Vegetation Species Data (FIFE)

Summary:

The Vegetation Species and Cover Abundance Data Set documents the species present at the FIFE staff data measurement sites. Percent cover is estimated for each species at approximately the time of the IFC's. Disturbances occur over a variety of spatial and temporal scales in North American grasslands, and interactions of these different disturbances affect community structure. Two types of disturbance commonly occur over large spatial scales in grasslands, namely, fire and grazing.

Analysis of percent cover of dominant species indicated that composition and heterogeneity was significantly affected by grazing intensity and burning. The effects of disturbances on community structure are not additive, and may not be extrapolated from studies of single factors. The interpretation of patterns in natural communities is clearly scale dependent, and processes may act differently when viewed from different spatial or temporal scales. The effects of scale may not always be predictable; therefore, an understanding of pattern and process at one hierarchical level may not provide useful information about pattern and process at a different hierarchical level.

Table of Contents:

1. Data Set Overview:

Data Set Identification:

Vegetation Species Data (FIFE).
(Vegetation Species and Cover Abundance).

Data Set Introduction:

The Vegetation Species and Cover Abundance Data Set documents the species present at the FIFE staff data measurement sites. Percent cover is estimated for each species at approximately the time of the IFC's.

Objective/Purpose:

The objectives of this study were:

1. To provide FIFE Science investigators with measurements and analyses of vegetation species and community structure for use with remotely sensed data and surface flux measurements, and
2. To determine the effects of fire, grazing, and the two in combination on heterogeneity within and between communities in the tallgrass prairie landscape.

Summary of Parameters:

Plant species code and cover abundance.

Discussion:

This data set documents the species present at the FIFE staff data measurement sites. Percent cover is estimated for each species at approximately the time of the IFC's.

Analysis of percent cover of dominant species indicated that composition was significantly affected by grazing intensity. Grazing also increased the variation in composition between sites. When burning is combined with grazing, species composition is extremely variable across sites. Grazing alone tended to increase heterogeneity between samples within sites, except at high grazing intensities. Burning also increased heterogeneity within a site, but heterogeneity was lower in burned sites that were moderately to heavily grazed. Therefore, the effects of disturbances on community structure are not additive, and may not be extrapolated from studies of single factors.

Related Data Sets:

- Biophysical Properties of Vegetation.
- Vegetation Species Reference.

FIS Data Base Table Name:

VEG_SPECIES_DATA.

2. Investigator(s):

Investigator(s) Name and Title:

Staff Science.

Title of Investigation:

Staff Science Data Acquisition Program.

Contact Information:

Contact 1:
Dr. D.J. Gibson
Southern Illinois University
Carbondale, IL
Tel. (618) 453-3231
Email: GA4239@SIUCVMB

Contact 2:
S.L. Collins
Univ. of Oklahoma
Norman, OK
(405) 325-1651
Email: AC0020@UOKMVSA

Contact 3:
S.M. Glenn
Oklahoma Biological Survey
Norman, OK
Tel. (405) 325-5374
Email: ac2020@uokmvsa.bitnet

Requested Form of Acknowledgment.

3. Theory of Measurements:

The interpretation of patterns in natural communities is clearly scale dependent, and processes may act differently when viewed from different spatial or temporal scales. The effects of scale may not always be predictable; therefore, an understanding of pattern and process at one

hierarchical level may not provide useful information about pattern and process at a different hierarchical level.

Disturbances occur over a variety of spatial and temporal scales in North American grasslands, and interactions of these different disturbances affect community structure. Two types of disturbance commonly occur over large spatial scales in grasslands, namely, fire and grazing. Previous analyses of the effects of burning and grazing on grassland community structure have been limited to within community effects. It is generally assumed that these effects may be extrapolated to a larger scale. However, there have been no studies that have considered the interactive effect of these two disturbances in grasslands at both the within community (local) and regional (landscape) scales.

4. Equipment:

Sensor/Instrument Description:

Circular rings were used to mark the plots in which the cover abundance was determined. The rings enclosed a 2 square meter area.

Collection Environment:

Ground-based.

Source/Platform:

Plant properties and processes were measured by persons on the ground, using portable circular rings for area delineation.

Source/Platform Mission Objectives:

The aim was to collect species information and analyze community heterogeneity in a tallgrass prairie at regional and local hierarchical levels, to assess the effects of disturbances on community structure at different spatial scales.

