RICHARDSON RIVER DUNES WILDLAND PROVINCIAL PARK

A Synthesis of Biophysical Information

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Front page picture: Richardson River Dunes Wildland Provincial Park – **parabolic paleodune**

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INTRODUCTION

This report represents a synthesis of the available information on the special and representative features of Richardson River Dunes Wildland Provincial Park (RRD). It is largely based on a number of reports and documents that were prepared as a result of field studies conducted during June and August of 2000. These reports and documents are listed in the Bibliography section of this report and will be available on the website of the Alberta Natural Heritage Information Centre (http://www.cd.gov.ab.ca/preserving/parks/anhic/flashindex.asp) or through the offices of the Parks and Protected Areas Division.

Richardson River Dunes Wildland Provincial Park was established on 18 March 1998 by Order-in-Council (#105/98). Most of the park is currently mapped as occurring within the Central Mixedwood Subregion of the Boreal Forest Natural Region. However, the landscapes and features of the park are more representative of and have more affinities to the Athabasca Plain Subregion of the Canadian Shield Natural Region. The boundaries of the Natural Regions / Subregions are currently under review. Although the site does have some representative natural features, it was established primarily for its special features.

Location

Richardson River Dunes Wildland Provincial Park covers about 320 km^2 (3.4 townships) of sand plain, sand dune, wetland, and river and creek valley landscapes in a relatively remote part of northeastern Alberta. It is located about 60 km south of Fort Chipewyan and 150 km north of Ft. McMurray (Figure 1). The park is situated between Eleanor Creek, the Athabasca River and the Richardson River. The Fort Chipewyan winter road forms part of the park's southeastern boundary and the Embarras road the north and northeastern boundary.

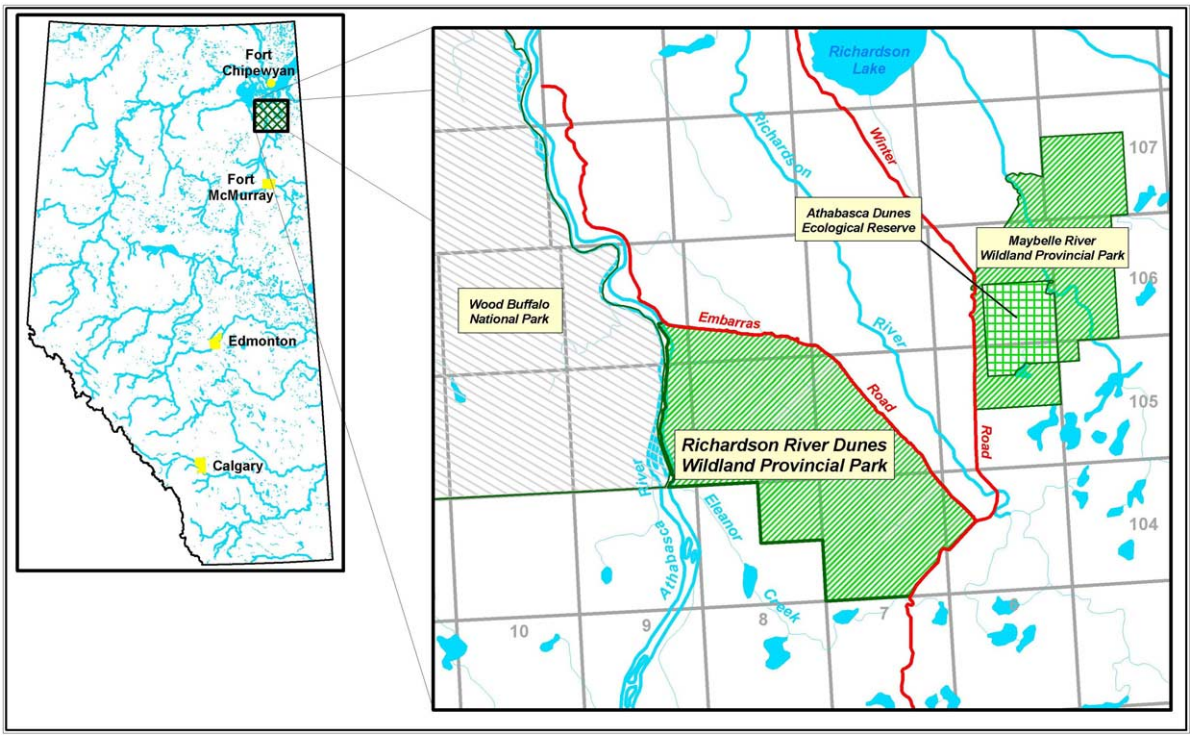


Figure 1. Location of Richardson River Dunes Wildland Provincial Park in northeastern Alberta.

Surficial Geology

The present-day surficial features of the region were formed during or after the last glaciation. Glaciers advanced from the northeast, flowing over and eroding the bedrock of granites, gneisses, limestones and sandstones (Jonker and Rowe 2001). As the glaciers retreated, extensive glacial meltwaters deposited the eroded sand and gravel materials over much of the region. In many areas, the sands were further re-worked by strong winds to form various types of aeolian features (Jonker and Rowe 2001, Raup and Argus 1982).

Within RRD, aeolian deposits occur on the uplands either in the form of sand sheets or as dunes. Sand sheets are characterized by muted topography, with the surface dominated by low undulations, hillocks, dry flats and slacks (Jonker and Rowe 2001). The sheet sand deposits range in thickness from 0.6 to 3 meters (Bayrock 1972).

The dunes in RRD are well developed and many are now stabilized by vegetation. Dune forms in the park and its environs are termed paleodunes as they are believed to have originated during the warm xerothermic period (10,000 to 6500 years ago), immediately after the last great continental glacier withdrew (Jonker and Rowe 2001). Winds at this time originated from the southeast, opposite to the prevailing winds of today. The result is that paleodunes are aligned in a southeast – northwest direction, opposite to the alignment found in more recently formed dunes in the province. As prevailing winds later shifted to the northwest (about 6000 years ago), the original shape and form of the paleodunes may have been somewhat re-shaped to form what we see today.

The paleodunes of the park and its environs are expressed in two basic forms – the parabolic dune and the longitudinal dune (Landals 1978). Typical parabolic dunes are crescent-shaped with arms or wings pointing upwind instead of downwind (Whittow 1984). Parabolic dunes in the park are evident either as single dunes or more commonly as a dune field complex. Parabolic dunes can be quite variable in form, with one arm often shorter than the other or missing entirely so that the remaining arm forms a linear ridge. Or they may be united laterally to produce broadly curved, wavy parabolic or U-shaped ridges. In the park, they are generally oriented convex to the northwest, with the arms tapering windward (i.e., southeast), reflecting their paleo origins. The arms or wings of the dunes enclose deflation troughs that now are often occupied by wetlands.

Longitudinal dunes are sharply-edged ridges of sand whose axis lies parallel with the direction of the prevailing wind and may extend for considerable distances (Whittow 1984). In RRD, there are six distinctive longitudinal dunes each with a northwest-southeast bearing (about 145 degrees) and spaced about 1 to 3 km apart. They are elongated sand ridges, relatively straight and extend for several kilometres. Some reach up to 20 m high and some have a curved ridge at one end of the dune in the shape of a fish-hook (Landals 1978). There is some debate as to whether longitudinal dunes are just extreme examples of the parabolic dune form whose crescent-shaped head disappeared long ago, leaving only the linear arms as isolated ridges (Jonker and Rowe 2001). Even if this were the case, these dunes are exceptional in their shape, size and orientation. Longitudinal dunes of this size, extent and origin are not known from any other place in Alberta.

Recent stream sediments (alluvial deposits) occupy the valleys of the Athabasca River and smaller creeks in the park. The floodplain sediments of the larger rivers are predominantly silt and sand with a small amount of clay, whereas those of the smaller rivers and creeks are mainly sand (Bayrock 1972).

Postglacial accumulations of organic materials mantle many of the surficial deposits described above. In general, these deposits are thin, although locally they may attain a thickness of 6 m or more (Bayrock 1972).

Hydrology

Only a narrow strip of land (between the eastern boundary of the park and first dune ridge to the west) drains to the Richardson River, which joins to the Athabasca River 30 km further north. The rest of RRD is drained (poorly) by three unnamed creeks, of which the longest one, located on the eastern side of the second dune ridge, flows into the Athabasca River north of the park. This creek flows about 11 km through the park, often without a distinctive creek bed and with very slow, almost stagnant to no water movement. Two other shorter creeks in the park flow into the Athabasca River. The last two or three kilometers of these creeks have deep gullies and steep banks.

Several lakes of varying sizes dot the landscape in the park. Most lakes are relatively shallow and ringed by emergent vegetation.

More than half of RRD is covered by extensive, interconnected wetlands in the form of fens and bogs, that are prevented from draining by the low gradient and by the dunes. Sub-surface water discharge into the park from higher land to the southeast also contributes to wetland formation. Discontinuous permafrost is expected to occur in the park where peat accumulations are deep (Fairbarns 1979).

Vegetation

A plant community is defined as "a collection of plant species growing together in a particular location that show a definite association or affinity with one another" (Kent and Coker 1992). The mosaic of plant communities in the site make up the vegetation. Some of the plant communities of RRD have been described (Allen and Johnson 2000, Meijer 2002), however some areas of the site were difficult to access and have not been documented. The following discussion includes the communities that have been documented as well as some discussion on what additional plant communities might be expected based on observations in the general area.

