



**Technical Report Series on the
Boreal Ecosystem-Atmosphere Study (BOREAS)**

Forrest G. Hall and Sara K. Conrad, Editors

Volume 224

**BOREAS TGB-3 Plant Species
Composition Data over the NSA Fen**

Jill L. Bubier, University of New Hampshire, Durham

National Aeronautics and
Space Administration

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Greenbelt, Maryland 20771

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BOREAS TGB-3 Plant Species Composition Data over the NSA-Fen

Jill L. Bubier

Summary

The BOREAS TGB-3 team collected several data sets that contributed to understanding the measured trace gas fluxes over sites in the NSA. This data set contains information about the composition of plant species that were within the collars used to measure NEE. The species composition was identified to understand the differences in NEE among the various plant communities in the NSA fen. The data were collected in July of 1994 and 1996. The data are contained in comma-delimited, ASCII files.

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1. Data Set Overview

1.1 Data Set Identification

BOREAS TGB-03 Plant Species Composition Data over the NSA Fen

1.2 Data Set Introduction

As part of the BOREal Ecosystem-Atmosphere Study (BOREAS), the Trace Gas Biogeochemistry (TGB)-03 team measured plant species within the net ecosystem exchange (NEE) collars to understand the differences in NEE among the various plant communities in the Northern Study Area (NSA) fen. Measurements were made from the period of snow melt and thaw through the full growing season to fall freeze up to examine the seasonal patterns of NEE, differences in phenology, and relative importance of vascular plants and bryophytes to the carbon balance. The following is a description of the acquisition of data and the final data sets.

1.3 Objective/Purpose

Plant species compositions were characterized at the four subsites within the fen in the NSA. The locations represent the range of plant communities, water chemistry, and peatland types found in northern peatlands, including bog, rich fen, poor fen, and collapse scar (pH ranges from 3.8 to 7.2). Continuous measurements of water level and air and soil temperatures were taken to understand the thermal and hydrological gradients associated with each plant community.

1.4 Summary of Parameters

The plant communities for each chamber were characterized.

1.5 Discussion

Plant species compositions were measured at four subsites in the NSA fen, designated as collapse bog (CB), collapse fen (CF), tower fen (TF), and Zoltai fen (ZF). A spur (1, 2, 3, or 4) designates each collar location along the boardwalk at each subsite. The collars are further designated by the microtopography or dominant ground cover of the collar location: pal=palsa, hk=hummock, hw=hollow, lwn=lawn, moat=open water at the edge of the collapse scars, b_moss=brown moss, sph=sphagnum, and lich=lichen. The plant species composition of each collar where NEE measurements were taken was recorded as percent cover of the total collar area. The plant data for each collar at all four subsites are located in one American Standard Code for Information Interchange (ASCII) (DOS)-delimited text file: fen96_pla.txt.

1.6 Related Data Sets

BOREAS TGB-01 CH₄ Concentration and Flux Data from NSA Tower Sites
BOREAS TGB-01 NSA CH₄ and CO₂ Chamber Flux Data
BOREAS TGB-01 Soil CH₄ and CO₂ Profile Data from NSA Tower Sites
BOREAS TGB-01/TGB-03 NEE Data over the NSA Fen
BOREAS TGB-01/TGB-03 CH₄ Chamber Flux Data over the NSA Fen
BOREAS TGB-03 CH₄ and CO₂ Chamber Flux Data over NSA Upland Sites

2. Investigator(s)

2.1 Investigator(s) Name and Title

Dr. Jill L. Bubier
Research Associate
University of New Hampshire

Dr. Patrick M. Crill
Research Associate Professor
University of New Hampshire

Dr. Tim R. Moore
Professor
McGill University

2.2 Title of Investigation

Magnitude and Control of Trace Gas Exchange in Boreal Ecosystems

2.3 Contact Information

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3. Theory of Measurements

Plant species composition within the NEE collars was identified to understand the differences in net CO₂ exchange among the various plant communities in the fen.

4. Equipment

4.1 Sensor/Instrument Description

4.1.1 Collection Environment

Data were collected in mid-July of 1994 and 1996. Deciduous and annual plants would be expected to be fully leafed out at this time.

4.1.2 Source/Platform

The TGB-03 team members identified the plant species within the collars. One of two chamber sizes was used to measure NEE depending on the height of the vegetation. The larger chamber covered 3,660 cm² of surface area and was 90.5 cm in height. The smaller chamber covered the same area as the larger chamber to fit the same collars (3,660 cm²), but was half the height (45 cm).

4.1.3 Source/Platform Mission Objectives

The objective was to determine the plant composition within the collars to help determine differences in observed NEE measurements.

4.1.4 Key Variables

The key variable measured during the sampling period was plant species composition.

4.1.5 Principles of Operation

Not applicable.

4.1.6 Sensor/Instrument Measurement Geometry

Not applicable.

4.1.7 Manufacturer of Sensor/Instrument

Not applicable.

4.2 Calibration

4.2.1 Specifications

None given.

4.2.1.1 Tolerance

Not applicable.

4.2.2 Frequency of Calibration

Not applicable.

4.2.3 Other Calibration Information

Not applicable.

