Spatial Data in Geographic Information System Format on Agricultural Chemical Use, Land Use, and Cropping Practices in the United States

By WILLIAM A. BATTAGLIN and DONALD A. GOOLSBY

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations Report 94-4176

Prepared in cooperation with the
U.S. ENVIRONMENTAL PROTECTION AGENCY

Denver, Colorado
1995
The use of trade, product, industry, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

For additional information write to:
Regional Hydrologist
U.S. Geological Survey
Box 25046, MS 406
Denver Federal Center
Denver, CO 80225

Copies of this report can be purchased from:
U.S. Geological Survey
Earth Science Information Center
Open-File Reports Section
Box 25286, MS 517
Denver Federal Center
Denver, CO 80225
CONTENTS

Abstract ................................................................................................................. 1
Introduction .......................................................................................................... 1
Scope ..................................................................................................................... 1
Methods used to process source data into geographic information system products ........................................... 2
   Construction of geographic information system coverages ......................................................... 2
   Construction of color maps ........................................................................................................ 2
Data sources for geographic information system coverages ........................................................................ 3
   Herbicide-use data .................................................................................................................... 3
   Nitrogen-fertilizer sales data ................................................................................................... 4
   Census of agriculture data ....................................................................................................... 5
Obtaining and using the geographic information system coverages .......................................................... 5
   Obtaining the coverages ......................................................................................................... 5
   Use of the coverages .............................................................................................................. 6
Summary .................................................................................................................. 6
Selected references .................................................................................................... 6
Supplemental information ............................................................................................ 9
Appendix 1--Sample coverage documentation .............................................................................. 46
Appendix 2--Data specifications and retrieval documentation ....................................................... 85

FIGURES
1-12. Maps showing:
   1. Estimated annual county-level herbicide use, 1989: (a) atrazine; (b) alachlor ........................................... 9
   2. Estimated annual county-level herbicide use, 1989: (a) metolachlor; (b) EPTC ........................................ 10
   3. Estimated annual county-level herbicide use, 1989: (a) 2,4-D; (b) cyanazine ........................................... 11
   4. Estimated annual county-level herbicide use, 1989: (a) metribuzin; (b) simazine .................................. 12
   5. Estimated annual county-level (a) nitrogen-fertilizer use and (b) phosphate use, July 1, 1986, to June 30, 1987 ......................................................... 13
   6. Estimated annual county-level (a) nitrogen-fertilizer use and (b) potash use, July 1, 1990, to June 30, 1991 ................................................................. 14
   7 Estimated annual county-level farm expenses for (a) commercial fertilizer and (b) agricultural chemicals, 1987 ......................................................... 15
   8. Estimated (a) harvested cropland, 1987, and (b) harvested, irrigated cropland, 1987, expressed as a percentage of the total area of each county ......................................................... 16
   9. Estimated area treated with (a) commercial fertilizer, 1987, and (b) products used to control weeds, grass, or brush in crops and pasture, 1987, expressed as a percentage of the total area of each county ................................................................. 17
  10. Estimated number of (a) cattle and calves, 1987, and (b) broilers and other meat-type chickens, 1987, by county ................................................................. 18
  11. Estimated harvested (a) corn for grain or seed, 1987, and (b) soybeans for beans, 1987, expressed as a percentage of the total area of each county ........................................................ 19
  12. Estimated harvested (a) sorghum for grain or seed, 1987, and (b) wheat for grain, 1987, expressed as a percentage of the total area of each county ......................... 20

TABLES
   1. Herbicide codes .............................................................................................................. 21
   2. Herbicide-use coverage names, attribute names, and crops on which the largest weight of active ingredient was used, 1989 ......................................................... 22
   3. Nitrogen-fertilizer sales coverage names, attribute names, and short attribute descriptions ......................................................................................................................... 35
   4. 1987 Census of Agriculture coverage names, attribute names, and short attribute descriptions ................................................................. 39
### CONVERSION FACTORS

<table>
<thead>
<tr>
<th>Multiply</th>
<th>By</th>
<th>To obtain</th>
</tr>
</thead>
<tbody>
<tr>
<td>foot (ft)</td>
<td>0.3048</td>
<td>meter</td>
</tr>
<tr>
<td>acre</td>
<td>0.4047</td>
<td>hectare</td>
</tr>
<tr>
<td>mile (mi)</td>
<td>1.609</td>
<td>kilometer</td>
</tr>
<tr>
<td>square mile (mi²)</td>
<td>2.590</td>
<td>square kilometer</td>
</tr>
<tr>
<td>pound</td>
<td>0.4536</td>
<td>kilogram</td>
</tr>
<tr>
<td>ton</td>
<td>0.9078</td>
<td>metric ton</td>
</tr>
<tr>
<td>pound per square mile</td>
<td>0.1751</td>
<td>kilogram per square kilometer</td>
</tr>
<tr>
<td>ton per square mile</td>
<td>0.3505</td>
<td>metric ton per square kilometer</td>
</tr>
</tbody>
</table>

Degree Celsius (°C) may be converted to degree Fahrenheit (°F) by using the following equation:

\[ °F = \frac{9}{5} (°C) + 32. \]

Degree Fahrenheit (°F) may be converted to degree Celsius (°C) by using the following equation:

\[ °C = \frac{5}{9} (°F-32). \]
Spatial Data in Geographic Information System Format on Agricultural Chemical Use, Land Use, and Cropping Practices in the United States

By William A. Battaglin and Donald A. Goolsby

Abstract

The spatial data in geographic information system format described in this report consist of estimates for all counties in the conterminous United States of the annual use of 96 herbicides in 1989; annual sales of nitrogen fertilizer, in tons, for 1985-91; and agricultural expenses, land use, chemical use, livestock holdings, and cropping practices in 1987. The source information, originally in tabular form, is summarized as digital polygon attribute data in the 18 geographic information system spatial data layers (coverages) provided. The information in these coverages can be used in estimating regional agricultural-chemical use or agricultural practices and in producing visual displays and mapping relative rates of agricultural-chemical use or agricultural practices across broad regions of the United States.

INTRODUCTION

Agricultural chemicals (herbicides, insecticides, and fertilizers) are used extensively in the United States to increase yields of agricultural crops. Many agricultural chemicals are partially water soluble and can leach to ground water or run off to surface water (Thurman and others, 1992). The presence of agricultural chemicals in ground water and surface water has been documented in many recent reports (Madison and Brunett, 1985; Goolsby and others, 1991a; Goolsby and others, 1991b; Goolsby and Battaglin, 1993; Spalding and Exner, 1991; Thurman and others, 1991; Thurman and others, 1992; U.S. Environmental Protection Agency, 1992; Battaglin and others, 1993; Scribner and others, 1993; Kolpin and others, 1993; and Burkart and Kolpin, 1993). Analysis of relations among the presence and distribution of agricultural chemicals in the environment, estimates of agricultural-chemical use, estimates of agricultural land use, and descriptions of hydrologic conditions is greatly facilitated by the application of geographic-information-system (GIS) technology (Battaglin and others, 1994, 1993; Battaglin and others, 1993; Goolsby and Battaglin, 1993; Kolpin and others, 1993; Rains and Latham, 1993; and He and others, 1993).

This report describes the data sources and methods used to construct spatial data layers in GIS format (coverages) on agricultural-chemical use and agricultural practices that may help in future research concerning the presence and distribution of agricultural chemicals in water resources of the United States. The coverages contain information at the county scale for the conterminous United States. The 3,111 counties of the conterminous United States constitute the study area for this report.

SCOPE

The report contains: (1) 18 ARC/INFO (GIS software produced and distributed by Environmental Systems Research Institute) GIS coverages summarizing the annual use of 96 herbicides in 1989; annual sales of nitrogen fertilizer, in tons, for 1985-91; and agricultural expenses, land use, chemical use, livestock holdings, and cropping practices in 1987, for counties in the conterminous United States; (2) complete on-line documentation of the 18 coverages and a self-installing version the U.S. Geological Survey's documentation AML (ARC Macro Language) (Nebert, 1994); and (3) 12 page-sized color maps summarizing selected attribute data from the 18 coverages (see figs. 1-12). These products were prepared by the U.S. Geological Survey in cooperation with the U.S. Environmental Protection Agency under Interagency Agreement DW14934820-01-1.

Information from four primary sources is summarized as polygon attribute data in the 18 coverages provided. Five coverages summarizing the use of 96 herbicides were constructed from estimates reported in Gianessi and Puffer (1991). Seven coverages summarizing annual nitrogen fertilizer sales, in tons, for the years 1985-91 were constructed from estimates reported by the U.S. Environmental
Six coverages summarizing agricultural expenses, land use, chemical use, livestock holdings, and cropping practices were constructed from estimates reported by the U. S. Department of Commerce (1989a, 1989b) in the 1987 Census of Agriculture. The 18 coverages contain a total of 521 attributes that were derived from the four cited data sources. All coverages described in this report were created and documented, and are stored on-line, in accordance with the guidelines given by Nebert (1994).

**METHODS USED TO PROCESS SOURCE DATA INTO GEOGRAPHIC INFORMATION SYSTEM PRODUCTS**

A polygon coverage representing county boundaries in the conterminous United States, as well as lakes, estuaries, and other nonland-area features, is used as the base for the coverages described in this report. The base county coverage was derived from the Digital Line Graph (DLG) files representing the 1:2,000,000-scale map in the National Atlas of the United States (U.S. Geological Survey, 1970; Domeratz and others, 1983). Polygon coverages in general are used to represent area features. Polygons are defined by a series of arcs that form a many-sided, closed figure. A label point inside each polygon is used to assign attributes to the polygon. Attributes can contain any information that pertains to the area represented by the polygon. For example, every polygon in the base coverage contains an attribute called PLYTYPE which is a numeric code that indicates whether the polygon represents land, a lake, or an estuary. Each county land polygon is identified by a five-digit Federal Information Processing Standard (FIPS) code. Some counties are represented by more than one polygon.

A missing value code of -99.0 is used when no attribute data are given for a county land polygon and also is used for all nonland-area polygons. Attribute values in counties represented by one polygon are equal to county totals. For counties described by more than one polygon, attribute values are provided for each polygon and are calculated as the county total multiplied by the ratio of the area of each county polygon to the total area of the county. For example, if county A is represented by two polygons of equal area, and 1,000 pounds of atrazine are reported to have been used in county A, then the value of the attribute for pounds of atrazine used for each of the two polygons representing county A would be 500 pounds.

**Construction of Geographic Information System Coverages**

Automated procedures were developed for processing the raw herbicide-use, nitrogen-fertilizer-sales, and 1987 Census of Agriculture data into ARC/INFO coverage attributes. Procedures generally were coded in AML (Environmental Systems Research Institute, 1992); however, some Fortran codes and awk programs (Aho and others, 1988) also were used. The procedure was to copy the ARC/INFO county base coverage to a new coverage and then execute an attribute addition AML program to transfer attribute values from the raw data files to the new coverage. Other automated procedures were developed to calculate summary statistics of attribute values, and to produce maps (color postscript files) that represent attribute values across the United States (figs. 1-12). The on-line documentation file that accompanies each coverage was generated by using the program document.aml, which is available from the U.S. Geological Survey (Nebert, 1994). An example of the hard copy of an on-line documentation data set, as created by document.aml, is given in appendix 1.

All products were inspected visually for obvious errors. County-level herbicide-use estimates were sometimes absent as a result of withheld census data. County herbicide-use data cannot be totaled to obtain the State use totals reported in Gianessi and Puffer (1991) because of differences between statewide crop-acreage estimates (which include all counties) and county-level crop-acreage estimates (some of which are withheld because of census disclosure rules). Estimates of nitrogen-fertilizer use in Utah in 1985 are missing. Estimates from the 1987 Census of Agriculture were compared visually with maps published in U. S. Department of Commerce (1990). Most missing data in unexpected areas results from withholding of Census of Agriculture data as a result of census disclosure rules. Additional details concerning the processing of coverage and ancillary information are given in the Data Sources For Geographic Information System Coverages section of this report.

**Construction of Color Maps**

Color maps summarizing 24 selected attributes from the 18 coverages were constructed in ARC/INFO by use of a consistent methodology (see figs. 1-12). The maps were developed to show locations and relative rates of agricultural-chemical use or agricultural practices across broad regions of the United States.
A statistical distribution was used to select six class intervals for the graphic display of agricultural-chemical use, land use, and cropping-practice data. The empty (white) class (see figs. 1-12) represents counties in which attribute values are missing or zero. The first shaded class (light blue) represents attribute values that are reported (not missing or zero) and as large as the 25th percentile of the data. The second shaded class (green) represents attribute values that are greater than the 25th percentile and as large as the 50th percentile (median) of the data. The third shaded class (yellow) represents attribute values that are greater than the median and as large as the 75th percentile of the data. The fourth shaded class (orange) represents attribute values that are greater than the 75th percentile and as large as the 75th percentile plus two standard deviations of the data. The fifth shaded class (red) represents attribute values that are greater than the 75th percentile plus two standard deviations.

**DATA SOURCES FOR GEOGRAPHIC INFORMATION SYSTEM COVERAGES**

**Herbicide-Use Data**

Five coverages summarizing the use of 96 herbicides were constructed from estimates reported in Gianessi and Puffer (1991). A ranking of national herbicide-use amounts (Gianessi and Puffer, 1991, Table A-6) was used to divide herbicide-use attribute data into five coverages. The tabular estimates of herbicide use by county and by crop were constructed by Gianessi and Puffer (1991) by:

1. compiling statistics, by State and by crop, on the percentage of acres treated with a given herbicide and the average annual application rate of the herbicide from responses to surveys sent to U.S. Department of Agricultural Cooperative Extension Service weed scientists in 1987 and 1989;
2. augmenting survey data with published surveys and reports from individual States (U.S. Department of Agriculture, 1989a; U.S. Department of Agriculture, 1989b; Rinehold and Witt, 1989)
3. establishing herbicide-use profiles, by State and by crop, that contain the percentage of acres treated and average annual application rates;
4. multiplying county-level crop-acreage estimates from the 1987 Census of Agriculture (U.S. Department of Commerce, 1989a) by the percentage of acres treated and the average annual application rates to obtain herbicide-use estimates; and
5. tabulating herbicide-use amounts and acres treated by crop and by county.

Eighty-four crops were profiled, resulting in usage estimates for 96 herbicide active ingredients. Although crop acreages are from 1987 data, the herbicide-use estimates generally reflect 1989 usage amounts (Gianessi and Puffer, 1991). Estimates of herbicide use by county were generated from a combination of data collected from surveys of weed scientists and from surveys of farmers. Herbicide-use profile data were generated by using ancillary data sources or were calculated from profiles for neighboring States when no responses to surveys or published reports were available (Gianessi and Puffer, 1991). Sampling and statistics were used to account for crop acreages from nonresponding farm operations. Thus, the information describing crop acreages is subject to sampling variability as well as reporting and coverage errors (U.S. Department of Commerce, 1989b). Census disclosure rules also prevent the publication of information that would reveal the operation of individual farms.

Herbicide-use attributes by crop and by county were extracted from the tabular data files provided by Gianessi and Puffer (1991). The total use of each herbicide on all crops was calculated for all counties with herbicide use. Three attributes were added to an ARC/INFO coverage for each of the 96 herbicides. Attributes with names ending in .ACR are estimates of the number of acres treated with a given herbicide. Attributes with names ending in .LBS are estimates of the total number of pounds of active ingredient of a given herbicide applied on all crops. Attributes ending in .USE are estimates of a county-level herbicide-use rate in pounds per square mile. Attribute names are keyed to four-digit herbicide code numbers provided in table 1. For example, estimates of the number of pounds of atrazine applied are contained in the attribute named H1980.LBS. Herbicide-coverage names, attribute names, and the crops on which the
The largest amount of active ingredient of each herbicide was used are listed in table 2.

Herbicide-use estimates for counties represented by one polygon are equal to county totals. For counties described by more than one polygon, herbicide-use estimates are provided for each polygon and are calculated as the county total multiplied by the ratio of the area of the county polygon divided by the total area of the county. A missing-value code of -99.0 is used when no herbicide-use estimates are available for a county and for all nonland-area polygons. A missing-value code in a county land polygon can indicate any of the following conditions:

- herbicide not used in the county (for example, no alachlor used in county),
- crop data withheld because of census disclosure rules,
- crop data not available to the census, or
- crop data not published because county contains fewer than 10 farms.

