Ruggiero et al. 2000); however, they do not use regenerating sites (e.g., clearcuts and burns) until there is sufficient cover for hunting, even though hares may have recolonized such areas earlier (Boyd 1978; Todd 1983). Lynx track numbers did not differ among habitat types in the Prophet River Territory but there were more tracks in immature habitats (0.24 tracks per km-day) than in older age classes (0.08 tracks per km-day) (Poole and Stanley 1998). The wetland habitats that are common along the proposed route are of generally low value to lynx, although they have higher value in the winter.

[3] Includes black bear

There is some evidence that roads may influence lynx movements (Clayton 2000a), but there is also evidence that they will cross highways and openings (Mowat et al. 2000), perhaps depending on width and availability of cover (Todd 1985). Lynx occasionally hunt or travel along seismic lines (Riewe 1980), and have been reported to follow road edges and forest trails for considerable distances (Parker 1981). In northern Canada and Alaska, anecdotal evidence suggests that lynx will tolerate moderate levels of snowmobile traffic through their home ranges (Mowat et al. 2000). In western Alberta, lynx frequently crossed a pipeline ROW prior to construction, but almost completely avoided the area during the construction period (Morgantini 1984). Lynx have been found to persist mainly in isolated, untrapped refugia during low points in the population cycle, and increased access or other disturbances to such areas could negatively affect subsequent population recovery (Todd 1983, 1985; Poole 1994; Slough and Mowat 1996; O'Donoghue et al. 1997; Mowat et al. 2000). Habitat fragmentation tends to increase competition between lynx and generalist predators, such as coyotes and cougars (Buskirk et al. 2000).

### 13.7.1.3.2 Wolverine

The wolverine is blue-listed in British Columbia and considered a species of concern federally (Appendix 13H-1). Wolverines are solitary animals, which range widely and occur at low densities. In northern Canada, the range of wolverine is contiguous with the northern boreal forest; however, they likely occur only infrequently in and around the Project area. Their relative scarcity in the harvest records for MU 7-56 is likely a good approximation of their abundance in the region. Wolverines have been seen periodically over the last three years in the Project area (George Behn, pers. comm.). Wolverine were infrequently recorded during winter track surveys in the southeast Prophet River Territory (Poole and Stanley 1998) and none were observed during surveys in the Zama Lakes-Rainbow Lake area (AXYS 1995a) or the Shekille River-Zeues Lake area (AXYS 1998).

Wolverine will use a wide variety of habitats, but are generally closely associated with coniferous woods, mixedwoods, and alpine areas with minimal human disturbance (Hummel and Pettigrew 1985). Annual home ranges can be between 65 and 1000 $km^2$ (Hornocker and Hash 1981; Hummel and Pettigrew 1985). Food availability is the fundamental factor influencing movement patterns and home range selection of wolverines although the habitat use patterns of adult males are also influenced by breeding activities.

The wetland habitats that are common along the proposed route are of generally low value to wolverine.

Wolverines appear to avoid human settlements (Banci 1994); however, they have been observed feeding in garbage dumps, and are known to occur in the logged forests of the sub-boreal interior of British Columbia, and in habitats where seismic lines are common (Banci 1994). Wolverines may be particularly sensitive to human disturbance when they have kits. Females have been known to move their young to less secure dens to avoid human contact (Banci 1994; Pulliainen 1968). Human development and major access routes (highways) may function as dispersal barriers (Krebs and Lewis 1999; Kyle and

Strobeck 2001). Determining the impacts of agriculture, forestry, and energy development on wolverines is confounded by the effects of mortality from hunting, trapping, and poisoning (Dauphiné 1989), and by the lack of information on the species habitat requirements (Banci 1994). The persistence of wolverine populations appears to depend on the existence of large, unroaded, wilderness refugia (e.g., National Parks) where human activity is limited (Hornocker and Hash 1981; Hatler 1989; Banci 1994; Krebs and Lewis 1999).

#### 13.7.1.3.3 Fisher

The fisher is blue-listed in British Columbia but is not considered at risk federally (Appendix 13H-1). Their relative scarcity in the harvest records for MU 7-56 is likely a reasonable approximation of their abundance in the region. Fishers were seldom recorded during winter track surveys in the southeast Prophet River Territory (Poole and Stanley 1998) or during surveys in the Zama Lakes-Rainbow Lake area (AXYS 1995a) or Shekille River-Zeues Lake area (AXYS 1998).

The fisher is typically found in dense conifers or mixedwood forests with a continuous canopy, adequate cover and an abundance of potential den sites (deVos 1951, 1952; Coulter 1966; Brander and Books 1973; Clem 1975; Kelly 1977; Powell 1982). They avoid stands with a high deciduous component, but will inhabit second-growth forests if suitable cover is present (Kelly 1977). Stands of low canopy cover are used only when directly adjacent to dense stands, and fisher will not venture far into openings (Ingram 1973). Fishers were completely absent from recently logged areas and burned forest stands in Ontario (deVos 1951). Clearcutting of large areas can significantly reduce the availability of winter foraging sites (Powell 1982).

Fisher habitat capability is moderate at the west end of the proposed route but mostly nil/very low in the east, although there is a mix of mostly low with some moderate capability habitat along the Hay River (MELP 1995).

Fishers have been shown to seldom travel along roads or powerline ROWs (Johnson and Todd 1985). While they apparently avoid linear corridors during construction activities, they may not significantly shift their territories in response to post-construction levels of activity (Morgantini 1984; Eccles and Duncan 1987). Fishers are considered curious by nature, but their usual reaction to the presence of humans seems to be avoidance (Jalkotzy et al. 1997). However, Johnson and Todd (1985) suggest that the rarity of sightings may actually be the result of their relative scarcity rather than actual avoidance behaviour. Little is known about the impacts of forest removal activities, such as seismic clearings, on the fisher’s use of forest edges (Fenske-Crawford and Niemi 1997).

#### 13.7.1.3.4 Marten

The marten is not listed provincially or federally. They occur in forested habitats throughout most of British Columbia, with their greatest densities in coastal old-growth forests, but generally common across their range (Stevens and Lofts 1988; Stevens 1995). Prey abundance (e.g., voles) appears to be a critical factor affecting marten population dynamics (Mech and Rogers 1977; Fryxell et al. 1999). The marten's prominence in the harvest records for MU 7-56 indicates that it could be relatively abundant in and around the Project area. However, marten are thought to be decreasing in the region due to forest harvesting and improved access (George Behn, pers. comm.). Marten were frequently recorded in winter track surveys in the southeast Prophet River Territory (Poole and Stanley 1998) and during surveys in the Zama Lakes-Rainbow Lake area (AXYS 1995a) and Shekille River-Zeues Lake area (AXYS 1998).

Marten are often referred to as old growth dependent; however, they may occur in second-growth stands (Buskirk and Powell 1994; Bowman and Robitaille 1997). Marten in the northern boreal forest are closely associated with late successional coniferous stands, especially those dominated by spruce and fir with complex structure near the ground (e.g., dead and downed material) (Slough 1989; Buskirk and Powell 1994). Commonly reported refuge sites include ground burrows, rock piles and crevices (Mech and Rogers 1977), downfall, stumps, snags, brush or slash piles and squirrel middens (Steventon and Major 1982; Davis 1983; Buskirk 1984; Ruggiero et al. 1994; Bull and Heater 2000). Marten tracks in the Prophet River Territory were most abundant (0.49 tracks per km-day) in old forest conifer habitats and least abundant in immature deciduous habitats (0.03 tracks per km-day) (Poole and Stanley 1998). First Nation trappers participating in overflights of the proposed Ekwan pipeline route in December indicated that marten can be trapped in shrubby muskeg areas, but are more abundant in more mature forest stands (J. Cabot-Blanc, pers. comm.).

The pattern and rating of marten habitat capability within the Project area is very similar to fisher except that there is predominately moderate rather than low capability habitat along the Hay River (MELP 1995).

Marten are known to be sensitive to intense human disturbance, but they may be able to adapt to less intense disturbances (e.g., selective logging) (Koehler et al. 1975; Soutière 1979). Many studies have reported that marten respond negatively to clearcutting and habitat fragmentation (e.g., Steventon and Major 1982; Hargis et al. 1999; Potvin et al. 1999; Forsey and Baggs 2001). No consistent response to linear development has been demonstrated, but there is some evidence that crossings of wider cleared ROWs are generally avoided or attempted unsuccessfully (Eccles and Duncan 1986; Jalkotzy et al. 1997; Robitaille and Aubry 1999). Several studies have reported that marten occasionally cross large openings (e.g., 50 to 200 m), although they generally will stop only in areas with cover (Koehler et al. 1975; Soutière 1979; Hargis and McCullough 1984).

#### 13.7.1.3.5 Beaver

The beaver is not considered to be at risk in the British Columbia nor is it listed federally. Its prominence in the harvest records for MU 7-56 indicates that it could be relatively abundant in and around the Project area, although abundance may be very localized within a broad area (e.g., Poole 1998). A lodge survey in the Klua Lakes area (approximately 100 km southwest of Project area) in 1997 found an overall (low) density of 0.11 active lodges/km$^2$ (Poole 1998). A beaver was observed at the Hay River south crossing during limited ground reconnaissance along the Project route in October 2002 and active and inactive beaver lodges were seen frequently during the concurrent overflight along a number of unnamed tributaries associated with the Kotcho River, Hay River and Townsoitoi Creek.

Beavers inhabit aquatic and riparian habitats along slow-flowing rivers, streams, marshes, lakes and ponds (Banfield 1974). They require a permanent water supply and prefer stable water levels (Slough and Sadleir 1977). Beaver populations can only be supported in forested areas where there is an adequate and accessible supply of woody vegetation (Boyce 1981). They prefer deciduous trees, such as aspen, willow, poplar, birch and alder, but may subsist in some areas by feeding on conifers (Banfield 1974; Jenkins and Busher 1979; Jenkins 1981; Slough 1988). In northeastern British Columbia, beaver lodges were found in all age classes of commercial forests, but beavers tended to select for immature non-commercial forest (Poole 1998).

Beaver habitat capability is rated as nil/very low throughout the Project area although there is some low capability habitat in the region, particularly to the north (MELP 1995). This nil/very low rating is countered by the obvious presence of beavers in the proposed Project area. This paradox may be a function of several factors – the generally lower availability of deciduous-dominated habitats in the area, the habitat capability rating system itself (relative to provincial benchmark), and the low resolution of the mapping (1:250,000).

There has been little study of the impacts of oil and gas exploration and production on the beaver. Potential impacts might be expected if there were localized hydrological regimes alterations (e.g., artificial damming). Habitat alterations that result in deciduous regeneration can produce high quality beaver habitat (Slough and Sadleir 1977; Slough 1988; Poole 1998; Barnes and Mallik 2001).

#### 13.7.1.4 Small Mammals

At least 20 small mammal species are expected to occur within the Project area. However, only the northern long-eared bat (*Myotis septentrionalis*) is considered a potential key species because of its special conservation status. Several small mammal species (e.g., meadow vole, *Microtus pennsylvanicus*) are significant components of the region’s prey base but have not been proposed as key species because of their large and dynamic populations and presumably abundant microhabitats.

##### 13.7.1.4.1 Northern Long-eared Bat

The northern long-eared bat is blue-listed in British Columbia, but does not have any federal designation (Appendix 13H-3). This bat is relatively uncommon in northern British Columbia and Alberta (Caceres and Pybus 1997; Wilkinson et al. 1995), but is thought to be generally associated with boreal forests (Nagorsen and Brigham 1993; van Zyll de Jong

1985). A preliminary bat inventory in the southeast Prophet River Territory in 1997 captured one lactating northern long-eared bat (Crampton et al. 1997).

