

Small Patch Communities of Fidler-Greywillow Wildland Provincial Park
Lorna Allen, J. Derek Johnson, Ksenija Vujnovic



Front page: North Shore of Lake Athabasca, with beach vegetation and backshore dunes.
Photo by K. Vujnovic

For copies of this report, contact:
Alberta Natural Heritage Information Centre
Alberta Community Development
2nd Floor, 9820 – 106 Street
Edmonton, AB T5K 2J6

This report may be cited as:

Allen, L., J. D. Johnson, K. Vujnovic. 2003. Small Patch Communities of Fidler-Greywillow Wildland Provincial Park. A report prepared for Parks and Protected Areas, Alberta Community Development, Edmonton, Alberta.

CONTENTS

	Page
Introduction	1
Methods	4
Results	6
Plant Communities Documented	7
Discussion	24
Recommendations	25
Conclusion	26
Acknowledgements	26
References Cited	27
Appendix 1. Unusual communities or habitats that potentially occur in northeastern Alberta	29
Appendix 2. Communities on the Preliminary Plant Community Tracking List that occur in the Canadian Shield and Boreal Forest Natural Regions	29
Appendix 3. Additional Plant Communities noted in FGW	31
List of Tables	
Table 1. Target Landscapes	6
List of Figures	
Figure 1. Fidler-Greywillow Wildland Provincial Park: Location, Subregions and Community Type (CT) Plot Locations	2
Figure 2. Fen Complex	10
Figure 3. Burntwood Island Fen	10
Figure 4. CT4 plot and occurrence locations	18
Figure 5. CT5 site and occurrence locations	21
Figure 6. CT6 occurrence location	23

Small Patch Communities of Fidler-Greywillow Wildland Provincial Park

Lorna Allen, J. Derek Johnson, Ksenija Vujnovic

Introduction

In July 2001, Fidler – Greywillow Wildland Provincial Park (FGW) was surveyed to document small patch plant communities. Small patch plant communities add considerably to the diversity of a site, harbouring flora and potentially fauna dependent on these specialized habitats¹. They are however often overlooked in vegetation studies because they are neither extensive nor common enough to be considered representative. The focus of this study was to look within the matrix of the representative plant communities to find and document the small patch communities that may be significant in a provincial context.

FGW is a remote site located in the northeast corner of Alberta. It stretches along the north shore of Lake Athabasca from Fidler Point in the west to about 3.5 km northeast of Cypress Point and includes some of the larger islands in the lake (Figure 1). One previous biophysical investigation of the site was carried out in 1984. No report was completed from that work, but field notes are available². H.M. Raup reported on a similar site at Shelter Point³, also on the north shore of Lake Athabasca, but about 40 km southwest of Fidler Point.

Fidler-Greywillow Wildland Provincial Park is made up of two main landscape units:

- a series of islands and a portion of the northern shoreline of Lake Athabasca, that are for the most part within the Athabasca Plain (AP) Subregion of the Canadian Shield Natural Region. This unit is largely shoreline shaped by wave, wind and ice action, with sand plains behind, and
- extensive outcrops of Precambrian granite and gneiss⁴ typical of the Kazan Upland (KU) Subregion of the Canadian Shield Natural Region, found behind the shoreline, or sometimes extending out into the lake as rocky points.

The islands and areas of the north shore are underlain by late Precambrian sandstones, and so are considered part of the Athabasca Plains Subregion of the Canadian Shield Natural Region. Bustard and Burntwood are the largest of the islands. Shorelines are sandy and vegetation is very similar to that along the north shore of Lake Athabasca, described below. The islands show little relief and are largely vegetated by open stands of black spruce (*Picea mariana*) and / or jack pine (*Pinus banksiana*). Coniferous forests are best developed on the south side of Bustard Island. Both Bustard and Burntwood Islands have areas covered by poor fens.

Bustard Island is more complex than Burntwood Island. On the east side there are high, sandy beach ridges along horseshoe bays. These support mature white spruce (*Picea glauca*) and paper birch (*Betula papyrifera*) with a well-developed arboreal lichen flora. The island has two internal, shallow lagoons. The largest lagoon, on the east side of the island, has an extensive and healthy population of the rare northern quillwort (*Isoetes echinospora*) growing on a sandy substrate in water up to 30 cm deep. The open poor

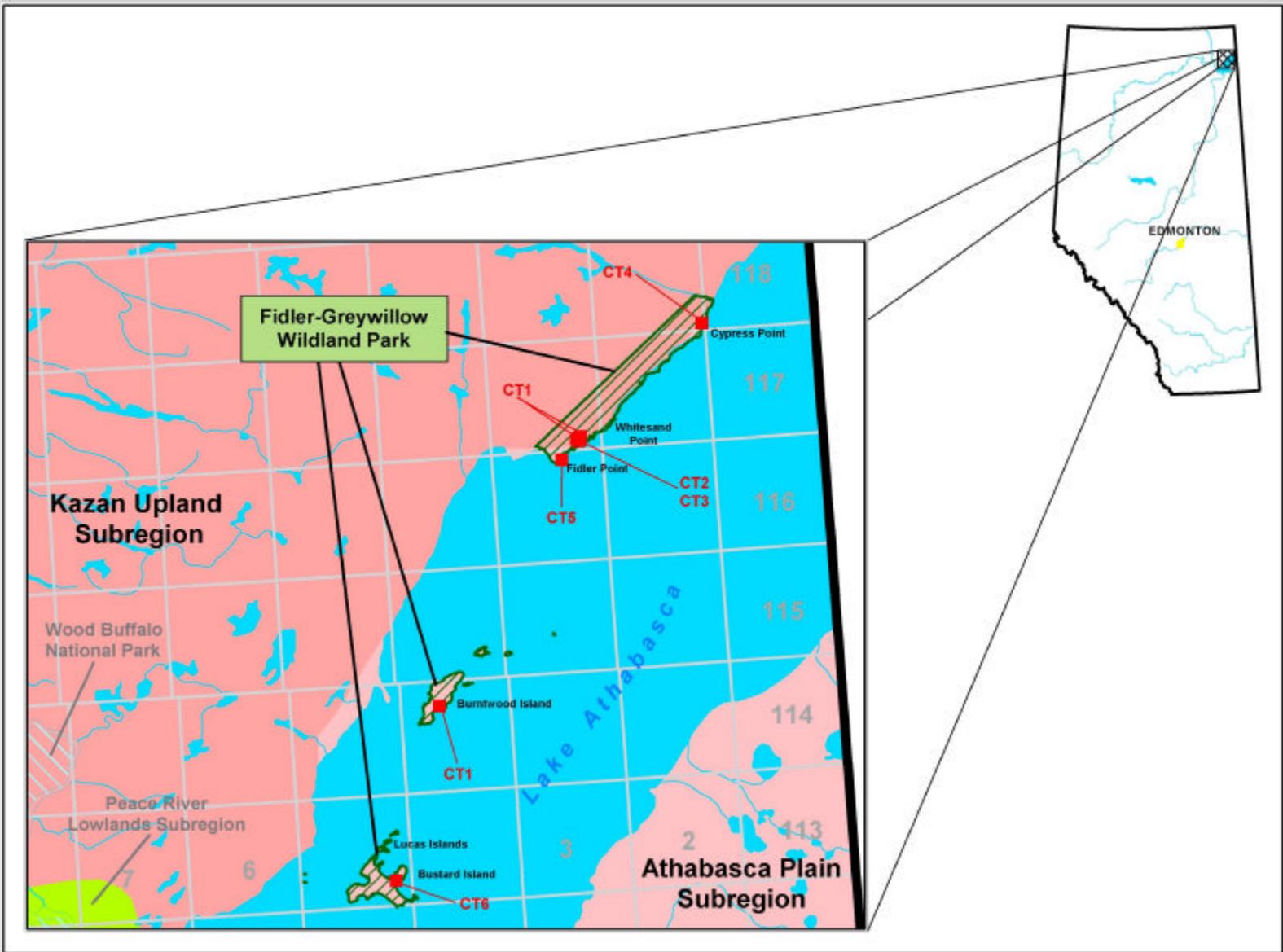


Figure 1. Fidler-Greywillow Wildland Park
Location, Subregions and Community Type (CT) Locations

fen off the south end of this lagoon is the largest poor fen that has been found in any of the Wildland Provincial Parks in the Canadian Shield Natural Region. It supports vegetation dominated by leatherleaf (*Chamaedaphne calyculata*), brown moss (*Warnstorfia exannulata*) and peat mosses (*Sphagnum* spp.). Small "islands" in the fen, likely underlain by permafrost, support stunted black spruce with an understory of common Labrador tea (*Ledum groenlandicum*) and rusty peat moss (*Sphagnum fuscum*). The large bay on the west side of Bustard Island has a primarily rocky shoreline and access is difficult.

A number of sparsely vegetated, sandy, horseshoe bays characterize the south side of Burntwood Island. The bays are followed by a several meters high, vegetated beach ridge with a series of wet basins behind. These wetlands support provincially rare species such as beaked sedge (*Carex rostrata*) and marsh rush (*Juncus stygius*). Other rare plants, including slender beak-rush (*Rhynchospora capillacea*), pearlwort (*Sagina nodosa*), large Canada St. John's-wort (*Hypericum majus*), thread rush (*Juncus filiformis*) and American winter cress (*Barbarea orthoceras*) can be found in some rocky areas along the shoreline. Much of the northern shore of the island is also rocky with a similar mix of species to what was noted in the rocky areas of the southern shoreline of the island.

The north shore of Lake Athabasca also has sandy bays, often with eroded dune ridges behind. There are also areas of rocky shoreline, spots where cliffs or outcrops come right to the water's edge and areas where small creeks drain into the lake.

The sandy bays of both the islands and the north shore all tend to have similar vegetation zonation patterns and are found to have some of the more interesting small patch communities. Variations may reflect how exposed the particular bay is to wind and wave action, and perhaps to ice push. Moving from open water to shore, there is a zone of bare sand subject to wave action. Then, in the more protected bays, there is often a zone of sparse vegetation in bands reflecting a pattern of sand ridges (no more than a few decimetres high) with low, moist swales behind. Provincially rare plants such as large Canada St. John's-wort, short-tail rush (*Juncus brevicaudatus*) and thread rush are often found in these protected bays.

On other, slightly more exposed beaches, a zone of small dunes up to a meter high has built up behind an area of bare dry sand that is just out of the wave action zone. These small dunes are characterized by the presence of two rare species, American dune grass (*Leymus (Elymus) mollis*) and Indian tansy (*Tanacetum bipinnatum* ssp. *huronense*). Frequently, beach ridges several meters high follow next, with wet basins often found behind. Provincially rare species, beaked sedge and few-fruited sedge (*Carex oligosperma*) can be found in the poor fens with a sandy substrate that occur in some of these wet basins. In others, shrublands have developed that are dominated by flat-leaved willow (*Salix planifolia*) and / or sweet gale (*Myrica gale*).