Nitrogen-Fertilizer Sales Data

Seven coverages summarizing annual nitrogen-fertilizer sales, in tons, for the fertilizer years 1985-91 (for example, the 1987 fertilizer year is the period from July 1, 1986, to June 30, 1987), were constructed from estimates reported by the U.S. Environmental Protection Agency (1990). Estimates for 1990 and 1991 were provided to the U.S. Geological Survey by Jerald Fletcher (West Virginia University, written commun., 1992) in cooperation with the National Fertilizer and Environmental Research Center, Tennessee Valley Authority (TVA). Estimates of fertilizer sales estimates were generated and are reported as tons of actual nutrient (inorganic nitrogen, phosphate, and potash). The fertilizer-sales estimates do not account for the use of manure.

The method used to construct fertilizer sales estimates is similar to that used by Alexander and Smith (1990). The data are summarized for fertilizer years. The county-level nitrogen-fertilizer sales estimates (U.S. Environmental Protection Agency, 1990) were constructed by:

(1) compiling annual State fertilizer-sales data reported as tonnages to the National Fertilizer and Environmental Research Center of the TVA;

(2) calculating the ratio of expenditures for commercial fertilizers by county to expenditures for commercial fertilizers by State from the 1987 Census of Agriculture (U.S. Department of Commerce, 1989a); and

(3) computing annual county-level fertilizer sales, in tons, by multiplying estimates of annual State sales by the ratio of county expenditures to State expenditures.

Nitrogen-fertilizer sales estimates by county were constructed from estimates reported by the U.S. Environmental Protection Agency (1990) for 1985-89 and by Jerald Fletcher (West Virginia University, written commun., 1992) for 1990-91. The estimates of nitrogen-fertilizer sales in tons of actual nutrient were entered directly into the GIS. Nitrogen-fertilizer sales estimates are provided for each year (1985-91); however, the 1987 Census of Agriculture data on fertilizer expenditures used to disaggregate State sales totals represent only 1987 sales. Fertilizer-sales data submitted annually to State regulatory agencies by fertilizer dealers were compiled by the National Fertilizer and Environmental Research Center, TVA (U.S. Environmental Protection Agency, 1990). These data reflect total sales of fertilizer without regard to the land use for which it was bought, or the State (or county) in which the fertilizer was actually used.

Estimates of fertilizer sales by county were constructed from a combination of data reported to Census of Agriculture. In the Census of Agriculture, sampling and statistics are used to account for nonresponding farm operations (U.S. Department of Commerce, 1989b). Thus, the information that describes county-level fertilizer sales is subject to sampling variability as well as reporting and coverage errors. Census disclosure rules also prevent the publication of information that would reveal the operation of individual farms.

Eleven attributes were added to an ARC/INFO coverage for each year of fertilizer-sales data. All attribute names contain a number that represents the year of the data. For example, NTOT86 is the attribute name for total nitrogen-fertilizer sales in 1986. Sales estimates are provided for total nitrogen, potash, and phosphate, and for nitrogen sold as ammonium nitrate, anhydrous ammonia, miscellaneous forms, nitrogen solutions, and urea. Nitrogen-fertilizer sales coverage names, attribute names, and short attribute descriptions are listed in table 3.
Fertilizer-use estimates for counties represented by one polygon are equal to county totals. For counties described by more than one polygon, fertilizer-use estimates are provided for each polygon and are calculated as the county total multiplied by the ratio of the area of the county polygon divided by the total area of the county. A missing-value code of -99.0 is used when no fertilizer-use estimate is available for a county and in all nonland-area polygons. A missing-value code in a county land polygon can indicate any of the following conditions:

- fertilizer not sold in the county,
- crop data withheld because of census disclosure rules,
- crop data not available to the census,
- crop data not published because county contains fewer than 10 farms.

Census of Agriculture Data

Six coverages summarizing agricultural expenses, land use, chemical use, livestock holdings, and cropping practices were constructed from estimates reported by the U. S. Department of Commerce (1989a, 1989b) in the 1987 Census of Agriculture. A total of 123 data fields from the Census of Agriculture are summarized by 156 attributes in the 6 coverages. Most of the attributes summarized represent 1987 data, but some information from the 1982 Census of Agriculture also was included.

The estimates were constructed from surveys of all farms where $1,000 or more of agricultural products were sold, or normally would have been sold, during the census year. Sampling and statistics were used to account for nonresponding farm operations. Thus, the information in the Census of Agriculture is subject to sampling variability as well as reporting and coverage errors. Census disclosure rules prevent publication of information that would disclose the operation of individual farms. Thus, for example, one or two sod farms may be reported in a county, but no acreage of sod grown is reported, because release of that information might disclose information about a particular farmer's operation.

All census attributes were extracted from tabular data files provided by the U. S. Department of Commerce (1989a). Data are reported in either thousands of dollars, number, tons, acres, or percent of county. Attribute names are keyed to field names found in the technical documentation of the Census of Agriculture (U. S. Department of Commerce, 1989b).

Specifically, the four-digit number at the end of the ARC/INFO item names matches the field-name numbers in the technical-documentation reference. Complete definitions of attributes and terms used in the census can be found in U. S. Department of Commerce (1989b; 1990). Census of Agriculture coverages and attribute names and short descriptions are listed in table 4. Attribute names beginning with CA represent data fields transferred directly from the census tabular data files. Attribute names beginning with PCT are percent-of-county attributes and represent relative intensities of an agricultural practice. Attributes reported as percent of county were calculated as the attribute value (in acres) divided by the county polygon area (in acres) multiplied by 100.

Census estimates for counties represented by one polygon are equal to county totals. For counties described by more than one polygon, attribute values are provided for each polygon and are calculated as the county total multiplied by the ratio of the area of each county polygon divided by the total area of the county. A missing-value code of -99 is used when no census-attribute data are given for a county and for all nonland-area polygons. A missing-value code in a county land polygon could indicate any of the following conditions:

- agricultural practice not present in county (for example, no corn grown in county),
- data withheld because of census disclosure rules,
- data not available to census, or
- data not published because county contains fewer than 10 farms.

OBTAINING AND USING THE GEOGRAPHIC INFORMATION SYSTEM COVERAGES

Obtaining the Coverages

The GIS coverages described in this report were prepared in compliance with the guidelines presented by Nebert (1994) for National-scope thematic data layers. These coverages are available through the U.S. Geological Survey Distributed Spatial Data Library (DSDL) (Nebert, 1994). DSDL is a distributed repository, and custody of specific data sets is assigned to individuals or groups within the organization. Complete documentation (metadata) and review of spatial and attribute information are required for all data sets prior to their inclusion in DSDL. Information in DSDL is accessible to the wide-area...
network and can be retrieved by using information-discovery programs such as the Wide Area Information Server (WAIS), gopher, or mosaic. The GIS coverages described in this report currently (1994) also can be made available on 1/4-inch tape or in DLG-O format upon special request to the Regional Hydrologist at the address on page iii.

The coverages are retrievable as individual themes. The compressed ARC/INFO coverage export files range in size from 4.1 to 4.9 megabytes (MB). Uncompressed, these files range in size from 8.5 to 10.9 MB. All 18 uncompressed ARC/INFO coverage export files occupy about 170 MB of disk space. All 18 imported ARC/INFO coverages occupy about 100 MB of disk space. Generally, about 200 to 300 MB of disk space is required to work with data sets of this size. Additional information on data retrieval, coverage import, and a suggested data directory structure are given in appendix 2.

Use of the Coverages

The information on agricultural-chemical use, land use, and cropping practices presented in this report are intended for use directly in a geographic information system. Several aspects of the processing of this information into GIS coverage format are important when working with the data. First, census disclosure rules affect the content of all of the coverages. In some cases the absence of a reported value for a particular attribute in a particular county is the result of census disclosure rules rather than a true zero value for the attribute in that county. Second, for counties described by more than one polygon, attribute values are provided for each polygon and are calculated as the county total multiplied by the ratio of the area of each county polygon to the total area of the county. This operation makes the coverage easier to work with in the GIS but also means that care must be used when the information in the coverages is used to estimate total attribute values for counties described by more than one polygon. Most of the counties in the coverages are represented by only one polygon, however. Third, additional details on coverage preparation, item definitions, and coverage projection are given in the on-line coverage documentation files (see example in appendix 1). Not all of the documentation files were printed in this report because of their length (about 35 pages each). The GIS coverage attributes that are accessible to users are listed in tables 1-4.

The information summarized in the coverages provided is intended for use in estimating regional agricultural-chemical use, land use, or cropping practices, and in producing visual displays and mapping relative rates of agricultural-chemical use, land use, or cropping practices across broad regions of the United States (Battaglin and Goolsby, 1994; Battaglin and others, 1993; Goolsby and others, 1993; Goolsby and Battaglin, 1993; Mueller and others, 1993). The estimates provided can not be used appropriately to determine rates of agricultural-chemical use or the presence or absence of a particular agricultural practice in small areas (less than 20 square miles) or at specific locations.

SUMMARY

Eighteen geographic information systems spatial data layers (coverages) summarizing for all counties in the conterminous United States the use of 96 herbicides in 1989; the annual sales of nitrogen fertilizer, for 1985-91; and agricultural expenses, land use, chemical use, livestock holdings, and cropping practices in 1987 are discussed in this report and are available through the U.S. Geological Survey Distributed Spatial Data Library (DSDL). Information in DSDL is accessible to the wide-area network. The information in these coverages is intended for use in estimating regional agricultural-chemical use, land use, or cropping practices, and in producing visual displays and mapping relative rates of agricultural-chemical use, land use, or cropping practices across broad regions of the United States.

The 18 coverages were constructed by relating tabular source materials to a polygon coverage representing county boundaries, lakes, estuaries, and other nonland-area features in the conterminous United States at a scale of 1:2,000,000.

SELECTED REFERENCES


Environmental Systems Research Institute, 1992, AML user’s guide: Redlands, Calif., Environmental Systems Research Institute, Inc., various pagination.


Figure 1. Estimated annual county-level herbicide use, 1989: (a) atrazine; (b) alachlor.
Figure 2. Estimated annual county-level herbicide use, 1989: (a) metolachlor; (b) EPTC.
Figure 3. Estimated annual county-level herbicide use, 1989: (a) 2,4-D; (b) cyanazine.
Figure 4. Estimated annual county-level herbicide use, 1989: (a) metribuzin; (b) simazine.

12 Spatial Data in Geographic Information System Format on Agricultural Chemical Use, Land Use, and Cropping Practices in the United States
Figure 5. Estimated annual county-level (a) nitrogen-fertilizer use and (b) phosphate use, July 1, 1986, to June 30, 1987.
Figure 6. Estimated annual county-level (a) nitrogen-fertilizer use and (b) potash use, July 1, 1990, to June 30, 1991.
EXPENSES FOR COMMERCIAL FERTILIZER, 1987 ($1,000)

<table>
<thead>
<tr>
<th>Category</th>
<th>No data or 0</th>
<th>1 - 457</th>
<th>458 - 1,306</th>
<th>1,307 - 3,016</th>
<th>3,017 - 8,832</th>
<th>More than 8,832</th>
</tr>
</thead>
</table>

Coverage name: ag_expn

EXPENSES FOR AGRICULTURAL CHEMICALS, 1987 ($1,000)

<table>
<thead>
<tr>
<th>Category</th>
<th>No data or 0</th>
<th>1 - 208</th>
<th>209 - 760</th>
<th>761 - 2,009</th>
<th>2,010 - 8,229</th>
<th>More than 8,229</th>
</tr>
</thead>
</table>

Coverage name: ag_expn

Attribute name: CA0295

Figure 7. Estimated annual county-level farm expenses for (a) commercial fertilizer and (b) agricultural chemicals, 1987.
Figure 8. Estimated (a) harvested cropland, 1987, and (b) harvested, irrigated cropland, 1987, expressed as a percentage of the total area of each county.
Figure 9. Estimated area treated with (a) commercial fertilizer, 1987, and (b) products used to control weeds, grass, or brush in crops and pasture, 1987, expressed as a percentage of the total area of each county.
Figure 10. Estimated number of (a) cattle and calves, 1987, and (b) broilers and other meat-type chickens, 1987, by county.
Figure 11. Estimated harvested (a) corn for grain or seed, 1987, and (b) soybeans for beans, 1987, expressed as a percentage of the total area of each county.
Figure 12. Estimated harvested (a) sorghum for grain or seed, 1987, and (b) wheat for grain, 1987, expressed as a percentage of the total area of each county.
Table 1. Herbicide codes

(Herbicides listed alphabetically)

<table>
<thead>
<tr>
<th>Herbicide code number</th>
<th>Herbicide name</th>
<th>Herbicide code number</th>
<th>Herbicide name</th>
<th>Herbicide code number</th>
<th>Herbicide name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1302</td>
<td>2,4-D</td>
<td>1005</td>
<td>Diclofop</td>
<td>1417</td>
<td>Molinate</td>
</tr>
<tr>
<td>1308</td>
<td>2,4-DB</td>
<td>9015</td>
<td>Diethatyl-ethyl</td>
<td>1900</td>
<td>Napropamide</td>
</tr>
<tr>
<td>1002</td>
<td>Acifluorfen</td>
<td>1374</td>
<td>Difenzoquat</td>
<td>1307</td>
<td>Naptalam</td>
</tr>
<tr>
<td>1863</td>
<td>Alachlor</td>
<td>1375</td>
<td>Dinoseb</td>
<td>1018</td>
<td>Norflurazon</td>
</tr>
<tr>
<td>1982</td>
<td>Ametryn</td>
<td>1366</td>
<td>Diphenamid</td>
<td>1873</td>
<td>Oryzalin</td>
</tr>
<tr>
<td>9048</td>
<td>Asulam</td>
<td>1974</td>
<td>Dicpropetryn</td>
<td>4000</td>
<td>Oxyfluorfen</td>
</tr>
<tr>
<td>1980</td>
<td>Atrazine</td>
<td>1950</td>
<td>Diquat</td>
<td>1616</td>
<td>Paraquat</td>
</tr>
<tr>
<td>1176</td>
<td>Barban</td>
<td>1991</td>
<td>Diuron</td>
<td>1419</td>
<td>Pebulate</td>
</tr>
<tr>
<td>1362</td>
<td>Benefin</td>
<td>1414</td>
<td>EPTC</td>
<td>1629</td>
<td>Pendimethalin</td>
</tr>
<tr>
<td>1098</td>
<td>Bensulide</td>
<td>1948</td>
<td>Endothall</td>
<td>2220</td>
<td>Phenmedipham</td>
</tr>
<tr>
<td>1287</td>
<td>Bentazon</td>
<td>9009</td>
<td>Ethalfuralin</td>
<td>1051</td>
<td>Picloram</td>
</tr>
<tr>
<td>1309</td>
<td>Bifenox</td>
<td>9012</td>
<td>Ethofumesate</td>
<td>1396</td>
<td>Profluralin</td>
</tr>
<tr>
<td>1809</td>
<td>Bromacil</td>
<td>5003</td>
<td>Fenoxaprop</td>
<td>1987</td>
<td>Prometryn</td>
</tr>
<tr>
<td>1116</td>
<td>Bromoxynil</td>
<td>9007</td>
<td>Fluazifop</td>
<td>1888</td>
<td>Pronamide</td>
</tr>
<tr>
<td>1839</td>
<td>Butylate</td>
<td>1397</td>
<td>Fluchloralin</td>
<td>1191</td>
<td>Propachlor</td>
</tr>
<tr>
<td>1885</td>
<td>CDAA</td>
<td>1998</td>
<td>Fluometuron</td>
<td>1282</td>
<td>Propanil</td>
</tr>
<tr>
<td>1299</td>
<td>Chloramben</td>
<td>4010</td>
<td>Fomesafen</td>
<td>1979</td>
<td>Propazine</td>
</tr>
<tr>
<td>4008</td>
<td>Chlorimuron</td>
<td>1099</td>
<td>Glyphosate</td>
<td>2158</td>
<td>Propham</td>
</tr>
<tr>
<td>2053</td>
<td>Chloroxuron</td>
<td>2070</td>
<td>Hexazinone</td>
<td>2250</td>
<td>Pyrazon</td>
</tr>
<tr>
<td>1183</td>
<td>Chlorpropham</td>
<td>9000</td>
<td>Imazethapyr</td>
<td>1910</td>
<td>Sethoxydim</td>
</tr>
<tr>
<td>1913</td>
<td>Chlorsulfuron</td>
<td>4005</td>
<td>Imazaquin</td>
<td>1984</td>
<td>Siduron</td>
</tr>
<tr>
<td>5000</td>
<td>Clomazone</td>
<td>1867</td>
<td>Isopropalin</td>
<td>1981</td>
<td>Simazine</td>
</tr>
<tr>
<td>4002</td>
<td>Clopyralid</td>
<td>4009</td>
<td>Lactofen</td>
<td>1963</td>
<td>Tebuthiuron</td>
</tr>
<tr>
<td>1369</td>
<td>Cyanazine</td>
<td>1993</td>
<td>Linuron</td>
<td>1109</td>
<td>Terbacil</td>
</tr>
<tr>
<td>2069</td>
<td>Cycloate</td>
<td>1305</td>
<td>MCPA</td>
<td>1977</td>
<td>Terbutryn</td>
</tr>
<tr>
<td>1872</td>
<td>DCPA</td>
<td>1889</td>
<td>MCPB</td>
<td>4004</td>
<td>Thiameturon</td>
</tr>
<tr>
<td>4001</td>
<td>DSMA</td>
<td>1477</td>
<td>MCPP</td>
<td>1903</td>
<td>Thiobencarb</td>
</tr>
<tr>
<td>1289</td>
<td>Dalapon</td>
<td>1124</td>
<td>MSMA</td>
<td>1790</td>
<td>Triallate</td>
</tr>
<tr>
<td>9014</td>
<td>Desmedipham</td>
<td>9096</td>
<td>Methazole</td>
<td>1988</td>
<td>Triclopyr</td>
</tr>
<tr>
<td>9016</td>
<td>Diallate</td>
<td>1011</td>
<td>Metolachlor</td>
<td>4007</td>
<td>Tridiphane</td>
</tr>
<tr>
<td>1298</td>
<td>Dicamba</td>
<td>1975</td>
<td>Metribuzin</td>
<td>1361</td>
<td>Trifluralin</td>
</tr>
<tr>
<td>1865</td>
<td>Dichlobenil</td>
<td>4003</td>
<td>Metsulfuron</td>
<td>1432</td>
<td>Vernolate</td>
</tr>
</tbody>
</table>
Table 2. Herbicide-use coverage names, attribute names, and crops on which the largest weight of active ingredient was used, 1989