5. Data Acquisition Methods

Plant species composition was recorded in each collar during the height of the growing season in mid-July 1996. Visual estimates of percent cover of each vascular plant and bryophyte species were made using the light/canopy intercept method (Daubenmire, 1968). Each species was assigned a percent cover value based on an estimate of spatial coverage (relative to the total area of the collar) when the canopy of that species was visually projected to the ground below. Percent cover of all species totals over 100 percent for each collar because of several layers of vegetation. Specimens for each unknown species were collected in plant communities outside of the collars and identified in the lab at the Heritage North Museum, Thompson, Manitoba, or at Dr. Barry Rock's laboratory at Complex Systems Research Center, University of New Hampshire (UNH), Durham, NH.

6. Observations

6.1 Data Notes

None given.

6.2 Field Notes

None given.

7. Data Description

7.1 Spatial Characteristics

7.1.1 Spatial Coverage

The collars were placed so as to cover the environmental gradients in the TF complex, an area approximately 6 km². Global Positioning System (GPS) coordinates based on the North American Datum of 1983 (NAD83) for the major sampling locations are:

Site	N Latitude	Sdev	W Longitude	Sdev	Elevation	Sdev
----	-----	----	-----	----	-----	----
CB	55°55'4.931"	2.75	98°25'5.294"	1.18	217.20	3.86
CF	55°54'59.959"	5.60	98°25'6.109"	1.90	218.40	7.62
ZF	55°55'5.477"	2.07	98°25'26.396"	1.29	217.10	3.11

CB collars were located in a small, circular collapse scar (75 m diameter) almost completely surrounded by permafrost peat plateau, behind the generator shed. Three spurs were located perpendicular to the boardwalk. Spur 1 was adjacent to the moat, or open water area; spur 2 was in a hummock-hollow area; and spur 3 was in the center of the collapse scar. In addition to the collars in the collapse scar, this subsite had two collars on the palsa (frozen peat plateau) adjacent to the collapse scar. Collar designations were as follows:

CB1moat = collapse bog, spur 1, moat
CB2hk = collapse bog, spur 2, hummock
CB2hw = collapse bog, spur 2, hollow
CB3hk = collapse bog, spur 3, hummock
Cbpalmoss = collapse bog, palsa, moss
Cbpallich = collapse bog, palsa, lichen

CF collars were located in a small, linear collapse feature that was east of and accessed from the main trail to the tower hut. Four spurs were located perpendicular to the main boardwalk. Spur 1 was located adjacent to the moat, spur 2 was in a uniform lawn of *Sphagnum riparium*, spur 3 was in a small treed ridge, and spur 4 was on the far edge of the collapse scar where the influence of groundwater was apparent. Collar designations were as follows:

CF1moat = collapse fen, spur 1, moat
CF2lwn = collapse fen, spur 2, lawn
CF3hka = collapse fen, spur 3, hummock (a)
CF3hkb = collapse fen, spur 3, hummock (b)
CF4b_moss = collapse fen, spur 4, brown moss
CF4sph = collapse fen, spur 4, sphagnum

TF collars were located along the boardwalk to the micrometeorological tower in the NSA fen. Four spurs were located perpendicular to the main boardwalk. Spur 1 was just beyond the moat at the beginning of the boardwalk in a treed area of tamarack (*Larix laricina*), spur 2 was in a tall shrub zone (*Betula glandulosa*), spur 3 was in a low shrub zone just before the hut, and spur 4 was just beyond the hut in a mixed low shrub/sedge zone. Collar designations were as follows:

TF1hk = tower fen, spur 1, hummock
TF2hk = tower fen, spur 2, hummock
TF2hw = tower fen, spur 2, hollow
TF3hk = tower fen, spur 3, hummock
TF3hw = tower fen, spur 3, hollow
TF4hw = tower fen, spur 4, hollow

ZF collars were located in a sedge-dominated (*Carex* sp.) fen area of the peatland complex, north of the fen tower, and accessed from Route 391. Three spurs were located perpendicular to the main boardwalk. Spur 1 was on a treed ridge; spur 2 was in a shrub-dominated hummock-hollow area; and spur 3 was in a wet, sedge-dominated area near the edge of a palsa. Collar designations were as follows:

ZF1hk = zoltai fen, spur 1, hummock
ZF2hk = zoltai fen, spur 2, hummock
ZF2hw = zoltai fen, spur 2, hollow
ZF3b_moss = zoltai fen, spur 3, brown moss
ZF3hw = zoltai fen, spur 3, hollow (*Sphagnum*)
ZF3hk = zoltai fen, spur 3, hummock (*Sphagnum*)

7.1.2 Spatial Coverage Map

Not available.

7.1.3 Spatial Resolution

The 24 collars spanned the full range of hydrologic, plant community, and water chemistry gradients found in the larger peatland complex. They were placed along those gradients at each of the four subsites to capture the spatial variability in CO₂ fluxes. The area within each collar was 3,660 cm².

7.1.4 Projection

Not applicable.

7.1.5 Grid Description

Not applicable.

7.2 Temporal Characteristics

7.2.1 Temporal Coverage

Plant species composition was recorded in each collar during the height of the growing season in mid-July of 1994 and 1996.

7.2.2 Temporal Coverage Map

Not applicable.

7.2.3 Temporal Resolution

Plant species compositions were recorded once in each collar during the height of the growing season in mid-July of 1994 and 1996.