Key Variables:

Species, cover abundance in multiple plots, average cover abundance for a site or along a transect.

Principles of Operation:

Species cover was estimated by eye by the investigators. See the *Data Acquisition Methods Section* below for details.

Sensor/Instrument Measurement Geometry:

Two square meter circle.

Manufacturer of Sensor/Instrument:

Locally fabricated.

Calibration:

Species and cover estimates were made by eye, by a trained human observer.

Specifications:

Not applicable.

Tolerance:

Not applicable.

Frequency of Calibration:

Not applicable.

Other Calibration Information:

Not applicable.

5. Data Acquisition Methods:

Plant measurements were made at various sites with different combinations of disturbances; namely, burned only, both grazed and burned, or undisturbed The site for each disturbance treatment (0.1 ha) was sampled using ten permanent 2 square meter circular quadrants in which cover of species was estimated using the Daubenmire (1959) scale of cover classes and converted to percent cover using class midpoints (Abrams and Hulbert 1987). Only species responsible for greater than 5% live cover in a quadrant were sampled. The table below contains the cover class system used in the field and the midpoints for each class used in calculating average and percent cover:

Cover class	Percent cover	Midpoint (% cover)
1	0 – 1	0.5
2	1 – 5	3.0
3	5 – 25	15.0
4	25 – 50	37.5
5	50 – 75	62.5
6	75 – 95	85.0
7	95 – 100	97.5

Data collection design for historical (pre-1987) was different, in that sites were located on transects through LTER research treatment areas.

6. Observations:

Data Notes:

Not available.

Field Notes:

Field observations and initial analyses indicated that some of the sites were not dominated by prairie vegetation. One was an old field dominated by BROMUS INERMIS species, and another was dominated by shrubs. These two sites were eliminated from the analyses.

One of the FIFE site locations was moved from a shrub-dominated slope sampled in May to a grass-dominated upland sampled in June. Therefore, the May sample was not used in the analyses (see Glenn et al., 1992 for details).

7. Data Description:

Spatial Characteristics:

The FIFE study area, with areal extent of 15 km by 15 km, is located south of the Tuttle Reservoir and Kansas River, and about 10 km from Manhattan, Kansas, USA. The northwest corner of the area has UTM coordinates of 4,334,000 Northing and 705,000 Easting in UTM Zone 14.

Spatial Coverage:

Data were collected along 18 transects and from 35 distinct locations within the FIFE study area.

Spatial Coverage Map:

Not available.

Spatial Resolution:

Not provided by Principal Investigator.

Projection:

Not available.

Grid Description:

Not available.

Temporal Characteristics:

Temporal Coverage:

Data collected along the transects was collected before FIFE by the LTER program. These pre-FIFE data were collected from May 7, 1984 through September 26, 1984; May 6, 1985 through October 16, 1985; April 23, 1986 through September 25, 1986.

The FIFE measurements in 1987, began on May 22 and ended on October 10. In 1988, there were no data. An additional observation was made in 1989 from August 15 to August 18.

Temporal Coverage Map:

Not available.

Temporal Resolution:

The transects were observed at 3 times (spring, summer, and fall) during each year that observations were made. During FIFE the observations were made at 4 times during 1987, in May, June, August, and November, and once in August of 1989.

Data Characteristics:

The SQL definition for this table is found in the VEG_SPEC.TDF file located on FIFE CD-ROM Volume 1.

Parameter/Variable Name		

Parameter/Variable Description Source	Range	Units

```
SITEGRID_ID
This is a FIS grid location code.                                    FIS
Site grid codes (SSEE-III) give
the south (SS) and east (EE) cell
number in a 100 x 100 array of
200m square cells.  The last 3
characters (III) are an instrument
identifier.
```

```
STATION_ID
```

The station ID where the data was observed. 65 IDs from 1 to 944 FIS

OBS_DATE
The date when the data was observed. min = 07-MAY-84 max = 18-AUG-89 FIS

LTER_SPECIES_CODE   missing value
= 999
The LTER species code of the 211 codes from FIS
plant found. 1 to 489

LTER_TYPE
The LTER type of the plant found. min = 0, FIS
max = 11

COVER_ABUN   **
The Cover Abundance of the plant. min = 1, FIS
There are 10 to 20 readings here, max = 7
ranging from 1 to 7, indicating 0%
to 100%.