Limited suitable bat habitat occurs along the proposed route due to the lack of old growth forest types. During the summer, the northern long-eared bat will roost in crevices or behind the bark of partially decayed trees (van Zyll de Jong 1985). Usually these trees are large in diameter with a high percentage of bark remaining (Caceres and Pybus 1997) and are typically a component of old-growth forests. This species forages over ponds, streams, roads, and clearings usually under the forest canopy and close to the ground (van Zyll de Jong 1985). The northern long-eared bat is a non-migratory species that hibernates in caves or abandoned mines (van Zyll de Jong 1985). This species may migrate to other more favourable locations in western Canada during winter months (van Zyll de Jong 1985; Caceres and Pybus 1996).

The northern long-eared bat is known to be particularly vulnerable to disturbance at the juvenile stage and during the winter (Caceres and Pybus 1997). During hibernation, disturbance effects may deplete their limited energy stores (Speakman et al. 1991; Thomas 1995; Caceres and Pybus 1997), and any changes to the internal environment of a hibernaculum may result in its abandonment (Caceres and Pybus 1997). The ecology of this species is little known (Caceres and Pybus 1997), and there is no research available regarding potential impacts of oil and gas exploration and development.

#### 13.7.1.5 Birds

Relatively limited information exists on bird species abundance and distribution in northeastern British Columbia. The Taiga Plains is thought to have lower bird species diversity than other ecoprovinces of British Columbia (Campbell et al. 1990a) – approximately 200 bird species may occur within the Project area.

Given the general paucity of information on the demography and habitat use patterns of bird species in this region and the limited information available on the species-specific effects of oil and gas exploration and development, the following summary will focus on species groups rather than individual species. The species groups to be considered are waterfowl, shorebirds, raptors and owls, gamebirds and passerines.

##### 13.7.1.5.1 Waterfowl

More than 35 waterfowl species potentially breed within or migrate through the Project area. Twenty-three waterfowl species were recorded during surveys in the Kahntah River area, south of the Project area (AXYS 1995b). Mallard (*Anas platyrhynchos*), Green-winged Teal (*Anas crecca*) and American Wigeon (*Anas americana*) were the most commonly recorded species (AXYS 1995b). Mallards were observed occasionally along the Project route during limited ground surveys in October 2002, and a pair of Tundra Swans (*Cygnus columbiana*) was recorded during the concurrent overflight.

Two waterfowl species were identified as potential key species for the Project area: Trumpeter Swan (*Cygnus buccinator*) and Surf Scoter (*Melanitta perspicillata*). Both the species are blue-listed in British Columbia, although neither is considered sensitive federally (Appendix 13H-3). Trumpeter Swans are a local but widespread breeder throughout the region and Surf Scoters breed occasionally in the Peace and Fort Nelson Lowlands (Campbell et al. 1990a). One of the specific management objectives from the Fort Nelson LRMP is to conserve Trumpeter Swan nesting habitat by providing visual screening and minimizing disturbance (Fort Nelson LRMP Working Group 1997).

Waterfowl nesting requirements vary considerably, from the use of shrubland habitats to floating vegetation mats in wetlands to natural cavities or woodpecker holes in trees to the use of lakes and riverbanks (Bellrose 1976). Surf Scoters breed on lakes and ponds in forested areas (Savard et al. 1998). Suitable habitat for Trumpeter Swans includes lakes, ponds, marshes, large sloughs and rivers with emergent vegetation (Bellrose 1976; Campbell et al. 1990a; Semenchuk 1992).

Limited suitable breeding habitat occurs for either Surf Scoters or Trumpeter Swans within the proposed Project area given the lack of shallow open water sites. However, the broader habitat preferences of the Trumpeter Swan increase the likelihood of its occurrence in the area.

Considerable research has been conducted on the effects of development on geese and swans in northern Canada and Alaska. For example, Canada Geese (*Branta canadensis*) were found to exhibit varying flight and alert responses to aircraft overflights according to aircraft type, altitude, and lateral distance (Ward et al. 1999). Construction of features such as gravel roads, pads, and quarries can result in loss of Tundra Swan nesting habitat (Ritchie and King 2000). Human activity (e.g., traffic) can lead to avoidance of areas within 100-200 m of roads, and may cause nest abandonment and increased predation risk in this species (Ritchie and King 2000). Passing vehicles and regular aircraft overflights alerted Trumpeter Swans but did not cause nest abandonment (Henson and Grant 1991); however, other human disturbances (e.g., boating, bird watching, floatplane use, stopped vehicles) did result in significant behavioural changes that could lead to nest failure and loss of young (Henson and Grant 1991; Mitchell 1994). There appears to be no information on the effects of oil and gas exploration and development on Surf Scoters, although habitat loss and alteration are a concern, particularly on wintering grounds and more southerly breeding areas (Savard et al. 1998; Government of Northwest Territories 2000).

#### 13.7.1.5.2 Shorebirds

Approximately 20 species of shorebirds may breed within or migrate through the Project area.

Two shorebird species were identified as potential key species for this Project area: Sandhill Crane (*Grus canadensis*) and American Bittern (*Botaurus lentiginosus*). Sandhill Cranes breed in the Fort Nelson Lowlands and their migration route runs through the Fort

Nelson area (Kessel 1984). The distribution of the American Bittern in northeastern British Columbia is not well delineated but they have been recorded in the Peace Lowlands and northeast of Kotcho Lake and it is possible they breed in the region (Campbell et al. 1990a). Neither species is federally listed, but in British Columbia both species are blue-listed (Appendix 13H-3).

Suitable habitats (i.e., wetland types) for shorebird species are patchily distributed with the proposed Project area. American Bitterns inhabit marshes, swamps, moist meadows, wet thickets and (less often) drier meadows (Campbell et al. 1990a; Semenchuck 1992). Sandhill Cranes require a mosaic of shallow freshwater marshes with emergent vegetation and forested upland or grassland habitats (Iverson et al. 1987; Baker et al. 1995; Tacha et al. 1992). They also require roosting sites that are open and isolated from disturbances (e.g., extensive wet meadows) (Kessel 1984).

The major concern for shorebirds is the loss or alteration of wetland habitats that are critical to breeding and migration. The effects of oil and gas exploration and development on shorebirds are essentially unknown. Some shorebirds (e.g., Lesser Yellowlegs (*Tringa flavipes*)) have been observed to nest on roadsides, seismic lines, and agricultural fields (Campbell et al. 1990b).

#### 13.7.1.5.3 Raptors and Owls

Approximately 20 species of raptors and owls may breed in and around the Project area. Northern Goshawk (*Accipiter gentilis*), Great Gray Owl (*Strix nebulosa*) and Northern Harrier (*Circus cyaneus*) were observed in the Shekille River-Zeues Lake area (AXYS 1998).

One raptor and one owl were identified as potential key species for this Project area: the short-eared owl (*Asio flammeus*) and broad-winged hawk (*Buteo platypterus*). Both species are blue-listed in British Columbia and the short-eared owl is designated as a species of concern federally (Appendix 13H-3). Neither species occurs commonly or predictably in the Project area. Breeding populations of the broad-winged hawk are found primarily in the Fort St. John area but may be expanding into other areas of the Peace Lowlands (Campbell et al. 1990b). It is generally difficult to predict local occurrences of the short-eared owl as it wanders in search of food, and can occur anywhere that suitable habitat and prey co-exist (Holt and Leasure 1993).

Limited habitat is available for the short-eared owl or broad-winged hawk along the proposed pipeline route. The broad-winged hawk prefers large stands of mature mixed deciduous forests (Campbell et al. 1990b; AEP 1996). Short-eared owls occur in a variety of open habitats with short vegetation, such as marshes, swamps, sloughs, lakeshores, forest clearings, grasslands and fields (Campbell et al. 1990b). They are patchily distributed in forested areas and absent from densely forested regions (Cadman and Page 1994).

Development activities such as agriculture (e.g., wetland drainage), urban expansion, forestry, and mining have eliminated or alienated important habitat for raptors throughout their ranges (Brownell and Oldham 1985; Holt and Leasure 1993; Cadman 1994; Rowell and Stepinsky 1997; Buehler 2000; Clayton 2000b). Linear developments may negatively impact raptors through the loss and fragmentation of habitat, collisions with overhead wires and vehicles, and direct human disturbance (Postovit and Postovit 1987; Williams and Colson 1987; Watson 1993), but for most species, the effects of oil and gas exploration and development are little known and poorly understood.

#### 13.7.1.5.4 Gamebirds

Three species of gamebirds breed in and around the Project area. The sharp-tailed grouse (*Tympanuchus phasianellus*) was the only potential key species selected for this group in the Project area. This species is not considered at risk federally or in British Columbia, but it is considered sensitive in Alberta. This grouse is uncommon in the Fort Nelson Lowlands (Campbell et al. 1990b). They were observed occasionally during winter surveys in the Shekille-Zeues Lake area (AXYS 1998), and grouse sign (unknown species) was recorded during limited ground visitations along the proposed route in October 2002.

The proposed Project area may meet some of the sharp-tailed grouse's habitat requirements (e.g., numerous openings), however there is a lack of young deciduous forest which limits overall habitat needs. Sharp-tailed grouse generally require open lowlands adjacent to brushy or scattered open woodlands and, in northeast British Columbia, young deciduous forests are also important (Campbell et al. 1990b). Open swamps, meadows, muskeg and burns are frequented in the boreal forest (Campbell et al. 1990b). Winter habitats are primarily riparian areas (Moyles 1981; Marks and Marks 1988; Connelly et al. 1998). Lek sites are usually on elevated areas, but may occur in lower areas such as muskeg, wet meadows and clearcuts (Connelly et al. 1998, Deeble et al. 2000). There are no known lek sites along the proposed Project route.

There is limited information available on the effects of oil and gas exploration and development on this species, although there may be health risks associated with ingestion of, and dermal contact, with contaminated soils. Human presence may displace sharp-tailed grouse from lek sites, although they are also known to habituate to various activities (e.g., road construction) (Baydack and Hein 1987; Connelly et al. 1998). This grouse's habitat can be lost through conversion to cropland, livestock use, and fire suppression (Connelly et al. 1998).

#### 13.7.1.5.5 Passerines

Over 100 passerine species are likely to breed within or migrate through the Project area. Fifty passerine species were recorded in the Kahntah River region of the Fort Nelson Lowlands in June 1995 (Appendix 0 in AXYS 1995b). The most common species were the yellow-rumped warbler (*Dendroica coronata*), dark-eyed junco (*Junco hyemalis*), Swainson's thrush (*Catharus ustulatus*), alder flycatcher (*Empidonax alnorum*), whitethroated sparrow (*Zonotricha albicollis*), pine siskin (*Carduelis pinus*), gray jay (*Perisoreus canadensis*), and white-winged crossbill (*Loxia leucoptera*) (AXYS 1995b).

Five passerine species were identified as potential key species for the Project area: the Philadelphia vireo (*Vireo philadelphicus*), Cape May warbler (*Dendroica tigrina*), black-throated green warbler (*Dendroica virens*), bay-breasted warbler (*Dendroica castanea*), and LeConte's sparrow (*Ammospiza leconteii*). The Philadelphia vireo, black-throated green warbler, and LeConte's sparrow are blue-listed in British Columbia; the other two species are red-listed (Appendix 13H-3). None of these species are considered at risk federally (Appendix 13H-3). These species were selected because of their special conservation status and because their expected presence in the Project area (Campbell et al. 1997).

