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

Forrest G. Hall, Editor

Volume 116

Agriculture Canada Central Saskatchewan Vector Soils Data

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National Aeronautics and Space Administration

Goddard Space Flight Center
Greenbelt, Maryland 20771

September 2000
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Saskatchewan Vector Soils Data

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Summary

This data set consists of GIS layers that describe the soils of the BOREAS SSA. These original data layers were submitted as vector data in ARC/INFO EXPORT format. These data also include the soil name and soil layer files, which provide additional information about the soils. There are three sets of attributes that include information on the primary, secondary, and tertiary soil type within each polygon. Thus, there is a total of nine main attributes in this data set.

Based on agreements made with Agriculture Canada, these data are available only to individuals and groups that have an official relationship with the BOREAS project. These data are not included on the BOREAS CD-ROM set. A raster version of this data set titled ‘BOREAS Soils Data over the SSA in Raster Format and AEAC Projection’ is publicly available and is included on the BOREAS CD-ROM set. See Section 15 for current details on data availability.

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1. Data Set Overview

1.1 Data Set Identification
Agriculture Canada Central Saskatchewan Vector Soils Data

1.2 Data Set Introduction
This data set consists of Geographic Information System (GIS) layers that describe the soils of an area that covers a swath through central Saskatchewan and a small area in Manitoba. The original data were submitted as vector layers in ARC/INFO EXPORT format.
1.3 Objective/Purpose
The objective of these data is to provide BOReal Ecosystem-Atmosphere Study (BOREAS) investigators with a map of soil types and other soil properties. Because the original data were not collected by BOREAS staff, it cannot be said what the original objective was for collecting them. Although these data were received from Agriculture Canada, they do not cover agricultural areas of the BOREAS Southern Study Area (SSA), only forested areas.

1.4 Summary of Parameters
The parameters include:

- SOIL CODE
- MODIFIERS
- EXTENT
- soil names for primary, secondary, and tertiary soil units.

1.5 Discussion
This data set consists of GIS layers that describe the soils of the BOREAS SSA. These original data layers were submitted as vector data in ARC/INFO EXPORT format. These data also include the soil name and soil layer files, which provide additional information about the soils. There are three sets of attributes that include information on the primary, secondary, and tertiary soil type within each polygon. Thus, there is a total of nine main attributes in this data set. See Section 7.3 for more details.

1.6 Related Data Sets
- BOREAS Soils Data over the SSA in Raster Format and AEAC Projection
- CanSIS Regional Soils Data in Vector Format
- BOREAS Regional Soils Data in Raster Format and AEAC Projection

2. Investigator(s)

2.1 Investigator(s) Name and Title
BOReAS Staff Science

2.2 Title of Investigation
BOReAS Staff Science GIS Data Collection Program

2.3 Contact Information

Contact 1:
Dr. Harold Rostad
Agriculture Canada
Saskatoon, SK
Canada S7N 0W0
(306) 975-6305
rostad@digger.usask.ca

Contact 2:
David Knapp
Raytheon ITSS
Code 923
NASA GSFC
Greenbelt, MD 20771
(301) 286-1424
(301) 286-0239 (fax)
David.Knapp@gsfc.nasa.gov
3. Theory of Measurements

Unknown.

4. Equipment

4.1 Sensor/Instrument Description
   Unknown.

4.1.1 Collection Environment
   Unknown.

4.1.2 Source/Platform
   Unknown.

4.1.3 Source/Platform Mission Objectives
   Unknown.

4.1.4 Key Variables
   Unknown.

4.1.5 Principles of Operation
   Unknown.

4.1.6 Sensor/Instrument Measurement Geometry
   Unknown.

4.1.7 Manufacturer of Sensor/Instrument
   Unknown.

4.2 Calibration

4.2.1 Specifications
   Unknown.

4.2.1.1 Tolerance
   Unknown.

4.2.2 Frequency of Calibration
   Unknown.

4.2.3 Other Calibration Information
   Unknown.

5. Data Acquisition Methods

These data were acquired in ARC/INFO EXPORT format as vector coverages. The Soil Names files and Soil Layer files are standard INFO files (also in EXPORT format) that provide soil attributes for the provinces of Saskatchewan and Manitoba. The soil code for each polygon can be linked to the corresponding soil code attribute in the Soil Names file. The Soil Layer file contains information about the various soil layers that exist for each soil name.
6. Observations

6.1 Data Notes
None.

6.2 Field Notes
None.

7. Data Description

7.1 Spatial Characteristics

7.1.1 Spatial Coverage
These data cover a swath running east-west through the central part of Saskatchewan. These coverages are in the Universal Transverse Mercator (UTM) projection using the North American Datum of 1927 (NAD27) in UTM zones 12, 13, and 14. The *.pp files give some information about the bounding latitude/longitudes of each coverage. Some information about the projection of each coverage may also be given. Sometimes this projection name may not be very descriptive (e.g., TABLE). In these cases, the user must determine in which zone the coverage might exist. This can be done by plotting the data with coverages of a known UTM zone. The approximate locations of the corners of this area are:

<table>
<thead>
<tr>
<th>Corner</th>
<th>Longitude</th>
<th>Latitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northwest</td>
<td>110.4511W</td>
<td>55.0614N</td>
</tr>
<tr>
<td>Northeast</td>
<td>99.8739W</td>
<td>55.0614N</td>
</tr>
<tr>
<td>Southeast</td>
<td>99.8739W</td>
<td>52.8618N</td>
</tr>
<tr>
<td>Southwest</td>
<td>110.4511W</td>
<td>52.8618N</td>
</tr>
</tbody>
</table>

7.1.2 Spatial Coverage Map
Not available.

7.1.3 Spatial Resolution
These vector data are based on soils maps that were created at a scale of 1:125,000.

7.1.4 Projection
These data are in the UTM projection. The various coverages are in one of three different UTM zones (12, 13, or 14). Some of the coverages on the western end of this area are in UTM zone 12, most of the coverages in the center are in UTM zone 13, and those on the east end of the area are in UTM zone 14. These UTM projections are based on NAD27.