Behind the immediate shoreline there is often a sand plain, with open jack pine and a well-developed lichen understory. These jack pine stands on sand are very similar to the extensive stands characteristic of the Athabasca Plains Natural Subregion. Where they occur on the north shore, they extend back to the first granite and gneiss outcrops.

In some areas, the rock outcrops extend right into the beach zone. Within the park, branched cinquefoil (*Potentilla multifida*), another rare species, is mostly restricted to these beach rock outcrops. Often, at the base of the beach rock outcrops is a shore of sharp, little-worn rocks. Plant cover is made up of individuals scattered in sheltered cracks between rocks. There is often an area of wet sand with scattered cobbles forming a transition zone from rocky shoreline to sandy beaches. This provides habitat for a number of species, including the rare pearlwort.

The landscape unit of Precambrian granite and gneiss outcrops is composed generally of a series of alternating rock ridges and wetland-filled valleys. Small creeks occasionally cut through these. On the rock ridges themselves, vascular plant species are largely restricted to cracks and pockets in the rocks where some soil and moisture collect. Provincially rare species, such as umbellate sedge (*Carex umbellata*), mountain club-moss (*Huperzia selago*) and Siberian polypody (*Polypodium sibiricum*) can be found growing there. There are sparse woods of stunted jack pine with a predominantly lichen understory, and areas dominated by lichen communities. Wallis and Wershler⁵ detail the species that can be expected on these rocky sites and Raup⁶ discusses the similarities and differences between the sandy and rocky pine woods. The wetlands between the rock ridges are primarily poor fens or bogs, although along the creeks other wetland types were also noted.

Methods

The focus of this work was to collect information on small patch communities in Fidler-Greywillow Wildland Provincial Park. Although the information presented here will supplement the information on representative vegetation, emphasis was placed on documenting communities that may be significant in a provincial context.

A literature review was done for sites with similarities to FGW, including sites in northern Alberta, northwestern Saskatchewan and the nearby Northwest Territories. This included both sites within the Canadian Shield Natural Region, as well as sites in other adjacent natural regions, as plant communities may occur in more than one natural region. Plant communities or habitats found through the literature review that have been documented as unusual in any way were considered community types of interest that potentially occur within FGW. Wherever possible these community types of interest were linked to landscapes that could be picked out as target areas on aerial photographs. The types of interest and target landscapes are listed in Appendix 1.

The Alberta Natural Heritage Information Centre Preliminary Plant Community Tracking List⁷ (TL) is a compilation of plant communities thought to be of restricted distribution in the province. Types known to occur in the Canadian Shield or Boreal Forest natural regions were also linked to a landscape, and are listed in Appendix 2.

In total, 29 unusual communities or habitats were identified as potentially occurring within the study area and linked to landscapes (Appendices 1 and 2). Aerial photographs for the Wildland Provincial Park were then reviewed and all landscapes with potential to include these unusual communities or habitats were marked as target areas. In addition, habitats that looked different or might include some unusual communities were also targeted. These included areas such as north or south facing cliffs and small water bodies that could provide habitat for aquatic communities.

As many target areas as possible were visited during the field program (July 16 - 26, 2001). Sites were reached by foot or by boat. At least one location of each of the target areas chosen through the preliminary air-photo investigation was surveyed. In most cases, unusual communities were not encountered.

When a plant community that might be unusual was encountered, a vegetation plot was subjectively placed in a homogeneous location. Site data and floristic composition were documented and the percent cover of each species visually estimated. General locations of detailed vegetation plots are marked as CT locations on Figure 1. Plot sizes were chosen appropriate to the physiognomy of the vegetation. They are as follows:

- 20 X 20 m for cover values of tree species in forested stands
- 10 X 10 m for shrublands and for understory estimates in forested stands
- 5 X 5 m for dwarf shrublands or grasslands

Specimens of difficult taxonomic groups or of unknown species were collected and identified in the camp or pressed for later identification. Scientific names for the most part follow Moss⁸, but have been updated to be consistent with the taxonomy used by the Alberta Natural Heritage Information Centre. When taxonomy other than Moss is used, the name found in Moss is included in parenthesis in the discussion of the community type (CT). Common names follow Ealey⁹.



shore and dunes (photo by K. Vujnovic)



outcrop / sand interface (photo by D. Vujnovic)



organic pocket in KU unit (photo by L. Allen)



open jack pine / lichen woodlands of AP unit (photo by J. D. Johnson)

Results

Table 1 summarizes the targeted landscapes that the literature suggested may include some unusual community types and that the aerial photograph review suggested might reasonably be expected to occur in FGW. Landscapes that might be expected to occur, but were not located during the aerial photograph review or field program, are also listed. Some of the landscapes listed in Appendix 2 are not included in this section, as they do not occur in FGW (e.g. communities associated with river terraces or saline seepages). If a community type (CT) was located that was considered potentially significant, it is noted in the observations column and documented in further detail in the following section. Other communities were noted, and are listed in Appendix 3.

Table 1. Target Landscapes	
Target Landscapes	Observations
Uplands	
Open graminoid slopes	No sites located on aerial photographs
Graminoid openings	No sites located on aerial photographs
Conifers on dunes	Sites visited, no unusual types noted
Dune blowouts	Sites visited, no unusual types noted
Shrubby forest openings	Sites visited, no unusual types noted
Aspen stands	Stands visited, no unusual types noted
Open pine stands	Stands visited, no unusual types noted
Spruce stands	Stands visited, no unusual types noted
Shorelines	
Rocky shoreline	Sites visited, no unusual types noted
Sandy shoreline	Sites visited, and two types documented (CT4. <i>Leymus (Elymus) mollis</i> – <i>Tanacetum bipinnatum</i> ssp. <i>huronense</i> sand dune community, CT5. Sandy beach complex)
Wetlands	
Graminoid wetlands on sand	Stands visited and three types documented (CT1. <i>Carex limosa</i> – <i>Scheuchzeria palustris</i> / <i>Sphagnum angustifolium</i> poor fen, CT2. <i>Carex oligosperma</i> – <i>Carex rostrata</i> / <i>Sphagnum angustifolium</i> poor fen, CT3. <i>Carex rostrata</i> - <i>C. chordorrhiza</i> / <i>Warnstorfia exannulata</i> poor fen)
Beaver ponds	Stands visited, no unusual types noted
Larix fen	No sites located on aerial photographs
Patterned fen	No sites located on aerial photographs
Shrubby fen	Sites visited, no unusual types noted
Small ponds of open water	Sites visited, no unusual types noted
Other targets	
North-facing cliffs	Sites visited, unusual moss species noted but more work needed to determine CT (see No. B1, Appendix 3)
South-facing cliffs	Sites visited, no unusual types noted
Small water bodies	Sites visited, one type documented (CT6. <i>Isoetes echinospora</i> submergent aquatic community)

Most landscape types visited did not support plant communities that were considered unusual. Although in some cases they may be a restricted community within the Wildland Provincial Park, they were similar to more widespread types outside the Park, and so were not documented in detail.

Those plant communities located that were potentially significant in a provincial context were documented, usually through plots, and are listed in the following section. Other types were just noted and are listed in Appendix 3. Future studies may show that some of the complexes or communities listed in Appendix 3 may also be significant, but more work is needed to better define these communities and assess their significance at a Provincial scale. The communities noted that are recommended for further study are given below, followed by their reference number from Appendix 3, in parentheses:

- *Carex utriculata* / *Limprichtia revolvens* rich fen (No. H5)
- Rock outcrop mosaic (H9)
- Stony beach complex (H10)
- Lichen crust (L1)
- North-facing rock outcrops (B1)
- *Salix planifolia* / *Myrica gale* - *Carex aquatilis* / *C. echinata* - *Scorpidium scorpioides* community (S8)
- *Salix planifolia* / *Myrica gale* / *Scirpus microcarpus* community (S9)
- *Betula papyrifera* / *Empetrum nigrum* - *Hudsonia tomentosa* / *Cladonia mitis* - *Cladonia* spp. community (W1)
- *Populus tremuloides* / *Vaccinium myrtilloides* - *Vaccinium vitis-idaea* community (W13)

Plant Communities Documented

Six plant community types (CT) of potential significance were documented. The general locations of the plots are given in Figure 1 and are listed beside each type. The types documented include:

Three wetland communities:

- CT1. *Carex limosa* – *Scheuchzeria palustris* / *Sphagnum angustifolium* poor fen
Mud sedge –scheuchzeria / peat moss poor fen
- CT2. *Carex oligosperma* – *C. rostrata* / *Sphagnum angustifolium* poor fen
Few-fruited sedge - beaked sedge / peat moss poor fen
- CT3. *Carex rostrata* – *C. chordorrhiza* / *Warnstorfia exannulata* poor fen
Beaked sedge - prostrate sedge / brown moss poor fen

Two herbaceous communities:

- CT4. *Leymus mollis* – *Tanacetum bipinnatum* ssp. *huronense* sand dune community
American dune grass - Indian tansy sand dune community
- CT5. Sandy beach complex

One aquatic community:

- CT6. *Isoetes echinospora* submergent aquatic community
Northern quillwort submergent aquatic community

Detailed information on each of the above is presented, followed by a discussion, an evaluation of the community's significance and brief recommendations.

**CT1. *Carex limosa* – *Scheuchzeria palustris* / *Sphagnum angustifolium* poor fen
Mud sedge –scheuchzeria / peat moss poor fen**

Location (Figure 1)

Fidler – Greywillow Wildland Provincial Park (UTMs in NAD 83)

Fen #2: UTM 12V 534703.61 Easting 6554064.16 Northing

Fen #4: UTM 12V 535366.39 Easting 6554365.78 Northing

Burntwood Fen: UTM 12V 521635.25 Easting 6532358.43 Northing

Site Description

The first site documented below (fen #2, Figure 2) is a poor fen found in a distinct depression, with some open water (about 2% cover). It is surrounded by a black spruce / common Labrador tea / rusty peat moss (*Picea mariana* / *Ledum groenlandicum* / *Sphagnum fuscum*) community. Fen #4 is in an enclosed basin behind a barrier dune. There are pockets of open water with flat-leaved bladderwort (*Utricularia intermedia*). The “Burntwood” fen (Figure 3) is found along the southern shore of Burntwood Island, behind a barrier dune. It is a floating fen, edging a small pond. The pond itself has an emergent vegetation ring, primarily made up of swamp horsetail (*Equisetum fluviatile*) and aquatic vegetation including yellow pond-lily (*Nuphar (variegatum) lutea*).



Fen 2 - photo by L. Allen

Comments

Poor fen #2 is being covered over by an expanding “bog cap” which is underlain by permafrost within meters of the edge of the fen. Barring extreme perturbation (a break in the shore dune or an extreme rise in the water level of the lake), it is likely that this poor basin fen will become a basin bog over time. All three fens are likely influenced by lake water, at least during high water levels. The brown moss (*Warnstorfia exannulata*) noted in fen #4 was primarily in the center of the wetland, indicating increasing wetness and more minerotrophic conditions than found in the main body of the fen.

