



## Coastal Sand Dunes of New Brunswick: A Biodiversity and Conservation Status Assessment



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**Overview**

During the fall of 2009, baseline ecosystem data was collected from coastal sand dunes of eastern New Brunswick. Four hundred field plots were surveyed on 16 coastal dune systems, from Miscou Island in the north, to the Cape Jourimain in the south.

Data collected were analyzed to define distinct coastal sand dune ecosystem types. Nineteen dune vegetation communities were identified including several ecosystems that were previously undocumented and or poorly understood.

Standardized Canadian protocols were used to develop fact-sheet descriptions of coastal dunes in Eastern New Brunswick. Fact-sheets include text, graphics, and photographs. Written descriptions of each dune concept, vegetation, environmental setting, dynamics, and distribution were compiled and incorporated into these fact-sheets.

The author met with members of the Atlantic Canada Conservation Data Centre to develop preliminary status ranks for coastal dune communities of NB. New rank and rank factor data emerging from this effort are documented in the community fact sheets; which indicate that several coastal dune communities found in eastern New Brunswick are vulnerable to further human pressures.

## **Introduction**

Coastal sand dunes are among the most ecologically significant but poorly studied components of New Brunswick's natural landscape heritage. Provincial dunes are also relatively extensive, supporting a broad diversity of ecosystems, habitats, and rare species. Dunes in the Gulf of Saint Lawrence are particularly well developed and are considered among the best representations of their kind in Canada, if not eastern North America. Initial analyses indicate the high potential for nationally unique, and in some cases rare, ecosystem and habitat types. Coastal sand dunes and beaches are among the most heavily impacted ecosystems in New Brunswick. Recreational vehicle and human traffic, coastal development, and exotic species invasions threaten dune ecosystem integrity, rare species habitat, and associated biodiversity values. The effects of climate change are also expected to strongly influence dune values in New Brunswick. Rising water levels and storm surges, associated with shifting weather patterns, will shape the ecology, geomorphology, and extent of provincial dunes.

This baseline study was completed to assess dune biodiversity values and to determine the conservation status of dune ecosystems and habitats in New Brunswick. Few resources are available to groups and individuals interested in conserving, studying, and or managing dune ecosystems and habitats of New Brunswick. Numerous public sectors have asked the CDC to help interpret dune ecology and address various rare ecosystem and species conservation issues. Some inquiries have included: guidelines for identifying dune ecosystems in the field; information on different dune structures and habitat values; provincial measures and trends of dune ecosystem conservation status, and suggestions for using CDC dune ecosystem and species data to help structure conservation and management activities.

## **Methods**

### **Data collection**

Vegetation communities were sampled using a series of quadrats chosen by visual observation. The number of quadrats sampled varied with size and variation of each dune system surveyed. Also a sea-inland transect was used to survey the vegetation profile of each study site at a representative area. A quadrat was analyzed every time there was a visible change in species composition or density, as described by Chapman (1976). Quadrat sizes were 5 m<sup>2</sup> in herbaceous dominated communities, 4 m<sup>2</sup> in lichen dominated communities and 10 m<sup>2</sup> in treed areas. Detailed observations were also made of anthropogenic and other disturbances at each study site. A set of lichen specimens will be deposited at the herbarium of the New Brunswick Museum, Saint John.

### Data analysis and summarization

The field data from were pooled and analyzed to determine unique sand dune ecosystems of New Brunswick. Standard multivariate statistical approaches were employed in ecosystem classification. Diagnostic dune species and or species groups were identified and documented through the classification process.

### Conservation Status Ranking

Members of the Atlantic Canada CDC determined preliminary provincial conservation status of each sand dune ecosystem using international conservation status protocols and a ranking software application. Rank factor inputs included: ecosystem occurrence and range, threats, and degree of protection.