7.1.5 Grid Description
Not applicable.

7.2 Temporal Characteristics

7.2.1 Temporal Coverage
The time at which these soils were mapped could not be determined. They may have originally been mapped in the early 1980s, but the data have been updated and edited by Agriculture Canada based on new information since that time.
7.2.2 Temporal Coverage Map
Not available.

7.2.3 Temporal Resolution
Unknown.

7.3 Data Characteristics
See table of parameter names and descriptions following Section 7.3.3.

7.3.1 Parameter/Variable
SOIL CODE 1
SOIL CODE 2
SOIL CODE 3
MODIFIER SOIL 1
MODIFIER SOIL 2
MODIFIER SOIL 3
EXTENT OF SOIL 1
EXTENT OF SOIL 2
EXTENT OF SOIL 3

7.3.2 Variable Description/Definition
SOIL_CODE1 3-character code for the primary soil name. In this layer, the numerical value of each pixel corresponds to the SOIL NUM attribute in the soil name and soil layer files. There is a unique SOIL NUM for each SOIL CODE.
SOIL_CODE2 3-character code for the secondary soil name. This layer is coded and can be used in the same way as the SOIL_CODE1 layer.
SOIL_CODE3 3-character code for the tertiary soil name. This layer is coded and can be used in the same way as the SOIL_CODE1 layer.
MODIFIER1 3-character code to show soil variations of the primary soil. The modifier applies to the soil name and the soil code. The numerical value of each pixel in this layer corresponds to the MOD NUM attribute in the soil name and soil layer files. There is a unique MOD NUM for each MODIFIER. Together with the SOIL NUM, a unique record can be identified in the soil name and soil layer file that matches both the SOIL_NUM and MOD_NUM of the pixel.
MODIFIER2 3-character code to show soil variations. The modifier applies to the soil name and the soil code.
MODIFIER3 3-character code to show soil variations. The modifier applies to the soil name and the soil code.
EXTENT1 Percent of the map occupied by a specific soil. The numeric value of each pixel represents the percentage. Range = 34 to 100
EXTENT2 Percent of the map occupied by a specific soil. The numeric value of each pixel represents the percentage. Range = 0 to 50
EXTENT3 Percent of the map occupied by a specific soil. The numeric value of each pixel represents the percentage. Range = 0 to 33

The three SOIL_CODE and three MODIFIER attributes are associated with soil names. As explained above, they can be linked to the soil name and soil modifier values in the soil name and soil layer files. The items in the Saskatchewan soil names file include:
An unknown and undocumented attribute
Province name (here they will all be SK for Sask. or MB for Manitoba)
Name of soil
A 3-character code identifying a soil
Soil type modifier
Land use
Kind of soil
Water table characteristics
Soil layer that restricts root growth
Type of root restricting layer
Soil drainage class
Mode of deposition for primary soil
Mode of deposition for secondary soil
Mode of deposition for tertiary soil
Soil order
Soil subgroup
Great group
Header from Detail II file
Date of last revision
A horizon thickness
Soil thickness
Soil chemistry
Parent material modification
Parent material complex
Mode of deposition of second parent material deposition
where a soil name is a complex of materials
Parent material chemistry
Parent material textural class
Texture modification
Soil family particle size
Physiography

The column names in the Manitoba soil names file are very similar, but some of the column names appear to be duplicated. The reason for this is unknown. The soil layer file is also included with these data. The information in the soil names file can be linked to the soil layer file. The soil layer file provides information about the soil strata for a particular soil name. The attributes in the soil layer file include:

Province name (here they will all be SK for Sask. or MB for Manitoba)
A 3-character code identifying a soil
Soil type modifier
Land Use
Horizon number
Horizon lithological discontinuity
Master horizon (upper case)
Master suffix (lower case)
Horizon modifier
Upper horizon depth (cm)
Lower horizon depth (cm)
Coarse fragments (% by volume)
Dominant sand fraction
Very fine sand (% by weight)
Total sand (% by weight)
Total silt (% by weight)
TCLAY  Total clay (% by weight)
ORGCARB  Organic carbon (% by weight)
PHCA  pH in calcium chloride
PH2  pH as specified in project report
BASES  Base saturation
CEC  Cation exchange capacity (meq/100 g)
KSAT  Saturated hydraulic conductivity (cm/h)
KP0  Water retention at 0 kilopascals
KP10  Water retention at 10 kilopascals
KP33  Water retention at 33 kilopascals
KP1500  Water retention at 1500 kilopascals

(Water retention units are % by volume corrected for coarse fragment content.)

