

AFRICA DATA SAMPLER
USER'S GUIDE
CD-ROM Version

A Geo-Referenced Database
for all African Countries

World Resources Institute
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Monitoring Centre
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PADCO, Inc.

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Africa Data Sampler User's Guide

CD-ROM Version

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We invite your comments and suggestions on how to improve the Africa Data Sampler. We especially encourage you to contact WRI or the primary data providers directly (see respective contacts in Section II and III of this Guide) if you want to provide feedback on data errors, send corrections, or suggest additional data sets that could help to improve and update the database.

I. INTRODUCTION

The Africa Data Sampler (ADS) is a set of internationally comparable digital maps at a scale of 1:1,000,000 available for every African country. These data sets can be used to visualize and assess environment and development conditions in individual countries or a region—for example, a river basin or an agro-ecological zone.

The ADS contains data on drainage, topography, infrastructure, parks and protected areas, forests, wetlands, and subnational administrative boundaries with corresponding population estimates, though not all data sets are available for all countries. The data are introduced through a series of Guided Tours and Views. The data sets are stored in geographic-referenced map features with descriptive tabular data. The Guided Tours were developed using a Windows-based map-viewing and query software; they are accompanied by descriptive text in this User's Guide. This CD-ROM User's Guide introduces data sets and Views for three countries—Tunisia, Uganda, and Guinea—though Views have been developed for each country. The digital format allows users equipped with readily available hardware and software to view, query, print, and distribute maps.

Data Samplers are available for all African countries. Because all country data were developed using the same base maps, maps from different countries can be easily combined to create regional, watershed, and other transborder maps (albeit with varying data quality within and among countries). In addition to this CD-ROM, Data Samplers can be obtained for individual African countries separately on diskette from the World Resources Institute.

With the release of this prototype ADS, the World Resources Institute and its collaborators are hoping to increase the availability of international digital maps and data, bring spatial information into policy planning and decision-making, provide a tool for training and education, and raise the quality of presentation and communication of environmental information. The distribution and use of the ADS should ultimately prompt many organizations to invest in the construction of more up-to-date and accurate geo-referenced databases, especially at the national and local levels.

USERS AND USES OF THE AFRICA DATA SAMPLER

The data and structure of the ADS can support three broad levels of expertise and use:

- 1) The Guided Tours and Views in the ADS will help users unfamiliar with Geographic Information Systems (GIS) read and analyze maps. The Tours

provide these users with an overview of the data, introduce them to major tools and applications of the map-viewing and query software (ArcView), and allow them to prepare simple maps of national parks and forest areas, roads and cities, population densities, and other features, for use in reports and presentations.

- 2) Policy analysts can integrate the ADS' internationally comparable data sets (assuming the data quality is judged as adequate) into their own digital maps. Those familiar with spreadsheet programs and ArcView can add and modify tabular attribute data. For example, the data can be used to assess growing stress on critical habitat or cropland. Policy analysts can also use these data to assess national conditions and compare them to conditions in neighboring countries and regions. The ADS can be used in training students to prepare and analyze their own maps.
- 3) Because the ADS is distributed in the ARC/INFO software format in decimal degrees, geographic information from the ADS can be used in GIS applications. GIS experts can use either all or parts of these data with ARC/INFO software or import the data to other widely available GIS and mapping programs (e.g., Atlas*GIS, MapInfo, Idrisi). These programs can then be used to edit the data, produce quality cartographic output, or add geographic information. For example, locations of projects and project information can be added to the ADS. This information can then be used to help program planners locate projects in areas of need and assist in project management.

WHAT THE AFRICA DATA SAMPLER IS NOT

The Africa Data Sampler is *not* an official national base map for any country. Nor are the digital data sets comprehensive. Rather, they are a sample of international digital information, made available at a country level. Because of the limitations in scale, compatibility, and data quality inherent in the ADS, it *should not* be used in its present form as an analytical tool for decision-making in such areas as infrastructure management, environmental impact assessments, forestry concessions, or agricultural extension. Such decisions have to be based on more detailed GIS analysis. Doing so will require investments in the construction of up-to-date geo-referenced databases with careful consideration for database architecture (i.e., database formats, hierarchy, nomenclature, metadata, etc.), quality control, and standards (i.e., digitizing density, precision, etc.). Ultimately, specific applications to support planning and decision-making have to be developed to take full advantage of GIS capabilities. (See Section VII of this Guide for more on the benefits and limitations of the ADS.)

ORGANIZATION OF THE USER'S GUIDE

Section II outlines the contents, the system requirements, and installation routine of the Africa Data Sampler from the CD-ROM. Section III provides general information on data sources, data processing, and data quality issues. The Guided Tours of the Africa Data Sampler can be found in Section IV. Here, the various data sets are introduced in three Views set up in ArcView, so you can examine and compare the data. The next section shows you how to produce hard-copy output with ArcView and addresses issues of map layout and the export of maps to other Windows applications. Section VI is intended for analysts who wish to add and manipulate the tabular data of the geographic data sets in a Windows environment. The benefits and limitations, both software and data-related, and potential extensions of the Africa Data Sampler are discussed in Section VII.

This User's Guide includes six appendices. Appendix A provides a list of abbreviations. The data catalog and data dictionary can be found in Appendices B and C, respectively. GIS and PC ARC/INFO terms are listed in Appendix D. Appendix E gives an overview of the production of the Africa Data Sampler and highlights some data problems encountered during processing. Country-specific data sources and processing issues are summarized in Appendix F.

II. CONTENTS, REQUIREMENTS FOR USE, AND INSTALLATION OF THE AFRICA DATA SAMPLER

CONTENTS OF THE AFRICA DATA SAMPLER

The Africa Data Sampler consists of a set of national geographic data sets and accompanying data Views for every African country. The data sets are provided in PC ARC/INFO coverage format, which was chosen because of its widespread use. A PC ARC/INFO *coverage* is a MS-DOS subdirectory that contains several files defining both spatial and tabular attribute data. The spatial data of these coverages cannot be manipulated outside of ARC/INFO or ArcCAD. However, the tabular data are stored in dBase format (.DBF) files, which can be accessed and edited independent of the spatial data. The Guided Tours consist of thematic Views that are displayed using ArcView for Windows. The Views act as an interactive digital map with various data layers that may be visually turned "on" or "off." Views can either be printed directly from ArcView or exported to other software packages to enhance their cartographic layout. Each View was developed around a common subject matter.

In this package you will find:

This User's Guide and one CD-ROM which contains:

- Data sets and Views for 53 countries (in Robinson Projection),
- PC ARC/INFO Export Files for all countries (in Geographic Format),
- A data set that provides political and ocean boundaries for all of Africa, and
- A utility that will allow you to do one or more of the following: (1) copy the data sets used in the Guided Tours of this User's Guide onto the hard drive of your PC, (2) copy the data set and Views for a particular country to the hard drive of your PC, (3) configure your PC to run the Guided Tours and views for other countries directly from the CD-ROM drive, and (4) uncompress the PC ARC/INFO Export files for a selected country to the hard drive of your PC.

HARDWARE AND SOFTWARE REQUIREMENTS

The recommended hardware and software configuration is:

- 11.8 megabytes (MB) of memory on the hard drive of your PC for the Guided Tours' data sets, not including space required for the operating system and Windows;

- PC ArcView for Windows (Version 1);
- MS-DOS Version 5.0 or later;
- Microsoft Windows Version 3.1 or later;
- A minimum of 8 megabytes (MB) of RAM;
- IBM or compatible PC with an 80486 or higher processor; and
- Color monitor with 256-color graphics and 640 x 480 resolution.

The ADS will run on a PC with a 80386 processor with 4 MB of RAM, but the display will be much slower. Limited display is supported on a color monitor with 16-color graphics. The installation routine (SETUP.BAT) will not run on MS-DOS versions earlier than 5.0.

The Views supporting the Guided Tours were created for use with ArcView for Windows, Version 1. These files can also be used in ArcView 2 by choosing the import utility for opening Version 1 files. However, these imported views may differ from their original layout. For example, ArcView 2 uses a different color palette, does not maintain the original theme definition of ArcView 1, and may not maintain the original outlines or the annotation of the original coverage. (See the ArcView 2 User's Guide for further details.)

NOTE: ArcView for Windows comes with multiple language files. If these files were not selected at the time ArcView was initially installed, they can be added to your system by rerunning the installation program. Select "Add Language Files Only." For further information on adding language files to ArcView, refer to page 2 of your ArcView (Version 1) User's Guide.

LEVEL OF EXPERTISE

The ADS has been developed for those who are not familiar with GIS or ArcView software. However, some level of familiarity with the Windows environment and using a mouse is assumed.

GEOGRAPHIC PROJECTION

The ADS is provided in two formats—Geographic (decimal degrees) and Robinson projection. Within the Geographic version, coordinates are provided in decimal degrees of latitude and longitude. This format is useful if you wish to add geographic data from other sources to the ADS or use data from the ADS with other "unprojected" data in decimal degrees with a GIS program. A limitation of the unprojected data is that they cannot be used to measure distance or area because lengths or areas computed as decimal degrees are not meaningful. The Geographic version of the Africa Data Sampler is stored in compressed PC ARC/INFO Export format in the EXPORT directory. You have to uncompress

and import these files before you can work with the data in ArcView or another GIS software.

The Geographic data have been projected into Robinson projection with units in meters. This common pseudo-cylindrical projection is often used for global and regional scale mapping. It allows for proportional representation of area, with relatively minor distortion of distance and shape, especially for the latitudes lower than 45 degrees. (The closer to the equator, the smaller the distortion.) Also, areas close to the central meridian (15 degrees east, near the geometric center of the continent) are only minimally distorted. The directions along the central meridian and the equator are true. Using the projected data sets results in meaningful units of measure for areas and distances. The Guided Tours are based on the Robinson (projected) data sets, which are recommended for use with this Guide.

INSTALLING THE ADS FILES WITH THE INSTALLATION ROUTINE

A MS-DOS installation routine (called SETUP.BAT) can be used to either configure your PC to run the Views directly from your CD-ROM drive or copy files to your hard drive and configure your PC to run the ADS Views from the hard drive. Before installing the Africa Data Sampler, be sure you have installed your CD-ROM driver software correctly. In addition, ArcView should have been successfully installed prior to running the ADS installation utility.

Figure 1 shows the directory structure of your CD-ROM. The Views, which serve as the basis of the Guided Tours in Section V, are under the VIEWS subdirectories under individual COUNTRY subdirectories (e.g., "ETHIOPIA"). Although there are only three countries used in the Guided Tours, there are Views for each country included on your CD-ROM. These Views reflect the same themes described in the Guided Tours. PC ARC/INFO coverages are contained in a subdirectory reflecting the source of the data sets under a DATA subdirectory within the individual COUNTRY subdirectories.

The Guided Tours can be run more quickly from the hard drive than from the CD, so we recommend installing the files on the hard drive.

To install the Robinson Projection data sets for the Guided Tours on your hard drive:

- 1) If you are in Windows, exit Windows.
- 2) Under MS-DOS, change to your CD-ROM drive (e.g., "D:" if D is your CD-ROM reader) and type "SETUP."

- 3) You will be offered the following options:
- Option 1* Install the data and Views for the Guided Tours—Tunisia, Uganda, and Guinea (Requires 11.8 megabytes)—and configure your PC to run the Views from the hard drive of your PC.
 - Option 2* Install the data and Views for some other African country.
 - Option 3* Configure your PC to run the Views directly from the CD-ROM drive or your hard drive.
 - Option 4* Uncompress the PC ARC/INFO Export files for a selected country to the hard drive of your PC.

The installation routine will copy the data sets and Views to the ADS directory of your hard drive, under a country-specific subdirectory. Offered as a recommended option is the automatic addition of a line to the AUTOEXEC.BAT file to reflect that the ADS Views will access data from your hard drive, (e.g., SET ADS=C:, if C is your hard drive.) This command will automatically be executed by the installation program, so there is no need to re-boot at this time. The ADS variable is used within the Views to locate the ADS directory. (The ADS variable requires environment space on your computer. If you see the message "Out of environment space" while running SETUP.BAT, you will need to increase the amount of environment space on your computer. You can use the "/E" option of the SHELL command in your CONFIG.SYS file to increase the size of your environment space, for example, /E:1014).

To run the ADS directly from the CD-ROM in the future, you will need to re-set this variable to the CD-ROM drive (i.e., SET ADS=D:, if D is the CD-ROM drive). This can be achieved by choosing option 3 in the installation utility or by running a batch file called SETADS.BAT from the CD-ROM. (This batch file will then be installed in the ADS directory on your hard drive as well.) Alternatively, you can edit the AUTOEXEC.BAT manually.

The installation routine specifies the amount of disk space required for the ADS data and Views for each country. This amount is an estimate. It can vary on different computers because the minimum file allocation unit size varies with the size of the hard drive. Some computers may require more disk space for a given country than is specified in the ADS installation routine.

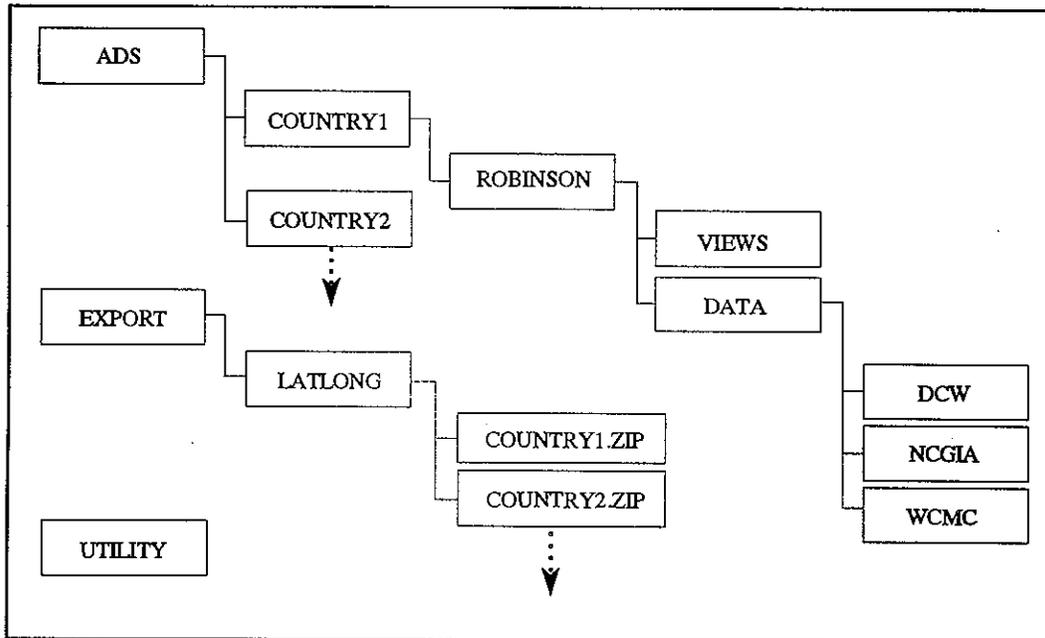


Figure 1 Africa Data Sampler Directory Structure

The Guided Tours make use of the Robinson projection PC ARC/INFO coverages on the CD-ROM. The EXPORT directory on the CD-ROM contains the data sets in PC ARC/INFO Export format in Geographic projection. There is a single file for each country with an extension of "ZIP" (e.g., ETHIOPIA.ZIP). These are compressed files containing the PC ARC/INFO Export format files for each country. PKWARE's PKZIP compression software was used to perform the compression. The UTILITY subdirectory contains the decompression software. You can decompress the files for a particular country by choosing option 4 in the installation utility.

The resulting files will be stored in a directory reflecting the country's name with subdirectories reflecting the data sources (i.e. DCW, NCGIA, WCMC). The PC ARC/INFO Export format files (which have .E00 extension) need to be imported for use in ArcView or ARC/INFO. This can be done by using the IMPORT command of either ArcView or ARC/INFO. Also, these files can then be imported into other GIS software formats, such as Atlas*GIS and MapInfo, notwithstanding the feature limitations of these formats.

For support with installation of the Africa Data Sampler or for related questions, contact Norbert Henninger at the World Resources Institute (WRI), 1709 New York Avenue, N.W., Washington, D.C. 20006, USA, Tel. +1 (202) 662-2571, Fax. +1 (202) 638-0036 , or via Internet: norbert@wri.org.

Technical support for ArcView for Windows is available from the Environmental Systems Research Institute (ESRI), 380 New York Street, Redlands, CA 92373, USA, Tel. +1 (909) 793-2853, Fax. +1 (909) 793-5953, or via Internet: support@esri.com.

CHOOSE.EXE which allows for interactive responses in batch files and is used by SETUP.BAT was developed by Professor Timo Salmi, University of Vaasa, Finland, and was obtained from his 6th utility set on ftp://garbo.uwasa.fi/pc/ts/tsutlfl4.zip. CHOOSE.EXE is used with Professor Salmi's permission.

MANUAL INSTALLATION

Experienced MS-DOS and Windows users may choose to install ADS files manually.

To install files for an individual country:

This can be done in any Windows file manager or in MS-DOS. Under MS-DOS, change to the CD-ROM drive and type: XCOPY \ADS\GHANA C:\ADS\GHANA /S (where GHANA is an example of a country you may want to copy, and C: is the destination drive). If you are using MS-DOS 6 or later you may be asked whether GHANA is a file or a directory: press D for directory.

To uncompress PC ARC/INFO Export files:

The files are stored in compressed format (using PKZIP 2.04g) and can be uncompressed using PKUNZIP. Shareware version 2.04g of PKUNZIP is located in the UTILITY directory of this CD-ROM. Under MS-DOS, change to the CD-ROM drive and type: \UTILITY\PKUNZIP -D \EXPORT\LATLONG\ NIGERIA C: (if you want to uncompress the NIGERIA export files to the C: drive). Using the -D option will create the ADS directory structure and place export files in the DCW, NCGIA, and WCMC subdirectories.

To install on network drives:

You can install the ADS to a directory location other than the root directory, such as M:\USER

- a) Change to the CD-ROM drive in MS-DOS,
- b) Use the XCOPY command to copy the files to the appropriate directory (i.e., XCOPY \ADS\GHANA M:\USER\ADS\GHANA /S) and then

- c) Modify the ADS variable in your AUTOEXEC.BAT (i.e., SET ADS = M:\USER).

UNIX INSTALLATION

PC ARC/INFO Export files are available for every African country in Geographic format (decimal degrees) within the EXPORTLATLONG subdirectory of the CD-ROM. These files are stored in compressed (.ZIP) format with one file for each country. PKZIP Version 2.04g was used to create these files.

To use the PC ARC/INFO Export files under UNIX, the individual country file needs to be uncompressed (sometimes called "unzipped") on the UNIX machine, and the carriage return/line feeds in the PC format needs to be converted to line feeds in the UNIX format. Most UNIX unzip software contains such a conversion option. Additionally, MS-DOS file names need to be made lower-case characters prior to being imported into ARC/INFO.

Info-ZIP's UnZip software can be used on UNIX operating systems to uncompress the files compressed with PKZIP. UnZip is an extraction utility for files compressed in .ZIP format. UnZip is available both as source code and as executable files for different operating systems at many different ftp sites on the Internet. The latest version of these programs usually appears first on the following ftp site: <ftp.uu.net:/pub/archiving/zip>. A compressed tar file (UNZIP512.Z) of UnZip 5.12 (the most recent version as of summer 1995) can also be found in the UTILITY directory of this CD-ROM along with the UNZIP512.TXT text file that describes the contents of the tar file. More information on Info-ZIP and UnZip can be obtained via e-mail (zip-bugs@wkuvx1.wku.edu) or via the World Wide Web (<http://quest.jpl.nasa.gov/Info-ZIP/>).