Philadelphia vireos inhabit deciduous forests dominated by trembling aspen or balsam poplar (Campbell et al. 1997). Cape May warblers breed in open stands of mature coniferous and mixedwood forests, particularly those dominated by white spruce (Godfrey 1986). Similarly, the black-throated green and bay-breasted warblers are associated with mature white spruce or conifer-dominated mixedwood forests (Erskine and David 1976; Enns and Siddle 1996; McGillivray and Semenchuk 1998; Norton 2001a). LeConte's sparrows prefers open wetland habitats such as wet grasslands, marshy meadows, slough and bog edges and roadside ditches (McGillivray and Semenchuk 1998).

The availability of warbler habitat is relatively limited along the proposed route as older white spruce dominated stands are relatively scarce and localized (e.g., Hay River corridor). Vireo habitat is even more scarce as there is essentially no older deciduous-dominated types within the proposed Project area. However, wetland habitats in the area could support LeConte's sparrow.

Unlike forestry-related activities, the impacts of oil and gas development on passerines have not been widely studied (Williams 1996; Cooper et al. 1997b; Norton 2001b). Obviously, habitat loss and fragmentation is a concern for many of these species (e.g., Drolet et al. 1999). For example, the occurrence of the Connecticut warbler (*Oporomis agilis*) in the aspen-parkland of Saskatchewan was positively related to aspen grove size and negatively related to grove isolation (Johns 1993; Hobson and Bayne 2000). Forest fragmentation (and the resultant increase in edge habitat) can result in an increase in predation and nest parasitism (Bull and Jackson 1995; Moskoff and Robinson 1996; Cooper et al. 1997a). There was, however, apparently no effect of increasing seismic line development in Alberta's boreal forest on the bay-breasted warbler, despite the increase in habitat fragmentation (Cooper et al. 1997b; Norton 2001a). Air pollution from sour gas plants can affect the growth of deciduous trees by increasing disease frequency, and thus, indirectly reduce nesting habitat suitability for some passerines (Cooper et al. 1997b). There are also apparent mortality risks for bay-breasted warbler populations that are in the immediate vicinity of oil and gas plants that are producing $SO_2$ emissions (Cooper et al. 1997b).

#### 13.7.1.6 Reptiles and Amphibians

Two amphibian species may potentially occur in the Project area – striped chorus frog (*Pseudacris triseriata*) and wood frog (*Rana sylvatica*). No reptiles are found in the Project area.

Neither the striped chorus frog nor the wood frog are considered at risk in British Columbia or Alberta and they are not listed federally. Therefore, no amphibians were selected as potential key species with respect to this Project area.

#### 13.7.1.7 Selection of Key Species of Concern for Impact Assessment

Of the 21 potential key species of concern described above, the following subset of key species was selected for use in the impact assessment: woodland caribou, moose, grizzly bear, marten, beaver, trumpeter swan, and black-throated green warbler. These seven key species were selected from the list of potential key species according to the following criteria:

- species considered regionally important (i.e., of significant conservation concern federally or provincially within British Columbia or Alberta)
- species with a high public or socio-economic profile within the region
- species known or presumed to require habitats that were identified as being potentially negatively impacted by effects related to pipeline development
- species that function as an indicator species for a wildlife group

The rationale for key species selection is presented in Table 13.7-1. By selecting these seven key species of concern on which to focus the impact assessment, it is believed that the results of the environmental effects analysis, including a consideration of cumulative environmental effects, will be representative of the ecosystem in the vicinity of the Project. No additional issues or species of concern were identified during consultation with federal (Paul Gregoire, Canadian Wildlife Service, Edmonton, AB; Kristin Charleton, Canadian Wildlife Service, Delta, BC) and provincial authorities (Pierre Johnstone, Ministry of Water, Land and Air Protection, Fort St. John, BC; Rod Bachmayer, Ministry of Water, Land and Air Protection, Fort St. John, BC; Kim Morton, Alberta Fish and Wildlife, High Level, AB).

### Table 13.7-1 Key Species Selected for Impact Assessment

| Key Species | Rationale |
|---|---|
| Woodland caribou | Conservation status, habitat concerns |
| Moose | Socio-economic status (hunting, subsistence) |
| Grizzly bear | Conservation status, high public profile, indicator species for other large ranging carnivores (e.g., wolverine) |
| Marten | Socio-economic status (trapping), indicator species for other terrestrial furbearers |
| Beaver | Socio-economic status (trapping), indicator species for other semi-aquatic furbearers |
| Trumpeter swan | Conservation status, wetland habitat concerns, indicator species for waterfowl |
| Black-throated green warbler | Conservation status, indicator species for passerines |

### 13.7.1.8 Field Survey Program

To verify elements of the baseline information discussed above, and to provide additional detail for the mitigation strategies discussed in the following sections, a wildlife field program is planned in spring, 2003. The results of this field program described below will be submitted to the NEB upon finalization.

Two wildlife field surveys are planned for the spring 2003:

- wildlife habitat assessment
- breeding bird survey

The wildlife habitat assessment will be conducted in May, 2003, and where logistically possible, will be coordinated with the fisheries spring survey. Most observations will be recorded from the air, with detailed assessments on the ground at riparian survey sites. The wildlife habitat assessment will focus on identifying potential denning habitat features (e.g., fluvial deposits associated with riparian areas and older structural stage forests) for canids or bears within the Project corridor. These features are critical life history requirements for canids and bears, and are further emphasized in the Project area because of the general paucity of suitable denning habitat (i.e., upland areas with mature forest stands). Other important habitat features (e.g., wildlife trees for raptor nests, mustelid den sites, or bat roosts) will also be noted. Sign or occurrence of other wildlife species of concern will be documented during aerial and ground-based observations.

The breeding bird survey will be conduced in early June, 2003, coinciding with the optimal nesting season for neotropical migrant bird species. Helicopter access will be used to locate biologists for ground-based observations. Fixed-radius point count surveys will be conducted during mornings in representative habitat types within the Project corridor. All vocalizing songbirds will be recorded at these sites, and a density of breeding pairs of songbirds will be determined. Sign or occurrence of other wildlife species of concern will be documented during aerial and ground-based observations.

The associated technical reports to be completed after the surveys will provide detailed descriptions of survey methods, results, and recommended mitigation procedures where necessary.

### 13.7.2 Results of Issues Scoping

The Project may affect wildlife during construction and operations phases, which will involve clearing and pipeline operation activities. The disturbance associated with development activities of the Pipeline ROW may affect wildlife both over the short-term and long-term. In areas where existing ROW will be paralleled, the impacts on wildlife resulting from the Project are expected to be minimal (e.g., reduced habitat availability and fragmentation), and will likely have little potential for affecting wildlife resources on a regional basis. Greater impacts on wildlife may occur in areas of new ROW development and the resulting change to access potential. These potential effects will be minimized through a combination of route selection, timing of construction, and through implementation of site-specific mitigation measures (e.g., access control).

The Project is located within a region that has experienced high levels of multiple land use developments and has been determined to be an area of Enhanced Resource Management (Fort Nelson LRMP 1997). Specific project effects may interact in a cumulative manner with existing and future land use pressures. As a result, this assessment, while addressing the localized effects of the Project, also conducted a quantitative analysis of cumulative effects to which the Project could potentially contribute.

#### 13.7.2.1 Project Effects Analysis

Potential negative environmental effects on wildlife from the Project may occur from individual or combined effects of:

- reduced habitat availability
- reduced habitat diversity
- blockage of movements
- direct and indirect wildlife mortalities

From a biodiversity perspective, these potential project effects may impact wildlife species at three levels of organization:

- Landscape level – fragmentation effects may reduce habitat patch size or increase access potential, both of which may indirectly affect wildlife mortality risk.
- Community level – loss of habitat or a change in habitat diversity may reduce carrying capacity of an area for a wildlife species.

- Species level – direct mortality of wildlife from development activities (e.g., construction), or localized disruption of wildlife movements may influence mortality risk.

The following discussion summarizes these project-specific effects of pipeline developments on wildlife.

#### 13.7.2.1.1 Reduced Habitat Availability

Habitat availability can be directly influenced by the physical alteration of natural terrain and vegetation resulting from either natural or human-related occurrences. For pipelines, highly localized habitat loss occurs at permanent above-ground facilities (e.g., valve assemblies), while habitat alteration occurs along the ROW or in temporary workspace where native vegetation is removed and replaced through reclamation efforts. Of specific concern would be the potential loss through construction activities of an important localized habitat feature for a special status species.

Habitat availability can also be indirectly influenced by zones of sensory disturbance adjacent to physically altered areas created by human activities, where habitats become less attractive to wildlife because of increased disturbance or mortality risk. Species that reside in the Project area will be exposed to and potentially disturbed by construction activities. Wildlife responses can be expected to vary from elevated heart rates to more overt reactions such as flight and abandonment of local habitat. The severity of response depends on the species of wildlife, the nature of the stimulus, and a variety of environmental factors such as type of habitat and topography where the stimulus is encountered; it may also depend upon the previous experience of individual animals. Generally, pipeline construction can lead to temporary reductions in habitat availability next to centers of construction activity, but can also lead to long-term reductions if the ROW is accessible for recreational use after construction. More permanent facilities, such as well sites and compressor stations, typically reduce habitat availability for longer periods in these localized areas.

Habitat availability can also be influenced through habitat fragmentation. Habitat fragmentation is the process of insularization of habitat into fragments that are either too small to be of functional value or that are not accessible from other habitats (Primack 1993). Pipeline ROWs may lead to forest fragmentation where the ROWs are of sufficient width to discourage crossing by wildlife, or where the ROWs intersect important interior forest habitats, creating edge habitats or unnatural movement or disturbance corridors within large forest blocks.

#### 13.7.2.1.2 Habitat Diversity

The diversity of habitat in a region can influence the diversity of the wildlife community. Wildlife species have evolved to maximize productivity in different ecosystems, and as a result, typically have specific habitat associations. Changes to the distribution or availability of specific habitat types in a region may have significant effects on the persistence of wildlife populations, ecological processes (e.g., trophic stability), and ultimately wildlife diversity.

Three main types of habitat diversity that may affect wildlife species include vegetation type (e.g., ecosystem unit), structural stage (e.g., young or old growth forest), and wetland type (e.g., permanent open water or fen complex). Changes to habitat diversity may affect the availability of specific seasonal habitat requirements for wildlife species. This may include habitat requirements for foraging (e.g., old growth mixed wood forests for warblers or furbearers; wetlands for semi-aquatic furbearers), breeding (e.g., old growth forest structural stages for black-throated green warblers; permanent wetlands for trumpeter swans), or thermal or security needs (e.g., low elevation forest for ungulates).

As described in the vegetation section (see Section 13.6), pipeline developments will primarily result in the localized alteration of vegetation type and structural stage, and it is unlikely that these development will have regional effects. The restricted footprint of the ROW of the Pipeline is not expected to have a significant effect on landscape parameters (e.g., forest patch size, area of upland vs. wetland cover). However, the ROW development does have the potential to locally change the structural and community diversity of ecosystem units if unusual or under-represented units (e.g., old growth, uncommon communities) are encountered by construction activities.

#### 13.7.2.1.3 Blockage of Movements

Seasonal or daily movements may be blocked or disrupted due to construction activities and, more specifically, the presence of vehicles and construction personnel in and around a pipeline area. However, given the paralleling and sharing of workspace with existing ROWs for the Project, the short duration of activities in localized areas, the winter construction season when few animals are moving large distances, and mitigation measures to ensure passage of wildlife (see Section 13.7.5), the potential for wildlife movements to be significantly disrupted as a result of the Project is remote. Therefore, the assessment does not consider blockage of movements as a potential environmental effect for this proposed pipeline development.