7.3 Data Characteristics

7.3.1 Parameter/Variable

The parameters contained in the 1994 data files on the CD-ROM are:

Plant_species	FC2c09	RFc05	TF4cA
BC1c01	FC2c10	RFc06	TF4cB
BC1c02	FC2cA	RFc07	TF4cC
BC1c03	FC2cB	RFc08	TF4cD
BC1c04	FC2cC	RFc09	TF4n17
BC1c05	FC2cD	RFk01	TF4n19
BC2k08	FC2cE	RFk03	ZF1k01
BC2k10	FC3k12	RFw02	ZF1k02
BC2w06	FC3k15	TF1k02	ZF1k03
BC2w07	FC3n11	TF1k03	ZF1w04
BC2w09	FC3n13	TF1k04	ZF1w05
BC3k11	FC3n14	TF1w05	ZF2k06
BC3k14	FC4p16	TF1w01	ZF2k10
BC3k15	FC4p17	TF2k07	ZF2w07
BC3w12	FC4p18	TF2k10	ZF2w08
BC3w13	FC4p19	TF2n06	ZF2w09
FC1c01	FC4p20	TF2w08	ZF3cA
FC1c02	RBc07	TF2w09	ZF3cB
FC1c03	RBc08	TF3k12	ZF3cC
FC1cA	RBc09	TF3k13	ZF3cD
FC1cB	RBn01	TF3w11	ZF3cE
FC1cC	RBn02	TF3w14	ZF3k11
FC1cD	RBn03	TF3w15	ZF3k14
FC1cE	RBn04	TF4c16	ZF3p12
FC2c06	RBn05	TF4c18	ZF3p13
FC2c07	RBn06	TF4c20	ZF3p15
FC2c08	RFc04		

The parameters contained in the 1996 data files on the CD-ROM are:

Column Name

Plant Species
CB1moat
CB2hk
CB2hw
CB3hk
Cbpal_lich
Cbpal_moss
CF3hka
CF3hkb
CF4sph
CFb_moss
CF1moat
CF2lwn
TF4hw
TF3hk
TF3hw
TF1hk
TF2hk
TF2hw
ZF1hk
ZF2hk
ZF2hw
ZF3b_moss
ZF3hk
ZF3hw

7.3.2 Variable Description/Definition

The descriptions of the parameters contained in the 1994 data files on the CD-ROM are:

Column Name	Description
-----	-----
Plant Species	Vascular and Bryophyte plant species
BC1c01	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
BC1c02	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
BC1c03	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
BC1c04	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
BC1c05	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
BC2k08	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.

BC2k10	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
BC2w06	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
BC2w07	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
BC2w09	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
BC3k11	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
BC3k14	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
BC3k15	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
BC3w12	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
BC3w13	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
FC1c01	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
FC1c02	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
FC1c03	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
FC1cA	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
FC1cB	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
FC1cC	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
FC1cD	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
FC1cE	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
FC2c06	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.

RFw02	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
TF1k02	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
TF1k03	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
TF1k04	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
TF1w05	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
TF1w01	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
TF2k07	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
TF2k10	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
TF2n06	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
TF2w08	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
TF2w09	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
TF3k12	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
TF3k13	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
TF3w11	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
TF3w14	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
TF3w15	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
TF4c16	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
TF4c18	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.

TF4c20	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
TF4cA	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
TF4cB	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
TF4cC	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
TF4cD	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
TF4n17	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
TF4n19	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
ZF1k01	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
ZF1k02	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
ZF1k03	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
ZF1w04	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
ZF1w05	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
ZF2k06	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
ZF2k10	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
ZF2w07	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
ZF2w08	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
ZF2w09	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
ZF3cA	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.

ZF3cB	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
ZF3cC	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
ZF3cD	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
ZF3cE	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
ZF3k11	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
ZF3k14	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
ZF3p12	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
ZF3p13	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
ZF3p15	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.

The descriptions of the parameters contained in the 1996 data files on the CD-ROM are:

Column Name	Description
Plant Species	Vascular and Bryophyte plant species
CB1moat	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
CB2hk	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
CB2hw	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
CB3hk	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
Cbpal_lich	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
Cbpal_moss	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
CF3hka	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.

CF3hkb	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
CF4sph	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
CFb_moss	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
CFlmoat	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
CF2lwn	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
TF4hw	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
TF3hk	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
TF3hw	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
TF1hk	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
TF2hk	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
TF2hw	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
ZF1hk	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
ZF2hk	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
ZF2hw	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
ZF3b_moss	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
ZF3hk	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.
ZF3hw	Column name designates collar number, and the column contains the percentage of plant coverage contained within the chamber.