### Reporting and Communications

Standardized written protocols were used to describe sand dunes ecosystem types of New Brunswick in a series of fact-sheet reports. Fact-sheets are synoptic overviews of ecosystem composition, structure, habitat, distribution, geomorphic features, and biodiversity values. Each includes a description of the ecosystem concept, ecological context, successional dynamics, disturbance agents, rare and non-native species, geomorphic structure, and geography. Statistical summaries of vegetation, species, and environmental attributes were incorporated into each fact-sheet report. In addition a digital database of dune communities and rare species locations has been created.

## Results

Over four hundred quadrats were surveyed on 16 coastal dune systems (Appendix I). Surveyed dune systems were located along the Eastern coast of New Brunswick (Figure 1). Over 115 species of vascular plants, 26 species of lichens and 9 species of bryophytes were identified from the plots.

Using multivariate statistical analyses and review of regional coastal sand dune literature, nineteen dune vegetation communities were identified including several ecosystems that were previously undocumented and or poorly understood (Appendix II).

Standardized Canadian protocols were used to develop fact-sheet descriptions of coastal dunes in Eastern New Brunswick. Fact-sheets (Appendices III to X) include text, graphics, and photographs. Written descriptions of each dune concept, vegetation, environmental setting, dynamics, and distribution were compiled and incorporated into these fact-sheets.

Results of the preliminary provincial status ranking process are documented in the ecosystem fact-sheets and tabular summary (Table 1).

Table 1. Results of the preliminary provincial status ranking process for New Brunswick's coastal dune communities

SRank	Type	Community Name
S4	1A	Embryo dune (Fact Sheet 1)
S4	1B	<i>Ammophila breviligulata</i> herbaceous foredune (Fact Sheet 1)
S3S4	2A	<i>Ammophila breviligulata</i> herbaceous open dune (Fact Sheet 2)
S3S4	2B	<i>Ammophila breviligulata</i> herbaceous closed dune (Fact Sheet 2)
S3	3A	<i>Ammophila breviligulata</i> / <i>Cladina</i> spp. Herbaceous / Lichen Fixed Dune (Fact Sheet 3)
S2S3	3B	<i>Morella pensylvanica</i> / <i>Ammophila breviligulata</i> / <i>Cladina</i> spp. Shrub / Herbaceous Fixed Dune (Fact Sheet 3)
S3?	3C	<i>Morella pensylvanica</i> Shrub Dune (Fact Sheet 3)
S2	4A	<i>Cladina</i> spp. - <i>Ammophila breviligulata</i> Lichen Fixed Dune (Fact Sheet 4)
S2	4B	<i>Hudsonia tomentosa</i> - <i>Ammophila breviligulata</i> Dwarf Shrub/Herbaceous Fixed Dune (Fact sheet 4)
S2	4C	<i>Arctostaphylos uva-ursi</i> or <i>Empetrum nigrum</i> Dwarf Shrub Fixed Dune (Fact Sheet 4)
S2S3	5	<i>Picea glauca</i> Forested Fixed Dune (Fact Sheet 5)
	6A	<i>Spartina alterniflora</i> Low Salt Marsh (Fact Sheet 6)
	6B	<i>Spartina patens</i> High Salt Marsh (Fact Sheet 6)
	6C	<i>Spartina</i> spp. Marsh Lagoon Edge (Fact Sheet 6)
S3S4	7A	<i>Juncus balticus</i> var. <i>littoralis</i> / <i>Spartina pectinata</i> Herbaceous Fresh Slack (Fact Sheet 7)
S3	7B	<i>Morella pensylvanica</i> / <i>Myrica gale</i> / <i>Spiraea alba</i> var. <i>latifolia</i> Shrub Fresh Slack (Fact Sheet 7)
S2S3	8	<i>Populus tremuloides</i> or <i>Acer rubrum</i> Treed Slack (Fact Sheet 8)
S3	9A	<i>Typha latifolia</i> Fresh Marsh (Fact Sheet 9)
S3	9B	<i>Myrica gale</i> / <i>Spiraea alba</i> var. <i>latifolia</i> Fresh Shrub Thicket (Fact Sheet 9)