BD  Bulk density (g/cm³)
EC  Electrical conductivity (dS/m)
CACO₃  Calcium carbonate equivalent (%)
VONPOST  Von Post estimate of decomposition
WOOD  Volume (%) of woody material
DATE  Date of last revision

7.3.3 Unit of Measurement
SOIL_CODE1 - None
SOIL_CODE2 - None
SOIL_CODE3 - None
MODIFIER1 - None
MODIFIER2 - None
MODIFIER3 - None
EXTENT1 - Percent
EXTENT2 - Percent
EXTENT3 - Percent

7.3.4 Data Source
These data were acquired in ARC/INFO format from:

Dr. Harold P.W. Rostad, Unit Head
Agriculture Canada-Research-CLBRR/LRD
Saskatchewan Land Resource Unit
Room 5C26 Agriculture Building
c/o The Soil Science Department
University of Saskatchewan Campus
Saskatoon, SK Canada S7N 0W0

7.3.5 Data Range
See Section 7.3.2.

7.4 Sample Data Record
Not applicable.
8. Data Organization

8.1 Data Granularity
The smallest unit of data for this data set is the entire data set on tape.

8.2 Data Format(s)

8.2.1 Uncompressed Data Files
This data set is stored in a single tar file. The files with an *.e00 extension are ARC/INFO EXPORT files. The mb* files are for Manitoba, while the sk* files are for Saskatchewan. The *.pp files contain latitude/longitude bounds of the coverage as well as other information. The *.doc files provide background information about the production of the map and source materials that were used. The files contained within the one tar file are:

mbd246s.doc
mbd246s.e00
mbd246s.pp
skd019s.doc
skd019s.e00
skd019s.pp
skd020s.doc
skd020s.e00
skd020s.pp
skd053s.doc
skd053s.e00
skd053s.pp
skd054s.doc
skd054s.e00
skd054s.pp
skd055s.doc
skd055s.e00
skd055s.pp
skd056s.doc
skd056s.e00
skd056s.pp
skd057.doc
skd057.pp
skd057s.e00
skd058.doc
skd058.pp
skd058s.e00
skd059.doc
skd059.pp
skd059s.e00
skd060.doc
skd060.pp
skd060s.e00
skd061.doc
skd061s.e00
skd061s.pp
skdl13s.doc
skdl13s.e00
skdl13s.pp
skdl14s.doc
The following information, which is needed to decode the Soil Names file, was extracted (with modifications) from an information sheet supplied by the Canadian Soil Information System (CanSIS):