7.3.3 Unit of Measurement

The measurement units for the parameters contained in the 1994 data files on the CD-ROM are:

Column Name	Units
Plant_species	[None]
BC1c01	[Percent]
BC1c02	[Percent]
BC1c03	[Percent]
BC1c04	[Percent]
BC1c05	[Percent]
BC2k08	[Percent]
BC2k10	[Percent]
BC2w06	[Percent]
BC2w07	[Percent]
BC2w09	[Percent]
BC3k11	[Percent]
BC3k14	[Percent]
BC3k15	[Percent]
BC3w12	[Percent]
BC3w13	[Percent]
FC1c01	[Percent]
FC1c02	[Percent]
FC1c03	[Percent]
FC1cA	[Percent]
FC1cB	[Percent]
FC1cC	[Percent]
FC1cD	[Percent]
FC1cE	[Percent]
FC2c06	[Percent]
FC2c07	[Percent]
FC2c08	[Percent]
FC2c09	[Percent]
FC2c10	[Percent]
FC2cA	[Percent]
FC2cB	[Percent]
FC2cC	[Percent]
FC2cD	[Percent]
FC2cE	[Percent]
FC3k12	[Percent]
FC3k15	[Percent]
FC3n11	[Percent]
FC3n13	[Percent]
FC3n14	[Percent]
FC4p16	[Percent]
FC4p17	[Percent]
FC4p18	[Percent]
FC4p19	[Percent]
FC4p20	[Percent]
RBc07	[Percent]
RBc08	[Percent]
RBc09	[Percent]
RBn01	[Percent]
RBn02	[Percent]
RBn03	[Percent]

RBn04	[Percent]
RBn05	[Percent]
RBn06	[Percent]
RFc04	[Percent]
RFc05	[Percent]
RFc06	[Percent]
RFc07	[Percent]
RFc08	[Percent]
RFc09	[Percent]
RFk01	[Percent]
RFk03	[Percent]
RFw02	[Percent]
TF1k02	[Percent]
TF1k03	[Percent]
TF1k04	[Percent]
TF1w05	[Percent]
TF1w01	[Percent]
TF2k07	[Percent]
TF2k10	[Percent]
TF2n06	[Percent]
TF2w08	[Percent]
TF2w09	[Percent]
TF3k12	[Percent]
TF3k13	[Percent]
TF3w11	[Percent]
TF3w14	[Percent]
TF3w15	[Percent]
TF4c16	[Percent]
TF4c18	[Percent]
TF4c20	[Percent]
TF4cA	[Percent]
TF4cB	[Percent]
TF4cC	[Percent]
TF4cD	[Percent]
TF4n17	[Percent]
TF4n19	[Percent]
ZF1k01	[Percent]
ZF1k02	[Percent]
ZF1k03	[Percent]
ZF1w04	[Percent]
ZF1w05	[Percent]
ZF2k06	[Percent]
ZF2k10	[Percent]
ZF2w07	[Percent]
ZF2w08	[Percent]
ZF2w09	[Percent]
ZF3cA	[Percent]
ZF3cB	[Percent]
ZF3cC	[Percent]
ZF3cD	[Percent]
ZF3cE	[Percent]
ZF3k11	[Percent]
ZF3k14	[Percent]
ZF3p12	[Percent]

ZF3p13	[Percent]
ZF3p15	[Percent]

The measurement units for the parameters contained in the 1996 data files on the CD-ROM are:

Column Name	Units
Plant Species	[None]
CB1moat	[Percent]
CB2hk	[Percent]
CB2hw	[Percent]
CB3hk	[Percent]
Cbpal_lich	[Percent]
Cbpal_moss	[Percent]
CF3hka	[Percent]
CF3hkb	[Percent]
CF4sph	[Percent]
Cfb_moss	[Percent]
CF1moat	[Percent]
CF2lwn	[Percent]
TF4hw	[Percent]
TF3hk	[Percent]
TF3hw	[Percent]
TF1hk	[Percent]
TF2hk	[Percent]
TF2hw	[Percent]
ZF1hk	[Percent]
ZF2hk	[Percent]
ZF2hw	[Percent]
ZF3b_moss	[Percent]
ZF3hk	[Percent]
ZF3hw	[Percent]

7.3.4 Data Source

The sources of the parameter values contained in the 1994 data files on the CD-ROM are:

Column Name	Data Source
Plant_species	[Investigator]
BC1c01	[Investigator]
BC1c02	[Investigator]
BC1c03	[Investigator]
BC1c04	[Investigator]
BC1c05	[Investigator]
BC2k08	[Investigator]
BC2k10	[Investigator]
BC2w06	[Investigator]
BC2w07	[Investigator]
BC2w09	[Investigator]
BC3k11	[Investigator]
BC3k14	[Investigator]
BC3k15	[Investigator]
BC3w12	[Investigator]
BC3w13	[Investigator]

FC1c01	[Investigator]
FC1c02	[Investigator]
FC1c03	[Investigator]
FC1cA	[Investigator]
FC1cB	[Investigator]
FC1cC	[Investigator]
FC1cD	[Investigator]
FC1cE	[Investigator]
FC2c06	[Investigator]
FC2c07	[Investigator]
FC2c08	[Investigator]
FC2c09	[Investigator]
FC2c10	[Investigator]
FC2cA	[Investigator]
FC2cB	[Investigator]
FC2cC	[Investigator]
FC2cD	[Investigator]
FC2cE	[Investigator]
FC3k12	[Investigator]
FC3k15	[Investigator]
FC3n11	[Investigator]
FC3n13	[Investigator]
FC3n14	[Investigator]
FC4p16	[Investigator]
FC4p17	[Investigator]
FC4p18	[Investigator]
FC4p19	[Investigator]
FC4p20	[Investigator]
RBc07	[Investigator]
RBc08	[Investigator]
RBc09	[Investigator]
RBn01	[Investigator]
RBn02	[Investigator]
RBn03	[Investigator]
RBn04	[Investigator]
RBn05	[Investigator]
RBn06	[Investigator]
RFc04	[Investigator]
RFc05	[Investigator]
RFc06	[Investigator]
RFc07	[Investigator]
RFc08	[Investigator]
RFc09	[Investigator]
RFk01	[Investigator]
RFk03	[Investigator]
RFw02	[Investigator]
TF1k02	[Investigator]
TF1k03	[Investigator]
TF1k04	[Investigator]
TF1w05	[Investigator]
TF1w01	[Investigator]
TF2k07	[Investigator]
TF2k10	[Investigator]
TF2n06	[Investigator]