AVG_COVER   #
The average cover of the plant, min = 0, FIS
computed from the cover abundance. max = 91

COMMENTS $
Any comments that pertain to the Bro rne, FIS
data set as a whole (i.e., missing Era tri,
data, incorrect data). Eup mac,
Phy lon,
Poa spp,
Pol spp,
Set fab

LAST_REVISION_DATE
data, in the format (DD-MMM-YY). max = 23-JUL-90

FIFE_DATA_CRTFCN_CODE   *
The FIFE Certification Code for CPI=Checked by FIS
the data, in the following format: Principal
CPI (Certified by PI), CPI-??? Investigator
(CPI - questionable data).

Footnotes:

** If the sitegrid_ID ends with the 3 letter extension "VTL", the cover abundances are for a random distance along one of the standard LTER transects (indicated by the first four digits of the sitegrid_ID).

There are up to 20 cover abundance values given for each transect.

The values in this field are encoded. To decode them, use the table given in the *Data Acquisition Methods Section*.

If the extension is "VSC" then the cover abundances are for replicate plots at the location indicated by the first four digits of the sitegrid_ID. At most 10 replicate plots were observed.

If a species was not found at a site, the cover abundance for that species was not recorded.

This is the average for the plots within a site where the species was found. This is not a true transect or location average since only those plots where the species is found are averaged together.

$ These values are shorthand notation for species which were not listed in the LTER_SPECIES_CODE. For an explanation contact one of the individuals listed in the *Contact Information Section*.

* Valid levels

The primary certification codes are: EXM Example or Test data (not for release) PRE Preliminary (unchecked, use at your own risk) CPI Checked by Principal Investigator (reviewed for quality) CGR Checked by a group and reconciled (data comparisons and cross checks)

The certification code modifiers are: PRE-NFP Preliminary - Not for publication, at the request of investigator CPI-MRG PAMS data which is "merged" from two separate receiving stations to eliminate transmission errors. CPI-??? Investigator thinks data item may be questionable.

Sample Data Record:

```
      SITEGRID_ID    STATION_ID    OBS_DATE     LTER_SPECIES_CODE    LTER_TYPE
-----------    ----------   ---------   -----------------    ---------
3129-VSC           912         17-AUG-89           58
3129-VSC           912         17-AUG-89           65
3129-VSC           912         17-AUG-89           109
3129-VSC           912         17-AUG-89           86
     COVER_ABUN                                       AVG_COVER
----------------------------------------   ---------
2      1    2              1    1    1    1        1.210
2               1                           1.750
2               1              2          2.170
1       3    2              2          5.380
          COMMENTS                  LAST_REVISION_DATE    FIFE_DATA_CRTFCN_CODE
-----------------------------   ------------------    ----------------------
23-JUL-90                  CPI
```

```
23-JUL-90               CPI
23-JUL-90               CPI
23-JUL-90               CPI
```

8. Data Organization:

Data Granularity:

The transects were observed at 3 times (spring, summer, and fall) during each year that observations were made. During FIFE the observations were made at 4 times during 1987, in May, June, August, and November, and once in August of 1989.

A general description of data granularity as it applies to the IMS appears in the EOSDIS Glossary.

Data Format:

The CD-ROM file format consists of numerical and character fields of varying length separated by commas. The character fields are enclosed with a single apostrophe. There are no spaces between the fields. Each file begins with five header records. Header records contain the following information: Record 1 Name of this file, its table name, number of records in this file, path and name of the document that describes the data in this file, and name of principal investigator for these data. Record 2 Path and filename of the previous data set, and path and filename of the next data set. (Path and filenames for files that contain another set of data taken at the same site on the same day.) Record 3 Path and filename of the previous site, and path and filename of the next site. (Path and filenames for files of the same data set taken on the same day for the previous and next sites (sequentially numbered by SITEGRID_ID)). Record 4 Path and filename of the previous date, and path and filename of the next date. (Path and filenames for files of the same data set taken at the same site for the previous and next date.) Record 5 Column names for the data within the file, delimited by commas. Record 6 Data records begin.