#### 13.7.2.1.4 Direct and Indirect Wildlife Mortality

Pipeline developments can result in direct wildlife mortalities through active nest or den site disruption, collisions with project vehicles, and unrestricted use of firearms by Project personnel. The new access afforded by pipeline ROW can also increase the risk of hunting related mortalities for some species of wildlife. Additionally, increased human activity associated with new access and facilities leads to increased risk of problematic bear-human conflicts, and the potential for management removals of bears. Access was also raised as an issue during consultation for the Pipeline (see Sections 10 and 12 of the Application). Quantification of core security habitat can be used to infer changes in risk to key species such as caribou or grizzly bears due to increased access potential and loss of secure habitat.

#### 13.7.2.2 Key Impact Questions

Based on the above discussion, the following key issues will be focus of the wildlife component of the subsequent impact assessment:

| Key Impact Issue | Assessment Approach |
|---|---|
| How will the Project affect habitat availability for wildlife? | Quantitative assessment of changes to high quality habitat (using TEM habitat ratings for caribou, moose, grizzly bear, marten, and black-throated green warbler; and using buffers for trumpeter swan and beaver) within the mapped two km-wide study corridor, incorporating disturbance levels of linear corridors. Fluvial deposits were also assessed to identify potential high quality denning habitat for large carnivores (e.g., canids and bears) |
| How will the Project affect habitat diversity for wildlife? | Quantitative assessment of changes to habitat diversity (uncommon site series or structural stages) within the mapped two km-wide study corridor. The assessment was based on information from the vegetation discipline. |
| How will the Project indirectly affect wildlife mortality risk? | Quantitative assessment of the change in access use potential resulting from the Pipeline. If project specific effects were noted, then a quantitative assessment of fragmentation effects on core security habitat for landscape level species (e.g., caribou, grizzly bear) within the 30 km-wide study corridor was conducted, incorporating disturbance levels of linear corridors. |
| How will the Project directly affect wildlife mortality risk? | Qualitative discussion of potential mortality of wildlife species of concern along the route due to active nest or den site disruption, collisions with project vehicles, and unrestricted use of firearms by project personnel. |

### 13.7.3 Study Area

Two study areas were used to complete the wildlife assessment:

- a 2 km-wide corridor centered on the Pipeline (the Project corridor)
- a Core Security Study Area (CSSA)

The Project corridor was defined as a 2 km-wide corridor along the preferred pipeline route (Figure 13.7-1, Wildlife Study Area). The majority of wildlife observations, ground surveys, and TEM for the wildlife habitat ratings occurred within the smaller 2 km-wide Project corridor. The Project corridor was used to describe the general setting of the Project, and to discuss localized, project-specific effects and their contributions to local cumulative effects. Specifically, habitat based analyses for seven wildlife species of concern were conducted within this 2 km-wide corridor.

The Core Security Study Area (CSSA) (see Figure 13.7-1) was defined as a 30 km-wide corridor along the preferred pipeline route starting where the proposed alignment ceased to follow an existing major ROW. The CSSA was developed to allow for the assessment of regional cumulative pressures on more mobile, landscape level species such as caribou and grizzly bear, whose seasonal movements would extend well beyond the 2 km-wide corridor. The CSSA was considered large enough to potentially encompass the year-round seasonal movements of a female grizzly bear. This 30 km-wide corridor was used to better understand Project contributions to cumulative losses of core security habitat for both species (see Section 13.1.6.1 for description of analytical procedure). It extended from approximately KP 21 of the Pipeline alignment to the eastern terminus point. This portion of the Pipeline has the potential to measurably contribute to improved access potential and loss of core security habitat. West of KP 21, the proposed Pipeline parallels an existing pipeline ROW and associated truck trail that have already compromised core security habitat. Information on land use, and in particular on high use linear corridors, was collected for this larger corridor to provide a better perspective of cumulative effects possibly influencing these species.

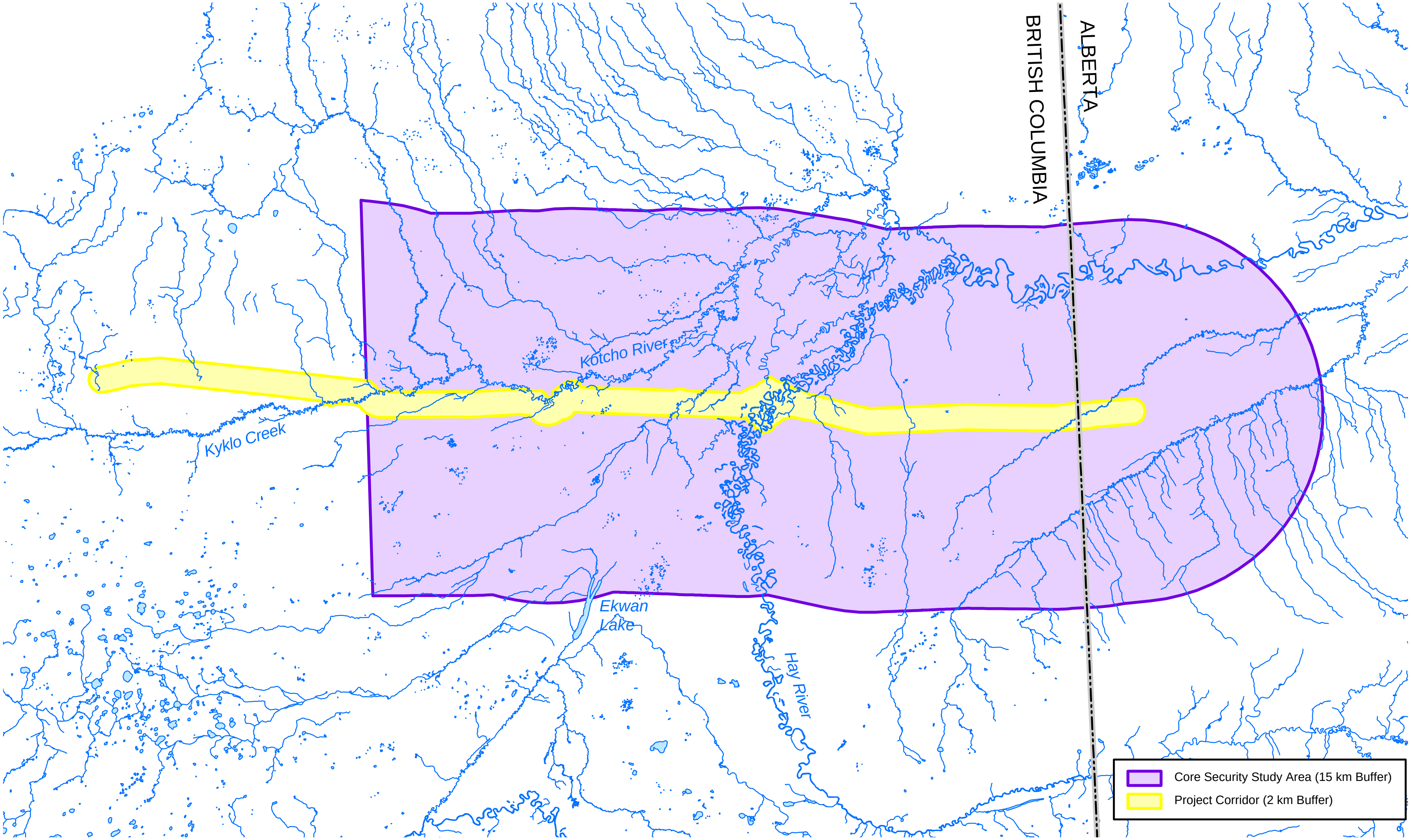
The CSSA was too large to practically map to TEM specifications, and habitat availability and diversity analyses were not undertaken for this area. The core security analysis undertaken for the corridor was considered to be a conservative and more appropriate approach for assessing cumulative effects for the Project and land use setting (see Section 13.7.6.1 for details of core security analyses).

### 13.7.4 Assessment Scenarios

To assess project effects on wildlife, habitat conditions have been described and compared for the following assessment periods:

**Hypothetical Baseline** – This represents the hypothetical condition of the land base in the absence of existing human-related disturbance. This assessment scenario was used for the regional core security habitat analysis undertaken for caribou over the CSSA.

**Baseline** – This represents the condition of the land base under existing baseline (early February 2003) conditions. By comparing Baseline to Hypothetical Baseline, the degree of cumulative change in wildlife habitat to date can be assessed.




EKWAN PIPELINE PROJECT

# Wildlife Study Areas

Area of Detail

NORTH

4 0 4 8 12

Scale in kilometres

*Acknowledgements:*
*Original drawing by AXYS Environmental Consulting Ltd.*

ENCANA

| PREPARED BY AXYS | | | | |
|---|---|---|---|---|
| DRAFT DATE 27/February/2003 | | | SCALE 1:450,000 | |
| REVISION DATE 27/February/2003 | | | PROJECT POG1045 | FIGURE NO. 13.7-1 |
| DRAWN AO | CHECKED | APPROVED | VOL | |

**Construction** – This represents the predicted condition of the land base at the time of construction (i.e., December 2003 to March 2004). By comparing construction to baseline conditions, the effects of the construction of the Pipeline on wildlife can be tracked from baseline conditions.

**Operations** - This represents the predicted condition of the land base during operations, five years into the future from baseline (i.e., 2007). By comparing operations to baseline conditions, the effects of operational activities on wildlife, as well as those associated with other new (i.e., since baseline) unrelated development within the study corridor, can be tracked from baseline conditions.

A qualitative discussion on the implications of Project abandonment on wildlife is also presented.

### 13.7.5 Proposed Mitigation

The majority of the specific mitigation measures recommended to reduce impacts to wildlife are outlined in the Environmental Protection Plan (Appendix D). Additional site-specific mitigation measures may be developed after the wildlife habitat and breeding bird surveys are completed in May and June 2003, which will be used to corroborate wildlife habitat mapping and identify unique habitat features. The following general measures will be adopted as part of best available practices and have been factored into the assessment of residual project effects:

- slash rollback will be placed at strategic locations (e.g., approaches to mature forest stands associated with fluvial deposits along major watercourses, intersections with key winter roads) along specific sections of the ROW for access control (see the Access Control Plan in the EPP, Appendix D)
- avoidance of localized important habitats
- directional drills at selected creek crossings, which will limit the clearing of valuable wildlife habitat in riparian corridors
- avoidance of sensitive wildlife seasons for clearing and construction activities

Clearing and development of the proposed ROW poses the risk of creating new access. Access proliferation is an important issue for both grizzly bear and caribou due to potential to lead to access-induced mortalities from both humans and natural predators (in the case of caribou). While mitigating the risks of mortality during construction or associated with operational personnel and activity can both focus on timing and implementation of personnel codes of conduct, mortality risk associated with public access and natural predator activity must focus on curtailing the accessibility and utility of the new ROW.

To this end, specific access control measures have been developed for the Project, and are detailed in the Access Management Plan (see the EPP, Appendix D). One focus of the access management plan is the protection of mature forest habitats associated with the major watercourses in the region. These forests offer a botanical composition and structural diversity not found in the more open wetland communities of the region, and are important seasonal and/or year-round habitats for a number of wildlife species. Measures outlined in the plan are designed to limit new access into these areas. Site-specific access management measures are indicated on the Environmental Alignment Sheets (Appendix 13A).

All critical wildlife features (e.g., nest sites, dens, mineral licks) will be avoided by the Project through routing modifications, unless such modifications represent unacceptable risks or constraints to the Project. Where routing modifications are not possible, EnCana Ekwan will provide a detailed alternative mitigation plan for the protection of such resources. These critical wildlife features will be identified during wildlife habitat assessments and breeding bird surveys scheduled for the spring 2003.

Extra workspace will not be developed where critical habitat components are encountered by the ROW, unless such restrictions represent unacceptable risks or constraints to the Project. Where such restrictions are not possible, EnCana Ekwan will provide a detailed alternative mitigation plan for the protection of such resources.