Much of RRD is made up of extensive sandy uplands vegetated by forests dominated by jack pine *(Pinus banksiana)*. These forests are largely young jack pine stands, regenerating after fires (Meijer 2002). There is generally much dead and down material, a dense needle carpet and little understory vegetation. Understory vegetation increases in more mature stands, with typical species including bearberry (*Arctostaphylos uva-ursi*) and common blueberry (*Vaccinium myrtilloides*). Lichens become increasingly significant as stands age, but mature, open jack pine stands are infrequent. The one such community looked at in RRD (Allen and Johnson 2000) had an open canopy with a well-developed lichen understory, primarily made up of green reindeer lichen (*Cladina mitis*), *Cladonia cristatella* and *Cladonia borealis*. On more mesic sites, such as seepage areas at the base of dune ridges, jack pine / green alder (*Alnus crispa*) stands are common. Some sand areas are largely unvegetated as a result of blowouts. These are important habitats for successional species such as sand heather (*Hudsonia tomentosa*) and paper birch (*Betula papyrifera*) as well for as some rare species such as sand-dune chickweed (*Stellaria arenicola).*

Peatlands in the region range from relatively dry sites dominated by jack pine, black spruce (*Picea mariana*), Labrador tea (*Ledum groenlandicum*), and reindeer lichens to wetter peatlands with black spruce, tamarack (*Larix laricina*), Labrador tea, and peat mosses (*Sphagnum* spp.). Shrubby peatlands typically contain Labrador tea, northern laurel (*Kalmia polifolia*), water sedge (*Carex aquatilis*), marsh reed grass (*Calamagrostis canadensis*), and peat mosses. Other shrubby wetlands dominated by bog birch (*Betula pumila*), willows (*Salix* spp.) with an understory of grasses and sedges also occur. The aerial photographs of RRD show a large central wetland in the park that appears to be a peatland complex, however only a very small part near the edge of that complex was looked at on the ground.

A variety of wetlands are scattered throughout the site. Many are on a sand substrate, fed by seepage and dominated by graminoids, primarily small bottle sedge (*Carex utriculata*) communities, or few-fruited sedge (*Carex oligosperma*) communities. Rings of flat leaved willow (*Salix planifolia*) – basket willow (*S. petiolaris*) communities occur around some wetlands. Plant communities around water bodies are composed of species such as swamp horsetail (*Equisetum fluviatile*), cattail (*Typha latifolia*), reed *(Phragmites australis*) or water sedge (*Carex aquatilis*) communities (Allen and Johnson 2000).

Riverine habitats along the smaller creeks in the park were not examined in detail, but were usually dominated by willow (*Salix* spp.) shrublands. The Athabasca River valley contains extensive riverine habitats with mature coniferous forests of white spruce and balsam fir (*Abies balsamea*) as well as mixed forests of aspen (*Populus tremuloides*), balsam poplar (*P. balsamifera*) and white spruce (*Picea glauca*). There are several oxbow lakes with open water, edged by emergent vegetation. Old meander channels have rich shrublands dominated by river alder (*Alnus tenuifolia*) and ostrich fern (*Matteuccia struthiopteris*).

Mature and old growth forests occur in the park, principally along the Athabasca River valley, but they are localized and relatively small in aerial extent due to wildfires that have burned much of the park in recent years. Some mature forests were looked at along the Athabasca River and included mature white spruce, mixed woods and balsam poplar stands (Allen and Johnson 2000).

Fire History

Fire is the major natural disturbance that occurs in the area. The jack pine-lichen woodlands particularly reflect the effect of frequent fires -- the even age stands, dense forests of pine, the lack of organic material in the soil and the degree of sand activity (Landals 1978). Major fires have occurred in the park and surrounding areas in 1950, 1980 and 1981 (Alberta Sustainable Resource Development 2002).

A 1981 fire burned most of the park. Only small portions such the Athabasca River valley were left unburned (Figure 2). A considerable portion of the southern part of the park was burned in 1950. As the result, there are only a few areas in the park that have mature or old growth forests remaining. The area burned in 1981 is now regenerating and has dense stands of relatively young pine.

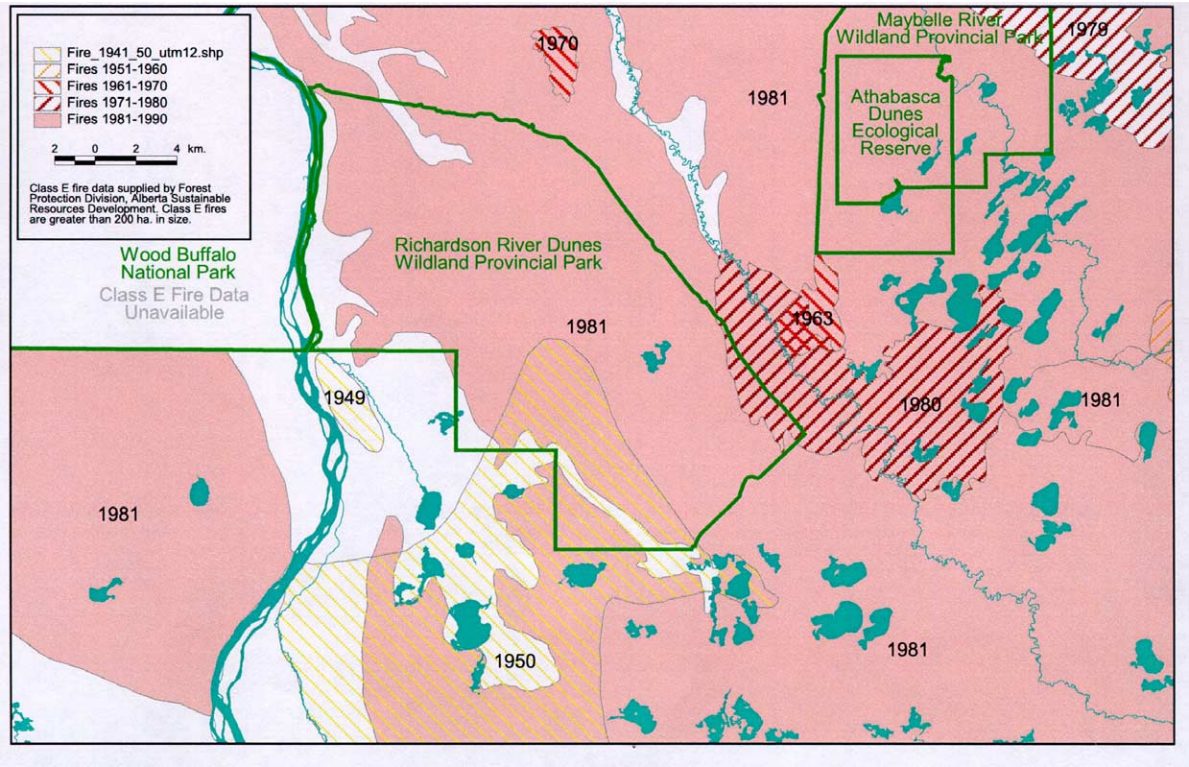


Figure 2. Wildfire occurrences within and near Richardson River Dunes Wildland Provincial Park.

Wildlife

Sixty-four bird species were recorded within the park, however, the region as a whole appears to support low densities of birds (Thomas and Carroll 2001). This is apparently attributable to the extensive stands of young jack pine that occur throughout the area, habitat known to support lower densities of birds (Francis and Lumbis 1979). Some species, however, such as the common nighthawk do use open jack pine forests for nesting and foraging and are common inhabitants. The most bird-rich habitats in the park are wetland related (e.g., beaver pond complexes, small lakes, riparian areas). The Athabasca River valley functions as an important migration corridor for both spring and fall migrants, including raptors such as the sharp-shinned and red-tailed hawks. Both species occur in the park. Some of the bird species observed within the park represent significant extensions to their known ranges (e.g., blue jay, Baltimore oriole, western meadowlark), are rare in the park (e.g., sora, northern goshawk), are rare in the region (e.g., marbled godwit), or are on the Alberta Natural Heritage Information Centre's 'watch list' (e.g., sandhill crane, short-eared owl).

Twenty eight species of mammals were recorded within the park during the 2000 field surveys, but with low densities, attributable to several factors (Vujnovic 2001). The riparian habitats that surround lakes, wetlands, streams and rivers in the park constitute the most important areas for mammalian biodiversity (e.g., ungulates, carnivores, rodents, shrews). Woodland caribou occurs in the park. It is a provincially threatened species (Dzus 2001) and is ranked S2 by ANHIC. Some of the small mammal species recorded for the area are believed to be uncommon in the park (e.g., dusky shrew, water shrew). Others such as snowshoe hare and red squirrel are common and often abundant residents. Carnivores such as wolves and foxes frequent the park and its environs. They often use dune ridges as travel routes and slopes as den sites.

The occurrence and distribution of fish in RRD was not studied during the 2000 survey. However, there are a total of 24 species of fish known or expected to occur in the lakes, rivers and streams of the region, 14 of which are relatively common (Alberta Community Development 2002). The wetlands of the park also support good populations of wood frog, boreal chorus frog and Canadian toad (Gammon 2000).

Of the insect and spider species collected or observed within the park or adjacent areas, many represent significant extensions to their known ranges or were the first recorded occurrences for the species in Alberta (Hornung 2001, Schmidt and Pohl 2000, Nordstrom 2002). Some wetland habitats in the park (e.g., willow / sedge fens) were found to be particularly rich in moths and butterflies. One phenomenon noted during the field study in June 2000 was the importance of the emergence of Junebugs. They were abundant in sand landscapes and provided a food source for a wide assortment of species (e.g., cranes, nighthawks, bears and foxes).

METHODS

To meet the intent of this report of synthesizing the known information on the special and representative features of Richardson River Dunes Wildland Provincial Park, the following approach was used:

- Synthesize the biological information that is known for RRD. This process involved:
  - reviewing the existing literature
  - reviewing the results from field surveys done in the area in 2000
  - identifying the representative features within RRD based on Natural History Themes
  - identifying, evaluating and mapping special features, including:
    - areas of importance to species (e.g. migration corridors)
    - areas of high diversity
    - areas of species concentrations
    - rare elements as defined on the ANHIC tracking and watch lists
    - disjunct species or species with significant range extensions
    - features uncommon within the region or within the park itself

- Rank special features according to their level of significance, as defined below:
  - *nationally significant* - features which are limited in distribution at a national level or which are the best and only representatives in Canada (Sweetgrass Consultants 1997).
  - *provincially significant* - features which are of limited distribution in Alberta or are the best examples of a particular feature in Alberta. Included here are the provincially rare elements on the ANHIC tracking lists.
  - *regionally significant* – features which are of limited distribution in the Athabasca Plains Subregion or which are the best examples of a particular feature in that subregion.
  - *locally significant* – features which are of limited distribution in Richardson River Dunes Wildland Provincial Park or which are the best examples of a particular feature in that park.

