4.0 ENVIRONMENTAL REVIEW OF PRAIRIE GRAIN ROAD PROJECTS

4.1 Introduction

This section will review the typical project/environment interactions associated with prairie grain road projects. Typical environmental characteristics of the project area are identified and discussed by ecoregion. Typical project/environment interactions are identified and discussed in terms of Integral Ecosystem Components (IECs). Standard best-management-practices (BMPs) are prescribed to ameliorate the potential environmental impacts associated with project activities and IECs. Residual environmental effects and the significance of residual effects are discussed in relation to each IEC. Methods for identifying the potential for cumulative effects of project activities and procedures for ensuring follow-up and monitoring conclude this section.

4.2 Biophysical Characteristics

4.2.1 Prairie Ecozones and Ecoregions

The focus of the Prairie Grain Roads Program is on the improvement of roads used extensively for grain transportation. Most projects will take place in the primary grain growing areas of Manitoba, Saskatchewan and Alberta. Most road projects will take place within one of two "ecozones", defined as "areas at the earth's surface representative of large and very generalized units characterized by interactive and adjusting abiotic and biotic factors" (Ecological Stratification Working Group (ESWG) 1996).

The primary grain growing areas occur mostly within the Prairie ecozone. Some projects may take place outside this ecozone in suitable locations within the Boreal Plains ecozone (Figure 4.1). In Manitoba and Saskatchewan most road projects taking place within the Boreal Plains will be situated along the southern fringe of the ecozone in close proximity to the Prairie ecozone. In Alberta, some productive grain growing areas are found well within the Boreal Plains ecozone (i.e. in the Peace River and Grande Prairie districts).

Prairie Ecozone

The Prairies ecozone has its base on the Canada–United States border and arcs from the western edge of Alberta to the eastern edge of Manitoba. This zone comprises the northern extension of open grasslands in the Great Plains of North America. Although characterized by relatively little topographic relief with its grasslands and limited forests, and its sub-humid to semiarid climate, it is also the most human-altered region in Canada

Climate

The climate of the Prairies ecozone is determined by its location in the heart of North America. The Rocky Mountains to the west impede easy access of moisture-bearing winds from the Pacific. The result is a continental climate, sub-humid to semiarid with short hot summers, long

cold winters, low levels of precipitation, and high evaporation. Mean annual temperatures range from 1.5°C to 3.5°C. Mean winter temperatures range from –12.5°C to –8°C and mean summer temperatures from 14°C to 16°C. Mean annual precipitation has extreme variability, ranging from 250 mm in the arid grassland regions in southwest Saskatchewan and southeast Alberta, to slightly less than 700 mm in the Manitoba Plain, the warmest and most humid region in the ecozone. A water deficit situation is a characteristic of this ecozone. The presence of high winds accelerates the evaporation of water.

Vegetation

The Aspen Parkland constitutes the northern edge of this ecozone, a transition zone to the boreal forest. It is associated with groves of trembling aspen, balsam poplar, intermittent grasslands, and Black Chernozemic soils. The Aspen Parkland has expanded southward considerably since the prairie fires were effectively stopped by settlement. Natural grassland vegetation was dominated by spear, wheat, and blue grama grass. Sagebrush is abundant. Yellow cactus and prickly pear are found on drier sites. Its shortgrass prairie section occupies the driest southerly arc of this ecozone, where Brown Chernozemic soils are dominant. The moist mixed grasslands are associated with the Dark Brown Chernozemic soils to the north.

Landforms and Soils

The ecozone is underlain for the most part by Cretaceous shales and by flat-lying Palaeozoic limestone in southeastern Manitoba. The surface of this nearly level to rolling plain consists largely of hummocky glacial moraine and level to gently undulating lacustrine deposits. The relatively high natural fertility and good moisture-holding capacity of the area's Chernozemic soils make them highly productive for agriculture. The most productive soils are found on the Black, Dark Gray and Dark Brown Chernozems of the Aspen Parkland and the tall and moist mixed grass prairie. Relatively flat topography is particularly conducive to highly mechanized farming. Depending on rainfall, there are millions of small depressional wetland areas in the form of sloughs, ponds and marshes. The greatest concentration occurs in the sub-humid northern grasslands and adjacent Aspen Parkland. Most of the major rivers originate in the Rocky Mountains and flow in an easterly direction across the ecozone. They are dominated by rainfall as well as snowmelt and glacial runoff at their headwaters. Many of the smaller rivers and streams have pronounced variability in streamflow and are often dry for extended periods.

Wildlife

Characteristic mammals include mule deer, elk (wapiti), coyote, pronghorn antelope, badger, white-tailed jack rabbit, Richardson's ground squirrel, and northern pocket gopher. White-tailed deer are a recent invader. Bird species include ferruginous hawk, Swainson's hawk, American avocet, and burrowing owl. Great blue heron, black-billed magpie, northern oriole, veery, and brown thrasher are other representative birds. The wetlands in the Prairies ecozone provide major breeding, staging, and nesting habitat for migratory waterfowl using the North American Flyway. These wetlands provide critical habitat for more than half of North America's waterfowl. The transformation of the Prairies ecozone by agricultural activities has resulted in dramatic reduction in habitat for many species. It has resulted in a significant number of extirpated, threatened and endangered wildlife species relative to its area and population (Appendix A).