<table>
<thead>
<tr>
<th>Column Name</th>
<th>Coded Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>LU</td>
<td>Land Use</td>
</tr>
<tr>
<td></td>
<td>N Native Conditions</td>
</tr>
<tr>
<td></td>
<td>A Agriculture</td>
</tr>
<tr>
<td>KIND</td>
<td>Kind of Soil</td>
</tr>
<tr>
<td></td>
<td>M Mineral</td>
</tr>
<tr>
<td></td>
<td>O Organic</td>
</tr>
<tr>
<td></td>
<td>N Nonsoil</td>
</tr>
<tr>
<td></td>
<td>U Unclassified</td>
</tr>
<tr>
<td>WATERTBL</td>
<td>Water table characteristics</td>
</tr>
<tr>
<td></td>
<td>NO Not present any time</td>
</tr>
<tr>
<td></td>
<td>YU Present during unspecified time</td>
</tr>
<tr>
<td></td>
<td>YG Present during the growing season</td>
</tr>
<tr>
<td></td>
<td>YN Present during nongrowing season</td>
</tr>
<tr>
<td></td>
<td>YB Present during both seasons</td>
</tr>
<tr>
<td>ROOTRESTR</td>
<td>Soil Layer that restricts root growth</td>
</tr>
<tr>
<td></td>
<td>-- Not applicable</td>
</tr>
<tr>
<td></td>
<td>0 Not present</td>
</tr>
<tr>
<td></td>
<td>1-9 Restricting layer number</td>
</tr>
<tr>
<td>RESTR_TYPE</td>
<td>Type of Root Restricting Layer</td>
</tr>
<tr>
<td>------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>--</td>
<td>Not applicable</td>
</tr>
<tr>
<td>UN</td>
<td>Undifferentiated</td>
</tr>
<tr>
<td>BN</td>
<td>Solonetzic B</td>
</tr>
<tr>
<td>SA</td>
<td>EC&gt;4dS/m</td>
</tr>
<tr>
<td>CT</td>
<td>Compact (Basal) Till</td>
</tr>
<tr>
<td>OR</td>
<td>Ortstein</td>
</tr>
<tr>
<td>FP</td>
<td>Fragipan</td>
</tr>
<tr>
<td>LI</td>
<td>Lithic</td>
</tr>
<tr>
<td>CR</td>
<td>Cryic</td>
</tr>
<tr>
<td>DU</td>
<td>Duric</td>
</tr>
<tr>
<td>PL</td>
<td>Placic</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DRAINAGE</th>
<th>Soil Drainage Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>--</td>
<td>Not applicable</td>
</tr>
<tr>
<td>VR</td>
<td>Very Rapidly</td>
</tr>
<tr>
<td>R</td>
<td>Rapidly</td>
</tr>
<tr>
<td>W</td>
<td>Well</td>
</tr>
<tr>
<td>MW</td>
<td>Moderately Well</td>
</tr>
<tr>
<td>I</td>
<td>Imperfectly</td>
</tr>
<tr>
<td>P</td>
<td>Poorly</td>
</tr>
<tr>
<td>VP</td>
<td>Very Poorly</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MDEP1</th>
<th>Mode of Deposition for primary soil</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDEP2</td>
<td>Mode of Deposition for secondary soil</td>
</tr>
<tr>
<td>MDEP3</td>
<td>Mode of Deposition for tertiary soil</td>
</tr>
<tr>
<td>--</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>ANTH</td>
<td>Anthropogenic</td>
</tr>
<tr>
<td>COLL</td>
<td>Colluvial</td>
</tr>
<tr>
<td>EOLI</td>
<td>Eolian</td>
</tr>
<tr>
<td>FLEO</td>
<td>Fluvioeolian</td>
</tr>
<tr>
<td>FLLC</td>
<td>Fluviolacustrine</td>
</tr>
<tr>
<td>FLUV</td>
<td>Fluvial</td>
</tr>
<tr>
<td>FNPT</td>
<td>Fen Peat</td>
</tr>
<tr>
<td>FOPT</td>
<td>Forest Peat</td>
</tr>
<tr>
<td>GLFL</td>
<td>Glaciofluvial</td>
</tr>
<tr>
<td>GLLC</td>
<td>Glaciolacustrine</td>
</tr>
<tr>
<td>GLMA</td>
<td>Glaciomarine</td>
</tr>
<tr>
<td>LACU</td>
<td>Lacustrine</td>
</tr>
<tr>
<td>LATL</td>
<td>Lacustro-Till</td>
</tr>
<tr>
<td>MARI</td>
<td>Marine</td>
</tr>
<tr>
<td>RESD</td>
<td>Residual</td>
</tr>
<tr>
<td>SAPR</td>
<td>Saproglite</td>
</tr>
<tr>
<td>SEPT</td>
<td>Sedimentary Peat</td>
</tr>
<tr>
<td>SPPT</td>
<td>Sphagnum Moss</td>
</tr>
<tr>
<td>TILL</td>
<td>Till (Morainal)</td>
</tr>
<tr>
<td>UNDM</td>
<td>Undifferentiated mineral</td>
</tr>
<tr>
<td>UNDO</td>
<td>Undifferentiated organic</td>
</tr>
<tr>
<td>VOLC</td>
<td>Volcanic</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ORDER</th>
<th>Soil Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>--</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Soil Subgroup and Great Group. Characters before the dot (.) go into the S_GROUP (soil subgroup) field. Characters after the dot go into the G_GROUP (soil great group) field.</td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>-,-</td>
<td></td>
</tr>
<tr>
<td>Not Applicable</td>
<td></td>
</tr>
<tr>
<td>O.MB Orthic Melanic Brunisol</td>
<td></td>
</tr>
<tr>
<td>E.MB Eluviated Melanic Brunisol</td>
<td></td>
</tr>
<tr>
<td>GL.MB Gleyed Melanic Brunisol</td>
<td></td>
</tr>
<tr>
<td>GLE.MB Gleyed Eluviated Melanic Brunisol</td>
<td></td>
</tr>
<tr>
<td>O.EB Orthic Eutric Brunisol</td>
<td></td>
</tr>
<tr>
<td>E.EB Eluviated Eutric Brunisol</td>
<td></td>
</tr>
<tr>
<td>GL.EB Gleyed Eutric Brunisol</td>
<td></td>
</tr>
<tr>
<td>GLE.EB Gleyed Eluviated Eutric Brunisol</td>
<td></td>
</tr>
<tr>
<td>O.SB Orthic Sombric Brunisol</td>
<td></td>
</tr>
<tr>
<td>E.SB Eluviated Sombric Brunisol</td>
<td></td>
</tr>
<tr>
<td>DU.SB Duric Sombric Brunisol</td>
<td></td>
</tr>
<tr>
<td>GL.SB Gleyed Sombric Brunisol</td>
<td></td>
</tr>
<tr>
<td>GLE.SB Gleyed Eluviated Sombric Brunisol</td>
<td></td>
</tr>
<tr>
<td>O.DYB Orthic Dystric Brunisol</td>
<td></td>
</tr>
<tr>
<td>E.DYB Eluviated Dystric Brunisol</td>
<td></td>
</tr>
<tr>
<td>DU.DYB Duric Dystric Brunisol</td>
<td></td>
</tr>
<tr>
<td>GL.DYB Gleyed Dystric Brunisol</td>
<td></td>
</tr>
<tr>
<td>GLE.DYB Gleyed Eluviated Dystric Brunisol</td>
<td></td>
</tr>
<tr>
<td>O.B Orthic Brown</td>
<td></td>
</tr>
<tr>
<td>R.B Rego Brown</td>
<td></td>
</tr>
<tr>
<td>CA.B Calcareous Brown</td>
<td></td>
</tr>
<tr>
<td>E.B Eluviated Brown</td>
<td></td>
</tr>
<tr>
<td>SZ.B Solonetzic Brown</td>
<td></td>
</tr>
<tr>
<td>GL.B Gleyed Brown</td>
<td></td>
</tr>
<tr>
<td>GLR.B Gleyed Rego Brown</td>
<td></td>
</tr>
<tr>
<td>GLCA.B Gleyed Calcareous Brown</td>
<td></td>
</tr>
<tr>
<td>GLE.B Gleyed Eluviated Brown</td>
<td></td>
</tr>
<tr>
<td>GLSZ.B Gleyed Solonetzic Brown</td>
<td></td>
</tr>
<tr>
<td>O.DB Orthic Dark Brown</td>
<td></td>
</tr>
<tr>
<td>R.DB Rego Dark Brown</td>
<td></td>
</tr>
<tr>
<td>CA.DB Calcareous Dark Brown</td>
<td></td>
</tr>
<tr>
<td>E.DB Eluviated Dark Brown</td>
<td></td>
</tr>
<tr>
<td>SZ.DB Solonetzic Dark Brown</td>
<td></td>
</tr>
<tr>
<td>GL.DB Gleyed Dark Brown</td>
<td></td>
</tr>
<tr>
<td>GLR.DB Gleyed Rego Dark Brown</td>
<td></td>
</tr>
<tr>
<td>GLCA.DB Gleyed Calcareous Dark Brown</td>
<td></td>
</tr>
<tr>
<td>GLE.DB Gleyed Eluviated Dark Brown</td>
<td></td>
</tr>
<tr>
<td>GLSZ.DB Gleyed Solonetzic Dark Brown</td>
<td></td>
</tr>
<tr>
<td>O.BL Orthic Black</td>
<td></td>
</tr>
<tr>
<td>R.BL Rego Black</td>
<td></td>
</tr>
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</table>

