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

Forrest G. Hall and Andrea Papagno, Editors

Volume 147
BOREAS TE-6 Allometry Data

S.T. Gower and J.G. Vogel

National Aeronautics and
Space Administration

Goddard Space Flight Center
Greenbelt, Maryland 20771

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BOREAS TE-6 Allometry Data

Stith T. Gower, Jason G. Vogel

Summary

The BOREAS TE-6 team collected several data sets in support of its efforts to characterize and interpret information on the plant biomass, allometry, biometry, sapwood, leaf area index, net primary production, soil temperature, leaf water potential, soil CO_2 flux, and multivegetation imagery of boreal vegetation. This data set includes tree measurements conducted on the above-ground biomass of trees in the BOREAS NSA and SSA during the growing seasons of 1994 and 1995 and the derived allometric relationships/equations. The data are stored in ASCII files.

Table of Contents

1. Data Set Overview

1.1 Data Set Identification

BOREAS TE-06 Allometry Data

1.2 Data Set Introduction

Allometric measurements were conducted on above-ground biomass of trees at the BOReal Ecosystem-Atmosphere Study (BOREAS) Southern Study Area (SSA) and Northern Study Area (NSA) as part of an effort by the BOREAS Terrestrial Ecology (TE)-06 team to develop allometric equations for various Canadian boreal forest types. For specific site and species information, please see Section 7.2.1. The mathematical relationship between two phenotypic traits is referred to as an allometric relationship. An allometric relationship is often used to estimate a not-so-easily measured variable from an easily measured variable. In the case of this study, it is the use of diameter at breast height (DBH) (1.37 m) to describe the leaf area, sapwood volume, or some other biomass component of each individual tree.

1.3 Objective/Purpose

The purpose of this study was to develop allometric equations for the predominant tree species at the Tower Flux (TF) and Carbon Evaluation (CEV) sites.

1.4 Summary of Parameters

The data records include measurements of DBH, total height of tree, height to the base of live crown, biomass parameters (new foliage, previous year's foliage, total foliage, new branch, previous year's branch, total branch, live stem), sapwood volume, leaf areas (new foliage, previous year's foliage, and total foliage), min and max tree diameters (base and at 137 cm), tissue type, and regression equation parameters (slope, Y-intercept, second slope, r-squared, mean square error, correction factor, and equation).

1.5 Discussion

Biomass, sapwood volume, and Leaf Area Index (LAI) are important, if not defining, characteristics of forests. To describe these characteristics, researchers often rely on allometric equations that provide an easily measured variable (i.e., DBH) as a surrogate to actually measuring each tree's variable of interest (i.e., biomass, sapwood volume, leaf area). These equations have been used to estimate biomass and net primary productivity at the TF, CEV, and auxiliary (AUX) sites. Tree species studied at these sites were Picea mariana (black spruce), Populus tremuloides (aspen), Pinus banksiana (jack pine), and Picea glauca (white spruce). For specific site and species information, please see Section 7.2.1.

1.6 Related Data Sets

BOREAS RSS-04 1994 Southern Study Area Jack Pine LAI and FPAR Data
BOREAS TE-06 1994 Soil and Air Temperatures in the NSA
BOREAS TE-06 Predawn Leaf Water Potentials and Foliage Moisture Contents
BOREAS TE-06 Multiband Vegetation Imager Data
BOREAS TE-06 NPP for the Tower Flux, Carbon Evaluation, and Auxiliary Sites
BOREAS TE-06 Biomass and Foilage Area Data

2. Investigator(s)

2.1 Investigator(s) Name and Title

Stith T. Gower
Professor

2.2 Title of Investigation

Measurement and Scaling of Carbon Budgets for Contrasting Boreal Forest Sites

2.3 Contact Information

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3. Theory of Measurements

To develop allometric equations for the BOREAS TF and CEV sites, the TE-06 team dissected, weighed, and measured 8-10 trees and derived least-squares regression equations to predict the values of all components from the diameter of the tree at breast height or 1.37 m. The site-specific allometric equations (see Sections 7.2.1 and 9.1) in conjunction with the plot inventories were used to estimate stand-level values for overstory biomass, increment, sapwood volume, and LAI.

4. Equipment

4.1 Instrument Description

Chainsaw, diameter tape, 30-kg scale, 1000-g scale, 20-m measuring tape, spray paint, leaf area meter, Q-Beam light source, and tarps.

4.1.1 Collection Environment

Measurements were made under a variety of field conditions that had no effect on the quality of estimates.

4.1.2 Source/Platform

None given.

4.1.3 Source/Platform Mission Objectives

None given.

4.1.4 Key Variables
See Section 7.3.

4.1.5 Principles of Operation
None given.

4.1.6 Sensor/Instrument Measurement Geometry
None given.

4.1.7 Manufacturer of Sensor/Instrument
Leaf Area Meter 3100
LI-COR, Inc.
P.O. Box 4425
4421 Superior Street
Lincoln, NE 68504
(402) 467-3576
(402) 467-2819 (fax)

Q-Beam 2001 Light Source
Quantum Devices, Inc.
Barneveld, WI

4.2 Calibration

4.2.1 Specifications
None given.

4.2.1.1 Tolerance
None given.

4.2.2 Frequency of Calibration
None given.

4.2.3 Other Calibration Information
None given.

5. Data Acquisition Methods

Above-ground biomass of tree components (stem, branch, new twig, foliage, and new foliage), sapwood volume, and leaf area were determined by destructive analysis. In early August 1994 (before leaf fall), two dominant, three codominant, three intermediate, and two suppressed trees representative of the range of diameters of live trees were destructively sampled from the dominant species at each site. For specific site and species information, please see Section 7.2.1. Exceptions included the two mixed species stands (U6W5S and D9I1M) and a high-density aspen stand (B9B7A). Six jack pine and six black spruce trees were harvested at U6W5S, and five aspen and eight white spruce trees were harvested at D9I1M. Only five trees were harvested at the extensive site, B9B7A in Prince Albert National Park (PANP), because of park regulations. Another harvest was executed at the SSA Old Jack Pine (OJP) site in August 1995 to better quantify the leaf area and foliage biomass of these stands. Trees were cut at the soil surface, and total tree height and length of the live crown were measured. The live crown was marked into thirds (top, middle, and lower), and all live branches from each position were cut and weighed separately. Dead branches were weighed for the entire canopy. One branch from each canopy position was randomly selected for detailed analysis in the field immediately after each tree was felled. Aspen branch samples were divided into foliated twig and

nonfoliage-bearing branches.