Human Activities

Agriculture is the dominant land use in the prairie landscape. Called the breadbasket of Canada, over 60% of Canada's cropland and 80% of its rangeland, and pasture are located in the ecozone. The other major activities contributing to the economy are mining (coal, potash, mineral, and aggregates) and oil and gas production. Despite the dominance of agricultural activities on the landscape, approximately 80% of the population of 3.8 million are found in urban communities. The major population centres are Calgary, Edmonton, Winnipeg, Regina, and Saskatoon.

Boreal Plains Ecozone

The Boreal Plains ecozone extends as a wide band from the Peace River country of British Columbia in the northwest to the southeastern corner of Manitoba. Unlike the neighbouring Boreal Shield, the ecozone is not bedrock controlled, has few bedrock outcrops and considerably less lakes.

Climate

The climate is typified by cold winters and moderately warm summers and is strongly influenced by continental climatic conditions. The mean annual temperature ranges between –2°C to 2°C. Mean summer temperatures range between 13°C to 15.5°C. Mean winter temperatures range from –17.5°C to –11°C. Winter temperatures in the foothills of Alberta are a few degrees warmer. Mean annual precipitation rises from 300 mm in northern Alberta to 625 mm in southwest Manitoba. The average annual growing season ranges 1000–1250 growing degree–days above 5°C.

Vegetation

White and black spruce, jack pine, and tamarack are the main coniferous species. Broadleaf trees, particularly white birch, trembling aspen, and balsam poplar, are most numerous in the transitional section leading to the prairie grasslands. Black spruce and tamarack increase in dominance along the northerly sections of the ecozone.

Landforms and Soils

Underlain by Cretaceous shales, this nearly level to gently rolling plain consists largely of hummocky to kettled glacial moraine and lacustrine deposits. The surface materials are usually deep and tend to mask the underlying topography. The soils of this ecozone are largely Luvisols. These grade southward into Black Chernozems and northward into Brunisols and Organics. Wetlands, including peatlands with organic soils cover between 25–50% of the ecozone.

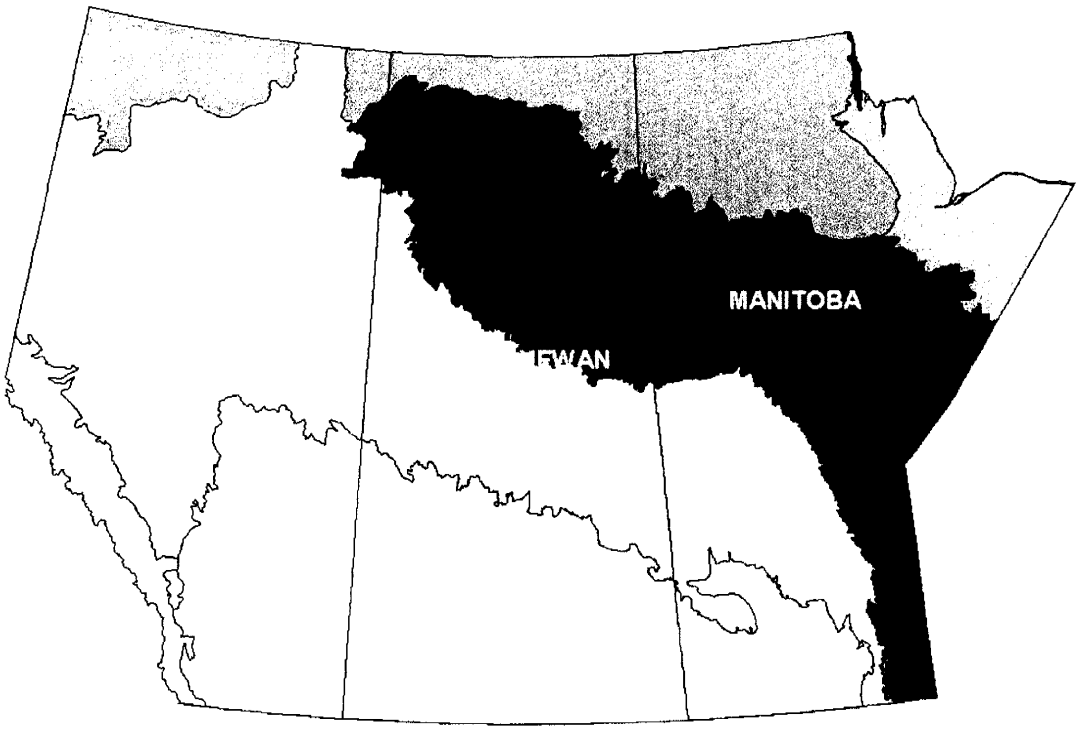
Wildlife

Characteristic mammals include woodland caribou, mule and white-tailed deer, moose, wapiti (elk), coyote, black bear, marten, fisher, lynx, and chipmunk. Representative birds include boreal and great horned owl, blue jay, rose-breasted and evening grosbeak, Franklin's gull, red-tailed hawk, and northern harrier. This is also the zone in which pelican, cormorant, gull, heron, and tern are most prominent. The whooping crane, perhaps Canada's most famous endangered species, nests in wetlands of Wood Buffalo National Park at the extreme north of the ecozone (Appendix A).