Page 11
Calcareous Black
Eluviated Black
Solonetzic Black
Gleyed Black
Gleyed Rego Black
Gleyed Calcereous Black
Gleyed Eluviated Black
Gleyed Solonetzic Black
Orthic Dark Gray
Rego Dark Gray
Calcareous Dark
Solonetzic Dark Gray
Gleyed Dark Gray
Gleyed Rego Dark Gray
Gleyed Calcereous Dark Gray
Gleyed Solonetzic Dark Gray
Orthic Turbic Cryosol
Brunisolic Turbic Cryosol
Rego Turbic Cryosol
Gleysolic Turbic Cryosol
Orthic Static Cryosol
Brunisolic Static Cryosol
Regosolic Static Cryosol
Gleysolic Static Cryosol
Fibric Organic Cryosol
Mesic Organic Cryosol
Humic Organic Cryosol
Terric Fibric Organic Cryosol
Terric Mesic Organic Cryosol
Terric Humic Organic Cryosol
Glacic Organic Cryosol
Orthic Humic Gleysol
Rego Humic Gleysol
Fera Humic Gleysol
Solonetzic Humic Gleysol
Orthic Gleysol
Rego Gleysol
Fera Gleysol
Solonetzic Gleysol
Orthic Luvic Gleysol
Humic Luvic Gleysol
Fera Luvic Gleysol
Fragic Luvic Gleysol
Solonetzic Luvic Gleysol
Orthic Gray Brown Luvisol
Brunisolic Gray Brown Luvisol
Podzolic Gray Brown Luvisol
Gleyed Gray Brown Luvisol
Gleyed Brunisolic Gray Brown Luvisol
Gleyed Podzolic Gray Brown Luvisol
Orthic Gray Luvisol
Dark Gray Luvisol
Brunisolic Gray Luvisol
Podzolic Gray Luvisol
Solonetzic Gray Luvisol
Fragic Gray Luvisol
Gleyed Gray Luvisol
Gleyed Dark Gray Luvisol
Gleyed Brunisolic Gray Luvisol
Gleyed Podzolic Gray Luvisol
Gleyed Solonetzic Gray Luvisol
Gleyed Fragic Gray Luvisol
Typic Fibrisol
Mesic Fibrisol
Humic Fibrisol
Limno Fibrisol
Cumulo Fibrisol
Terric Fibrisol
Terric Mesic Fibrisol
Terric Humic Fibrisol
Hydric Fibrisol
Typic Mesisol
Fibric Mesisol
Humic Mesisol
Limno Mesisol
Cumulo Mesisol
Terric Mesisol
Terric Fibric Mesisol
Terric Humic Mesisol
Hydric Mesisol
Typic Humisol
Fibric Humisol
Mesic Humisol
Humic Humisol
Lignic Folisol
Orthic Humic Podzol
Ortstein Humic Podzol
Placic Humic Podzol
Duric Humic Podzol
Fragic Humic Podzol
Orthic Ferro-Humic Podzol
Ortstein Ferro-Humic Podzol
Placic Ferro-Humic Podzol
Duric Ferro-Humic Podzol
Fragic Ferro-Humic Podzol
Luvisolic Ferro-Humic Podzol
Sombric Ferro-Humic Podzol
Gleyed Ferro-Humic Podzol
Gleyed Sombric Ferro-Humic Podzol
Gleyed Ortstein Ferro-Humic Podzol
Orthic Humo-Ferric Podzol
Ortstein Humo-Ferric Podzol
Placic Humo-Ferric Podzol
Duric Humo-Ferric Podzol
Fragic Humo-Ferric Podzol
Luvisolic Humo-Ferric Podzol
Gleyed Humo-Ferric Podzol
Gleyed Sombric Humo-Ferric Podzol
Sombric Humo-Ferric Podzol
Gleyed Ortstein Humo-Ferric Podzol
Orthic Regosol
Cumulic Regosol
Gleyed Regosol
Orthic Humic Regosol
Cumulic Humic Regosol
Gleyed Humic Regosol
Brown Solonetz
Dark Brown Solonetz
Black Solonetz
Alkaline Solonetz
Gleyed Brown Solonetz
Gleyed Dark Brown Solonetz
Gleyed Black Solonetz
Brown Solodized Solonetz
Dark Brown Solodized Solonetz
Black Solodized Solonetz
Dark Gray Solodized Solonetz
Gray Solodized Solonetz
Gleyed Brown Solodized Solonetz
Gleyed Dark Brown Solodized Solonetz
Gleyed Black Solodized Solonetz
Gleyed Dark Gray Solodized Solonetz
Gleyed Gray Solodized Solonetz
Brown Solod
Dark Brown Solod
Black Solod
Dark Gray Solod
Gray Solod
Gleyed Brown Solod
Gleyed Dark Brown Solod
Gleyed Black Solod
Gleyed Dark Gray Solod
Gleyed Gray Solod