[Attribute names: those ending in .ACR are estimates of acres treated, .LBS are estimates of total pounds of active ingredient applied, and .USE are estimates of county-level herbicide-use rate; treated crops: the crops on which the largest weights of active ingredients were estimated to have been used in the United States, 1989; percentage treated: percentage of the crop treated; treated crops and percentage treated are as reported in Gianessi and Puffer (1991, Tables B-1 through B-96); <, less than]

<table>
<thead>
<tr>
<th>Herbicide name</th>
<th>Attribute names</th>
<th>Treated crops</th>
<th>Percentage treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alachlor</td>
<td>H1863.ACR, H1863.LBS, and H1863.USE</td>
<td>corn, soybeans, sorghum, peanuts, dry beans, sweet corn</td>
<td>31, 19, 13, 42, 16, 33</td>
</tr>
<tr>
<td>Metolachlor</td>
<td>H1011.ACR, H1011.LBS, and H1011.USE</td>
<td>corn, soybeans, sorghum, peanuts, dry beans, potatoes, cotton</td>
<td>26, 11, 19, 29, 14, 18, 3</td>
</tr>
<tr>
<td>EPTC</td>
<td>H1414.ACR, H1414.LBS, and H1414.USE</td>
<td>corn, alfalfa, dry beans, potatoes, sugar beets, green beans, sweet corn</td>
<td>10, 5, 38, 27, 10, 38, 8</td>
</tr>
</tbody>
</table>

HERBICIDE1—Coverage of use estimates for the 20 most-used herbicides in the conterminous United States
Table 2. Herbicide-use coverage names, attribute names, and crops on which the largest amount of active ingredient was used, 1989 -- continued

<table>
<thead>
<tr>
<th>Herbicide name</th>
<th>Attribute names</th>
<th>Treated crops</th>
<th>Percentage treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,4-D</td>
<td>H1302.ACR, H1302.LBS, and H1302.USE</td>
<td>pasture</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>wheat</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td></td>
<td>corn</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>other hay</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>barley</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sorghum</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>rice</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td></td>
<td>oats</td>
<td>14</td>
</tr>
<tr>
<td>Trifluralin</td>
<td>H1361.ACR, H1361.LBS, and H1361.USE</td>
<td>soybeans</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cotton</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td></td>
<td>wheat</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sunflowers</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td></td>
<td>alfalfa</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>dry beans</td>
<td>38</td>
</tr>
<tr>
<td>Cyanazine</td>
<td>H1369.ACR, H1369.LBS, and H1369.USE</td>
<td>corn</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cotton</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sorghum</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sweet corn</td>
<td>16</td>
</tr>
<tr>
<td>Butylate</td>
<td>H1839.ACR, H1839.LBS, and H1839.USE</td>
<td>corn</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sweet corn</td>
<td>8</td>
</tr>
<tr>
<td>Pendimethalin</td>
<td>H1629.ACR, H1629.LBS, and H1629.USE</td>
<td>soybeans</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cotton</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>corn</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>peanuts</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td></td>
<td>tobacco</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sorghum</td>
<td>2</td>
</tr>
</tbody>
</table>
Table 2. Herbicide-use coverage names, attribute names, and crops on which the largest amount of active ingredient was used, 1989—continued

<table>
<thead>
<tr>
<th>Herbicide name</th>
<th>Attribute names</th>
<th>Treated crops</th>
<th>Percentage treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glyphosate</td>
<td>H1099.ACR, H1099.LBS, and H1099.USE</td>
<td>soybeans</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cotton</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>corn</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>pasture</td>
<td>&lt;1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>wheat</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>grapes</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sorghum</td>
<td>8</td>
</tr>
<tr>
<td>Dicamba</td>
<td>H1298.ACR, H1298.LBS, and H1298.USE</td>
<td>pasture</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>corn</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>wheat</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>other hay</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sorghum</td>
<td>4</td>
</tr>
<tr>
<td>Bentazon</td>
<td>H1287.ACR, H1287.LBS, and H1287.USE</td>
<td>soybeans</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td>rice</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>dry beans</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>corn</td>
<td>&lt;1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>peanuts</td>
<td>12</td>
</tr>
<tr>
<td>Propanil</td>
<td>H1282.ACR, H1282.LBS, and H1282.USE</td>
<td>rice</td>
<td>76</td>
</tr>
<tr>
<td>MSMA</td>
<td>H1124.ACR, H1124.LBS, and H1124.USE</td>
<td>cotton</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sod</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>citrus</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>potatoes</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td></td>
<td>alfalfa</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sugarcane</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td></td>
<td>wheat</td>
<td>&lt;1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>tomatoes</td>
<td>40</td>
</tr>
<tr>
<td>Molinate</td>
<td>H1417.ACR, H1417.LBS, and H1417.USE</td>
<td>rice</td>
<td>40</td>
</tr>
</tbody>
</table>
Table 2. Herbicide-use coverage names, attribute names, and crops on which the largest amount of active ingredient was used, 1989 -- continued

HERBICIDE1—Coverage of use estimates for the 20 most-used herbicides in the conterminous United States—continued

<table>
<thead>
<tr>
<th>Herbicide name</th>
<th>Attribute names</th>
<th>Treated crops</th>
<th>Percentage treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCPA</td>
<td>H1305.ACR, H1305.LBS, and H1305.USE</td>
<td>wheat</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>barley</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>oats</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>rice</td>
<td>12</td>
</tr>
<tr>
<td>Propachlor</td>
<td>H1191.ACR, H1191.LBS, and H1191.USE</td>
<td>sorghum</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>corn</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>green peas</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>citrus</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td></td>
<td>alfalfa</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>grapes</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td></td>
<td>seed crops</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>apples</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td></td>
<td>asparagus</td>
<td>40</td>
</tr>
</tbody>
</table>

HERBICIDE2—Coverage of use estimates for the twenty-first through the fortieth most-used herbicides in the conterminous United States

<table>
<thead>
<tr>
<th>Herbicide name</th>
<th>Attribute names</th>
<th>Treated crops</th>
<th>Percentage treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethalfuralin</td>
<td>H9009.ACR, H9009.LBS, and H9009.USE</td>
<td>soybeans</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>dry beans</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sunflowers</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td>peanuts</td>
<td>21</td>
</tr>
<tr>
<td>Triallate</td>
<td>H1790.ACR, H1790.LBS, and H1790.USE</td>
<td>wheat</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>barley</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>dry peas</td>
<td>14</td>
</tr>
</tbody>
</table>
Table 2. Herbicide-use coverage names, attribute names, and crops on which the largest amount of active ingredient was used, 1989 -- continued

**HERBICIDE2—coverage of use estimates for the twenty-first through the fortieth most-used herbicides in the conterminous United States—continued**

<table>
<thead>
<tr>
<th>Herbicide name</th>
<th>Attribute names</th>
<th>Treated crops</th>
<th>Percentage treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paraquat</td>
<td>H1616.ACR, H1616.LBS, and H1616.USE</td>
<td>soybeans, corn, cotton, alfalfa, citrus, peanuts, grapes</td>
<td>5, 3, 10, 1, 36, 53, 20</td>
</tr>
<tr>
<td>Chloramben</td>
<td>H1299.ACR, H1299.LBS, and H1299.USE</td>
<td>soybeans, dry beans, sweet potatoes, sunflowers, tomatoes, peanuts</td>
<td>4, 21, 30, 2, 5, 7</td>
</tr>
<tr>
<td>Picloram</td>
<td>H1051.ACR, H1051.LBS, and H1051.USE</td>
<td>pasture, other hay</td>
<td>1, 1</td>
</tr>
<tr>
<td>Clomazone</td>
<td>H5000.ACR, H5000.LBS, and H5000.USE</td>
<td>soybeans, pumpkins</td>
<td>7, 5</td>
</tr>
<tr>
<td>Bromoxynil</td>
<td>H1116.ACR, H1116.LBS, and H1116.USE</td>
<td>corn, wheat, barley, oats, rice, alfalfa, garlic</td>
<td>5, 5, 10, 3, 9, &lt;1, 99</td>
</tr>
</tbody>
</table>
Table 2. Herbicide-use coverage names, attribute names, and crops on which the largest amount of active ingredient was used, 1989 -- continued

**HERBICIDE2**—coverage of use estimates for the twenty-first through the fortieth most-used herbicides in the conterminous United States—continued

<table>
<thead>
<tr>
<th>Herbicide name</th>
<th>Attribute names</th>
<th>Treated crops</th>
<th>Percentage treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCPA</td>
<td>H1872.ACR, H1872.LBS, and H1872.USE</td>
<td>onions</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td></td>
<td>broccoli</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cauliflower</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td></td>
<td>seed crops</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cabbage</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td></td>
<td>garlic</td>
<td>89</td>
</tr>
<tr>
<td></td>
<td></td>
<td>citrus</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td></td>
<td>seed crops</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>wheat</td>
<td>&lt;1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>grapes</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td></td>
<td>alfalfa</td>
<td>&lt;1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>celery</td>
<td>78</td>
</tr>
<tr>
<td></td>
<td></td>
<td>parsley</td>
<td>100</td>
</tr>
<tr>
<td>Norflurazon</td>
<td>H1018.ACR, H1018.LBS, and H1018.USE</td>
<td>cotton</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>citrus</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>grapes</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td></td>
<td>almonds</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>apples</td>
<td>9</td>
</tr>
<tr>
<td>DSMA</td>
<td>H4001.ACR, H4001.LBS, and H4001.USE</td>
<td>cotton</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sod</td>
<td>2</td>
</tr>
<tr>
<td>Acifluorfen</td>
<td>H1002.ACR, H1002.LBS, and H1002.USE</td>
<td>soybeans</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>peanuts</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>rice</td>
<td>6</td>
</tr>
<tr>
<td>Diclofop</td>
<td>H1005.ACR, H1005.LBS, and H1005.USE</td>
<td>wheat</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>barley</td>
<td>3</td>
</tr>
</tbody>
</table>

Supplemental Information 27
Table 2. Herbicide-use coverage names, attribute names, and crops on which the largest amount of active ingredient was used, 1989 -- continued

**HERBICIDE2—coverage of use estimates for the twenty-first through the fortieth most-used herbicides in the conterminous United States—continued**

<table>
<thead>
<tr>
<th>Herbicide name</th>
<th>Attribute names</th>
<th>Treated crops</th>
<th>Percentage treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oryzalin</td>
<td>H1873.ACR, H1873.LBS, and H1873.USE</td>
<td>grapes soybeans almonds apples</td>
<td>46 1 50 21</td>
</tr>
<tr>
<td>2,4-DB</td>
<td>H1308.ACR, H1308.LBS, and H1308.USE</td>
<td>alfalfa soybeans peanuts seed crops</td>
<td>3 3 67 8</td>
</tr>
<tr>
<td>Thiobencarb</td>
<td>H1903.ACR, H1903.LBS, and H1903.USE</td>
<td>rice</td>
<td>21</td>
</tr>
<tr>
<td>Cycloate</td>
<td>H2069.ACR, H2069.LBS, and H2069.USE</td>
<td>sugar beets beets spinach</td>
<td>29 79 38</td>
</tr>
</tbody>
</table>

**HERBICIDE3—Coverage of use estimates for the forty-first through the sixtieth most-used herbicides in the conterminous United States**

<table>
<thead>
<tr>
<th>Herbicide name</th>
<th>Attribute names</th>
<th>Treated crops</th>
<th>Percentage treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzin</td>
<td>H1362.ACR, H1362.LBS, and H1362.USE</td>
<td>peanuts alfalfa tobacco seed crops lettuce</td>
<td>35 1 5 1 44</td>
</tr>
<tr>
<td>Bromacil</td>
<td>H1809.ACR, H1809.LBS, and H1809.USE</td>
<td>citrus</td>
<td>76</td>
</tr>
<tr>
<td>Asulam</td>
<td>H9048.ACR, H9048.LBS, and H9048.USE</td>
<td>sugarcane sod</td>
<td>50 10</td>
</tr>
</tbody>
</table>
Table 2. Herbicide-use coverage names, attribute names, and crops on which the largest amount of active ingredient was used, 1989 -- continued

**HERBICIDE3—Coverage of use estimates for the forty-first through the sixtieth most-used herbicides in the conterminous United States—continued**

<table>
<thead>
<tr>
<th>Herbicide name</th>
<th>Attribute names</th>
<th>Treated crops</th>
<th>Percentage treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imazaquin</td>
<td>H4005.ACR, H4005.LBS, and H4005.USE</td>
<td>soybeans</td>
<td>20</td>
</tr>
<tr>
<td>Diphenamid</td>
<td>H1366.ACR, H1366.LBS, and H1366.USE</td>
<td>tobacco, tomatoes, sweet potatoes, sweet peppers</td>
<td>16, 20, 37, 24</td>
</tr>
<tr>
<td>Vernolate</td>
<td>H1432.ACR, H1432.LBS, and H1432.USE</td>
<td>peanuts, soybeans, corn</td>
<td>17, &lt;1, &lt;1</td>
</tr>
<tr>
<td>Sethoxydim</td>
<td>H1910.ACR, H1910.LBS, and H1910.USE</td>
<td>soybeans, cotton, sugar beets, alfalfa, peanuts</td>
<td>4, 9, 34, 1, 16</td>
</tr>
<tr>
<td>Fluazifop</td>
<td>H9007.ACR, H9007.LBS, and H9007.USE</td>
<td>soybeans, cotton, grapes, onions</td>
<td>4, 14, 4, 24</td>
</tr>
<tr>
<td>Napropamide</td>
<td>H1900.ACR, H1900.LBS, and H1900.USE</td>
<td>tomatoes, tobacco, strawberries, sweet peppers</td>
<td>34, 9, 41, 49</td>
</tr>
<tr>
<td>Naptalam</td>
<td>H1307.ACR, H1307.LBS, and H1307.USE</td>
<td>soybeans, cucumbers, watermelons, peanuts</td>
<td>1, 13, 26, 4</td>
</tr>
<tr>
<td>Pebulate</td>
<td>H1419.ACR, H1419.LBS, and H1419.USE</td>
<td>tobacco, tomatoes, sugar beets</td>
<td>15, 18, &lt;1</td>
</tr>
</tbody>
</table>
Table 2. Herbicide-use coverage names, attribute names, and crops on which the largest amount of active ingredient was used, 1989 -- continued