Jack pine sample branches were divided into current, 1-, 2-, 3-, and > 4-yr.-old shoots (needles + twig) and nonfoliage-bearing sample branches. Black spruce and white spruce sample branches were divided into current, 1-2, 3-4, and >5 yr.-old shoots and nonfoliage-bearing sample branches. The pile of foliage-bearing twigs was mixed thoroughly, and approximately 30-50 shoots were selected from each shoot age class from each canopy position. The fresh mass of each component was determined using an electronic balance, and the sample was placed in a labeled bag and stored in a cold room until it was transported to Madison, WI. Approximately 5-10 shoots were used for specific leaf area measurement and moisture content determination of the leaf and wood tissue. The methodology for determining specific leaf area can be found in Chen et al., 1997; all leaf area measurements are on a half-surface area.

At the young aged stands (Young Jack Pine (YJP) and U6W5S) that contained many small trees, the stems were cut in 1-m sections and weighed on an electronic balance. At all other sites, stems were cut in 2-m sections and weighed using a 30- or 100-kg capacity balance. A 2-cm-thick disk was taken from the base of each stem section and weighed on an electronic balance. Additional disks were taken from the base of the tree, breast height (1.37 m), and base of live crown for sapwood area measurements. The dry mass of each stem section was calculated by multiplying the wet mass of each stem section by the dry:wet ratio of each stem disk, and the total dry mass of a stem was calculated by summing the dry mass of all stem sections.

All fresh samples were stored at 4-6 °C in walk-in coolers at the end of each day. Samples were transported from Canada to Madison, WI, in an insulated, ice-cooled truck. In Madison, all samples to be dried were immediately placed in a walk-in, forced-air drying oven and dried at 70 °C to a constant mass. Sapwood area disks were stored at 2 °C until processed.

The sapwood-heartwood boundary was determined by placing a Q-Beam 2001 (Quantum Devices, Inc., Barneveld, WI) light source behind each sapwood disk and marking the boundary with a permanent pen. This technique provided reliable estimates of sapwood area for conifers but was less so for aspen. It was, however, more rapid than using stains and provided comparable estimates for all trees. The sapwood image was photocopied on clear acetate sheets, labeled, cut out, and spray-painted black. The area of each sapwood image was measured using a LI-COR 3100 area meter (LI-COR, Inc., Lincoln, NE). Sapwood volume was calculated following Gower et al. (1997).

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 trees selected for the allometric harvest were chosen because they represented a range of size classes of the trees found within the plots established at each site. The plot locations were chosen because they represented the forest within the Wind-Aligned Blob (WAB). The WAB was the area around a flux tower where most of the measured fluxes originated. During BOREAS, access to this area was limited to prevent contamination of flux measurements.

The measurement sites and associated North American Datum of 1983 (NAD83) coordinates are:

Site Name	Site ID	Latitude	Longitude	UTM Zone	UTM Northing	UTM Easting
SSA-9OA-FLXTR	C3B7T	53.62889˚N	106.19779˚W	13	5,942,899.9	420,790.5
SSA-YJP-FLXTR	F8L6T	53.87581˚N	104.64529˚W	13	5,969,762.5	523,320.2
SSA-OJP-FLXTR	G2L3T	53.91634˚N	104.69203˚W	13	5,974,257.5	520,227.7
SSA-OBS-FLXTR	G8I4T	53.98717˚N	105.11779˚W	13	5,982,100.5	492,276.5
NSA-OBS-FLXTR	T3R8T	55.88007˚N	98.48139˚W	14	6,192,853.4	532,444.5
NSA-OJP-FLXTR	T7Q8T	55.92842˚N	98.62396˚W	14	6,198,176.3	523,496.2
NSA-YJP-FLXTR	T8S9T	55.89575˚N	98.28706˚W	14	6,194,706.9	544,583.9
SSA-ASP-AUX02	B9B7A	53.59098˚N	106.18693˚W	13	5,938,447.2	421,469.8
SSA-9BS-AUX01	D0H6S	53.64877˚N	105.29534˚W	13	5,944,263.4	480,508.7
SSA-ASP-AUX03	D6L9A	53.66879˚N	104.6388˚W	13	5,946,733.2	523,864
SSA-ASP-AUX05	D9G4A	53.74019˚N	105.46929˚W	13	5,954,718.4	469,047.1
SSA-ASP-AUX06	E7C3A	53.84741˚N	106.08112˚W	13	5,966,863.1	428,905.9
SSA-MIX-AUX01	F1N0M	53.80594˚N	104.533˚W	13	5,962,031.8	530,753.7
SSA-9JP-AUX02	F5I6P	53.86608˚N	105.11175˚W	13	5,968,627.1	492,651.3
SSA-9JP-AUX04	F7J0P	53.88336˚N	105.05115˚W	13	5,970,323.3	496,667
SSA-9JP-AUX03	F7J1P	53.88211˚N	105.03226˚W	13	5,970,405.6	497,879.4
SSA-9JP-AUX05	G1K9P	53.9088˚N	104.74812˚W	13	5,973,404.5	516,546.7
SSA-9BS-AUX03	G2I4S	53.93021˚N	105.13964˚W	13	5,975,766.3	490,831.4
SSA-9BS-AUX02	G2L7S	53.90349˚N	104.63785˚W	13	5,972,844.3	523,793.6
SSA-MIX-AUX02	G4I3M	53.9375˚N	105.14246˚W	13	5,976,354.9	490,677.3
SSA-9JP-AUX06	G4K8P	53.91883˚N	104.76401˚W	13	5,974,516.6	515,499.1
SSA-9BS-AUX04	G6K8S	53.94446˚N	104.759˚W	13	5,977,146.9	515,847.9
SSA-9JP-AUX07	G7K8P	53.95882˚N	104.77148˚W	13	5,978,963.8	514,994.2
SSA-9JP-AUX08	G8L6P	53.96558˚N	104.63755˚W	13	5,979,752.7	523,778
SSA-9BS-AUX05	G9I4S	53.99877˚N	105.11805˚W	13	5,983,169.1	492,291.2
SSA-9JP-AUX09	G9L0P	53.97576˚N	104.73779˚W	13	5,980,856	517,197.7
SSA-9BS-AUX06	H1E4S	54.04093˚N	105.73581˚W	13	5,988,326.1	451,815.7
SSA-MIX-AUX03	H2D1M	54.06535˚N	105.92706˚W	13	5,991,190.3	439,327.7
SSA-9BS-AUX07	H2D1S	54.06199˚N	105.92545˚W	13	5,990,814.4	439,428.1
SSA-MIX-AUX04	H3D1M	54.066˚N	105.92982˚W	13	5,991,042.3	439,178.4
SSA-9JP-AUX10	I2I8P	54.11181˚N	105.05107˚W	13	5,995,963.1	496,661.4
NSA-ASP-AUX01	P7V1A	55.50253˚N	98.07478˚W	14	6,151,103.7	558,442.1
NSA-MIX-AUX01	Q1V2M	55.54568˚N	98.03769˚W	14	6,155,937.3	560,718.3
NSA-9JP-AUX01	Q3V3P	55.55712˚N	98.02473˚W	14	6,157,222.2	561,517.9
NSA-ASP-AUX03	R8V8A	55.67779˚N	97.8926˚W	14	6,170,774.8	569,638.4
NSA-9BS-AUX01	S8W0S	55.76824˚N	97.84024˚W	14	6,180,894.9	572,761.9
NSA-ASP-AUX05	S9P3A	55.88576˚N	98.87621˚W	14	6,193,371.6	507,743.3
NSA-MIX-AUX02	T0P5M	55.88911˚N	98.85662˚W	14	6,193,747.3	508,967.7
NSA-9BS-AUX08	T0P7S	55.88371˚N	98.82345˚W	14	6,193,151.1	511,043.9
NSA-9BS-AUX07	T0P8S	55.88351˚N	98.80225˚W	14	6,193,132	512,370.1
NSA-9BS-AUX02	T0W1S	55.78239˚N	97.80937˚W	14	6,182,502	574,671.7
NSA-9OA-9TETR	T2Q6A	55.88691˚N	98.67479˚W	14	6,193,540.7	520,342
NSA-9BS-AUX03	T3U9S	55.83083˚N	97.98339˚W	14	6,187,719.2	563,679.1
NSA-ASP-AUX04	T4U5A	55.84757˚N	98.04329˚W	14	6,189,528.2	559,901.6
NSA-9BS-AUX05	T4U8S	55.83913˚N	97.99325˚W	14	6,188,633.4	563,048.2
NSA-9BS-AUX04	T4U9S	55.83455˚N	97.98364˚W	14	6,188,132.8	563,657.5
NSA-9BS-AUX14	T5Q7S	55.9161˚N	98.64022˚W	14	6,196,800.5	522,487.2