- Create a base map of landscape units by building on existing Alberta Land Inventory (ALI) polygons. The ALI project (Archibald *et al.* 1979) used 1:50,000 scale aerial photographs to classify the physical landscape into relatively broad homogeneous units based on parent geological material, topography and drainage. The ALI polygons within RRD were evaluated and revised to reflect more recent interpretation of aerial photographs (Jedrzycki 2000) and the results obtained from field surveys.

- Link the representative and special features to the landscape unit base map.

- Develop a list of additional rare elements from northeastern Alberta that potentially occur within RRD. This involved extracting from the ANHIC database or from published reports those element occurrences (i.e., species, plant communities) that are found within the Athabasca Plains Subregion and for which suitable habitat is believed to occur in RRD.

RESULTS

RRD can be considered a nationally significant site as it falls almost totally within two nationally significant Environmentally Significant Areas (ESA) (Sweetgrass Consultants 1997) (Figure 3). The portion of the park within the Richardson River Sand Hills ESA contains a variety of dune forms and is part of the largest single uninterrupted sand dune complex in Canada (David 1977). RRD encompasses that portion of the dune complex with the best-developed paleodune features. No other comparable paleodunes have been documented in Canada (Sweetgrass Consultants 1997).

The Athabasca River – Tar Sands Reach ESA is also ranked as nationally significant, recognizing the Athabasca River valley as one of the longest, most diverse and productive river valley systems in the Mixedwood Boreal Forest of Canada (Westworth and Associates 1990). The ESA contains extensive riparian forest, including old growth stands, and the portion that is within RRD significantly increases the site's richness in species and plant communities.

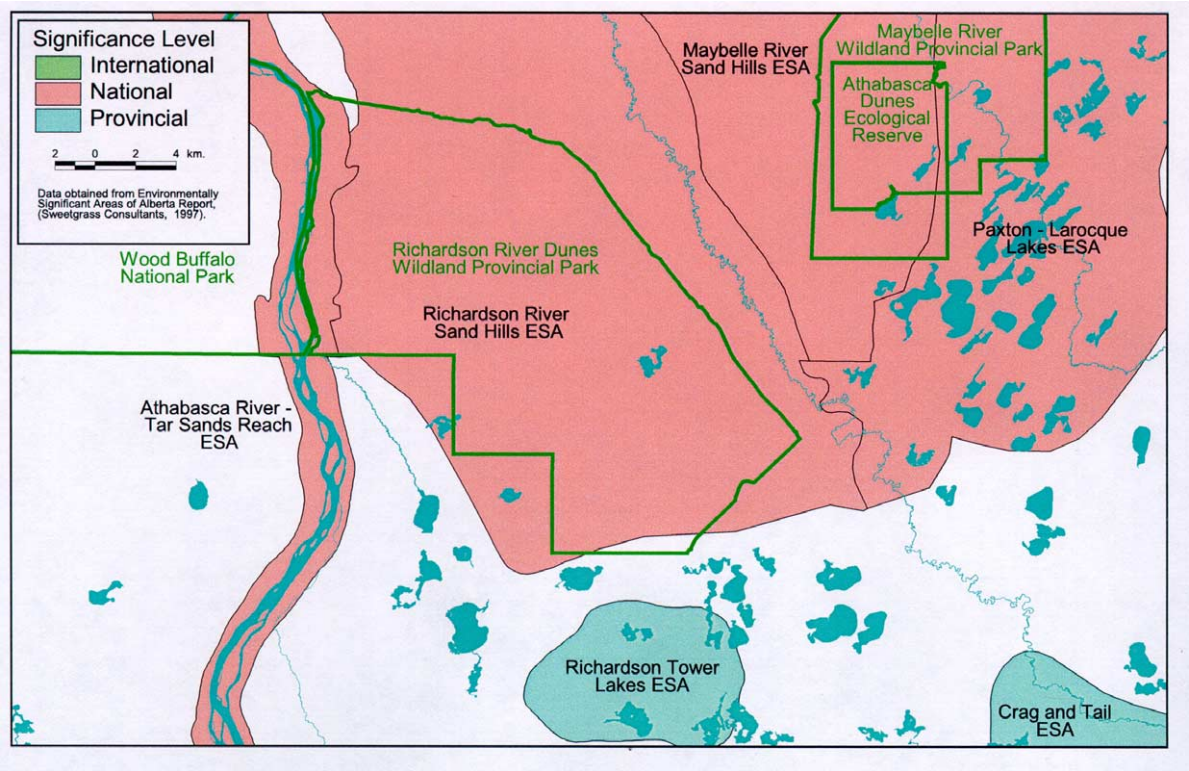


Figure 3. Environmentally Significant Areas within and around Richardson River Dunes Wildland Provincial Park.

In addition to the nationally significant features, the fieldwork done in 2000 confirmed a number of other special features within RRD. Only a small part of the park was surveyed, however, so it is quite likely that the special features are more widespread than the surveys documented. To facilitate an analysis of the features found within RRD, the park was divided into six landscape units. Each unit has fairly distinctive landscape features and vegetation. These units are listed below and illustrated in Figure 4.

Landscape Unit 1. Dune Ridge
Landscape Unit 2. Sand Plain / Sand Dune Complex
Landscape Unit 3. Sand Dune / Wetland Complex
Landscape Unit 4. Wetlands
Landscape Unit 5. Fen Complex
Landscape Unit 6. Riverine

Each LU and the special features that are known or expected to occur there are described below. The features are listed according to their level of significance (i.e., national, provincial, regional, local). The map associated with each LU also lists the special features according to their level of significance. The provincial Sranks (i.e., S1, S2, etc.) are shown beside those species and plant communities which are tracked by ANHIC. For definitions of Srank and the most up-to-date lists of both tracked and watched elements refer to the webpage of ANHIC at http://www.cd.gov.ab.ca/preserving/parks/anhic/flashindex.asp.

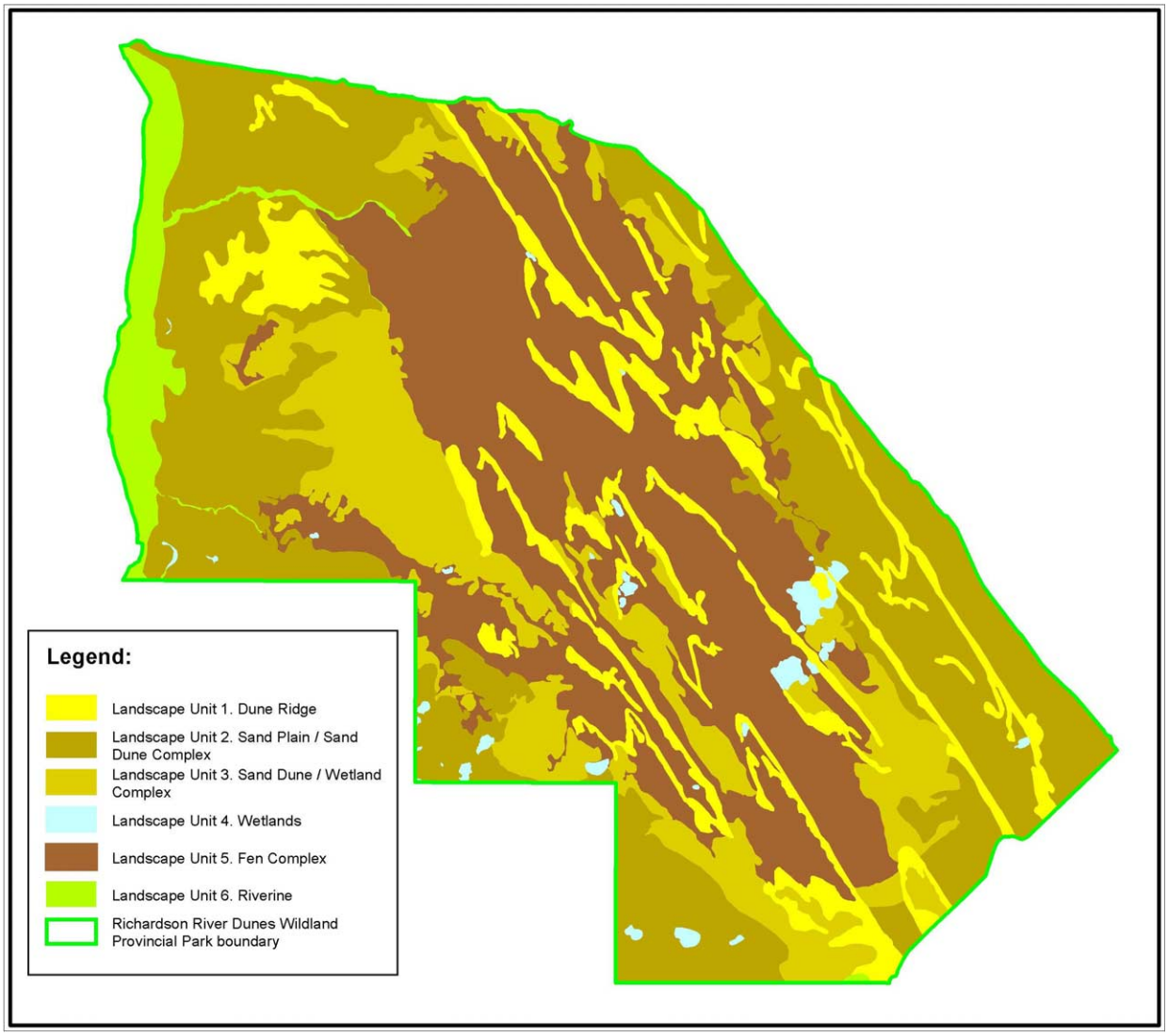


Figure 4. Landscape Units of Richardson River Dunes Wildland Provincial Park.

Landscape Unit 1. Dune Ridge (Map 1)

Size
- This LU is about 3174 ha in size.
- It occupies about 10% of the total land area of the park.

Description
- Sand (paleo) dunes of various types, including parabolic and longitudinal dunes.
- This LU is primarily made up of large, distinctive dune ridges that rise well above the surrounding wetlands or sand plains.
- The dunes characteristically have steep slopes, dune crests and often include areas of active sand (blowouts).

Dominant Vegetation
- Tops of stabilized dune ridges have mature jack pine / lichen communities.
- Blowouts generally unvegetated, with areas of sand heather / lichen crust beginning the stabilization process.
- Jack pine / green alder communities in moister locations (e.g. bases of sand ridges).