<table>
<thead>
<tr>
<th>Herbicide name</th>
<th>Attribute names</th>
<th>Treated crops</th>
<th>Percentage treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bensulide</td>
<td>H1098.ACR, H1098.LBS, and H1098.USE</td>
<td>watermelons, cantaloupes, cucumbers, sod</td>
<td>29, 43, 30, 8</td>
</tr>
<tr>
<td>Profluralin</td>
<td>H1396.ACR, H1396.LBS, and H1396.USE</td>
<td>soybeans, cotton</td>
<td>1, 2</td>
</tr>
<tr>
<td>Tebuthiuron</td>
<td>H1963.ACR, H1963.LBS, and H1963.USE</td>
<td>pasture</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Oxyfluorfen</td>
<td>H4000.ACR, H4000.LBS, and H4000.USE</td>
<td>grapes, almonds, cotton</td>
<td>35, 30, 3</td>
</tr>
<tr>
<td>Diethatyl-ethyl</td>
<td>H9015.ACR, H9015.LBS, and H9015.USE</td>
<td>sugar beets, spinach</td>
<td>21, 53</td>
</tr>
<tr>
<td>Dalapon</td>
<td>H1289.ACR, H1289.LBS, and H1289.USE</td>
<td>sugarcane, cotton, citrus, seed crops</td>
<td>6, &lt;1, 7, &lt;1</td>
</tr>
<tr>
<td>Dinoseb</td>
<td>H1375.ACR, H1375.LBS, and H1375.USE</td>
<td>dry peas, green peas, dry beans, green beans, sweet corn, potatoes</td>
<td>24, 3, 2, 1</td>
</tr>
</tbody>
</table>
Table 2. Herbicide-use coverage names, attribute names, and crops on which the largest amount of active ingredient was used, 1989 -- continued

<table>
<thead>
<tr>
<th>Herbicide name</th>
<th>Attribute names</th>
<th>Treated crops</th>
<th>Percentage treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terbacil</td>
<td>H1109.ACR, H1109.LBS, and H1109.USE</td>
<td>alfalfa, mint, sugarcane</td>
<td>1, 80, 16</td>
</tr>
<tr>
<td>Hexazinone</td>
<td>H2070.ACR, H2070.LBS, and H2070.USE</td>
<td>alfalfa, seed crops, blueberries</td>
<td>2, 3, 22</td>
</tr>
<tr>
<td>Imazethapyr</td>
<td>H9000.ACR, H9000.LBS, and H9000.USE</td>
<td>soybeans, green beans</td>
<td>5, 6</td>
</tr>
<tr>
<td>Ethofumesate</td>
<td>H9012.ACR, H9012.LBS, and H9012.USE</td>
<td>sugar beets, seed crops</td>
<td>19, 3</td>
</tr>
<tr>
<td>Pyrazon</td>
<td>H2250.ACR, H2250.LBS, and H2250.USE</td>
<td>sugar beets, beets</td>
<td>15, 68</td>
</tr>
<tr>
<td>Propham</td>
<td>H2158.ACR, H2158.LBS, and H2158.USE</td>
<td>alfalfa, seed crops, sugar beets, lettuce</td>
<td>&lt;1, 2, 1, 3</td>
</tr>
<tr>
<td>Methazole</td>
<td>H9096.ACR, H9096.LBS, and H9096.USE</td>
<td>cotton</td>
<td>5</td>
</tr>
<tr>
<td>Chlorimuron</td>
<td>H4008.ACR, H4008.LBS, and H4008.USE</td>
<td>soybeans, peanuts</td>
<td>8, 22</td>
</tr>
<tr>
<td>Difenzoquat</td>
<td>H1374.ACR, H1374.LBS, and H1374.USE</td>
<td>barley, wheat</td>
<td>2, &lt;1</td>
</tr>
<tr>
<td>Chlorpropham</td>
<td>H1183.ACR, H1183.LBS, and H1183.USE</td>
<td>alfalfa, onions, seed crops, carrots</td>
<td>&lt;1, 18, &lt;1, 2</td>
</tr>
</tbody>
</table>
Table 2. Herbicide-use coverage names, attribute names, and crops on which the largest amount of active ingredient was used, 1989 -- continued

**HERBICIDE4—Coverage of use estimates for the sixty-first through the eightieth most-used herbicides in the conterminous United States—continued**

<table>
<thead>
<tr>
<th>Herbicide name</th>
<th>Attribute names</th>
<th>Treated crops</th>
<th>Percentage treated</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>lettuce</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td></td>
<td>seed crops</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>artichokes</td>
<td>28</td>
</tr>
<tr>
<td>Fomesafen</td>
<td>H4010.ACR, H4010.LBS, and H4010.USE</td>
<td>soybeans</td>
<td>1</td>
</tr>
<tr>
<td>Tridiphane</td>
<td>H4007.ACR, H4007.LBS, and H4007.USE</td>
<td>corn</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Endothall</td>
<td>H1948.ACR, H1948.LBS, and H1948.USE</td>
<td>sugar beets</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cotton</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>potatoes</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sugarcane</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td></td>
<td>citrus</td>
<td>20</td>
</tr>
<tr>
<td>Phenmedipham</td>
<td>H2220.ACR, H2220.LBS, and H2220.USE</td>
<td>sugar beets</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td></td>
<td>spinach</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>beets</td>
<td>11</td>
</tr>
<tr>
<td>Diquat</td>
<td>H1950.ACR, H1950.LBS, and H1950.USE</td>
<td>potatoes</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>alfalfa</td>
<td>&lt;1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>seed crop</td>
<td>4</td>
</tr>
<tr>
<td>Desmedipham</td>
<td>H9014.ACR, H9014.LBS, and H9014.USE</td>
<td>sugar beets</td>
<td>68</td>
</tr>
<tr>
<td>Bifenox</td>
<td>H1309.ACR, H1309.LBS, and H1309.USE</td>
<td>rice</td>
<td>3</td>
</tr>
<tr>
<td>Diallate</td>
<td>H9016.ACR, H9016.LBS, and H9016.USE</td>
<td>sugar beets</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>potatoes</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>soybeans</td>
<td>&lt;1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>flax</td>
<td>1</td>
</tr>
</tbody>
</table>
Table 2. Herbicide-use coverage names, attribute names, and crops on which the largest amount of active ingredient was used, 1989 -- continued

**HERBICIDES**—Coverage of use estimates for the eighty-first through the ninety-sixth most-used herbicides in the conterminous United States

<table>
<thead>
<tr>
<th>Herbicide name</th>
<th>Attribute names</th>
<th>Treated crops</th>
<th>Percentage treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lactofen</td>
<td>H4009.ACR, H4009.LBS, and H4009.USE</td>
<td>soybeans</td>
<td>1</td>
</tr>
<tr>
<td>Isopropalin</td>
<td>H1867.ACR, H4009.LBS, and H4009.USE</td>
<td>tobacco</td>
<td>13</td>
</tr>
<tr>
<td>Chlorsulfuron</td>
<td>H1913.ACR, H1913.LBS, and H1913.USE</td>
<td>wheat</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>barley</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>oats</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>pasture</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Chloroxuron</td>
<td>H2053.ACR, H2053.LBS, and H2053.USE</td>
<td>strawberries</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td></td>
<td>celery</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td></td>
<td>carrots</td>
<td>4</td>
</tr>
<tr>
<td>Dichlobenil</td>
<td>H1865.ACR, H1865.LBS, and H1865.USE</td>
<td>apples</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cranberries</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td></td>
<td>grapes</td>
<td>1</td>
</tr>
<tr>
<td>Thiameturon</td>
<td>H4004.ACR, H4004.LBS, and H4004.USE</td>
<td>wheat</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>barley</td>
<td>6</td>
</tr>
<tr>
<td>Barban</td>
<td>H1176.ACR, H1176.LBS, and H1176.USE</td>
<td>wheat</td>
<td>&lt;1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>barley</td>
<td>&lt;1</td>
</tr>
<tr>
<td>MCPB</td>
<td>H1889.ACR, H1889.LBS, and H1889.USE</td>
<td>green peas</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td></td>
<td>dry peas</td>
<td>2</td>
</tr>
<tr>
<td>Metsulfuron</td>
<td>H4003.ACR, H4003.LBS, and H4003.USE</td>
<td>wheat</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>barley</td>
<td>4</td>
</tr>
<tr>
<td>MCPP</td>
<td>H1477.ACR, H1477.LBS, and H1477.USE</td>
<td>sod</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>H1477.LBS</td>
<td>seed crops</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Fenoxaprop</td>
<td>H5003.ACR, H5003.LBS, and H5003.USE</td>
<td>rice</td>
<td>4</td>
</tr>
</tbody>
</table>
Table 2. Herbicide-use coverage names, attribute names, and crops on which the largest amount of active ingredient was used, 1989 -- continued

<table>
<thead>
<tr>
<th>Herbicide name</th>
<th>Attribute names</th>
<th>Treated crops</th>
<th>Percentage treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylopyralid</td>
<td>H4002.ACR, H4002.LBS, and H4002.USE</td>
<td>wheat</td>
<td>&lt;1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sugar beets</td>
<td>3</td>
</tr>
<tr>
<td>CDAA</td>
<td>H1885.ACR, H1885.LBS, and H1885.USE</td>
<td>onions</td>
<td>4</td>
</tr>
<tr>
<td>Fluchloralin</td>
<td>H1397.ACR, H1397.LBS, and H1397.USE</td>
<td>cotton</td>
<td>1</td>
</tr>
</tbody>
</table>
### NIT85—Coverage of nitrogen-fertilizer sales estimates, 1985

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NTOT85</td>
<td>Total estimated nitrogen-fertilizer sales, 1991 (tons)</td>
</tr>
<tr>
<td>NTOT85.USE</td>
<td>Rate of nitrogen-fertilizer use in county polygon (tons per square mile)</td>
</tr>
<tr>
<td>K2O85</td>
<td>Estimated potash (K\textsubscript{2}O) sales, 1985 (tons)</td>
</tr>
<tr>
<td>K2O85.USE</td>
<td>Rate of potash use in county polygon (tons per square mile)</td>
</tr>
<tr>
<td>P2O585</td>
<td>Estimated phosphate (P\textsubscript{2}O\textsubscript{5}) sales, 1985 (tons)</td>
</tr>
<tr>
<td>P2O585.USE</td>
<td>Rate of phosphate use in county polygon (tons per square mile)</td>
</tr>
<tr>
<td>AMNI85</td>
<td>Fertilizer sold as ammonium nitrate, 1985 (tons)</td>
</tr>
<tr>
<td>ANHY85</td>
<td>Fertilizer sold as anhydrous ammonia, 1985 (tons)</td>
</tr>
<tr>
<td>NMIS85</td>
<td>Fertilizer sold as miscellaneous forms, 1985 (tons)</td>
</tr>
<tr>
<td>NSOL85</td>
<td>Fertilizer sold as nitrogen solutions, 1985 (tons)</td>
</tr>
<tr>
<td>UREA85</td>
<td>Fertilizer sold as urea, 1985 (tons)</td>
</tr>
</tbody>
</table>

### NIT86—Coverage of nitrogen-fertilizer sales estimates, 1986

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NTOT86</td>
<td>Total estimated nitrogen-fertilizer sales, 1986 (tons)</td>
</tr>
<tr>
<td>NTOT86.USE</td>
<td>Rate of nitrogen-fertilizer use in county polygon (tons per square mile)</td>
</tr>
<tr>
<td>K2O86</td>
<td>Estimated potash (K\textsubscript{2}O) sales, 1986 (tons)</td>
</tr>
<tr>
<td>K2O86.USE</td>
<td>Rate of potash use in county polygon (tons per square mile)</td>
</tr>
<tr>
<td>P2O586</td>
<td>Estimated phosphate (P\textsubscript{2}O\textsubscript{5}) sales, 1986 (tons)</td>
</tr>
<tr>
<td>P2O586.USE</td>
<td>Rate of phosphate use in county polygon (tons per square mile)</td>
</tr>
<tr>
<td>AMNI86</td>
<td>Fertilizer sold as ammonium nitrate, 1986 (tons)</td>
</tr>
<tr>
<td>ANHY86</td>
<td>Fertilizer sold as anhydrous ammonia, 1986 (tons)</td>
</tr>
<tr>
<td>NMIS86</td>
<td>Fertilizer sold as miscellaneous forms, 1986 (tons)</td>
</tr>
<tr>
<td>NSOL86</td>
<td>Fertilizer sold as nitrogen solutions, 1986 (tons)</td>
</tr>
<tr>
<td>UREA86</td>
<td>Fertilizer sold as urea, 1986 (tons)</td>
</tr>
</tbody>
</table>
Table 3. Nitrogen-fertilizer sales coverage names, attribute names, and short attribute descriptions -- continued

### NIT87—Coverage of nitrogen-fertilizer sales estimates, 1987

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NTOT87</td>
<td>Total estimated nitrogen-fertilizer sales, 1987 (tons)</td>
</tr>
<tr>
<td>NTOT87.USE</td>
<td>Rate of nitrogen-fertilizer use in county polygon (tons per square mile)</td>
</tr>
<tr>
<td>K2O87</td>
<td>Estimated potash (K₂O) sales, 1987 (tons)</td>
</tr>
<tr>
<td>K2O87.USE</td>
<td>Rate of potash use in county polygon (tons per square mile)</td>
</tr>
<tr>
<td>P2O587</td>
<td>Estimated phosphate (P₂O₅) sales, 1987 (tons)</td>
</tr>
<tr>
<td>P2O587.USE</td>
<td>Rate of phosphate use in county polygon (tons per square mile)</td>
</tr>
<tr>
<td>AMNI87</td>
<td>Fertilizer sold as ammonium nitrate, 1987 (tons)</td>
</tr>
<tr>
<td>ANHY87</td>
<td>Fertilizer sold as anhydrous ammonia, 1987 (tons)</td>
</tr>
<tr>
<td>NMIS87</td>
<td>Fertilizer sold as miscellaneous forms, 1987 (tons)</td>
</tr>
<tr>
<td>NSOL87</td>
<td>Fertilizer sold as nitrogen solutions, 1987 (tons)</td>
</tr>
<tr>
<td>UREA87</td>
<td>Fertilizer sold as urea, 1987 (tons)</td>
</tr>
</tbody>
</table>

### NIT88—Coverage of nitrogen-fertilizer sales estimates, 1988

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NTOT88</td>
<td>Total estimated nitrogen-fertilizer sales, 1988 (tons)</td>
</tr>
<tr>
<td>NTOT88.USE</td>
<td>Rate of nitrogen-fertilizer use in county polygon (tons per square mile)</td>
</tr>
<tr>
<td>K2O88</td>
<td>Estimated potash (K₂O) sales, 1988 (tons)</td>
</tr>
<tr>
<td>K2O88.USE</td>
<td>Rate of potash use in county polygon (tons per square mile)</td>
</tr>
<tr>
<td>P2O588</td>
<td>Estimated phosphate (P₂O₅) sales, 1988 (tons)</td>
</tr>
<tr>
<td>P2O588.USE</td>
<td>Rate of phosphate use in county polygon (tons per square mile)</td>
</tr>
<tr>
<td>AMNI88</td>
<td>Fertilizer sold as ammonium nitrate, 1988 (tons)</td>
</tr>
<tr>
<td>ANHY88</td>
<td>Fertilizer sold as anhydrous ammonia, 1988 (tons)</td>
</tr>
<tr>
<td>NMIS88</td>
<td>Fertilizer sold as miscellaneous forms, 1988 (tons)</td>
</tr>
<tr>
<td>NSOL88</td>
<td>Fertilizer sold as nitrogen solutions, 1988 (tons)</td>
</tr>
<tr>
<td>UREA88</td>
<td>Fertilizer sold as urea, 1988 (tons)</td>
</tr>
</tbody>
</table>