For all wildlife species of concern, mitigation of potential direct project-related mortalities is focused on selection of timing windows for clearing that are outside vulnerable periods for wildlife (e.g., reproductive period for avian species, May 1 to July 15), and by implementing procedures that control the activities of project personnel and the general public that may lead to wildlife mortalities. Potential toxicity to wildlife due to hazardous materials spills will be mitigated by spill prevention and contingency response measures detailed in the EPP (Appendix 13D).

### 13.7.6 Residual Project Effects

#### 13.7.6.1 Analytical Procedures

Quantitative and qualitative tools were used to measure project-specific effects for wildlife species of concern:

- **Habitat Availability**: Using Terrestrial Ecosystem Mapping (TEM) wildlife habitat ratings, an analysis of change in the quality and quantity of habitat was undertaken in the Project corridor for five wildlife species (caribou, moose, grizzly bear, marten and black-throated green warbler). Analyses were also conducted to assess the proximity of the Pipeline route to high quality habitat for trumpeter swan and beaver in the Project corridor. In addition, the distribution and availability of fluvial deposits (potentially related to high quality denning habitat for canids or bears) intersecting by the Pipeline route was investigated from terrain and soils information provided by TEM (see Soils and Terrain Section for details on analytical techniques). The assessment of habitat availability focused on project contributions to cumulative change in high quality habitat resulting from the Pipeline development, as impacts to these important areas for wildlife species are expected to have the most dramatic effects.

- **Habitat Diversity**: Using TEM, an analysis of change in habitat diversity was undertaken for the 2 km-wide Project corridor. Habitat types of particular concern included uncommon vegetation site series, structural stages (with a focus on old growth), and wetlands. The uncommon site series, structural stage, and wetland analyses conducted as part of the vegetation assessment were used as the information source for this habitat analysis.
- **Mortality Risk**: Direct mortality risk to wildlife from the Project was assessed qualitatively, based on the potential for direct mortalities such as den/nest disruption, vehicle animal collisions, destruction of nuisance/dangerous wildlife etc.

The development of new access potential by the Project creates an indirect mortality risk to wildlife, as previously secure, remote habitats are exposed to possible hunter/predator traffic. Therefore, an analysis of the change in access potential along the Pipeline route resulting from construction and operational activities was undertaken. Access potential along the proposed pipeline alignment was rated under pre-construction conditions, based on the types of linear corridors being followed and the degree of regrowth along these lines. The proposed alignment was then re-rated for the construction and operation period, taking into account mitigation planned along the ROW to control access. Access control measures proposed for the Pipeline, coupled with the remote, wet location of the line, are expected to effectively discourage access along the Pipeline during its operational phase. Therefore, the ROW under operation conditions has been assigned a low access potential value.

Based on the results of the assessment of indirect mortality risk from new access, it was apparent that the new pipeline was contributing to some new access potential that could measurably contribute to cumulative mortality risk to wildlife species at the broader regional level. Consequently, a more extensive cumulative effects analysis was undertaken, using a core security habitat assessment, to better define project contributions to cumulative loss of core security habitat for caribou. Core security habitat is defined as usable habitat for a particular species that falls outside defined zones of disturbance around human developments and, in particular, high use linear developments such as roads, railroads, high use recreation trails, pipelines, and other utility corridors. Therefore, using existing and future land use information collected for the Resource Use section of the EIA, high use facilities and linear corridors were mapped for the 30 km-wide corridor for the various assessment periods, and the cumulative loss of core security habitat was tracked with and without the effects of the Project.

More details on these wildlife analytical techniques are provided in Appendix 13H-2. For analytical techniques used to identify fluvial materials for the denning habitat assessment, see the soils and terrain section (Section 13.5). For analytical techniques used to identify and track uncommon site series, structural stage, or wetland types, see the vegetation section (Section 13.6).

**Residual Effects Rating Criteria**

As described above, the four types of residual impacts (i.e., those effects anticipated to persist after mitigation) through which pipeline construction and operation can affect wildlife populations are reduced habitat availability, reduced habitat diversity, increased direct mortality risk, or indirect mortality risk. Project-specific effects on wildlife from these residual impacts were evaluated and described using three impact attributes (i.e., Magnitude/Extent, Duration, and Reversibility; Table 13.7-2). These attributes assisted in determining the potential for project-specific impacts to contribute to meaningful cumulative effects at the regional level (i.e., within the Etsho Resource Management Zone).

**Table 13.7-2 Impact Attributes to Describe Project-specific Effects on Wildlife**

| Attribute | Options | Definition |
|---|---|---|
| Magnitude / Extent | Low | Change in measurable parameter will have no effect on local species abundance or diversity (i.e., within two km mapped corridor) |
| | Moderate | Change in measurable parameter will have possible localized effect on species abundance or diversity (i.e., within two km mapped corridor) |
| | High | Change in measurable parameter will have possible measurable effect on species abundance or diversity within Etsho RMZ |
| Duration | Short-term | Effects are measurable for less than one year |
| | Medium-term | Effects are measurable for greater than one year but not beyond life of project |
| | Long-term | Effects are measurable beyond life of project |
| Reversibility | Reversible | Will likely revert to baseline conditions following end of project life or before |
| | Non-reversible | Unlikely to revert to baseline conditions following end of project life |
| Contribution to Cumulative Effects | Yes | Measurable contribution to CE within Etsho RMZ (generally requires high magnitude and medium to long-term impact on species) |
| | No | No measurable contribution to CE within Etsho RMZ |

### 13.7.6.2 Results

As described above, potential effects on wildlife from the proposed Project may occur from individual or combined effects of:

- reduced habitat availability
- reduced habitat diversity
- direct mortality
- indirect mortality

The assessment results of these effects are described below for wildlife species of concern within each species group (i.e., ungulates, large carnivores, furbearers and birds).

#### 13.7.6.2.1 Ungulates

Caribou and moose were identified as representative ungulate species of concern for the Project.

##### 13.7.6.2.1.1 Reduced Habitat Availability

Caribou and moose are landscape species that occupy a variety of habitat types within large territories, thus diminishing (but not precluding) the likelihood of significant effects on important localized habitats from oil and gas development (i.e., well site, access road and pipeline development). Caribou and moose may use the grass and shrub-dominated communities which will develop along most of the ROW as a forage source, as these animals often rely on graminoids and early developing herbs as a spring to fall dietary item. Therefore, the ROW, once reclaimed, will provide a potential foraging area for these species in close proximity to escape cover. In general, direct project effects to habitat are expected to be too localized to result in significant reductions in habitat availability from physical habitat alteration.

Construction activities may lead to sensory disturbance and reduced habitat availability for caribou and moose. Construction will overlap with the critical late winter period for ungulates (January through April). Caribou and moose are mobile and will generally demonstrate some displacement (i.e., generally less than one km in wooded or hilly terrain) away from the immediate vicinity of activities (Horejsi 1979; Morgantini 1994, Jalkotzy 1996). However, there is no evidence in the literature to suggest that such short-term displacement persists or results in significant decreases in local animal numbers (Bangs and Bailey 1982), provided that increased hunting pressures are not associated with the development. Given the relatively homogeneous habitat conditions occurring within the Project area (i.e., largely black spruce, or shrub dominated wetlands with more continuous aspen occurring at the west end of the line), displaced animals will have the ability to temporarily relocate away from the ROWs without being forced into sub-optimal habitats.

**Project Effects**

Potential changes in habitat availability were calculated for both caribou and moose during different seasons for the mapped, 2 km-wide corridor. The cumulative effects of existing linear disturbances are reflected in the habitat values calculated for baseline. The construction scenario reflects changes from the Project alone from baseline values. The operations scenario reflects cumulative change from baseline from all future known projects. Values have been provided with and without the effects of the Project to indicate project contributions to cumulative effects within the corridor.

Moderate amounts (26.7 percent) of high quality spring range occur in the Project corridor for caribou, however, no high quality habitat occurs for late summer/fall range, early winter range, or late winter range (Table 13.7-3, Appendix 13H-3, Figures 13.7-2, 13.7-3, 13.7-4, 13.7-5). Because of the winter schedule for construction, effects on this spring habitat are discussed under Operations only.

Including project effects during the operational phase, baseline high quality habitat for caribou within the Project corridor will increase by 2.4 percent for spring range (Table 13.7-3). This positive change in habitat quality is due to the increase in sedge and grass habitat types along the cleared pipeline ROW, which are preferred forage types for caribou during the spring. This long-term effect represents a positive change in habitat availability within the Project corridor, and is not considered to contribute to negative cumulative effects.

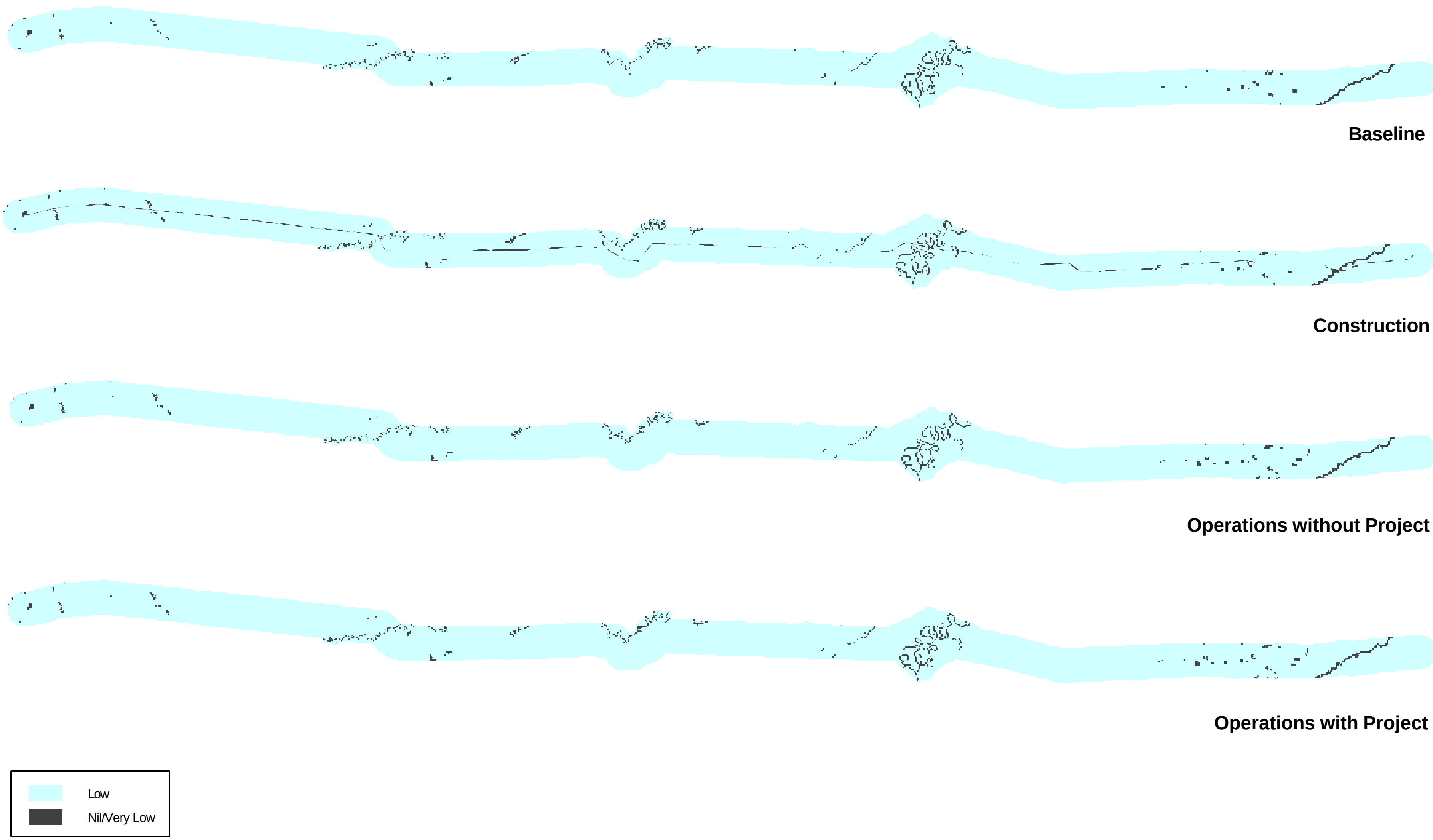
**Table 13.7-3 High Quality Habitat Availability for Caribou in the Project Corridor at Different Assessment Scenarios**

| **Season** | **Baseline** (ha) | **Baseline** (% of high quality habitat in Project corridor) | **Construction** (% change from baseline) | **Operations without the Project** (% change from baseline) | **Operations with the Project** (% change from baseline) |
|---|---|---|---|---|---|
| Spring | 4,638.7 | 26.7 | N/A | >0.1 | 2.4 |
| Summer/fall | 0 | 0 | - | - | - |
| Early winter | 0 | 0 | - | - | - |
| Late winter | 0 | 0 | - | - | - |