**PROFILE**

Header from Detail II File

**DATE**

YY.MM/DD Date of last revision

**A-THICK**

Thickness of A Horizon

L20 less than 20
G20 greater than 20

**SOL-THICK**

Soil thickness in centimeters

99 Not applicable
<table>
<thead>
<tr>
<th>SOL-CHEM</th>
<th>Soil Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>UD</td>
<td>Undifferentiated</td>
</tr>
<tr>
<td>EA</td>
<td>Extremely Acid</td>
</tr>
<tr>
<td>AN</td>
<td>Medium Acid to Neutral</td>
</tr>
<tr>
<td>WC</td>
<td>Weakly Calcareous</td>
</tr>
<tr>
<td>VC</td>
<td>Very Calcareous</td>
</tr>
<tr>
<td>EC</td>
<td>Extremely Calcareous</td>
</tr>
<tr>
<td>SA</td>
<td>Saline</td>
</tr>
<tr>
<td>-</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PM-MODIFY</th>
<th>Parent Material Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHAL</td>
<td>Shale</td>
</tr>
<tr>
<td>CRET</td>
<td>Cretaceous</td>
</tr>
<tr>
<td>TERT</td>
<td>Tertiary</td>
</tr>
<tr>
<td>STON</td>
<td>Stony contact</td>
</tr>
<tr>
<td>LIME</td>
<td>Limestone</td>
</tr>
<tr>
<td>TECR</td>
<td>Tertiary-Cretaceous</td>
</tr>
<tr>
<td>NA</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PM-COMPLEX</th>
<th>Parent Material Complex</th>
</tr>
</thead>
<tbody>
<tr>
<td>COM</td>
<td>Complex</td>
</tr>
<tr>
<td>NA</td>
<td>Not applicable</td>
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<table>
<thead>
<tr>
<th>PMDEP2</th>
<th>Parent Material Deposition for secondary soil</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>ANTH</td>
<td>Anthropogenic</td>
</tr>
<tr>
<td>COLL</td>
<td>Colluvial</td>
</tr>
<tr>
<td>EOLI</td>
<td>Eolian</td>
</tr>
<tr>
<td>FLEO</td>
<td>Fluvioeolian</td>
</tr>
<tr>
<td>FLLC</td>
<td>Fluviolacustrine</td>
</tr>
<tr>
<td>FLUV</td>
<td>Fluvial</td>
</tr>
<tr>
<td>FNPT</td>
<td>Fen Peat</td>
</tr>
<tr>
<td>FOPT</td>
<td>Forest Peat</td>
</tr>
<tr>
<td>GLFL</td>
<td>Glaciofluvial</td>
</tr>
<tr>
<td>GLLC</td>
<td>Glaciolacustrine</td>
</tr>
<tr>
<td>GLMA</td>
<td>Glaciomarine</td>
</tr>
<tr>
<td>LACU</td>
<td>Lacustrine</td>
</tr>
<tr>
<td>LATL</td>
<td>Lacusto-Till</td>
</tr>
<tr>
<td>MARI</td>
<td>Marine</td>
</tr>
<tr>
<td>RESD</td>
<td>Residual</td>
</tr>
<tr>
<td>SAPR</td>
<td>Saprolite</td>
</tr>
<tr>
<td>SEPT</td>
<td>Sedimentary Peat</td>
</tr>
<tr>
<td>SPPT</td>
<td>Sphagnum Moss</td>
</tr>
<tr>
<td>TILL</td>
<td>Till (Morainal)</td>
</tr>
<tr>
<td>UNDM</td>
<td>Undifferentiated mineral</td>
</tr>
<tr>
<td>UNDO</td>
<td>Undifferentiated organic</td>
</tr>
<tr>
<td>VOLC</td>
<td>Volcanic</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PM-CHEM</th>
<th>Parent Material Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>UD</td>
<td>Undifferentiated</td>
</tr>
<tr>
<td>EA</td>
<td>Extremely Acid</td>
</tr>
<tr>
<td>AN</td>
<td>Medium Acid to Neutral</td>
</tr>
<tr>
<td>WC</td>
<td>Weakly Calcareous</td>
</tr>
<tr>
<td>VC</td>
<td>Very Calcareous</td>
</tr>
<tr>
<td>EC</td>
<td>Extremely Calcareous</td>
</tr>
<tr>
<td>SA</td>
<td>Saline</td>
</tr>
<tr>
<td>-</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PMTEXCLASS</th>
<th>Parent Material Textural Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>VCS</td>
<td>very coarse sand</td>
</tr>
<tr>
<td>CS</td>
<td>coarse sand</td>
</tr>
<tr>
<td>LCS</td>
<td>loamy coarse sand</td>
</tr>
<tr>
<td>S</td>
<td>sand</td>
</tr>
<tr>
<td>FS</td>
<td>fine sand</td>
</tr>
<tr>
<td>LS</td>
<td>loamy sand</td>
</tr>
<tr>
<td>LFS</td>
<td>loamy fine sand</td>
</tr>
<tr>
<td>VFS</td>
<td>very fine sand</td>
</tr>
<tr>
<td>LVFS</td>
<td>loamy very fine sand</td>
</tr>
<tr>
<td>CSL</td>
<td>coarse sandy loam</td>
</tr>
<tr>
<td>SL</td>
<td>sandy loam</td>
</tr>
<tr>
<td>FSL</td>
<td>fine sandy loam</td>
</tr>
<tr>
<td>VFSL</td>
<td>very fine sandy loam</td>
</tr>
<tr>
<td>L</td>
<td>loam</td>
</tr>
<tr>
<td>SIL</td>
<td>silt loam</td>
</tr>
<tr>
<td>SCL</td>
<td>sandy clay loam</td>
</tr>
<tr>
<td>SICL</td>
<td>silty clay loam</td>
</tr>
<tr>
<td>CL</td>
<td>clay loam</td>
</tr>
<tr>
<td>C</td>
<td>clay</td>
</tr>
<tr>
<td>HC</td>
<td>heavy clay</td>
</tr>
<tr>
<td>O</td>
<td>organic</td>
</tr>
<tr>
<td>F</td>
<td>fibric</td>
</tr>
<tr>
<td>M</td>
<td>mesic</td>
</tr>
<tr>
<td>H</td>
<td>humic</td>
</tr>
<tr>
<td>NA</td>
<td>not applicable</td>
</tr>
</tbody>
</table>