The default version of UnZip (with no options set) is to extract all files from the specified .ZIP file into the current directory and subdirectories below it. Because the ARC/INFO Export files and the compressed .ZIP files were created in MS-DOS, several options must be specified to convert carriage return / line feeds to line feeds and upper-case to lower-case characters. Using UnZip with the -L option converts all filenames to lower-case characters. The -d option allows the user to specify a destination directory. The -a option will perform carriage return/line feeds to line feeds conversion. For example, to uncompress the files for Ethiopia into a specific directory (/gisdata/), type: `unzip -a -L ethiopia -d /gisdata/`. Then the resulting ARC/INFO Export files can be imported with the import utility of ARC/INFO.

III. DATA SOURCES, PROCESSING, AND QUALITY ISSUES

The base map layers for the ADS were extracted from the Digital Chart of the World (DCW). Other thematic data sets were obtained from the National Center for Geographic Information and Analysis, World Conservation Monitoring Centre, and World Conservation Union. Table 1 summarizes the ADS themes and their data sources, scale, and related information. Table 2 is a matrix of coverages available for each country. Detailed documentation can be found in the Data Catalog (Appendix B) and the Data Dictionary (Appendix C). Definitions and descriptions of GIS and PC ARC/INFO terms are contained in Appendix D. Further details about data sources and processing issues for each country are listed in Appendix F.

DIGITAL CHART OF THE WORLD (DCW)

DCW is a 1:1,000,000 scale, standardized digital global geographic database. Environmental Systems Research Institute (ESRI) created the DCW from the U.S. Defense Mapping Agency (DMA) Operational Navigation Chart (ONC) series. The ONC series was produced by DMA at a scale of 1:1,000,000 for use by pilots and air crews for medium- and low-altitude navigation and to support military operational planning. The ONC sheets are "the largest-scale unclassified map series that provides consistent, contiguous coverage of essential map features"—the main reason they are used in the DCW (*Digital Chart of the World Data Dictionary*, ESRI, 1993).

The DCW is available on CD-ROM in ARC/INFO coverage format from ESRI. The data are stored in a series of five-degree tiles. For each country, PADCO clipped the DCW features for each tile by the national boundary, joined them into a single coverage for each data layer, appended additional fields to the tabular data (see the Data Dictionary in Appendix C for specific fields), and checked the quality of the resulting coverage. (For a summary of PADCO's production process, see Appendix E.)

Because the DCW comes from a single data source, it is internally consistent (that is, features are well registered to one another). The DCW serves as the base for integration of other data sets.

For more information on the DCW, contact ESRI Customer Service, 380 New York Street, Redlands, CA 92373, USA, Tel. +1 (909) 793-2853. Fax. +1 (909) 793-5953, or via Internet: info@esri.com.

For more information on the ONC sheets, contact the National Oceanic and Atmospheric Administration (NOAA) Distribution Branch, N/CG33, National

Ocean Service, Riverdale, MD 20737-1199, USA, Tel. +1 (301) 436-6990, Fax .
+1 (301) 436-6829.

Table 1 Generic List of Data Layers

THEME	COVERAGE	FEATURE	DESCRIPTION	SOURCE SCALE	SOURCE
Political Boundary	Ponet	polygon, line	Political boundary for the country	1:1,000,000	DCW
Small Coastal Islands	Popoint	point	Small coastal islands belonging to the country	1:1,000,000	DCW
Populated Places Annotation	Pppoint	annotation	Text for place names	1:1,000,000	DCW
Settlement Names	Pppoint	point	Village locations with names	1:1,000,000	DCW
Settlements	Pppoint	point	Village locations	1:1,000,000	DCW
Urbanized Area Names	Pppoint	point	Urbanized area locations with names	1:1,000,000	DCW
Urbanized Areas	Pppoly	polygon	Urbanized areas	1:1,000,000	DCW
Airports	Acpoint	point	Airports	1:1,000,000	DCW
Transportation Points	Tspoint	point	Bridges, tunnels, ferries, etc.	1:1,000,000	DCW
Transportation Structures	Tsline	line	Bridges, tunnels, ferries, etc.	1:1,000,000	DCW
Railroad	Rrline	line	Railroads	1:1,000,000	DCW
Roads	Rdline	line	Primary and secondary roads	1:1,000,000	DCW
Utilities	Utline	line	Power transmission lines, telephone lines, pipelines	1:1,000,000	DCW
Drainage Points	Dnpoint	point	Dams, rapids, falls, reservoirs, springs/wells/waterholes	1:1,000,000	DCW
Supplemental Drainage Points	Dspoint	point	Small lakes and islands within inland water bodies	1:1,000,000	DCW
Rivers and Streams (1)	Dnnet (1)	line	Perennial and nonperennial rivers, streams, and channels	1:1,000,000	DCW
Lakes (1)	Dnnet (1)	polygon	Perennial and nonperennial inland water bodies	1:1,000,000	DCW
Spot Elevations	Hypoint	point	Points with elevation in feet and meters	1:1,000,000	DCW
Supplemental Spot Elevations	Hspoint	point	Points with elevation in feet and meters	1:1,000,000	DCW
Elevation Contours	Hynetl	line	Elevation contours every 1,000 feet, also shown in meters	1:1,000,000	DCW
Supplemental Elevation Contours	Hsline	line	Additional elevation contours in feet and meters	1:1,000,000	DCW
Elevation Ranges	Hynetp	polygon	Generalized elevation shown in feet, also in meters	1:1,000,000	DCW
Cultural Landmarks	Clpoint	point	Power stations, border posts, water tanks, campsites, etc.	1:1,000,000	DCW
Land Cover Annotation	Lepoly	annotation	Text describing land cover	1:1,000,000	DCW
Land Cover (points)	Lepoint	point	Mines, quarries, miscellaneous land features	1:1,000,000	DCW
Land Cover (polygons)	Lepoly	polygon	Surface features for some areas	1:1,000,000	DCW
Data Quality	Dqnet	polygon, line	ONC information	1:1,000,000	DCW
Tropical Moist Forest (1)	Forest (1)	polygon	Tropical forests by type	varies	WCMC
Wetlands	Wetlands	polygon	Wetlands shown by type	1:1,000,000	WCMC
Production Forests	Prox_for	polygon	Classified production forests	varies	WCMC
Protected Areas (polygons)	Parkpy	polygon	Managed areas, including national parks and reserves	varies	WCMC
Protected Areas (points)	Parkpt	point	Center points of managed areas	varies	WCMC
Population Density	Pop	polygon, line	Population and population density by administrative units	varies	NCGIA
Administrative Boundaries	Pop	polygon, line	Administrative boundaries by level	varies	NCGIA

NOTES

- Not all DCW data layers are available or are complete for each country.
 - Theme descriptions provide an idea of the type of features that typically occur in African countries in DCW.
- (1) For some themes, such as Rivers and Streams and Lakes, there were too many features to include in a single "Dnnet" coverage, so multiple coverages were used. In these cases, the coverage name was extended to reflect the region of the country, such as "Dnnetn" or "DnnetS" for North and South, respectively.

Table 2 Availability of Data Layers (part 1)

		Algeria	Angola	Benin	Botswana	Burkina Faso	Burundi	Cameroon	Cape Verde	C.A.R.	Chad	Comoros	Congo	Cote d'Ivoire	Djibouti	Egypt	Equatorial Guinea	Eritrea	Ethiopia	Gabon	Gambia	Ghana	Guinea	Guinea-Bissau	Kenya	Lesotho	Liberia
THEME																											
Political Boundary	PONET	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Small Coastal Islands	POPOINT	1	1					1	1			1		1	1	1	1		1	1	1	1	1	1	1	1	1
Populated Places Annotation	PPPOINT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Settlement Names	PPPOINT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Settlements	PPPOINT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Urbanized Area Names	PPPOINT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Urbanized Areas	PPPOLY	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Airports	AEPOINT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Transportation Points	TSPPOINT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Transportation Structures	TSLINE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Railroad	RRLINE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Roads	RDLINE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Utilities	UTLINE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Drainage Points	DNPOINT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Supplemental Drainage Points	DSPOINT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Rivers and Streams	DNNET	8	3	1	1	2	1	1	1	3	6	6	1	1	1	2	1	1	2	1	1	1	1	1	1	1	1
Lakes	DNNET	8	3	1	1	2	1	1	1	3	6	6	1	1	1	2	1	1	2	1	1	1	1	1	1	1	1
Spot Elevations	HYPOINT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Supplemental Spot Elevations	HSPOINT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Elevation Contours	HYNEL	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Supplemental Elevation Contours	HSLINE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Elevation Ranges	HYNELP	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Cultural Landmarks	CLPOINT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Land Cover Annotation	LCPOLY	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Land Cover (points)	LCPOINT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Land Cover (polygons)	LCPOLY	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Data Quality	DQNET	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Tropical Moist Forest	FOREST			1			1	2		1			1	1		1	1	1	1	1	1	1	1	1	1	1	1
Wetlands	WETLANDS	1	1	1	1	1	1	1		1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Production Forest	PROD_FOR													1					1								
Protected Areas (polygons)	PARKPY	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Protected Areas (points)	PARKPT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Population Density	POP	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Administrative Boundaries	POP	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

NOTES

- The numbers signify the number of coverages for each theme by country.
- A blank cell reflects that the theme is not available for the given country.

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Table 2 Availability of Data Layers (part 2)

		Libya	Madagascar	Malawi	Mali	Mauritania	Mauritius	Morocco/W. Sahara	Mozambique	Namibia	Niger	Nigeria	Rwanda	Sao Tome/Principe	Senegal	Sierra Leone	South Africa	Sudan	Swaziland	Tanzania	Togo	Tunisia	Uganda	Zaire	Zambia	Zimbabwe
THEME																										
Political Boundary	PONET	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Small Coastal Islands	POPOINT		1				1	1	1	1				1	1	1	1			1			1			
Populated Places Annotation	PPPOINT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Settlement Names	PPPOINT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Settlements	PPPOINT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Urbanized Area Names	PPPOINT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Urbanized Areas	PPPOLY	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Airports	AEPOINT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Transportation Points	TSPPOINT		1		1	1		1	1						1					1	1	1	1	1	1	1
Transportation Structures	TSLINE		1		1	1		1	1		1	1			1		1	1		1	1	1	1	1	1	1
Railroad	RRLINE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Roads	RDLINE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Utilities	UTLINE	1	1	1	1			1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1
Drainage Points	DNPOINT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Supplemental Drainage Points	DSPPOINT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Rivers and Streams	DNNET	1	2	1	4	2	1	2	4	1	4	4	1	1	1	1	5	7	1	4	1	1	1	1	9	3
Lakes	DNNET	1	2	1	4	2	1	2	4	1	4	4	1	1	1	1	5	7	1	4	1	1	1	1	9	3
Spot Elevations	HYPOINT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Supplemental Spot Elevations	HSPOINT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Elevation Contours	HYNETL	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Supplemental Elevation Contours	HSLINE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Elevation Ranges	HYNETP	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Cultural Landmarks	CLPOINT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Land Cover Annotation	LCPOLY	1	1	1		1		1	1	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1
Land Cover (points)	LCPOINT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Land Cover (polygons)	LCPOLY	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Data Quality	DQNET	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Tropical Moist Forest	FOREST		1									2	1	1	1					1	1		1	6		
Wetlands	WETLANDS	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Production Forest	PROD_FOR											1								1	1		1			
Protected Areas (polygons)	PARKPY	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Protected Areas (points)	PARKPT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Population Density	POP	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Administrative Boundaries	POP	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

NOTES

- The numbers signify the number of coverages for each theme by country.
- A blank cell reflects that the theme is not available for the given country.

POPULATION DATA SET

A medium resolution database reflecting human population by administrative unit was produced for all of Africa by the National Center for Geographic Information and Analysis (NCGIA). The data set is a compilation of subnational administrative boundaries and census data from different sources. The base geographic coverage was produced by the Food and Agriculture Organization of the United Nations (FAO), but were supplemented where more detailed coverages or maps were available. Census data come from census publications from individual countries, published digital databases (including the U.S. Bureau of the Census International Database and UNEP/FAO's African Database), and published gazetteers and yearbooks. The source of the data for each country is noted in Appendix F.

Depending upon the country and the original data source, population data are available by first-, second-, or third-level administrative unit. Spatial and statistical accuracy of the population data sets vary by country.

PADCO extracted the population data set for each country from the continental population data set. The international political boundaries were replaced with those in the DCW, and subnational boundaries were then edited to match.

For further information on the population data set, contact Uwe Deichmann at the NCGIA: University of California at Santa Barbara, 3510 Phelps Hall, Santa Barbara, CA 93106, USA, Tel. +1 (805) 893-8652, Fax. +1 (805) 893-8617 or via Internet: uwe@ncgia.ucsb.edu.

BIODIVERSITY DATA SETS

The World Conservation Monitoring Centre (WCMC) has developed the Biodiversity Map Library (BML) to maintain a variety of data sets relating to conservation. The data come from disparate sources and are at a nominal scale of 1:1,000,000. The BML data sets included here cover four major themes:

Protected Areas, Tropical Moist Forest, Production Forest, and Wetlands.

For some countries, not all themes are available. (For detailed descriptions of the WCMC data sets, see Appendix C. Refer to Appendix F for the original data sources, which vary by country.)

Protected Areas

WCMC manages a database of the world's protected areas that has been built up over more than 15 years. Currently more than 37,000 records with summary information are held in the database. These data were compiled from material provided and reviewed by agencies responsible for the administration and

management of protected areas. Additional information was obtained from IUCN (The World Conservation Union) Commission on National Parks and Protected Areas, a voluntary network of protected area professionals, and other experts.

The Biodiversity Map Library holds polygon or point data for some or all of the protected areas within each country. In most cases the protected area data sets comprise those areas that qualify for inclusion in IUCN management categories I through VIII (see data set description in Appendix C) and that have an area of more than 10 square kilometers. It was not possible in all instances to obtain sufficient information to prepare a map depicting the boundaries of individual protected areas. In these cases, data maintained in the WCMC protected areas database were used to identify sites by means of a point location. For this reason, there are both point and polygon files reflecting protected areas within the ADS for many countries.

For most countries, a number of protected areas could not be shown within either a polygon or a point coverage because of missing geographical coordinates. For this reason, an additional file (named PA.WK1) with a complete list of protected areas from WCMC's Protected Areas Database is located in the WCMC subdirectory for each country. This file—in a spreadsheet format—includes information on the name of the protected area, type of protected area, IUCN category, area, site code, and a field indicating whether the protected area is mapped in the ADS. It will allow you to assess the completeness of the protected areas mapped in the ADS.

For further information concerning the Protected Areas database, contact Michael Green at WCMC, 219 Huntingdon Road, Cambridge, CB3 0DL, U.K., Tel. +44 (1223) 27-73-14, Fax. +44 (1223) 27-71-36, or via Internet: michael.green@wcmc.org.uk.

Tropical Moist Forest

The Tropical Moist Forest data set was originally created by WCMC for the IUCN Conservation Atlas of Tropical Forests. Forest data were derived from digital sources, including satellite imagery and structured databases, and from more traditional sources, such as maps, survey data, and aerial photographs. For most of these, WCMC harmonized the source information into standardized forest-type categories so that they can be nationally or regionally compared and analyzed. The four major categories are Inland swamp forest, Lowland rain forest, Mangrove, and Montane rain forest.

For further information concerning the Tropical Moist Forest database, contact Richard Luxmoore at WCMC, 219 Huntingdon Road, Cambridge, CB3 0DL,

U.K., Tel. +44 (1223) 277314, Fax. +44 (1223) 277136, or via Internet:
richard.luxmoore@wcmc.org.uk.

Production Forest

As a contribution to the FAO Forest Resources Assessment (1990), the WCMC Protected Areas database was extended to include managed forest areas, notably forest reserves. Areas within this study were classified according to their function: production, protection, or conservation. The protection and conservation areas are combined in the Protected Areas data set, while the production areas are maintained separately as the Production Forest data set. The features in the latter data set thus represent areas that may be of some conservation value but are managed for commercial purposes. Names are included for individual forest reserves when information is available. The Production Forest data set is available for a limited number of countries.

For further information concerning the Production Forest database, contact Michael Green at WCMC, 219 Huntingdon Road, Cambridge, CB3 0DL, U.K., Tel. +44 (1223) 27-73-14, Fax. +44 (1223) 27-71-36, or via Internet:
michael.green@wcmc.org.uk.

Wetlands

WCMC and the IUCN created a global inventory of wetlands for *Wetlands in Danger*, an atlas published by Mitchell Beazley (1993). Wetlands information was interpreted and generalized by R. H. Hughes from the 1:1,000,000 scale ONC sheets. These data were digitized at WCMC and linked to attribute databases created by IUCN. See also *A Directory of African Wetlands*, by R. H. Hughes and Hughes (1992, IUCN, Gland, Switzerland). Additional data are available for some other areas.

For further information concerning the Wetlands database, contact Richard Luxmoore at WCMC, 219 Huntingdon Road, Cambridge, CB3 0DL, U.K. Tel. +44 (1223) 27-73-14, Fax. +44 (1223) 27-71-36, or via Internet:
richard.luxmoore@wcmc.org.uk.

The original data sets for Tropical Moist Forest, Wetlands, Protected Area, and Production Forest were registered to Mundocart, a topographic database derived from the ONC charts, but distinct from the DCW. PADCO's processing of Protected Areas, Tropical Moist Forest, Production Forest, and Wetlands data sets included checks for missing or incomplete attribute information and for aligning feature boundaries to DCW political boundaries where features abut an international boundary or coastline. PADCO also reviewed Protected Areas and

Production Forest features adjacent to very prominent water bodies (such as Lake Victoria and Lake Tumba) and made adjustments as needed based on the source materials available. Features were not aligned to other inland water bodies. WCMC reviewed any changes made by PADCO.

DATA QUALITY

The Africa Data Sampler integrates several data sets, which were developed from a variety of sources for a single country. Several of the data sets were enhanced as part of the production process. For the DCW descriptive text, fields were added to the attribute data. The spatial extent of the WCMC and Population data sets were adjusted along political boundaries for better registration to the DCW data set. Additionally, features in the WCMC Protected Areas and Production Forest data sets were adjusted along very large lakes in the DCW but not along smaller water bodies.

The data sets were developed in "unprojected" Geographic format and projected into Robinson projection. All projections of the earth's globe distort some spatial characteristics (e.g., relative area, shape, distance, and direction). In the case of the Robinson projection, area proportion is preserved, but there is some distortion of shape and direction in regions remote from the equator and the central meridian (15 degrees east). In general, the distortions are minimal.

The DCW was chosen as the base map for this project because it is the most detailed and consistent digital data set available for the world, having been developed from the largest scale unclassified map series available. The overall accuracy of the DCW data set is somewhat varied, in terms of both spatial and attribute accuracy. A shortcoming of the DCW results from the age of the source data—the ONC series was produced between 1960 and 1989 and revised in the 1970s and 1980s, but the revisions address only selected features. As a result, some landscape features are not present or have since changed, and some features are not correctly labeled (e.g., place names, road types). Since revisions occurred by ONC chart, data quality can vary across the country. Features such as roads and streams sometimes disappear or change definition at ONC chart boundaries. In many countries, utility lines within the DCW sometimes include gaps that result from text appearing in that location on the original ONC chart.