Human Activities

Agricultural development has made considerable inroads into the southerly and northwesterly fringes (Peace River). However, the other principal uses of this ecozone include forestry, mining, oil and gas exploration and production, hunting and trapping, outdoor recreation, and tourism. Forestry operations focus on harvesting large volumes of wood fibre for pulp and paper. The largest employment sectors are service industries and public administration. The population of the ecozone is approximately 707 700, and the largest centres include Fort McMurray, Grande Prairie, Fort St. John, Dawson Creek, and Hinton.

Figure 4.1 Terrestrial Ecozones of the Prairie Provinces



Legend

Ecozones

- Southern Arctic Ecozone
- Taiga Plains Ecozone
- Taiga Shield Ecozone
- Boreal Shield Ecozone
- Boreal Plains Ecozone
- Prairies Ecozone
- Montagne Cordillera Ecozone
- Hudson Plains Ecozone

N

250 0 250 500

Kilometres

4.2.2 Typical Environmental Issues by Ecoregion

An "ecoregion" is defined as "a part of an ecozone characterized by distinctive regional ecological factors, including climate, physiography, vegetation, soils, water and fauna".

The Boreal Plains ecozone is subdivided into 10 different ecoregions. Of these, only three are likely to be project locations for the purposes of the Prairie Grains Road Program; the Peace Lowland, Boreal transition and Interlake Plain (Figure 4.2).