Cover estimates were only done for fen #2; for the others, only presence (P) was noted.
 Plot: 5 X 5 m Date: July 18, 2001

Species Name		% Cover		
Scientific	Common	Fen #2	Fen #4	Burntwood Fen
Forbs				
<i>Drosera anglica</i>	Oblong-leaved sundew	1	-	P
<i>Menyanthes trifoliata</i>	Buck-bean	1	P	P
<i>Triglochin maritima</i>	Seaside arrow-grass	-	P	-
Graminoids				
<i>Carex chordorrhiza</i>	Prostrate sedge	-	P	P
<i>Carex lasiocarpa</i>	Hairy-fruited sedge	-	P	P
<i>Carex limosa</i>	Mud sedge	10	P	P
<i>Carex rostrata</i>	Beaked sedge	-	P	P
<i>Juncus stygius</i>	Marsh rush	1	-	P
<i>Scheuchzeria palustris</i>	Scheuchzeria	5	P	-
Bryophytes				
<i>Sphagnum angustifolium</i>	Peat moss	90	P	-
<i>Sphagnum</i> sp.		-	-	P
<i>Warnstorfia exannulata</i>	Brown moss	-	P	-

Discussion

Although not noted in the sample plot, hairy-fruited sedge, prostrate sedge and beaked sedge were also present in fen #2. These three sites have been included in one CT description because of the similarities in the sedge component, however there were some differences. Marsh rush was abundant in both fen #2 and the Burntwood fen, but missing from fen #4. Fen #4 had much less mud sedge than the other two fens. Also, scheuchzeria was not observed in the Burntwood fen.

There are two mud sedge – scheuchzeria / peat moss fen types on the preliminary plant community tracking list⁷: *Carex limosa* - *Scheuchzeria palustris* / *Sphagnum majus* - *S. jensenii* - *S. riparium* from the Upper Foothills Natural Subregion, and *Carex limosa* - *Scheuchzeria palustris* / *Sphagnum teres* - *S. subsecundum* known from subhydric quaking wetlands of the Dry Mixedwood Boreal Forest Natural Subregion.

Poor fens, with a species composition similar to CT1 (but never with marsh rush), occur with somewhat greater frequency in Saskatchewan¹⁰, but are not common.

Significance

This poor fen includes species not common in Alberta (scheuchzeria is an S3 species; marsh rush and beaked sedge are S2 species¹¹). Fens such as these are likely relatively uncommon in Alberta, however significance is unknown as further work is needed to sort out the poor fen types.

Recommendation

Poor fens are not common in FWG and should be considered significant features within the park. They have an additional significance in that they include provincially rare species. More study is needed to define CTs, to determine their relationships with other types of poor fens in Alberta and to assess their status in a provincial context. The water chemistry should be investigated and compared to that of other poor fens in the region.

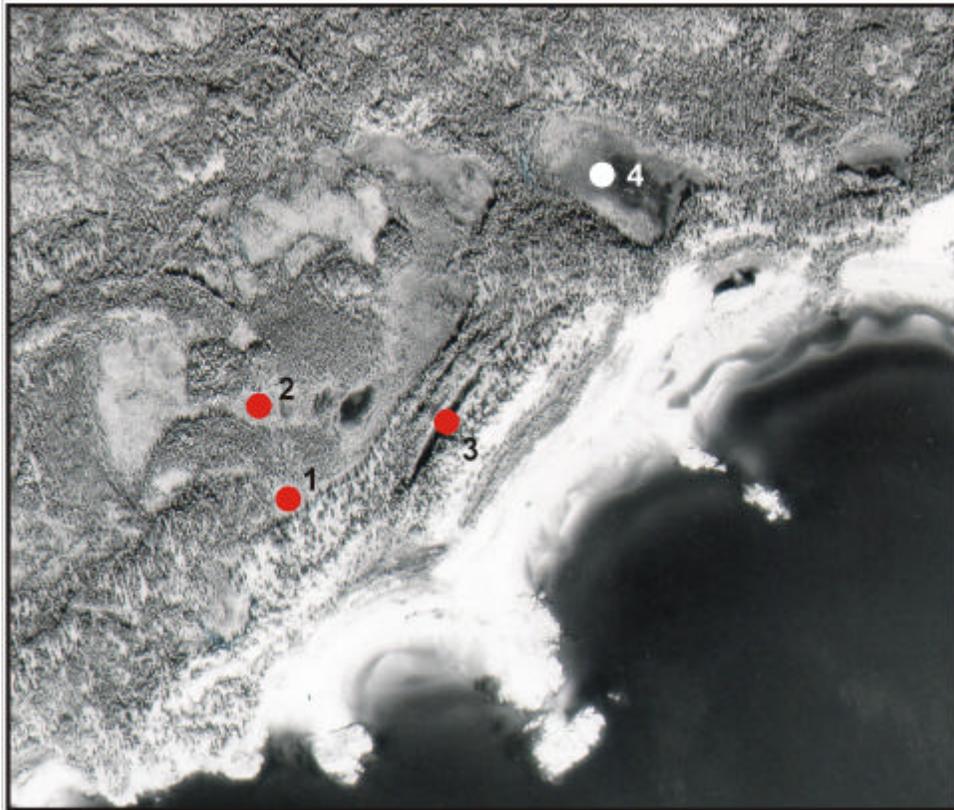


Figure 2. Fen complex

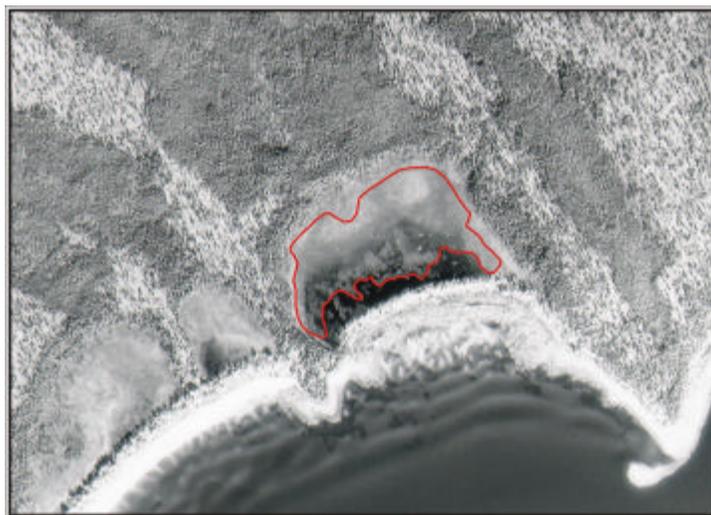


Figure 3. Burntwood Island Fen

**CT2. *Carex oligosperma* – *Carex rostrata* / *Sphagnum angustifolium* poor fen
Few-fruited sedge - beaked sedge / peat moss poor fen**

Location (Figure 1)

Fidler – Greywillow Wildland Provincial Park

UTM 12V 534846.48 Easting 6553996.69 Northing (NAD 83)

Site Description

This poor fen is located in a sandy basin behind a beach ridge (Fen #1, Figure 2). It is a small extension of a larger wetland. The water table is at or near the surface.



photo by K. Vujnovic

Comments

Although back from the lake and behind the dune ridge, the basin is low enough that it is likely influenced by lake water, at least during high water levels. The site that was looked at had “islands” with leatherleaf (*Chamaedaphne calyculata*), common and northern Labrador tea (*Ledum groenlandicum*, *L. palustre*), cloudberry (*Rubus chamaemorus*) and northern laurel (*Kalmia polifolia*). Although the islands are not permafrost related at the present time, this is where permafrost could form, given time. Ultimately the fen would be covered with a “bog cap.”

Cover estimates were not done for this CT; only dominance (D) or presence (P) was noted.

Date: July 18, 2001

Species		Cover
Scientific	Common	Fen #1
Graminoids		
<i>Carex oligosperma</i>	Few-fruited sedge	D
<i>Carex rostrata</i>	Beaked sedge	D
<i>Carex utriculata</i>	Small bottle sedge	P
Bryophytes		
<i>Sphagnum angustifolium</i>	Peat moss	D

Discussion

A similar community, the few-fruited sedge / peat moss (*Carex oligosperma* / *Sphagnum subsecundum*) poor channel fen has been documented in the Richardson River Dunes Wildland Provincial Park (RRD)¹². The RRD community type is almost totally dominated by the two named species and was found several times, but only on a specific habitat – sand substrate with seepage at or near the surface. The wettest portions of the channel fens at RRD had some brown moss (*Warnstorfia exannulata*).

The few-fruited sedge - beaked sedge / peat moss CT found at FGW is also a poor fen found on a sand substrate with seepage at or near the surface. However, the RRD type was found in seepage channels, whereas the FGW type is in an enclosed basin. The FGW CT does likely receive input of minerotrophic water through seepage; otherwise a basin bog would be expected. The dominance of totally different species of mosses and a co-dominance of beaked sedge in the FGW CT separate the two types and suggest that despite the similarity of substrate, the water chemistry can be expected to be quite different.

Significance

This poor fen is dominated by species not common in Alberta (few-fruited sedge is an S1S2 species and beaked sedge is an S2 species¹¹). Fens such as these are likely uncommon in Alberta, however significance is unknown as further work is needed to sort out the poor fen types.

Recommendation

Poor fens are not common in FWG and should be considered significant features within the park. This site has additional significance in that it includes two provincially rare plant species. Further locations should be documented to define CTs and to determine their relationships with other types of poor fens in Alberta in order to assess their status in a provincial context. The water chemistry should be investigated and compared between this and the RRD type.

**CT3. *Carex rostrata* - *C. chordorrhiza* / *Warnstorfia exannulata* poor fen
Beaked sedge - prostrate sedge / brown moss poor fen**

Location (Figure 1)

Fidler – Greywillow Wildland Provincial Park

UTM 12V 535149.22 Easting 6553919.23 Northing (NAD 83)

(NE edge of the wetland)

Site Description

The zonation of the sandy shoreline in this area includes a distinct beach ridge several meters high, well back from the lakeshore. This poor fen is a long, narrow wetland (ca 20 x 150 m) between the dune ridge and a smaller dune behind (fen #3, Figure 2). It has a sandy substrate and the water table is at or near the surface.



photo by L. Allen

Comments

Aerial photographs show standing water in the 1970s, but our survey found a graminoid wetland with peat moss (*Sphagnum fuscum*) hummocks common.

Plot: 5 x 5 m

Date: July 18, 2001

Species		Cover
Scientific	Common	Fen #3
Graminoids		
<i>Carex chordorrhiza</i>	Prostrate sedge	5
<i>Carex rostrata</i>	Beaked sedge	30
Bryophytes		
<i>Warnstorfia exannulata</i>	Brown moss	80

Discussion

Beaked sedge appears to be more abundant in the northern than in the southern portion of the wetland. Peat moss seems to be replacing the brown moss in the southern part of the wetland, possibly responding to a difference in water regime or chemistry. Small bottle sedge (*Carex utriculata*) also occurs sporadically in the southern portion.

Although this fen is physically separate from the other poor fens discussed in this report (CT1 and CT2), they are all on a sand substrate and close enough together that groundwater seeping through the sand may interconnect them all.

