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

Forrest G. Hall, Editor

Volume 232

BOREAS TGB-5 Fire History of Manitoba 1980 to 1991 in Vector Format

B.J. Stocks, R. Zepp, and D. Knapp

National Aeronautics and
Space Administration

Goddard Space Flight Center
Greenbelt, Maryland 20771

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BOREAS TGB-5 Fire History of Manitoba 1980 to 1991 in Vector Format

Brian J. Stocks, Canadian Forest Service-Ontario Region, Sault Ste. Marie
Richard Zepp, U.S. Environmental Protection Service, Athens, Georgia
David Knapp, Raytheon ITSS, NASA Goddard Space Flight Center, Greenbelt, Maryland

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BOREAS TGB-5 Fire History of Manitoba 1980 to 1991 in Vector Format

Brian J. Stocks, Richard G. Zepp, David Knapp

Summary

The BOREAS TGB-5 team collected several data sets related to the effects of fire on the exchange of trace gases between the surface and the atmosphere. This vector format data set covers the province of Manitoba between 1980 and 1991 and was produced by Forestry Canada from hand-drawn boundaries of fires on photocopies of 1:250,000 scale maps. The locational accuracy of the data is considered fair to poor. When the locations of some fire boundaries were compared to Landsat TM images, they were found to be off by as much as a few kilometers.

Note that some of the data set files on the BOREAS CD-ROMs have been compressed using the Gzip program. See Section 8.2 for details.

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1. Data Set Overview

1.1 Data Set Identification

BOREAS TGB-05 Fire History of Manitoba 1980 to 1991 in Vector Format

1.2 Data Set Introduction

This data set covers the province of Manitoba and was produced by Forestry Canada from hand-drawn boundaries of fires on photocopies of 1:250,000-scale maps. The locational accuracy of these data is considered fair to poor. When the locations of some fire boundaries were compared to Landsat Thematic Mapper (TM) images, they were found to be off by as much as a few kilometers. This problem should be kept in mind when using these data.

1.3 Objective/Purpose

These data are provided as part of the BOReal Ecosystem-Atmosphere Study (BOREAS) Trace Gas Biogeochemistry (TGB)-05 team data collection activities. The objective of collecting these data was to give BOREAS investigators a product showing the spatial distribution of fires in the province of Manitoba.

1.4 Summary of Parameters

This data set provides information indicating whether or not a given area had a fire in a specific year.

1.5 Discussion

Some investigators who have been using Advanced Very High Resolution Radiometer (AVHRR) imagery have found these data useful because they are on a scale that is suitable for 1,000-m x 1,000-m AVHRR pixels. This product is useful as a ground truth for comparing to image classifications from AVHRR imagery. However, because the location of fire polygons may be off by as much as a few kilometers, care should be taken when determining fire locations. This data set is the original vector data submitted by Forestry Canada. It was delivered as ARC/INFO Export files of polygons that identify fires from 1980 to 1991 (inclusive).

1.6 Related Data Sets

BOREAS TGB-05 Fire History of Manitoba 1980 to 1991 in Raster Format
SERM Forest Fire Chronology of Saskatchewan in Vector Format

2. Investigator(s)

2.1 Investigator(s) Name and Title

Brian J. Stocks
Richard G. Zepp

2.2 Title of Investigation

Trace Gas Exchange in the Boreal Forest Biome: Effects of Fire and Beaver Activity

2.3 Contact Information

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Athens, GA 30613

Contact 3:
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Greenbelt, MD 20771
(301) 286-1424
(301) 286-0239 FAX
David.Knapp@gsfc.nasa.gov

3. Theory of Measurements

As stated above, this product was created for BOREAS investigators who are interested in the fire history of this area. It could be used for ground truth of satellite image classifications and to get an estimate of the amount of burned area. The way in which these data were collected will have little to no impact on the theory behind the way they are being used, especially because these data are very simple and easy to understand. No information with regard to the intensity of the burn is identified in this data base. Only the presence or absence of a fire is given for each year.

4. Equipment

4.1 Sensor/Instrument Description

This vector format data set was produced by Forestry Canada from hand-drawn boundaries of fires on photocopies of 1:250,000 scale maps. Apparently, the fires were mapped based on observation from the air.

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

Presence or absence of fire in a particular year.

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.

Not applicable

4.2.1 Specifications
Unknown.

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

Forestry Canada compiled these data from maps of fires in the province of Manitoba. Apparently, the fires were mapped based on observation from the air. These fire polygons were hand traced onto photocopies of 1:250,000-scale maps. The fire data were then compiled by year and hand digitized into ARC/INFO polygon coverages.