Nationally Significant Features
- Part of a nationally significant dune complex, containing large and extensive longitudinal and parabolic paleodunes (Sweetgrass Consultants 1997, David 1977). The paleodune complex in NE Alberta and NW Saskatchewan is the best-developed one documented for Canada.
- The paleodunes are found throughout RRD, in all but the riverine landscape units.

Provincially Significant Features
- Sand-dune chickweed (*Stellaria arenicola*) (S1) and *Stereocaulon condensatum* (S1) were found on one area of open sand on a distinct parabolic dune. Both are species of sandy habitats, and may also be expected in LU 2 and LU 3. Sand dune chickweed seems to prefer areas of shifting sand, so is expected to be restricted to unvegetated sand ridges.
- Another rare lichen, *Cladonia macrophylla* (S2) was found in this unit (Johnson 2001), and may also occur in LU 2 and LU 3.
- Two rare lichens, an old man's beard lichen (*Bryoria simplicior*) (S2S3) and American starburst lichen (*Imshaugia placorodia*) (S2) were commonly found on jack pine in the area. They were noted from this landscape unit as well as LU 2 and LU 3.
- Important year-round habitat for woodland caribou (*Rangifer tarandus caribou*) (S2).

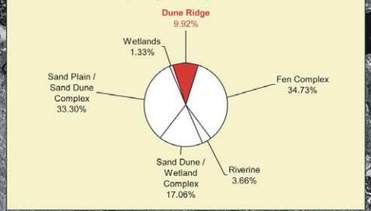
Regionally Significant Features
- The dune ridges often function as a travelling corridor for carnivores and ungulates as evidenced by well-worn game trails and tracks.

Locally Significant Features
- Active fox den found in this landscape unit.
- Junebugs (*Phyllophaga* spp.) are seasonally abundant in sand landscapes and provide a food source for a wide assortment of species (e.g., cranes, nighthawks, bears and foxes).

Map 1. Richardson River Dunes Wildland Provincial Park - **Landscape Unit 1. DUNE RIDGE**

Representative Features of Landscape Unit 1. Dune Ridge		
Component	**Level 1 Theme**	**Level 2 Theme**
Sandy Upland	Dune Field	Stabilized Dune

% of area occupied by Landscape Unit 1. DUNE RIDGE



Significant Features of Landscape Unit 1. Dune Ridge

National	Provincial		Regional	Local
longitudinal and parabolic paleodune complex	sand-dune chickweed *(Stellaria arenicola)* (S1)	P*	wildlife travel corridors	red fox *(Vulpes vulpes)* (S5) denning area
	old man's beard *(Bryoria simplicior)* (S2S3)	P		seasonally important wildlife feeding area
	Cladonia macrohylla (S2)	P		
	American starburst lichen *(Imshaugia placorodia)* (S2)	P		
	Stereocaulon condensatum (S1)	P		
	woodland caribou *(Rangifer tarandus caribou)* (S2) important year-round habitat			

P* = present; E* = expected

N

Legend:

Landscape Unit 1.
- DUNE RIDGE -

Richardson River Dunes Wildland Provincial Park boundary

1 0 1 2 Kilometers

Landscape Unit 2. Sand Plain / Sand Dune Complex (Map 2)

Size
- This LU is about 10,655 ha in size, the second largest in RRD.
- It occupies about 33% of the total land area of the park.

Description
- Level, sand-dominated landscape, with occasional parabolic sand dunes.
- Aeolian blanket or sand sheet, usually over morainal or glaciofluvial materials.
- Wetlands are essentially absent, although some small ones do occur.

Dominant Vegetation
- Frequent fires are reflected in the vegetation patterns.
- Much of the sand plain area is covered with closed, young jack pine with sparse understory, regenerating after fires (Meijer 2002). There are considerable quantities of dead and down woody material.
- Occasional mature, open stands of jack pine with lichen understory on the sand plain in locations that have escaped recent fires.
- Jack pine / green alder communities in moister locations (e.g. bases of sand ridges).
- Some dune ridges with plant communities as discussed in LU 1 above, but these are a minor component of the LU.

Nationally Significant Features
- Part of a nationally significant dune complex, including part of the best-developed paleodune complex documented in Canada (see discussion under LU 1 above).

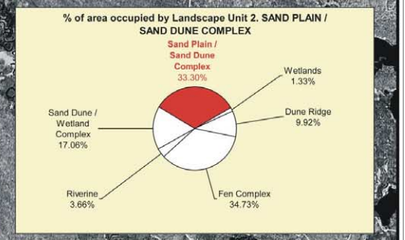
Provincially Significant Features
- Some occurrences of hot-springs millet (*Panicum acuminatum*) (SU) were noted in moist sand at woodland edges. This species is also expected to occur in LU 3.
- Old man's beard lichen (*Bryoria simplicior*) (S2S3) and American starburst lichen (*Imshaugia placorodia*) (S2) were noted from this landscape unit as well as LU 1 and LU 3.
- sand-dune chickweed (S1), *Cladonia macrophylla* (S2) and *Stereocaulon condensatum* (S1) were all found in LU 1 and may occur in this LU as well.
- neat bog moss (*Sphagnum compactum*) (S1S2) was found in LU 3 and may also occur in this LU.
- Some small wetlands within this LU have the paired rare plant community as discussed under LU 3, as well as the associated rare species, the few-fruited sedge (*Carex oligosperma*) (S1S2).
- Important spring / summer habitats for woodland caribou (S2), a threatened species in Alberta.

Regionally Significant Features
- An important wolf hunting and travelling area.
- In 2000, a western meadowlark (S5B) was recorded for the park (Thomas and Carroll 2001). This observation may represent the first documented record of this species for the Canadian Shield Natural Region and would be a significant range extension.

Locally Significant Features
- High density of red squirrels; good supplies of jack pine cones as a food source (Landals 1978).
- Important nesting habitat (open jack pine forests) for the common nighthawk (S5B).
- The northern goshawk *(Accipiter gentiles)* (S3S4B) was observed in LU 3 and is also expected to occur in this LU. The species is considered to be rare in RRD.
- The sandhill crane (*Grus canadensis*) (S4B) was observed foraging in LU 4 and is also expected to occur in this LU. The species is on ANHIC's 'watch' list of birds.

Map 2. Richardson River Dunes Wildland Provincial Park - **Landscape Unit 2. SAND PLAIN / SAND DUNE COMPLEX**

Representative Features of Landscape Unit 2. Sand Plain / Sand Dune Complex		
Component	**Level 1 Theme**	**Level 2 Theme**
Sandy Upland	Dune Field	Stabilized Dune
	Sandy Plain	Coniferous forest
		Recently burned



Significant Features of Landscape Unit 2. Sand Plain / Sand Dune Complex

National	Provincial		Regional	Local	
longitudinal and parabolic paleodune complex	few-fruited sedge (*Carex oligosperma*) (S1S2)	P*	important gray wolf (*Canis lupus*) (S3) area	high density of red squirrels (*Tamiasciurus hudsonicus*) (S5)	
	hot-springs millet (*Panicum acuminatum*) (SU)	P	western meadowlark (*Sturnella neglecta*) (S5B) -believed to be the first Canada Shield Natural Region record	northern goshawk (*Accipiter gentiles*) (S3S4B)	E
	sand-dune chickweed (*Stellaria arenicola*) (S1)	E		sandhill crane (*Grus canadensis*) (S4B)	E
	neat bog moss (*Sphagnum compactum*) (S1S2)	E		common nighthawk (*Chordeiles minor*) (S5B) important nesting habitat	
	old man's beard (*Bryoria simplicior*) (S2S3)	P			
	Cladonia macrophylla (S2)	E			
	American starburst (*Imshaugia placorodia*) (S2)	P			
	Stereocaulon condensatum (S1)	E			
	few-fruited sedge / twisted bog moss poor fen (*Carex oligosperma / Sphagnum subsecundum* poor fen) (S1S2)	P			
	leatherleaf - northern laurel / green reindeer lichen shrubland (*Chamaedaphne calyculata - Kalmia polifolia / Cladina mitis* shrubland) (S1S2)	P			
	woodland caribou (*Rangifer tarandus caribou*) (S2) important spring / summer habitat				

P* = present; E* = expected

N

Legend:

- Landscape Unit 2. - SAND PLAIN / SAND DUNE COMPLEX -
- Richardson River Dunes Wildland Provincial Park boundary

1 0 1 2 Kilometers

Landscape Unit 3. Sand Dune / Wetland Complex (Map 3)

Size
- This LU is about 5459 ha in size.
- It occupies about 17% of the total land area of the park.

Description
- A complex of dunes (primarily parabolic dunes) with closely associated wetlands on a sand substrate.
- The dunes tend to be less prominent and more vegetated than those of LU 1.

Dominant Vegetation
- The dune vegetation is described under LU 1 above, although blowouts are generally missing perhaps due to the lower profile of these dunes.
- A diversity of wetland types are found in this complex, a result of varying water levels.
- Some areas have small ponds with open water, ringed by wetland vegetation (see LU 4 below).
- Many of the wetlands are dominated by graminoids, primarily small bottle sedge communities, or few-fruited sedge communities.

Nationally Significant Features
- Part of a nationally significant dune complex, including part of the best-developed paleodune complex documented in Canada (see discussion under LU 1 above).

Provincially Significant Features
- Capitate sedge (*Carex capitata*) (S2) was found in one of the wetlands within this complex and may also occur in LU 4 and LU 5.
- Few-fruited sedge (S1S2) was found in LU 2 and LU 3 and may also occur in LU 4 and LU 5.
- Hot-springs millet (SU) was found in LU 2 and may also occur in LU 3.
- Sand-dune chickweed (S1), *Cladonia macrophylla* (S2) and *Stereocaulon condensatum* (S1) were all found in LU 1 and may occur in this LU as well.
- Old man's beard lichen (*Bryoria simplicior*) (S2S3) and American starburst lichen (S2) were noted from this landscape unit as well as LU 1 and LU 2.
- Neat bog moss (S1S2) was found in one of the wetland complexes that also included the paired plant communities (on the tracking list) listed below. It may also be expected in LU 2.
- The few-fruited sedge / twisted bog moss (*Carex oligosperma / Sphagnum subsecundum*) poor fen plant community (S1S2) is found here (Allen and Johnson 2000). This community is often paired with a shrubland that occurs on slightly drier sites, namely the leatherleaf – northern laurel / green reindeer lichen (*Chamaedaphne calyculata - Kalmia polifolia / Cladina mitis*) plant community (S1S2). Both were also noted in LU 2.
- Important year-round habitat for woodland caribou (S2).