Site Name	Site ID	Latitude	Longitude	UTM Zone	UTM Northing	UTM Easting
NSA-9BS-9TETR	T6R5S	55.90802˚N	98.51865˚W	14	6,195,947	530,092
NSA-9BS-AUX06	T6T6S	55.87968˚N	98.18658˚W	14	6,192,987.9	550,887.9
NSA-9BS-AUX13	T7R9S	55.91506˚N	98.44877˚W	14	6,196,763.6	534,454.5
NSA-9JP-AUX03	T7S9P	55.89486˚N	98.30037˚W	14	6,194,599.1	543,752.4
NSA-9BS-AUX09	T7T3S	55.89358˚N	98.22621˚W	14	6,194,505.6	548,391.8
NSA-9JP-AUX06	T8Q9P	55.93219˚N	98.6105˚W	14	6,198,601.4	524,334.5
NSA-ASP-AUX07	T8S4A	55.91856˚N	98.37041˚W	14	6,197,194.6	539,348.3
NSA-9BS-AUX15	T8S4S	55.91689˚N	98.37111˚W	14	6,197,008.6	539,306.4
NSA-9JP-AUX04	T8S9P	55.90456˚N	98.28385˚W	14	6,195,688.9	544,774.3
NSA-9JP-AUX05	T8T1P	55.90539˚N	98.26269˚W	14	6,195,795.3	546,096.3
NSA-9JP-AUX07	T9Q8P	55.93737˚N	98.59568˚W	14	6,199,183.2	525,257.1
NSA-9BS-AUX10	U5W5S	55.9061˚N	97.70986˚W	14	6,196,380.8	580,655.5
NSA-9BS-AUX12	U6W5S	55.91021˚N	97.70281˚W	14	6,196,846.5	581,087.8
NSA-ASP-AUX08	V5X7A	55.97396˚N	97.48565˚W	14	6,204,216.6	594,506.1
NSA-ASP-AUX09	W0Y5A	56.00339˚N	97.3355˚W	14	6,207,706.6	603,796.6
NSA-9JP-AUX02	99O9P	55.88173˚N	99.03952˚W	14	6,192,917.5	497,527.8
NSA-ASP-AUX02	Q3V2A	55.56227˚N	98.02635˚W	14	6,157,793.5	561,407.9
SSA-MIX-9TETR	D9I1M	53.7254˚N	105.20643˚W	13	5,952,989.7	486,379.7
SSA-OJP-FLXTR	G2L3T	53.91634˚N	104.69203˚W	13	5,974,257.5	520,227.7

7.1.2 Spatial Coverage Map
Not available.

7.1.3 Spatial Resolution
The data are point source measurements made at the given locations.

7.1.4 Projection
Not applicable.

7.1.5 Grid Description
Not applicable.

7.2 Temporal Characteristics

7.2.1 Temporal Coverage
The allometric relationships were made from data collected in 1994 and 1995.

7.2.2 Temporal Coverage Map
Sites visited in 1994:

Site_ID	SPECIES	Number of trees sampled	Tissue used in calculation of allometry equation
T2Q6A	Populus tremuloides	12	
T2Q6A	Populus tremuloides	12	Stem Mass
T2Q6A	Populus tremuloides	10	Sapwood Volume
T2Q6A	Populus tremuloides	8	Total Foliage Biomass
T2Q6A	Populus tremuloides	8	Total Branch Biomass
T2Q6A	Populus tremuloides	8	Total Foliage Leaf Area
T3R8T	Picea mariana	10	