The spatial accuracy of the DCW is reasonably good for most features, and most features are well registered in relation to one another. The DCW's scale of 1:1,000,000 means the absolute spatial accuracy is no more reliable than 0.3 to 0.5 kilometers. A comparison with larger scale 1:250,000 topographic maps revealed a disagreement or "inaccuracy" of between 0.5 and 1.0 kilometer. This disagreement is to be expected when comparing maps of such different scales.

Note that the width of linear features on the ONC sheets is about 0.5 kilometers. Overall, most features within the DCW can be assumed to be within 1.0 kilometer accuracy.

When using the DCW data sets, keep in mind that the level of detail available depends on the scale of the original data set—1:1,000,000 in the case of DCW. As you zoom into the DCW data set, you will view the data at a more detailed scale than was originally intended. However, the initial View of a country in almost all cases will be displayed at a scale much smaller than 1:1,000,000. *The DCW is an appropriate base map at the national and regional levels, but it is not suitable for analyses requiring larger scales and higher accuracy (e.g., urban analyses).*

Data sets from different sources will never match perfectly. But in the integration of ADS data from three sources, care has been taken to ensure that spatial features in all data sets are properly registered to the DCW political boundaries. On the other hand, these data sets were not fully integrated with other features in the DCW, such as roads or rivers, and such discrepancies will be visible when the spatial features are examined at a large scale (zoomed in).

There are some redundant data in the ADS. Major hydrological features are represented in data from all three data sources. Lakes, rivers, and streams are contained in the DCW Drainage network (DNNET) data set; major lakes and rivers are contained in the WCMC Moist Tropical Forest and Wetlands data sets and in the NCGIA Population data set. Discrepancies in the hydrological data result from a combination of the following: different source maps, different interpretations, different digitizing precision and accuracy, and different geoids and map-projection parameters.

Within the NCGIA population data set, only the largest lakes and rivers are represented. Close examination reveals differences with the DCW hydrology. Large water bodies are included in the population data set to allow the exclusion of water bodies when calculating population density. Since NCGIA water bodies are adequate for this purpose, no effort was made to make them consistent with the DCW. DCW water bodies are available as a separate data set for any application requiring a more accurate set of water bodies.

Within the Guided Tour of the biodiversity data sets is an optional tour comparing wetlands data from WCMC and DCW. This Tour raises some of the problems associated with integrating data from different sources. The two data sources use different categories of wetlands and identify wetlands in different locations. The WCMC data set was also derived from the ONC charts, but incorporates additional material from expert evaluation and contains more detail on wetland

type, generally including several distinct wetland categories. DCW holds wetlands in the land-cover theme as "undifferentiated wetlands" and in the drainage theme as "nonperennial water bodies." Which wetland classification is more reliable? That depends on the history of the data set, the original sources, production methods used, the original purpose of the data set, and the resulting data quality.

As in any other data set, the quality of the protected areas data depends on the source materials available. Thus, not all protected areas are included in the polygon and point coverages.

The subnational administrative boundaries for the population data set came from a data source of unknown scale and accuracy. These spatial data are useful for visualization of the attribute data. Attribute information on 1994 population count and population density is in the form of projections based on the available census, as well as population growth estimates published by the United Nations. Population for all African countries was projected using the common baseline year of 1994 to facilitate cross-country comparison.

The following Guided Tours present many of the strengths and weaknesses of the ADS.

IV. GUIDED TOURS

The following Guided Tours introduce the different data sets and themes available within the Africa Data Sampler. Through a series of Views set up in ArcView, you can examine and compare different data sets, perform data queries, and explore different areas within a country. The Tours include basic information about ArcView, enabling a novice user to navigate through the system. The Tours raise issues of data scale, consistency, and accuracy.

Style Conventions Used in the Guided Tours

The following conventions have been used to make the Guided Tours document easier to read and use:

- 1) Supplemental information is included in shaded boxes.
- 2) To allow for both quick and detailed exploration of the data, fundamental and optional Guided Tours are provided.

Within the Guided Tours:

- 1) ArcView commands are in *italics*.
- 2) Names of Views are in **BOLD** uppercase letters, with the ".AV" extension, e.g., **THEVIEW.AV**.
- 3) Theme names are also in **BOLD** uppercase.
- 4) Names of items (variables) are in lowercase courier font.
- 5) Coverage names are in uppercase COURIER font.

Note: The Guided Tours assume the Robinson version of the ADS for Tunisia, Uganda, and Guinea have been installed on the C:\ drive.

VIEW 1-BASE MAP (DCW)

The Base Map View contains all of the themes available for Tunisia from DCW. These themes serve as the base map of Tunisia, providing a framework for integrating other data sets.

Opening ArcView and the first View

- 1) Open the ArcView application either by double clicking rapidly on the ArcView icon, or clicking once on the icon and selecting *Open*.

- 2) To open the Base Map View:
 - a) Choose *Open* from the *File* menu. This will open the file browser window.
 - b) Go to the directory where the Views are stored. First, double-click on the drive C:\ icon in the dialog box on the right. Next, double click on the ADS subdirectory; double click on the TUNISIA subdirectory, and then the ROBINSON subdirectory; and then double click on the VIEWS subdirectory in the dialog box on the right. The Views available in the ADS for Tunisia will appear in the dialog box on the left.
 - c) Either click twice rapidly on **BASEMAP.AV** or click once to highlight **BASEMAP.AV** and select the *Open* button.

This will bring up a country-scale View of Tunisia. In this View, all DCW themes are available, though only the country boundary is switched on initially. Additional themes can be turned on or off by clicking on the small square to the left of the theme name in the map legend. A check mark appears in the box if the theme is turned on.

Overview of Base Map Themes

As you scroll down the map legend, note that the themes are grouped by broad subject area. Beneath the **POLITICAL BOUNDARY** theme there are several themes related to populated places and their names. (**URBANIZED AREAS** are large populated places, while **SETTLEMENTS** are smaller. Both have place names that can be turned on or off independently of the markers representing their locations.) Beneath **URBANIZED AREAS** are several themes related to transportation and infrastructure, including **ROADS**, **RAILROADS**, **BRIDGES**, and **AIRPORTS**. Farther down the key are the hydrological themes—**LAKES**, **RIVERS**, and **DRAINAGE POINTS** such as dams and springs, followed by elevation information—**SPOT ELEVATIONS**, **ELEVATION CONTOURS**, and **ELEVATION RANGES**. Near the bottom of the map legend are themes reflecting assorted **CULTURAL LANDMARKS** and **LAND COVER FEATURES**, and a theme called **DATA QUALITY**, which provides information on ONC sheet compilation dates and estimated accuracy.

Figure 2 illustrates the three basic components of ArcView—the map legend, which provides the list of available themes; the map View, where map themes are displayed; and the *Tools* box, which provides tools for map query, measurement, and control of the geographic areas displayed.

- 3) Scroll up and down the map legend to see what themes are available from the DCW. You can grab the lower right-hand corner of the map legend to resize the map legend. Lengthen it so that more themes can be seen. You can also enlarge the map View in a similar fashion. Only a few themes can be displayed simultaneously at the national level before the map becomes too dense with graphic features.

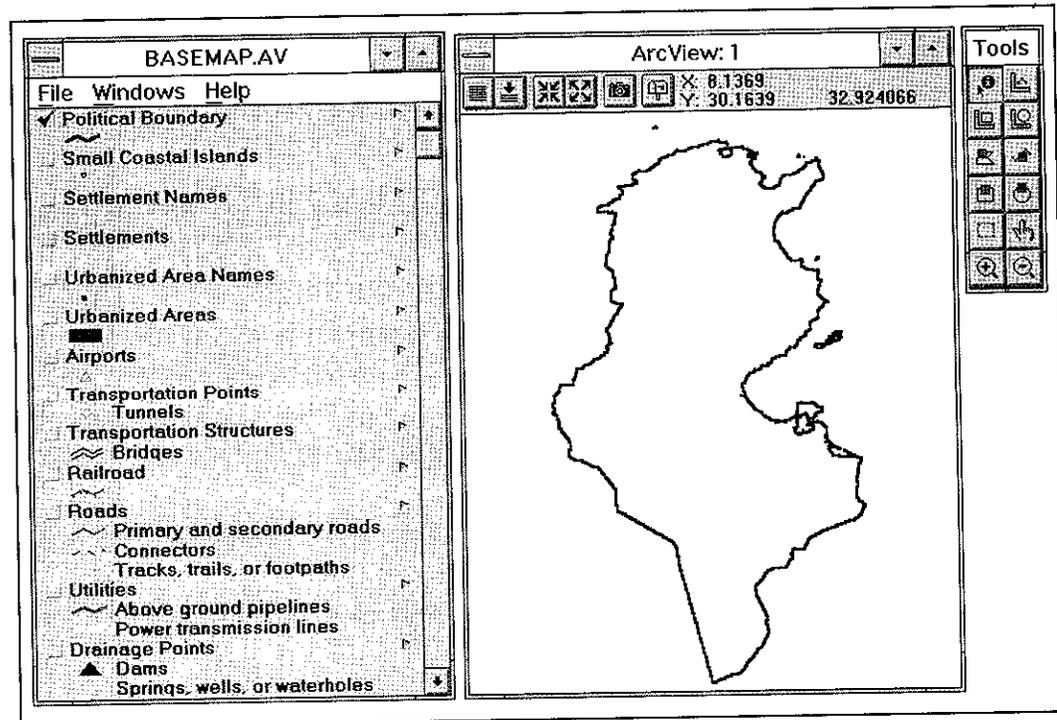


Figure 2 Base Map for Tunisia—Map Legend, Map View, and Tools Box

Base Map Tour

- 1) Switch on the **RAILROAD** theme by clicking on the small square to the left of the theme name in the map legend.
- 2) Turn on the **ROADS** theme and observe the transportation network for the country.
- 3) Next, display major populated areas by turning on the theme called **URBANIZED AREAS**. This theme includes only large population centers. **URBANIZED AREAS** represent the approximate physical extent of the urban area, rather than any official political boundaries. These areas are difficult to see when the whole country is being viewed, but will become more apparent later when smaller areas are viewed in greater detail.

- 4) Click on the theme called **URBANIZED AREA NAMES**. This turns on a theme containing the place name text associated with the built-up areas. These names may obscure other features at this scale of display.
- 5) Turn off this display by clicking on **URBANIZED AREA NAMES** again.
- 6) Turn off the **ROADS** theme and display airport locations by turning on the **AIRPORT** theme.
- 7) Scroll down to the themes representing hydrology and turn on all of the **RIVERS** and **LAKES** for Tunisia. The **LAKES** theme includes major lakes, reservoirs, and large perennial rivers, which are represented as polygons. The **RIVERS** theme represents smaller rivers and streams as lines. These features stand out fairly well when viewing the whole country and show the hydrologic patterns of Tunisia. Note in the map legend that there are both perennial and nonperennial features within these themes. The perennial features are drawn as solid dark blue lines for **RIVERS** and dark blue fill for **LAKES**, while the nonperennial features are drawn as dashed light blue lines for **RIVERS** and a light blue fill for **LAKES**. Can you differentiate perennial from nonperennial features in the map View?
- 8) By zooming in on a particular area (moving to a larger scale), the visual resolution is increased and features can be examined in greater detail. You can progressively zoom in on this map by using the *Zoom-in-center* button on the display bar at the top of the map. Use this feature several times to observe the increase in detail as the area to be displayed is reduced. You can also zoom out using the *Zoom-out-center* button on the display bar.

Figure 3 provides a list of the features available from the buttons at the top of the map View.

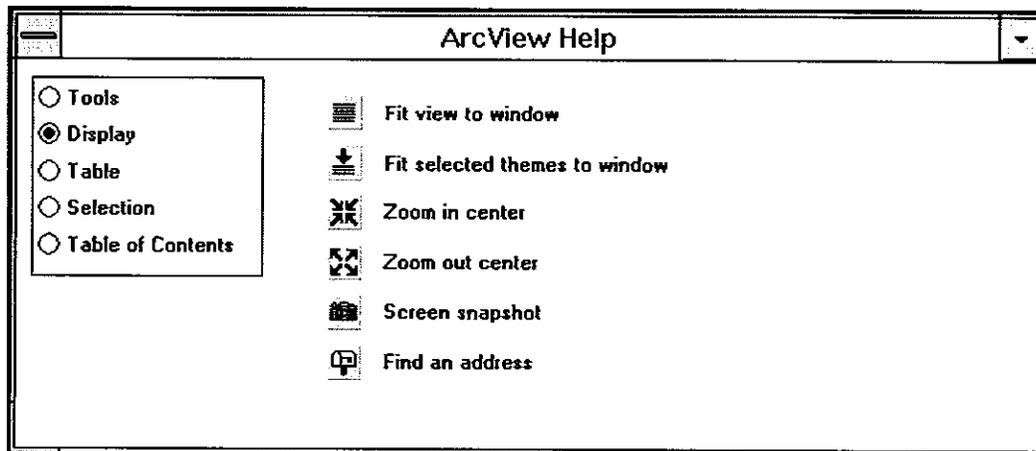


Figure 3 Tools Available from the Map View Tool Bar

ArcView Tips—Controlling the Map View Area

Several additional methods of zooming are available within ArcView. You can control the extent by using the *Zoom to point* (the left button) or the *Zoom to box* feature to define a specific area of focus. Both features are available under the *Tools* menu. Return to the full country map by clicking on the first button (*Fit-view-to-window*) on the display bar at the top of the map. Now click on *Zoom to* on the *Tools* menu and then click on a location of interest on the map using the left button on your mouse. This will serve as the center point for the zoom in. You can do this repeatedly to get increasing detail in an area. An alternate method of zooming, which may be the quickest way to zoom to a particular area, involves using the *Zoom to box* feature of the *Tools* box. After selecting *Zoom to box*, select a point to serve as a corner for the box using the left button on the mouse. Continue to hold the button down and move the pointer to another location; this will serve as the opposing corner of the zoom rectangle. Once the button is released, the defined rectangle becomes the new extent of the map to be displayed. Figure 4 provides a list of the functions available through the *Tools* box.

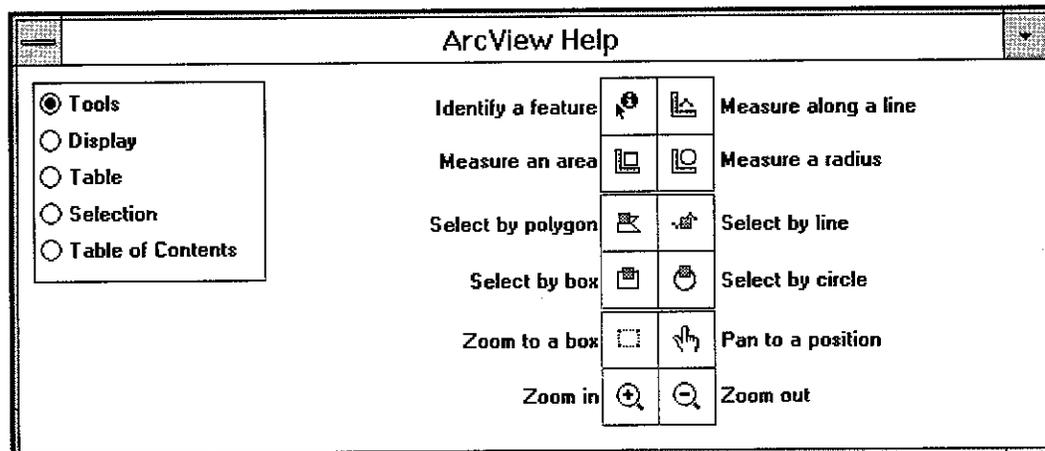


Figure 4 Functions Available from ArcView Tools Menu

- 9) Click on the *Fit-view-to-window* button on the display window bar to see this pattern for the whole country.
- 10) Turn off the **AIRPORTS** theme.
- 11) Turn on the theme called **ELEVATION RANGES**, which provides a coarse summary of elevation information for Tunisia. This theme is shaded based on

varying intervals and provides a striking description of coarse topography for Tunisia. (All elevation information is given in both meters and feet. The elevation information was taken from DMA charts, which use feet. PADCO added a field to reflect elevation in meters. Elevation ranges and contours are based on 250-foot and 1,000-foot thresholds, which translates into unusual metric intervals, such as 76.2 meters or 304.8 meters.)

- 12) **ELEVATION CONTOURS** and **SPOT ELEVATIONS** provide more detailed elevation information than does the **ELEVATION RANGES** theme. You may turn off **ELEVATION RANGES** and explore these other themes if you wish. **ELEVATION CONTOURS** are colored based on the value of elevation. The **SPOT ELEVATIONS** provide additional measurements of elevation points not lying directly on contours (in both meters and feet) for many locations around Tunisia.
- 13) Turn off **ELEVATION RANGES** before exploring additional themes in the Base Map. Other themes, such as **SETTLEMENTS**, **UTILITIES**, **DRAINAGE POINTS**, and **LAND COVER FEATURES**, can be turned on similarly. Explore some of these themes on your own. Also, the **DATA QUALITY** layer provides information on ONC chart boundaries and compilation and review dates for each chart.

The following optional Tour provides greater detail on several themes contained in the DCW. If you decide to skip this Tour, you may wish to examine the final View of the optional Tour, which is stored in the View called **DCWZOOM.AV**.

Optional Detailed Tour of the DCW Base Map

You do not need to open a new View. Please continue this Tour using **BASEMAP.AV**.

- 1) Turn off all themes except the **POLITICAL BOUNDARY** and **URBANIZED AREAS** and zoom into the area near Tunis.
- 2) Turn on **URBANIZED AREA NAMES**, **ROADS**, **RAILROADS**, **AIRPORTS**, and **SETTLEMENTS**.
- 3) Turn on **SETTLEMENT NAMES**. This provides a display of the settlement name stored in an attribute field called `ppptname`. If your View is too cluttered, zoom in further.
- 4) Turn on the **LAKES** and **RIVERS** themes for Tunisia. Figure 5 provides an illustration of this View.