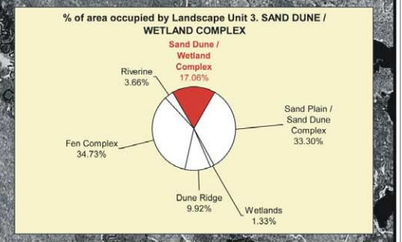
Regionally Significant Features
- Wetlands on sand dominated by graminoids, although widespread, cover only a small area (Raup and Argus 1982).
- Marbled godwit (S5B) nesting area. During the 2000 survey, an adult accompanied by a chick was observed (Thomas and Carroll 2001). This represents a significant range extension for this species and is the first breeding record for NE Alberta.

Locally Significant Features

- Common nighthawks (S5B) were noted foraging and feeding in this LU.
- High diversity of bird species.
- The dusky shrew *(Sorex monticolus)* (S5) and water shrew *(Sorex palustris)* (S4) were collected in this LU and may occur elsewhere in the park (e.g., LU 4, LU 5, LU 6).
- The Canadian toad *(Bufo hemiophrys)* (S4) was observed in this LU; the wetlands here provide suitable breeding habitat for this species. This toad may also occur in LU 5 and LU 6.
- The northern goshawk (S3S4B) was observed foraging in this LU and is expected to occur in other areas in the park (e.g., LU 2, LU 5, LU 6). The species is considered to be rare in RRD.
- The sora *(Porzana carolina)* (S5B) was observed in this LU; a probable nesting area for this species. The sora may also occur in other areas in the park (e.g., LU 4). The species is considered to be rare in RRD.
- The sandhill crane (S4B) was observed foraging in LU 4 and is also expected to occur in this LU. The species is on ANHIC's 'watch' list of birds.
- The short-eared owl (*Asio flammeus*) (S3B) was observed foraging in LU 4 and is also expected to occur in this LU. This owl is a 'may-be-at-risk' species (Alberta Sustainable Resource Development 2000)

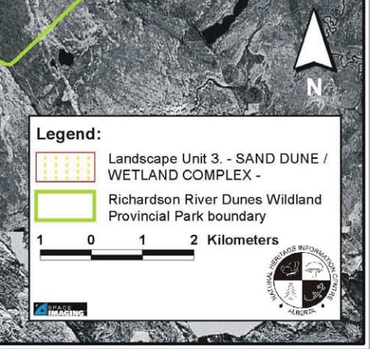
Map 3. Richardson River Dunes Wildland Provincial Park - Landscape Unit 3. SAND DUNE / WETLAND COMPLEX

Representative Features of Landscape Unit 3. Sand Dune / Wetland Complex		
Component	**Level 1 Theme**	**Level 2 Theme**
Sandy Upland	Dune Field	Stabilized Dune
	Sandy Plain	Recently burned
Wetland	Mineral	Marsh
		Wet dune slack
	Organic	Graminoid Fen



Significant Features of Landscape Unit 3. Sand Dune / Wetland Complex							
National	**Provincial**		**Regional**		**Local**		
longitudinal and parabolic paleodune complex	capitate sedge *(Carex capitata)* (S2)	P*	graminoid - dominated small wetlands		dusky shrew *(Sorex monticolus)* (S5)	P	
	few-fruited sedge *(Carex oligosperma)* (S1S2)	P	marbled godwit *(Limosa fedoa)* (S5B) nesting area - range extension		water shrew *(Sorex palustris)* (S4)	P	
	hot-springs millet *(Panicum acuminatum)* (SU)	E			northern goshawk *(Accipiter gentiles)* (S3S4B) foraging area		
	sand-dune chickweed *(Stellaria arenicola)* (S1)	E			common nighthawk *(Chordeiles minor)* (S5B) foraging, feeding		
	neat bog moss *(Sphagnum compactum)* (S1S2)	P			sora *(Porzana carolina)* (S5B)	P	
	old man's beard *(Bryoria simplicior)* (S2S3)	P			sandhill crane *(Grus canadensis)* (S4B) foraging and feeding area		
	Cladonia macrohylla (S2)	E			short-eared owl *(Asio flammeus)* (S3B)	E	
	American starburst *(Imshaugia placorodia)* (S2)	P			Canadian toad *(Bufo hemiophrys)* (S4) breeding area		
	Stereocaulon condensatum (S1)	E			diversity of small mammal species		
	few-fruited sedge / twisted bog moss poor fen *(Carex oligosperma / Sphagnum subsecundum* poor fen) (S1S2)	P			high diversity of bird species		
	leatherleaf - northern laurel / green reindeer lichen shrubland *(Chamaedaphne calyculata - Kalmia polifolia / Cladina mitis* shrubland) (S1S2)	P					
	woodland caribou *(Rangifer tarandus caribou)* (S2) important year-round habitat						

P* = present; E* = expected



Landscape Unit 4. Wetlands (Map 4)

Size
- This LU is about 424 ha in size.
- It occupies between 1 and 2% of the total land area of the park.

Description
- The larger water bodies and adjacent wet areas are included in this LU.
- It is made up of lakes and ponds with open water, ringed by wetland vegetation.
- Information on this landscape unit is very limited.

Dominant Vegetation
- Many of the wetlands are dominated by graminoids, probably including small bottle sedge communities, or few-fruited sedge communities.
- Rings of flat leaved willow – basket willow communities likely occur around some wetlands. One such community was noted around an old beaver pond (Allen and Johnson 2000).
- Plant communities around water bodies noted in the region include swamp horsetail, cattail or reed emergent communities or water sedge wet meadow communities. This part of the LU was not looked at during the 2000 study.

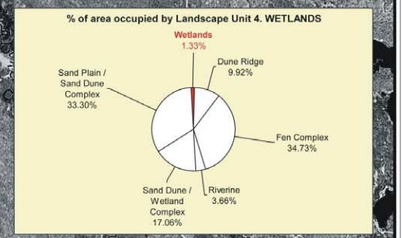
Provincially Significant Features
- As discussed below, several of the rare plant species associated with wetlands and one rare plant community may occur within this LU, but no occurrences were confirmed.
- Capitate sedge (S2) was found in LU 3 and may also occur in LU 4 and LU 5.
- Few-fruited sedge (S1S2) was found in LU 2 and LU 3 and may also occur in LU 4 and LU 5.
- The cyperus-like sedge – water arum (*Carex pseudocyperus - Calla palustris*) plant community (S1S2) was found in LU 6 and may also occur in this LU. Cyperus-like sedge (S2) is also a rare species.

Regionally Significant Features
- Important habitats for a diversity of odonate species.

Locally Significant Features
- High diversity of bird and small mammal species.
- The short-eared owl (S3B) was observed foraging in this LU and may occur elsewhere in the park (e.g., LU 3, LU 5). This owl is a 'may-be-at-risk' species (Alberta Sustainable Resource Development 2000).
- The beaver *(Castor canadensis)* was only recorded in this unit and in LU 6.
- Evidence (signs and tracks) of moose *(Alces alces)* was most frequently found in this LU.
- The sandhill crane (S4B) was observed foraging in this LU and may occur elsewhere in the park (e.g., LU 2, LU 3). The species is on ANHIC's 'watch' list of birds.
- The Canadian toad (S4) was observed in this LU; the wetlands here provide suitable breeding habitat for this species. This toad may also occur in LU 5 and LU 6.
- A combination of old-growth jack pine stands and adjacent open willow-sedge fens in this LU and LU 5 and was found to be particularly rich in butterflies and moths. Several species were found only in these habitats (Schmidt and Pohl 2000).
- The dusky (S5) and water shrew (S4) were both collected in LU 3 and are expected to occur in this LU.
- The sora (S5B) was observed in LU 3 and is expected to occur in this LU. The species is considered to be rare in RRD.

Map 4. Richardson River Dunes Wildland Provincial Park - Landscape Unit 4. WETLANDS

Representative Features of Landscape Unit 4. Wetlands		
Component	**Level 1 Theme**	**Level 2 Theme**
Valley / Ridge	Floor / Stream	Bog Stream
Wetland	Mineral	Marsh
	Organic	Graminoid Fen
	Lake	Mesotrophic / Oligotrophic



Significant Features of Landscape Unit 4. Wetlands					
National	**Provincial**		**Regional**	**Local**	
	capitate sedge (*Carex capitata*) (S2)	E*	diversity of odonate species	dusky shrew (*Sorex monticolus*) (S5)	E
	few-fruited sedge (*Carex oligosperma*) (S1S2)	E		water shrew (*Sorex palustris*) (S4)	E
	cyperus-like sedge (*Carex pseudocyperus*) (S2)	E		sora (*Porzana carolina*) (S5B)	E
	cyperus-like sedge - water arum wetland (*Carex pseudocyperus - Calla palustris* wetland) (S1S2)	E		sandhill crane (*Grus canadensis*) (S4B) foraging and feeding area	
				short-eared owl (*Asio flammeus*) (S3B) foraging area	
				Canadian toad (*Bufo hemiophrys*) (S4)	P
				areas rich in butterfly and moth species high diversity of small mammal and bird species	

P* = present; E* = expected

N

Legend:

Landscape Unit 4. - WETLANDS -

Richardson River Dunes Wildland Provincial Park boundary

1 0 1 2 Kilometers

Landscape Unit 5. Fen Complex (Map 5)

Size
- This LU is about 11,115 ha in size, the largest unit in RRD.
- It occupies about 35% of the total land area of the park.

Description
- Air photo analysis suggests that this LU is made of extensive organic wetlands (probably dominantly a fen complex with inclusions of small bogs).
- This LU is large and extends through much of the central part of the park.
- The unit is quite difficult to access (little information is currently available for it).