**Note**: High quality habitat refers to >51-100 percent suitability limits (very high and high categories combined) based on British Columbia provincial benchmarks

Moderate amounts of high quality habitat occurs in the Project corridor for moose during spring, summer/fall, and early winter seasons, with limited amounts for late winter (Table 13.7-4, Appendix 13H-3, Figures 13.7-6, 13.7-7, 13.7-8, 13.7-9). The Construction phase of the proposed Project will reduce baseline high quality habitat for moose within the Project corridor by 17.0 percent for early winter range, and 15.6 percent for late winter range (Table 13.7-4). While of low to moderate magnitude, these short-term construction effects are not considered to contribute to regional cumulative effects. Because of the winter schedule for construction, effects on spring and late summer/fall habitats are discussed under Operations only

Including project effects during the operational phase, baseline high quality habitat for moose within the Project corridor will increase by 2.0 percent for spring range and 0.9 percent for late summer/fall range, but will be reduced by 17.0 percent for early winter range and 15.7 percent for late winter range (Table 13.7-4, Figures 13.7-6, 13.7-7, 13.7-8, 13.7-9). It should be recognized that these reductions do not represent an absolute loss of habitat for these animals, but rather a conversion of higher quality habitats to moderate or lower quality habitats that will still be available for moose. Therefore, although long-term, these shifts in habitat quality are not expected to significantly change moose distributions and numbers within the 2 km-wide and are rated as low to moderate magnitude effects.




EKWAN PIPELINE PROJECT

# Woodland Caribou Habitat Availability during the Early Winter Season


NORTH

3 0 3 6 9

Scale in kilometres

*Acknowledgements:*
*Original drawing by AXYS Environmental Consulting Ltd.*

ENCANA

PREPARED BY AXYS

| DRAFT DATE | SCALE |
|---|---|
| 14/February/2003 | 1:350,000 |

| REVISION DATE | PROJECT | FIGURE NO. |
|---|---|---|
| 10/March/2003 | POG1045 | 13.7-2 |

| DRAWN | CHECKED | APPROVED | VOL |
|---|---|---|---|
| AO | | | |


EKWAN PIPELINE PROJECT

**Woodland Caribou Habitat Availability during the Late Winter Season**


NORTH

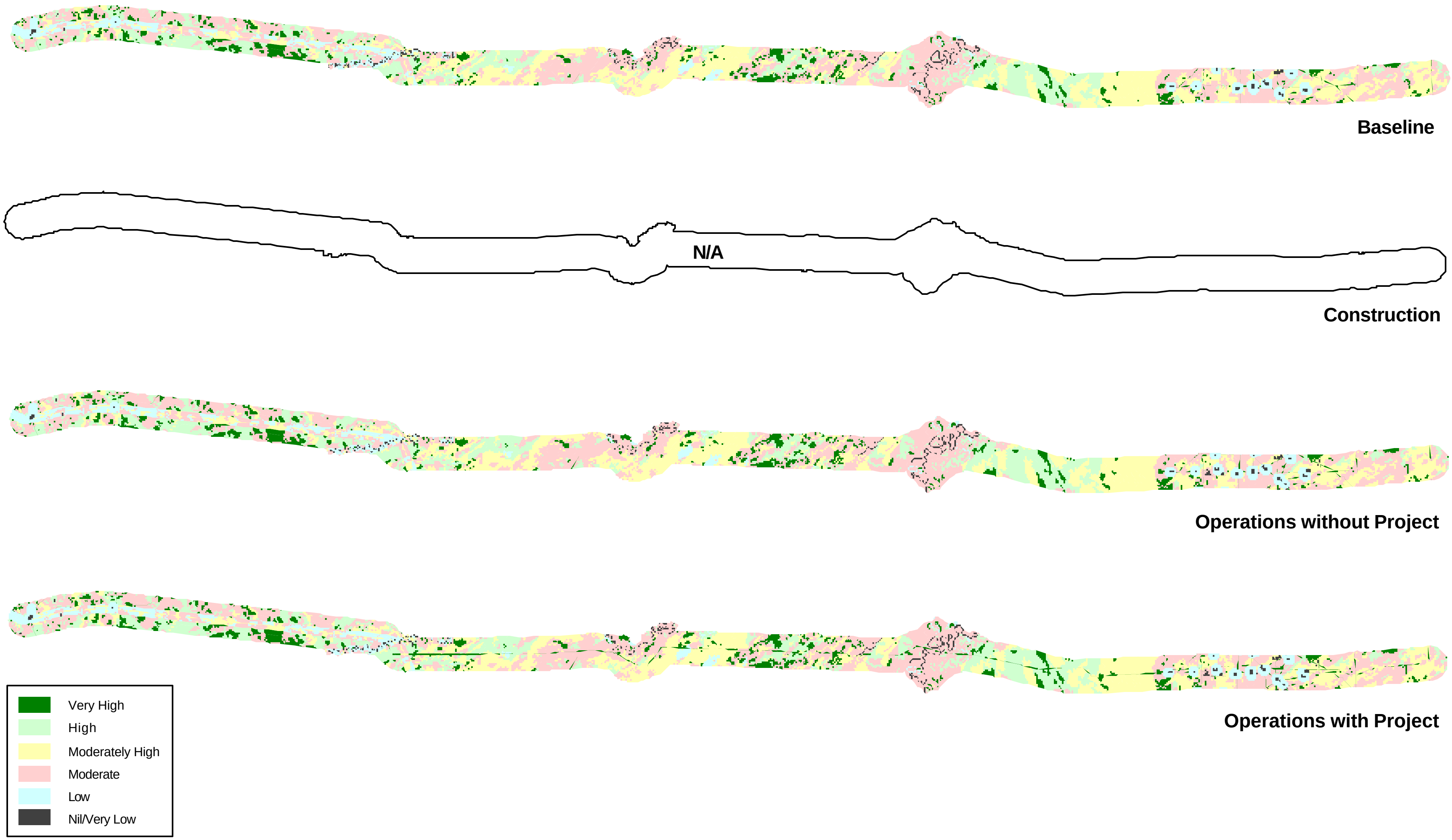
3 0 3 6 9

Scale in kilometres

*Acknowledgements: Original drawing by AXYS Environmental Consulting Ltd.*

EnCana

| PREPARED BY | AXYS | | | |
|---|---|---|---|---|
| DRAFT DATE | 14/February/2003 | | SCALE | 1:350,000 |
| REVISION DATE | 10/March/2003 | | PROJECT POG1045 | FIGURE NO. 13.7-3 |
| DRAWN AO | CHECKED | APPROVED | VOL | |




EKWAN PIPELINE PROJECT

# Woodland Caribou Habitat Availability during the Spring Season


NORTH

3 0 3 6 9

Scale in kilometres

*Acknowledgements:*
*Original drawing by AXYS Environmental Consulting Ltd.*

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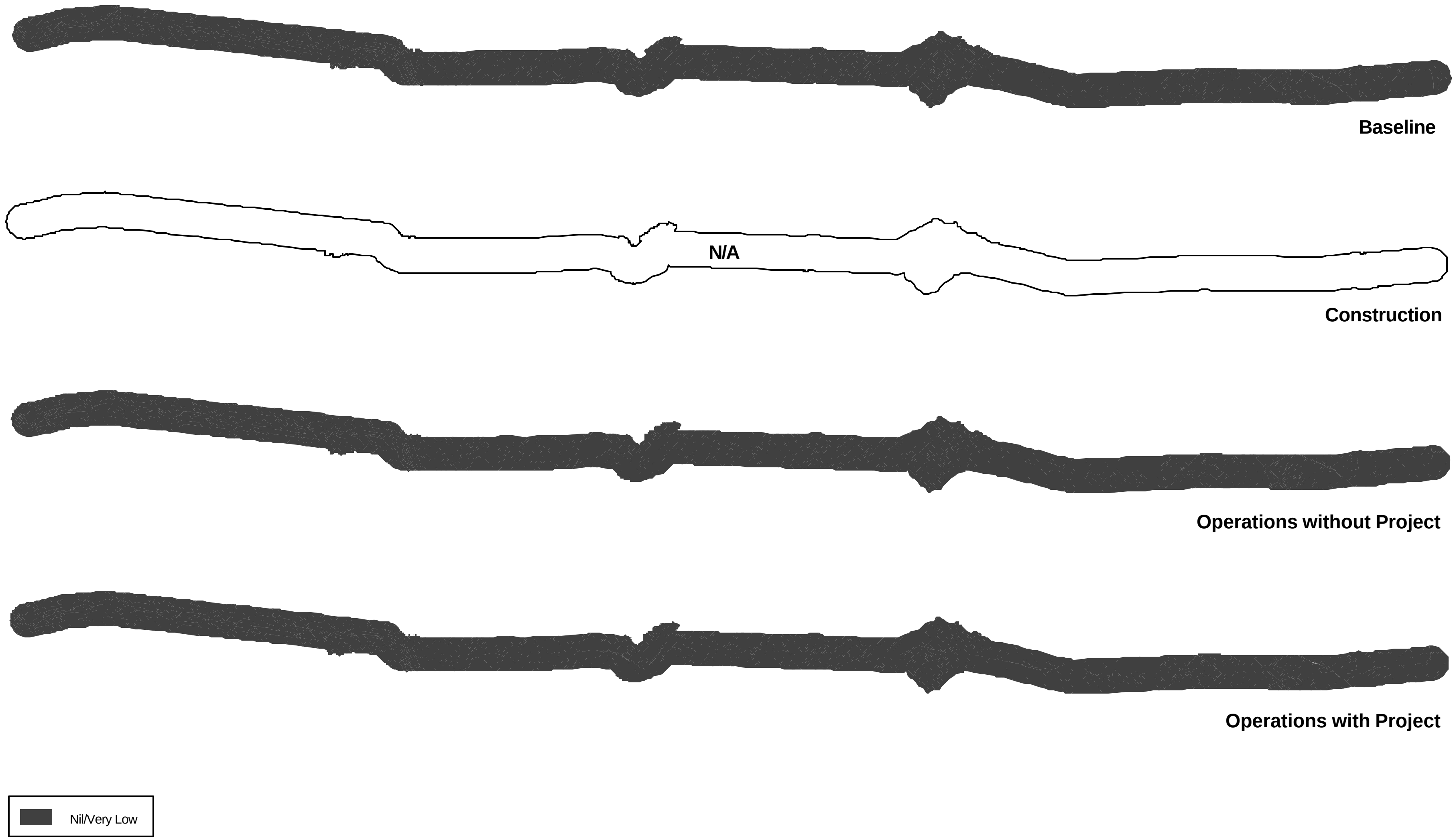
| PREPARED BY | AXYS | | | |
|---|---|---|---|---|
| DRAFT DATE 14/February/2003 | | | SCALE 1:350,000 | |
| REVISION DATE 10/March/2003 | | | PROJECT POG1045 | FIGURE NO. 13.7-4 |
| DRAWN AO | CHECKED | APPROVED | VOL | |