36 Spatial Data in Geographic Information System Format on Agricultural Chemical Use, Land Use, and Cropping Practices in the United States
Table 3. Nitrogen-fertilizer sales coverage names, attribute names, and short attribute descriptions -- continued

### NIT89—Coverage of nitrogen-fertilizer sales estimates, 1989

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NTTOT</td>
<td>Total estimated nitrogen-fertilizer sales, 1989 (tons)</td>
</tr>
<tr>
<td>NTTOT.USE</td>
<td>Rate of nitrogen-fertilizer use in county polygon (tons per square mile)</td>
</tr>
<tr>
<td>K2O</td>
<td>Estimated potash (K₂O) sales, 1989 (tons)</td>
</tr>
<tr>
<td>K2O.USE</td>
<td>Rate of potash use in county polygon (tons per square mile)</td>
</tr>
<tr>
<td>P2O5</td>
<td>Estimated phosphate (P₂O₅) sales, 1989 (tons)</td>
</tr>
<tr>
<td>P2O5.USE</td>
<td>Rate of phosphate use in county polygon (tons per square mile)</td>
</tr>
<tr>
<td>AMN</td>
<td>Fertilizer sold as ammonium nitrate, 1989 (tons)</td>
</tr>
<tr>
<td>ANH</td>
<td>Fertilizer sold as anhydrous ammonia, 1989 (tons)</td>
</tr>
<tr>
<td>NMI</td>
<td>Fertilizer sold as miscellaneous forms, 1989 (tons)</td>
</tr>
<tr>
<td>NSO</td>
<td>Fertilizer sold as nitrogen solutions, 1989 (tons)</td>
</tr>
<tr>
<td>URE</td>
<td>Fertilizer sold as urea, 1989 (tons)</td>
</tr>
</tbody>
</table>

### NIT90—Coverage of nitrogen-fertilizer sales estimates, 1990

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NTTOT</td>
<td>Total estimated nitrogen-fertilizer sales, 1990 (tons)</td>
</tr>
<tr>
<td>NTTOT.USE</td>
<td>Rate of nitrogen-fertilizer use in county polygon (tons per square mile)</td>
</tr>
<tr>
<td>K2O</td>
<td>Estimated potash (K₂O) sales, 1990 (tons)</td>
</tr>
<tr>
<td>K2O.USE</td>
<td>Rate of potash use in county polygon (tons per square mile)</td>
</tr>
<tr>
<td>P2O5</td>
<td>Estimated phosphate (P₂O₅) sales, 1990 (tons)</td>
</tr>
<tr>
<td>P2O5.USE</td>
<td>Rate of phosphate use in county polygon (tons per square mile)</td>
</tr>
<tr>
<td>AMN</td>
<td>Fertilizer sold as ammonium nitrate, 1990 (tons)</td>
</tr>
<tr>
<td>ANH</td>
<td>Fertilizer sold as anhydrous ammonia, 1990 (tons)</td>
</tr>
<tr>
<td>NMI</td>
<td>Fertilizer sold as miscellaneous forms, 1990 (tons)</td>
</tr>
<tr>
<td>NSO</td>
<td>Fertilizer sold as nitrogen solutions, 1990 (tons)</td>
</tr>
<tr>
<td>URE</td>
<td>Fertilizer sold as urea, 1990 (tons)</td>
</tr>
</tbody>
</table>
Table 3. Nitrogen-fertilizer sales coverage names, attribute names, and short attribute descriptions -- continued

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NTOT91</td>
<td>Total estimated nitrogen-fertilizer sales, 1991 (tons)</td>
</tr>
<tr>
<td>NTOT91.USE</td>
<td>Rate of nitrogen-fertilizer use in county polygon (tons per square mile)</td>
</tr>
<tr>
<td>K2O91</td>
<td>Estimated potash (K$_2$O) sales, 1991 (tons)</td>
</tr>
<tr>
<td>K2O91.USE</td>
<td>Rate of potash use in county polygon (tons per square mile)</td>
</tr>
<tr>
<td>P2O591</td>
<td>Estimated phosphate (P$_2$O$_5$) sales, 1991 (tons)</td>
</tr>
<tr>
<td>P2O591.USE</td>
<td>Rate of phosphate use in county polygon (tons per square mile)</td>
</tr>
<tr>
<td>AMNI91</td>
<td>Fertilizer sold as ammonium nitrate, 1991 (tons)</td>
</tr>
<tr>
<td>ANHY91</td>
<td>Fertilizer sold as anhydrous ammonia, 1991 (tons)</td>
</tr>
<tr>
<td>NMIS91</td>
<td>Fertilizer sold as miscellaneous forms, 1991 (tons)</td>
</tr>
<tr>
<td>NSOL91</td>
<td>Fertilizer sold as nitrogen solutions, 1991 (tons)</td>
</tr>
<tr>
<td>UREA91</td>
<td>Fertilizer sold as urea, 1991 (tons)</td>
</tr>
</tbody>
</table>
Table 4. 1987 Census of Agriculture coverage names, attribute names, and short attribute descriptions
[Descriptions of coverage attributes from U.S. Department of Commerce, 1989b]

### AG_EXPN—Coverage of agricultural expenses estimates from the 1987 Census of Agriculture

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA0275</td>
<td>Total farm production expenses, 1987 ($1,000)</td>
</tr>
<tr>
<td>CA0279</td>
<td>Livestock and poultry purchased, 1987 ($1,000)</td>
</tr>
<tr>
<td>CA0283</td>
<td>Feed for livestock and poultry, 1987 ($1,000)</td>
</tr>
<tr>
<td>CA0291</td>
<td>Seeds, bulbs, plants, and trees, 1987 ($1,000)</td>
</tr>
<tr>
<td>CA0295</td>
<td>Commercial fertilizer, 1987 ($1,000)</td>
</tr>
<tr>
<td>CA0299</td>
<td>Agricultural chemicals, 1987 ($1,000)</td>
</tr>
<tr>
<td>CA0303</td>
<td>Petroleum products, 1987 ($1,000)</td>
</tr>
<tr>
<td>CA0323</td>
<td>Electricity, 1987 ($1,000)</td>
</tr>
<tr>
<td>CA0327</td>
<td>Hired farm labor, 1987 ($1,000)</td>
</tr>
<tr>
<td>CA0331</td>
<td>Contract labor, 1987 ($1,000)</td>
</tr>
<tr>
<td>CA0341</td>
<td>Interest paid, 1987 ($1,000)</td>
</tr>
<tr>
<td>CA0350</td>
<td>Property taxes paid, 1987 ($1,000)</td>
</tr>
</tbody>
</table>

### AG_LAND—Coverage of agricultural-land estimates from the 1987 Census of Agriculture

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA0398</td>
<td>Farms, 1987 (number)</td>
</tr>
<tr>
<td>CA0400</td>
<td>Land in farms, 1987 (acres)</td>
</tr>
<tr>
<td>PCT0400</td>
<td>Percent of county as land in farms, 1987</td>
</tr>
<tr>
<td>CA0401</td>
<td>Land in farms, 1982 (acres)</td>
</tr>
<tr>
<td>PCT0401</td>
<td>Percent of county as land in farms, 1982</td>
</tr>
<tr>
<td>CA0402</td>
<td>Average size of farm, 1987 (acres)</td>
</tr>
<tr>
<td>CA0460</td>
<td>Total cropland, 1987 (acres)</td>
</tr>
<tr>
<td>PCT0460</td>
<td>Percent of county as total cropland, 1987</td>
</tr>
<tr>
<td>CA0461</td>
<td>Total cropland, 1982 (acres)</td>
</tr>
<tr>
<td>PCT0461</td>
<td>Percent of county as total cropland, 1982</td>
</tr>
</tbody>
</table>
Table 4. 1987 Census of Agriculture coverage names, attribute names, and short attribute descriptions -- continued

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA0464</td>
<td>Harvested cropland, 1987 (acres)</td>
</tr>
<tr>
<td>PCT0464</td>
<td>Percent of county as harvested cropland, 1987</td>
</tr>
<tr>
<td>CA0468</td>
<td>Cropland used only for pasture or grazing, 1987 (acres)</td>
</tr>
<tr>
<td>CA0476</td>
<td>Cropland in cover crops, legumes, and soil-improvement grasses, not harvested and not pastured, 1987 (acres)</td>
</tr>
<tr>
<td>CA0477</td>
<td>Cropland in cover crops, legumes, and soil-improvement grasses, not harvested and not pastured, 1982 (acres)</td>
</tr>
<tr>
<td>CA0492</td>
<td>Total woodland, 1987 (acres)</td>
</tr>
<tr>
<td>PCT0492</td>
<td>Percent of county as total woodland, 1987</td>
</tr>
<tr>
<td>CA0496</td>
<td>Woodland pastured, 1987 (acres)</td>
</tr>
<tr>
<td>CA0500</td>
<td>Woodland not pastured, 1987 (acres)</td>
</tr>
<tr>
<td>CA0516</td>
<td>Pastureland, all types, 1987 (acres)</td>
</tr>
<tr>
<td>PCT0516</td>
<td>Percent of county as pastureland, all types, 1987</td>
</tr>
<tr>
<td>CA0523</td>
<td>Cropland placed under the conservation reserve program, 1987 (acres)</td>
</tr>
<tr>
<td>CA0612</td>
<td>Farms with irrigation, 1987 (number)</td>
</tr>
<tr>
<td>CA0613</td>
<td>Farms with irrigation, 1982 (number)</td>
</tr>
<tr>
<td>CA0614</td>
<td>Land in irrigated farms, 1987 (acres)</td>
</tr>
<tr>
<td>PCT0614</td>
<td>Percent of county as land in irrigated farms, 1987</td>
</tr>
<tr>
<td>CA0615</td>
<td>Land in irrigated farms, 1982 (acres)</td>
</tr>
<tr>
<td>CA0618</td>
<td>Harvested cropland, irrigated, 1987 (acres)</td>
</tr>
<tr>
<td>CA0619</td>
<td>Harvested cropland, irrigated, 1982 (acres)</td>
</tr>
<tr>
<td>CA0622</td>
<td>Other cropland, excluding cropland pastured, irrigated, 1987 (acres)</td>
</tr>
<tr>
<td>CA0623</td>
<td>Other cropland, excluding cropland pastured, irrigated, 1982 (acres)</td>
</tr>
<tr>
<td>CA0629</td>
<td>Irrigated land, 1987 (acres)</td>
</tr>
<tr>
<td>PCT0629</td>
<td>Percent of county as irrigated land, 1987</td>
</tr>
<tr>
<td>CA0632</td>
<td>Harvested cropland, irrigated, 1987 (acres)</td>
</tr>
<tr>
<td>CA0636</td>
<td>Pastureland and other land, irrigated 1987 (acres)</td>
</tr>
<tr>
<td>CA3223</td>
<td>Land in orchards, total, 1987 (acres)</td>
</tr>
<tr>
<td>PCT3223</td>
<td>Percent of county as land in orchards, total, 1987</td>
</tr>
</tbody>
</table>
Table 4. 1987 Census of Agriculture coverage names, attribute names, and short attribute descriptions -- continued

AG_CHEM--Coverage of agricultural-chemical use estimates from the 1987 Census of Agriculture

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA0772</td>
<td>Commercial fertilizer, 1987 (acres on which used)</td>
</tr>
<tr>
<td>PCT0772</td>
<td>Percent of county treated with commercial fertilizer, 1987</td>
</tr>
<tr>
<td>CA0773</td>
<td>Commercial fertilizer, 1982 (acres on which used)</td>
</tr>
<tr>
<td>PCT0773</td>
<td>Percent of county treated with commercial fertilizer, 1982</td>
</tr>
<tr>
<td>CA0776</td>
<td>Cropland fertilized, 1987 (acres on which used)</td>
</tr>
<tr>
<td>PCT0776</td>
<td>Percent of county as cropland fertilized, 1987</td>
</tr>
<tr>
<td>CA0777</td>
<td>Cropland fertilized, 1982 (acres on which used)</td>
</tr>
<tr>
<td>PCT0777</td>
<td>Percent of county as cropland fertilized, 1982</td>
</tr>
<tr>
<td>CA0780</td>
<td>Pastureland and rangeland fertilized, 1987 (acres on which used)</td>
</tr>
<tr>
<td>PCT0780</td>
<td>Percent of county as pastureland and rangeland fertilized, 1987</td>
</tr>
<tr>
<td>CA0784</td>
<td>Lime, 1987 (acres on which used)</td>
</tr>
<tr>
<td>PCT0784</td>
<td>Percent of county treated with lime, 1987</td>
</tr>
<tr>
<td>CA0786</td>
<td>Lime, 1987 (tons)</td>
</tr>
</tbody>
</table>

Sprays, dusts, granules, fumigants, and other compounds use to control --

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA0790</td>
<td>Insects on hay and other crops, 1987 (acres on which used)</td>
</tr>
<tr>
<td>PCT0790</td>
<td>Percent of county treated for insects on hay and other crops, 1987</td>
</tr>
<tr>
<td>CA0791</td>
<td>Insects on hay and other crops, 1982 (acres on which used)</td>
</tr>
<tr>
<td>PCT0791</td>
<td>Percent of county treated for insects on hay and other crops, 1982</td>
</tr>
<tr>
<td>CA0794</td>
<td>Nematodes in crops, 1987 (acres on which used)</td>
</tr>
<tr>
<td>PCT0794</td>
<td>Percent of county treated for nematodes in crops, 1987</td>
</tr>
<tr>
<td>CA0795</td>
<td>Nematodes in crops, 1982 (acres on which used)</td>
</tr>
<tr>
<td>PCT0795</td>
<td>Percent of county treated for nematodes in crops, 1982</td>
</tr>
<tr>
<td>CA0798</td>
<td>Diseases in crops and orchards, 1987 (acres on which used)</td>
</tr>
<tr>
<td>PCT0798</td>
<td>Percent of county treated for diseases in crops and orchards, 1987</td>
</tr>
<tr>
<td>CA0799</td>
<td>Diseases in crops and orchards, 1982 (acres on which used)</td>
</tr>
<tr>
<td>PCT0799</td>
<td>Percent of county treated for diseases in crops and orchards, 1982</td>
</tr>
<tr>
<td>CA0802</td>
<td>Weeds, grass, or brush in crops and pasture, 1987 (acres on which used)</td>
</tr>
<tr>
<td>PCT0802</td>
<td>Percent of county treated for weeds, grass, or brush in crops and pasture, 1987</td>
</tr>
<tr>
<td>CA0803</td>
<td>Weeds, grass, or brush in crops and pasture, 1982 (acres on which used)</td>
</tr>
</tbody>
</table>
Table 4. 1987 Census of Agriculture coverage names, attribute names, and short attribute descriptions -- continued

### AG_CHEM—Coverage of agricultural-chemical use estimates from the 1987 Census of Agriculture—continued

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCT0803</td>
<td>Percent of county treated for weeds, grass, or brush in crops and pasture, 1982</td>
</tr>
<tr>
<td>CA0806</td>
<td>Chemicals used for defoliation or for growth control of crops or thinning of fruit, 1987 (acres on which used)</td>
</tr>
<tr>
<td>PCT0806</td>
<td>Percent of county treated with chemicals used for defoliation or for growth control of crops or thinning of fruit, 1987</td>
</tr>
<tr>
<td>CA0807</td>
<td>Chemicals used for defoliation or for growth control of crops or thinning of fruit, 1982 (acres on which used)</td>
</tr>
<tr>
<td>PCT0807</td>
<td>Percent of county treated with chemicals used for defoliation or for growth control of crops or thinning of fruit, 1982</td>
</tr>
</tbody>
</table>