TF2w08	[Investigator]
TF2w09	[Investigator]
TF3k12	[Investigator]
TF3k13	[Investigator]
TF3w11	[Investigator]
TF3w14	[Investigator]
TF3w15	[Investigator]
TF4c16	[Investigator]
TF4c18	[Investigator]
TF4c20	[Investigator]
TF4cA	[Investigator]
TF4cB	[Investigator]
TF4cC	[Investigator]
TF4cD	[Investigator]
TF4n17	[Investigator]
TF4n19	[Investigator]
ZF1k01	[Investigator]
ZF1k02	[Investigator]
ZF1k03	[Investigator]
ZF1w04	[Investigator]
ZF1w05	[Investigator]
ZF2k06	[Investigator]
ZF2k10	[Investigator]
ZF2w07	[Investigator]
ZF2w08	[Investigator]
ZF2w09	[Investigator]
ZF3cA	[Investigator]
ZF3cB	[Investigator]
ZF3cC	[Investigator]
ZF3cD	[Investigator]
ZF3cE	[Investigator]
ZF3k11	[Investigator]
ZF3k14	[Investigator]
ZF3p12	[Investigator]
ZF3p13	[Investigator]
ZF3p15	[Investigator]

The sources of the parameter values contained in the 1996 data files on the CD-ROM are:

Column Name	Data Source
Plant Species	[Investigator]
CB1moat	[Investigator]
CB2hk	[Investigator]
CB2hw	[Investigator]
CB3hk	[Investigator]
Cbpal_lich	[Investigator]
Cbpal_moss	[Investigator]
CF3hka	[Investigator]
CF3hkb	[Investigator]
CF4sph	[Investigator]
CFb_moss	[Investigator]
CF1moat	[Investigator]
CF2lwn	[Investigator]

TF4hw	[Investigator]
TF3hk	[Investigator]
TF3hw	[Investigator]
TF1hk	[Investigator]
TF2hk	[Investigator]
TF2hw	[Investigator]
ZF1hk	[Investigator]
ZF2hk	[Investigator]
ZF2hw	[Investigator]
ZF3b_moss	[Investigator]
ZF3hk	[Investigator]
ZF3hw	[Investigator]

7.3.5 Data Range

The following table gives information about the parameter values found in the 1994 data files on the CD-ROM.

Column Name	Minimum Data Value	Maximum Data Value	Missng Data Value	Unrel Data Value	Below Detect Limit	Data Not Clctd

Plant Species						
BC1c01	0.1	100	-999	None	None	None
BC1c02	0.1	75	-999	None	None	None
BC1c03	0.1	95	-999	None	None	None
BC1c04	0.1	90	-999	None	None	None
BC1c05	0.1	95	-999	None	None	None
BC2k08	1	100	-999	None	None	None
BC2k10	0.1	100	-999	None	None	None
BC2w06	0.1	60	-999	None	None	None
BC2w07	0.1	60	-999	None	None	None
BC2w09	0.1	50	-999	None	None	None
BC3k11	0.1	100	-999	None	None	None
BC3k14	0.1	100	-999	None	None	None
BC3k15	0.1	100	-999	None	None	None
BC3w12	0.1	75	-999	None	None	None
BC3w13	0.1	100	-999	None	None	None
FC1c01	10	100	-999	None	None	None
FC1c02	0.1	100	-999	None	None	None
FC1c03	0.1	100	-999	None	None	None
FC1cA	5	100	-999	None	None	None
FC1cB	5	100	-999	None	None	None
FC1cC	1	100	-999	None	None	None
FC1cD	10	100	-999	None	None	None
FC1cE	5	100	-999	None	None	None
FC2c06	10	100	-999	None	None	None
FC2c07	0.1	100	-999	None	None	None
FC2c08	0.1	100	-999	None	None	None
FC2c09	0.1	100	-999	None	None	None
FC2c10	0.1	100	-999	None	None	None
FC2cA	0.1	100	-999	None	None	None
FC2cB	1	100	-999	None	None	None
FC2cC	1	100	-999	None	None	None
FC2cD	5	100	-999	None	None	None
FC2cE	1	100	-999	None	None	None