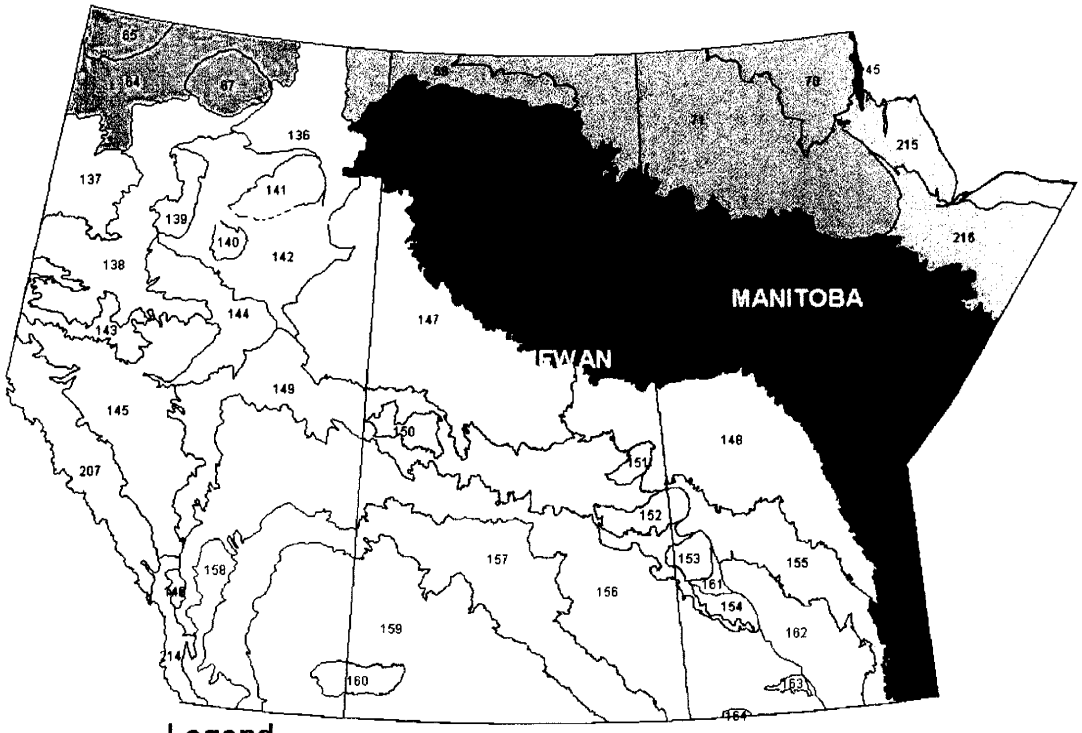
Peace Lowland

This region is composed of the gently undulating, or sloping lands associated with the Peace River and its major tributaries. The ecoregion is characterized by a unique climate, marked by warmer summers than the surrounding areas. The mean annual temperature is 0.5°C. The mean summer temperature is 13°C and the mean winter temperature is –14°C. The mean annual precipitation ranges 350–600 mm. The ecoregion is classified as having a subhumid low boreal ecoclimate. It forms part of the extensive deciduous forest belt that extends from southeastern Manitoba to north–central Alberta. A closed cover of tall trembling aspen with secondary quantities of balsam poplar, an understory of mixed herbs, and tall shrubs is the predominant vegetation. White spruce and balsam fir are the climax species but are not well represented because of fires. Poorly drained sites are usually covered with sedges, willow, some black spruce, and tamarack. There are some areas of more open parkland vegetation associated with a warmer climate and often saline soils. The rivers are incised up to 300 m in the foothills of northeastern British Columbia, where the elevation of the valleys is about 750 m asl, and drop gradually to the Slave Lowland at an elevation of about 300 m asl. Clayey lacustrine deposits are the predominant parent material, along with some fine-textured tills and significant areas of sandy fluvial deposits. Gray Luvisols are the predominant soil type, but the abundant vegetative understory and common restricted drainage have resulted in an abundance of Dark Gray Luvisols and Solods with some Chernozemic soils in the Alberta portion of the ecoregion. The region also provides habitat for white-tailed deer, black bear, moose, beaver, ruffed grouse, coyote, rabbit, and waterfowl. There is also some oil and gas activity, forestry, and hunting. About 45% of the area is farmland with annual small grains and grasses dominating. The major communities include Fort St. John, Dawson Creek, Grande Prairie, Fairview, and High Level. The population of the ecoregion is approximately 148 000.

Boreal Transition

This ecoregion extends from southern Manitoba to central Alberta. The ecoregion is characterized by warm summers and cold winters. The mean annual temperature is approximately 1°C. The mean summer temperature is 14°C and the mean winter temperature is –13.5°C. The mean annual precipitation ranges from 450 mm in the west to 550 mm in the east. The ecoregion is classified as having a subhumid low boreal ecoclimate. As part of the dominantly deciduous boreal forest, it is characterized by a mix of forest and farmland. It marks the southern limit of closed boreal forest and northern advance of arable agriculture. A closed cover of tall, trembling aspen with secondary quantities of balsam poplar, a thick understory of mixed herbs, and tall shrubs is the predominant vegetation White spruce and balsam fir are the climax species, but are not well represented because of fires. Poorly drained sites are usually covered with sedges, willow, some black spruce, and tamarack. Underlain by Cretaceous shale,

Figure 4.2 Ecoregions of the Prairie Provinces



Legend

Ecoregions

- 45 - Maguse River Upland
- 64 - Hay River Lowland
- 65 - Northern Alberta Uplands
- 67 - Northern Alberta Uplands
- 69 - Tazin Lake Upland
- 70 - Kazan River Upland
- 71 - Selwyn Lake Upland
- 87 - Athabasca Plain
- 88 - Churchill River Upland
- 89 - Hayes River Upland
- 90 - Lac Seul Upland
- 91 - Lake Of the Woods
- 136 - Slave River Lowland
- 137 - Clear Hills Upland
- 138 - Peace Lowland
- 139 - Mid-Boreal Uplands
- 140 - Mid-Boreal Uplands
- 141 - Mid-Boreal Uplands
- 142 - Wabasca Lowland
- 143 - Western Boreal
- 144 - Mid-Boreal Uplands
- 145 - Western Alberta Upland
- 146 - Western Alberta Upland
- 147 - Mid-Boreal Uplands
- 148 - Mid-Boreal Lowland
- 149 - Boreal Transition
- 150 - Mid-Boreal Uplands
- 151 - Mid-Boreal Uplands
- 152 - Mid-Boreal Uplands
- 153 - Mid-Boreal Uplands
- 154 - Mid-Boreal Uplands
- 155 - Interlake Plain
- 156 - Aspen Parkland
- 157 - Moist Mixed Grassland
- 158 - Fescue Grassland
- 159 - Mixed Grassland
- 160 - Cypress Upland
- 161 - Aspen Parkland
- 162 - Lake Manitoba Plain
- 163 - Southwest Manitoba Uplands
- 164 - Southwest Manitoba Uplands
- 207 - Eastern Continental Ranges
- 214 - Northern Continental Divide
- 215 - Coastal Hudson Bay Lowland
- 216 - Hudson Bay Lowland

N

250 0 250 500

Kilometres

this hummocky to kettled plain is covered by calcareous, glacial till and significant inclusions of relatively level lacustrine deposits. Associated with the rougher morainal deposits are a large number of small lakes, ponds, and sloughs occupying shallow depressions. The region drains northeastward via the Saskatchewan River system. Well- to imperfectly drained Gray Luvisols and Dark Gray Chernozemic soils are predominant. Local areas of Black Chernozemic, peaty Gleysolic, and Mesisolic soils also occur. The region also provides habitat for white-tailed deer, black bear, moose, beaver, coyote, snowshoe hare, and cottontail. It also provides critical habitat for large numbers of neotropical migrant bird species, as well as ruffed grouse and waterfowl. Over 70% of the ecoregion is farmland, spring wheat and other cereals, oilseeds, and hay are the dominant crops. Other land uses include forestry, hunting, fishing, and recreation. The major communities include Athabasca, Lac la Biche, Meadow Lake, Prince Albert, Melfort, Hudson Bay, and Kamsack. The population of the ecoregion is approximately 298 100.