### AG_STOCK—Coverage of livestock holdings estimates from the 1987 Census of Agriculture

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA0930</td>
<td>Cattle and calves, 1987 (number)</td>
</tr>
<tr>
<td>CA0966</td>
<td>Beef cows, 1987 (number)</td>
</tr>
<tr>
<td>CA0984</td>
<td>Milk cows, 1987 (number)</td>
</tr>
<tr>
<td>CA1006</td>
<td>Steers, steer calves, bulls, and bull calves, 1987 (number)</td>
</tr>
<tr>
<td>CA1094</td>
<td>Hogs and pigs, 1987 (number)</td>
</tr>
<tr>
<td>CA1183</td>
<td>Sheep and lambs inventory, 1987 (number)</td>
</tr>
<tr>
<td>CA1210</td>
<td>Horses and ponies inventory, 1987 (number)</td>
</tr>
<tr>
<td>CA1218</td>
<td>Any poultry, 1987 (farms)</td>
</tr>
<tr>
<td>CA1222</td>
<td>Chickens 3 months old or older, 1987 (number)</td>
</tr>
<tr>
<td>CA1226</td>
<td>Hens and pullets of laying age, 1987 (number)</td>
</tr>
<tr>
<td>CA1247</td>
<td>Broilers and other meat-type chickens, 1987 (number)</td>
</tr>
<tr>
<td>CA1251</td>
<td>Turkeys, 1987 (number)</td>
</tr>
<tr>
<td>CA1261</td>
<td>Any poultry sold, 1987 ($1,000)</td>
</tr>
</tbody>
</table>
Table 4. 1987 Census of Agriculture coverage names, attribute names, and short attribute descriptions -- continued

AG_CROP1—Coverage of cropping-practices estimates from the 1987 Census of Agriculture—part 1

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA2107</td>
<td>Corn for grain or seed, harvested, 1987 (acres)</td>
</tr>
<tr>
<td>PCT2107</td>
<td>Percent of county as corn for grain or seed, harvested, 1987</td>
</tr>
<tr>
<td>CA2110</td>
<td>Corn for grain or seed, irrigated, 1987 (acres)</td>
</tr>
<tr>
<td>CA2117</td>
<td>Sorghum for grain or seed, harvested, 1987 (acres)</td>
</tr>
<tr>
<td>PCT2117</td>
<td>Percent of county as sorghum for grain or seed, harvested, 1987</td>
</tr>
<tr>
<td>CA2120</td>
<td>Sorghum for grain or seed, irrigated, 1987 (acres)</td>
</tr>
<tr>
<td>CA2127</td>
<td>Wheat for grain, harvested, 1987 (acres)</td>
</tr>
<tr>
<td>PCT2127</td>
<td>Percent of county as wheat for grain, harvested, 1987</td>
</tr>
<tr>
<td>CA2130</td>
<td>Wheat for grain, irrigated, 1987 (acres)</td>
</tr>
<tr>
<td>CA2137</td>
<td>Barley for grain, harvested, 1987 (acres)</td>
</tr>
<tr>
<td>CA2140</td>
<td>Barley for grain, irrigated, 1987 (acres)</td>
</tr>
<tr>
<td>CA2197</td>
<td>Oats for grain, harvested, 1987 (acres)</td>
</tr>
<tr>
<td>CA2200</td>
<td>Oats for grain, irrigated, 1987 (acres)</td>
</tr>
<tr>
<td>CA2227</td>
<td>Rice, harvested, 1987 (acres)</td>
</tr>
<tr>
<td>CA2230</td>
<td>Rice, irrigated, 1987 (acres)</td>
</tr>
<tr>
<td>CA2237</td>
<td>Rye for grain, harvested, 1987 (acres)</td>
</tr>
<tr>
<td>CA2240</td>
<td>Rye for grain, irrigated, 1987 (acres)</td>
</tr>
<tr>
<td>CA2287</td>
<td>Cotton, harvested, 1987 (acres)</td>
</tr>
<tr>
<td>CA2290</td>
<td>Cotton, irrigated, 1987 (acres)</td>
</tr>
<tr>
<td>CA2297</td>
<td>Tobacco, harvested, 1987 (acres)</td>
</tr>
<tr>
<td>CA2300</td>
<td>Tobacco, irrigated, 1987 (acres)</td>
</tr>
<tr>
<td>CA2307</td>
<td>Soybeans for beans, harvested, 1987 (acres)</td>
</tr>
<tr>
<td>PCT2307</td>
<td>Percent of county as soybeans for beans, harvested, 1987</td>
</tr>
<tr>
<td>CA2310</td>
<td>Soybeans for beans, irrigated, 1987 (acres)</td>
</tr>
<tr>
<td>CA2317</td>
<td>Dry edible beans, excluding limas, harvested, 1987 (acres)</td>
</tr>
<tr>
<td>CA2320</td>
<td>Dry edible beans, excluding limas, irrigated, 1987 (acres)</td>
</tr>
<tr>
<td>CA2367</td>
<td>Irish potatoes, harvested, 1987 (acres)</td>
</tr>
<tr>
<td>CA2370</td>
<td>Irish potatoes, irrigated, 1987 (acres)</td>
</tr>
<tr>
<td>CA2397</td>
<td>Sugar beets for sugar, harvested, 1987 (acres)</td>
</tr>
<tr>
<td>CA2340</td>
<td>Sugar beets for sugar, irrigated, 1987 (acres)</td>
</tr>
</tbody>
</table>
Table 4. 1987 Census of Agriculture coverage names, attribute names, and short attribute descriptions -- continued

**AG_CROP1—Coverage of cropping practices estimates from the 1987 Census of Agriculture—part 1—continued**

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA2427</td>
<td>Sugarcane for sugar, harvested, 1987 (acres)</td>
</tr>
<tr>
<td>CA2430</td>
<td>Sugarcane for sugar, irrigated, 1987 (acres)</td>
</tr>
</tbody>
</table>

**AG_CROP2—Coverage of cropping practices estimates from the 1987 Census of Agriculture—part 2**

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA2447</td>
<td>Peanuts for nuts, harvested, 1987 (acres)</td>
</tr>
<tr>
<td>CA2450</td>
<td>Peanuts for nuts, irrigated, 1987 (acres)</td>
</tr>
<tr>
<td>CA2717</td>
<td>Hay—all, harvested, 1987 (acres)</td>
</tr>
<tr>
<td>PCT2717</td>
<td>Percent of county as hay—all, harvested, 1987</td>
</tr>
<tr>
<td>CA2720</td>
<td>Hay—all, irrigated, 1987 (acres)</td>
</tr>
<tr>
<td>CA2727</td>
<td>Alfalfa Hay, harvested, 1987 (acres)</td>
</tr>
<tr>
<td>CA2730</td>
<td>Alfalfa Hay, irrigated, 1987 (acres)</td>
</tr>
<tr>
<td>CA2777</td>
<td>Corn for silage or green chop, harvested, 1987 (acres)</td>
</tr>
<tr>
<td>CA2780</td>
<td>Corn for silage or green chop, irrigated, 1987 (acres)</td>
</tr>
<tr>
<td>CA2807</td>
<td>Land used for vegetables, harvested, 1987 (acres)</td>
</tr>
<tr>
<td>PCT2807</td>
<td>Percent of county as land used for vegetables, harvested, 1987</td>
</tr>
<tr>
<td>CA2809</td>
<td>Land used for vegetables, irrigated, 1987 (acres)</td>
</tr>
<tr>
<td>CA3007</td>
<td>Garlic harvested, 1987 (acres)</td>
</tr>
<tr>
<td>CA3087</td>
<td>Hot peppers harvested, 1987 (acres)</td>
</tr>
<tr>
<td>CA3159</td>
<td>Sweet corn, harvested, 1987 (acres)</td>
</tr>
<tr>
<td>CA3167</td>
<td>Tomatoes harvested, 1987 (acres)</td>
</tr>
<tr>
<td>CA3169</td>
<td>Tomatoes irrigated, 1987 (acres)</td>
</tr>
<tr>
<td>CA3232</td>
<td>Apples, total, 1987 (acres)</td>
</tr>
<tr>
<td>CA3331</td>
<td>Grapes, total, 1987 (acres)</td>
</tr>
<tr>
<td>CA3367</td>
<td>Nectarines, total, 1987 (acres)</td>
</tr>
</tbody>
</table>
Table 4. 1987 Census of Agriculture coverage names, attribute names, and short attribute descriptions -- continued

**AG_CROP2—Coverage of cropping practices estimates from the 1987 Census of Agriculture—part 2—continued**

<table>
<thead>
<tr>
<th>Attribute name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA3403</td>
<td>Peaches, total, 1987 (acres)</td>
</tr>
<tr>
<td>CA3457</td>
<td>All citrus fruit, total, 1987 (acres)</td>
</tr>
<tr>
<td>PCT3457</td>
<td>Percent of county as all citrus fruit, total, 1987</td>
</tr>
<tr>
<td>CA3484</td>
<td>Lemons, total, 1987 (acres)</td>
</tr>
<tr>
<td>CA3493</td>
<td>Limes, total, 1987 (acres)</td>
</tr>
<tr>
<td>CA3502</td>
<td>Oranges, total, 1987 (acres)</td>
</tr>
<tr>
<td>CA3619</td>
<td>Berries, harvested, 1987 (acres)</td>
</tr>
<tr>
<td>CA3810</td>
<td>Sod, harvested, 1987 (acres in the open)</td>
</tr>
<tr>
<td>CA3814</td>
<td>Sod, harvested, 1982 (acres in the open)</td>
</tr>
</tbody>
</table>
APPENDIX 1

Sample Coverage Documentation

Documentation-file contents for coverage HERBICIDE1

METADATA FOR HERBICIDE1

/* Identification Information */
Data_Set_Identity: HERBICIDE1 -- Herbicide use estimates for counties in the United States
Identification_Code: N/A
Theme_Keyword: Herbicide Use--part 1
Thematic_Accuracy: See Attribute Descriptions
Thematic_Accuracy_Explanation: See Attribute Descriptions
Logical_Consistency: Polygon topology present
Completeness: See Data_Set_Description
Data_Set_Citation:
   system format on agricultural chemical use, land use, and cropping practices
   in the United States: U.S. Geological Survey Water-Resources
   Investigations Report 94-4176.

Native_Data_Set_Environment: UNIX
Use_Restrictions: See Data_Set_Description
Access_Restrictions: Available to public upon request.
Security_Classification: UNCLASSIFIED

/* Spatial Reference */
Native_Data_Set_Structure: ARC/INFO COVER
Horizontal_Coordinate_System: Planar
Map_Projection_Name: ALBERS
Map_Projection_Coordinate Units: METERS
Horizontal_Datum_Name: NAD27
Ellipsoid_Name: CLARKE1866
Vertical_Datum_Name: NGVD29
Longitude_of_Central_Meridian: -96 0 0.000
Latitude_of_Projection_Origin: 23 0 0.000
Latitude_of_First_Standard_Parallel: 29 30 0.000
Latitude_of_Second_Standard_Parallel: 45 30 0.000
False_Easting: 0.00000
False_Northing: 0.00000
X-Shift: 0.0000000000
Y-Shift: 0.0000000000
Point/Vector_Object_Information:
   Number of points: 4787
   Number of lines: 11926
   Number of line segments: 270213
   Number of polygons: 4788
Point_Object_Information:
   Number of control points: 197
Horizontal_Positional_Accuracy: N/A
Horizontal_Positional_Accuracy_Explanation: N/A
Vertical_Positional_Accuracy: N/A
Vertical_Positional_Accuracy_Explanation: N/A
West_Bounding_Coordinate: -118.8170
East_Bounding_Coordinate: -65.2570
North_Bounding_Coordinate: 48.2619
South_Bounding_Coordinate: 22.6777
Data_Set_G-Polygon_Outer_G-Ring: N/A
Data_Set_G-Polygon_Exclusion_G-Ring: N/A
Geographic_Keyword_Name: Conterminous United States
Geographic_Keyword_Type: Location

/* Status Information */
Data_Set_Status:
  Available to public upon request.
Release_Date: N/A
Maintenance_and_Update_Frequency: N/A

/* Metadata Reference Section */
Metadata_Date: 941215.142217
Metadata_Review_Date: N/A
Metadata_Future_Review_Date: N/A
Metadata_Contact: wbattagl

/* Source Information */
Source_Identity:
  system format on agricultural chemical use, land use, and cropping practices in the
/* Processing History Information */
/* Per Process Step */
Process_Description: RESELECT COUNTY2M COUNTY.NEW POLY
Process_Date: 11/12/1991 (MDY)
Process_Time: 15:28
Process_Description: LABELERRORS COUNTY.NEW
Process_Date: 11/12/1991 (MDY)
Process_Time: 15:29
Process_Description: LABELERRORS COUNTY.NEW
Process_Date: 11/12/1991 (MDY)
Process_Time: 15:56
Process_Description: EXTERNALALL
Process_Date: 11/12/1991 (MDY)
Process_Time: 17:21
Process_Description: RENAME COUNTY.NEW COUNTY2M
Process_Date: 11/13/1991 (MDY)
Process_Time: 12:49
Process_Description: CREATELABELS COUNTY2M 5000
Process_Date: 11/15/1991 (MDY)
Process_Time: 16:56
Process_Description: EXTERNALALL
Process_Date: 12/04/1991 (MDY)
Process_Time: 14:10
Process_Description: COPY COUNTY2M /ARC3/WORK/LIB/COUNTY2M
Process_Date: 01/02/1992 (MDY)
Process_Time: 8:33
Process_Description: COPY /ARC3/WORK/LIB/COUNTY2M COUNTY.AG
Process_Date: 01/02/1992 (MDY)
Process_Time: 15:27
Process_Description: RENAME COUNTY.AG CNTY.AG
Process_Date: 01/02/1992 (MDY)
Process_Time: 15:27
Process_Description: COPY /ARC3/WORK/CNTY.AG COUNTY2M
Process_Date: 01/07/1992 (MDY)
Process_Time: 14:23
Process_Description: EXPORT COVER COUNTY2M COUNTY2M
Process_Date: 01/17/1992 (MDY)
Process_Time: 13:50
Process_Description: COPY /ARC3/WORK/LIB/COUNTY2M COUNTY2M
Process_Date: 01/21/1992 (MDY)
Process_Time: 15:49
Process_Description: BUILD COUNTY2M POLY
Process_Date: 01/21/1992 (MDY)
Process_Time: 16:15
Process_Description: ARCEDIT /ARC3/WORK/COUNTY2M
Process_Date: 01/22/1992 (MDY)
Process_Time: 9:48
Process_Description: BUILD COUNTY2M POLY
Process_Date: 01/22/1992 (MDY)
Process_Time: 9:56
Process_Description: IDEDIT COUNTY2M POLY
Process_Date: 01/22/1992 (MDY)
Process_Time: 11:01
Process_Description: COPY COUNTY2M /ARC3/WORK/LIB/COUNTY2M
Process_Date: 01/22/1992 (MDY)
Process_Time: 11:02
Process_Description: IDEDIT COUNTY2M POLY
Process_Date: 03/30/1992 (MDY)
Process_Time: 15:37
Process_Description: EXPORT COVER COUNTY2M COUNTY2M
Process_Date: 06/08/1992 (MDY)
Process_Time: 11:03
Process_Description: ARCEDIT /ARC3/WORK/LIB/COUNTY2M
Process_Date: 08/03/1992 (MDY)
Process_Time: 17:48
Process_Description: BUILD COUNTY2M POLY
Process_Date: 08/03/1992 (MDY)
Process_Time: 17:58
Process_Description: CLEAN COUNTY2M # 2 2 POLY
Process_Date: 08/03/1992 (MDY)
Process_Time: 18:46
Process_Description: COPY COUNTY2M /WB2/DB/USA/COUNTY2M
Process_Date: 08/04/1992 (MDY)
Process_Time: 9:19
Process_Description: COPY /WB2/DB/USA/COUNTY2M HERBICIDE1
Process_Date: 12/28/1992 (MDY)
Process_Time: 15:41
Process_Description: DOCUMENT HERBICIDE1 UPDATE WBATTAGL
Process_Date: 03/30/1993 (MDY)
Process_Time: 16:50
Process_Description: DOCUMENT HERBICIDE1 UPDATE WBATTAGL
Process_Date: 03/31/1993 (MDY)
Process_Time: 11:54
Process_Description: DOCUMENT HERBICIDE1 UPDATE WBATTAGL
Process_Date: 03/31/1993 (MDY)
Process_Time: 13:17
Process_Description: DOCUMENT HERBICIDE1 UPDATE WBATTAGL
Process_Date: 04/03/1993 (MDY)
Process_Time: 11:49
Process_Description: EXPORT COVER HERBICIDE1 HERBICIDE1
Process_Date: 04/13/1993 (MDY)
Process_Time: 16:34
Process_Description: COPY HERBICIDE1 /AG/WORK/HERBICIDE1
Process_Date: 07/18/1994 (MDY)
Process_Time: 12:06
Process_Description: DOCUMENT HERBICIDE1 UPDATE WBATTAGL
Process_Date: 07/26/1994 (MDY)
Process_Time: 14:22
Process_Description: PROJECTDEFINE COVER HERBICIDE1
Process_Date: 07/26/1994 (MDY)
Process_Time: 14:27
Process_Description: DOCUMENT HERBICIDE1 UPDATE WBATTAGL
Process_Date: 07/26/1994 (MDY)
Process_Time: 16:37
Process_Description: DOCUMENT HERBICIDE1 UPDATE WBATTAGL
Process_Date: 07/27/1994 (MDY)
Process_Time: 10:23
Process_Description: COPY /AG/WORK/HERBICIDE1 HERBICIDE1
Process_Date: 08/18/1994 (MDY)
Process_Time: 9:02
Process_Description: EXPORT COVER HERBICIDE1 HERBICIDE1
Process_Date: 08/18/1994 (MDY)
Process_Time: 9:07
Process_Description: COPY /ARC3/EPA1/RFF/HERBICIDE1 HERBICIDE1
Process_Date: 12/15/1994 (MDY)
Process_Time: 9:06
Process_Description: DOCUMENT HERBICIDE1 UPDATE WBATTAGL
Process_Date: 12/15/1994 (MDY)
Process_Time: 11:41
Process_Description: DOCUMENT HERBICIDE1 UPDATE WBATTAGL
Process_Date: 12/15/1994 (MDY)
Process_Time: 14:22