**Texture Modifier**

| GR  | gravelly            |
| VG  | very gravelly       |
| WY  | woody               |
| NA  | not applicable      |

**Family Particle Size**

| UD   | undifferentiated    |
| FR   | fragmental          |
| SK   | skeletal            |
| SY   | sandy               |
| CL   | coarse loamy        |
| FL   | fine loamy          |
| LY   | loamy               |
| CY   | clayey              |
| SM   | stratified mineral  |
| SU   | stratified mineral and organic |
| SO   | stratified organic  |
| OG   | organic             |
| WY   | woody               |
| FI   | fibric              |
| ME   | mesic               |
| HU   | humic               |
| RU   | bedrock undifferentiated |
| RA   | bedrock acid        |
| RB   | bedrock basic       |
| RS   | bedrock soft        |
| NA   | not applicable      |

**Physiography**

| PHY  | physiographic      |
The Soil Layer files contain the following information:

<table>
<thead>
<tr>
<th>Column Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROVINCE</td>
<td>Province abbreviation.</td>
</tr>
<tr>
<td>SOIL_CODE</td>
<td>The 3-character soil code, as in the Soil Name file.</td>
</tr>
<tr>
<td>MODIFIER</td>
<td>The 3-character modifier code, as in the Soil Name file.</td>
</tr>
<tr>
<td>LU</td>
<td>The land use code. See Soil Name file description above to decode.</td>
</tr>
<tr>
<td>LAYER_NO</td>
<td>The layer number for the soil.</td>
</tr>
<tr>
<td>HZN_LIT</td>
<td>Horizon lithological discontinuity. Decoding information for this is available from the CSSC (the meaning of this acronym is unknown, but it might mean something like &quot;Canadian Soil Survey Code&quot;).</td>
</tr>
<tr>
<td>HZN_MAS</td>
<td>Master Horizon (upper case). Decoding information for this is available from the CSSC.</td>
</tr>
<tr>
<td>HZN_SUF</td>
<td>Horizon suffix (lower case). Decoding information for this is available from the CSSC.</td>
</tr>
<tr>
<td>HZN_MOD</td>
<td>Horizon modifier. Decoding information for this is available from the CSSC.</td>
</tr>
<tr>
<td>UDEPTH</td>
<td>Upper horizon depth (cm).</td>
</tr>
<tr>
<td>LDEPTH</td>
<td>Lower horizon depth (cm).</td>
</tr>
<tr>
<td>COFRAG</td>
<td>Coarse fragments (% by volume).</td>
</tr>
<tr>
<td>DOMSAND</td>
<td>Dominant sand fraction.</td>
</tr>
<tr>
<td>VFSAND</td>
<td>Very fine sand (% by weight).</td>
</tr>
<tr>
<td>TSAND</td>
<td>Total sand (% by weight).</td>
</tr>
<tr>
<td>TSILT</td>
<td>Total silt (% by weight).</td>
</tr>
<tr>
<td>TCLAY</td>
<td>Total clay (% by weight).</td>
</tr>
<tr>
<td>ORGCARB</td>
<td>Organic carbon (% by weight).</td>
</tr>
<tr>
<td>PHCA</td>
<td>pH in calcium chloride.</td>
</tr>
<tr>
<td>PH2</td>
<td>pH as specified in project report.</td>
</tr>
<tr>
<td>BASES</td>
<td>Base saturation (%).</td>
</tr>
<tr>
<td>CEC</td>
<td>Cation exchange capacity (meq/100 g).</td>
</tr>
<tr>
<td>KSAT</td>
<td>Saturated hydraulic conductivity (cm/hour).</td>
</tr>
<tr>
<td>KP0</td>
<td>Water retention at 0 kilopascals.</td>
</tr>
<tr>
<td>KP10</td>
<td>Water retention at 10 kilopascals.</td>
</tr>
<tr>
<td>KP33</td>
<td>Water retention at 33 kilopascals.</td>
</tr>
<tr>
<td>KP1500</td>
<td>Water retention at 1500 kilopascals.</td>
</tr>
</tbody>
</table>

Water retention units are % volume corrected for coarse fragment content.

BD        | Bulk density (g/cm³). |
EC        | Electrical conductivity (deciSiemens/meter). |
CACO32    | Calcium carbonate equivalent (%). |
VONPOST   | Von Post estimate of decomposition. |
WOOD      | Volume (%) of woody material. |
DATE      | Date of last revision. |
8.2.2 Compressed CD-ROM Files

On the BOREAS CD-ROMs, the single tar file has been compressed with the Gzip compression program (file name *.gz). These data have been compressed using gzip version 1.2.4 and the high compression (-9) option (Copyright (C) 1992-1993 Jean-loup Gailly). Gzip (GNU zip) uses the Lempel-Ziv algorithm (Welch, 1994) used in the zip and PKZIP programs. The compressed files may be uncompressed using gzip (-d option) or gunzip. Gzip is available from many Web sites (for example, ftp site prep.ai.mit.edu/pub/gnu/gzip-*.*) for a variety of operating systems in both executable and source code form. Versions of the decompression software for various systems are included on the CD-ROMs.