Each field represents one of the attributes listed in the chart in the *Data Characteristics Section* and described in detail in the TDF file. These fields are in the same order as in the chart.

9. Data Manipulations:

Formulae:

Derivation Techniques and Algorithms:

Not available at this revision.

Data Processing Sequence:

Processing Steps:

Measurements from the field were averaged and put into computer files.

Processing Changes:

None.

Calculations:

Special Corrections/Adjustments:

None.

Calculated Variables:

Not available.

Graphs and Plots:

None.

10. Errors:

Sources of Error:

Human errors in estimating cover percentages are the largest problem in this data set. Note that cover is estimated by species, and species may overlap, resulting in the sum of the abundances exceeding 100 percent. This is not an error.

Errors could arise from intermediate levels of disturbances, such as burned treatments with low grazing pressure, and unburned treatments with intermediate grazing pressure, where dominant species were selectively grazed in patches but not completely eliminated from the sites.

Quality Assessment:

Data Validation by Source:

No information on data validation was provided by the investigator.

Confidence Level/Accuracy Judgment:

Data are judged to be within normal range of accuracy for these types of data.

Measurement Error for Parameters:

Quantitative assessment was not made, see the *Confidence Level/Accuracy Judgment Section*.

Additional Quality Assessments:

FIS staff applied a general Quality Assessment (QA) procedure to the data to identify inconsistencies and problems for potential users. As a general procedure, the FIS QA consisted of examining the maximum, minimum, average, and standard deviation for each numerical field in the data table. An attempt was made to find an explanation for unexpected high or low values, values outside of the normal physical range for a variable, or standard deviations that appeared inconsistent with the mean. In some cases, histograms were examined to determine whether outliers were consistent with the shape of the data distribution.

Data Verification by Data Center:

The data verification performed by the ORNL DAAC deals with the quality of the data format, media, and readability. The ORNL DAAC does not make an assessment of the quality of the data itself except during the course of performing other QA procedures as described below.

The FIFE data were transferred to the ORNL DAAC via CD-ROM. These CD-ROMs are distributed by the ORNL DAAC unmodified as a set or in individual volumes, as requested. In addition, the DAAC has incorporated each of the 98 FIFE tabular datasets from the CD-ROMs into its online data holdings. Incorporation of these data involved the following steps:

- Copying the entire FIFE Volume 1, maintaining the directory structure on the CD-ROM.
- Using data files, documentation, and SQL code provided on the CD-ROM to create a database in Statistical Analysis System (SAS).
- Creating transfer files to transfer the SAS metadata database to Sybase tables.

Each distinct type of data (i.e. "data set" on the CD-ROM), is accompanied by a documentation file (i.e., .doc file) and a data format/structure definition file (i.e., .tdf file). The data format files on the CD-ROM are Oracle SQL commands (e.g., "create table") that can be used to set up a relational database table structure. This file provides column/variable names, character/numeric type, length, and format, and labels/comments. These SQL commands were converted to SAS code and were used to create SAS data sets and subsequently to input data files directly from the CD-ROM into a SAS dataset. During this process, file names and directory paths were captured and metadata was extracted to the extent possible electronically. No files were found to be corrupted or unreadable during the conversion process.

Additional Quality Assurance procedures were performed as follows:

- Statistical operations were performed to calculate minimum and maximum values for all numeric fields and to create a listing of all values of the character fields. During this process, it was determined that various conventions were used to represent missing values. (Note: no modifications were made to any data by the DAAC). In most cases, missing value identification conventions were discussed in the accompanying .doc file. Based on a visual check of the minimum and maximum values, no glaring errors or holes were identified that might indicate errors introduced during CD-ROM mastering by the FIFE project or data ingest by the DAAC.

- Some minor inconsistencies and typographical errors were identified in some of the character fields and column labels, however, no modifications were made to the data by the DAAC.
- Some conversions of ASCII data were necessary to move the data from a DOS platform to a UNIX platform. Standard operating system conversion utilities were used (e.g., dos2unix).
- Much of the metadata required for archival is imbedded in the narrative documentation accompanying the data sets and extracted manually by DAAC staff who have read the .doc files provided on the CD-ROM and have hand entered this information into the metadata database maintained by the DAAC. QA procedures have been performed on these metadata to identify and eliminate typographical errors and inconsistencies in naming conventions, to ensure that all required metadata is present, and to ensure the accuracy of file names and paths for retrieval.
- Data requested for distribution to users are checked to verify that files copied from disk to other media remain uncorrupted.