/* Distribution Information */
Distribution_Contact: William A. Battaglin, U.S. Geological Survey
Distribution_Liability: N/A
Transfer_Options: N/A
Transfer_Instructions: N/A
Fees: N/A
Turnaround: N/A

/* Contact Information */
Contact_Organization: U.S. Geological Survey
Contact_Person: William A. Battaglin
Contact_Position: N/A
Contact_Mailing_Address: N/A
Contact_Physical_Location: N/A
Contact_Voice_Telephone: N/A
Contact_Facsimile_Telephone: N/A
Contact_Electronic_Mail_Address: N/A
Contact_Instructions: EMAIL: wbattagl@wrdmail.er.usgs.gov

/* Entity/Attribute Information */
Data_Base_Identity: HERBICIDE1
Partition_Identity: N/A

Entity_Type_Label: HERBICIDE1.PAT

———
Entity_Type_Definition: Polygon attribute table
Entity_Type_Definition_Source: ARC/INFO file
Number_of_Attributes_in_Entity: 72

Attribute_Label: AREA
Attribute_Definition: Area of polygon in square coverage units (meters)
Attribute_Definition_Source: Computed
EA_Domain_Values: Positive real numbers
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: PERIMETER
Attribute_Definition: Perimeter of polygon in coverage units (meters)
Attribute_Definition_Source: Computed
EA_Domain_Values: Positive real numbers
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: HERBICIDE1#
Attribute_Definition: Internal feature number
Attribute_Definition_Source: Computed
EA_Domain_Values: Sequential unique positive integer
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: HERBICIDE1-ID
Attribute_Definition: User-assigned feature number
Attribute_Definition_Source: User-defined
EA_Domain_Values: Integer
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: FIPS
Attribute_Definition: 5-digit County FIPS code
Attribute_Definition_Source: Federal Information Processing Standard
EA_Domain_Values: 01001 - 56998, none = 0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: ST
Attribute_Definition: two-character state abbreviation
Attribute_Definition_Source: U.S. Postal Service
EA_Domain_Values: AL - WY, none = blank
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: CNTYNAME
Attribute_Definition: County name
Attribute_Definition_Source: U.S. Geological Survey files
EA_Domain_Values: upper-case alphanumeric, none = blank
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: PLYTYPE
Attribute_Definition: polygon type: 0=county land, others are lakes, estuaries, etc.
Attribute_Definition_Source: see narrative
EA_Domain_Values: 0-4,9
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: WORKB
Attribute_Definition: variable used for data processing
Attribute_Definition_Source: n/a
EA_Domain_Values: any integer
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: AREA.ACRES
Attribute_Definition: total county land area (all polygons) in acres
Attribute_Definition_Source: calculated from area of polygons with like FIPS code and PLYTYPE=0
EA_Domain_Values: numeric values greater than 0, missing = -99.000
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1980.ACR
Attribute_Definition: Acres treated with atrazine
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
Attribute_Label: H1980.LBS
Attribute_Definition: pounds of atrazine used
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1980.USE
Attribute_Definition: rate of atrazine use in county polygon in pounds per square mile
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.000
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1863.ACR
Attribute_Definition: acres treated with alachlor
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
Attribute Label: H1863.LBS
Attribute Definition: pounds of alachlor used
Attribute Definition Source: Gianessi and Puffer, 1991
EA Domain Values: numeric values greater than 0, missing = -99.0
EA Units of Measure: N/A
EA Measurement Precision: N/A
EA Beginning Date: N/A
EA Ending Date: N/A
EA Accuracy: N/A
EA Accuracy Explanation: N/A
EA Measurement Frequency: N/A

Attribute Label: H1863.USE
Attribute Definition: rate of alachlor use in county polygon in pounds per square mile
Attribute Definition Source: Gianessi and Puffer, 1991
EA Domain Values: numeric values greater than 0, missing = -99.000
EA Units of Measure: N/A
EA Measurement Precision: N/A
EA Beginning Date: N/A
EA Ending Date: N/A
EA Accuracy: N/A
EA Accuracy Explanation: N/A
EA Measurement Frequency: N/A

Attribute Label: H1011.ACR
Attribute Definition: acres treated with metolachlor
Attribute Definition Source: Gianessi and Puffer, 1991
EA Domain Values: numeric values greater than 0, missing = -99.0
EA Units of Measure: N/A
EA Measurement Precision: N/A
EA Beginning Date: N/A
EA Ending Date: N/A
EA Accuracy: N/A
EA Accuracy Explanation: N/A
EA Measurement Frequency: N/A

Attribute Label: H1011.LBS
Attribute_Definition: pounds of metolachlor used
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1011.USE
Attribute_Definition: rate of metolachlor use in county polygon in pounds per square mile
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.000
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1414.ACR
Attribute_Definition: acres treated with EPTC
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1414.LBS
Attribute_Definition: pounds of EPTC used
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
Attribute Label: H1414.USE
Attribute Definition: rate of EPTC use in county polygon in pounds per square mile
Attribute Definition Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.000
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute Label: H1302.ACR
Attribute Definition: acres treated with 2,4-D
Attribute Definition Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = 99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute Label: H1302.LBS
Attribute Definition: pounds of 2,4-D used
Attribute Definition Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A
<table>
<thead>
<tr>
<th>Attribute Label</th>
<th>Definition</th>
<th>Definition Source</th>
<th>Domain Values</th>
<th>Units of Measure</th>
<th>Measurement Precision</th>
<th>Beginning Date</th>
<th>Ending Date</th>
<th>Accuracy</th>
<th>Accuracy Explanation</th>
<th>Measurement Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1302.USE</td>
<td>rate of 2,4-D use in county polygon in pounds per square mile</td>
<td>Gianessi and Puffer, 1991</td>
<td>numeric values greater than 0, missing = -99.000</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>H1361.ACR</td>
<td>acres treated with trifluralin</td>
<td>Gianessi and Puffer, 1991</td>
<td>numeric values greater than 0, missing = -99.0</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>H1361.LBS</td>
<td>pounds of trifluralin used</td>
<td>Gianessi and Puffer, 1991</td>
<td>numeric values greater than 0, missing = -99.0</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Attribute_Definition: rate of trifluralin use in county polygon in pounds per square mile
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.000
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1369.ACR
Attribute_Definition: acres treated with cyanazine
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1369.LBS
Attribute_Definition: pounds of cyanazine used
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1369.USE
Attribute_Definition: rate of cyanazine use in county polygon in pounds per square mile
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.000
EA_Units_of_Measure: N/A
Attribute Label: H1839.ACR
Attribute Definition: acres treated with butylate
Attribute Definition Source: Gianessi and Puffer, 1991
EA Domain Values: numeric values greater than 0, missing = -99.0
EA Units of Measure: N/A
EA Measurement Precision: N/A
EA Beginning Date: N/A
EA Ending Date: N/A
EA Accuracy: N/A
EA Accuracy Explanation: N/A
EA Measurement Frequency: N/A

Attribute Label: H1839.LBS
Attribute Definition: pounds of butylate used
Attribute Definition Source: Gianessi and Puffer, 1991
EA Domain Values: numeric values greater than 0, missing = -99.0
EA Units of Measure: N/A
EA Measurement Precision: N/A
EA Beginning Date: N/A
EA Ending Date: N/A
EA Accuracy: N/A
EA Accuracy Explanation: N/A
EA Measurement Frequency: N/A

Attribute Label: H1839.USE
Attribute Definition: rate of butylate use in county polygon in pounds per square mile
Attribute Definition Source: Gianessi and Puffer, 1991
EA Domain Values: numeric values greater than 0, missing = -99.000
EA Units of Measure: N/A
EA Measurement Precision: N/A
EA Beginning Date: N/A
EA Ending Date: N/A
EA Accuracy: N/A
EA Accuracy Explanation: N/A
EA Measurement Frequency: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1629.ACR
Attribute_Definition: acres treated with pendimethalin
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1629.LBS
Attribute_Definition: pounds of pendimethalin used
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1629.USE
Attribute_Definition: rate of pendimethalin use in county polygon in pounds per square mile
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.000
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1099.ACR
Attribute Definition: acres treated with glyphosate
Attribute Definition Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute Label: H1099.LBS
Attribute Definition: pounds of glyphosate used
Attribute Definition Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute Label: H1099.USE
Attribute Definition: rate of glyphosate use in county polygon in pounds per square mile
Attribute Definition Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.000
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute Label: H1298.ACR
Attribute Definition: acres treated with dicamba
Attribute Definition Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
Attribute_Label: H1298.LBS
Attribute_Definition: pounds of dicamba used
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1298.USE
Attribute_Definition: rate of dicamba use in county polygon in pounds per square mile
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.000
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1287.ACR
Attribute_Definition: acres treated with bentazon
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1287.LBS
Attribute_Definition: pounds of bentazon used
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain.Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1287.USE
Attribute_Definition: rate of bentazon use in county polygon in pounds per square mile
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain.Values: numeric values greater than 0, missing = -99.000
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1282.ACR
Attribute_Definition: acres treated with propanil
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain.Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1282.LBS
Attribute_Definition: pounds of propanil used
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1282.USE
Attribute_Definition: rate of propanil use in county polygon in pounds per square mile
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.000
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1124.ACR
Attribute_Definition: acres treated with MSMA
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1124.LBS
Attribute_Definition: pounds of MSMA used
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
Attribute_Label: H1124.USE
Attribute_Definition: rate of MSMA use in county polygon in pounds per square mile
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.000
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1975.ACR
Attribute_Definition: acres treated with metribuzin
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1975.LBS
Attribute_Definition: pounds of metribuzin used
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A
Attribute Label: H1975.USE
Attribute Definition: rate of metribuzin use in county polygon in pounds per square mile
Attribute Definition Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute Label: H1417.ACR
Attribute Definition: acres treated with molinate
Attribute Definition Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute Label: H1417.LBS
Attribute Definition: pounds of molinate used
Attribute Definition Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute Label: H1417.USE
Attribute_Definition: rate of molinate use in county polygon in pounds per square mile
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.000
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1305.ACR
Attribute_Definition: acres treated with MCPA
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1305.LBS
Attribute_Definition: pounds of MCPA used
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1305.USE
Attribute_Definition: rate of MCPA use in county polygon in pounds per square mile
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.000
EA_Units_of_Measure: N/A
Attribute.Label: H1979.ACR
Attribute.Definition: acres treated with propazine
Attribute.Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute.Label: H1979.LBS
Attribute_Definition: pounds of propazine used
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute.Label: H1979.USE
Attribute_Definition: rate of propazine use in county polygons in pounds per square mile
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.000
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A
Attribute_Label: H1191.ACR
Attribute_Definition: acres treated with propachlor
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1191.LBS
Attribute_Definition: pounds of propachlor use
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1191.USE
Attribute_Definition: rate of propachlor use in county polygons pounds per square mile
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.000
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1981.ACR
Attribute_Definition: acres treated with simazine
Attribute_Definition_Source: Gianessi and Puffer, 1991
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1981.LBS
Attribute_Definition: pounds of simazine used
Attribute_Definition_Source: Gianessi and Puffer, 1990
EA_Domain_Values: numeric values greater than 0, missing = -99.0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: H1981.USE
Attribute_Definition: rate of simazine use in county polygon (pounds per square mile)
Attribute_Definition_Source: Gianessi and Puffer, 1990
EA_Domain_Values: numeric values greater than 0, missing = -99.000
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: FIPSST
Attribute_Definition: two-digit state FIPS code
Attribute_Definition_Source: Federal Information Processing Standard
EA_Domain_Values: 01 - 56, none = 0
EA_Units_of_Measure: N/A
Attribute_Label: FIPSCNTY
Attribute_Definition: three-digit county FIPS code
Attribute_Definition_Source: Federal Information Processing Standard
EA_Domain_Values: 001 - 998, none = 0
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Entity_Type_label: HERBICIDE1.AAT

Entity_Type_Definition: Line attribute table
Entity_Type_Definition_Source: ARC/INFO file
Number_of_Attributes_in_Entity: 8

Attribute_Label: FNODE#
Attribute_Definition: Internal number of from-node
Attribute_Definition_Source: Computed
EA_Domain_Values: Sequential unique positive integer
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: TNODE#
Attribute_Definition: Internal number of to-node
Attribute_Definition_Source: Computed
EA_Domain_Values: Sequential unique positive integer
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: LPOLY#
Attribute_Definition: Internal number of polygon to left of arc
Attribute_Definition_Source: Computed
EA_Domain_Values: Sequential unique positive integer
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: RPOLY#
Attribute_Definition: Internal number of polygon to right of arc
Attribute_Definition_Source: Computed
EA_Domain_Values: Sequential unique positive integer
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
EA_Accuracy: N/A
EA_Accuracy_Explanation: N/A
EA_Measurement_Frequency: N/A

Attribute_Label: LENGTH
Attribute_Definition: Length of arc in coverage units
Attribute_Definition_Source: Computed
EA_Domain_Values: Positive real numbers
EA_Units_of_Measure: N/A
EA_Measurement_Precision: N/A
EA_Beginning_Date: N/A
EA_Ending_Date: N/A
Attribute_Label: HERBICIDE1#  
Attribute_Definition: Internal feature number  
Attribute_Definition_Source: Computed  
EA_Domain_Values: Sequential unique positive integer  
EA_Units_of_Measure: N/A  
EA_Measurement_Precision: N/A  
EA_Beginning_Date: N/A  
EA_Ending_Date: N/A  
EA_Accuracy: N/A  
EA_Accuracy_Explanation: N/A  
EA_Measurement_Frequency: N/A

Attribute_Label: HERBICIDE1-ID  
Attribute_Definition: User-assigned feature number  
Attribute_Definition_Source: User-defined  
EA_Domain_Values: Integer  
EA_Units_of_Measure: N/A  
EA_Measurement_Precision: N/A  
EA_Beginning_Date: N/A  
EA_Ending_Date: N/A  
EA_Accuracy: N/A  
EA_Accuracy_Explanation: N/A  
EA_Measurement_Frequency: N/A

Attribute_Label: BNDTYPE  
Attribute_Definition: boundary type  
Attribute_Definition_Source: see narrative  
EA_Domain_Values: 0-8  
EA_Units_of_Measure: N/A  
EA_Measurement_Precision: N/A  
EA_Beginning_Date: N/A  
EA_Ending_Date: N/A  
EA_Accuracy: N/A  
EA_Accuracy_Explanation: N/A  
EA_Measurement_Frequency: N/A
Data_Set_Description:

1. Abstract

This coverage contains estimates of herbicide use for the 20 most-used herbicides in the conterminous United States as reported in Gianessi and Puffer (1991). Herbicide-use estimates in this coverage are reported for each county polygon as acres treated, pounds of active ingredient used, and pounds used per square mile.