FC3k12	0.1	100	-999	None	None	None
FC3k15	2	100	-999	None	None	None
FC3n11	0.1	80	-999	None	None	None
FC3n13	0.1	100	-999	None	None	None
FC3n14	0.1	75	-999	None	None	None
FC4p16	1	100	-999	None	None	None
FC4p17	1	100	-999	None	None	None
FC4p18	1	100	-999	None	None	None
FC4p19	0.1	100	-999	None	None	None
FC4p20	1	100	-999	None	None	None
RBc07	30	100	-999	None	None	None
RBc08	10	100	-999	None	None	None
RBc09	40	100	-999	None	None	None
RBn01	5	75	-999	None	None	None
RBn02	0.1	75	-999	None	None	None
RBn03	0.1	50	-999	None	None	None
RBn04	0.1	100	-999	None	None	None
RBn05	0.1	100	-999	None	None	None
RBn06	0.1	100	-999	None	None	None
RFc04	1	95	-999	None	None	None
RFc05	0.1	85	-999	None	None	None
RFc06	0.1	95	-999	None	None	None
RFc07	1	100	-999	None	None	None
RFc08	5	90	-999	None	None	None
RFc09	1	100	-999	None	None	None
RFk01	0.1	95	-999	None	None	None
RFk03	0.1	100	-999	None	None	None
RFw02	0.1	95	-999	None	None	None
TF1k02	0.1	50	-999	None	None	None
TF1k03	0.1	100	-999	None	None	None
TF1k04	0.1	100	-999	None	None	None
TF1w05	0.1	90	-999	None	None	None
TF1w01	0.1	50	-999	None	None	None
TF2k07	0.1	100	-999	None	None	None
TF2k10	0.1	100	-999	None	None	None
TF2n06	0.1	90	-999	None	None	None
TF2w08	0.1	95	-999	None	None	None
TF2w09	0.1	90	-999	None	None	None
TF3k12	0.1	100	-999	None	None	None
TF3k13	0.1	80	-999	None	None	None
TF3w11	0.1	50	-999	None	None	None
TF3w14	0.1	75	-999	None	None	None
TF3w15	0.1	80	-999	None	None	None
TF4c16	0.1	90	-999	None	None	None
TF4c18	0.1	90	-999	None	None	None
TF4c20	0.1	90	-999	None	None	None
TF4cA	0.1	60	-999	None	None	None
TF4cB	0.1	30	-999	None	None	None
TF4cC	0.1	40	-999	None	None	None
TF4cD	0.1	80	-999	None	None	None
TF4n17	0.1	100	-999	None	None	None
TF4n19	0.1	25	-999	None	None	None
ZF1k01	0.1	100	-999	None	None	None
ZF1k02	0.1	100	-999	None	None	None

ZF1k03	0.1	100	-999	None	None	None
ZF1w04	0.1	100	-999	None	None	None
ZF1w05	0.1	100	-999	None	None	None
ZF2k06	0.1	100	-999	None	None	None
ZF2k10	0.1	100	-999	None	None	None
ZF2w07	0.1	90	-999	None	None	None
ZF2w08	0.1	90	-999	None	None	None
ZF2w09	0.1	30	-999	None	None	None
ZF3cA	0.1	100	-999	None	None	None
ZF3cB	0.1	100	-999	None	None	None
ZF3cC	0.1	100	-999	None	None	None
ZF3cD	0.1	100	-999	None	None	None
ZF3cE	0.1	100	-999	None	None	None
ZF3k11	0.1	100	-999	None	None	None
ZF3k14	0.1	100	-999	None	None	None
ZF3p12	0.1	50	-999	None	None	None
ZF3p13	0.1	100	-999	None	None	None
ZF3p15	0.1	100	-999	None	None	None

The following table gives information about the parameter values found in the 1996 data files on the CD-ROM.

Column Name	Minimum Data Value	Maximum Data Value	Missng Data Value	Unrel Data Value	Below Detect Limit	Data Not Clcltd

Plant Species						
CB1moat	0.1	100	-999	None	None	None
CB2hk	0.1	100	-999	None	None	None
CB2hw	0.1	75	-999	None	None	None
CB3hk	0.1	100	-999	None	None	None
Cbpal_lich	1	99	-999	None	None	None
Cbpal_moss	0.1	100	-999	None	None	None
CF3hka	0.1	90	-999	None	None	None
CF3hkb	0.1	100	-999	None	None	None
CF4sph	5	100	-999	None	None	None
CFb_moss	0.1	100	-999	None	None	None
CF1moat	10	100	-999	None	None	None
CF2lwn	0.1	100	-999	None	None	None
TF4hw	0.1	75	-999	None	None	None
TF3hk	0.1	50	-999	None	None	None
TF3hw	0.1	50	-999	None	None	None
TF1hk	1	90	-999	None	None	None
TF2hk	0.1	90	-999	None	None	None
TF2hw	0.1	75	-999	None	None	None
ZF1hk	0.1	100	-999	None	None	None
ZF2hk	0.1	100	-999	None	None	None
ZF2hw	0.1	100	-999	None	None	None
ZF3b_moss	5	90	-999	None	None	None
ZF3hk	1	100	-999	None	None	None
ZF3hw	0.1	100	-999	None	None	None