Significance

This poor fen is dominated by beaked sedge, a species not common in Alberta (ranked S2¹¹). Fens such as these are likely uncommon in Alberta, however significance is unknown as further work is needed to sort out the poor fen types.

Recommendation

Poor fens are not common in FWG and should be considered significant features within the park. This site has additional significance in that it includes a provincially rare plant species. Further locations should be documented to define CTs and to determine their relationships with other types of poor fens in Alberta in order to assess their status in a provincial context. The water chemistry should be investigated and compared to that of other poor fen types in the region.

CT4. *Leymus (Elymus) mollis* – *Tanacetum bipinnatum* ssp. *huronense* sand dune community
American dune grass - Indian tansy sand dune community

Location (Figure 1)

Fidler – Greywillow Wildland Provincial Park

Plot: UTM 12V 547195.61 Easting 6564262.29 Northing (NAD 83)

Site description

The American dune grass - Indian tansy sand dune community is found on slightly exposed lake beaches. It occurs on low, stabilizing, discontinuous dunes, located above the active wave zone and behind an area of unvegetated, dry blowing sand.



photo by K. Vujnovic

Comments

This is early pioneer vegetation with up to 60% bare sand and subject to blowing sand. The percent cover of Indian tansy ranged from very low (less than 2%) to up to 50% of the overall vegetation cover at different locations along the shore. One plot was done at the northeast edge of the park (CT4, Figure 4), but several other locations of the CT were noted (Figure 4). Comparable communities were noted by Raup³ at Shelter Point and by Jonker and Rowe¹³ on the south shore of Lake Athabasca in Saskatchewan. Information from these reports is included in the table below, as presence (P) and in some cases dominance (D).

Plot: 5 X 5 m

Date: July 20, 2001

Species		Cover		
Scientific	Common	FGW plot	Shelter Point ³	S shore L. Athabasca ¹³
Shrubs				
<i>Betula neoalaskana</i>	Alaska birch seedlings	-	P	-
<i>Empetrum nigrum</i>	Crowberry	-	P	-
<i>Juniperus</i> seedlings	Juniper seedlings	-	P	-
<i>Salix</i> seedlings	Willow seedlings	-	P	P
Forbs				
<i>Artemisia campestris</i>	Northern wormwood	-	-	P
<i>Stellaria longipes</i>	Long-stalked chickweed	2	P	P
<i>Tanacetum bipinnatum</i> ssp. <i>huronense</i>	Indian tansy	2	P	P
Graminoids				
<i>Bromus inermis</i> var. <i>pumpellianus</i>	Awnless brome	1	D	-
<i>Leymus (Elymus) mollis</i>	American dune grass	25	D	P
<i>Festuca rubra</i>	Red fescue	+	D	P

Discussion

American dune grass is the dominant species in this CT, with Indian tansy being a constant species. Raup's³ "small dune" community at Shelter Point and Jonker and Rowe's¹³ "foredune" community on the south shore of Lake Athabasca in Saskatchewan appear to be examples of the same CT. An increased number of species in the dwarf and low shrub layers in the Shelter Point community suggest that the occurrence may be older, so additional species have had time to root as a result of the stabilizing effect of the grasses.

American dune grass, awnless brome and red fescue have been described as primary species responsible for the creation of "Cushion Dunes" of the inland active sand dune areas in Saskatchewan¹⁴. Individuals or small groups of other species, including Indian tansy and long-stalked chickweed, were reported growing scattered among the grasses. It is not clear whether some of these "Cushion Dunes" may be considered equivalent to CT4.

Another similar dune community, American dune grass (also called sea lyme-grass) – yellow sand verbena (*Leymus mollis* – *Abronia latifolia*) is widespread on coastal dunes from California to BC. It is a CT that has been highly degraded as invasion by non-native species has caused stabilization of the dunes and reduced movement of the sand¹⁵.

The American dune grass - Indian tansy sand dune community occurs on sandy shores, the types of sites most likely to be impacted by campers. A change in the balance between disturbance and stabilization of the sand would be expected to have a negative impact on this community.

Significance

Both American dune grass (S1) and Indian tansy (S2) are rare species in Alberta¹¹, so the community itself also appears to be rare. American dune grass is known only from the north shore of Lake Athabasca in Alberta, but is somewhat more common in Saskatchewan (rank S2¹⁵). It is found on the south shore of Lake Athabasca on the Saskatchewan side, at times forming communities comparable to this American dune grass - Indian tansy sand dune community.

This community reoccurs in numerous locations with appropriate habitat along the north shore of Lake Athabasca in Alberta and possibly along the south shore, as it has been documented along the south shore in Saskatchewan. It is regionally very restricted. In addition, this community grows in vulnerable locations and is most likely sensitive to changes in disturbance regime.

Recommendation

The American dune grass - Indian tansy sand dune community should be recognized as a community of provincial significance and recommended for addition to the Alberta Preliminary Plant Community Tracking List with a proposed rank of S1. It should be recognized as a sensitive and significant element in FGW Wildland Provincial Park.

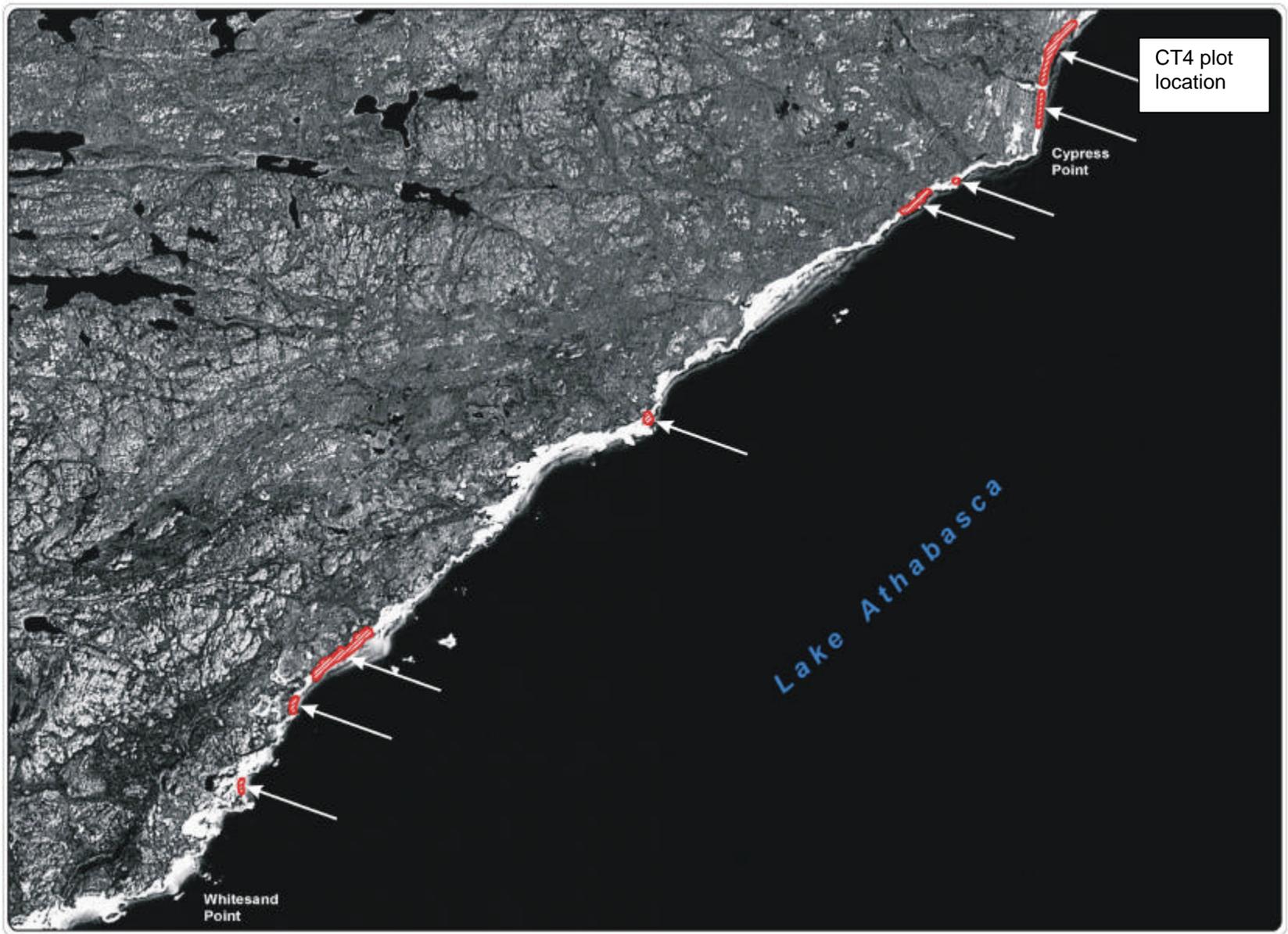


Figure 4. CT4 plot and occurrence locations

CT5. Sandy Beach Complex

Location (see Figure 1)

Fidler – Greywillow Wildland Provincial Park

Site described: UTM 12V 533342.32 Easting 6552306.00 Northing (NAD 83)

Site Description

The sandy beach complex was found in protected bays with sandy beaches and a shallow shore. The complex of vegetation reflects a series of roughly linear habitats. These appear to correspond to the effects of wave action, sand movement and dune formation. Moving inland from moist wave-washed sands, to moist sands past the main wave push area, there is an area of low dunes of dry sand. The low dunes alternate with shallow depressions of moist sands, then finally there are areas of dry sand leading to either outcrops or sand plains, behind the beach area.



photo by L. Allen

Comments

There were a series of linear strings of species that varied little between protected sandy bays. A plot was not done in this complex, but one site was looked at in detail (UTM provided above and marked as CT5 on Figures 1 and 5). It showed the following pattern, moving inland from the water:

- Barren, wave-washed sand at the water's edge.
- A narrow line of wire rush (*Juncus balticus*) just past the wave push area in damp sand. This zone may be subject to periodic sand deposition².
- Alpine rush (*Juncus alpinoarticulatus*) and short-tail rush (*J. brevicaudatus*) in dry sand of low dunes, slightly above the water table.
- A wire rush – water sedge (*Juncus balticus* - *Carex aquatilis*) complex in a slight depression behind the first low dune area.
- Shallow dunes with alpine rush followed by a small depression with wire rush – water sedge then another alpine rush dune.
- A stretch of dry sand with alpine rush, willow and aspen seedlings and tufted hair grass (*Deschampsia caespitosa*).
- Open dry sand, leading to a rock outcrop.

Discussion

Beach communities detailed by Raup³ at Shelter Point showed less complex patterns than those described here. Possibly the beaches he studied were less sheltered. Heavier or more frequent wave action would be expected to be less suitable for plant community development. CT4, the American dune grass - Indian tansy (*Leymus mollis* - *Tanacetum bipinnatum* ssp. *huronense*) sand dune community was also found in sandy bays, but occurred on low, stabilizing dunes, located on slightly more exposed sites than the sheltered bays described above.