Site_ID	SPECIES	Number of trees sampled	Tissue used in calculation of allometry equation
T3R8T	Picea mariana	10	Stem Mass
T3R8T	Picea mariana	10	Sapwood Volume
T3R8T	Picea mariana	9	New (Current) Foliage Biomass
T3R8T	Picea mariana	9	Old (Prev Years) Foliage Biomass
T3R8T	Picea mariana	9	Total Foliage Biomass
T3R8T	Picea mariana	9	New Branch Biomass
T3R8T	Picea mariana	9	Old Branch Biomass
T3R8T	Picea mariana	9	Total Branch Biomass
T3R8T	Picea mariana	9	New Foliage Leaf Area
T3R8T	Picea mariana	9	Old Foliage Leaf Area
T3R8T	Picea mariana	9	Total Foliage Leaf Area
T6R5S	Picea mariana	10	
T6R5S	Picea mariana	10	Stem Mass
T6R5S	Picea mariana	10	Sapwood Volume
T6R5S	Picea mariana	10	New (Current) Foliage Biomass
T6R5S	Picea mariana	10	Old (Prev Years) Foliage Biomass
T6R5S	Picea mariana	10	Total Foliage Biomass
T6R5S	Picea mariana	10	New Branch Biomass
T6R5S	Picea mariana	10	Old Branch Biomass
T6R5S	Picea mariana	10	Total Branch Biomass
T6R5S	Picea mariana	10	New Foliage Leaf Area
T6R5S	Picea mariana	10	Old Foliage Leaf Area
T6R5S	Picea mariana	10	Total Foliage Leaf Area
U6W5S	Picea mariana	6	
U6W5S	Picea mariana	6	Stem Mass
U6W5S	Picea mariana	5	Sapwood Volume
U6W5S	Picea mariana	6	New (Current) Foliage Biomass
U6W5S	Picea mariana	6	Old (Prev Years) Foliage Biomass
U6W5S	Picea mariana	6	Total Foliage Biomass
U6W5S	Picea mariana	6	New Branch Biomass
U6W5S	Picea mariana	6	Old Branch Biomass
U6W5S	Picea mariana	6	Total Branch Biomass
U6W5S	Picea mariana	6	New Foliage Leaf Area
U6W5S	Picea mariana	6	Old Foliage Leaf Area
U6W5S	Picea mariana	6	Total Foliage Leaf Area
T7Q8T	Pinus banksiana	10	
T7Q8T	Pinus banksiana	10	Stem Mass
T7Q8T	Pinus banksiana	10	Sapwood Volume
T7Q8T	Pinus banksiana	10	New (Current) Foliage Biomass
T7Q8T	Pinus banksiana	10	Old (Prev Years) Foliage Biomass
T7Q8T	Pinus banksiana	10	Total Foliage Biomass
T7Q8T	Pinus banksiana	10	New Branch Biomass
T7Q8T	Pinus banksiana	10	Old Branch Biomass
T7Q8T	Pinus banksiana	10	Total Branch Biomass
T7Q8T	Pinus banksiana	10	New Foliage Leaf Area
T7Q8T	Pinus banksiana	10	Old Foliage Leaf Area
T7Q8T	Pinus banksiana	10	Total Foliage Leaf Area
T8S9T	Pinus banksiana	10	
T8S9T	Pinus banksiana	10	Stem Mass
T8S9T	Pinus banksiana	10	Sapwood Volume

Site_ID	SPECIES	Number of trees sampled	Tissue used in calculation of allometry equation
T8S9T	Pinus banksiana	10	New (Current) Foliage Biomass
T8S9T	Pinus banksiana	10	Old (Prev Years) Foliage Biomass
T8S9T	Pinus banksiana	10	Total Foliage Biomass
T8S9T	Pinus banksiana	10	New Branch Biomass
T8S9T	Pinus banksiana	10	Old Branch Biomass
T8S9T	Pinus banksiana	10	Total Branch Biomass
T8S9T	Pinus banksiana	10	New Foliage Leaf Area
T8S9T	Pinus banksiana	10	Old Foliage Leaf Area
T8S9T	Pinus banksiana	10	Total Foliage Leaf Area
U6W5S	Pinus banksiana	6	
U6W5S	Pinus banksiana	6	Stem Mass
U6W5S	Pinus banksiana	6	Sapwood Volume
U6W5S	Pinus banksiana	5	New (Current) Foliage Biomass
U6W5S	Pinus banksiana	5	Old (Prev Years) Foliage Biomass
U6W5S	Pinus banksiana	5	Total Foliage Biomass
U6W5S	Pinus banksiana	5	New Branch Biomass
U6W5S	Pinus banksiana	5	Old Branch Biomass
U6W5S	Pinus banksiana	5	Total Branch Biomass
U6W5S	Pinus banksiana	5	New Foliage Leaf Area
U6W5S	Pinus banksiana	5	Old Foliage Leaf Area
U6W5S	Pinus banksiana	5	Total Foliage Leaf Area
G6K8S	Picea mariana	3	
C3B7T	Populus tremuloides	10	
C3B7T	Populus tremuloides	10	Stem Mass
C3B7T	Populus tremuloides	10	Sapwood Volume
C3B7T	Populus tremuloides	10	Total Foliage Biomass
C3B7T	Populus tremuloides	10	Total Branch Biomass
C3B7T	Populus tremuloides	10	Total Foliage Leaf Area
B9B7A	Populus tremuloides	5	
B9B7A	Populus tremuloides	5	Stem Mass
B9B7A	Populus tremuloides	5	Total Foliage Biomass
B9B7A	Populus tremuloides	5	Total Branch Biomass
B9B7A	Populus tremuloides	5	Total Foliage Leaf Area
D9I1M	Populus tremuloides	5	
D9I1M	Populus tremuloides	5	Stem Mass
D9I1M	Populus tremuloides	5	Sapwood Volume
D9I1M	Populus tremuloides	5	Total Foliage Biomass
D9I1M	Populus tremuloides	5	Total Branch Biomass
D9I1M	Populus tremuloides	5	Total Foliage Leaf Area
G8I4T	Picea mariana	10	
G8I4T	Picea mariana	10	Stem Mass
G8I4T	Picea mariana	9	Sapwood Volume
G8I4T	Picea mariana	9	New (Current) Foliage Biomass
G8I4T	Picea mariana	9	Old (Prev Years) Foliage Biomass
G8I4T	Picea mariana	9	Total Foliage Biomass
G8I4T	Picea mariana	9	New Branch Biomass
G8I4T	Picea mariana	9	Old Branch Biomass
G8I4T	Picea mariana	9	Total Branch Biomass
G8I4T	Picea mariana	9	New Foliage Leaf Area
G8I4T	Picea mariana	9	Old Foliage Leaf Area