Interlake Plain

This ecoregion extends northwestward from the southeastern corner of Manitoba to the Saskatchewan boundary north of the Porcupine Hills (Mid-Boreal Uplands 152). The climate is marked by warm summers and cold winters. The mean annual temperature is approximately 1°C. The mean summer temperature is 15.5°C and the mean winter temperature is –14.5°C. The mean annual precipitation ranges from 425 mm in the northwest to 575 mm in the southeast. The ecoregion is classified as having a subhumid low boreal ecoclimate. It is part of the dominantly deciduous boreal forest that extends from southeastern Manitoba to the Peace River in north–central Alberta. It presents a mosaic of farmland and forest, marking the southern limit of closed boreal forest and northern extent of arable agriculture. Its native vegetative cover consists of a closed cover of tall to low trembling aspen with secondary quantities of balsam poplar, an understory of tall shrubs, and a ground cover of mixed herbs. White spruce and balsam fir are the climax species but are not well represented. Open stands of tall jack pine occur on dry, sandy sites. Depressions are water-filled or are covered with sedges, willow, some black spruce, and tamarack. Underlain by flat-lying Palaeozoic limestone, the region is covered by broadly ridged, extremely calcareous, glacial till and by shallow, level lacustrine sands, silts, and clays. Predominant soils are Dark Gray Chernozems. Peaty Gleysols and Mesisols are usually associated with poorly drained depressions. The ecoregion includes habitat for white-tailed deer, black bear, moose, beaver, coyote, snowshoe hare, and eastern cottontail, as well as for waterfowl and colonial water birds like cormorant, gull, tern, heron, American white pelican, and grebe. Approximately 40% of the ecoregion is in farmland. Growing season length, available heat, and precipitation permit production of spring wheat, other cereal grains, oilseeds, and hay on the more suitable lacustrine soils. Native hay used for pasture is more prevalent on the stony, glacial till soils. The major communities include Swan River, Gypsumville, Winnipegosis, Riverton, Steinbach, and Selkirk. The population of the ecoregion is approximately 84 600.

The Prairie Ecozone is subdivided into seven ecoregions (Figure 4.2). Of these, four are most likely to be project locations for the purposes of the Prairie Grains Road Program; the Aspen Parkland, Moist Mixed Grassland, Mixed Grassland, and the Lake Manitoba Plain.

Aspen Parkland

This ecoregion extends in a broad arc from southwestern Manitoba, northwestward through Saskatchewan to its northern apex in central Alberta. The parkland is considered transitional

between the boreal forest to the north and the grasslands to the south. The climate is marked by short, warm summers and long, cold winters with continuous snow cover. The mean annual temperature is approximately 1.5°C. The mean summer temperature is 15°C and the mean winter temperature is –12.5°C. The mean annual precipitation ranges 400–500 mm. The ecoregion is classified as having a transitional grassland ecoclimate. Most of the ecoregion is now farmland but in its native state, the landscape was characterized by trembling aspen, oak groves, mixed tall shrubs, and intermittent fescue grasslands. Open stands of trembling aspen and shrubs occur on most sites, and bur oak and grassland communities occupy increasingly drier sites on loamy Black Chernozemic soils. Poorly drained, Gleysolic soils support willow and sedge species. This broad plains region, underlain by Cretaceous shale, is covered by undulating to kettled, calcareous, glacial till with significant areas of level lacustrine and hummocky to ridged fluvioglacial deposits. Associated with the rougher hummocky glacial till, landscapes are numerous tree-ringed, small lakes, ponds, and sloughs that provide a major habitat for waterfowl. The ecoregion also provides a major breeding habitat for waterfowl and includes habitat for white-tailed deer, coyote, snowshoe hare, cottontail, red fox, northern pocket gopher, Franklin's ground squirrel, and bird species like sharp-tailed grouse and black-billed magpie. Owing to its favourable climate and fertile, warm black soils, this ecoregion represents some of the most productive agricultural land in the Prairies. It produces a wide diversity of crops, including spring wheat and other cereals, oilseeds, as well as forages and several specialty crops. Dryland continuous cropping methods for spring wheat and other cereal grains are prevalent. Major communities include Red Deer, Edmonton, Lloydminster, North Battleford, Humboldt, Yorkton, and Brandon. The population of the ecoregion is approximately 1 689 000.