Dominant Vegetation
- Areas of graminoid wetlands are present.
- Extensive areas of shrubby wetlands appear to be present, likely dominated by ericaceous shrubs such as leatherleaf, common Labrador tea and northern laurel. Areas dominated by dwarf birch or willow species were noted in the region and likely occur in RRD as well.
- Air photo analysis suggests that there are areas of treed fen or bog in this unit, likely primarily black spruce / peat moss (*Sphagnum* spp.) communities, possibly with areas of tamarack.

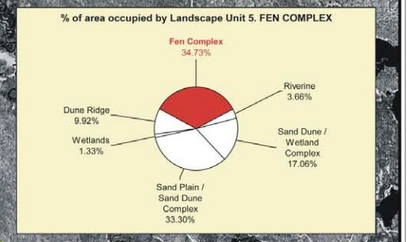
Provincially Significant Features
- Capitate sedge (S2) was found in LU 3 and may also occur in LU 4 and LU 5.
- Few-fruited sedge (S1S2) was found in LU 2 and LU 3 and may also occur in LU 4 and LU 5.
- Macloskey's violet (*Viola pallens*) (S1S2) and large Canada St. John's-wort (*Hypericum majus*) (S2) were found in an dried-up beaver pond at the northern end of the fen complex.
- Important year-round habitat for woodland caribou (S2).

Regionally Significant Features
- Important habitats for a diversity of odonate species.
- Presence of a localized butterfly, the northern marble (*Euchloe creusa*) (S4). The northern boreal populations of this species are known from only six sites in Alberta (Schmidt and Pohl 2000).

Locally Significant Features
- A combination of old-growth jack pine stands and adjacent open willow-sedge fens in this LU and LU 4 was found to be particularly rich in butterflies and moths. Several species were found only in these habitats (Schmidt and Pohl 2000).
- Highest density of snowshoe hare (S5) noted in the park.
- Hunting area for raptors (golden eagle (S3B), red-tailed hawk (S5B), sharp-shined hawk (S4B)).
- The northern goshawk (S3S4B) was observed foraging in LU 3 and is also expected to occur in this LU. The species is considered to be rare in RRD.
- The short-eared owl (S3B) was observed foraging in LU 4 and is also expected to occur in this LU. This owl is a 'may-be-at-risk' species (Alberta Sustainable Resource Development 2000).
- The dusky (S5) and water shrew (S4) were both collected in LU 3 and are expected to occur in this LU.
- The Canadian toad (S4) was observed in LU 3 and LU 4 and is also expected to occur in this LU.

Map 5. Richardson River Dunes Wildland Provincial Park - Landscape Unit 5. FEN COMPLEX

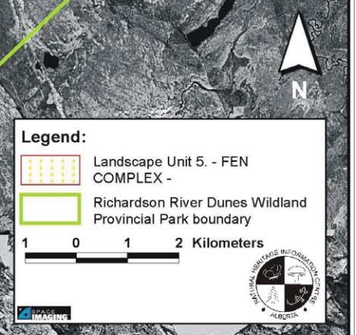
Representative Features of Landscape Unit 5. Fen Complex		
Component	**Level 1 Theme**	**Level 2 Theme**
Sandy Upland	Sandy Plain	Coniferous forest
		Recently burned
Valley / Ridge	Floor / Stream	Bog Stream
Wetland	Organic	Bog
		Graminoid Fen
		Shrub Fen
		Forested



Significant Features of Landscape Unit 5. Fen Complex

National	Provincial		Regional		Local	
	capitate sedge *(Carex capitata)* (S2)	E*	diversity of odonate species		dusky shrew *(Sorex monticolus)* (S5)	E
	few-fruited sedge *(Carex oligosperma)* (S1S2)	E	northern marble *(Euchloe creusa)* (S4)	P	water shrew *(Sorex palustris)* (S4)	E
	large Canada St. John's-wort *(Hypericum majus)* (S2)	P			snowshoe hare *(Lepus americanus)* (S5) important habitat	
	Macloskey's violet *(Viola pallens)* (S1S2)	P			northern goshawk *(Accipiter gentiles)* (S3S4B)	E
	woodland caribou *(Rangifer tarandus caribou)* (S2) important year-round habitat				short-eared owl *(Asio flammeus)* (S3B)	E
					Canadian toad *(Bufo hemiophrys)* (S4)	E
					areas rich in butterfly and moth species	
					raptor hunting area	

P* = present; E* = expected



Landscape Unit 6. Riverine (Map 6)

Size
- This LU is about 1172 ha in size.
- It occupies about 4% of the total land area of the park.

Description
- Narrow zones of vegetation on fluvial deposits adjacent to streams or to the Athabasca River.
- Includes oxbow lakes in old meander channels.
- Recent and old beaver ponds.

Dominant Vegetation
- Areas of mature forest on terraces adjacent to the Athabasca River including:
  - mixed woods comprised of white spruce and paper birch with balsam fir in the understory and a well developed moss layer
  - white spruce stands, some with a common horsetail understory, others with a well developed shrub layer of rose and low bush cranberry
  - balsam poplar / red-osier dogwood stands on river terraces.
- Dense stands of river alder with an ostrich fern understory in old meander channels.
- Willow shrublands along creeks.
- Emergent and wet meadow vegetation such as swamp horsetail, cattail or water sedge communities adjacent to oxbow lakes.

Nationally Significant Features
- A substantial portion of the Athabasca River valley north of Ft. McMurray is recognized as a nationally significant ESA (Sweetgrass Consultants 1997). The ESA includes part of the park (Figure 3).

Provincially Significant Features
- One oxbow lake found to have the cyperus-like sedge – water arum plant community (S1S2). Cyperus-like sedge is also a rare species (S2).
- A rare lichen (*Cladonia bacilliformis*) (S2S3) was found in one of the old growth forests.
- A rare moss (*Hygroamblystegium tenax*) (S2) was noted in the mud beside a meander channel of the Athabasca River.
- Bird migration corridor.

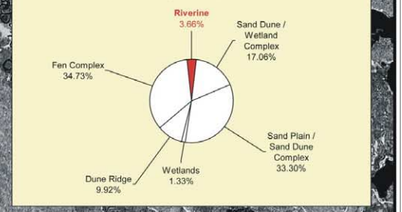
Regionally Significant Features
- Oxbows are important habitats for a diversity of odonate species.
- Well-developed animal trails.

Locally Significant Features
- Only area with mature to old-growth forests in the wildland park.
- The majority of the plant communities along the Athabasca River are unique to this LU.
- Evidence of extensive use by ungulates (e.g., deer, moose).
- Black bear (S5) habitat.
- The northern goshawk (S3S4B) was observed foraging in LU 3 and is also expected to occur in this LU. The species is considered to be rare in RRD.
- The dusky (S5) and water shrew (S4) were both collected in LU 3 and are expected to occur in this LU.
- The Canadian toad (S4) was observed in LU 3 and LU 4 and is also expected to occur in this LU.
- The beaver was only recorded in this unit and in LU 4.

Map 6. Richardson River Dunes Wildland Provincial Park - **Landscape Unit 6. RIVERINE**

Representative Features of Landscape Unit 6. Riverine		
Component	**Level 1 Theme**	**Level 2 Theme**
Sandy Upland	Sandy Plain	Coniferous forest
Valley / Ridge	Floor / Stream	River
		Bog Stream
Wetland	Mineral	Marsh

% of area occupied by Landscape Unit 6. RIVERINE



Significant Features of Landscape Unit 6. Riverine

National	Provincial		Regional	Local	
Part of the Athabasca River valley; one of the largest, longest, most diverse and productive river valley systems in the Mixedwood Boreal Forest of Canada	cyperus-like sedge *(Carex pseudocyperus)* (S2)	P*	diversity of odonate species	mature and old-growth forests	
	Hygroamblystegium tenax (S2)	P	well-developed wildlife trails	most of plant communities unique to this landscape unit	
	Cladonia bacilliformis (S2S3)	P		dusky shrew *(Sorex monticolus)* (S5)	E
	cyperus-like sedge - water arum wetland *(Carex pseudocyperus - Calla palustris* wetland) (S1S2)	P		water shrew *(Sorex palustris)* (S4)	E
	bird migration corridor			black bear *(Ursus americanus)* (S5) important habitat	
				important ungulate area	
				northern goshawk *(Accipiter gentilis)* (S3S4B)	E
				Canadian toad *(Bufo hemiophrys)* (S4)	E

P* = present; E* = expected

N

Legend:

Landscape Unit 6. - RIVERINE -

Richardson River Dunes Wildland Provincial Park boundary

1 0 1 2 Kilometers

Table 1 below summarizes the special elements found within RRD that are currently on ANHICs tracking and watch lists. When an element occurs in a particular LU, the element occurrence number for that record is supplied. This number provides a link back to the ANHIC database. Also, those elements that are expected to occur in a particular LU are indicated with an "E". The letter "P" refers to those elements that were confirmed in a particular LU but were generally distributed widely in the park and no individual element occurrence records were done for them.

Table 1. Special elements found within RRD that are currently on ANHICs tracking and watch lists.