Site_ID	SPECIES	Number of trees sampled	Tissue used in calculation of allometry equation
G8I4T	Picea mariana	9	Total Foliage Leaf Area
G2L3T	Pinus banksiana	10	
G2L3T	Pinus banksiana	10	Stem Mass
G2L3T	Pinus banksiana	10	Sapwood Volume
G2L3T	Pinus banksiana	9	New Branch Biomass
G2L3T	Pinus banksiana	9	Old Branch Biomass
G2L3T	Pinus banksiana	9	Total Branch Biomass
F8L6T	Pinus banksiana	10	
F8L6T	Pinus banksiana	10	Stem Mass
F8L6T	Pinus banksiana	10	Sapwood Volume
F8L6T	Pinus banksiana	10	New (Current) Foliage Biomass
F8L6T	Pinus banksiana	10	Old (Prev Years) Foliage Biomass
F8L6T	Pinus banksiana	10	Total Foliage Biomass
F8L6T	Pinus banksiana	10	New Branch Biomass
F8L6T	Pinus banksiana	10	Old Branch Biomass
F8L6T	Pinus banksiana	10	Total Branch Biomass
F8L6T	Pinus banksiana	10	New Foliage Leaf Area
F8L6T	Pinus banksiana	10	Old Foliage Leaf Area
F8L6T	Pinus banksiana	10	Total Foliage Leaf Area
D9I1M	Picea glauca	8	
D9I1M	Picea glauca	8	Stem Mass
D9I1M	Picea glauca	8	Sapwood Volume
D9I1M	Picea glauca	8	New (Current) Foliage Biomass
D9I1M	Picea glauca	8	Old (Prev Years) Foliage Biomass
D9I1M	Picea glauca	8	Total Foliage Biomass
D9I1M	Picea glauca	8	New Branch Biomass
D9I1M	Picea glauca	8	Old Branch Biomass
D9I1M	Picea glauca	8	Total Branch Biomass
D9I1M	Picea glauca	8	New Foliage Leaf Area
D9I1M	Picea glauca	8	Old Foliage Leaf Area
D9I1M	Picea glauca	8	Total Foliage Leaf Area

Sites visited in 1995:

Site_ID	SPECIES	Number of trees sampled	Tissue used in calculation of allometry equation
G2L3T	Pinus banksiana	10	
G2L3T	Pinus banksiana	10	New (Current) Foliage Biomass
G2L3T	Pinus banksiana	10	Old (Prev Years) Foliage Biomass
G2L3T	Pinus banksiana	10	Total Foliage Biomass
G2L3T	Pinus banksiana	10	New Foliage Leaf Area
G2L3T	Pinus banksiana	10	Old Foliage Leaf Area
G2L3T	Pinus banksiana	10	Total Foliage Leaf Area

7.2.3 Temporal Resolution

Not applicable.

7.3 Data Characteristics

7.3.1 Parameter/Variable

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

```
         Column Name
------------------------------
SITE_NAME
SUB_SITE
START_DATE
END_DATE
SPECIES
TREE_DIAMETER_BREAST_HT
TREE_DIAMETER_BASE
TREE_HEIGHT
HEIGHT_TO_CROWN_BASE
NEW_FOLIAGE_MASS
PREV_YRS_FOLIAGE_MASS
TOTAL_FOLIAGE_MASS
NEW_BRANCH_MASS
PREV_YRS_BRANCH_MASS
TOTAL_BRANCH_MASS
LIVE_STEM_MASS
SAPWOOD_VOLUME_SAMPLE
NEW_FOLIAGE_AREA
PREV_YRS_FOLIAGE_AREA
TOTAL_FOLIAGE_AREA
MIN_TREE_DIAMETER_BASE
MAX_TREE_DIAMETER_BASE
MIN_TREE_DIAMETER_BREAST_HT
MAX_TREE_DIAMETER_BREAST_HT
TISSUE_TYPE
DIAMETER_MEASURE_IN_REGRESSION
SAMPLE_AMOUNT
A_COEFF_TISSUE_TYPE_V_DIAM
B_COEFF_TISSUE_TYPE_V_DIAM
C_COEFF_TISSUE_TYPE_V_DIAM
R_SQUARED_TISSUE_TYPE_V_DIAM
MEAN_SQ_ERR_TISSUE_TYPE_V_DIAM
COR_FACTOR_TISSUE_TYPE_V_DIAM
REGRESSION_TYPE
CRTFCN_CODE
REVISION_DATE
```

7.3.2 Variable Description/Definition

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

Column Name	Description
SITE_NAME	The identifier assigned to the site by BOREAS, in the format SSS-TTT-CCCCC, where SSS identifies the portion of the study area: NSA, SSA, REG, TRN, and TTT identifies the cover type for the site, 999 if unknown, and CCCCC is the identifier for site, exactly what it means will vary with site type.
SUB_SITE	The identifier assigned to the sub-site by BOREAS, in the format GGGGG-IIIII, where GGGGG is the group associated with the sub-site instrument, e.g. HYD06 or STAFF, and IIIII is the identifier for sub-site, often this will refer to an instrument.
START_DATE	The date on which the collection of data commenced.
END_DATE	The date on which the collection of the data was terminated.
SPECIES	Botanical (Latin) name of the species (Genus species).
TREE_DIAMETER_BREAST_HT	The diameter of the tree at breast height (137 cm) above the ground.
TREE_DIAMETER_BASE	The diameter of the tree at the tree base measured at the soil surface.
TREE_HEIGHT	The height of the tree.
HEIGHT_TO_CROWN_BASE	The height from the ground to the base of the live tree crown.
NEW_FOLIAGE_MASS	The mass of the foliage grown during the current year.
PREV_YRS_FOLIAGE_MASS	The mass of previously grown foliage.
TOTAL_FOLIAGE_MASS	The mass of the total foliage
NEW_BRANCH_MASS	The mass of the branches grown during the current year.
PREV_YRS_BRANCH_MASS	The mass of previously grown branches.
TOTAL_BRANCH_MASS	The mass of the total branches.
LIVE_STEM_MASS	The mass of the live tree stems.
SAPWOOD_VOLUME_SAMPLE	The sapwood volume of a tree sample.
NEW_FOLIAGE_AREA	The area of the foliage grown during the current year.
PREV_YRS_FOLIAGE_AREA	The area of the foliage grown before the current year.
TOTAL_FOLIAGE_AREA	The total foliage area.
MIN_TREE_DIAMETER_BASE	The minimum tree diameter of the tree base measured at the soil surface.
MAX_TREE_DIAMETER_BASE	The maximum tree diameter of the tree base measured at the soil surface.
MIN_TREE_DIAMETER_BREAST_HT	The minimum tree diameter measured at breast height (137 cm) above the ground.
MAX_TREE_DIAMETER_BREAST_HT	The maximum tree diameter measured at breast height (137 cm) above the ground.