The herbicide-use estimates provided by Gianessi and Puffer (1991) list acres treated and pounds of active ingredient applied for a given crop in each county for which use has been estimated. Cropping data are from the 1987 Census of Agriculture, and are subject to occasional suppressions of acreage estimates at the county level due to problems of confidentiality and census disclosure rules. The herbicide-use estimates included in this coverage are totals of use on all crops treated in a given county.

The polygons representing county boundaries in the conterminous United States, as well as lakes, estuaries, and other nonland-area features were derived from the Digital Line Graph (DLG) files representing the 1:2,000,000-scale map in the National Atlas of the United States (1970).

1.1 Keywords:

Herbicides
Herbicide use
Counties
United States

1.2 Descriptors:

Herbicides
Counties
Boundaries
United States

2. Applications of these data

2.1 Intended use of data
The herbicide-use estimates in this coverage are intended for use as a means for estimating regional herbicide use, and for producing maps showing relative rates of herbicide use across broad regions of the United States.

2.2 Limitations of data

HERBICIDE-USE DATA

Estimates of herbicide use by county were generated by Gianessi and Puffer (1991) by using the following procedure:

1. collect statistics by State, by crop, on percentage of acres treated with a given herbicide, and average annual application rate of the herbicide from surveys sent to Extension Service weed scientists in 1987 and 1989;

2. augment survey data with published information from some States;

3. establish herbicide-use profiles, by State, by crop, containing the percentage of acres treated, and average annual application rates;

4. apply data in herbicide-use profiles to county-level crop-acreage estimates from the 1987 Census of Agriculture (U.S. Department of Commerce, 1989a); and

5. tabulate pounds of active ingredient of herbicides used by crop, by county.

Eighty-four crops were profiled, resulting in usage estimates for 96 herbicide active ingredients. This coverage contains estimates of use for the 20 most-used herbicides in the conterminous United States.

Although crop-acreage data represent the 1987 growing year, the herbicide-use estimates generally reflect 1989 usage amounts (Gianessi and Puffer, 1991).

Estimates of herbicide use by county were generated from a combination of data collected from surveys of weed scientists and from surveys of farmers. Herbicide-use profile data were generated from ancillary data.
sources or were calculated from profiles in neighboring states when no responses to surveys or published reports were available (Gianessi and Puffer, 1991). Sampling and statistics were used to account for nonresponding farm operations. Thus, the information describing crop acreages is subject to sampling variability as well as reporting and coverage errors (U.S. Department of Commerce, 1989b). Census disclosure rules also prevent the publication of information that would disclose the operation of individual farms.

Before herbicide-use estimates entered into this coverage, the total use of individual herbicides on all crops for each county was calculated.

COUNTY BOUNDARIES

The original files for this map were provided in 15 sections. Boundaries near the edges of sections have been adjusted in edgematching.

Polygons that extend into the water (an ocean or the Great Lakes) should be considered arbitrary.

3. Attribute discussion

HERBICIDE-USE ATTRIBUTES

Herbicide-use attributes are from tabular data files provided by Gianessi and Puffer (1991). Three attributes are added to an ARC/INFO coverage for each of the 96 herbicides. Attributes with names ending in .ACR are estimates of the number of acres treated with a given herbicide. Attributes with names ending in .LBS are estimates of the number of pounds of active ingredient applied of a given herbicide. Attributes ending in .USE are estimates of a county-level herbicide-use rate in pounds per square mile.

Attribute names are keyed to four-digit herbicide code numbers provided in the table below. A ranking of national herbicide-use amounts (Gianessi and Puffer, 1991) was used to divide herbicide-use data into five coverages (herbicide1, herbicide2, herbicide3, herbicide4, and herbicide5).
Table 1. Herbicide codes for herbicide coverage

<table>
<thead>
<tr>
<th>Code</th>
<th>Herbicide</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>Atrazine</td>
</tr>
<tr>
<td>1863</td>
<td>Alachlor</td>
</tr>
<tr>
<td>1011</td>
<td>Metolachlor</td>
</tr>
<tr>
<td>1414</td>
<td>EPTC</td>
</tr>
<tr>
<td>1302</td>
<td>2,4-D</td>
</tr>
<tr>
<td>1361</td>
<td>Trifluralin</td>
</tr>
<tr>
<td>1369</td>
<td>Cyanazine</td>
</tr>
<tr>
<td>1839</td>
<td>Butylate</td>
</tr>
<tr>
<td>1629</td>
<td>Pendimethalin</td>
</tr>
<tr>
<td>1099</td>
<td>Glyphosate</td>
</tr>
<tr>
<td>1298</td>
<td>Dicamba</td>
</tr>
<tr>
<td>1287</td>
<td>Bentazon</td>
</tr>
<tr>
<td>1282</td>
<td>Propanil</td>
</tr>
<tr>
<td>1124</td>
<td>MSMA</td>
</tr>
<tr>
<td>1975</td>
<td>Metribuzin</td>
</tr>
<tr>
<td>1417</td>
<td>Molinate</td>
</tr>
<tr>
<td>1305</td>
<td>MCPA</td>
</tr>
<tr>
<td>1979</td>
<td>Propazine</td>
</tr>
<tr>
<td>1191</td>
<td>Propachlor</td>
</tr>
<tr>
<td>1981</td>
<td>Simazine</td>
</tr>
</tbody>
</table>

Herbicide-use estimates in counties represented by one polygon are equal to county totals. For counties described by more than one polygon, attribute values are provided for each polygon and are calculated as the county total multiplied by the ratio of the area of each county polygon divided by total area of the county.

A missing-value code of -99.0 is used when no herbicide-attribute data are given for a county and for all nonland-area polygons. The missing-value code can indicate any of the following conditions:

-- herbicide use not present in county (for example, no atrazine used
in county)
-- crop data withheld because of census disclosure rules
-- crop data not available to the census
-- crop data not published because county contains fewer than 10 farms.

COUNTY POLYGON ATTRIBUTES

Each county is identified by a five-digit Federal Information Processing Standard (FIPS) code. The first two digits represent the State and the three remaining represent the county within the State. County names (in upper case) and the two-character State abbreviation also are included.

All polygons are coded by polygon type (PLYTYPE) as follows:
0 = U.S. land.
1 = Extensions of counties into the ocean and estuaries. Some boundaries may be arbitrary.
2 = U.S. Great Lakes. Some boundaries between counties may be arbitrary.
3 = Canadian Great Lakes.
4 = Canadian islands in Great Lakes, included for visual cartographic purposes.
9 = External polygon.

All arcs are coded by boundary type (BNDTYPE) as follows:
0 = Coastline of United States.
1 = State-State border located on land.
2 = County-county border, within State, located on land.
3 = State-State border located on the ocean, an estuary, or a Great Lake. Some of these borders are arbitrary.
4 = County-county border, with State, but located on an ocean, an estuary, or a Great Lake. Some of these borders are arbitrary.
5 = International border located on land.
6 = International border located on water.
7 = Canadian shoreline of the Great Lakes.
8 = Arbitrary separation line between the Canadian portions of the Great Lakes.
9 = Closure line with the external polygon. This is arbitrary.

All BNDTYPE values are determined from the adjoining polygons by the
routine INDEX_COUNTY.AML. The coverage is indexed (ARC: INDEXITEM) on FIPS code, State FIPS code, State abbreviation, county name, polygon type, and boundary type.

4. Procedures used to create or automate data

HERBICIDE-USE DATA

An automated procedure was developed to process the raw herbicide-use data into ARC/INFO coverage attributes. The procedure is summarized below:

(1) copy county2m coverage to coverage called herbicide%#%, and
(2) run the AML herbadd.aml for each herbicide to be added.

The herbadd.aml program runs a fortran program to total estimates of herbicide use on all crops by county, then processes these data, finally adding them as three columns of attribute data to the county coverage.

Other programs were developed to calculate summary statistics of the herbicide-attribute data and to produce maps that show attribute values across the United States.

COUNTY BOUNDARIES

This series of maps was published as part of the National Atlas of the United States (U.S. Geological Survey, 1970). The maps for the conterminous United States were digitized in 15 sheets and published in the Digital Line Graph (DLG) format as described by Domeratz and others (1983).

Each sheet was prepared by reading the DLG files of the political and water-bodies layers, converting them to ARC/INFO; extracting the county boundaries and the coastline, respectively; and joining the two layers. FIPS codes were assigned to all polygons by using available sources and were checked manually.

Boundaries with adjacent sheets of the 15-sheet set were edgematched manually; one of the sheets was chosen arbitrarily as the “correct” border. Edgematching operations were used to adjust the linework as far as was necessary so that the coverages would fit to a tolerance of 100 meters (328.1 feet). The coverage (referred to herein as Version 1.0) was stored as 49 separate coverages (48 States and the District of Columbia) because
the ARC/INFO software in use at the time could not process the entire coverage. Individual States could be joined by specifying a tolerance of 100 meters.

From time to time, adjustments were made to the State coverages to reflect changes in counties. The accuracy of these adjustments is believed to be comparable to that of the original linework.

For Version 2.0, all State coverages were rejoined and manually edited to produce a perfect edgematch between all States. For States on the original map-sheet boundaries, this adjustment averaged less than 20 meters and in no case was more than 100 meters. The whole coverage was CLEANed to a tolerance of 20 meters (65.6 feet), which resulted in few, if any, effects on small offshore islands. The coverage also was checked to ensure that it represented current counties or county equivalents.

The coverage in Version 1.0 ended at the coastline. No attempt was made to depict offshore areas. This created problems when the coverage was used to assign county codes to sampling stations located near the coast. To help in this matter, Version 2.0 includes offshore extensions of the county polygons. The (water) boundaries of many of these polygons are arbitrary.

The Canadian Great Lakes features are another new addition to Version 2.0. They were added to improve the utility of the coverage for visual displays. Although the Canadian Great Lakes are represented logically by a single polygon, practical considerations—the inability of some software to plot polygons with a large number of vertices—made it necessary to separate them into four polygons. The dividing lines are located in narrow channels to minimize interference with plotting patterns. Canadian islands within the Great Lakes also were included.

All tick marks were relocated to places that are easily visible on maps of the United States, to help in registering maps that otherwise may not have adequate registration information.

To expedite accessing parts of the coverage, certain items have been indexed with the procedure INDEX_COUNTY.AML. See Section 3 above. A spatial index also was created.

When this coverage is used to clip or intersect other coverages, a
tolerance as low as 2 meters (6.6 feet) can be used.

The processing used to derive this coverage moved boundaries from their positions on the original maps. In cases of conflicting lines, preference was given to forming the correct topology. Strictly speaking, this coverage is not identical to the source materials. These changes were unavoidable in producing a continuous coverage of the conterminous United States.

5. Revisions made to data (revision number, date, description)

COUNTY POLYGON DATA

Revision 1.0, 12/17/90. This revision represents many corrections and minor modifications made to this set of coverages from its construction in 1985 through the revision date.

Revision 2.0, 3/18/91. Major reworking of the coverage, combining all State coverages.

6. Reviews applied to data (review type, date, person, description)

The herbicide-use data-processing procedure and attribute data have been peer reviewed in 1993 by Leonard Orzol and Barbara Ruddy, U.S. Geological Survey hydrologists.

The herbicide-use estimates prepared by Gianessi and Puffer (1991) were compared with National estimates provided by the Office of Pesticide Programs of the U.S. Environmental Protection Agency, and were reviewed by more than 20 individuals from the companies that registered the chemicals.

The county boundaries in this coverage were not reviewed formally. They have, however, been used in numerous applications where serious errors would have been obvious. Some State coverages were corrected following such use. The offshore polygon extensions and the Canadian Great Lakes polygons have not been reviewed.

7. Related spatial and tabular data sets

This coverage is part of series of 1:2,000,000-scale base maps that cover the United States. Also available are:
COUNTY—County boundaries.
STATE—State boundaries (formed from COUNTY).
WATERBOD—Water Bodies.
STREAM—Streams.
HUC—Hydrologic cataloging units (basins).

8. References cited


9. Notes

DOCUMENTATION

The documentation for this coverage was generated by using the ARC macro language (AML) program document.aml available from the U.S. Geological Survey (Nebert, 1994).
APPENDIX 2

Data Specifications and Retrieval Documentation

Files

Currently available through the U.S. Geological Survey's Distributed Spatial Data Library (DSDL) or upon special request on 1/4-inch tape are 18 compressed ARC/INFO (GIS software produced and distributed by Environmental Systems Research Institute) coverage export files. The file names are listed below:

- ag_chem.e00.Z
- ag_crop1.e00.Z
- ag_crop2.e00.Z
- ag_expn.e00.Z
- ag_land.e00.Z
- ag_stock.e00.Z
- herbicide1.e00.Z
- herbicide2.e00.Z
- herbicide3.e00.Z
- herbicide4.e00.Z
- herbicide5.e00.Z
- nit85.e00.Z
- nit86.e00.Z
- nit87.e00.Z
- nit88.e00.Z
- nit89.e00.Z
- nit90.e00.Z
- nit91.e00.Z

Storage Requirements

The 18 files represent about 80 megabytes (MB) of raw binary data. The compressed ARC/INFO coverage export files range in size from 4.1 to 4.9 MB. Uncompressed, these files range in size from 8.5 to 10.9 MB. The 18 uncompressed ARC/INFO coverage export files will occupy about 170 MB of disk space. The 18 imported ARC/INFO coverages will occupy about 100 MB of disk space. In general, about 200 to 300 MB of disk space will be required to work with data sets of this magnitude.

Format and Retrieval

The geographic information system coverages are available through the DSDL. Information in the DSDL is accessible to the wide-area network and can be retrieved by using information-discovery programs such as the Wide Area Information Server (WAIS), gopher, or mosaic. If a tape of the data is used, the tape contains binary data written to a 1/4-inch tape by using the UNIX command:

```
tar cv ag
```

This command writes all the files in the directory "ag" to the tape.
To retrieve the data on the tape, go to the point in your directory structure in which you wish to copy the data and issue the command:

```
tar xvfo (device name if not default)
```

This command will write the data onto your disk. The files will be in a directory called "ag". Once copied from the tape, the compressed files can be uncompressed by using the command:

```
uncompress (file name)
```

for example,

```
uncompress herbicide1.e00.Z
```

This command will uncompress the file and erase the compressed file. The ARC/INFO coverage export file can then be copied to its desired location in a UNIX directory structure.

The ARC/INFO coverage export file is imported with the following command issued from the ARC prompt:

```
Arc: import cover <export file name> <coverage name>
```

for example,

```
import cover herbicide1 herbicide1
```

This command will make the ARC/INFO coverage from the export file, but does not erase the export file.

**Recommended Directory Structure**

All of the coverages can be stored under one directory, or separate directories can be made for the Census of Agriculture, herbicide-use, nitrogen-fertilizer sales, and other National extent and scale coverages. To prevent corruption or unwanted modification of the coverages provided, create a large work space for manipulation and processing involving the coverages. Copy coverages to the work space before executing any ARC, ARCEdit, ARCPLOT, or GRID commands that may affect coverage topology or attributes. Failure to make working copies of the coverages could result in the corruption of the original data or in the loss of the metadata describing coverage construction and attributes.
The graphic below is a schematic illustration of one possible directory structure.

```
AG

WORK  USA  HERB  NIT  CENSUS
```