6. Observations

6.1 Data Notes
These data simply contain information that indicates whether a fire occurred at a particular location in a given year.

6.2 Field Notes
There is no record of observations except for the actual data.

7. Data Description

7.1 Spatial Characteristics

7.1.1 Spatial Coverage
The data for Manitoba cover the entire province with the following approximate North American Datum of 1983 (NAD83) corner coordinates:

	Longitude	Latitude
Northwest	89.000W	60.000N
Northeast	102.000W	60.000N
Southeast	89.000W	49.000N
Southwest	102.000W	49.000N

7.1.2 Spatial Coverage Map
Not available.

7.1.3 Spatial Resolution
Based on the original mapping specifications, use of these data at a spatial resolution of 1,000 meters is recommended.

7.1.4 Projection

The area mapped is projected in the Platte Carre projection, which is really not a projection at all. The coordinates are longitudes and latitudes expressed in decimal degrees.

7.1.5 Grid Description

Not applicable to vector data.

7.2 Temporal Characteristics

Each ARC/INFO EXPORT file contains the polygons of fires that occurred during that year. The years between 1980 and 1991 (inclusive) are in this data set.

7.2.1 Temporal Coverage

This data set covers the period between 1980 and 1991 (inclusive).

7.2.2 Temporal Coverage Map

Not available.

7.2.3 Temporal Resolution

The temporal resolution of this data set is 1 year.

7.3 Data Characteristics

7.3.1 Parameter/Variable

Overall, these data simply indicate the presence or absence of a fire in a particular year over a particular area. The following columns exist in each of the coverages' polygon attribute table:

```
Column Name
-----------
AREA
PERIMETER
COV#
COV-ID
YEAR
MONTH
DAY
FIRENUM
AREAC
AREAB
FIRENUMB
```

Although the MONTH and DAY columns are listed, the information is blank. Although there are identifying numbers (i.e., FIRENUM and FIRENUMB), they are not useful in terms of finding additional information about a particular fire.

7.3.2 Variable Description/Definition

The occurrence of a fire in a given year.

7.3.3 Unit of Measurement

Unitless but coded value.

7.3.4 Data Source

Forestry Canada

7.3.5 Data Range
Zero to one.

7.4 Sample Data Record
Not applicable.

8. Data Organization

8.1 Data Granularity
The smallest amount of obtainable data is the entire data set containing all of the vector layers and any supporting files.

8.2 Data Format(s)

8.2.1 Uncompressed Data Files
The Manitoba fire history data set consists of 1 tar file (created from the UNIX "tar" command) that contains a set of 13 files. The tar file contains:

```
                                                File Name
                                                ---------
-rw-r--r-- 11624/120       356 Apr 24 16:57 1995 README.TXT
-rw-r--r-- 11624/120     94993 Feb 10 13:26 1995 temp80.e00
-rw-r--r-- 11624/120    156791 Feb 10 13:26 1995 temp81.e00
-rw-r--r-- 11624/120     21017 Feb 10 13:26 1995 temp82.e00
-rw-r--r-- 11624/120      4223 Feb 10 13:26 1995 temp83.e00
-rw-r--r-- 11624/120     22673 Feb 10 13:26 1995 temp84.e00
-rw-r--r-- 11624/120     70623 Feb 10 13:26 1995 temp85.e00
-rw-r--r-- 11624/120      5650 Feb 10 13:26 1995 temp86.e00
-rw-r--r-- 11624/120     42698 Feb 10 13:26 1995 temp87.e00
-rw-r--r-- 11624/120     81117 Feb 10 13:26 1995 temp88.e00
-rw-r--r-- 11624/120   1449253 May 28 11:54 1996 temp89.e00
-rw-r--r-- 11624/120     11339 Feb 10 13:26 1995 temp90.e00
-rw-r--r-- 11624/120     39532 Feb 10 13:26 1995 temp91.e00
```

Except for the README.TXT file, the files are ARC/INFO EXPORT files.

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

No manipulations were made by BOREAS Information System (BORIS) staff; these data remain in their original form as they were submitted to BORIS.

9.1.1 Derivation Techniques and Algorithms

None.

9.2 Data Processing Sequence

9.2.1 Processing Steps

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

None.

9.3.2 Calculated Variables

None.

9.4 Graphs and Plots

None

10. Errors

10.1 Sources of Error

Potential sources of error in the original data set could be interpretation or digitizing error. As indicated above, the data were hand traced onto photocopied maps based on air observations. No precision mapping of the fire boundaries was done.

10.2 Quality Assessment

10.2.1 Data Validation by Source

Unknown.