Moist Mixed Grassland

This ecoregion comprises the northern extension of open grasslands in the Interior Plains of Canada and is closely correlated with semiarid moisture conditions and Dark Brown Chernozemic soils. The mean annual temperature is approximately 2.5°C. In some areas of southwestern Alberta the mean annual temperature can reach 5°C. The mean summer temperature is 15.5°C and the mean winter temperature is –11°C. The mean annual precipitation ranges 350–400 mm. Native vegetation is relegated to nonarable pasturelands, dominated by spear grass and wheat grass, and a variety of deciduous shrubs including buckbrush, chokecherry, wolf willow, and saskatoon. Patches of scrubby aspen, willow, cottonwood, and box-elder occur to a limited extent on shaded slopes of valleys, on river terraces, and ringing nonsaline depressional sites covered with meadow grasses and sedges. Local saline soil areas support alkali grass, wild barley, red sampire, and sea blite. The region is composed of upper Cretaceous sediments and covered almost entirely by hummocky to kettled glacial till and level to very gently undulating, sandy to clayey lacustrine deposits. Although Dark Brown Chernozemic soils are dominant, significant areas of Solonetzic soils occur, particularly in eastern Alberta. Intermittent sloughs and ponds provide habitat for waterfowl. White-tailed deer, pronghorn antelope, coyote, rabbit, and ground squirrel are common in the region. Spring wheat and other cereal grains are produced by employing a wheat or other grain–fallow rotation. Oilseed crops are also becoming increasingly important. Irrigation of these crops occurs near Lake Diefenbaker in Saskatchewan and in southern Alberta. Waterfowl hunting is common, and recreation is important around several large reservoirs. Major communities include Fort Macleod, Lethbridge, Drumheller, Rosetown, Unity, Biggar, Saskatoon, Moose Jaw, Regina, Estevan, and Weyburn. The total population of the ecoregion is approximately 656 000.

Mixed Grassland

This semiarid grassland ecoregion in southwestern Saskatchewan and southeastern Alberta forms part of the shortgrass prairie in the Great Plains of North America. The mean annual temperature is approximately 3.5°C. In southern Alberta, west of the Cypress Upland ecoregion mean annual temperatures can exceed 5°C. The mean summer temperature is 16°C and the mean winter temperature is –10°C. The mean annual precipitation ranges 250–350 mm. Moisture deficits in late summer are caused by low precipitation and high evapotranspiration. The natural vegetative cover is dominated by spear grass, blue grama grass, and wheat grass. June grass and dryland sedge are significant associates. Blue grama and spear grass predominate on drier sites, along with dwarf sedges. A variety of shrubs and herbs also occurs, but sagebrush is most abundant, and on the driest sites yellow cactus and prickly pear can be found. Scrubby aspen, willow, cottonwood, and box-elder occur to a limited extent on shaded slopes of valleys and river terraces. Local saline areas support alkali grass, wild barley, greasewood, red sampire, and sea blite. The region is composed of upper Cretaceous sediments and is covered almost entirely by dissected to kettled, loamy glacial till, undulating to dissected, loamy lacustrine sediments, and hummocky sandy eolian deposits. The region skirts the Cypress Hills with the area to the south being drained by the Missouri River system, and the area to the north by the South Saskatchewan River. The soils are mainly Brown Chernozemic with significant areas of Solonetzic soils. Pronghorn antelope, deer, sage grouse, short-horned lizard, western rattlesnake, coyote, rabbit, and ground squirrel are common species in the region. The production of spring wheat and other cereal grains occurs by employing a grain–fallow rotation. Flaxseed and durum wheat are also grown. About half of the region is cultivated with the remainder being used for pasture or rangeland. As part of the North American waterfowl migratory flyway and with its diverse wildlife habitat, the region provides opportunities for hunting and recreation. The major communities include Medicine Hat, Leader, Swift Current, Assiniboia, Maple Creek, Shaunavon, and Kindersley. The population of the ecoregion is approximately 187 200.

Lake Manitoba Plain

This ecoregion stretches northwestward from the International Boundary with the United States to Dauphin Lake. It is one of the warmest and most humid regions in the Canadian prairies. The mean annual temperature ranges from 2°C in the north to over 3°C along the Canada–United States border. The mean summer temperature is 16°C and the mean winter temperature is –12.5°C. The mean annual precipitation ranges 450–700 mm. The ecoregion is transitional between areas of boreal forest to the north and the aspen parkland of the southwest. It is a mosaic of trembling aspen/oak groves and rough fescue grasslands. Trembling aspen and shrubs occur on moist sites, and bur oak and grass species occupy increasingly drier sites on loamy to clayey, Black Chernozemic soils. Poorly drained, Gleysolic soils support willow and sedge communities. Lower and smoother than the Saskatchewan Plain to the west (Aspen Parkland ecoregion), the surface of the plain has an elevation ranging from about 410 m asl near the Manitoba Escarpment to 218 m asl at Lake Winnipeg. This low-relief ecoregion, underlain by limestone bedrock, is covered by extremely calcareous, broadly ridged glacial till in its northern half and by smooth, level, lacustrine sands, silts, and clays in its southern half. Wildlife includes significant waterfowl, as well as white-tailed deer, coyote, rabbit, and ground squirrel. Its growing season length, available heat, and precipitation permit the production of corn, spring wheat, and other cereal grains by dryland continuous cropping methods. Oilseeds, hay, and livestock production are more prevalent in the northern section owing to topography and