The sandy beach complex is found in protected sandy bays; the types of sites most likely to be negatively impacted by visitors and campers (good boat landing and campsite areas).

Significance

Beach complexes similar to this were found in several of the more sheltered bays (Figure 5). Wire rush – water sedge on sandy shorelines has been reported in Wood Buffalo National Park¹⁶. A more detailed study of the complex is needed before significance can be assessed. The complex does however frequently include rare species such as short-tailed rush (ranked S2¹¹) and sandy shorelines with significant vegetation cover are thought to be uncommon in the Kazan Upland⁵.

Recommendation

The sheltered bays with these beach complexes should be recognized as sensitive features within FGW Wildland Park and as habitat for significant species. Further study is needed to characterize the plant communities that make up the complex and to assess their significance.

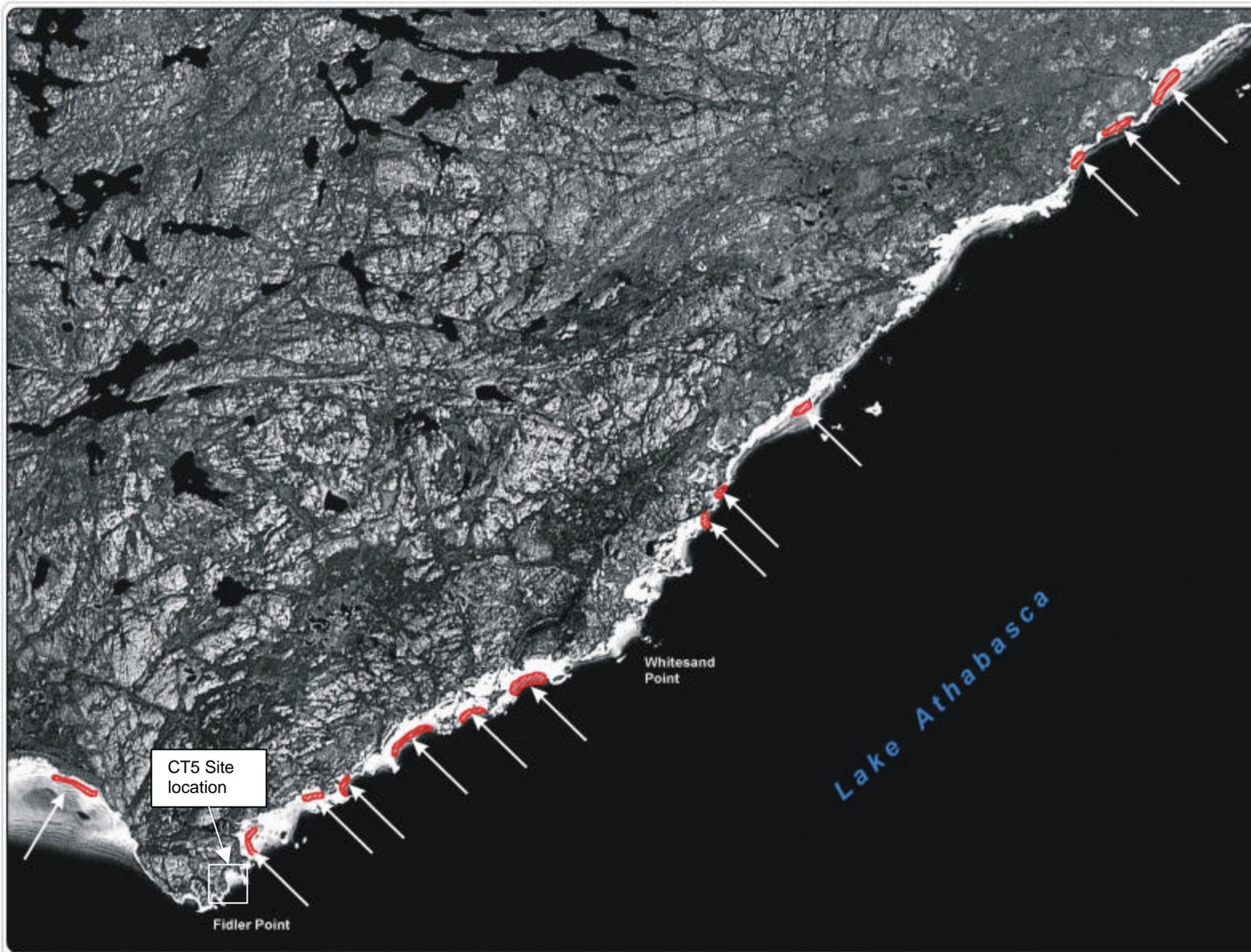


Figure 5. CT5 site and occurrence locations

**CT6. *Isoetes echinospora* submergent aquatic community
Northern quillwort submergent aquatic community**

Location

Fidler – Greywillow Wildland Provincial Park
UTM 12V 516843.28 Easting 6517189.48 Northing (NAD 83)

Site description

The northern quillwort submergent aquatic community was growing along the east side of the largest lagoon on Bustard Island. It was found in a band close to the shoreline, on a sandy substrate in water from 0-30 cm deep. The band stretched for the length of the shore area examined (about 30 m). The extent of suitable habitat suggests that this community most likely inhabits sands in shallow water around the entire lake.

Comments

Northern quillwort is by far the dominant species. Seedlings of other aquatic species, primarily arum-leaved arrowhead (*Sagittaria cuneata*), strands of water milfoil (*Myriophyllum* sp.) and pondweeds (*Potamogeton* spp.), and some white water crowfoot (*Ranunculus aquatilis*) are the only other species noted. Close to the shoreline, there is considerable plant refuse intermingled with the quillwort, most likely deposited by waves off the lagoon. The consistency of the water depth in which the northern quillwort was growing was striking.

Discussion

Raup and Argus¹⁴ noted that the Lake Athabasca region is poor in aquatic plants, probably because all the bays along the lake are subject to wave and ice action. They did note aquatic plants in lagoons behind raised beaches, which is the type of habitat CT6 was found in. FGW has few such lagoons, so it is unlikely that additional occurrences will be found within the park.

Significance

The northern quillwort submergent aquatic community is currently on the preliminary plant community tracking list⁷, ranked S1. The dominant species of the community, northern quillwort, is also considered rare in Alberta (ranked S1)¹¹. In addition, the large lagoon on Bustard Island is likely the only location for this CT in FGW.

Recommendation

The northern quillwort submergent aquatic community is recognized as a community of provincial significance. It should be recognized as an element of provincial significance in FGW Wildland Provincial Park.

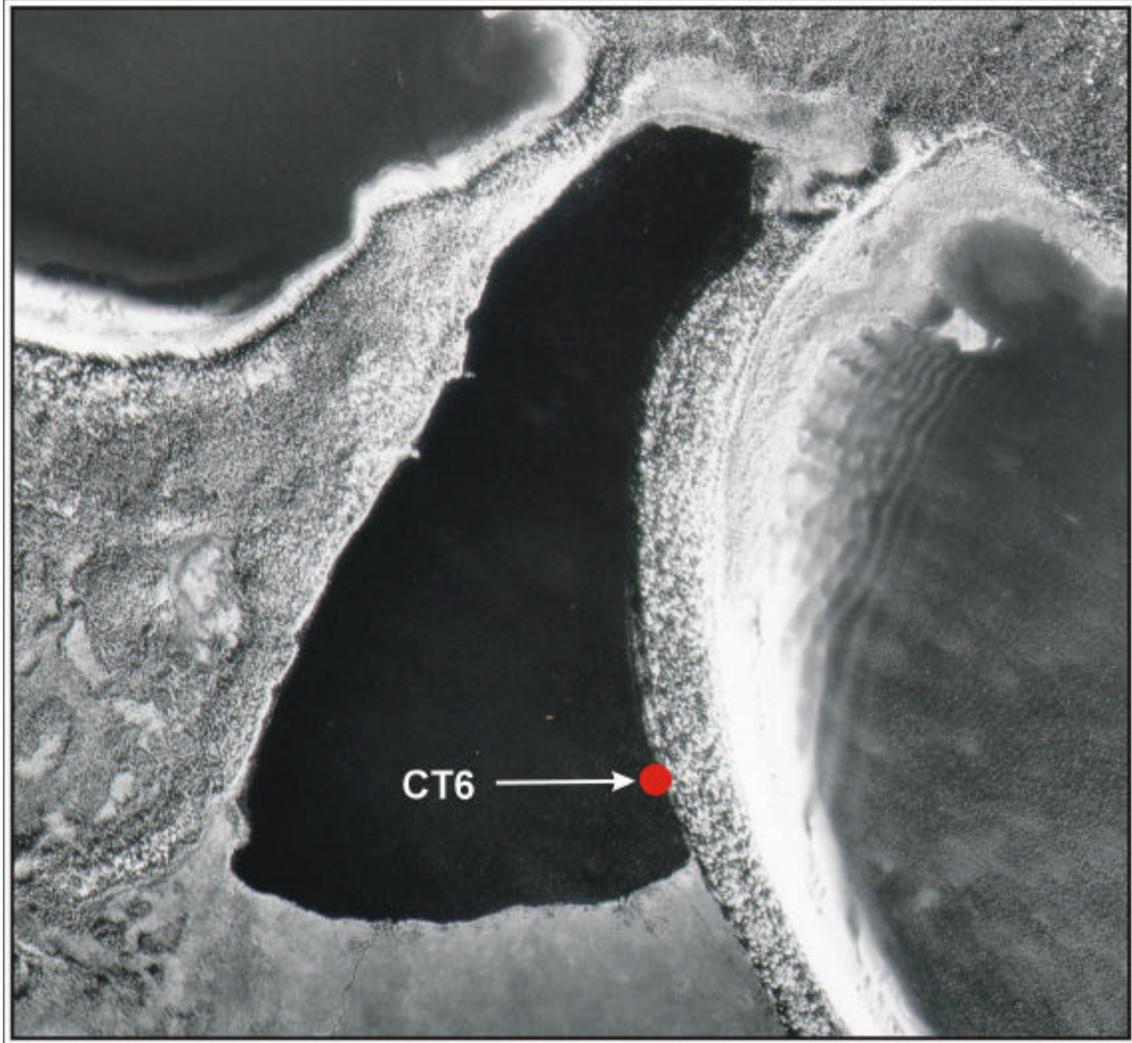


Figure 6. CT6 occurrence location

Discussion

Fidler – Greywillow Wildland Provincial Park can be roughly divided into two main landscape units:

- the Athabasca Plains unit, including the shoreline and beach communities of the islands and the north shore of Lake Athabasca, as well as areas of sand plains behind the shore, and
- a series of rock ridges and wetlands of the Kazan Upland unit.

Each unit has characteristic vegetation and species restricted to it.