EKWAN PIPELINE PROJECT

**Woodland Caribou Habitat Availability during the Summer/Fall Season**


NORTH

3 0 3 6 9

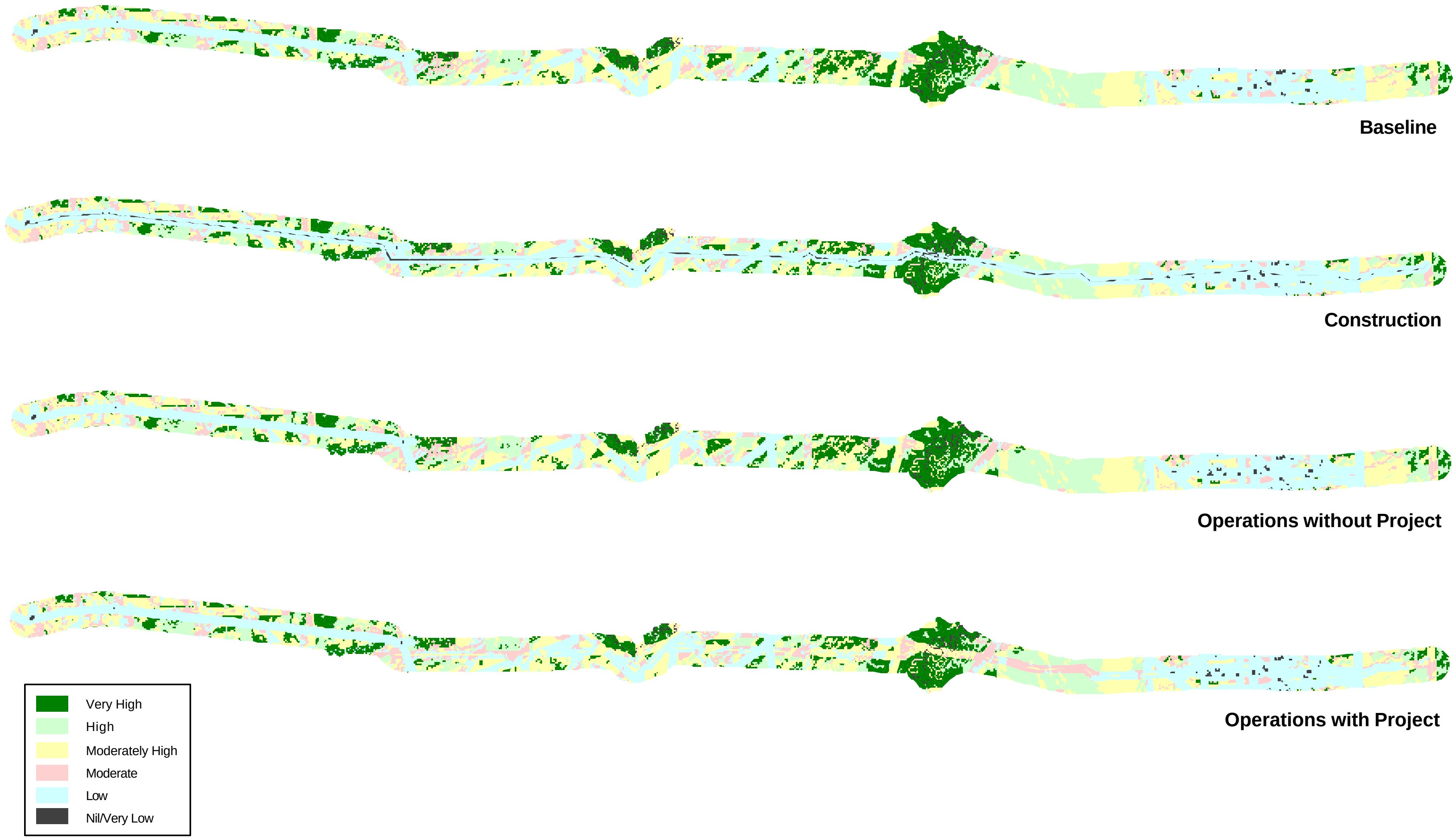
Scale in kilometres

*Acknowledgements: Original drawing by AXYS Environmental Consulting Ltd.*

ENCANA

PREPARED BY AXYS

| DRAFT DATE | SCALE | |
|---|---|---|
| 14/February/2003 | 1:350,000 | |
| REVISION DATE | PROJECT | FIGURE NO. |
| 10/March/2003 | POG1045 | 13.7-5 |
| DRAWN AO / CHECKED / APPROVED | VOL | |




EKWAN PIPELINE PROJECT

# Moose Habitat Availability during the Early Winter Season


NORTH

3 0 3 6 9

Scale in kilometres

*Acknowledgements:*
*Original drawing by AXYS Environmental Consulting Ltd.*

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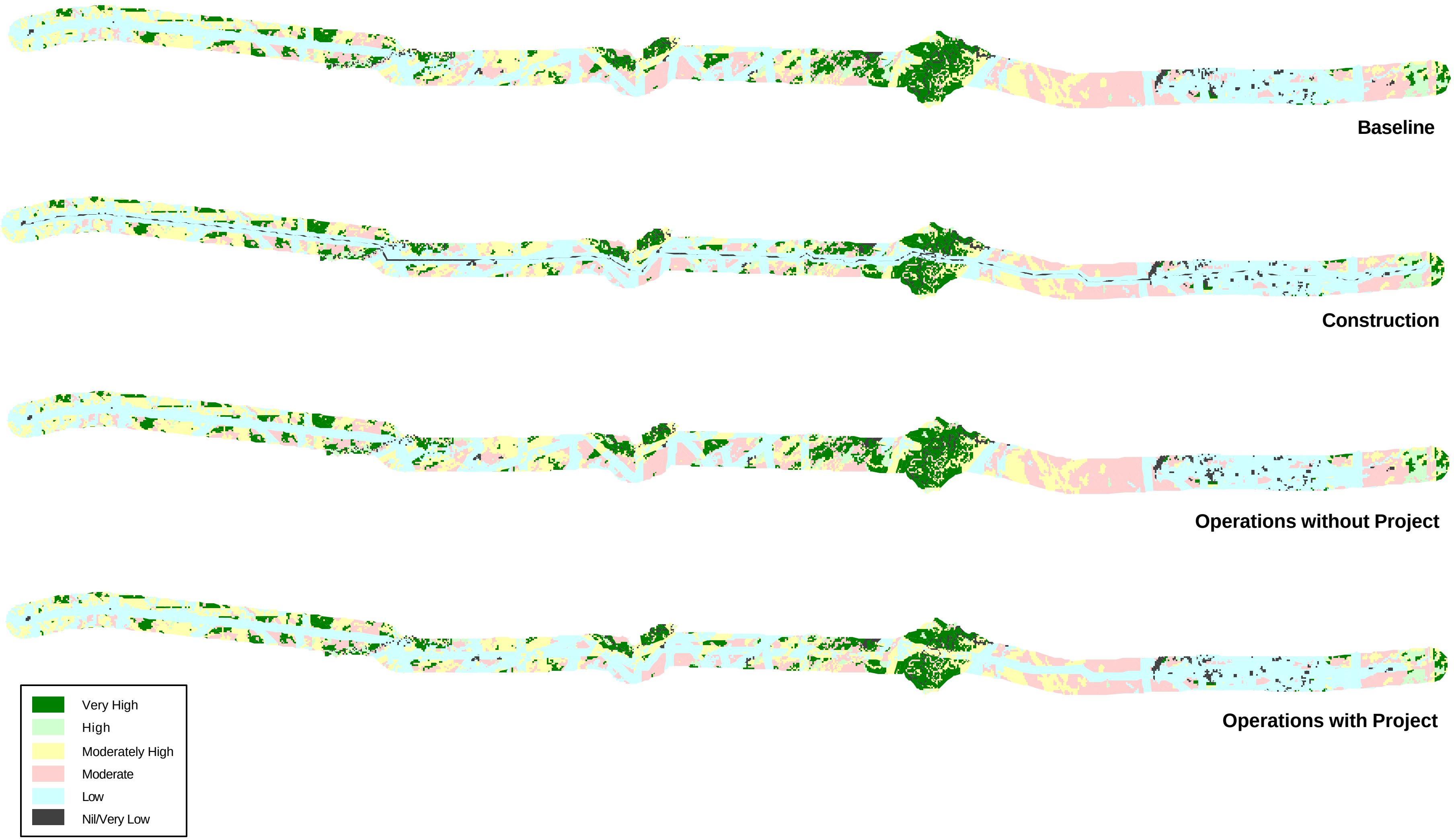
| | | | | |
|---|---|---|---|---|
| DRAFT DATE 14/February/2003 | | | SCALE 1:350,000 | |
| REVISION DATE 10/March/2003 | | | PROJECT POG1045 | FIGURE NO. 13.7-6 |
| DRAWN AO | CHECKED | APPROVED | VOL | |