stoniness limitations. Hunting and water-oriented recreation are additional significant uses of land. The major communities include Winnipeg, Portage la Prairie, Emerson, and Dauphin. The population of the ecoregion is approximately 782 100.

Fescue Grassland

This region of fescue grassland lies in the chinook belt of southwestern Alberta along the face of the Rocky Mountain foothills. The climate is characterized by warm summers and winters that are mild, due to moderating chinook conditions. The mean annual temperature is approximately 3.5°C. The mean summer temperature is 14°C and the mean winter temperature is –8°C. The mean annual precipitation ranges 400–450 mm. The thick grass sward and Black Chernozemic soils are similar to those of the Aspen Parkland ecoregion (156, 161), but trees are found only in very sheltered locations along some of the waterways. This grassland community is dominated by rough fescue with lesser quantities of Parry oat grass, June grass, and wheat grass. Forbs are abundant and often include yellow bean, sticky geranium, bedstraw, and chickweed. Drier sites have an increased amount of needle-and-thread grass. Moist sites along stream banks, north-facing slopes, and seepage sites support shrub communities dominated by snowberry, rose, saskatoon, and silverberry. Grazing and tillage have disturbed most of the native vegetation in the region. Underlain by sandstones and shale, the surface is covered by undulating to rolling, loamy glacial till and clayey lacustrine deposits. Chernozemic Black soils are dominant in the region. Intermittent sloughs and ponds on the plains provide habitat for waterfowl. White-tailed deer, pronghorn antelope, coyote, rabbit, ground squirrel, sage grouse, and duck are common in the region. The northern section of the ecoregion is almost completely cultivated. Its southern section, along the United States border, has a mixture of cultivation on the flatter portions and ranching on the rougher, ridged components of the uplands and foothills. The major communities include Beiseker, High River, and Cardston. The total population is approximately 528 000.

4.2.3 Watersheds and Hydrology

In Alberta, surface hydrology is dominated by large glacier-fed rivers originating in the Rocky mountains and flowing east and north across the province. The Peace and Athabasca rivers flow north from the Rockies and are part of the Upper Mackenzie basin. The North and South Saskatchewan River basins drain the south part of the province. The South Saskatchewan basin is fed by several major watercourses including the Red Deer, Bow and Oldman rivers. These rivers are fed by thousands of permanent, intermittant, and ephemeral tributary rivers and streams. Of note are many dry coulees in the southern part of the province that only flow during and immediately following major storm events or for a short time in the spring.

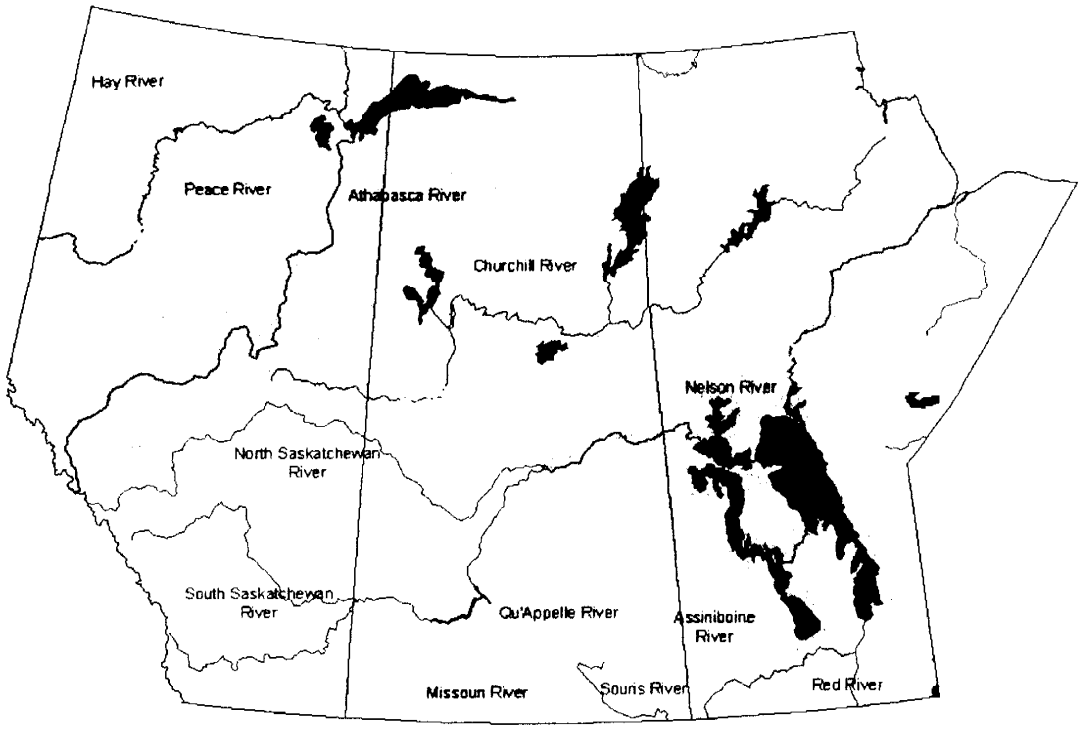
In Saskatchewan, surface hydrology is dominated by the North and South Saskatchewan rivers flowing in from Alberta and through the western and central part of the province. The Qu'Appelle, Souris and Assiniboine river figure prominently in the hydrology of the south and eastern portions of the province. These rivers are not sourced in the Rockies but find their headwaters in the springs, coulees and potholes of the southern prairies.