TISSUE_TYPE	The type of tissue being described by the regression equation.
DIAMETER_MEASURE_IN_REGRESSION	The tree diameter measurement used in the regression equation.
SAMPLE_AMOUNT	The number of trees sampled.
A_COEFF_TISSUE_TYPE_V_DIAM	The A coefficient in the regression equation describing the relationship between the amount of tissue type and the tree diameter using the regression equation in column REGRESSION_TYPE.
B_COEFF_TISSUE_TYPE_V_DIAM	The B coefficient in the regression equation describing the relationship between the amount of tissue type and the tree diameter using the regression equation given in the column REGRESSION_TYPE.
C_COEFF_TISSUE_TYPE_V_DIAM	The C coefficient in the regression equation describing the relationship between the amount of tissue type and tree diameter using the equation given in column REGRESSION_TYPE.
R_SQUARED_TISSUE_TYPE_V_DIAM	The r-squared value of the regression equation describing the relationship between the amount of tissue type and the tree diameter.
MEAN_SQ_ERR_TISSUE_TYPE_V_DIAM	The mean square error of the regression equation describing the relationship between the amount of tissue type and the tree diameter.
COR_FACTOR_TISSUE_TYPE_V_DIAM	The correction factor used to correct for non-homogeneous variance in the regression equation describing the relationship between the amount of tissue type and the tree diameter.
REGRESSION_TYPE	The form of the regression equation used to describe the relationship between the amount of tissue type, designated as Y, and the tree diameter, designated as X.
CRTFCN_CODE	The BOREAS certification level of the data. Examples are CPI (Checked by PI), CGR (Certified by Group), PRE (Preliminary), and CPI-??? (CPI but questionable).
REVISION_DATE	The most recent date when the information in the referenced data base table record was revised.

7.3.3 Unit of Measurement

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

Column Name	Units
SITE_NAME	[none]
SUB_SITE	[none]
START_DATE	[DD-MON-YY]
END_DATE	[DD-MON-YY]
SPECIES	[none]
TREE_DIAMETER_BREAST_HT	[meters]
TREE_DIAMETER_BASE	[meters]
TREE_HEIGHT	[meters]
HEIGHT_TO_CROWN_BASE	[meters]
NEW_FOLIAGE_MASS	[kilograms]

PREV_YRS_FOLIAGE_MASS	[kilograms]
TOTAL_FOLIAGE_MASS	[kilograms]
NEW_BRANCH_MASS	[kilograms]
PREV_YRS_BRANCH_MASS	[kilograms]
TOTAL_BRANCH_MASS	[kilograms]
LIVE_STEM_MASS	[kilograms]
SAPWOOD_VOLUME_SAMPLE	[meters^3]
NEW_FOLIAGE_AREA	[meters^2]
PREV_YRS_FOLIAGE_AREA	[meters^2]
TOTAL_FOLIAGE_AREA	[meters^2]
MIN_TREE_DIAMETER_BASE	[meters]
MAX_TREE_DIAMETER_BASE	[meters]
MIN_TREE_DIAMETER_BREAST_HT	[meters]
MAX_TREE_DIAMETER_BREAST_HT	[meters]
TISSUE_TYPE	[none]
DIAMETER_MEASURE_IN_REGRESSION	[none]
SAMPLE_AMOUNT	[counts]
A_COEFF_TISSUE_TYPE_V_DIAM	[unitless]
B_COEFF_TISSUE_TYPE_V_DIAM	[unitless]
C_COEFF_TISSUE_TYPE_V_DIAM	[unitless]
R_SQUARED_TISSUE_TYPE_V_DIAM	[unitless]
MEAN_SQ_ERR_TISSUE_TYPE_V_DIAM	[unitless]
COR_FACTOR_TISSUE_TYPE_V_DIAM	[unitless]
REGRESSION_TYPE	[none]
CRTFCN_CODE	[none]
REVISION_DATE	[DD-MON-YY]

7.3.4 Data Source

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

Column Name	Data Source
SITE_NAME	[BORIS Designation]
SUB_SITE	[BORIS Designation]
START_DATE	[Human Observer]
END_DATE	[Human Observer]
SPECIES	[Human Observer]
TREE_DIAMETER_BREAST_HT	[Laboratory Equipment]
TREE_DIAMETER_BASE	[Laboratory Equipment]
TREE_HEIGHT	[Laboratory Equipment]
HEIGHT_TO_CROWN_BASE	[Laboratory Equipment]
NEW_FOLIAGE_MASS	[Laboratory Equipment]
PREV_YRS_FOLIAGE_MASS	[Laboratory Equipment]
TOTAL_FOLIAGE_MASS	[Laboratory Equipment]
NEW_BRANCH_MASS	[Laboratory Equipment]
PREV_YRS_BRANCH_MASS	[Laboratory Equipment]
TOTAL_BRANCH_MASS	[Laboratory Equipment]
LIVE_STEM_MASS	[Laboratory Equipment]
SAPWOOD_VOLUME_SAMPLE	[Laboratory Equipment]
NEW_FOLIAGE_AREA	[Laboratory Equipment]
PREV_YRS_FOLIAGE_AREA	[Laboratory Equipment]
TOTAL_FOLIAGE_AREA	[Laboratory Equipment]
MIN_TREE_DIAMETER_BASE	[Laboratory Equipment]
MAX_TREE_DIAMETER_BASE	[Laboratory Equipment]

MIN_TREE_DIAMETER_BREAST_HT	[Laboratory Equipment]
MAX_TREE_DIAMETER_BREAST_HT	[Laboratory Equipment]
TISSUE_TYPE	[Human Observer]
DIAMETER_MEASURE_IN_REGRESSION	[Human Observer]
SAMPLE_AMOUNT	[Human Observer]
A_COEFF_TISSUE_TYPE_V_DIAM	[Calculation]
B_COEFF_TISSUE_TYPE_V_DIAM	[Calculation]
C_COEFF_TISSUE_TYPE_V_DIAM	[Calculation]
R_SQUARED_TISSUE_TYPE_V_DIAM	[Calculation]
MEAN_SQ_ERR_TISSUE_TYPE_V_DIAM	[Calculation]
COR_FACTOR_TISSUE_TYPE_V_DIAM	[Calculation]
REGRESSION_TYPE	[Human Observer]
CRTFCN_CODE	[BORIS Designation]
REVISION_DATE	[BORIS Designation]