The Athabasca Plains unit is made up of relatively few plant communities. The main community groups for this unit include:

- extensive jack pine, or sometimes black spruce woodlands, on sand plains
- birch, aspen, spruce or pine on vegetated dune ridges
- pioneer crowberry, sand heather or lichen communities on dune blowouts
- mesic sites with a mixed stand of jack pine, paper birch and black spruce
- organic wetlands dominated by black spruce, occasionally mixed with tamarack (*Larix laricina*), and a diverse shrub layer
- shrubby peatlands dominated by bog birch (*Betula glandulosa*), leatherleaf and common Labrador tea (*Ledum groenlandicum*)
- shrublands associated with swales and creek outlets
- graminoid wetlands, usually on sandy substrates
- rocky and sandy shoreline communities

Raup and Argus¹⁴ noted that graminoid wetlands on sand are quite localized in the region. Several were looked at in FGW, but they were found to be extremely variable. More work is needed to characterize them. The authors also noted that the region is poor in aquatic plants and few aquatic plant communities were noted. There is, however, one aquatic CT that is on the preliminary plant community tracking list and has been documented within this landscape unit: CT6 Northern quillwort submergent aquatic community. CT6 is located in the large lagoon on the east side of Bustard Island.

Large areas of the shoreline are unvegetated or only sparsely vegetated. Areas that are vegetated tend to show complex patterns, probably related to effects of wind, wave and ice. In most cases, the complexes of beaches, ridges and swales require detailed study to define plant community types. One, however, CT4 American dune grass - Indian tansy sand dune community is a recurring type that is likely rare in the provincial context. Raup and Argus¹⁴ noted some unusual small patch communities associated with dune formations, and the dune ridges found in FGW did have some plant communities not found elsewhere in the Wildland Provincial Park. These include, for example, white spruce, birch and lichen types associated with dune crests and blowouts (see Appendix 3, types L1, S4, S5, W1, W2). None, however, were considered to be significant on a provincial scale.

In their overview of the Kazan Upland Natural Subregion, Wallis and Wershler⁵ concluded that there are relatively few plant communities in this subregion. They broke them down into:

- rock outcrops
- jack pine woodlands on sandy plains and rocky hills
- deciduous woodlands
- black spruce bogs
- sedge marshes in wet depressions and
- swamps of willow, larch and black spruce

Given the simplicity of the regional vegetation, it is not surprising that few small patch communities of significance were noted in this unit. Detailed work, however, is needed to document the complex mosaic of plant communities on rock outcrops. It is likely that some small patch communities, particularly those on north-facing cliff faces, may be significant in the provincial context. Also, deciduous woodlands are generally not extensive in the area. It is possible that some of the deciduous community types may be restricted in distribution, but more work is needed to define types and to determine significance.

Recommendations

One plant community type documented in this study is recommended for addition to the Alberta Natural Heritage Information Centre Preliminary Plant Community Tracking List:

CT4. *Leymus mollis* – *Tanacetum bipinnatum* ssp. *huronense* sand dune community
American dune grass - Indian tansy sand dune community

This community type is probably rare in the Alberta context and should be considered a special and sensitive feature within FGW. Further studies to document additional occurrences are also recommended.

One plant community type documented in this study is on the TL⁷ and is considered rare in Alberta:

CT6. *Isoetes echinospora* submergent aquatic community
Northern quillwort submergent aquatic community

The large lagoon on Bustard Island is likely the only occurrence of this CT in the park and should be considered a special and sensitive feature within FGW. In addition, the largest poor fen complex noted within the Canadian Shield Wildland Parks is found just south of the lagoon. The horseshoe bay from shoreline, to beach ridge, to lagoon and including the large poor fen complex should be recognized as a special feature within FGW.

The other community types documented in detail in this report (CT1, CT2, CT3 and CT5) are all small patch communities that add to the diversity of the park, and should be considered special features within FGW. However, further work is needed to determine their significance in the provincial context.

Further work is recommended for several community types or groupings of communities noted during the course of this study, as follows:

- Detailed work on shoreline communities, including both sandy beach complexes and rocky shores (CT5 and type H10 in Appendix 3).
- Aquatic communities in Alberta generally need better documentation.
- The rich fens of shield / shore interface need to be looked at more closely. Rich fens are common in Alberta, but there may be some types restricted to the region. One site is discussed in Appendix 3, type H6.
- More work is needed to document and classify shield outcrop CTs in Alberta (including types H9, L2 and B1 in Appendix 3).
- More work is needed to document the lichen crust CT that seems to be an early colonizer of open sand (type L1 in Appendix 3).
- More work is needed to characterize the willow – sweet gale shrublands found along the shoreline of Lake Athabasca as there may be some types restricted to the region (types S6, S8 and S9 in Appendix 3).

- Birch stands are not well documented in the province and further work is needed to determine if there are some provincially significant CTs.
- Aspen woodlands are generally not extensive in the area, but more work is needed as there may be some types restricted to the region.

Conclusion

This study concentrated on documenting small patch communities of Fidler – Greywillow Wildland Provincial Park. Two provincially significant plant communities were documented and other significant and sensitive communities noted. Significant information gaps still remain on this aspect of the biodiversity of the wildland provincial park, and further work is recommended.

Acknowledgements

We would like to thank Drajs Vujnovic for developing the figures for this report.

References Cited

1. Anderson, M., P. Comer, D. Grossman, C. Groves, K. Poiani, M. Reid, R. Schneider, B. Vickery, and A. Weakley. 1999. Guidelines for representing ecological communities in ecoregional conservation plans. The Nature Conservancy, Arlington VA. 74 pp.
2. Fairbarns, M, P. Lee and C.W. Wallis. 1984. Notes from field work in the Fidler Point area. Files of Parks and Protected Areas, Alberta Community Development, Edmonton, Alberta.
3. Raup, H.M. 1928. A survey of the vegetation of Shelter Point, Athabasca Lake. University of Pittsburgh, Pittsburgh, Pennsylvania. 53 pp.
4. Green, R., G.B. Mellon and M.A. Carrigy. 1970. Bedrock geology of northern Alberta, NTS 84 and NTS 74D, 74E, 74L and 74M. Map 024, Alberta Geological Survey Reports.
5. Wallis, C.W. and C. Wershler. 1984. Kazan Upland resource assessment for ecological reserves planning in Alberta. Alberta Energy and Natural Resources, Edmonton, Alberta.
6. Raup, H.M. 1946. Phytogeographic Studies in the Athabaska-Great Slave Lake Region, II. *Journal of the Arnold Arboretum* (1946) Vol. XXVII, No. 1, 85 pp.
7. Allen, L. 2002. Alberta Natural Heritage Information Centre preliminary plant community tracking list. Alberta Community Development, Edmonton, Alberta.
8. Moss, E.H. 1983. *Flora of Alberta* (2nd edition). Revised by J.G. Packer. University of Toronto Press, Toronto, Ontario.
9. Ealey, D. 1993. Alberta plants and fungi - master species list and species group checklist. Alberta Energy, Forestry, Lands and Wildlife, Edmonton, Alberta.
10. Zoltai, S.C., R.M. Siltanen, and J.D. Johnson. 2000. A wetland data base for the western boreal, subarctic, and arctic regions of Canada. *Nat. Resour. Can., Can. For. Serv., North. For. Cent.* Information Report NOR-X-368. Disk.
11. Vujnovic, K. and J. Gould. 2002. Alberta Natural Heritage Information Centre Tracking and Watch Lists — Vascular Plants, Mosses, Liverworts and Hornworts. Alberta Community Development, Parks and Protected Areas Division, Edmonton, Alberta.
12. Allen, L. and J. D. Johnson. 2000. Potentially trackable small patch communities of the Maybelle Dunes, Richardson River Dunes and Marguerite Crag and Tail wildland parks. A report prepared for Parks and Protected Areas, Alberta Community Development, Edmonton, Alberta.
13. Jonker, P.M., and J.S. Rowe. 2001. *The sand dunes of Lake Athabasca: your adventure in learning.* University Extension Press, University of Saskatchewan, Saskatoon, Saskatchewan. 194 pp.
14. Raup, H.M. and G. W. Argus. 1982. The Lake Athabasca sand dunes of northern Saskatchewan and Alberta, Canada. 1. The land and vegetation. *Publications in Botany*, No. 12, National Museum of Natural Sciences, Ottawa, Ontario. 96 pp.

15. NatureServe Explorer: An online encyclopedia of life [web application]. 2002. Version 1.6, Arlington, Virginia, USA: NatureServe. Available: <http://www.natureserve.org/explorer>.
16. Raup, H.M. 1935. Botanical investigations in Wood Buffalo Park. Bulletin No. 74, Biological Series, No. 20. Canada Dept. of Mines and National Museum of Canada, Ottawa, Ontario. 174 pp.
17. Fairbarns, M. 1990. The salt meadows of northwestern Alberta: a reconnaissance biophysical inventory. Alberta Forestry, Lands and Wildlife, Edmonton, Alberta. 25 pp.
18. Allen, L., J. D. Johnson and K. Vujnovic. 2002. Small patch communities of La Butte Creek Wildland Provincial Park. A report prepared for Parks and Protected Areas, Alberta Community Development, Edmonton, Alberta.
19. Moss, E.H. 1953. Marsh and bog vegetation in Northwestern Alberta. *Can.J. Botany* 31:448-470.
20. Stringer, P.W. 1976. A preliminary vegetation survey of the Alberta Oil Sands Environmental Research Program study area. Alberta Oilsands Environmental Research Program.
21. Dirschl, H.J. 1973. Trends in vegetation succession in the Peace-Athabasca Delta. The Peace-Athabasca Delta Project technical appendices Volume 2, 1973, ecological investigations. A cooperative intergovernmental study established by the environmental ministers of Canada, Alberta and Saskatchewan.
22. Meijer, M. 2002. Vegetation communities of Marguerite Crag and Tail Wildland Provincial Park. Prepared for Parks and Protected Areas, Alberta Community Development, Lac La Biche, Alberta. 46 pp.
23. Hastings, R.I. and R.A. Ellis. 1990. Environment, vegetation and flora of the Andrew Lake area, northeastern Alberta. In McGillivray and Hastings. 1990. Natural history of the Andrew Lake region, Northeastern Alberta. Natural History Occasional Paper No. 12. Provincial Museum of Alberta, Edmonton, Alberta. 97 pp.
24. Beckingham, J.D., D.G. Nielsen and V.A. Futoransky. 1996. Field guide to ecosites of the Mid-Boreal Ecoregions of Saskatchewan. Natural Resources Canada, Canadian Forest Service. Northern Forestry Centre, Edmonton, Alberta. Special Report 6.
25. Beckingham, J.D. and J.H. Archibald. 1996. Field guide to ecosites of Northern Alberta. Natural Resources Canada, Canadian Forest Service. Northern Forestry Centre, Edmonton, Alberta. Special Report 5.
26. Meijer, M. 2002. Vegetation communities of Maybelle River Wildland Provincial Park. Prepared for Parks and Protected Areas, Alberta Community Development, Lac La Biche, Alberta. 31 pp.
27. Snyder, J. and P.M. Woodard. 1992. Lichen regeneration rates in Alberta following various types of logging and wildfire disturbance. Unpublished report.