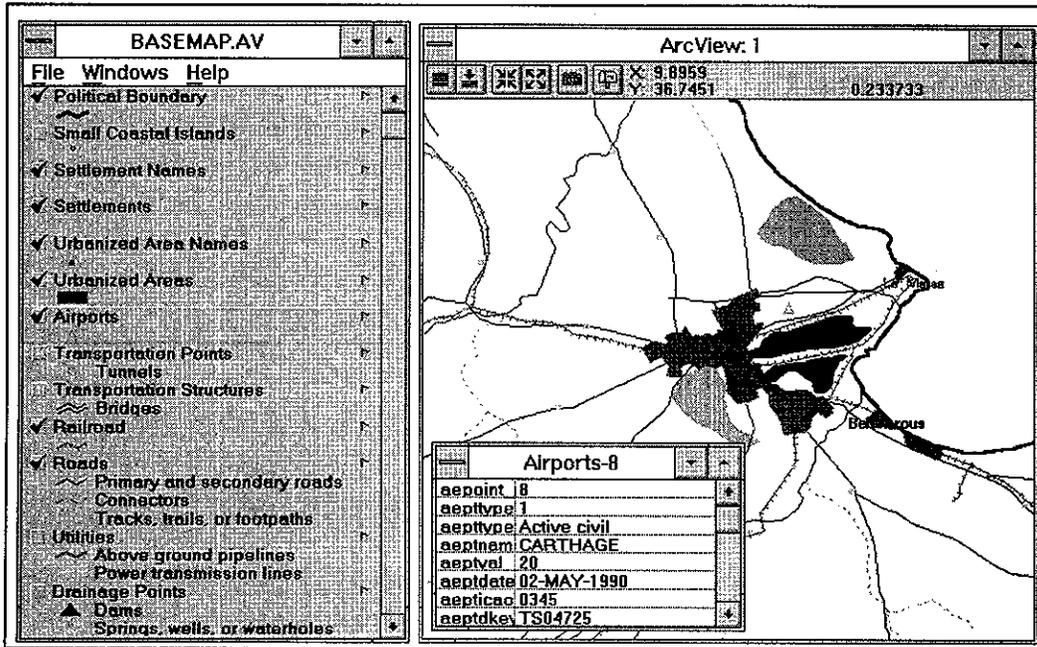
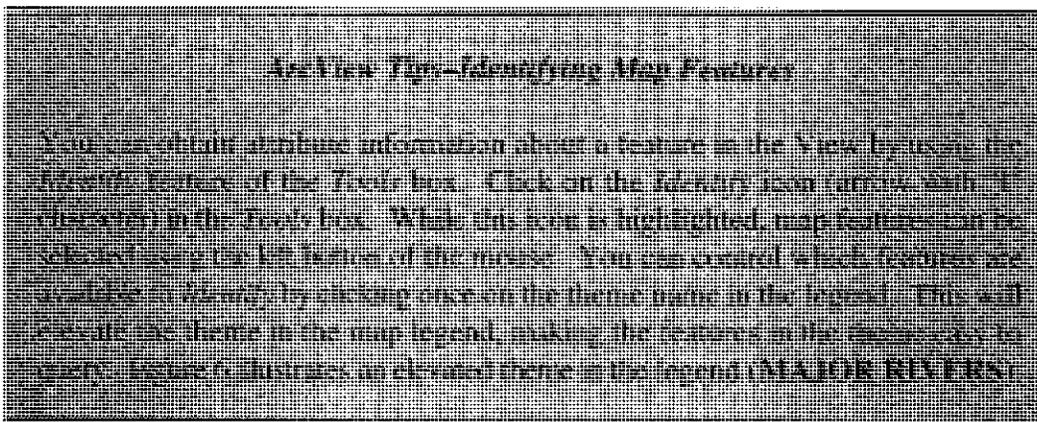


Figure 5 DCW Features for the Tunis Area with Airport Attributes Displayed

- 5) Make sure the *Identify* tool is selected and click on a road segment. (See **ArcView Tips—Identify Map Features** for further detail.) A small box pops up, which includes the feature type (road, path, or connector), length of the road or path segment (in meters), and status (such as whether the road is functional). You can close the box by double clicking on the upper left-hand corner of the box. Information on any map feature can be obtained this way.



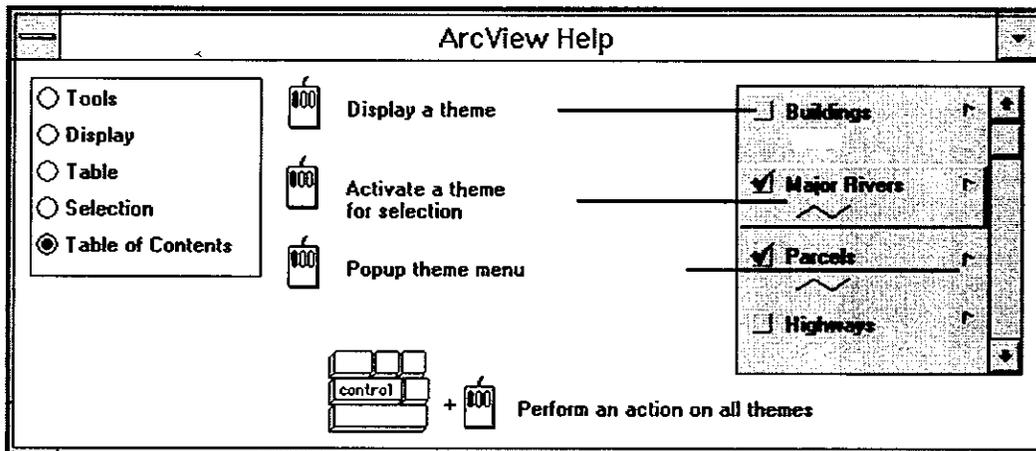


Figure 6 Controlling Themes for Display and Query

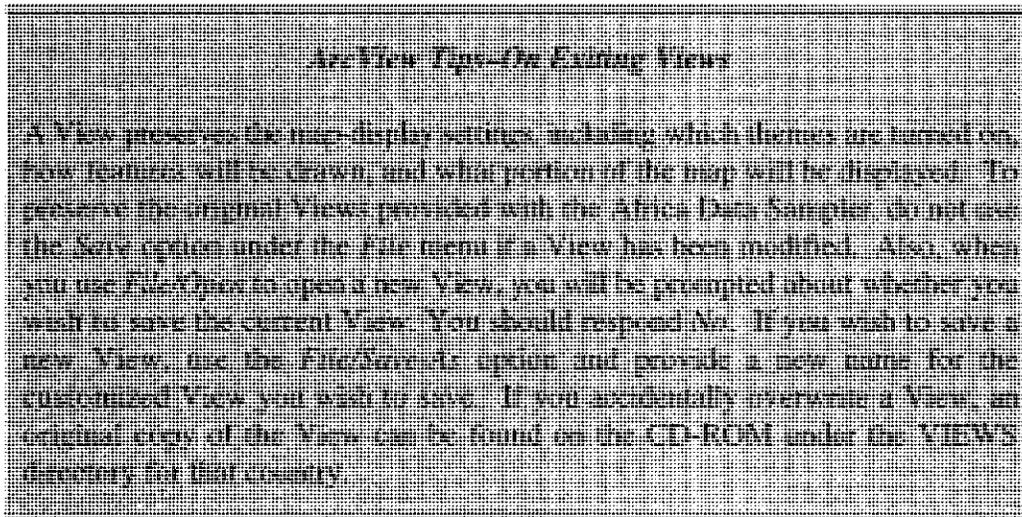
- 6) Click on part of the railroad line to reveal the information stored about railroads.
- 7) Click on an airport. The information that pops up includes the airport's name, type, and status. Why is there so much attribute information for airports? This detail reflects the original intended use of the ONC series (navigation by pilots), as opposed to the potential uses and users of the DCW.

It is easy to change the way a feature is displayed.

- 8) To access the legend properties for **AIRPORTS**:
 - a) Press and hold the left mouse button on the small triangle to the right of the **AIRPORTS** theme name;
 - b) Select *Properties*; and
 - c) Click the *Legend* button in the *Properties* window.
- 9) To change the way airports are displayed:
 - a) Double click on the current symbol for **AIRPORTS**. This opens a symbol and color palette window and allows you to select a new symbol and color.
 - b) Change the symbol by clicking on a different symbol.
 - c) Change the color by selecting a color and hitting *OK*.
 - d) Select *Apply* to implement these changes.

Note that all of the features displayed in this map seem well positioned with regard to one another. For example, the populated places are consistent with the location of water bodies, and the roads and railroads run through the populated places.

Because the DCW was created from a single data source, it is internally consistent, and the data in various themes (or coverages) are well registered to one another.



The next View introduces the Biodiversity data sets from WCMC that have been integrated into the ADS. When exiting the current View, take care to avoid overwriting **BASEMAP.AV**. (See ArcView Tips—On Exiting Views.)

VIEW 2—BIODIVERSITY DATA SETS

The Biodiversity View contains five data themes from WCMC for Uganda. These include polygon data sets representing Protected Areas, Tropical Moist Forest, Production Forest, and Wetlands, and an additional point-based data set representing Protected Areas. This View also contains the hydrologic themes from the DCW for reference.

To open the Biodiversity View for Uganda:

- 1) Choose *Open* from the *File* menu. This will open the file-browser window.
- 2) Go to the directory where the Views are stored. First, double-click on the ADS subdirectory; double click on the UGANDA subdirectory, and then the ROBINSON subdirectory; and then double click on the VIEWS subdirectory in the dialog box on the right. The Views available in the ADS for Uganda will appear in the dialog box on the left.

- 3) Either click twice rapidly on **BIODIV.AV** or click once to highlight **BIODIV.AV** and select the *Open* button.

Protected Areas Tour

- 1) Examine the themes available in the map legend, noting the classes available under each theme. Observe the two themes representing **PROTECTED AREAS**. Is it easy to differentiate a point theme from a polygon theme?

In the initial View only the country boundary and **PROTECTED AREAS** (polygon) themes are switched on. Figure 7 illustrates protected areas in Uganda. The Protected Areas are classified according to an item called *designate*, which identifies the national legal designation of the site. These designations, and their definitions, vary from country to country. Within the data set for Uganda are areas designated as Controlled Hunting Area, Game Reserve, National Park, and Sanctuary.

- 2) To examine the entire database for **PROTECTED AREAS** (polygons) in tabular format, use the *Table* feature of ArcView:
 - a) Click on the triangle to the right of **PROTECTED AREAS** and select *Table*. A database window pops up.
 - b) Click on the button in the upper right-hand corner to enlarge this to the whole screen.
 - c) Use the scroll button on the bottom right to move across the range of items. These items include area name, year of designation, IUCN categorization (*iucncat*), and designation. Where the default setting obscures item names, you can revise columns by dragging the column border.
 - d) When you are done looking at the tabular database, close it by double clicking on the upper left-hand corner.

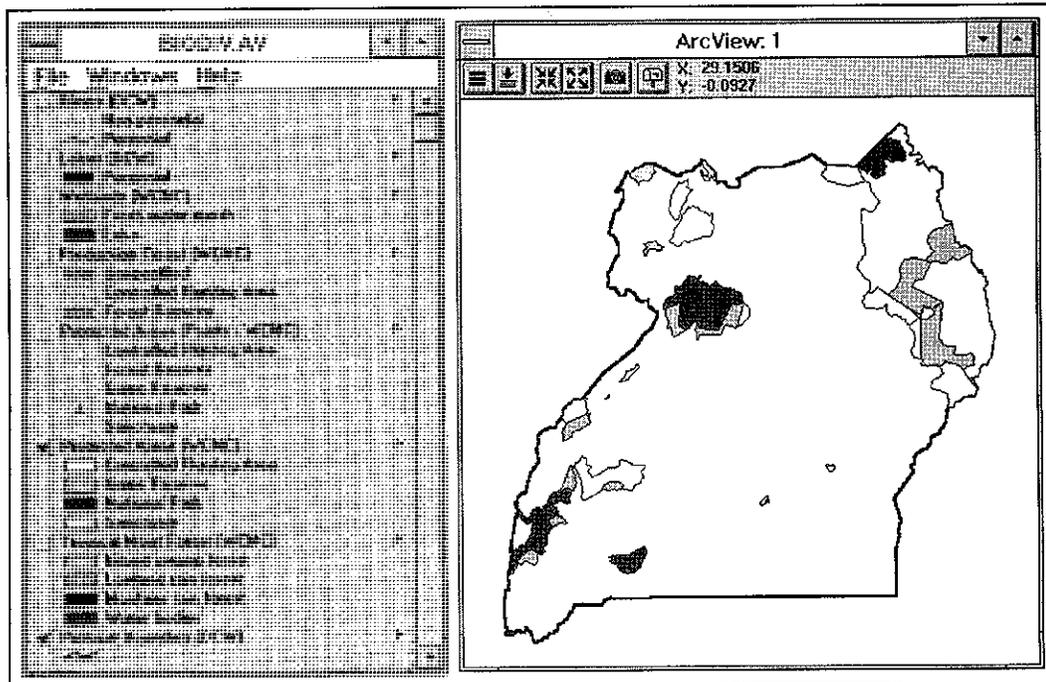


Figure 7 View of Protected Areas in Uganda

The IUCN has established categories for protected areas that reflect principal management objectives. This is a standardized classification that applies worldwide. Category I areas have the highest degree of protection. These areas are typically dedicated biological preserves. Category VIII areas are multiple-use areas where resource extraction is permitted, such as designated forests. The **PROTECTED AREAS** theme includes areas with IUCN categorizations (*iucncat*) of II, IV, V, and VIII. These include national parks, managed reserves and sanctuaries, and multiple-use management areas. (See Appendix C for a full description of the Protected Areas polygon data set, which is called PARKPY.)

It is easy to reclassify a theme based on a different attribute.

- 3) To reclassify **PROTECTED AREAS** by *iucncat*:
 - a) Duplicate **PROTECTED AREAS** in the map legend by clicking on the triangle next to the theme name and selecting *Duplicate*. You will then see a duplicate of this theme in the map legend.
 - b) Using the theme that is positioned higher in the map legend, access its legend properties by clicking on the small triangle and selecting *Properties*, and then clicking *Legend*.

- c) At present, `designat` is the item highlighted and therefore classified. Click on `iucncat` to establish this as the classified variable. The first category in the list might come up without a number. This is most likely a water body or some other unclassified feature within a protected area.
 - d) You can alter the shading of these areas by clicking and holding the *Symbol* button, and selecting either color ramp or random colors. If you select *Color Ramp*, you will be prompted for the starting and ending points for a color progression. Select colors indicative of high protection (start color) to low protection (end color).
 - e) If there is a category without a description, you might want to alter its color to show that it is not a part of the progression. You can do this by clicking on its drawing symbol, and selecting a new color or pattern. Click on *Apply* to implement this color scheme.
- 4) If you wish to add labels to **PROTECTED AREAS**:
- a) Click on *Labels*, which are located near the bottom of the *Legend Preferences* window within *Legend Properties*.
 - b) Within the *Labels* window, select `areaname` as the label item.
 - c) Position the text centrally within the polygon by clicking the button in the center of the word text.
 - d) Select a text size of about 10 and click on the *OK* button.
 - e) Click on *Apply* to implement this change.

Labels can be turned off later by clicking on *Labels* within *Legend Preferences* to switch the X off and then clicking on *Apply* again.

- 5) Examine this new display. Note that the classification based on `designat` draws first and is then covered over by the classification based on `iucncat`. (Themes lower in the map legend draw before those higher up.) If you click and hold the theme based on the `iucncat` categorization and move it to below the theme based on the `designat` categorization, it will draw first.
- 6) Turn off one of the **PROTECTED AREAS** displays at this time.

Other themes can be compared to **PROTECTED AREAS** to see the types of features that are protected or the types of features or activities that occur in or near protected areas. For Uganda, **PRODUCTION FOREST** has been established with a hatched drawing symbol. This allows you to clearly see the overlap and interplay between different themes.

- 7) Turn on the **PRODUCTION FOREST** theme.

- 8) *Zoom in* on the southwest part of the country and locate Rwenzori National Park. Note the overlap between the National Park and the Forest Reserve.

Within the following optional Tour, an additional theme is added to the View and compared with **PROTECTED AREAS** for Uganda.

Optional Tour—Comparing DCW Roads with Protected Areas

- 1) To add a new **ROADS** theme from DCW to this View:
 - a) Select *Add* from the *File* menu in the map legend.
 - b) Click in sequence on the subdirectories for ROBINSON, DATA, and DCW, so that DCW coverage names are displayed.
 - c) In the list of files on the left, scroll down, select RDLINE (for Road line), and click on *OK*. This adds RDLINE as a theme to the top of the map legend.

You may wish to change the drawing symbol for **RDLINE** by going into *Legend Preferences*. This process was described under the Optional Base Map Tour. You can also change the name displayed for the theme by typing in a new one (**ROADS**) under theme *Properties* and then clicking on *Apply*.

- 2) Turn on the **ROADS** theme.
- 3) Examine the pattern of roads and protected areas for the whole country, and then *Zoom in* on some **PROTECTED AREAS**. Do areas with greater protection status (such as national parks) have fewer roads cutting across them than areas with lower protection status (such as controlled hunting areas and forest reserves)?

You may add other themes from the DCW or WCMC Biodiversity data sets, such as **Populated Places** or **Railroads**, and perform a similar visual analysis.

Tropical Moist Forest Tour

- 1) Turn off all themes except for the **POLITICAL BOUNDARIES**.
- 2) *Zoom out* to the full extent of the country.
- 3) Turn on **TROPICAL MOIST FOREST**. These areas are classified according to vegetation type. There are four categories for Uganda: Inland swamp forest, Lowland rain forest, Montane rain forest and Water bodies. Areas not classified are forests other than tropical moist forest, nonforest vegetation, open land, urbanized areas, or some other land cover.

- 4) Turn on the **RIVERS** and **LAKES** for Uganda.
- 5) *Zoom in* very closely to a wide river or a lake. Can you see any discrepancy between the water body in the WCMC Tropical Moist Forest coverage and DCW coverage? *Zoom in* to examine the difference in registration in greater detail.
- 6) Click on the *Measure-along-a-line* tool in the *Tools* menu. Using the left button on the mouse, measure the distance between two distinct points that reflect the degree of misregistration. The length of the measurement will be shown at the top of the View window.

Is your estimate less than 500 or 1,000 meters? This misregistration is insignificant for a 1:1,000,000 scale data set, and is apparent only when you zoom in to a greater degree than is appropriate for a data set of this scale. This type of misregistration is common when data sets from different sources are integrated.

- 7) *Zoom out* to see the whole country.
- 8) Turn on the **PROTECTED AREAS** theme. Do many of the protected areas overlap with the Montane rain forest? It might be difficult to answer this if both themes use solid drawing symbols.
- 9) Change the display of **PROTECTED AREAS** to cross-hatched symbols under the theme *Properties* window.
 - a) After bringing up the legend properties for **PROTECTED AREAS**, double click on the first solid color in the key.
 - b) Rather than changing the color, change the pattern. You can scroll down the options until you see a cross-hatched symbol. Click on the symbol and then on *OK*.
 - c) Next, click and hold the *Symbol* button and select *Uniform Pattern*. This will change all of the drawing symbols to the hatched pattern.
 - d) Click on *Apply* to execute this change.

Explore this new display to see whether many of the Protected Areas overlap with the Tropical Moist Forest.

Wetlands Tour

- 1) Turn off all themes except for the **POLITICAL BOUNDARIES**.
- 2) *Zoom out* to the full extent of the country.

- 3) Turn on the **WETLANDS** theme. What types of wetlands and water bodies are classified within this theme?
 - 4) *Zoom in* on an area with many **WETLANDS**.
 - 5) Using the *Identify* tool, click on several different **WETLANDS** polygons to see the types of information available from WCMC on wetlands.
 - 6) Turn on **RIVERS** and **LAKES** from the DCW. This provides a richer context for examining wetlands. You might notice some minor misregistrations similar to those identified within the Tropical Moist Forest Tour.
 - 7) Turn on the **PROTECTED AREAS** theme with the cross-hatched pattern.
 - 8) *Zoom in* on some of the **WETLANDS** areas. Are many of the wetlands protected?
 - 9) Within the tabular database for **WETLANDS**, you can calculate the total area of a given type of wetland, such as Freshwater marsh.
 - a) Click and hold the triangle next to the **WETLANDS** theme in the Map Legend and select *Table*.
 - b) Select the *Hammer* tool from the top of the table window. A window pops up that allows you to specify which subset of features you wish to examine.
 - c) Click on the item `classtx` (class text); click on the "=" operator; select "Fresh water marsh" under the item descriptions. Notice that the equation appears below. Complete the query by clicking on *Select*.
- All Freshwater marsh areas will now be highlighted both in the table and in the display window.
- 10) You can calculate summary statistics on these selected records.
 - a) Click and hold on the item name area in the table.
 - b) Select *Statistics*.

The count tells you how many of the **WETLANDS** (total records) are Freshwater marsh (selected records). The total provides a summary of area in square meters for all Wetlands and for Freshwater marsh (under records and selected records, respectively). A similar function may be performed by first performing a spatial query, selecting **WETLANDS** features in the display window using the *Select-by-polygon* tool, and then selecting *Statistics* in the table window. For example,

WETLANDS that fall within protected areas can be compared with the total area of **WETLANDS** in a country.