7.3.5 Data Range

The following table gives information about the parameter values found in the 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 Cllctd
SITE_NAME	NSA-9BS-9TETR	SSA-YJP-FLXTR	None	None	None	None
SUB_SITE	9TE06-ALM01	9TE06-ALM01	None	None	None	None
START_DATE	01-AUG-94	01-AUG-95	None	None	None	None
END_DATE	31-AUG-94	31-AUG-95	None	None	None	None
SPECIES	N/A	N/A	None	None	None	None
TREE_DIAMETER_BREAST_HT	.8	29.8	None	None	None	Blank
TREE_DIAMETER_BASE	1.2	6.9	None	None	None	Blank
TREE_HEIGHT	.88	23.7	None	None	None	Blank
HEIGHT_TO_CROWN_BASE	0	16.2	-999	None	None	Blank
NEW_FOLIAGE_MASS	0	3	-999	None	None	Blank
PREV_YRS_FOLIAGE_MASS	0	21	-999	None	None	Blank
TOTAL_FOLIAGE_MASS	0	24	-999	None	None	Blank
NEW_BRANCH_MASS	0	1	-999	None	None	Blank
PREV_YRS_BRANCH_MASS	0	26	-999	None	None	Blank
TOTAL_BRANCH_MASS	0	27	-999	None	None	Blank
LIVE_STEM_MASS	0	374	-999	None	None	Blank
SAPWOOD_VOLUME_SAMPLE	0	1	-999	None	None	Blank
NEW_FOLIAGE_AREA	.05	18.55	-999	None	None	Blank
PREV_YRS_FOLIAGE_AREA	.19	118.33	-999	None	None	Blank
TOTAL_FOLIAGE_AREA	.21	136.48	-999	None	None	Blank
MIN_TREE_DIAMETER_BASE	.012	.017	None	None	None	Blank
MAX_TREE_DIAMETER_BASE	.039	.069	None	None	None	Blank
MIN_TREE_DIAMETER_BREAST_HT	.008	.113	None	None	None	Blank
MAX_TREE_DIAMETER_BREAST_HT	.064	.298	None	None	None	Blank

TISSUE_TYPE	N/A	N/A	None	None	None	Blank
DIAMETER_MEASURE_IN_ REGRESSION	N/A	N/A	None	None	None	None
SAMPLE_AMOUNT	5	12	None	None	None	Blank
A_COEFF_TISSUE_TYPE_ V_DIAM	-5.211	.054	None	None	None	Blank
B_COEFF_TISSUE_TYPE_ V_DIAM	.072	7.054	None	None	None	Blank
C_COEFF_TISSUE_TYPE_ V_DIAM	-.212	-.039	-999	None	None	Blank
R_SQUARED_TISSUE_ TYPE_V_DIAM	.478	.998	None	None	None	Blank
MEAN_SQ_ERR_TISSUE_ TYPE_V_DIAM	0	.239	None	None	None	Blank
COR_FACTOR_TISSUE_ TYPE_V_DIAM	1.001	1.139	-999	None	None	Blank
REGRESSION_TYPE	N/A	N/A	None	None	None	Blank
CRTFCN_CODE	CPI	CPI	None	None	None	None
REVISION_DATE	13-OCT-98	13-OCT-98	None	None	None	None

Minimum Data Value -- The minimum value found in the column.
Maximum Data Value -- The maximum value found in the column.
Missng Data Value -- The value that indicates missing data. This is used to indicate that an attempt was made to determine the parameter value, but the attempt was unsuccessful.
Unrel Data Value -- The value that indicates unreliable data. This is used to indicate an attempt was made to determine the parameter value, but the value was deemed to be unreliable by the analysis personnel.
Below Detect Limit -- The value that indicates parameter values below the instruments detection limits. This is used to indicate that an attempt was made to determine the parameter value, but the analysis personnel determined that the parameter value was below the detection limit of the instrumentation.
Data Not Cllctd -- This value indicates that no attempt was made to determine the parameter value. This usually indicates that BORIS combined several similar but not identical data sets into the same data base table but this particular science team did not measure that parameter.

Blank -- Indicates that blank spaces are used to denote that type of value.
N/A -- Indicates that the value is not applicable to the respective column.
None -- Indicates that no values of that sort were found in the column.

7.4 Sample Data Record

The following are wrapped versions of data record from a sample data file on the CD-ROM.

```
SITE_NAME,SUB_SITE,START_DATE,END_DATE,SPECIES,TREE_DIAMETER_BREAST_HT,
TREE_DIAMETER_BASE,TREE_HEIGHT,HEIGHT_TO_CROWN_BASE,NEW_FOLIAGE_MASS,
PREV_YRS_FOLIAGE_MASS,TOTAL_FOLIAGE_MASS,NEW_BRANCH_MASS,PREV_YRS_BRANCH_MASS,
TOTAL_BRANCH_MASS,LIVE_STEM_MASS,SAPWOOD_VOLUME_SAMPLE,NEW_FOLIAGE_AREA,
PREV_YRS_FOLIAGE_AREA,TOTAL_FOLIAGE_AREA,MIN_TREE_DIAMETER_BASE,
MAX_TREE_DIAMETER_BASE,MIN_TREE_DIAMETER_BREAST_HT,MAX_TREE_DIAMETER_BREAST_HT,
TISSUE_TYPE,DIAMETER_MEASURE_IN_REGRESSION,SAMPLE_AMOUNT,
A_COEFF_TISSUE_TYPE_V_DIAM,B_COEFF_TISSUE_TYPE_V_DIAM,C_COEFF_TISSUE_TYPE_V_DIAM,
R_SQUARED_TISSUE_TYPE_V_DIAM,MEAN_SQ_ERR_TISSUE_TYPE_V_DIAM,
COR_FACTOR_TISSUE_TYPE_V_DIAM,REGRESSION_TYPE,CRTFCN_CODE,REVISION_DATE
'NSA-9BS-9TETR','9TE06-ALM01',01-AUG-94,31-AUG-94,'Picea mariana',,,,,,,,,,,,,,,
,,.022,.158,,'new foliage area','Breast Height',10,-1.889,2.051,-999.0,.912,.031,
1.086,'LOG10(Y)=Y_INTERCEPT+SLOPE*LOG10(X)','CPI',13-OCT-98
'NSA-9BS-9TETR','9TE06-ALM01',01-AUG-94,31-AUG-94,'Picea mariana',,,,,,,,,,,,,,,
,,.022,.158,,'prev yrs foliage area','Breast Height',10,-.889,2.118,-999.0,.983,
.006,1.016,'LOG10(Y)=Y_INTERCEPT+SLOPE*LOG10(X)','CPI',13-OCT-98
```

8. Data Organization

8.1 Data Granularity

The smallest unit of data tracked by the BOREAS Information System (BORIS) was the data collected at a given site on a given date.

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. The character fields are enclosed with single apostrophe marks. There are no spaces between the fields.

Each data file on the CD-ROM has four header lines of Hyper-Text Markup Language (HTML) code at the top. When viewed with a Web browser, this code displays header information (data set title, location, date, acknowledgments, etc.) and a series of HTML links to associated data files and related data sets. Line 5 of each data file is a list of the column names, and line 6 and following lines contain the actual data.