EKWAN PIPELINE PROJECT

# Moose Habitat Availability during the Late Winter Season


NORTH

3 0 3 6 9

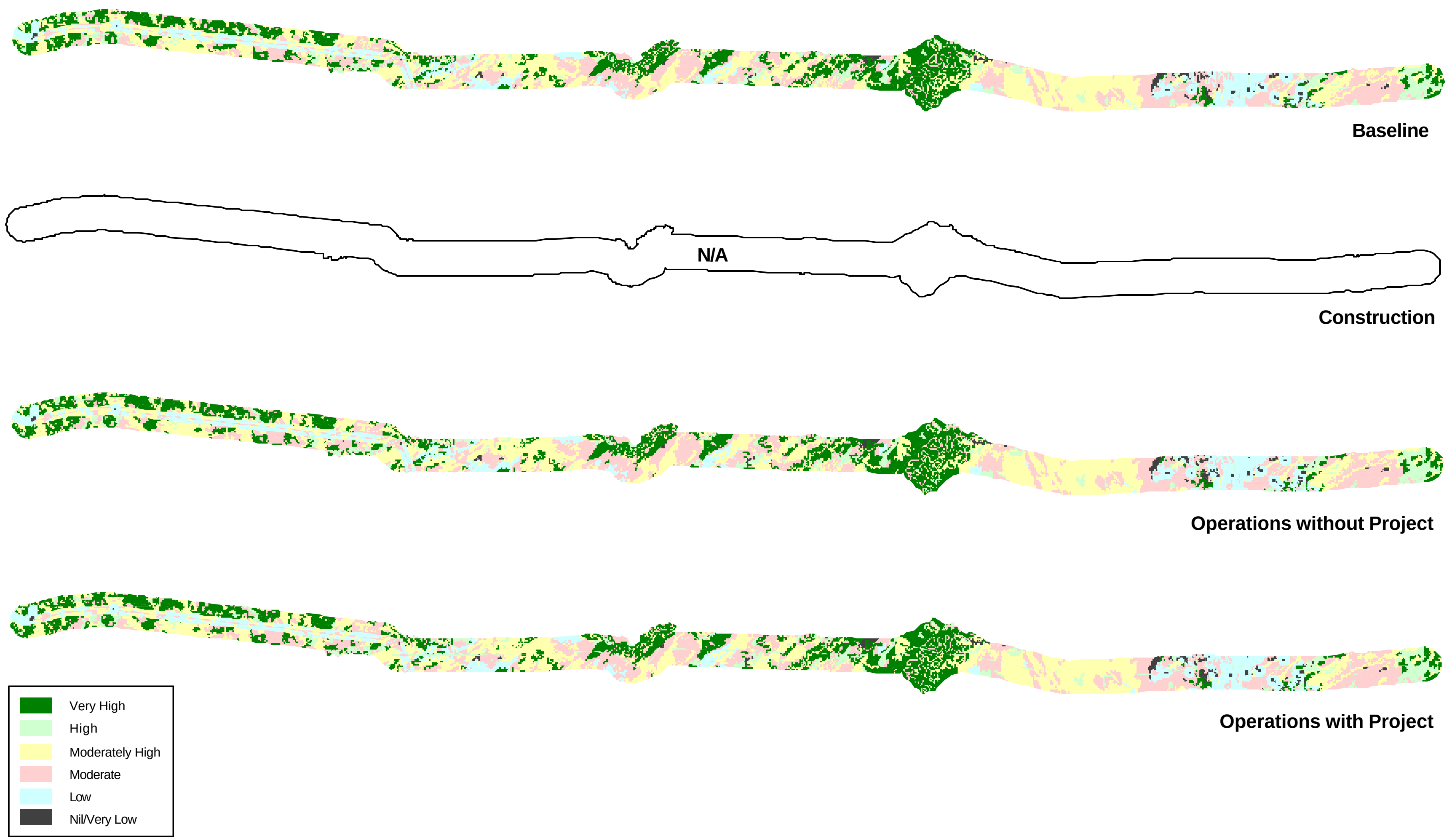
Scale in kilometres

*Acknowledgements:*
*Original drawing by AXYS Environmental Consulting Ltd.*

ENCANA

PREPARED BY AXYS

| | | | |
|---|---|---|---|
| DRAFT DATE: 14/February/2003 | | SCALE: 1:350,000 | |
| REVISION DATE: 10/March/2003 | | PROJECT: POG1045 | FIGURE NO. 13.7-7 |
| DRAWN: AO | CHECKED: | APPROVED: | VOL: |




EKWAN PIPELINE PROJECT

# Moose Habitat Availability during the Spring Season


NORTH

3 0 3 6 9

Scale in kilometres

*Acknowledgements: Original drawing by AXYS Environmental Consulting Ltd.*

ENCANA

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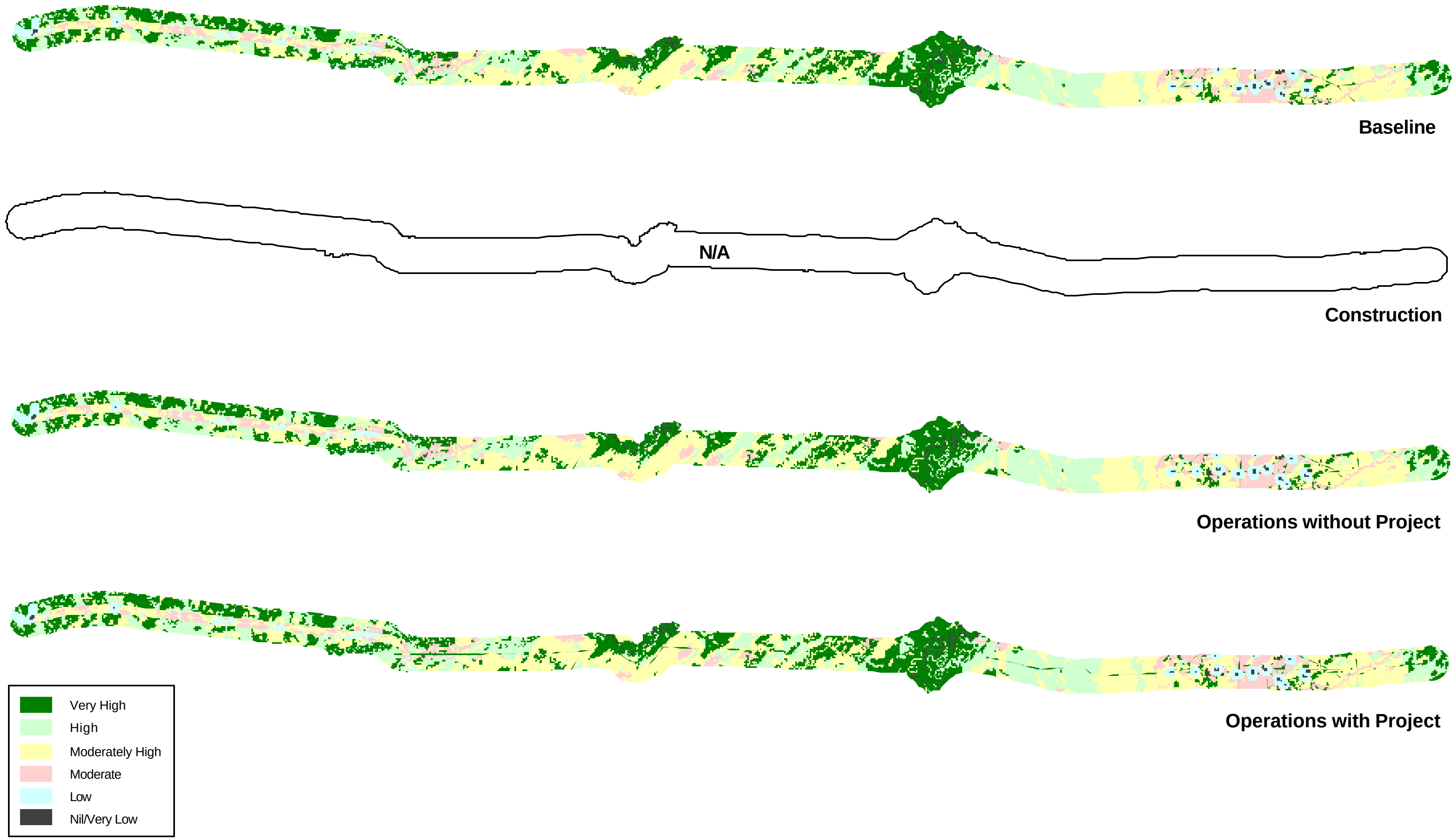
|---|---|---|---|---|---|
| PREPARED BY AXYS | | | | | |
| DRAFT DATE 14/February/2003 | | | SCALE 1:350,000 | | |
| REVISION DATE 10/March/2003 | | | PROJECT POG1045 | FIGURE NO. 13.7-8 | |
| DRAWN AO | CHECKED | APPROVED | VOL | | |




EKWAN PIPELINE PROJECT

# Moose Habitat Availability during the Summer Season


NORTH

3 0 3 6 9

Scale in kilometres

*Acknowledgements:*
*Original drawing by AXYS Environmental Consulting Ltd.*

ENCANA

| PREPARED BY | AXYS | | | |
|---|---|---|---|---|
| DRAFT DATE | 14/February/2003 | | SCALE | 1:350,000 |
| REVISION DATE | 10/March/2003 | | PROJECT POG1045 | FIGURE NO. 13.7-9 |
| DRAWN AO | CHECKED | APPROVED | VOL | |

The largest reductions in early and late winter moose habitat occur in the riparian corridor of the Hay River (Figures 13.7-6, 13.7-7). While conservative assumptions were made for the habitat modeling exercise (see Appendix 13H-2), it is expected that access control measures focused in the Hay River area will reduce the effect on high quality moose habitat. Therefore, the localized changes to habitat availability for moose within the 2 km-wide corridor are not considered to contribute to measurable cumulative effects at a regional management level, particularly with the proposed access control measures.

**Table 13.7-4 High Quality Habitat Availability for Moose in the Project Corridor at Different Assessment Scenarios**

| **Season** | **Baseline** (ha) | **Baseline** (% of high quality habitat in Project corridor) | **Construction** (% change from baseline) | **Operations without the Project** (% change from baseline) | **Operations with the Project** (% change from baseline) |
|---|---|---|---|---|---|
| Spring | 5,105.4 | 29.4 | N/A | -0.2 | 2.0 |
| Summer/fall | 8,726.4 | 50.3 | N/A | -0.1 | 0.9 |
| Early winter | 5,887.1 | 33.9 | -17.0 | -0.1 | -17.0 |
| Late winter | 3020.8 | 17.4 | -15.6 | -0.4 | -15.7 |

**Note**: High quality habitat refers to >51-100 percent suitability limits (very high and high categories combined) based on British Columbia provincial benchmarks

### 13.7.6.2.1.2 Habitat Diversity

Changes to habitat diversity for ungulates may affect the availability of habitat types for specific seasonal requirements. This may include habitat requirements for foraging (e.g., lichen dominated forests for caribou; sedge and grass habitats for moose), or thermal or security needs (e.g., old growth forest structural stages during winter).

Results from the vegetation assessment suggested that the Project would result in minor changes to the aerial extent of different site series and structural stages, but would not reduce botanical diversity at the community level in any way. Therefore, adverse changes to habitat diversity for ungulates are not expected to result from the Project.

### 13.7.6.2.1.3 Direct and Indirect Mortality

Given the low density of moose and caribou occurring in the Project area, direct interactions between the Project and these species that lead to wildlife mortalities are expected to be unlikely occurrences. Speed limit restrictions, and adoption of personnel codes of conduct (firearm restrictions) will help further mitigate these potential mortality risks that are directly related to the proposed Project.

Of most concern is the potential for increased access into the area and associated indirect increased risk of mortality. A potential increase in access from the ROW may affect caribou and moose by increasing mortality both from natural predators (e.g., wolves) or hunting by humans. The risk of access-induced caribou mortality associated with new ROW development was assessed using change in access use potential.

### Project Effects

The length of ROW representing improved access potential was calculated (using no, low, and high use ratings) between the different development scenarios. At baseline (i.e., before construction), 20.5 km (24.7 percent) of the proposed route follows high access potential corridors (e.g., pipeline ROWs, winter roads along seismic lines), 7.4 km (8.9 percent) low use, and 54.9 km (66.4 percent) encounters terrain with negligible existing access potential (Table 13.7-5). During construction, the entire ROW will represent a corridor with high access potential. Under the Operations scenario, only 20.5 km of the ROW is considered to remain as a high access potential corridor (i.e., the portion paralleling the existing pipeline), with the remainder reverting to a low access potential corridor. This low rating for the remainder of the line is considered to be a winter rating only, as the wetness of the terrain in summer drops access potential along the line to negligible. The rating is also considered to err on the side of caution, as the access control measures proposed for this portion of the route are expected to effectively eliminate winter access along the line for humans under current land use conditions.

While the increase in high potential use access during construction may have implications on habitat fragmentation and increased mortality risk for ungulates, this impact will be short-term, and is therefore not considered to contribute to measurable cumulative effects outside of the corridor. However, the large increase in low use access potential during operations may contribute to regional cumulative effects on core security habitat and associated mortality risk over the life of the Project (i.e., medium-term). Therefore, the residual project effects are discussed in a cumulative context below (see Section 13.7.7). For this cumulative effects analysis, it was assumed that moose and caribou may respond in a similar fashion, and therefore caribou was used as the representative species.

**Table 13.7-5 Winter Access Use Potential Along the Proposed Ekwan Pipeline for Different Assessment Scenarios**

| **Access Use Potential** | **Baseline** (km) | **Construction** (km) | **Operations** (km) |
|---|---|---|---|
| No Use | 54.9[1] | 0 | 0 |
| Low | 7.4 | 0 | 62.2 |
| High | 20.5[2] | 82.7[2] | 20.5[2] |
| Total | 82.7 | 82.7 | 82.7 |

**Note**: 1 Includes overgrown linear features and areas where new clearing will result from the proposed pipeline ROW

2 Includes 20.5 km of existing high use linear features at the west end of the proposed pipeline ROW