This concludes the main Tour of the WCMC data. The following optional Tour provides a comparison of wetlands categorizations from WCMC and from DCW.

Optional Tour–Wetlands Comparison

- 1) Open the View called **WETLANDS.AV** for Uganda, which contains two themes that reflect categorizations of wetlands: the **WCMC WETLANDS** theme, which was explored in the last View, and a wetlands classification from the **LCPOLY** (land cover–polygon) coverage from DCW. In the initial View, only the WCMC categorization of **WETLANDS** is turned on.

Categorizing and delineating wetlands is complicated by the subjective nature of wetlands definition. The term wetlands refers to a broad range of ecosystem types that are at least seasonally flooded. The DCW contains one class for all types of wetlands and one class for perennial water. The WCMC African Wetlands database includes classes for Freshwater marsh, Impoundment, Lake, and Tidal wetland. Both classifications are based on ONC charts, though the WCMC classification incorporates information from the IUCN Wetlands Program as well.

- 2) Turn on both themes called **WETLANDS**. This will cause the DCW data to be displayed as a cross-hatched pattern overlaying the WCMC theme. The edges of the **WETLANDS** areas are marked with a solid pink line.

The WCMC **WETLANDS** and DCW data sets are fairly well registered. WCMC delineates several freshwater wetlands along DCW streams that are not reflected in the DCW. There are also several areas identified as wetlands in the DCW that are not included in the WCMC mapping. In general, the WCMC wetlands delineations are more extensive than those in the DCW. For example, in areas that show wetlands from both sources, the wetlands in the WCMC database are larger and more spatially generalized than those in the DCW.

- 3) *Zoom in* and explore several **WETLANDS** areas.

What other data sets include wetlands? You may turn on the **RIVERS** and **LAKES** from DCW and compare the nonperennial water bodies with the WCMC **WETLANDS**.

The next View introduces the data set that represents population and that has been integrated into the ADS. When exiting the current View, take care to avoid overwriting the current View. (Refer to ArcView Tips–Exiting Views.)

VIEW 3—POPULATION DATA SET

The Population View includes three themes developed from the population data set, along with several themes from the DCW for Guinea.

- 1) To open the Population View for Guinea:
 - a) Choose *Open* from the *File* menu. This will open the file browser window.
 - b) Go to the directory where the Views are stored. First, double click on the ADS subdirectory; double click on the GUINEA subdirectory, and then the ROBINSON subdirectory; and then double click on the VIEWS subdirectory in the dialog box on the right. The Views available in the ADS for Guinea will appear in the dialog box on the left.
 - c) Either click twice rapidly on **POP.AV** or click once to highlight **POP.AV** and select the *Open* button.

- 2) Enlarge the map legend, if necessary, so all themes are visible.

This initial View reflects an estimate of population density in 1994 by second-level administrative district for all of Guinea. For some countries, population coverage includes major water bodies, which are established as a separate theme within this View. Figure 8 reflects this View.

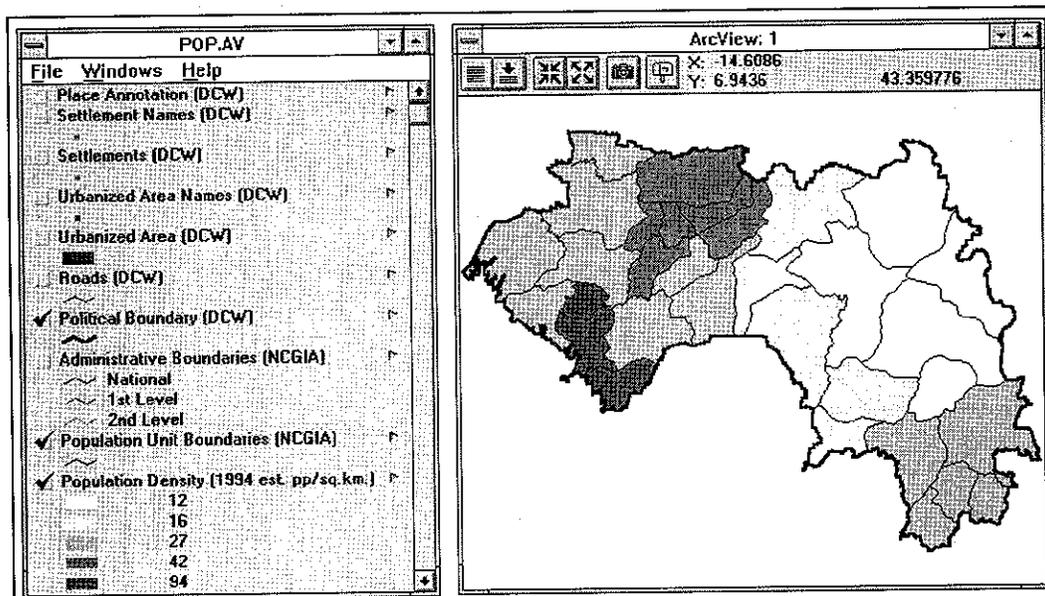
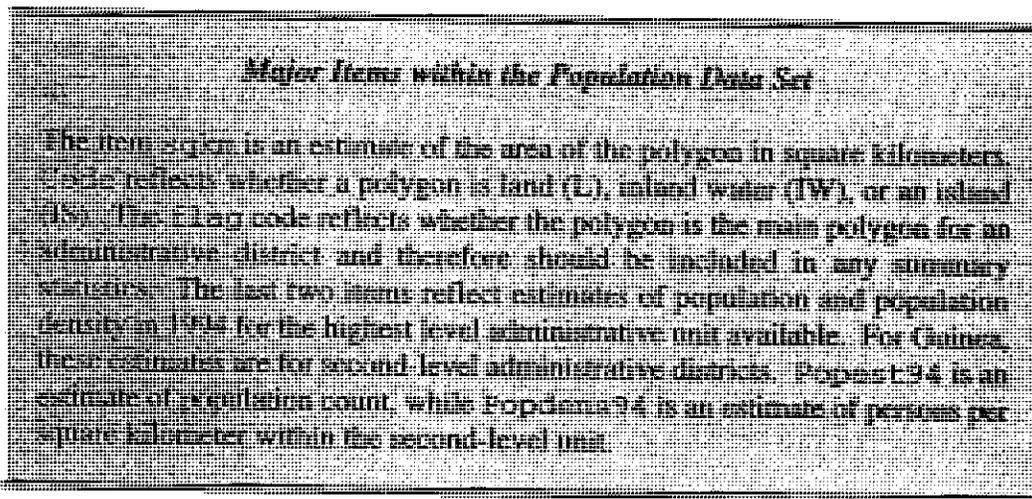


Figure 8 Population Density for Guinea

Population Data Set Tour

- 3) Use the *Identify* tool to examine the attributes of one of the **POPULATION DENSITY** polygons.

There are 25 attribute items associated with each of these polygons. Appendix C provides a detailed description of all items contained in the Population data set. It is important to have a good understanding of the items if you plan to use the data set for any applications. Several important items from the data set are described in the box below.



- 4) Click on several of the **POPULATION DENSITY** polygons to see estimates of population density. (You will need to scroll down to the bottom of the list of items.)
- 5) Examine the map legend for **POPULATION DENSITY**. This is a six-category, quantile classification. (The method for excluding polygons is explained below.) In a quantile classification, roughly the same number of objects is assigned to each class. Other classifications available in ArcView are equal interval, unique value, and customized ranges.
- 6) Bring up the *Properties* window for **POPULATION DENSITY** by double clicking on the theme name. In the box next to the *Hammer* tool is a line that reads "(code ^ lk 'IW')", which basically excludes any polygons with code = 'IW' (inland water) from being mapped. (No water bodies are included in the coverage for Guinea, but they may be for other countries.) Exit the *Properties* Window.

- 7) Turn on **URBANIZED AREAS** and **URBANIZED AREA NAMES**, which are both from the DCW.
- 8) *Zoom in* to the area near Conakry.
- 9) Turn on **PLACE ANNOTATION** and **SETTLEMENT NAMES** and *Zoom in* further. *Annotation* is descriptive text used to label coverage features. Unlike **SETTLEMENT NAMES**, which displays the contents of an attribute field of a theme, *Annotation* is not topologically linked with other features. It is used for display purposes only. (For further information on *Annotation*, see Appendix D, PC ARC/INFO Data Structure and Terminology.)

Do the DCW **SETTLEMENT NAMES** agree with the **PLACE ANNOTATION**? Because these data rely on the same information but were produced through different methods, agreement is likely to be considerable, but not absolute.

- 10) Turn off **POPULATION DENSITY**.
- 11) Turn on **ADMINISTRATIVE BOUNDARY**. Within this line coverage, the lines are color coded to reflect 1st- and 2nd-level administrative boundaries and national boundaries.
- 13) Turn off the **URBANIZED AREA NAMES**, **SETTLEMENT NAMES**, and **PLACE ANNOTATION**.
- 14) *Zoom out* to observe **ADMINISTRATIVE BOUNDARIES** for the whole country.
- 15) Look at the *Properties* for **ADMINISTRATIVE BOUNDARIES**. The item feature reflects whether the line represents a national, 1st- or 2nd- level administrative boundary, or a water body. How could this be used to produce a theme of only 1st-level administrative boundaries?

The following optional Tour provides a description of how to spatially select a set of polygons and calculate summary statistics for the selected set. Within this example, you calculate the total population within all administrative districts adjacent to a national park. Because of the varying size of administrative units, both within and among countries, this may over- or under-estimate the population living near the park. The example was included in order to demonstrate this capability in ArcView.

Optional Tour—Calculating Summary Statistics Based On a Spatial Selection

- 1) Turn off all layers except for **ADMINISTRATIVE BOUNDARIES**.
- 2) Add the **PROTECTED AREAS** polygon coverage called **PARKPY** (park polygons) from the WCMC directory. This procedure for adding a theme was previously described under Optional Tour for Protected Areas.
- 3) Classify this theme by *designate*, select a cross-hatched pattern for display, and turn on the polygon outline.
- 4) Turn on **PROTECTED AREAS**.
- 5) *Zoom in* on a national park.
- 6) Turn on **POPULATION DENSITY**. This results in a visual overlay of **PROTECTED AREAS** and **POPULATION DENSITY**.
- 7) Make sure that the **POPULATION DENSITY** theme is elevated in the Map Legend, and that this is the only elevated theme. This makes **POPULATION DENSITY** the theme available for selection.
- 8) Click on the *Select-by-Polygon* tool. To select administrative districts adjacent to the national park:
 - a) Trace around the park using the *Select-by-Polygon* tool and the left button of your mouse.
 - b) Double click the left button when you wish to close the polygon.

This results in all **POPULATION DENSITY** polygons within or overlapping this buffer to be selected and also results in their color changing. It will take a while for this layer to redisplay.

- 9) You can now look at summary statistics for the selected set of features:
 - a) Open the *Table* for **POPULATION DENSITY**.
 - b) Enlarge the table to the full screen.
 - c) Scroll to the right until the *Popest94* variable is in view.
 - d) Click and hold *Popest94* and select *Statistics*.

This results in the display of summary statistics on both the full **POPULATION DENSITY** theme and the subset of selected records. The *Sum* under *Selected Records* provides an estimate of the number of people living in administrative districts in or adjacent to the national park. The summary statistics may

overestimate population in areas where administrative units consist of more than one polygon. These areas have to be excluded with the help of the flag code.

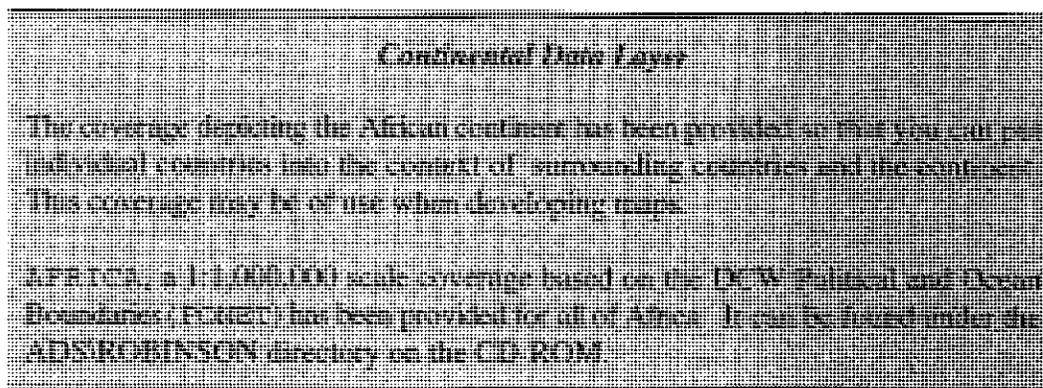
CREATING YOUR OWN VIEWS

This concludes the Guided Tour of the Africa Data Sampler. You should explore the data further on your own and create Views based on applications you develop. It is easy to create your own Views. You might want to start with one of the Views used in the Guided Tour, but remember to use the *Save As* option under the *File* menu to save the View under a new name.

Once you open an existing View that you intend to modify, you can:

- 1) Add additional themes using the *Add* option under the *File* menu. This procedure was described under the Optional Tour for Protected Areas.
- 2) Remove themes by clicking on the triangle next to the theme name and selecting *Remove*.
- 3) Once you have the themes you want included in the View, you can reclassify the theme display and change the drawing order by reordering the themes in the map legend.
- 4) By using the *Save As* option under the *File* menu, you can establish a new name for this View.

You can develop themes for two countries or a region by adding themes for other countries. You can then choose to use the same classification and shading to compare characteristics across borders or around the region.



V. OUTPUT AND DISPLAY IN ARCVIEW AND WINDOWS

The quality of display you see depends on the supported screen and color resolution of your PC's video card and monitor. The ADS Views were developed using a screen resolution of 640 x 480 pixels and 256 colors.

ArcView provides several options to produce hard-copy output. These options include:

- Printing a map directly to a dot-matrix printer, laser printer, paintjet printer, or plotter (pen or electrostatic).
- Printing a map layout to a file that can be reprinted at a later date.
- Saving the display to a Windows metafile that can be imported into a Windows word processing program such as WordPerfect for Windows or Microsoft Word. Graphics are to be incorporated with text this way, but ArcView will not export the legend.
- Capturing the Map legend and the Display Window to the Windows Clipboard, which may be edited in the Windows Paintbrush™ program and imported to a Windows word-processing program.

The first three options are accessed by the *Camera* icon in the Display Window. To control whether clicking the *Camera* icon will bring up ArcView's map layout facility or capture the map elements in the current Display Window to a file, choose the *Preferences* option under the *File* menu. Next click on *Display Snapshot*. Here you have several choices. Two of these choices are discussed below.

MAP LAYOUT

ArcView features a highly automated map-generation capability that makes it relatively easy to print maps of current Views. This procedure is useful for producing maps quickly but does not allow the degree of control needed to produce large maps of high cartographic quality.

The following steps serve as a rough guideline for producing hard-copy output. For more details, refer to your ArcView manual.

- 1) From above the map legend, select *File* and *Preferences*. Once the *Preferences* menu appears, click on *Display Snapshot* and make sure that output is directed to the printer. Click on *OK* to leave the *Preferences* window.

- 2) From above the map, click on the *Camera* icon. This will cause a printer control panel to pop up. Select the appropriate printer.
 - a) Click on the bar marked *Setup*, which allows you to switch between portrait (upright) and landscape (wide) orientation.
 - b) Click on *OK* to exit this menu.
- 3) Click on the *Layout* box. This will cause the contents of the current View to be laid out automatically on the page.

The automatic layout includes the map, the associated key, and a generic title to be positioned on the page according to the layout format selected at the upper right corner of the current screen. If you have any annotation themes turned on, they will display on the map.

You can alter the layout by changing the format selected. A scale bar and north arrow may also have been created as part of the layout. For the Robinson projection version of the ADS, the units of the scale bar are in meters. If you were to use the Geographic version of the ADS, the units of the scale bar would be decimal degrees.

The map title can be altered by typing a new title in the text box. Elements of this display, such as the map itself and the key or legend, can be resized and moved. Grab a corner of the map and stretch it. Click on the map and reposition it. You can move all map elements in this manner.

- 4) Once the map is in a desired layout, click on *OK*. The map should now print out.

The map layout can be saved to a file, copied to a parallel port, and sent directly to a printer at a later time. This enables a small batch program that requires a degree of processing time to be created for hard-copy output. Because ArcView does not save layouts when a View is closed, this is a good choice for saving a map.

To do this, choose the *Print to File* option in the printer control panel dialog. Be sure that both of the boxes to the left of the *Print to File* text and the *Layout* text each have an X placed in them.

CREATING A WINDOWS METAFILE

Graphics can be saved in either vector or bitmap format. Both formats can be exported to other windows applications, such as WordPerfect for Windows. Vector format is the preferred format when using ArcView since bitmap format graphics can appear blocky. Vector format, however, may not work for complex graphics.

VI. ADDITION AND MANIPULATION OF TABULAR DATA IN WINDOWS

Users unfamiliar with GIS concepts and ARC/INFO file structures should read Appendix D prior to reading this section.

The geographic data sets provided in the ADS include tabular information that can be accessed and modified using a spreadsheet or database program. This allows you to update data, append additional tabular data, or perform statistical analyses. (The only way to change the spatial features in the data sets is to use ARC/INFO or ArcCAD, which will allow you to modify and add to both the spatial features and their associated descriptive tabular data.) The attribute (tabular) information in the data sets is stored in dBase format, which can be accessed through a number of software packages that can read and write .DBF format files, such as dBase IV™, Microsoft Excel™, and Quattro Pro™. Once the information is open in a spreadsheet, additional descriptive data can be added to the attribute data for the geographic features.

You may want to update attributes for certain data themes, such as settlement names or the current status of roads, or add socioeconomic or other types of tabular data to feature locations. What kind of data might be available for urbanized areas or settlements? Is any census data available, aggregated by city or administrative district? Is there tabular information describing local development efforts and investments? Such information may be added to the settlement and urbanized area data from DCW and then displayed, queried, and compared to the other geographic data sets in ArcView.

Before manipulating coverage attribute data, keep the following precautions in mind:

- Always make a backup of the entire coverage (directory) before bringing the files into Excel or another spreadsheet or database-management software package.
- Do not delete any records from the data. This will corrupt the original data set.
- Do not sort the data records. (If you must sort, you will need to return to the original order before saving the file.)
- Carefully review the field being used to link additional data before performing any action. A settlement name spelled in a slightly different way or with different-case letters will pose a problem when joining tabular data.

- Make note of the item widths shown in the Data Dictionary. You will need to verify them before saving any changes made to attribute tables. Never change item widths or types in the original data because this can result in loss of data.

The following example shows how to view and update a point or polygon attribute table using Microsoft Excel™ 4.0.

Example:

- 1) Copy the PAT.DBF file in the coverage directory to PAT.BAK.
- 2) Start up MS Excel and choose *Open* from the *File* menu. The MS Excel file browser will appear.
- 3) Choose *dBase files* from the *List of File Types*.
- 4) Double click on the C:\ icon to display the root directories. Scroll down to the ADS subdirectory and move down the directory structure by clicking on the subdirectories until you reach the coverage with the attributes you want to modify. Click on the coverage name.
- 5) The PAT.DBF will appear in the file box to the left. Double click on the file name or click once to highlight and then click on the *Open* button. This will open the dBase format attribute table as an MS Excel spreadsheet.
- 6) Make your modifications to the data. You can modify specific attributes (e.g., settlement names) or add new fields as you wish. Be sure that you do not delete any records and do not change the item widths or types of the original fields. If you add fields, be sure that the format corresponds to the content (e.g., character, numeric, etc.).
- 7) Save the file in dBase format as PAT.DBF. Note: If you cannot save it directly, first save it under a new name and then copy the file to PAT.DBF under the coverage directory.