7.4 Sample Data Record

The following are wrapped versions of sample data records from the 1994 file on the CD-ROM:

```
Plant_species,BC1c01,BC1c02,BC1c03,BC1c04,BC1c05,BC2k08,BC2k10,BC2w06,BC2w07,
BC2w09,BC3k11,BC3k14,BC3k15,BC3w12,BC3w13,FC1c01,FC1c02,FC1c03,FC1cA,FC1cB,
FC1cC,FC1cD,FC1cE,FC2c06,FC2c07,FC2c08,FC2c09,FC2c10,FC2cA,FC2cB,FC2cC,FC2cD,
FC2cE,FC3k12,FC3k15,FC3n11,FC3n13,FC3n14,FC4p16,FC4p17,FC4p18,FC4p19,FC4p20,
RBc07,RBc08,RBc09,RBn01,RBn02,RBn03,RBn04,RBn05,RBn06,RFc04,RFc05,RFc06,RFc07,
RFc08,RFc09,RFk01,RFk03,RFw02,TF1k02,TF1k03,TF1k04,TF1w05,TF1w01,TF2k07,TF2k10,
TF2n06,TF2w08,TF2w09,TF3k12,TF3k13,TF3w11,TF3w14,TF3w15,TF4c16,TF4c18,TF4c20,
TF4cA,TF4cB,TF4cC,TF4cD,TF4n17,TF4n19,ZF1k01,ZF1k02,ZF1k03,ZF1w04,ZF1w05,ZF2k06,
ZF2k10,ZF2w07,ZF2w08,ZF2w09,ZF3cA,ZF3cB,ZF3cC,ZF3cD,ZF3cE,ZF3k11,ZF3k14,ZF3p12,
ZF3p13,ZF3p15
Andromeda_glaucophylla,,1,,,,,0.1,0.1,,0.1,0.1,,0.1,0.1,,,,,,,,,,,,,,,,,,,,,2,,
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,0.1,5,,0.1,,25,25,25,0.1,0.1,20,2,2,50,30,20,40,2,
25,0.1,,0.1,5,1,0.1,0.1,5,2,1,,,,,,,,,,,,,
Betula_glandulosa,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,2,0.1,0.1,,,,,,,,,,,,,,,,,,,,,
,,,,,10,0.1,10,5,0.1,5,0.1,5,20,10,0.1,1,1,0.1,1,,0.1,0.1,0.1,,15,,2,,5,0.1,
5,,0.1,,,,,,,,,0.1,,,,,
```

The following are wrapped versions of sample data records from the 1996 file on the CD-ROM:

```
Plant_species,CB1moat,CB2hk,CB2hw,CB3hk,CBpal_lich,CBpal_moss,CF3hka,CF3hkb,
CF4sph,CF4b_moss,CF1moat,CF2lwn,TF4hw,TF3hk,TF3hw,TF1hk,TF2hk,TF2hw,ZF1hk,ZF2hk,
ZF2hw,ZF3b_moss,ZF3hk,ZF3hw
Andromeda_glaucophylla,,,,,,,,,,,,,5,25,2,,5,5,0.1,10,20,,,
Betula_glandulosa,,,,,,,,,,,,,1,5,0.1,1,30,5,,0.1,,,1,
Caltha_palustris,,,,,,,,,,,,,1,,,,,,,,,
```

8. Data Organization

8.1 Data Granularity

The smallest unit of data is the entire data set for 1994 or 1996.

8.2 Data Format(s)

The Compact Disk-Read-Only Memory (CD-ROM) files contain American Standard Code for Information Interchange (ASCII) numerical and character fields of varying length separated by commas. There are no spaces between the fields.

9. Data Manipulations

9.1 Formulae

None.

9.1.1 Derivation Techniques and Algorithms

Not applicable.

9.2 Data Processing Sequence

9.2.1 Processing Steps

Plant species composition was recorded in each collar during the height of the growing season in mid-July of 1994 and 1996. Visual estimates of percent cover of each vascular plant and bryophyte species were made based on light interception of the canopy of each species. Percent cover of all species totals over 100 percent for each collar because of several layers of vegetation. Specimens for each unknown species were collected in plant communities outside of the collars and identified in the lab at the Heritage North Museum, Thompson, Manitoba, or at Dr. Barry Rock's laboratory at Complex Systems Research Center, UNH, Durham, NH.

9.2.2 Processing Changes

Not applicable.

9.3 Calculations

If -888 is present in the data set, it indicates that a measurement was taken, but was discarded for some reason. If -999 is present, then no data were taken.

9.3.1 Special Corrections/Adjustments

Not applicable.

9.3.2 Calculated Variables

Not applicable.

9.4 Graphs and Plots

None given.

10. Errors

10.1 Sources of Error

None given.

10.2 Quality Assessment

10.2.1 Data Validation by Source

None given.

10.2.2 Confidence Level/Accuracy Judgment

Not given.

10.2.3 Measurement Error for Parameters

Error for the light/canopy intercept method used (Daubenmire, 1968) is estimated to be 5-10% for percent cover values over 25%.

10.2.4 Additional Quality Assessments

Not applicable.

10.2.5 Data Verification by Data Center

Data were examined for general consistency and clarity.

11. Notes

11.1 Limitations of the Data

None given.

11.2 Known Problems with the Data

None given.

11.3 Usage Guidance

Note that the coverages are for midsummer. These values may be different at other times of the year.

11.4 Other Relevant Information

Not applicable.

12. Application of the Data Set

Remote sensing images, the chamber plant community data, and the chamber NEE data can be used to scale the CO₂ fluxes from the plot scale to wetland landscape.

13. Future Modifications and Plans

These data are in draft format.

14. Software

14.1 Software Description

Not applicable.

14.2 Software Access

Not applicable.

15. Data Access

The TGB-03 plant species composition data over the NSA fen are available from the Earth Observing System Data and Information System (EOSDIS) Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC).