Appendices

Appendix 1. Unusual communities or habitats that potentially occur in northeastern Alberta (based on literature review)

Community	Reason*	Landscape
Grassy, south/southwest-facing slopes	Restricted habitat ⁵	Open, south/southwest-facing slopes
Salt meadow	Restricted to a few sites ¹⁷	Graminoid openings, may have unvegetated patches
Grasslands	Restricted in extent ¹⁶	Graminoid openings
Spruce – Pine old growth	Noted in only a few locations ¹⁴	Large conifers on stabilized dune ridges
Park-like white spruce by blowouts	Noted in only a few locations ¹⁴	Dune blow outs with conifers
Spruce stands on floodplains	Limited to small, local areas ¹⁴	Riparian spruce on river terraces
Grass – sedge meadow on sand	Highly localized ¹⁴	Small graminoid wetlands among dunes
Stony shore	Minor habitat ¹⁴	Rocky shorelines
Sandy shore	Few vegetated sandy shores ⁵	Sandy shorelines
Sandstone ledges	Almost non-existent in study area ¹⁴	Sharp breaks

* as given in the reference cited

Appendix 2. Communities on the Preliminary Plant Community Tracking List that occur in the Canadian Shield and Boreal Forest Natural Regions

Community		SRank	Landscape
Scientific name	Common name		
Communities of Upland Landscapes			
<i>Amelanchier alnifolia</i> / <i>Arctostaphylos uva-ursi</i> / <i>Oryzopsis pungens</i>	saskatoon / common bearberry / northern rice grass	S2S3	Shrubby forest openings
<i>Picea glauca</i> / <i>Cetraria islandica</i>	white spruce / lichen	S1	Open stands, sandy knolls
<i>Populus tremuloides</i> / <i>Rubus parviflorus</i> / <i>Aralia nudicaulis</i>	aspen / thimbleberry / wild sarsaparilla	S2S3	Aspen stands
Communities of Riparian Landscapes			
<i>Picea glauca</i> / <i>Alnus tenuifolia</i> – <i>Betula neoalaskana</i> / <i>Equisetum pratense</i> / <i>Hylocomium splendens</i>	white spruce / river alder - Alaska birch / meadow horsetail / stair-step moss	S3	Spruce stands, river terraces
<i>Populus balsamifera</i> / <i>Alnus tenuifolia</i> / <i>Cornus stolonifera</i> / <i>Equisetum pratense</i>	balsam poplar / river alder / red-osier dogwood / meadow horsetail	S3	Deciduous stands, river terraces

Appendix 2. Continued

Community		SRank	Landscape
Scientific name	Common name		
<i>Populus balsamifera</i> / <i>Rhamnus alnifolia</i> / <i>Equisetum arvense</i>	balsam poplar / alder-leaved buckthorn/common horsetail	S1	Riparian deciduous stands
<i>Populus balsamifera</i> / <i>Viburnum opulus</i> / <i>Matteuccia struthiopteris</i>	balsam poplar / high-bush cranberry / ostrich fern	S1S2	Deciduous stands, river terraces
<i>Populus tremuloides</i> / <i>Salix bebbiana</i> - <i>Corylus cornuta</i> / <i>Calamagrostis canadensis</i> – <i>Matteuccia struthiopteris</i>	aspen / Bebb's willow - beaked hazelnut / bluejoint - ostrich fern	S1	Riparian deciduous stands
<i>Salix drummondiana</i> / <i>Scirpus microcarpus</i> – <i>Calamagrostis canadensis</i>	Drummond's willow / small-fruited bulrush - bluejoint	S1	Riparian shrubland
Wetland Communities			
<i>Andromeda polifolia</i> / <i>Sarracenia purpurea</i> / <i>Sphagnum angustifolium</i>	bog rosemary / pitcher-plant / peat moss	S1S2	Shrubby fen around small pools
<i>Carex limosa</i> – <i>Scheuchzeria palustris</i> – <i>Sphagnum majus</i> / <i>S. jensenii</i> / <i>S. riparium</i>	mud sedge - scheuchzeria / peat moss	S1	Patterned fen
<i>Carex oligosperma</i> / <i>Sphagnum subsecundum</i>	few-fruited sedge / twisted bog moss	S1S2	Channel fen on sand
<i>Carex pseudocyperus</i> - <i>Calla palustris</i>	cypress-like sedge - water arum	S1S2	Beaver ponds, ponds with open water
<i>Chamaedaphne calyculata</i> - <i>Kalmia polifolia</i> / <i>Cladina mitis</i>	leatherleaf - northern laurel / green reindeer lichen	S1S2	Channel fen on sand
<i>Isoetes echinospora</i>	northern quillwort	S1	Small water bodies with sandy shorelines
<i>Larix laricina</i> / <i>Carex prairea</i>	tamarack / prairie sedge	S1	Larix fen
<i>Puccinellia nuttalliana</i> – <i>Suaeda calceoliformis</i> – <i>Spergularia marina</i> barren	Nuttall's salt-meadow grass - western sea-blite - salt-marsh sand spurry barren	S2	Saline seepage
<i>Salicornia europaea</i>	samphire	S2	Saline seepage
<i>Salix athabascensis</i> string shrubland	Athabasca willow string shrubland	SP	Patterned fen

Appendix 3. Additional plant communities noted in FGW

No.	Community	Description	Comments*
Aquatic Communities			
A1	<i>Nuphar lutea (variegatum)</i>	Found in a backshore pond behind the shore dunes on the south side of Burntwood Island. Other associated aquatic species include <i>Sparganium angustifolium</i> , <i>Utricularia vulgaris</i> , <i>Potamogeton alpinus</i> and <i>Glyceria borealis</i> .	A common boreal and shield aquatic community, but not well documented in the literature. Aquatic communities are generally not well documented in Alberta.
Herbaceous Communities			
H1	<i>Calamagrostis canadensis</i> - <i>Deschampsia caespitosa</i>	Found on sand flats beside some of the creeks. <i>Agrostis scabra</i> is dominant in some areas.	Probably a common type on moist, sandy habitats, although not well documented in the literature.
H2	<i>Carex aquatilis</i>	Edge of beaver pond, with <i>C. sartwellii</i> .	Also noted at Shelter Point ³ and other CS parks in Alberta ^{12,18} . Widespread type ¹⁵ .
H3	<i>Carex lasiocarpa</i> – <i>C. rostrata</i>	A big floating fen with numerous small bodies of open water; <i>Carex ?limosa</i> , <i>C. chordorrhiza</i> and <i>Menyanthes trifoliata</i> also noted. Found in one area in the western part of the park.	Other community types dominated by <i>C. lasiocarpa</i> have been noted elsewhere ^{19,20} , but <i>C. rostrata</i> does not seem to be a significant component in these. A more detailed survey of this big fen is needed to better determine its species composition and assess its similarity to other fens in the region and the province.
H4	<i>Carex paupercula</i> / <i>Sphagnum magellanicum</i>	This CT was found on Burntwood Island in a wetland behind a shore dune. <i>C. lasiocarpa</i> was more prominent at the edge of the wetland, with <i>Menyanthes trifoliata</i> coming in in wetter areas. <i>Kalmia polifolia</i> hummocks with <i>Drosera rotundifolia</i> were noted.	This CT is partway between a bog and a fen; the deep-rooted vascular plants are in contact with minerotrophic water, but the <i>Sphagnum</i> is elevated above. This is an ephemeral type that changes with hydrology.
H5	<i>Carex utriculata</i>	Found at the edge of a wetland behind the shore dunes on the south side of Burntwood Island. <i>C. rostrata</i> was prominent.	Widespread CT ¹⁵ , although not commonly encountered at FGW. Also noted at RRD ¹² .

H6	<i>Carex utriculata</i> / <i>Limprichtia revolvens</i>	Rich fen formed behind dunes blocking creek flow, NE of Cypress Point. Other bryophytes noted include <i>Meesia triquetra</i> and <i>Scorpidium scorpioides</i> . <i>Limprichtia</i> was by far the dominant moss; <i>Meesia</i> and <i>Scorpidium</i> were rare.	This rich fen is similar in composition to the typical, widespread CT. Rich fens, however, are rare within FGW. More work is needed to characterize the fen and to determine if there are some unusual Shield types .
H7	<i>Equisetum fluviatile</i>	Backshore meadow on the south shore of Burntwood Island.	Widespread CT ¹⁵ , noted at other CS parks in Alberta ^{12,18} , although not commonly encountered at FGW.
H8	<i>Phragmites australis</i>	Small to larger stands of <i>Phragmites</i> noted along the shoreline in standing water or in backshore areas with water at the surface.	Widespread CT ¹⁵ , not encountered at LaB ¹⁸ , but fairly common south of Lake Athabasca ¹² and in the Peace – Athabasca Delta ²¹ .
H9	Rock outcrop mosaic	Mosaic of scattered patches dominated by <i>Woodsia ilvensis</i> , <i>Polypodium sibiricum</i> & <i>Cryptogramma acrostichoides</i> ; <i>Saxifraga tricuspidata</i> , <i>Potentilla tridentata</i> , <i>Campanula rotundifolia</i> and <i>Oryzopsis pungens</i> frequently common. <i>Abietinella abietina</i> , <i>Hedwigia ciliata</i> , <i>Polytrichum piliferum</i> , <i>Rhytidium rugosum</i> , & <i>Tortula ruralis</i> are the typical mosses. <i>Cladina</i> spp., (<i>C. mitis</i> and <i>C. stellaris</i> most common), <i>Cladonia</i> spp., (<i>C. amaurocraea</i> most common) and <i>Stereocaulon</i> spp. (<i>S. tomentosum</i> most common) are the typical lichens. Depending on the density and thickness of the moss and lichen mat, lichens such as <i>Arctoparmelia centrifuga</i> , <i>Melanelia</i> spp., <i>Umbilicaria</i> spp. (<i>U. muehlenbergii</i> most common), and <i>Xanthoparmelia coloradoensis</i> could also be present, along with numerous crustose species.	Typical mosaic of scattered vegetated patches on level to sloping Shield rock outcrops. Also noted at LaB ¹⁸ . Likely found throughout the Kazan Upland. More work is needed to define the rock outcrop communities.