VII. BENEFITS, LIMITATIONS, AND POTENTIAL EXTENSION OF THE AFRICA DATA SAMPLER

SOFTWARE ISSUES

ArcView was chosen to integrate and display data in the Africa Data Sampler because it is available free of charge (contact ESRI via e-mail at info@esri.com or via the World Wide Web at <http://www.esri.com>), easy to use, and has general potential for data and technical support through a widespread ARC/INFO customer base. One objective of the ADS is to foster national application development and information sharing. ArcView functions are advantageous for data exchange because a single View can access numerous coverages. Users can easily display multiple coverages, and Views permit interactive query of a variety of data sets. This choice does not exclude users of other GIS software from the benefits of the ADS compilation. The data sets are provided in PC ARC/INFO format, and conversion programs to and from this format are generally distributed by software manufacturers. Users of other software should be able to access and integrate the ADS with data sets created using common GIS software packages.

ArcView is useful for displaying data, performing visual overlays, and querying data. It also permits you to show data from several sources together. However, it does not support more advanced statistical or spatial analysis functions. For example, the population per kilometer for administrative districts cannot be calculated by dividing two data fields within ArcView. Spreadsheet, database, and statistical packages can externally calculate new field values; thereafter, these values can be displayed using ArcView. (See Section VI for details.)

ArcView does not support the creation of spatial buffer zones around features or the overlay of two coverages to show feature intersection. To perform spatial modifications of the data or to create new spatial data sets, fuller function GIS software (such as ARC/INFO) is required.

DATA ISSUES

Issues relating to the imperfect nature of data and the difficulties associated with integrating data from different sources were raised in Section III (Information on Data Quality) and within the Guided Tours. The data sets included within the ADS were compiled at international centers in the United States and the United Kingdom, far from the countries that are the subjects of the ADS. Local knowledge of natural features, infrastructure, and place names is vastly superior to that which can be derived from maps produced on another continent, and local users of the ADS will find many errors of commission and omission. Village names are often missing or inaccurate. Many new roads may not be included

because of the age of the DCW source data. Similarly, additional national parks that may have been created may not be included, or their status may have changed. Data sets need to evolve if they are to correctly represent current conditions.

The ADS is not intended to be a definitive digital data set for a country. Rather, it is a useful set of data for demonstration purposes, for use in exploring geographic data and GIS, and for use in catalyzing further spatial data set development and exchange. Where more detailed spatial data sets are not available, the ADS can serve as a preliminary, coarse-scale data set for a country.

EXTENSIONS OF THE ADS

The ADS is a product that will evolve as attribute data is added and more national data sets become available. The current compilation provides a sense of the type of data and application that can be developed, but it is in no way comprehensive. The ADS provides an initial framework for incorporating other data sets or revised and improved data sets. Such extensions will produce a tool useful for coarse-scale regional analysis of social, economic, and environmental conditions. Examples of data sets that will enhance the ADS include more comprehensive land use; data on cultivated lands, wildlife distribution, natural resources, climate, and soils; economic data; and additional census and demographic data aggregated by prefectures or by population centers.

With the addition of new data sets, the potential for applications will expand. For example, imagine an approach to tracking and storing information on agricultural lands. A point representing a large tract of cultivated land is embedded with attribute data describing crop production, soil type, ownership, etc., and a national profile of agricultural tracts is employed as an indicator of annual productivity. Another potential application is project management. With additional point and associated tabular data, comprehensive managerial tools describing national economic, medical, educational, or development activities could be developed. Data supporting this type of application include: project site locations with cost, objectives, number of staff, type of community being served (e.g., communities, a hospital, or a school), or other variables. Principles directing the management of resources and activities could incorporate the distribution of natural or social resources and their environmental impact.

With the distribution of the ADS, responsibility for future development is largely held by users at the national level. The ADS is intended to serve as a preliminary reference framework that can be updated and customized based on user-defined needs. With the integration of many data layers, a valuable country profile may emerge that supports a variety of planning, monitoring, and decision-making processes.

Appendices

Appendix A Abbreviations Used in this Guide

Appendix B Data Catalog

Appendix C Data Dictionary

Appendix D PC ARC/INFO Data Structure and Terminology

Appendix E Africa Data Sampler Production Process

Appendix F Country Specific Data Sources and Processing Issues

Appendix A

Abbreviations
Used in this Guide

USAID	U. S. Agency for International Development
BML	Biodiversity Map Library
DCW	Digital Chart of the World
DEM	Digital Elevation Model
DMA	U.S. Defense Mapping Agency
EOSAT	Earth Observation Satellite Corporation
EDC	EROS Data Center
EROS	Earth Resources Observation System
ESRI	Environmental Systems Research Institute, Inc.
FAO	Food and Agricultural Organization of the United Nations
GIS	Geographic Information Systems
IUCN	World Conservation Union (formerly International Union for the Conservation of Nature and Natural Resources)
IFPRI	International Food Policy Research Institute
ILRAD	International Livestock Research and Development
MAB	UNESCO's Man and the Biosphere Program
NCGIA	National Center for Geographic Information and Analysis (at the University of California, Santa Barbara)
ONC	Operational Navigation Chart
PADCO	Planning and Development Collaborative International
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific, and Cultural Organization
USGS	U. S. Geological Survey
WCMC	World Conservation Monitoring Centre
WMD	Wetlands Map Database
WRI	World Resources Institute

Appendix B

Data Catalog

THEME	COVERAGE NAME	FEATURE CLASS	DESCRIPTION
Political Boundary	Ponet	polygon, line	Political boundary of the country
Small Coastal Islands	Popoint	point	Small coastal islands belonging to the country
Populated Places Annotation	Pppoint	annotation	Locations of urbanized areas and villages
Settlement Names	Pppoint	point	Locations of urbanized areas and villages
Settlements	Pppoint	point	Locations of urbanized areas and villages
Urbanized Area Names	Pppoint	point	Locations of urbanized areas and villages
Urbanized Areas	Pppoly	polygon	Urbanized areas, generally representing the shape
Airports	Aepoint	point	Airport locations
Transportation Points	Tspoint	point	Bridges, tunnels, ferries, etc.
Transportation Structures	Tsline	line	Bridges, tunnels, ferries, etc.
Railroad	Rrline	line	Railroads
Roads	Rdline	line	Primary and secondary roads
Utilities	Utline	line	Power transmission lines
Drainage Points	Dnpoint	point	Locations of dams, reservoirs, springs/wells/waterholes
Supplemental Drainage Points	Dspoint	point	Small lakes and islands within inland water areas
Rivers and Streams	Dnnet	line	Perennial and nonperennial rivers and streams
Lakes	Dnnet	polygon	Perennial and nonperennial inland water
Spot Elevations	Hypoint	point	Points with elevation in feet and meters
Supplemental Spot Elevations	Hspoint	point	Points with elevation in feet and meters
Elevation Contours	Hynetl	line	Elevation contours in feet and meters
Supplemental Elevation Contours	Hsline	line	Additional contours in feet and meters
Elevation Ranges	Hynetp	polygon	Elevation ranges in feet and meters
Cultural Landmarks	Clpoint	point	Power stations, border posts, water tanks, campsites, etc.
Land Cover Annotation	Lcpoly	annotation	Surface features for some areas
Land Cover (points)	Lcpoint	point	Miscellaneous land features
Land Cover (polygons)	Lcpoly	polygon	Surface features for some areas
Data Quality	Dqnet	polygon, line	ONC information
Tropical Moist Forest	Forest	polygon	Types of forests
Wetlands	Wetlands	polygon	Wetlands classified by type
Production Forest	Prod_for	polygon	Classified production forest
Protected Areas (polygons)	Parkpy	polygon	Managed areas, including national forests and reserves
Protected Areas (points)	Parkpt	point	Center points of managed areas
Population Density	Pop	polygon	Human population by administrative unit
Administrative Boundaries	Pop	line	Type and level of boundary

Appendix C
Data Dictionary

The CD-ROM version of the Africa Data Sampler (ADS) is distributed in Robinson Projection as PC ARC/INFO coverages and in Geographic (unprojected) format as PC ARC/INFO Export files. In addition, individual country data sets are available on diskette as both Geographic and Robinson Projection PC ARC/INFO coverages. Within the Geographic version, data are provided in decimal degrees of latitude and longitude, while the units of the Robinson Projection are meters.

Projection Information

The Africa Data Samplers is distributed in a common projection—Robinson. The following set of parameters was used to project the data sets for each country in Africa:

Projection:	Robinson
Units:	Meters
Central meridian:	15° East
False easting:	4,500,000 meters
False northing:	4,500,000 meters

The values of 4,500,000 for false easting and false northing were chosen to facilitate measurements of distances and area for all African countries. These values result in positive coordinate values for all of Africa. Use of the default values of zero for false easting and false northing would result in negative coordinate values for the Western and Southern hemispheres.

The Robinson projection was chosen for the ADS because it allows for proportional representation of area with relatively minor distortion of distance and shape for areas within 45 degrees of the equator, which includes all of Africa.

PC ARC/INFO Internal Fields

PC ARC/INFO coverage attribute tables are assigned several default fields. Values for all items that store measurements (e.g., area, perimeter, length) are in coverage units (e.g., meters).

The default fields for Polygon and Point coverage attribute tables (PAT.DBF, Point/Polygon Attribute Table) are Area, Perimeter, an internal ID (cover_), and a user ID (cover_ID). Note that for Point coverages' values for the Area and Perimeter items are zero. The default fields for line coverage attribute tables (AAT.DBF, Arc Attribute Table) are Length; an internal ID (cover_); a user ID (cover_ID); Fnode_, a numeric identifier indicating the beginning point of a line feature; Tnode_, a numeric identifier indicating the ending node of a line feature; Lpoly_, the ID of the polygon to the left of a line feature; and Rpoly_, the ID of the polygon to the right of a line feature. Lpoly_ and Rpoly_ values for Line coverages are zero unless the coverage also has polygon topology.

Some of these fields cannot be viewed within the function of ArcView but are visible when the attribute table is opened in dBase format.

Notes

- An asterisk (*) demarcates items added by PADCO, Inc.
- The Data Dictionary lists all potential codes and definitions for each variable for each coverage. Not all features and variable types are necessarily included in a country-specific coverage.
- Annotation is blank for some coverages.

Africa Data Sampler Themes

Within the Data Dictionary, themes are ordered first by source of data (DCW, WCMC, NCGIA) and then by coverage name (i.e., AEPOINT for Airports and CLPOINT for Cultural Landmarks). A list relating themes to coverage names can be found in Appendix B, Data Catalog.

The following page shows the order of the coverages within this data dictionary and describes the coverage.

COVERAGE	DESCRIPTION	PAGE NO.
Base Map Data Sets		
Aepoint	Airports	C-4
Clpoint	Cultural Landmarks	C-5
Dnnet	Drainage	C-6
Dnpoint	Drainage Points	C-8
Dqnet	Data Quality	C-9
Dspoint	Supplemental Drainage Points	C-11
Hsline	Supplemental Elevation Contours	C-12
Hspoint	Supplemental Spot Elevations	C-13
Hynetl	Elevation Contours	C-14
Hynetp	Elevation Ranges	C-15
Hypoint	Spot Elevations	C-16
Lcpoint	Land Cover Features	C-17
Lcpoly	Land Cover Features	C-18
Ponet	Political Boundary	C-19
Popoint	Small Coastal Islands	C-21
Pppoint	Populated Places	C-22
Pppoly	Urbanized Areas	C-23
Rdline	Roads	C-24
Rrline	Railroad	C-25
Tsline	Transportation Structures	C-26
Tspoint	Transportation Points	C-27
Utlne	Utilities	C-28
Biological Diversity Data Sets		
Forest	Tropical Moist Forest	C-29
Parkpt	Protected Areas, Points	C-31
Parkpy	Protected Areas	C-32
Prod_for	Production Forest	C-36
Wetlands	Wetlands	C-37
Population Data Set		
Pop	Population	C-39
Continental Data Set		
Africa	Political Boundaries for Africa	C-42

Not all coverages are available or complete for each country. (See Table 2--Availability of Data Layers.)

Base Map Data Sets

THEME: Airports
COVERAGE NAME: AEPOINT
FEATURE CLASS: point
DESCRIPTION: Airport locations with airport type, name, and elevation
DATA SOURCE: DCW
SOURCE SCALE: 1:1,000,000

Point Attribute Table

AEPOINT.PAT

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	AREA	13	N	6	
14	PERIMETER	13	N	6	
27	AEPOINT_	11	N	0	
38	AEPOINT_ID	11	N	0	
49	AEPTTYPE	2	N	0	Airport type - numeric code
51	AEPTTYPEX	25	C	0	*Airport type - text
103	AEPTNAME	40	C	0	Airport name
143	AEPTVAL	5	N	0	Airport elevation value
148	AEPTDATE	8	D	0	Data revision date
156	AEPTICAO	4	C	0	International Civil Aviation Organization Number
160	AEPTDKEY	7	C	0	DAFIF reference number
167	LONG	13	N	6	*Decimal degrees longitude
180	LAT	13	N	6	*Decimal degrees latitude

AEPTTYPE

code	definition
1	Active civil
2	Active civil and military
3	Active military
4	Other
5	Added from ONC when not available from DAFIF

ANNOTATION

None.

THEME: Cultural Landmarks
COVERAGE NAME: CLPOINT
FEATURE CLASS: point
DESCRIPTION: Locations of power stations, border posts, water tanks, campsites, and other landmarks
DATA SOURCE: DCW
SOURCE SCALE: 1:1,000,000

Point Attribute Table

CLPOINT.PAT					
COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	AREA	13	N	6	
14	PERIMETER	13	N	6	
27	CLPOINT_	11	N	0	
38	CLPOINT_ID	11	N	0	
49	CLPTLABEL	50	C	0	Landmark description
99	CLPTFLAG	2	N	0	Proper name flag
101	LONG	13	N	6	*Decimal degrees longitude
114	LAT	13	N	6	*Decimal degrees latitude

ANNOTATION

Text describing cultural landmarks that are not represented by a single point (e.g., "plantation" and "numerous campsites and sheepfolds").

THEME: Drainage
COVERAGE NAME: DNNET
FEATURE CLASS: line, polygon
DESCRIPTION: Drainage network including perennial and nonperennial streams and rivers, lakes, and canals
DATA SOURCE: DCW
SOURCE SCALE: 1:1,000,000

Polygon Attribute Table

DNNET.PAT

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	AREA	13	N	6	
14	PERIMETER	13	N	6	
27	DNNET_	11	N	0	
38	DNNET_ID	11	N	0	
49	DNPYTYPE	2	N	0	Drainage feature type - code
51	DNPYTYPETX	30	C	0	*Drainage feature type - text

DNPYTYPE

code	definition
1	Perennial
2	Non-perennial
3	Wet sand. Includes wet sand and sand deposits in and along riverbeds.
4	Snowfield, glacier, ice field, or ice caps.
9	None. This code is used for any area that is not a Drainage feature. Polygons within this code include the background polygon, islands within inland water or ice areas, land areas enclosed by stream or river courses, or ocean areas.

Arc Attribute Table

DNNET.AAT

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	FNODE_	11	N	0	
12	TNODE_	11	N	0	
23	LPOLY_	11	N	0	
34	RPOLY_	11	N	0	
45	LENGTH	13	N	6	
58	DNNET_	11	N	0	
69	DNNET_ID	11	N	0	
80	DNLNTYPE	2	N	0	Drainage line type - code
82	DNLNTYPETX	50	C	0	*Drainage line type - text
182	DNLNSTAT	2	N	0	Drainage line status - code
184	DNLNSTATTX	50	C	0	*Drainage line status - text

(continued)

Arc Attribute Table (cont.)

DNLNTYPE

code	definition
1	Streams, rivers, or channelized rivers
2	Inland shorelines
3	Wet sand limits
4	Canals - aqueducts - flumes - penstocks - kanats
5	Glacial limits
6	Snowfield, glacier, land ice to water ice or ocean
7	Ice free limits (land/ice line)
8	Connectors (used to separate inland water from open ocean)**
9	Tile boundary or null arc

** These lines were derived from the border between the shade for inland water (dark blue) and open ocean or ocean ice (light blue) on the ONC sheets.

DNLNSTAT

code	definition
1	Perennial
2	Nonperennial
3	Definite (used for inland shorelines only)
4	Indefinite (used for inland shorelines only)
5	Unsurveyed perennial (used for streams only)
6	Unsurveyed nonperennial
7	Abandoned
8	Under construction
9	Suspended or elevated
10	Underground
11	Above ground
88	ONC module boundary
99	None (no status associated with feature)

ANNOTATION

Geographic names of selected rivers, streams, lakes, reservoirs.

NOTES

- The political boundary was used to clip all layers except for hydrology (DNNET). In clipping hydrology a 1 km buffer of the political boundary was used so as to include rivers which lie along the national border and those that inaccurately fall outside the border.
- Drainage includes some rivers that were taken from tile or ONC sheet boundaries to maintain connectivity among features.

THEME: Drainage Points
COVERAGE NAME: DNPOINT
FEATURE CLASS: point
DESCRIPTION: Locations of falls, dams, reservoirs, springs/wells/waterholes, and other features
DATA SOURCE: DCW
SOURCE SCALE: 1:1,000,000

Point Attribute Table

DNPOINT.PAT

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	AREA	13	N	6	
14	PERIMETER	13	N	6	
27	DNPOINT_	11	N	0	
38	DNPOINT_ID	11	N	0	
49	DNPTTYPE	2	N	0	Drainage point type - code
51	DNPTTYPETX	35	C	0	*Drainage point type - text
57	LONG	13	N	6	*Decimal degrees longitude
70	LAT	13	N	6	*Decimal degrees latitude

DNPTTYPE

code	definition
1	Springs, Wells, or Waterholes
2	Reservoir
3	Falls
4	Rapids
5	Locks
6	Dams
7	Sluice Gate

ANNOTATION

Descriptions of selected Drainage features that cannot be represented by a single point location; for example, "numerous wells" or "hot springs."

THEME: Data Quality
COVERAGE NAME: DQNET
FEATURE CLASS: polygon, line
DESCRIPTION: Source ONC sheet boundaries and DCW tile boundaries
DATA SOURCE: DCW
SOURCE SCALE: 1:1,000,000

Point Attribute Table

DQNET.PAT					
COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	AREA	13	N	6	
14	PERIMETER	13	N	6	
27	DQNET_	11	N	0	
38	DQNET_ID	11	N	0	
49	DQPYSID	6	C	0	ONC sheet IDs
55	DQPYCOM	8	D	0	Compilation date of source ONC
63	DQPYREV	8	D	0	Last revision date of ONC
71	DQPYLIT	8	D	0	Lithograph or print date of the current revision
79	DQPYREM	40	C	0	Remarks or comment field for sheetwide characteristics (e.g., "All roads are approximate alignment")
119	DQPYAHA	11	N	0	Absolute horizontal accuracy (in feet)
130	DQPYAVA	11	N	0	Absolute vertical accuracy (in feet)

Arc Attribute Table

DQNET.AAT					
COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	FNODE_	11	N	0	
12	TNODE_	11	N	0	
23	LPOLY_	11	N	0	
34	RPOLY_	11	N	0	
45	LENGTH	13	N	6	
58	DQNET_	11	N	0	
69	DQNET_ID	11	N	0	
80	DQLNID	4	N	0	Unique line identifier used to link additional attribute data
84	DQLNONC1	6	C	0	ONC sheets on either side of
90	DQLNONC2	6	C	0	the line feature

ANNOTATION

Sixteen annotation layers under DQNET contain descriptive text corresponding to the DCW thematic layers (e.g., drainage including DNNET, DNPOINT, DSPOINT; elevation including HYNETL, HYNETP, HYPOINT, HSLINE, HSPOINT). Examples of annotation include "Limits of reliable relief information" and "Drainage features (polygons and lines) are irreconcilable on the source." These features were edited during database production to maintain a consistent drainage network.