## Discussion

This project contributed to a greater understanding of New Brunswick's coastal sand dunes, an ecologically significant component of the province's natural landscape heritage. The development of the first comprehensive provincial summary of dune species, habitat, ecosystem diversity and geography will be beneficial to a variety of government and non-governmental organizations for many years to come. The outputs of this project will help support the province's Coastal Areas Protection Policy and the New Brunswick Climate Change Action Plan, by providing New Brunswick's provincial government planners and managers detailed ecological and geographic information regarding coastal sand dune systems. Other interest groups such as provincial conservation groups, landowners, educators, stake-holders, and advocacy groups now have a tool to assist in a better understanding of dune diversity, ecology, and geography.

The fact-sheet reports are assembled as downloadable pdf files, readily available for widespread electronic distribution. A notification of these electronic products will be posted on the Atlantic Canada CDC website, and in outgoing emails. The fact sheets will be distributed free-of-charge to a variety of other user groups. In addition, the CDC will be available by phone, e-mail, or on-site visit to field questions or familiarize users with the project. Sensitive data on rare ecosystem and species locations will only be shared with government partners. As new data becomes available the fact-sheets will be updated to reflect the most current information

regarding dune ecology. Also community ranks are preliminary will be updated as better information on their distribution is available.

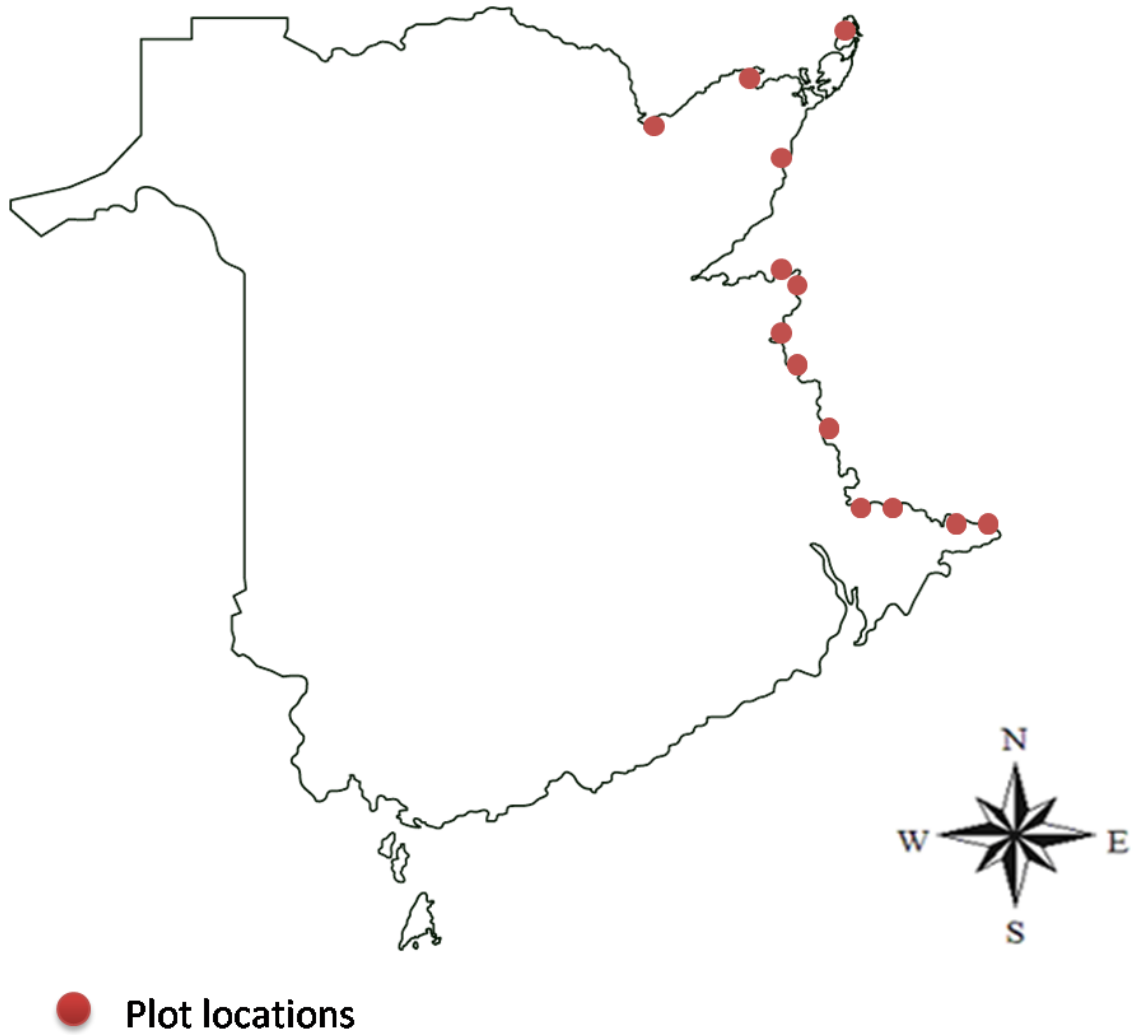


Figure 1. Survey sites associated with coastal sand dunes along coastal Eastern New Brunswick. (Surveyed by Sarah Robinson in 2009).