15.1 Contact Information

For BOREAS data and documentation please contact:

ORNL DAAC User Services
Oak Ridge National Laboratory
P.O. Box 2008 MS-6407
Oak Ridge, TN 37831-6407
Phone: (423) 241-3952
Fax: (423) 574-4665
E-mail: ornldaac@ornl.gov or ornl@eos.nasa.gov

15.2 Data Center Identification

Earth Observing System Data and Information System (EOSDIS) Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC) for Biogeochemical Dynamics
<http://www-eosdis.ornl.gov/>.

15.3 Procedures for Obtaining Data

Users may obtain data directly through the ORNL DAAC online search and order system [<http://www-eosdis.ornl.gov/>] and the anonymous FTP site [<ftp://www-eosdis.ornl.gov/data/>] or by contacting User Services by electronic mail, telephone, fax, letter, or personal visit using the contact information in Section 15.1.

15.4 Data Center Status/Plans

The ORNL DAAC is the primary source for BOREAS field measurement, image, GIS, and hardcopy data products. The BOREAS CD-ROM and data referenced or listed in inventories on the CD-ROM are available from the ORNL DAAC.

16. Output Products and Availability

16.1 Tape Products

None.

16.2 Film Products

None.

16.3 Other Products

These data are available on the BOREAS CD-ROM series.

17. References

17.1 Platform/Sensor/Instrument/Data Processing Documentation

Not applicable.

17.2 Journal Articles and Study Reports

Daubenmire, R. 1968. Plant communities. Harper & Row, New York. 300 pp.

Newcomer, J., D. Landis, S. Conrad, S. Curd, K. Huemmrich, D. Knapp, A. Morrell, J. Nickeson, A. Papagno, D. Rinker, R. Strub, T. Twine, F. Hall, and P. Sellers, eds. 2000. Collected Data of The Boreal Ecosystem-Atmosphere Study. NASA. CD-ROM.

Sellers, P. and F. Hall. 1994. Boreal Ecosystem-Atmosphere Study: Experiment Plan. Version 1994-3.0, NASA BOREAS Report (EXPLAN 94).

Sellers, P. and F. Hall. 1996. Boreal Ecosystem-Atmosphere Study: Experiment Plan. Version 1996-2.0, NASA BOREAS Report (EXPLAN 96).

Sellers, P., F. Hall, and K.F. Huemmrich. 1996. Boreal Ecosystem-Atmosphere Study: 1994 Operations. NASA BOREAS Report (OPS DOC 94).

Sellers, P., F. Hall, and K.F. Huemmrich. 1997. Boreal Ecosystem-Atmosphere Study: 1996 Operations. NASA BOREAS Report (OPS DOC 96).

Sellers, P., F. Hall, H. Margolis, B. Kelly, D. Baldocchi, G. den Hartog, J. Cihlar, M.G. Ryan, B. Goodison, P. Crill, K.J. Ranson, D. Lettenmaier, and D.E. Wickland. 1995. The boreal ecosystem-atmosphere study (BOREAS): an overview and early results from the 1994 field year. *Bulletin of the American Meteorological Society*. 76(9):1549-1577.

Sellers, P.J., F.G. Hall, R.D. Kelly, A. Black, D. Baldocchi, J. Berry, M. Ryan, K.J. Ranson, P.M. Crill, D.P. Lettenmaier, H. Margolis, J. Cihlar, J. Newcomer, D. Fitzjarrald, P.G. Jarvis, S.T. Gower, D. Halliwell, D. Williams, B. Goodison, D.E. Wickland, and F.E. Guertin. 1997. BOREAS in 1997: Experiment Overview, Scientific Results and Future Directions. *Journal of Geophysical Research* 102(D24): 28,731-28,770.

17.3 Archive/DBMS Usage Documentation

None.

18. Glossary of Terms

None given.

19. List of Acronyms

AES	- Atmospheric Environment Services, Canada
ASCII	- American Standard Code for Information Interchange
BOREAS	- BOReal Ecosystem-Atmosphere Study
BORIS	- BOREAS Information System
BP	- Beaver Pond site, NSA
CB	- Collapse Bog
CD-ROM	- Compact Disk-Read-Only Memory
CF	- Collapse Fen
CMDL	- Climate Monitoring and Diagnostics Laboratory
DAAC	- Distributed Active Archive Center
ECD	- Electron Capture Detector
EOS	- Earth Observing System
EOSDIS	- EOS Data and Information System
FID	- Flame Ionization Detector
GC	- Gas Chromatograph
GIS	- Geographic Information System
GSFC	- Goddard Space Flight Center
HTML	- HyperText Markup Language
IRGA	- Infrared Gas Analyzer
LI-6200	- LI-COR portable photosynthesis system
NAD83	- North American Datum of 1983
NASA	- National Aeronautics and Space Administration
NEE	- Net Ecosystem Exchange of CO ₂
NSA	- Northern Study Area
OBS	- Old Black Spruce site, NSA
OJP	- Old Jack Pine, NSA
ORNL	- Oak Ridge National Laboratory
PANP	- Prince Albert National Park
SSA	- Southern Study Area
TCD	- Thermal Conductivity Detector
TF	- Tower Fen
TGB	- Trace Gas Biogeochemistry

UNH - University of New Hampshire
URL - Uniform Resource Locator
YJP - Young Jack Pine site, NSA
ZF - Zoltai Fen

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