NOTES

- While the revision date may be fairly recent for an ONC sheet, this does not mean that all map features were revised. Thus, the most reliable date for the data is reflected in the compilation date.
 - Tile boundary lines were given item value of "TILE" for DQLNONC1 and DQLNONC2.
-

THEME: Supplemental Drainage Points
COVERAGE NAME: DSPOINT
FEATURE CLASS: point
DESCRIPTION: Small lakes and islands within inland water areas
DATA SOURCE: DCW
SOURCE SCALE: 1:1,000,000

Point Attribute Table

DSPOINT.PAT

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	AREA	13	N	6	
14	PERIMETER	13	N	6	
27	DSPOINT_	11	N	0	
38	DSPOINT_ID	11	N	0	
49	DSPTTYPE	2	N	0	Type of drainage - code
51	DSPTTYPEPX	60	C	0	*Type of drainage - text
188	LONG	13	N	6	*Decimal degrees longitude
201	LAT	13	N	6	*Decimal degrees latitude

DSPTTYPE

code	definition
1	Small lakes (includes lakes, reservoirs, lagoons)
2	Small islands within inland water areas

ANNOTATION

None.

THEME: Supplemental Elevation Contours
COVERAGE NAME: HSLINE
FEATURE CLASS: line
DESCRIPTION: Additional contours in feet and meters
DATA SOURCE: DCW
SOURCE SCALE: 1:1,000,000

Arc Attribute Table

HSLINE.AAT

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	FNODE_	11	N	0	
12	TNODE_	11	N	0	
23	LPOLY_	11	N	0	
34	RPOLY_	11	N	0	
45	LENGTH	13	N	6	
58	HSLINE_	11	N	0	
69	HSLINE_ID	11	N	0	
80	HSLNTYPE	2	N	0	Type of contour - code
82	HSLNTYPE_TX	90	C	0	*Type of contour - text
171	HSLNVAL	5	N	0	Elevation in feet
176	METERS	9	N	1	*Elevation in meters

HSLNTYPE

code	definition
1	Intermediate or auxiliary contour
2	Depression contour
3	Approximate intermediate or approximate auxiliary contour
4	Carrying contour where two or more contour lines with different elevation values meet
5	Cut or fill within one contour interval
6	Unreliable
7	Transition or erroneous contour
8	Approximate depression contour

ANNOTATION

None.

THEME: Supplemental Spot Elevations
COVERAGE NAME: HSPOINT
FEATURE CLASS: point
DESCRIPTION: Additional points with elevation in feet and meters
DATA SOURCE: DCW
SOURCE SCALE: 1:1,000,000

Point Attribute Table

HSPOINT.PAT					
COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	AREA	13	N	6	
14	PERIMETER	13	N	6	
27	HSPOINT_	11	N	0	
38	HSPOINT_ID	11	N	0	
49	HSPTVAL	5	N	0	Spot height elevation (feet)
54	METERS	9	N	1	*Spot height elevation (meters)
63	LONG	13	N	6	*Decimal degrees longitude
76	LAT	13	N	6	*Decimal degrees latitude

ANNOTATION

None.

THEME: Elevation Contours
COVERAGE NAME: HYNETL
FEATURE CLASS: line
DESCRIPTION: Elevation contours in feet and meters (every 1,000 feet)
DATA SOURCE: DCW
SOURCE SCALE: 1:1,000,000

Arc Attribute Table

HYNETL.AAT

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	FNODE_	11	N	0	
12	TNODE_	11	N	0	
23	LPOLY_	11	N	0	
34	RPOLY_	11	N	0	
45	LENGTH	13	N	6	
58	HYNETL_	11	N	0	
69	HYNETL_ID	11	N	0	
80	HYLNVAL	5	N	0	Elevation in feet
85	METERS	9	N	1	*Elevation in meters
94	HYLNTYPE	2	N	0	Type of contour - code
96	HYLNTYPEPX	100	C	0	*Type of contour - text

HYLNVAL

Valid contour line codes range from -1,000 feet to 29,000 feet incrementing by 1,000 feet. Boundaries associated with no data areas are assigned a value of 99999.

METERS

Elevation contour lines in meters were calculated from HYLNVAL and therefore range from -304.8 meters to 8,839.2 meters, incrementing by 304.8 meters. Boundaries associated with no data areas are assigned a value of 99999.

HYLNTYPE

code	definition
1	Closed land contour
2	Depression contour
3	Approximate closed land contour
4	Carrying contour - where contour lines coalesce
5	Approximate depression contour
8	Connector (An arbitrary connector of the contour network used to define no data or irreconcilable source data areas. Made to establish elevation zones as polygons.)
9	Tile boundary

ANNOTATION

None.

THEME: Elevation Ranges
COVERAGE NAME: HYPNETP
FEATURE CLASS: polygon
DESCRIPTION: Elevation ranges in feet and meters
DATA SOURCE: DCW
SOURCE SCALE: 1:1,000,000

Polygon Attribute Table

HYPNETP.PAT

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	AREA	13	N	6	
14	PERIMETER	13	N	6	
27	HYPNETP_	11	N	0	
38	HYPNETP_ID	11	N	0	
49	HYPYTYPE	2	N	0	Numeric code for elevation
51	HYPYTYPEPX	40	C	0	*Elevation ranges in feet
101	METERTXT	33	C	0	*Elevation ranges in meters

HYPYTYPE

code

definition

1	Below mean sea level
2	0 to 1000 feet above mean sea level
3	1000-3000 feet
4	3000-7000 feet
5	7000-11000 feet
6	11000 feet and above
7	Uncontoured or unsurveyed
8	Area does not have a 1000 foot interval
9	None

METERTXT

definition

Below mean sea level
0 to 304.8 meters above mean sea level
304.8 to 914.4 meters
914.4 to 2,133.6 meters
2,133.6 to 3,352.8 meters
3,352.8 meters and above
Uncontoured or unsurveyed
No data
No data

ANNOTATION

None.

THEME: Spot Elevations
COVERAGE NAME: HYPOINT
FEATURE CLASS: point
DESCRIPTION: Points with recorded elevations in feet and meters
DATA SOURCE: DCW
SOURCE SCALE: 1:1,000,000

Point Attribute Table

HYPOINT.PAT					
COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	AREA	13	N	6	
14	PERIMETER	13	N	6	
27	HYPOINT_	11	N	0	
38	HYPOINT_ID	11	N	0	
49	HYPTTYPE	2	N	0	Type of spot height - code
51	HYPTTYPETX	51	C	0	*Type of spot height - text
102	HYPTVAL	5	N	0	Spot height elevation (feet)
107	METERS	9	N	1	*Spot height elevation (meters)
116	LONG	13	N	6	*Decimal degrees longitude
129	LAT	13	N	6	*Decimal degrees latitude

HYPTTYPE

code	definition
1	Spot elevation
2	Spot elevation - questionable elevation or location
3	Elevation at the base of a tower
4	Hydrographic elevation point

ANNOTATION

None.

THEME: Land Cover Features
COVERAGE NAME: LCPOINT
FEATURE CLASS: point
DESCRIPTION: Locations of mines, quarries, and other miscellaneous land features
DATA SOURCE: DCW
SOURCE SCALE: 1:1,000,000

Point Attribute Table

LCPOINT.PAT

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	AREA	13	N	6	
14	PERIMETER	13	N	6	
27	LCPOINT_	11	N	0	
38	LCPOINT_ID	11	N	0	
49	LCPTTYPE	2	N	0	Land cover type - code
51	LCPTTYPETX	30	C	0	*Land cover type - text
151	LONG	13	N	6	*Decimal degrees longitude
164	LAT	13	N	6	*Decimal degrees latitude

LCPTTYPE

code	definition
1	Mines
2	Quarries/Strip mines/Mine dumps/Blasting areas
3	Unusual land features

ANNOTATION

Text that further distinguishes the type of point within codes 2 and 3 for LCPTTYPE.

THEME: Land Cover Features
COVERAGE NAME: LCPOLY
FEATURE CLASS: polygon
DESCRIPTION: Surface features for some areas
DATA SOURCE: DCW
SOURCE SCALE: 1:1,000,000

Polygon Attribute Table

LCPOLY.PAT

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	AREA	13	N	6	
14	PERIMETER	13	N	6	
27	LCPOLY_	11	N	0	
38	LCPOLY_ID	11	N	0	
49	LCPYTYPE	2	N	0	Land cover type - code
51	LCPYTYPEPX	25	C	0	*Land cover type - text

LCPYTYPE

code	definition
1	Rice fields
2	Cranberry bogs
3	Cultivated areas/gardens
4	Peat cuttings
5	Salt pans
6	Fish ponds/Hatcheries
7	Quarries/Strip mines/Mine dumps/Blasting areas
8	Oil/Gas fields
10	Lava flows
11	Distorted surface areas
12	Unconsolidated materials (includes glacial moraine, foreshore flat, sand or gravel area, sand ridges, sand dunes)
13	Natural landmark areas
14	Inundated areas
15	Undifferentiated wetlands (includes swamp, marsh and bog, hummocks and ridges, mangrove and nipa, peat bog)
99	None (uncoded areas, e.g., areas within wetlands that are not assigned another land code)

ANNOTATION

Text describing geological and agricultural features (e.g., "lava", "numerous craters", and "plantation").

THEME: Political Boundary
COVERAGE NAME: PONENT
FEATURE CLASS: polygon, line
DESCRIPTION: Political boundary of the country
DATA SOURCE: DCW
SOURCE SCALE: 1:1,000,000

Polygon Attribute Table

PONENT.PAT

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	AREA	13	N	6	
14	PERIMETER	13	N	6	
27	PONENT_	11	N	0	
38	PONENT_ID	11	N	0	
49	POPYTYPE	2	N	0	Type of boundary - code
51	POPYTYPETX	10	C	0	*Type of boundary - text
76	POPYREG	2	C	0	World Region - text code "F" for Africa
78	POPYCOUN	2	C	0	Country code (DIAM 65-18 two letter country code)

POPYTYPE

code	definition
1	Land
2	Open ocean

Arc Attribute Table

PONENT.AAT

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	FNODE_	11	N	0	
12	TNODE_	11	N	0	
23	LPOLY_	11	N	0	
34	RPOLY_	11	N	0	
45	LENGTH	13	N	6	
58	PONENT_	11	N	0	
69	PONENT_ID	11	N	0	
80	POLNTYPE	2	N	0	Boundary type - code
82	POLNTYPETX	101	C	0	
183	POLNSTAT	2	N	0	Boundary status - code
185	POLNSTATTX	90	C	0	*Boundary status - text

POLNTYPE

code	definition
1	International boundary - de jure

(continued)

Arc Attribute Table (cont.)

POLNTYPE (cont.)

code	definition
2	International boundary - de facto
3	International boundary - de jure and de facto
6	Treaty or occupancy line
7	Coastal closure line (used to connect ocean shoreline across river mouths, lagoons, etc.)
8	Ocean demarcation line
9	Ice line
10	Coastline
11	Ocean/sea ice boundary
12	Seawall
13	International Date Line
88	Arbitrary Connector
99	None - tile border

POLNSTAT

code	definition
1	Definite (boundary or coastline)
2	Approximate (boundary) or fluctuating (coastline)
3	Indefinite (boundary) or unsurveyed (coastline)
4	Man-made (coastline or dike)
5	Indeterminable (coastline)
6	Ice cliff (when coincident with coastline or ice line)
7	Political boundary (that is based on a single-line river or stream location)
8	Connector (international boundary extensions through inland water areas)
9	Tile boundary
88	ONC module boundary section retained to provide connectivity across ONC sheets

ANNOTATION

Geographic names for land areas, oceans, and mountains.

THEME: Small Coastal Islands
COVERAGE NAME: POPOINT
FEATURE CLASS: point
DESCRIPTION: Small Coastal Islands
DATA SOURCE: DCW
SOURCE SCALE: 1:1,000,000

Point Attribute Table

POPOINT.PAT

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	AREA	13	N	6	
14	PERIMETER	13	N	6	
27	POPOINT_	11	N	0	
38	POPOINT_ID	11	N	0	
49	POPTTYPE	2	N	0	Land/water - code
51	POPTTYPETX	15	C	0	*Land/water - text
151	POPTREG	2	C	0	Region/continent, "F" for Africa
153	POPTCOUN	2	C	0	Countries/oceans (two letter country code)
155	LONG	13	N	6	
168	LAT	13	N	6	

POPTTYPE

code	definition
1	Small island

POPTCOUN

code	definition
OO	Open ocean
XX	Island in dispute

ANNOTATION

None.

THEME: Populated Places
COVERAGE NAME: PPPOINT
FEATURE CLASS: point
DESCRIPTION: Locations of populated places including urbanized areas and villages
DATA SOURCE: DCW
SOURCE SCALE: 1:1,000,000

Point Attribute Table

PPPOINT.PAT

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	AREA	13	N	6	
14	PERIMETER	13	N	6	
27	PPPOINT_	11	N	0	
38	PPPOINT_ID	11	N	0	
49	PPPTTYPE	2	N	0	Populated place type - code
51	PPPTTYPETX	50	C	0	*Populated place type - text
151	PPPTNAME	40	C	0	Populated place name
191	PPPTFLAG	2	N	0	Special character flag for place names
193	LONG	13	N	6	*Decimal degrees longitude
206	LAT	13	N	6	*Decimal degrees latitude

PPPTTYPE

code	definition
1	Populated places (no subcategories)
2	Populated places associated with urbanized areas
3	Villages - strategic or landmark places
4	Kampongs
5	Circular village (if annotated)

PPPTFLAG

code	definition
1	Standard or regular characters
2	Diacritical marks or special characters required
9	No name associated with feature

ANNOTATION

Geographic names of populated places. These may be the same information as in the item PPPTNAME.

THEME: Urbanized Areas
COVERAGE NAME: PPPOLY
FEATURE CLASS: polygon
DESCRIPTION: Urbanized areas; these do not necessarily conform to political boundaries
DATA SOURCE: DCW
SOURCE SCALE: 1:1,000,000

Polygon Attribute Table

PPPYTYPE.PAT

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	AREA	13	N	6	
14	PERIMETER	13	N	6	
27	PPPOLY_	11	N	0	
38	PPPOLY_ID	11	N	0	
49	PPPYTYPE	2	N	0	Populated place type - code
51	PPPYTYPETX	50	C	0	*Populated place type - text

PPPYTYPE

code	definition
1	Built-up area (urbanized area)
9	None (holes within urbanized area)

ANNOTATION

None.

NOTES

- Place names are stored with the PPPOINT coverage as annotation and/or within the item PPPTNAME.

THEME: Roads
COVERAGE NAME: RDLINE
FEATURE CLASS: line
DESCRIPTION: Roads and trails
DATA SOURCE: DCW
SOURCE SCALE: 1:1,000,000

Arc Attribute Table

RDLINE.AAT

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	FNODE_	11	N	0	
12	TNODE_	11	N	0	
23	LPOLY_	11	N	0	
34	RPOLY_	11	N	0	
45	LENGTH	13	N	6	
58	RDLINE_	11	N	0	
69	RDLINE_ID	11	N	0	
80	RDLNTYPE	2	N	0	Type of road - code
82	RDLNTYPE TX	30	C	0	*Type of road - text
172	RDLNSTAT	2	N	0	Road status - code
174	RDLNSTAT TX	40	C	0	*Road status - text

RDLNTYPE

code	definition
1	Dual lane highways (divided)
2	Primary or secondary roads or highways
3	Tracks, trails, or footpaths
8	Connectors

RDLNSTAT

code	definition
1	Functional
2	Under construction
3	Existence doubtful or reported
4	Compiled - road connector
5	Compiled - from adjacent/more recent sheet
6	Compiled - under construction
9	Schematic road (used for arcs added within urbanized area polygons for network connectivity only)

ANNOTATION

Descriptive notes along roads that are not covered by the coding scheme (e.g., "approximate alignment").

THEME: Railroad
COVERAGE NAME: RRLINE
FEATURE CLASS: line
DESCRIPTION: Railroad lines
DATA SOURCE: DCW
SOURCE SCALE: 1:1,000,000

Arc Attribute Table

RRLINE.AAT

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	FNODE_	11	N	0	
12	TNODE_	11	N	0	
23	LPOLY_	11	N	0	
34	RPOLY_	11	N	0	
45	LENGTH	13	N	6	
58	RRLINE_	11	N	0	
69	RRLINE_ID	11	N	0	
80	RRLNTYPE	2	N	0	Railroad type - code
82	RRLNTYPEPX	25	C	0	*Railroad type- text
172	RRLNSTAT	2	N	0	Railroad status - code
174	RRLNSTATPX	60	C	0	*Railroad status - text

RRLNTYPE

code	definition
1	Single track railroads
2	Multiple track railroads
3	Light duty railroads
8	Connectors added within urbanized area polygons

RRLNSTAT

code	definition
1	Functional
2	Nonoperating, abandoned, destroyed, or under construction
3	Existence doubtful or reported
4	Compiled - railroads
5	Compiled - from adjacent more recent sheet
6	Compiled - under construction
9	Schematic rail line used for arcs added within urbanized polygons to show connectivity

ANNOTATION

Text information associated with these features.

THEME: Transportation Structures
COVERAGE NAME: TSLINE
FEATURE CLASS: line
DESCRIPTION: Bridges, tunnels, ferries, etc.
DATA SOURCE: DCW
SOURCE SCALE: 1:1,000,000

Arc Attribute Table

TSLINE.AAT

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	FNODE_	11	N	0	
12	TNODE_	11	N	0	
23	LPOLY_	11	N	0	
34	RPOLY_	11	N	0	
45	LENGTH	13	N	6	
58	TSLINE_	11	N	0	
69	TSLINE_ID	11	N	0	
80	TSLNTYPE	2	N	0	Transport type - code
82	TSLNTYPEPX	20	C	0	*Transport type - text
91	TSLNSTAT	2	N	0	Structure type - code
93	TSLNSTATTX	10	C	0	*Structure type - text

TSLNTYPE

code	definition
1	Road structure
2	Railroad structure

TSLNSTAT

code	definition
1	Snowsheds
2	Bridges
3	Causeways
4	Tunnels
5	Ferries
6	Fords

ANNOTATION

Text information associated with these features.

THEME: Transportation Points
COVERAGE NAME: TSPOINT
FEATURE CLASS: point
DESCRIPTION: Bridges, tunnels, ferries, etc.
DATA SOURCE: DCW
SOURCE SCALE: 1:1,000,000

Point Attribute Table

TSPOINT.PAT

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	AREA	13	N	6	
14	PERIMETER	13	N	6	
27	TSPOINT_	11	N	0	
38	TSPOINT_ID	11	N	0	
49	TSPTTYPE	2	N	0	Transport type - code
51	TSPTTYPEPIX	20	C	0	*Transport type - text
151	TSPTSTAT	2	N	0	Structure type - code
153	TSPTSTATPIX	20	C	0	*Structure type - text
253	LONG	13	N	6	*Decimal degrees longitude
266	LAT	13	N	6	*Decimal degrees latitude

TSPTTYPE

code	definition
1	Roads
2	Railroads

TSPTSTAT

code	definition
1	Snowsheds
2	Bridges
3	Causeways
4	Tunnels
5	Ferries
6	Fords
7	Railroad yards
8	Railroad stations

ANNOTATION

Text information associated with these features.