9. Data Manipulations

9.1 Formulae

9.1.1 Derivation Techniques and Algorithms
Unknown.

9.2 Data Processing Sequence

9.2.1 Processing Steps
BOREAS Information System (BORIS) staff copied and compressed the file for release on CD-ROM.

9.2.2 Processing Changes
None.

9.3 Calculations

9.3.1 Special Corrections/Adjustments
Unknown.

9.3.2 Calculated Variables
Unknown.

9.4 Graphs and Plots
None.

10. Errors

10.1 Sources of Error
A potential source of error in the original data set could be digitizing error. There is also the possibility of coding errors in the attributes; the value of an attribute could have been keyed in incorrectly. There is some question about the positional accuracy of the data. Although the data are mapped at a scale of 1:125,000, the source of the mapping is aerial photography that was not orthocorrected. Therefore, the soils mapping may contain distortions that exist in the air photos. This problem can be mitigated by "rubber sheeting" the data to an accurate map base, or acquiring the original air photos and compensating for their distortions. However, the minor benefits of improved positional accuracy would probably not be worth the time and effort of correcting all of these data.
10.2 Quality Assessment

10.2.1 Data Validation by Source
Unknown.

10.2.2 Confidence Level/Accuracy Judgment
The source in Canada from whom these data were received has strong caveats about the use of the data. These data are constantly being updated as new data are collected and become available. These data represent broad generalizations about the soil characteristics of this area. Caution is to be used when inferring information from the data.

10.2.3 Measurement Error for Parameters
Unknown.

10.2.4 Additional Quality Assessments
Unknown.

10.2.5 Data Verification by Data Center
No quality assessment of these data was performed beyond displaying the data set to make sure that it appeared to be a digital soils map covering an area of Saskatchewan.

11. Notes

11.1 Limitations of the Data
Sharp discontinuities may exist along map boundaries. These differences could be a result of coding and mapping variations between adjacent maps.

11.2 Known Problems with the Data
The original vector data apparently were digitized from aerial photography that was not orthometrically corrected. Therefore, the locational accuracy of the soil polygons may not be as accurate as one might expect.

11.3 Usage Guidance
Users of these data should be cautious about inferring information from this data set and extending those inferences over a larger area. The polygons from the original data set are large and may have small inclusions of various soil types that are not mapped in these data layers.

Before uncompressing the Gzip file on CD-ROM, be sure that you have enough disk space to hold the uncompressed data files. Then use the appropriate decompression program provided on the CD-ROM for your specific system.

11.4 Other Relevant Information
Unknown.

12. Application of the Data Set
The original intended use of these data is unknown. Users from the BOREAS project might use these data for hydrological modeling or some other ecosystem modeling activity.
13. Future Modifications and Plans

None.

14. Software

14.1 Software Description
A GIS software package called ARC/INFO (Versions 6 and 7) was used to grid these data. ARC/INFO is a proprietary software package produced by Environmental Systems Research Institute, Inc. (ESRI). Gzip (GNU zip) uses the Lempel-Ziv algorithm (Welch, 1994) used in the zip and PKZIP commands.

14.2 Software Access
ARC/INFO is proprietary software with copyright protection. Contact ESRI for details:

Environmental Systems Research Institute, Inc. (ESRI)
380 New York St.
Redlands, CA 92373-8100

Gzip is available from many Web sites across the Internet (for example, ftp site prep.ai.mit.edu/pub/gnu/gzip-*.*) for a variety of operating systems in both executable and source code form. Versions of the decompression software for various systems are included on the CD-ROMs.

15. Data Access

The Agriculture Canada central Saskatchewan vector soils 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
Based on agreements made with Agriculture Canada, these data are available only to individuals and groups that have an official relationship with the BOREAS project. A raster version of this data set titled 'BOREAS Soils Data over the SSA in Raster Format and AEAC Projection' is publicly available and is included on the BOREAS CD-ROM set.
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
These data can be made available on 8-mm, Digital Archive Tape (DAT), or 9-track tapes at 1600 or 6250 Bytes Per Inch (BPI).

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

17.2 Journal Articles and Study Reports


17.3 Archive/DBMS Usage Documentation
None.

18. Glossary of Terms
None.

19. List of Acronyms

- ASCII - American Standard Code for Information Interchange
- BOREAS - BOREal Ecosystem-Atmosphere Study
- BORIS - BOREAS Information System
- BPI - Bytes Per Inch
- CanSIS - Canadian Soil Information System
- CD-ROM - Compact Disk - Read-Only Memory
- DAAC - Distributed Active Archive Center
- EOS - Earth Observing System
- EOSDIS - EOS Data and Information System
- ESRI - Environmental Systems Research Institute, Inc.
- GIS - Geographic Information System
- GSFC - Goddard Space Flight Center
- NAD27 - North American Datum of 1927
- NAD83 - North American Datum of 1983
- NASA - National Aeronautics and Space Administration
- NSA - Northern Study Area
- ORNL - Oak Ridge National Laboratory
- PANP - Prince Albert National Park
- SSA - Southern Study Area
- URL - Uniform Resource Locator
- UTM - Universal Transverse Mercator
20. Document Information

20.1 Document Revision Dates
Written: 02-Dec-1994
Last Updated: 29-Nov-1999

20.2 Document Review Dates
Science Review:

20.3 Document ID

20.4 Citation
When using these data, please include the following acknowledgment as well as citations of relevant papers in Section 17.2: We would like to acknowledge Dr. Harold Rostad and Agriculture Canada for providing this data set to BOREAS for research purposes.

If using data from the BOREAS CD-ROM series, also reference the data as:


Also, cite the BOREAS CD-ROM set as:


20.5 Document Curator

20.6 Document URL
**Technical Report Series on the Boreal Ecosystem-Atmosphere Study (BOREAS)**
Agriculture Canada Central Saskatchewan Vector Soil Data

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This data set consists of GIS layers that describe the soils of the BOREAS SSA. These original data layers were submitted as vector data in ARC/INFO EXPORT format. These data also include the soil name and soil layer files, which provide additional information about the soils. There are three sets of attributes that include information on the primary, secondary, and tertiary soil type within each polygon. Thus, there is a total of nine main attributes in this data set.

**ABSTRACT (Maximum 200 words)**

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**SUBJECT TERMS**
BOREAS, remote sensing science.