10.2.2 Confidence Level/Accuracy Judgment

The accuracy of the gridding procedure is high. Some consideration should be given to the scale of the original data and data gathering procedures and how they are reflected in this data set. As indicated, the locational accuracy of these data is questionable. The location of the fire boundaries could be off by as much as a few kilometers. This problem should be kept in mind when using these data.

10.2.3 Measurement Error for Parameters

Unknown.

10.2.4 Additional Quality Assessments

Unknown.

10.2.5 Data Verification by Data Center

The only check on the data included visual inspection to ensure that the data could be read properly and included polygon boundaries. Some of the vector layers were compared to TM imagery of the study area. This comparison indicated that there is a discrepancy between the location of the polygons and the fires as depicted in the Landsat TM scene, which is precision corrected with Global Positioning System (GPS) and 1:50,000-scale maps. These fire history data were determined to have a locational error as high as a few kilometers.

11. Notes

11.1 Limitations of the Data

The precision and accuracy of this data set puts some limitations on its use. It should not be used for comparison to mapping products derived from high-resolution imagery (e.g., air photos). Care should be taken when using it with Landsat TM or other high-spatial-resolution imagery.

11.2 Known Problems with the Data

As indicated above, the locational accuracy of these data is suspect because of the way in which the data were collected (see Sections 5., 10.2.1, and 10.2.2).

11.3 Usage Guidance

Before uncompressing the Gzip files 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

None.

12. Application of the Data Set

Some investigators who have been using AVHRR data have found these data useful because they are on a scale that is suitable for 1-km by 1-km AVHRR pixels. This product would be useful as ground truth for comparing to image classifications from AVHRR imagery.

13. Future Modifications and Plans

None.

14. Software

14.1 Software Description

BORIS personnel used the ARC/INFO (Version 7) software and related tools to import and view the original vector data. The ARC/INFO software is a proprietary package developed and distributed 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 vector format fire history data of Manitoba from 1980 to 1991 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

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

ARC/INFO User's Guide (Version 7). 1994. Redlands, CA.

Welch, T.A. 1984. A Technique for High Performance Data Compression. IEEE Computer, Vol. 17, No. 6, pp. 8-19.

17.2 Journal Articles and Study Reports

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.

19. List of Acronyms

```
AEAC    - Albers Equal-Area Conic
AVHRR   - Advanced Very High Resolution Radiometer
BOREAS  - BOReal Ecosystem-Atmosphere Study
BORIS   - BOREAS Information System
BPI     - Bytes Per Inch
CCRS    - Canadian Centre for Remote Sensing
CCT     - Computer Compatible Tape
CD-ROM  - Compact Disk-Read-Only Memory
DAAC    - Distributed Active Archive Center
DAT     - Digital Archive Tape
EOS     - Earth Observing System
EOSDIS  - EOS Data and Information System
GIS     - Geographic Information System
GPS     - Global Positioning System
GSFC    - Goddard Space Flight Center
LRRC    - Land Resource Research Center
NASA    - National Aeronautics and Space Administration
NSA     - Northern Study Area
ORNL    - Oak Ridge National Laboratory
PANP    - Prince Albert National Park
SSA     - Southern Study Area
TGB     - Trace Gas Biogeochemistry
TM      - Thematic Mapper
URL     - Uniform Resource Locator
UTM     - Universal Transverse Mercator
```

20. Document Information

20.1 Document Revision Date

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Canadian Forest Service-Ontario Region
Great Lakes Forestry Centre
1219 Queen St.
East Sault Ste. Marie, Ontario, Canada P6A 5M7

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Stocks, B.J. and R.G. Zepp, "Trace Gas Exchange in the Boreal Forest Biome: Effects of Fire and Beaver Activity." In Collected Data of The Boreal Ecosystem-Atmosphere Study. Eds. J. Newcomer, 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. CD-ROM. NASA, 2000.

Also, cite the BOREAS CD-ROM set as:

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. Collected Data of The Boreal Ecosystem-Atmosphere Study. NASA. CD-ROM. NASA, 2000.

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13. ABSTRACT *(Maximum 200 words)*

The BOREAS TGB-5 team collected several data sets related to the effects of fire on the exchange of trace gases between the surface and the atmosphere. This vector format data set covers the province of Manitoba between 1980 and 1991 and was produced by Forestry Canada from hand-drawn boundaries of fires on photocopies of 1:250,000 scale maps. The locational accuracy of the data is considered fair to poor. When the locations of some fire boundaries were compared to Landsat TM images, they were found to be off by as much as a few kilometers.

14. SUBJECT TERMS
BOREAS, trace gas biogeochemistry.

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