**Appendix I. Dune Systems Surveyed**

Aboiteau Provincial Park

Cape Jourimain National Wildlife Area

Bayfield Beach

Johnston Point

Youghall Beach

Pointe de Maisonette

Grande Plaine, Miscou Island

Grants Beach

Escuminac Beaches

Escuminac Beach Provincial Park

La Dune de Bouctouche

Preston Beach

North Kouchibouguac Dune

North Richibucto Dune

Cap Brûlé Beach

Tracadie Beach



**Appendix II. Coastal Dune Communities in Eastern New Brunswick**

(Appendices III to X provide specific Fact-sheets)

Embryo dune (Fact Sheet 1)

*Ammophila breviligulata* herbaceous foredune (Fact Sheet 1)

*Ammophila breviligulata* herbaceous open dune (Fact Sheet 2)

*Ammophila breviligulata* herbaceous closed dune (Fact Sheet 2)

*Ammophila breviligulata* / *Cladina* spp. Herbaceous / Lichen Fixed Dune (Fact Sheet 3)

*Morella pensylvanica* / *Ammophila breviligulata* / *Cladina* spp. Shrub / Herbaceous Fixed Dune (Fact Sheet 3)

*Morella pensylvanica* Shrub Dune (Fact Sheet 3)

*Cladina* spp. - *Ammophila breviligulata* Lichen Fixed Dune (Fact Sheet 4)

*Hudsonia tomentosa* - *Ammophila breviligulata* Dwarf Shrub/Herbaceous Fixed Dune (Fact sheet 4)

*Arctostaphylos uva-ursi* or *Empetrum nigrum* Dwarf Shrub Fixed Dune (Fact Sheet 4)

*Picea glauca* Forested Fixed Dune (Fact Sheet 5)

*Spartina* spp. Marsh Lagoon Edge (Fact Sheet 6)

*Spartina patens* High Salt Marsh (Fact Sheet 6)

*Spartina alterniflora* Low Salt Marsh (Fact Sheet 6)

*Juncus balticus* var. *littoralis*/*Spartina pectinata* Herbaceous Fresh Slack (Fact Sheet 7)

*Morella pensylvanica*/*Myrica gale*/*Spiraea alba* var. *latifolia* Shrub Fresh Slack (Fact Sheet 7)

*Typha latifolia* Fresh Marsh (Fact Sheet 9)

*Myrica gale* / *Spiraea alba* var. *latifolia* Fresh Shrub Thicket (Fact Sheet 9)

*Populus tremuloides* or *Acer rubrum* Treed Slack (Fact Sheet 8)

**Literature cited**

Chapman, SB, 1976. Methods in plant ecology. Blackwell Scientific Publications, Oxford.