Scientific name	Common Name	Element Code	S Rank	Landscape Unit*					
				1	2	3	4	5	6
Vascular Plants									
Carex capitata	capitate sedge	PMCYP032H0	S2			021	E	E	
Carex oligosperma	few-fruited sedge	PMCYP039Q0	S1S2		004	005	E	E	
Carex pseudocyperus	cyperus-like sedge	PMCYP03B70	S2				E		022
Hypericum majus	large Canada St. John's-wort	PDCLU03120	S2					015	
Panicum acuminatum	hot-springs millet	PMPOA24020	SU		002 007 008	E			
Stellaria arenicola	sand-dune chickweed	PDCAR0X0N4	S1	006	E	E			
Viola pallens	Macloskey's violet	PDVIO04142	S1S2					015	
Mosses									
Hygroamblystegium tenax		NBMUS3R030	S2						012
Sphagnum compactum	neat bog moss	NBMUS6Z070	S1S2		E	006			
Lichens									
Bryoria simplicior	old man's beard	NLTEST5450	S2S3	P	P	P			
Cladonia bacilliformis		NLTEST5970	S2S3						013
Cladonia macrophylla		NLT0008590	S2	005	E	E			
Imshaugia placorodia	American starburst	NLT0012560	S2	007	P	P			
Stereocaulon condensatum		NLTES10620	S1	002	E	E			
Plant Communities									
Carex oligosperma/ Sphagnum subsecundum poor fen	few-seeded sedge / twisted bog moss poor fen	CEAB000121	S1S2		001	002			
Carex pseudocyperus – Calla palustris wetland	cyperus-like sedge – water arum wetland	CEAB000037	S1S2				E		004
Chamaedaphne calyculata - Kalmia polifolia / Cladina mitis shrubland	(leatherleaf – northern laurel / green reindeer lichen shrubland	CEAB000122	S1S2		001	002			
Mammals									
Rangifer tarandus	woodland caribou	AMALC0401E	S2	P	P	P		P	
Birds									
Asio flammeus	short-eared owl	ABNSB13040	S3B			E	P	E	
Amphibians									
Bufo hemiophrys	Canadian toad	AAABB01080	S4			P	P	E	E

*Landscape Unit 1. Dune Ridge
Landscape Unit 2. Sand Plain / Sand Dune Complex
Landscape Unit 3. Sand Dune / Wetland Complex
Landscape Unit 4. Wetlands
Landscape Unit 5. Fen Complex
Landscape Unit 6. Riverine

Representative Features

While currently mapped as occurring within the Central Mixedwood Subregion of the Boreal Forest Natural Region, the landscapes and features of the park are more representative of and have more affinities to the Athabasca Plain Subregion of the Canadian Shield Natural Region. The natural history themes representative of the Athabasca Plain Subregion that are found within the site are presented in Table 2.

For more information on natural history themes, their definitions and applications refer to the following reports:

- *Natural Regions, Subregions and Natural History Themes of Alberta* (Alberta Environmental Protection 1994)
- *Natural Regions and Natural History Themes: Targets for Alberta* (Achuff and Wallis 1992)

Table 2. Level 1 and Level 2 Natural History Themes within RRD and the main landscape units in which they occur.

Component	Level 1 Theme	Level 2 Theme	LU 1*	LU 2	LU 3	LU 4	LU 5	LU 6
Sandy Upland	Dune Field	Stabilized Dune	✔	✔	✔			
	Sandy Plain	Coniferous forest		✔			✔	✔
		Recently burned		✔	✔		✔	
Valley / Ridge	Floor / Stream	River						✔
		Bog Stream				✔	✔	✔
Wetland	Mineral	Marsh			✔	✔		✔
		Wet dune slack			✔			
	Organic	Bog					✔	
		Graminoid Fen			✔	✔	✔	
		Shrub Fen					✔	
		Forested					✔	
	Lake	Mesotrophic / Oligotrophic				✔		

*Landscape Unit 1. Dune Ridge
Landscape Unit 2. Sand Plain / Sand Dune Complex
Landscape Unit 3. Sand Dune / Wetland Complex
Landscape Unit 4. Wetlands
Landscape Unit 5. Fen Complex
Landscape Unit 6. Riverine

DATA GAPS AND RESEARCH NEEDS

Although several field surveys have been done in the general area, no studies other than the ones conducted in June and August of 2000 have been done within RRD. The time spent within the site by researchers, however, was very limited. This was in part because three large wildland provincial parks (Marguerite River, Maybelle River and RRD) were targeted for survey at the same time, thus allowing insufficient time per site. Available helicopter time was limited, and the helicopter time schedule was unreliable during the field survey. ATVs (quads) were used to travel the winter roads that border the park, but access to the interior of the park was by foot. Walking through the site proved to be difficult as much of RRD is covered by dense stands of regenerating jack pine blocked with deadfall.

Given the limited field time that researchers spent in RRD and the difficult access, there are insufficient species and plant community data available for substantial portions of the park. Data gaps exist for a large portion of RRD for which further field research and inventory is required. In particular, little is known about the plant and animal species, and the plant communities of the Fen Complex and Wetland LUs in the interior of the park.

Further general research is needed in RRD on:

- The paleodunes to better define and characterize the dune types.
- The distribution and abundance of species within each LU as well as among LUs.
- The type and distribution of plant communities.

A number of special elements are known to occur in RRD (Table 1), but additional studies are needed to better document their distribution. In addition, there are a number of species and plant communities of note that are known to occur in the region in habitats similar to those present in RRD (Appendices 1, 2, and 3). Their presence and distribution in the park should be determined.

CONCLUSIONS

The entire RRD can be considered **nationally significant** as it lies within two nationally significant ESA's. The site also includes a number of provincial, regional and locally significant features, as well as features representative of the Athabasca Plain Natural Subregion. There are many additional species and plant communities of conservation concern that are known to occur in the region (Appendices 1, 2 and 3). Some of these species and communities may occur within RRD since appropriate habitat for them is believed to be present in the park. More study is needed to verify and document the suite of special features of the park. As more studies are conducted, information should be deposited in the Alberta Natural Heritage Information Centre (ANHIC). To ensure the use of the most current information, ANHIC should be consulted for any updates to the information provided in this report as well as for details concerning specific element occurrences.

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Appendix 1. Additional special non-vascular and vascular plant and lichen species that may occur within RRD and the landscape units in which they are most likely to be found.

Scientific name	Common name	S Rank	Habitat in NE Alberta (from occurrence records when available)	Landscape Units*					
				1	2	3	4	5	6
Liverworts									
Calypogeia muelleriana	liverwort	S?	Black spruce muskeg					✔	
Lophozia guttulata	liverwort	S2	Treed fen.					✔	
Scapania irrigua	liverwort	S2	Black spruce fen					✔	
Mosses									
Aloina brevirostris	short beaked rigid screw moss	S2	Exposed soil along river banks						✔
Anomodon minor		S1	Mixed wood area						✔
Brachythecium nelsonii		S2	Found on moist soil in a partly shaded location at the edge of a sedge fen			✔	✔	✔	
Brachythecium rutabulum		S2?	In black spruce stand					✔	
Bryum cyclophyllum		S1S2	In moist black spruce stand					✔	
Bryum pallens		S2	In white spruce – balsam fir stand.						✔
Campylium polygamum		S3	balsam poplar forest on bottomlands						✔
Drepanocladus sendtneri	brown moss	S2	Subhydric, poorly drained, depressions in fens					✔	
Entodon schleicheri		S1	Riparian sites						✔
Hygroamblystegium noterophilum		SU	In moist white spruce stand						✔
Hypnum callichroum		S1	Riparian spruce forest						✔
Neckera pennata		S2	Riverine forests.						✔
Pohlia sphagnicola		S2	Fens and willow swamps				✔	✔	✔
Racomitrium microcarpon		S1?	Variable species of rock, tree bases or rotting wood						✔
Rhodobryum ontariense		S2	River banks and mesic forests						✔
Schistidium agassizii	elf bloom moss	S1	White spruce stands						✔
Sphagnum fallax	peat moss	S2	Poor fen					✔	
Sphagnum fimbriatum	fringed bog moss	S2S3	Black spruce stands					✔	
Sphagnum lindbergii	Lindberg's bog moss	S2S3	Poor fen					✔	
Sphagnum platyphyllum		S1	Poor fen and bog.					✔	
Splachnum ampullaceum	flagon fruited splachnum	S2	Animal (usually moose) dung in fens and bogs					✔	
Splachnum luteum	yellow collar moss	S2	Animal (usually moose) dung in fens and bogs					✔	
Splachnum rubrum	red collar moss	S2	Animal (usually moose) dung in fens and bogs					✔	

Appendix 1. Cont'd.

Scientific name	Common name	S Rank	Habitat in NE Alberta (from occurrence records when available)	Landscape Units*					
				1	2	3	4	5	6
Splachnum sphaericum	globe-fruited splachnum	S2	Animal (usually moose) dung in fens and bogs					✔	
Splachnum vasculosum	large-fruited splachnum	S2	Animal (usually moose) dung in fens and bogs					✔	
Vascular Plants									
Artemisia tilesii	Herriot's sagewort	S2	Eroded river banks						✔
Astragalus bodinii	Bodin's milk vetch	S1	Grassy river slopes						✔
Brasenia schreberi	watershield	S1	Slow-moving creeks and waterways				✔		✔
Carex houghtoniana	sand sedge	S2	Sandy sites, often in pine woods	✔	✔	✔			
Carex retrorsa	turned sedge	S2S3	Wet ground along rivers and streams and in fens					✔	✔
Carex rostrata	beaked sedge	S2	Floating fens at the edge of ponds and lakes				✔		
Carex umbellata	umbellate sedge	S1	Open pine woods, rock	✔	✔	✔			
Diphasiastrum sitchense	ground-fir	S2	Fens					✔	
Drosera linearis	slender-leaved sundew	S2	Fens					✔	
Dryopteris cristata	crested shield fern	S1	Moist woods and thickets						✔
Dryopteris filix-mas	male fern	S1	Moist woods and thickets						✔
Eupatorium maculatum	spotted Joe-pye weed	S1S2	Moist river bank						✔
Huperzia selago	mountain club-moss	S1	Moist substrates in fens, bogs and woods				✔	✔	✔
Isoetes echinospora	northern quillwort	S1	Aquatic plant of nutrient-poor ponds and lakes				✔		
Juncus brevicaudatus	short-tail rush	S2	Shorelines and mesic sandy depressions			✔	✔		
Juncus filiformis	thread rush	S2S3	Lake and river shorelines, wet soil in open areas				✔		✔
Lobelia dortmanna	water lobelia	S1	Emergent aquatic, shallows of sandy lakes and ponds				✔		
Lycopodiella inundata	bog club-moss	S1	Wet sites including sandy shores, bogs and fens			✔	✔	✔	
Malaxis monophylla	white adder's-mouth	S2	Mesic woodlands, shrublands and fens				✔	✔	✔
Nymphaea leibergii	pygmy water-lily	S1	Deep water, ponds and lakes				✔		
Pinguicula villosa	small butterwort	S1	*Sphagnum* hummocks in peatlands					✔	
Polygala paucifolia	fringed milkwort	S1	Moist coniferous or mixed woods						✔
Potamogeton foliosus	leafy pondweed	S2	Shallow lakes or ponds				✔		
Potamogeton natans	floating-leaf pondweed	S2	Still or slow-moving shallow water				✔		✔

Appendix 1: Cont'd.