As errors are discovered in the online tabular data by investigators, users, or DAAC staff, corrections are made in cooperation with the principal investigators. These corrections are then distributed to users. CD-ROM data are corrected when re-mastering occurs for replenishment of CD-ROM stock.

11. Notes:

Limitations of the Data:

Not available.

Known Problems with the Data:

None reported as of the time of this revision.

Usage Guidance:

The data could be used in conjunction with other vegetation biophysical measurements to compare remotely-sensed parameters from satellite and aircraft measurements. It could also be used with caution for comparisons in similar prairie landscapes.

Any Other Relevant Information about the Study:

See Glenn et al. (1992) for a report on the analyses of these data.

12. Application of the Data Set:

The Vegetation Species and Cover Abundance Data Set documents the species present and an estimate of cover abundance at the FIFE staff data measurement sites.

13. Future Modifications and Plans:

The FIFE field campaigns were held in 1987 and 1989 and there are no plans for new data collection. Field work continues near the FIFE site at the Long-Term Ecological Research (LTER) Network Konza research site (i.e., LTER continues to monitor the site). The FIFE investigators are continuing to analyze and model the data from the field campaigns to produce new data products.

14. Software:

Software to access the data set is available on the all volumes of the FIFE CD-ROM set. For a detailed description of the available software see the *Software Description Document*.

15. Data Access:

Contact Information:

ORNL DAAC User Services
Oak Ridge National Laboratory

Telephone: (865) 241-3952
FAX: (865) 574-4665

Email: ornldaac@ornl.gov

Data Center Identification:

ORNL Distributed Active Archive Center
Oak Ridge National Laboratory
USA

Telephone: (865) 241-3952
FAX: (865) 574-4665

Email: ornldaac@ornl.gov

Procedures for Obtaining Data:

Users may place requests by telephone, electronic mail, or FAX. Data is also available via the World Wide Web at http://daac.ornl.gov.

Data Center Status/Plans:

FIFE data are available from the ORNL DAAC. Please contact the ORNL DAAC User Services Office for the most current information about these data.

16. Output Products and Availability:

Vegetation Species and Cover Abundance data are available on FIFE CD-ROM Volume 1. The CD-ROM filename is as follows:

\DATA\BIOLOGY\VEG_SPEC\GRIDxxxx\ydddgrid.VSD

Where *xxxx* is the four digit code for the location within the FIFE site grid. Note: capital letters indicate fixed values that appear on the CD-ROM exactly as shown here, lower case indicates characters (values) that change for each path and file.

The format used for the filenames is: *ydddgrid.sfx*, where *grid* is the four-number code for the location within the FIFE site grid, *y* is the last digit of the year (e.g. 7 = 1987, and 9 = 1989), and *ddd* is the day of the year (e.g. 061 = sixty-first day in the year). The filename extension (*.sfx*), identifies the data set content for the file (see the *[Data Characteristics Section](#)*) and is equal to .VSD for this data set.

17. References:

Satellite/Instrument/Data Processing Documentation.

Daubenmire, R. 1959. A canopy-coverage method of vegetational analysis. Northwest Science. 33:43-66.

Journal Articles and Study Reports.

Abrams, M.D. 1988. Effects of burning regime on viable buried seed pools and canopy coverage in a northeast Kansas tallgrass prairie. Southwestern Naturalist. 33:65-70.

Abrams, M.D., and L.C. Hulbert. 1987. Effect of topographic position and fire on species in tallgrass prairie in northeast Kansas. American Midland Naturalist. 117:442-445.

Bark, D. 1987. Konza Prairie Research Natural Area, Kansas. p 45-50, In: D. Greenland (ed.). The Climates of the Long-Term Ecological Research Sites. Institute of Arctic and Alpine Res. Occasional Paper.No. 44. Univ. of Colorado, Boulder.

Belsky, A.J. 1988. Regional influences on small-scale vegetational heterogeneity within grasslands in the Serengeti National Park. Tanzania. Vegetation. 74:3-10.

Collins, S.L. 1987. Interaction of disturbances in tallgrass prairie: A field experiment. Ecology. 68:87-94.