Large lakes are not prominent hydrological features of the Alberta or Saskatchewan grain growing areas. The largest standing bodies of water take the form of reservoirs created by damming prairie rivers - usually for irrigation purposes. Examples include Lake Diefenbaker in southern Saskatchewan and 40 Mile Reservoir in southern Alberta. The provinces are however dotted with thousands of small potholes, wetlands and small lakes important as wildlife and migratory bird habitat, as groundwater recharge sources and for agricultural uses.

In Manitoba, rivers and large lakes are both prominent features of the hydrological landscape. The Red, Assiniboine and Souris rivers and their tributaries are very important water sources in southern Manitoba. Frequent and extensive spring flooding is a notable characteristic of these basins resulting in frequent recharging of agricultural soils with river sediments. Lake Manitoba and Lake Winnipeg, the sixth largest freshwater lake in the world, are major catchments for surface runoff in the south part of the province. These lakes drain to the Nelson River basin and eventually discharge into Hudson's Bay.

Major river basins of the prairies are shown on Figure 4.3.

Figure 4.3 Major River Basins of the Prairie Provinces



Legend

River Basins

- Assiniboine River
- Athabasca River
- Churchill River
- Hay River
- Missouri River
- Nelson River
- North Saskatchewan River
- Peace River
- Qu'Appelle River
- Red River
- Souris River
- South Saskatchewan River

- Rivers
- Lakes

N

250 0 250 500

Kilometres

4.2.4 Fish Habitat

The three Prairie Provinces fall under the jurisdiction of the Department of Fisheries and Oceans Canada, Central and Arctic Region. The Habitat Management Branch (HMB) divides the Region into nine distinct drainage basins for the purposes of fish habitat management considerations (DFO 1992). Of these, only three are likely to be project locations for the purposes of the Prairie Grain Roads Program):

- the Upper Nelson River - Red, Assiniboine and Winnipeg River basins
- the Upper Nelson - Saskatchewan River basin
- the Upper Mackenzie basin.

4.2.5 Sensitive Ecosystem Components

The prairie ecozone is one of the most heavily modified ecosystems in Canada, primarily due to the extensive cultivation of lands for the agricultural sector. The cultivation of native prairie and the drainage and filling of wetlands has resulted in a direct and widespread loss of wildlife habitat. As a result the prairie ecozone has the largest number of endangered and threatened wildlife species in Canada (Appendix A).

Remaining tracts of native vegetation can be considered to be some of the most important and sensitive wildlife habitats remaining on the prairies. Some of the most important and sensitive sites for wildlife include native grasslands, wetlands, and riparian zones. Riparian areas in particular are disproportionately important as wildlife habitat with respect to the land area covered by them. The wetlands in the Prairies ecozone provide major breeding, staging, and nesting habitat for migratory waterfowl using the North American Flyway. These wetlands provide critical habitat for more than half of North America's waterfowl. Although the figures vary across the prairie provinces, only 1 -25% of the original native grassland vegetation remains undisturbed by cultivation or other development. The loss of native grasslands has resulted in a loss of biodiversity across the prairies both in terms of species richness and in species abundance. For example there has been a steady decrease in population of most grassland birds since the inception of the North American Breeding Bird Survey and many grassland species are on provincial and federal lists of species at risk or of concern.

Drought is often a concern on the prairies, especially in southern Saskatchewan and Alberta making the integrity of surface water sources an important management and development issue. Projects that negatively affect runoff patterns or surface water features may result in an overall reduction in available water and have significant consequences for wildlife, and for agricultural and domestic water users.

In Manitoba where frequent flood conditions occur, seemingly small changes to runoff patterns or surface flows can result in the flooding of previously dry lands. Again, projects that affect runoff patterns or surface water features may result in unanticipated flood related effects and have significant consequences for wildlife, and for agricultural and domestic water and land users.