Scientific name	Common name	S Rank	Habitat in NE Alberta (from occurrence records when available)	Landscape Units*					
				1	2	3	4	5	6
Potamogeton obtusifolius	blunt-leaved pondweed	S2	Shallow lakes or ponds				✔		
Potamogeton praelongus	white-stem pondweed	S2	Deep clear water of lakes or ponds				✔		
Potentilla multifida	branched cinquefoil	S1	Dry open ground, often on disturbed sandy sites	✔	✔				
Sagittaria latifolia	broad-leaved arrowhead	S1	Shallow water of ponds and lakes				✔		✔
Salix tyrrellii	Tyrrell's willow	S1	Crests of active dunes	✔					
Sarracenia purpurea	pitcher-plant	S2	*Sphagnum* wetlands					✔	
Spiranthes lacera	northern slender ladies'-tresses	S1	Jack pine – lichen forest, often with common blueberry	✔	✔				
Tanacetum bipinnatum ssp huronense	Indian tansy	S2	Sand dunes	✔	✔	✔			
Utricularia cornuta	horned bladderwort	S1	Poor fens and muddy shores				✔	✔	✔
Lichens									
Arthonia patellulata		S3?	Bark of aspen						✔
Bacidia bagliettoana		S2	Bark of aspen						✔
Bryoria nadvornikiana		S2	Found on black spruce in peatlands. General habitat is boreal woodlands on conifers and birch (Brodo *et al.*).					✔	
Cladonia ramulosa		S1	Banks of the Athabasca River						✔
Cyphelium tigillare		S2	Conifer wood or bark					✔	✔
Pannaria conoplea		S?	Decaying log, on bark						✔
Phaeophyscia constipata		S3	Soil and moss in dry habitats (Brodo *et al.*)	✔	✔				
Phaeophyscia endococcina		S2?	On sandy soil	✔	✔	✔			
Rinodina exigua		S1	Riverine spruce-fir woodlands, most Alberta specimens collected on spruce bark						✔

*Landscape Unit 1. Dune Ridge
Landscape Unit 2. Sand Plain / Sand Dune Complex
Landscape Unit 3. Sand Dune / Wetland Complex
Landscape Unit 4. Wetlands
Landscape Unit 5. Fen Complex
Landscape Unit 6. Riverine

Appendix 2. Additional special plant communities that may occur within RRD and the landscape units in which they are most likely to be found.

Scientific name	Common name	S Rank	Habitat in NE Alberta	Landscape Units*					
				1	2	3	4	5	6
Andromeda polifolia / Sarracenia purpurea / Sphagnum angustifolium	bog rosemary / pitcher-plant / peat moss	S1S2	Fen around small pools				✔	✔	
Isoetes echinospora	northern quillwort	S1	Sandy shorelines				✔		
Picea glauca / Alnus tenuifolia – Betula neoalaskana / Equisetum pratense / Hylocomium splendens	white spruce / river alder - Alaska birch / meadow horsetail / stair-step moss	S3	River terraces						✔
Picea glauca / Cetraria islandica	white spruce / lichen	S1	Open stands on sandy knolls	✔					
Populus balsamifera / Alnus tenuifolia / Cornus stolonifera / Equisetum pratense	balsam poplar / river alder / red-osier dogwood / meadow horsetail	S3	River terraces						✔
Populus balsamifera / Rhamnus alnifolia / Equisetum arvense	balsam poplar / alder-leaved buckthorn/common horsetail	S1	Riparian stands						✔
Populus balsamifera / Viburnum opulus / Matteuccia struthiopteris	balsam poplar / high-bush cranberry / ostrich fern	S1S2	River terraces						✔
Salix athabascensis string shrubland	Athabasca willow string shrubland	SP	Patterned fen					✔	

*Landscape Unit 1. Dune Ridge
Landscape Unit 2. Sand Plain / Sand Dune Complex
Landscape Unit 3. Sand Dune / Wetland Complex
Landscape Unit 4. Wetlands
Landscape Unit 5. Fen Complex
Landscape Unit 6. Riverine

Appendix 3. Additional special vertebrates and invertebrates that have potential to occur within RRD and the landscape units in which they are most likely to be found.

Scientific name	Common name	S Rank	Comments	Landscape Unit*					
				1	2	3	4	5	6
Mammals									
Microtus xanthognathus	Taiga vole	SH	The only AB specimens were collected along the Athabasca River, the last being in 1904. Species prefers upland areas along rivers near stands of *Equisetum*.						✔
Sorex hoyi	pygmy shrew	S3	Prefers bogs, treed fens, riparian areas.			✔		✔	✔
Gulo gulo	wolverine	S3	A 'may be at risk' species. Wide-ranging.	✔	✔	✔		✔	✔
Birds									
Coturnicops noveboracensis	yellow rail	S2B	Prefers grass -sedge fens.			✔	✔	✔	
Picoides arcticus	black-backed woodpecker	S2S3	A 'sensitive' species. Prefers burned or mature coniferous stands		✔				✔
Reptiles									
Thamnophis sirtalis	red-sided garter snake	S3	A 'sensitive' species. Hibernacula are tracked.		✔	✔	✔		✔
Moths and Butterflies									
Oeneis chryxus caryi	chryxus Arctic	S1S2	Collected near RRD. Prefers open jack pine forests.	✔	✔				
Crambidia impure	moth	S?	Unknown from AB prior to the 2000 survey. Collected near RRD. Found in dry open habitats; larvae feed on lichens.	✔	✔	✔			
Drasteria adumbrata	moth	S?	Collected near RRD in 2000. Known from only one other location in AB (Wainwright), this being a historical record (~50 years ago). A species of open jack pine forests.	✔	✔				
Euxoa cursoria	moth	S?	Collected near RRD in 2000. Known from only one other location in AB (Jasper Lake dunes in Jasper NP). Prefers active sand dune areas.	✔	✔	✔			
Lapara bombycoides	moth	S?	Collected near RRD in 2000. Known from only 3 localities in AB. Found in jack pine forests, jack pine being the larval host plant.	✔	✔				
Eupithecia russeliata	moth	S?	Unknown from AB prior to the 2000 survey. Collected near RRD. Found in peatlands (larvae feed on *Kalmia)*			✔		✔	

Appendix 3. Cont'd.

Scientific name	Common name	S Rank	Comments	Landscape Unit*					
				1	2	3	4	5	6
Hemipachnobia monochromatea	moth	S?	In 2000, specimens were collected near RRD. Known from only one other location in AB. Found in peatlands.			✔		✔	
Sphinx poecila	moth	S?	Collected near RRD in 2000. A relatively rare species of 'boreal' forest wetlands. Occurs in peatlands where larch occurs.			✔		✔	
Spiders									
Schizocosa minnesotensis	wolf spider	S?	In 2000, collected near RRD. Specimens represent a newly discovered disjunct population for NE Alberta. Found in leaf litter and other detritus in vegetated sandy areas and dune habitat.	✔	✔	✔			
Habronattus captiosus	jumping spider	S?	In 2000, collected near RRD. Specimens represent a newly discovered disjunct population for NE Alberta. Occurs in open ground habitats with sparse vegetation, especially in dry leaf litter, sand and small stones.	✔	✔	✔			
Dictyna arundinacea	meshweb weaver (a spider)	S?	Collected near RRD. Unknown from AB prior to the 2000 survey. Webs are often built at the tips of dry and dead vegetation or on twigs. Spiders can also be found among stones and plant debris on the ground.	✔	✔	✔		✔	
Odonates									
Calopteryx aequabilis	river jewelwing (a damselfly)	S1	Collected near RDD in 2000. Prefers slow-moving creeks and waterways.				✔		✔
Aeshna Canadensis	Canada darner (a dragonfly)	S4S5	Collected near RRD in 2000. Prefers aquatic habitats such as ponds, marshy lakes and slow streams, with emergent vegetation such as rushes and reeds			✔	✔		✔
Aeshna subarctica	Subarctic darner (a dragonfly)	S4S5	Collected near RRD in 2000 (in Maybelle River WP). Has not been recorded in AB since 1983. Prefers cooler *Sphagnum* bog ponds and muskeg pools.			✔	✔	✔	

Appendix 3. Cont'd

Scientific name	Common name	S Rank	Comments	Landscape Unit*					
				1	2	3	4	5	6
Leucorrhinia glacialis	crimson-ringed whiteface (a dragonfly)	S1S3	Collected near RDD in 2000. Found in boggy lake habitats and marshy areas with typical bog vegetation.			✔	✔	✔	
Libellula julia	chalk-fronted skimmer (a dragonfly)	S3S4	Collected near RRD in 2000 (Maybelle River WP). Found in still waters of bog ponds and large swampy areas.			✔	✔	✔	

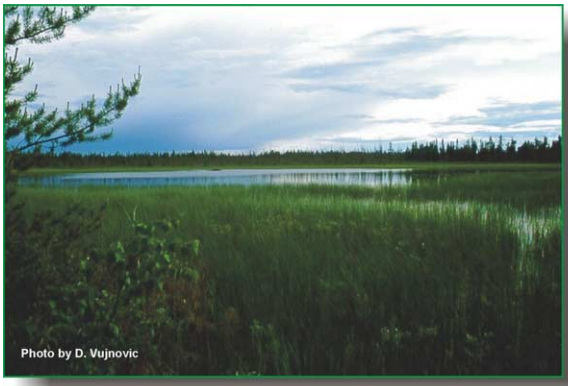
*Landscape Unit 1. Dune Ridge
Landscape Unit 2. Sand Plain / Sand Dune Complex
Landscape Unit 3. Sand Dune / Wetland Complex
Landscape Unit 4. Wetlands
Landscape Unit 5. Fen Complex
Landscape Unit 6. Riverine

Appendix 4. Images of RRD Landscape Units.

LU 1. Dune Ridge
Parabolic dune rising above surrounding vegetation

LU 2. Sand Plain / Sand Dune
Extensive, young jack pine forest

LU 3. Sand Dune / Wetland Complex
Graminoid wetland with dune vegetation behind



LU 4. Wetlands
Emergent vegetation around water bodies

LU 5. Fen Complex
Shrubby fen of common Labrador tea and northern laurel with peat moss

LU 6. Riverine
Mixed wood stand along Athabasca River