Collins, S.L., and S.C. Barber. 1985. Effects of disturbance on diversity in mixed-grass prairie. Vegetation. 64:87-94.

Collins, S.L., and S.M. Glenn. 1990. A hierarchical analysis of species abundance patterns in grassland vegetation. Am. Naturalist. 135: 633-648.

Davis, F., D. Schimel, R. Dubayah, T. Kittel, J. Dozier, M. Friedl, and S. Goward. 1991. Biophysical classification of a grassland ecosystem. Ecological Applications (submitted).

Gibson, D.J. 1988. Regeneration and fluctuation of tallgrass prairie vegetation in response to burning frequency. Bull. of the Torrey Botanical Club. 115:1-12.

Gibson, D.J., and L.C. Hulbert. 1987. Effects of fire, topography and year-to year climatic variation on species composition in tallgrass prairie. Vegetation. 72:175-185.

Glenn, S.M., and S.L. Collins. 1990. Patch structure in tallgrass prairie: dynamics of satellite species. Oikos. 57: 229-236.

Glenn, S.M., S.L. Collins, and D.J. Gibson. 1992. Disturbances in tallgrass prairie: local and regional effects on community heterogeneity. Landscape Ecology. 7:243-251.

Hobbs, N.T., D.S. Schimel, and C.E. Owensby, and D.J. Ojima. 1991. Fire and grazing in the tallgrass prairie: Contingent effects on nitrogen budgets. Ecology. 72:1374-1382.

Knapp, A.K., and T.R. Seastedt. 1986. Detritus accumulation limits productivity of Tallgrass prairie. BioScience. 36:662-668.

Sellers, P.J., F.G. Hall, G. Asrar, D.E. Strebel, and R.E. Murphy. 1988. The First ISLSCP Field Experiment (FIFE). Bull. of the Am. Meteorological Soc. 69:22-27.

Towne, G., and C.E. Owensby. 1984. Long-term effects of annual burning at different dates in ungrazed Kansas tallgrass prairie. J. of Range Management. 37:392-397.

Archive/DBMS Usage Documentation.

Contact the EOS Distributed Active Archive Center (DAAC) at Oak Ridge National Laboratory (ORNL), Oak Ridge, Tennessee (see the *Data Center Identification Section*). Documentation about using the archive and/or online access to the data at the ORNL DAAC is not available at this revision.

18. Glossary of Terms:

A general glossary for the DAAC is located at Glossary.

19. List of Acronyms:

CD-ROM Compact Disk-Read Only Memory DAAC Distributed Active Archive Center EOSDIS Earth Observing System Data and Information System FIFE First ISLSCP Field Experiment FIS FIFE Information system ISLSCP International Satellite Land Surface Climatology Project LTER Long-Term Ecological Research ORNL Oak Ridge National Laboratory SQL Structured Query Language URL Uniform Resource Locator UTM Universal Transverse Mercator

A general list of acronyms for the DAAC is available at Acronyms.

20. Document Information:

April 26, 1994 (citation revised on October 14, 2002).

This document has been reviewed by the FIFE Information Scientist to eliminate technical and editorial inaccuracies. Previous versions of this document have been reviewed by the Principal Investigator, the person who transmitted the data to FIS, a FIS staff member, or a FIFE scientist generally familiar with the data. It is believed that the document accurately describes the data as collected and as archived on the FIFE CD-ROM series.

Document Review Date:

January 6, 1996.

Document ID:

ORNL-FIFE_VEG_SPEC.

Citation:

Cite this data set as follows:

Gibson, D. J., S. L. Collins, and S. M. Glenn. 1994. Vegetation Species Data (FIFE). Data set. Available on-line [http://www.daac.ornl.gov] from Oak Ridge National Laboratory Distributed Active Archive Center, Oak Ridge, Tennessee, U.S.A. doi:10.3334/ORNLDAAC/136. Also published in D. E. Strebel, D. R. Landis, K. F. Huemmrich, and B. W. Meeson (eds.), Collected Data of the First ISLSCP Field Experiment, Vol. 1: Surface Observations and Non-Image Data Sets. CD-ROM. National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Maryland, U.S.A. (available from http://www.daac.ornl.gov).

Document Curator:
DAAC Staff

Document URL:
http://daac.ornl.gov