H10	Stony beach complex	Plants growing in the sand between large to very large sub rounded to sub angular stones on a shallow shore. <i>Sagina nodosa</i> and <i>Hypericum majus</i> are often found in this habitat.	Raup and Argus ¹⁴ noted that low stony beaches are not common, and supported a small, variable flora. More work is needed to better understand the community ecology of these sites and to potentially define a characteristic community type
Lichen Communities			
L1	Lichen crust	An early successional community found in small patches in several areas, usually adjacent to blowouts on stabilized dunes. Often associated with old burns. <i>Placynthiella uliginosa</i> seems to be the dominant lichen crust species.	A similar area of lichen crust was noted in RRD ¹² , where along with <i>P. uliginosa</i> , <i>Diploschistes muscorum</i> was a significant component of the crust. The significance and distribution of this CT is unknown.
L2	<i>Umbilicaria muehlenbergii</i>	Found on level to sloping rock surfaces. Almost completely covers the rocks in some areas. <i>Cladina mitis</i> occurs commonly along cracks in the rock and in depressions that collect some moisture.	A similar community was noted at LaB ¹⁸ , but in that community, <i>Umbilicaria</i> was co-dominant with <i>Arctoparmelia centrifuga</i> . This is part of the rock outcrop community complex that should be looked at in more detail to define CTs.
Bryophyte Communities			
B1	North-facing rock outcrops	The most common bryophytes on moist, shaded north-facing rock outcrops are <i>Bartramia pomiformis</i> , <i>Cynodontium strumiferum</i> , <i>C. tenellum</i> , <i>Neckera pennata</i> , <i>Pohlia cruda</i> and <i>Ulota curvifolia</i> . Less common bryophytes, but species that seem to only occur on these outcrops are <i>Barbilophozia hatcheri</i> , <i>Encalypta procera</i> and <i>Leskeella nervosa</i> . <i>Platismatia glauca</i> (a lichen) seems restricted to these moist/shaded rock outcrops and, in the Shield, doesn't occur at all on trees like it does so commonly in the mountains.	All of the dominant bryophytes, except <i>Pohlia cruda</i> , are tracking list species ¹¹ , as is one of the associated species, <i>Leskeella nervosa</i> . Some of the communities associated with north-facing outcrops should likely be considered for the Preliminary Plant Community Tracking List, once better defined. Also noted at LaB ¹⁸ .

Shrub Communities			
S1	<i>Alnus tenuifolia</i>	Narrow band of dense alder, usually with a sparse understory, lining creek. In places a more open canopy allows a denser graminoid layer dominated by <i>Calamagrostis canadensis</i> .	Widespread CT ¹⁵ , noted at other CS parks in Alberta ^{12,18} although not commonly encountered at FGW.
S2	<i>Chamaedaphne calyculata</i> – <i>Ledum groenlandicum</i> / <i>Sphagnum fuscum</i>	Edge of a poor fen on Burntwood Island, transitional to a stand of stunted <i>Picea mariana</i> .	Wet shrublands dominated by <i>C. calyculata</i> are common in the Kazan Upland ⁵ . A similar CT was documented at MGT ²² .
S3	<i>Chamaedaphne calyculata</i> / <i>Warnstorfia exannulata</i> - <i>Sphagnum</i> spp.	An open poor fen off the south end of the largest lagoon on Bustard Island.	Wet shrublands dominated by <i>C. calyculata</i> are common in the Kazan Upland ⁵ .
S4	<i>Empetrum nigrum</i>	Mats of <i>E. nigrum</i> were noted stabilizing old blowouts and on the face of the stabilized dune ridges just behind the current shoreline.	This is a CT that is regionally common in the Athabasca Plains ¹³ .
S5	<i>Hudsonia tomentosa</i>	Forming an open mat beside old blowouts near the crest of dune ridges. In places, the <i>H. tomentosa</i> CT overlaps with a mat of lichens (primarily <i>Cladina mitis</i> and <i>Flavocetraria nivalis</i>) under pine.	<i>H. tomentosa</i> often forms mats on the windward side of actively eroding dunes ¹⁴ . This is a CT that is common in the Athabasca Plains.
S6	<i>Myrica gale</i>	Dense <i>Myrica</i> stands were noted at numerous locations in flats beside creeks or in slacks behind old beach ridges.	Common along lakeshores and banks of sluggish creeks across northern Alberta. Dense stands are common on both sandy and rocky shores in the Kazan Upland ⁵ .
S7	<i>Salix planifolia</i> / <i>Calamagrostis canadensis</i>	Dense willow thicket beside a small creek.	Raup and Argus ¹⁴ noted a similar community beside wet meadows. <i>Salix planifolia</i> is the dominant willow of thickets in the Kazan Upland ⁵ . Likely a widespread CT.
S8	<i>Salix planifolia</i> / <i>Myrica gale</i> - <i>Carex aquatilis</i> / <i>C. echinata</i> - <i>Scorpidium scorpioides</i>	A lakeshore willow-sedge community found in Lapworth Bay.	The amount of <i>Scorpidium</i> present is unusual in this type of lakeshore situation, but suggests that the site is well protected with relatively stable water levels. More study is needed to determine if this is a repeating type, or just reflects very specific site conditions.

S9	<i>Salix planifolia</i> / <i>Myrica gale</i> / <i>Scirpus microcarpus</i>	A willow thicket found in a shallow lagoon behind the shoreline area on the south side of Burntwood Island. A similar community, but with a graminoid layer of <i>Calamagrostis canadensis</i> was noted in another backshore lagoon on the north side of the island. Both sites would be subject to periodic flooding.	Possibly transitional between <i>Myrica</i> and <i>Salix</i> wetlands. More information is needed to assess these shrubland types.
Woodland and Forest Communities			
W1	<i>Betula papyrifera</i> / <i>Empetrum nigrum</i> – <i>Hudsonia tomentosa</i> / <i>Cladina mitis</i> – <i>Cladonia</i> spp.	Small area of open woodland on south-facing slope of a backshore dune, on the south shore of Burntwood Island	Birch dominated communities tend to be small in area and scattered in occurrence. They are not well studied, so more work is needed to define types and determine their significance. Raup ³ noted a similar birch stand in the “zone of sliding sand” on the front slope of a ridge.
W2	<i>Picea glauca</i> – <i>Betula papyrifera</i> / <i>Rosa acicularis</i> – <i>Viburnum edule</i> / feather moss	Mature stand with a lush arboreal lichen flora on a sand ridge on the east side of Bustard Island.	Although <i>P. glauca</i> stands were not common in FGW, this is similar to widespread boreal CTs.
W3	<i>Picea mariana</i> / <i>Empetrum nigrum</i> – <i>Ledum groenlandicum</i> / <i>Hylocomium splendens</i>	Woodland on the north-facing slope of a backshore dune on the south shore of Burntwood Island.	Likely a transitional community of a mixture of dune and wetland species.
W4	<i>Picea mariana</i> / <i>Pleurozium schreberi</i>	Small <i>P. mariana</i> trees with a dense feathermoss carpet in low spots on the sandy, undulating upland of Burntwood Island.	This appears to be a CT found across the Alberta shield on unburned sites ^{5,23} and into the NWT ²³ . Also noted at MR ¹² .
W5	<i>Picea mariana</i> / <i>Geocaulon lividum</i> / <i>Cladina stellaris</i> – <i>Cladina mitis</i>	Stand is open with patches of <i>Vaccinium vitis-idaea</i> and <i>Cladina rangiferina</i> . Alternates with W3 as the dominant CT on Burntwood Island.	The sand plain association described for Shelter Point ³ has a mixed tree layer, but is otherwise very similar to this CT.
W6	<i>Picea mariana</i> / <i>Ledum groenlandicum</i> / <i>Cladina mitis</i>	Dense, mature <i>P. mariana</i> with well-developed shrub and lichen layers.	<i>P. mariana</i> stands with a significant shrub and lichen component are widespread ^{24,25} .

W7	<i>Picea mariana</i> / <i>Ledum groenlandicum</i> / <i>Pleurozium schreberi</i>	<i>Polytrichum commune</i> dominant moss in some areas. Patches with <i>Vaccinium vitis-idaea</i> or <i>Empetrum nigrum</i> dominant.	Raup ³ noted a similar association as common on “drier muskegs” at Shelter Point, with <i>Polytrichum commune</i> as the dominant bryophyte. Similar CTs were documented at MGT ²² and MB ²⁶ .
W8	<i>Picea mariana</i> / <i>Ledum groenlandicum</i> / <i>Sphagnum fuscum</i>	Found in three separate areas: as the dominant CT in a small basin bog; edging a poor fen complex; and as the CT on permafrost islands in the large fen on Bustard Island. Water table is at or near the surface.	A CT widespread in the region ³ .
W9	<i>Pinus banksiana</i> / <i>Hudsonia tomentosa</i> / <i>Cladina mitis</i> - <i>Flavocetraria nivalis</i>	Very open pine stand with a dense mat of <i>Hudsonia</i> and lichens on a stabilized dune. Areas with open sand blowouts are edged with the L1 lichen crust CT, discussed above.	A widespread CT on stabilized dunes and sandy plains ¹⁴ .
W10	<i>Pinus banksiana</i> / <i>Vaccinium myrtilloides</i> / <i>Cladina mitis</i>	Open pine stand on stabilized sand dunes.	A widespread CT on stabilized dunes and sandy plains ¹⁴ .
W11	<i>Pinus banksiana</i> / <i>Vaccinium vitis-idaea</i> / <i>Cladonia</i> spp.	A dense stand of young pine on sand, regenerating after a burn. Significant deadfall; patches of <i>Empetrum nigrum</i> . <i>Cladonia gracilis</i> and <i>C. cristatella</i> were the main lichen species noted.	A young phase of the jack pine / lichen type that is widespread on stabilized dunes and sandy plains ¹⁴ . <i>Cladonia</i> spp. have been documented to be the dominant lichens in such stands from 10 to up to 50 years post fire, followed by <i>Cladina</i> spp. ²⁷ .
W12	<i>Pinus banksiana</i> - <i>Betula papyrifera</i> / <i>Empetrum nigrum</i>	Upper part of south-facing slope and apex of a high dune ridge back, from the lakeshore on the south shore of Burntwood Island.	A similar community on the tops of sandy ridges was documented at Shelter Point ³ .
W13	<i>Populus tremuloides</i> / <i>Vaccinium myrtilloides</i> - <i>Vaccinium vitis-idaea</i>	Small, disturbed aspen clump beside a creek. Site of an old cabin, and some beaver cutting.	Aspen (<i>Populus tremuloides</i>) woodlands are generally not extensive in the Kazan Upland ⁵ . Although there may be some aspen CTs restricted to the sub-region, further work is needed to define types and determine their significance.

* The following abbreviations are used in the comments:

- CS = Canadian Shield
- LaB = La Butte Creek Wildland Provincial Park
- NWT = North West Territories
- MR = Maybelle River Wildland Provincial Park
- RRD = Richardson River Dunes Wildland Provincial Park
- MGT = Margeurite River Wildland Provincial Park

Figure 7. Gallery of Communities (Photo H3 by K.Vujnovic, H8 by J.D. Johnson, H10 by D. Vujnovic, others by L. Allen)



H1 *Calamagrostis canadensis* -
Deschampsia caespitosa



H3 *Carex lasiocarpa* – *C. rostrata*



H8 *Phragmites australis*



H10a Stony beach



H10b Stony beach complex



L1 Lichen crust at edge of blowout



L2 *Umbilicaria muehlenbergii*



S5 *Hudsonia tomentosa*



S6 *Myrica gale*



W5 *Picea mariana* / *Geocaulon lividum* /
Cladina stellaris – *Cladina mitis*



W8 *Picea mariana* / *Ledum*
groenlandicum / *Sphagnum fuscum*



W10 *Pinus banksiana* / *Vaccinium*
myrtilloides / *Cladina mitis*