9. Data Manipulations

9.1 Formulae

The majority of the regression equations are of the form:

$$\log10 (y) = a + b * (\log10(x)) \qquad (1)$$

where x is DBH and y is the biomass, sapwood volume, or area of a tissue.

The variable allometric ratio model was useful in describing the stem biomass of aspen. Aspen bole weight seemed to be negatively affected by heart rot as the tree aged, hence the c term, which was in fact a negative number.

$$\log10 (y) = a + b * (\log10(x)) + c * (x) \qquad (2)$$

The logarithmic transformation regression equation:

$$\log10 (y) = a + b * (\log10(x)) \quad (3)$$

The logarithmic transformation of Y only:

$$\log10 (y) = a + b * (x) \quad (4)$$

A Populus tremuloides correction factor was calculated to correct for nonhomogeneous variance (Sprugel, 1983). Often this correction factor was a very small percentage and was not included in the biomass calculations.

$$CF= \exp ((((\text{sqrt } (MSE))*2.303)^2)/2) \quad (5)$$

9.1.1 Derivation Techniques and Algorithms

The regression coefficients a, b, and c were derived using the least squares regression equations in Section 9.1.

9.2 Data Processing Sequence

None given.

9.2.1 Processing Steps

None given.

9.2.2 Processing Changes

None given.

9.3 Calculations

9.3.1 Special Corrections/Adjustments

None.

9.3.2 Calculated Variables

The regression coefficients a, b, and c were derived using the least squares regression equations in Section 9.1.

9.4 Graphs and Plots

Not applicable.

10. Errors

10.1 Sources of Error

Several sources of error can occur in the development of an allometric equation:

- The measurement of weights, heights, and diameters are sources of error.
- The selection of trees for a harvest is a potential source of error if the trees selected do not represent the stand overall.
- The size distribution of trees in a stand may represent an actual change in the tree allometrics that is "glossed over" in the final equation. This may have been a source of error in the black spruce stands because of the semishade tolerance of black spruce foliage and the resulting change in allometrics from large to small trees.

10.2 Quality Assessment

Of the three considerations listed above, 1 and 2 have been accounted for (see Section 10.2.1) and 3 has been examined. In the case of this study, 3 did seem to be a source of error for trees on the lower end of the harvested trees' diameter range in the black spruce stands. Populus tremuloides harvest is planned for the 1997 growing season to account for this error. Researchers interested in using the black spruce equations should be wary when their trees of interest approach the lower end of the DBH range listed.

10.2.1 Data Validation by Source

LAI was the only variable derived from the allometric equation and also measured using other techniques at all of the tower sites and so was used as a check of the foliage values. Agreement between the site LAI derived from the allometric equations and the LAI values found by a number of other methods was generally good for the aspen, black spruce, YJP, and northern OJP stands (Chen et al., 1997). The southern jack pine stand LAI did deviate from the other indices of LAI and was checked against equations from a harvest conducted at the same site in the fall of 1995. The allometric equations derived from trees harvested in 1995 yielded LAI values that closely matched those of other researchers, and therefore were used for the foliage calculations. Harvests have been and will be conducted to check various components of the black spruce equations; however, the results of these checks will not be available until the end of 1997.

10.2.2 Confidence Level/Accuracy Judgment

Confidence level for the tower sites is high for the data submitted. Researchers should note Section 10.1.

10.2.3 Measurement Error for Parameters

The mean square error, R-square, and the correction factor that was used to correct for non-homogeneous variance are given in the data.

10.2.4 Additional Quality Assessments

None given.

10.2.5 Data Verification by Data Center

Data were examined for general consistency and clarity.

11. Notes

11.1 Limitations of the Data

The allometric equations should not be used to describe components of trees beyond the diameter range listed. The allometric descriptions of foliage components are likely accurate only in stands that closely resemble the tower sites in hydrology and fertility.

11.2 Known Problems with the Data

See Section 10.1.

11.3 Usage Guidance

None.

11.4 Other Relevant Information

None.

12. Application of the Data Set

Populus tremuloides researchers can use these equations to describe various characteristics of the trees in and around the tower sites.

13. Future Modifications and Plans

See Section 10.2.1.

14. Software

14.1 Software Description

None given.

14.2 Software Access

None given.

15. Data Access

The allometry data 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

None.

17.2 Journal Articles and Study Reports

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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.

Sprugel D.G. 1983. Correcting for bias in log-transformed allometric equations. Ecology. 64:1, 209-210.

17.3 Archive/DBMS Usage Documentation

None.

18. Glossary of Terms

None.

19. List of Acronyms

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ASCII   - American Standard Code for Information Interchange
AUX     - Auxiliary Site
BAF     - Basal Area Factor
BOREAS  - BOReal Ecosystem-Atmosphere Study
BORIS   - BOREAS Information System
CD-ROM  - Compact Disk-Read-Only Memory
CEV     - Carbon Evaluation Site
DAAC    - Distributed Active Archive Center
DBH     - Diameter at Breast Height
EOS     - Earth Observing System
EOSDIS  - EOS Data and Information System
FLXTR   - Flux Tower
FPAR    - Fraction of Photosynthetically Active Radiation
GIS     - Geographic Information System
GSFC    - Goddard Space Flight Center
HTML    - HyperText Markup Language
LAI     - Leaf Area Index
MIX     - Mixed
NAD83   - North American Datum of 1983
NASA    - National Aeronautics and Space Administration
NPP     - Net Primary Productivity
NSA     - Northern Study Area
OA      - Old Aspen
OBS     - Old Black Spruce
OJP     - Old Jack Pine
ORNL    - Oak Ridge National Laboratory
PANP    - Prince Albert National Park
RSS     - Remote Sensing Science
SSA     - Southern Study Area
TE      - Terrestrial Ecology
TF      - Tower Flux
URL     - Uniform Resource Locator
UTM     - Universal Transverse Mercator
WAB     - Wind-Aligned Blob
YA      - Young Aspen
YJP     - Young Jack Pine
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The BOREAS TE-6 team collected several data sets in support of its efforts to characterize and interpret information on the plant biomass, allometry, biometry, sapwood, leaf area index, net primary production, soil temperature, leaf water potential, soil CO_2 flux, and multivegetation imagery of boreal vegetation. This data set includes tree measurements conducted on the above-ground biomass of trees in the BOREAS NSA and SSA during the growing seasons of 1994 and 1995 and the derived allometric relationships/equations. The data are stored in ASCII files.

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