THEME: Utilities
COVERAGE NAME: UTLINE
FEATURE CLASS: Line
DESCRIPTION: Telephone and telegraph lines, power transmission lines, and pipelines
DATA SOURCE: DCW
SOURCE SCALE: 1:1,000,000

Arc Attribute Table

UTLINE.AAT

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	FNODE_	11	N	0	
12	TNODE_	11	N	0	
23	LPOLY_	11	N	0	
34	RPOLY_	11	N	0	
45	LENGTH	13	N	6	
58	UTLINE_	11	N	0	
69	UTLINE_ID	11	N	0	
80	UTLNTYPE	2	N	0	Type of utility - code
82	UTLNTYPEX	30	C	0	*Type of utility - text

UTLNTYPE

code	definition
1	Power transmission lines
2	Telephone or telegraph lines
3	Above ground pipelines
4	Underground pipelines

ANNOTATION

Includes descriptions not covered or only partially covered by the coding scheme (e.g., a code exists for "pipeline", but not for "oil pipeline").

Biological Diversity Data Sets

THEME: Tropical Moist Forest
COVERAGE NAME: FOREST
FEATURE CLASS: polygon
DESCRIPTION: Tropical Moist Forest
DATA SOURCE: WCMC
SOURCE SCALE: generally 1:1,000,000

Polygon Attribute Table

FOREST.PAT

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	AREA	13	N	6	
14	PERIMETER	13	N	6	
27	FOREST_	11	N	0	
38	FOREST_ID	11	N	0	
49	VEGN	3	N	0	Forest classification - code
52	VEGNTX	50	C	0	*Forest classification - text

VEGN

code	definition
10	Water bodies
111	Mangrove
112	Degraded mangrove
113	Inland swamp forest
114	Degraded inland swamp forest
121	Montane rain forest
122	Lowland rain forest
123	Submontane rain forest
130	Degraded rain forest
131	Degraded montane rain forest
132	Degraded lowland rain forest
133	Degraded submontane rain forest
210	Montane monsoon forest
220	Lowland monsoon forest
230	Degraded monsoon forest
500	Dry forest
510	Pine forest
888	Cloud cover
900	Non forest
999	No data

ANNOTATION

None.

NOTES

- Polygons that are not assigned a VEGN and VEGNTX are areas that are enclosed by classified polygons (e.g., areas within tropical moist forests that are not tropical moist forests).
-

THEME: Protected Areas, Points
COVERAGE NAME: PARKPT
FEATURE CLASS: point
DESCRIPTION: Protected areas including reserves, parks, and national forests
DATA SOURCE: WCMC
SOURCE SCALE: generally 1:1,000,000

Point Attribute Table

PARKPT.PAT

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	AREA	13	N	6	
14	PERIMETER	13	N	6	
27	PARKPT_	11	N	0	
38	PARKPT_ID	11	N	0	
49	SITE_CODE	8	N	0	Unique numeric code
57	AREANAME	50	C	0	Name of the protected area
107	ISO3	3	C	0	ISO three letter code for identifying countries
110	SIZE	11	N	0	Area in hectares
121	YEAR	4	C	0	Date of designation
125	IUCNCAT	4	C	0	IUCN Management Category
129	LONG	9	N	4	Decimal degrees longitude
138	LAT	9	N	4	Decimal degrees latitude
147	CNTRYNAME	50	C	0	Full name of country
197	DESIGNATE	50	C	0	National legal designation of the site

IUCNCAT

Same as under PARKPY.PAT

ANNOTATION

None.

NOTES

- Data are not complete for all countries; some features lack attribute data for some items.
- See IUCNCAT definitions under PARKPY.PAT.
- A number of protected areas could not be shown within either a polygon or a point coverage because of missing geographical coordinates. We have provided an additional file with a complete set of protected areas from WCMC's Protected Areas Database which will allow you to assess the completeness of the protected areas mapped in the ADS. This file includes information on the name of the protected area, national designation, IUCN category, area, site code, and a field indicating whether the protected area is mapped in the ADS. The file (PA.WK1) is located in the WCMC subdirectory and is in a spreadsheet format.

THEME: Protected Areas
COVERAGE NAME: PARKPY
FEATURE CLASS: polygon
DESCRIPTION: Protected areas including national forests, parks, and reserves
DATA SOURCE: WCMC
SOURCE SCALE: generally 1:1,000,000

Polygon Attribute Table

PARKPY.PAT

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	AREA	13	N	6	
14	PERIMETER	13	N	6	
27	PARKPOL_	11	N	0	
38	PARKPOL_ID	11	N	0	
49	SITE_CODE	8	N	0	Unique numeric code
57	AREANAME	50	C	0	Name of the area
107	ISO3	3	C	0	ISO three letter code for identifying countries
110	SIZE	11	N	0	Area in hectares
121	YEAR	4	C	0	Date of designation
125	IUCNCAT	4	C	0	IUCN Management Category
129	LONG	9	N	4	Decimal degrees longitude
138	LAT	9	N	4	Decimal degrees latitude
147	CNTRYNAME	50	C	0	Full name of country
197	DESIGNATE	50	C	0	National legal designation of the site

IUCNCAT

Category Definition

- I *Strict Nature Reserve/Scientific Reserve*
 To protect nature and maintain natural processes in an undisturbed state, and to have ecologically representative examples of the natural environment available for scientific study, environmental monitoring, and education, and for the maintenance of genetic resources in a dynamic and evolutionary state.
- II *National Park*
 To protect outstanding natural and scenic areas of national or international significance for scientific, educational, and recreational use. These are relatively large natural areas, not materially altered by human activity, where extractive resource uses are not allowed.
- III *Natural Monument/Natural Landmark*
 To protect and preserve nationally significant natural features because of their special interest or unique characteristics. These are relatively small areas focused on protection of specific features.
- IV *Managed Nature Reserve/Wildlife Sanctuary*
 To ensure the natural conditions necessary to protect nationally significant species, groups of species, biotic communities, or physical features of the environment where these may require specific human manipulation for their perpetuation. Controlled harvesting of some resources may be permitted.

(continued)

Polygon Attribute Table (cont.)

IUCNCAT (cont.)

Category	Definition
V	<i>Protected Landscapes and Seascapes</i> To maintain nationally significant natural landscapes that are characteristic of the harmonious interaction of humans and land while providing opportunities for public enjoyment through recreation and tourism within the normal life-style and economic activity of these areas. These are mixed cultural/natural landscapes of high scenic value where traditional land uses are maintained.
VI	<i>Resource Reserve</i> To protect the natural resources of the area for future use and prevent or contain development activities that could affect the resource pending the establishment of objectives that are based on appropriate knowledge and planning. This is a holding category used until a permanent classification can be determined.
VII	<i>Anthropological Reserve/Natural Biotic Area</i> To allow the way of life of societies living in harmony with the environment to continue undisturbed by modern technology. This category is appropriate where resource extraction by indigenous people is conducted in a traditional manner.
VIII	<i>Multiple Use Management Area/Managed Resource Area</i> To provide for the sustained production of water, timber, wildlife, pasture and tourism, with the conservation of nature primarily oriented to the support of the economic activities (although specific zones may also be designated within these areas to achieve specific conservation objectives).
PRO	<i>Proposed</i> The area is under consideration by the appropriate authority and is likely to become protected subject to legislation being passed.
REC	<i>Recommended</i> The area has been recommended to be considered for protection.
UA	<i>Unassigned</i> The area has not been assigned a category.
?	<i>Unknown</i> No IUCN categories were available when the Data Sampler was produced.

ANNOTATION

Consists of a unique number for each site.

NOTES

- Data are not complete for all countries; some features lack attribute data for some items.
- Polygons that are not assigned a AREANAME, ISO3, YEAR, IUCNCAT, CNTRYNAME, OR DESIGNATE are areas which are enclosed by classified polygons (e.g., areas within national parks which are not part of the national park). These have a SITE_CODE of 99999.
- The IUCNCAT classes PRO, REC, UA, and ? are not official IUCNCAT classes, but are used by WCMC to keep track of the status of unclassified areas, or areas with no known classification.
- A number of protected areas could not be shown within either a polygon or a point coverage because of missing geographical coordinates. We have provided an additional file with a complete set of protected areas from WCMC's Protected Areas Database which will allow you to assess the completeness of the protected areas mapped in the ADS. This file includes information on the name of the protected area, national designation, IUCN category, area, site code, and a field indicating whether the protected area is mapped in the ADS. The file (PA.WK1) is located in the WCMC subdirectory and is in a spreadsheet format.
- In 1993, IUCN changed the Protected Areas Management System to include only 6 categories—the ADS still uses the 1978 System with 8 categories. A protected area is defined in the new "Guidelines for Protected Area Management Categories" as an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means.

The new protected areas management categories are as follows:

CATEGORY

I *Strict Nature Reserve and Wilderness Area: protected area managed mainly for science or wilderness protection*

Ia *Strict Nature Reserve: protected area managed mainly for science*

Definition

Area of land and/or sea possessing some outstanding or representative ecosystems, geological or physiological features and/or species, available primarily for scientific research and/or environmental monitoring.

Equivalent Category in 1978 System: Scientific Reserve/Strict Nature Reserve

Ib *Wilderness Area: protected area managed mainly for wilderness protection*

Definition

Large area of unmodified or slightly modified land, and/or sea, retaining its natural character and influence, without permanent or significant habitation, which is protected and managed so as to preserve its natural condition.

Equivalent Category in 1978 System: This sub-category did not appear in the 1978 system, but has been introduced following the IUCN General Assembly Resolution (16/34) on Protection of Wilderness Resources and Values, adopted at the 1984 General Assembly at Madrid, Spain.

II *National Park: protected area managed mainly for ecosystem protection and recreation*

Definition

Natural area of land and/or sea, designated to (a) protect the ecological integrity of one or more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes of designation of the area and © provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible.

Equivalent Category in 1978 System: National Park

III *Natural Monument: protected area managed mainly for conservation of specific natural features*

Definition

Area containing one, or more, specific natural or natural/cultural feature which is of outstanding or unique value because of its inherent rarity, representative or aesthetic qualities or cultural significance.

Equivalent Category in 1978 System: Natural Monument/Natural Landmark

IV *Habitat/Species Management Area: protected area managed mainly for conservation through management intervention*

Definition

Area of land and/or sea subject to active intervention for management purposes so as to ensure the maintenance of habitats and/or to meet the requirements of specific species.

Equivalent Category in 1978 System: Nature Conservation Reserve/Managed Nature Reserve/Wildlife Sanctuary

V *Protected Landscape/Seascape: protected area managed mainly for landscape/seascape conservation and recreation*

Definition

Area of land, with coast and sea as appropriate, where the interaction of people and nature over time has produced an area of distinct character with significant aesthetic, ecological and/or cultural value, and often with high

biological diversity. Safeguarding the integrity of this traditional interaction is vital to the protection, maintenance, and evolution of such an area.

Equivalent Category in 1978 System: Protected landscape

VI *Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural ecosystems*

Definition

Area containing predominantly unmodified natural systems, managed to ensure long-term protection and maintenance of biological diversity, while providing at the same time a sustainable flow of natural products and services to meet community needs.

Equivalent Category in 1978 System: This category does not correspond directly with any of those in the 1978 system, although it likely to include some areas previously classified as 'Resource Reserves', 'Natural Biotic Areas/Anthropological Reserves' and 'Multiple Use Management Areas/Managed Resource Areas'

For further information on the new management categories please consult the "Guidelines for Protected Area Management Categories" (IUCN, 1994).

THEME: Production Forest
COVERAGE NAME: PROD_FOR
FEATURE CLASS: polygon
DESCRIPTION: Classified production forest areas
DATA SOURCE: WCMC
SOURCE SCALE: generally 1:1,000,000

Polygon Attribute Table

PROD_FOR.PAT

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	AREA	13	N	6	
14	PERIMETER	13	N	6	
27	PROD_FOR_	11	N	0	
38	PROD_FOR_I	11	N	0	
49	SITE_CODE	8	N	0	Unique numeric code
57	AREANAME	50	C	0	Name of the protected area
107	ISO3	3	C	0	ISO three letter code for identifying countries
110	SIZE	11	N	0	Area in hectares
121	YEAR	4	C	0	Date of designation
125	IUCNCAT	4	C	0	IUCN Management Category
129	LONG	9	N	4	Decimal degrees longitude of center point
138	LAT	9	N	4	Decimal degrees latitude of center point
147	CNTRYNAME	50	C	0	Full name of country
197	DESIGNATE	50	C	0	National legal designation of the site

IUCNCAT

Same as under PARKPY.PAT

ANNOTATION

None.

NOTES

- The IUCN category system has been revised since the development of these data.
- Data are not complete for all countries; some features lack attribute data for some items.
- Polygons that are not assigned a Class, Name, or Description are areas that are enclosed by classified polygons (e.g., areas within production forests that are not production forests).
- See IUCNCAT definitions under PARKPY.PAT.

THEME: Wetlands
COVERAGE NAME: WETLANDS
FEATURE CLASS: polygons
DESCRIPTION: Types of wetlands
DATA SOURCE: WCMC
SOURCE SCALE: generally 1:1,000,000

Polygon Attribute Table

WETLANDS.PAT

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	AREA	13	N	6	
14	PERIMETER	13	N	6	
27	WETLANDS_	11	N	0	
38	WETLANDS_I	11	N	0	
49	CLASS	3	C	0	Classification of wetland - code
52	CLASSTX	50	C	0	*Classification of wetland - text
102	NAME	121	C	0	Geographic name of site
223	DESCRIP	251	C	0	Description of site

CLASS

code	description
ALS	Alkaline/saline lake
DAM	Dambo region
DEL	Delta
FF	Flooded forest
FWM	Fresh Water Marsh
GEN	General wetland area
I	Impoundment
LAG	Lagoon
LAK	Lake
MAN	Mangrove
OWC	Occasional wetland
POL	Pool
SEP	Semi-permanent lake
SES	Seasonal salt pans
SF	Swamp forest
SFW	Seasonally flooded wetland
SL	Salt lake
SP	Salt pan
TIW	Tidal wetland/estuary/coastal
WEX	Wetland complex

ANNOTATION

None.

NOTES

- Data are not complete for all countries; some features lack attribute data for Name and Description.
 - Polygons which are not assigned a Class, Name or Description are areas which are enclosed by classified polygons (e.g., areas within wetlands which are not wetlands).
-

Population Data Set

THEME: Population/Population Density
COVERAGE NAME: POP
FEATURE CLASS: polygon, line
DESCRIPTION: Population data by administrative district
DATA SOURCE: NCGIA, University of California Santa Barbara
SOURCE SCALE: unknown for most countries

Polygon Attribute Table

POP.PAT

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	AREA	13	N	6	
14	PERIMETER	13	N	6	
27	POP_	11	N	0	
38	POP_ID	11	N	0	
49	SQKM	13	N	6	Area in square kilometers. Derived by reprojecting coverage into equal area projection (Mollweide with central meridian 20E)
62	PERM_ID	11	N	0	"Permanent ID," unique for each polygon
73	DISS_ID	11	N	0	"Dissolve ID," Unique ID for each set of polygons that belong to the same administrative unit
84	CODE	2	C	0	Type of polygon
86	FLAG	1	N	0	Flag to identify a unique polygon for each administrative unit; only one of the polygons per unit has a FLAG value of 1; all others are 0. Used in calculating statistics to avoid double counting.
87	CNT_NUM	2	N	0	Numeric country number
89	CNT_CODE	3	N	0	U.N. numeric code for country
92	CNT_ABB	2	C	0	Two letter abbreviation for each country
94	NAME1	20	C	0	Name of first level admin. unit
114	TYPE1	2	N	0	Type of first level unit
116	LEVEL1	4	N	0	Unique number for each first level unit
120	POP1	8	N	0	Population in reference year for first level unit
128	Y1	2	N	0	Population data reference year
130	S1	5	C	0	Source code for first level units
135	NAME2	20	C	0	Name of second level administrative unit
155	TYPE2	2	N	0	Type of second level unit
157	LEVEL2	3	N	0	Unique number for each second level unit
160	POP2	8	N	0	Population in reference year for second level unit
168	Y2	2	N	0	Population data reference year for second level unit
170	S2	5	C	0	Source code for second level units

(continued)

Polygon Attribute Table (cont.)

POP.PAT (cont.)

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
175	POPEST94	8	N	0	Estimated population in 1994 based on an exponential growth model and average annual growth rates from the U.N.
183	POPDENS94	13	N	0	Population density based upon POPEST94. Derived by adding the areas of all polygons with code 'L' (land) and 'IS' (island) belonging to the administrative unit, and dividing POPEST94 by this total area.

CODE

code	definition
L	Land
IS	Island
IW	Inland Water body

TYPE1

code	definition
1	County
2	Department
3	District
4	Division
5	Governorate
6	Island
7	Prefecture
8	Province
9	Region
10	State

S1, S2

code	definition
#	S1 and S2 are codes referring to a data source for the country. For individual data sources, see Appendix F.

TYPE2

code	definition
1	Arrondissement
2	Cercles
3	Department
4	District
5	Prefecture
6	Statistical Region
7	Subdivision
8	Subregion
9	Province

Arc Attribute Table

POP.AAT

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	FNODE_	11	N	0	
12	TNODE_	11	N	0	
23	LPOLY_	11	N	0	
34	RPOLY_	11	N	0	
45	LENGTH	13	N	6	
58	POP_	11	N	0	
69	POP_ID	11	N	0	
80	FEATURE	2	N	0	Administrative boundary level

FEATURE

code	definition
0	Zero level (national) boundary
1	First level administrative unit
2	Second level administrative unit
3	Third level administrative unit
7	Islands within inland water bodies
8	Inland water bodies
9	Coastline and offshore islands

ANNOTATION

None.

Continental Data Set

THEME: Political Boundaries for Africa
COVERAGE NAME: AFRICA
FEATURE CLASS: polygon, line
DESCRIPTION: Political Boundaries for Africa
DATA SOURCE: DCW
SOURCE SCALE: 1:1,000,000

Polygon Attribute Table

PONET.PAT

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC	DESCRIPTION
1	AREA	13	N	6	
14	PERIMETER	13	N	6	
27	AFR_GEO_	11	N	0	
38	AFR_GEO_ID	11	N	0	
49	POPYTYPE	2	N	0	Type of boundary - code
51	POTYPETXT	25	C	0	*Type of boundary - text
76	POPYREG	2	C	0	World Region - text code "F" for Africa
78	POPYCOUN	2	C	0	Country code (DIAM 65-18 two letter country code)

POPYTYPE

code	definition
1	Land
2	Open ocean

POPYCOUN

code	country
AG	Algeria
AO	Angola
BN	Benin
BC	Botswana
UV	Burkina Faso
BY	Burundi
CM	Cameroon
CT	Central African Republic
CD	Chad
CN	Comores Islands
CF	Congo
IV	Côte d'Ivoire
DJ	Djibouti
EG	Egypt
EK	Equatorial Guinea
ER	Eritrea

(continued)

Polygon Attribute Table (cont.)

POPYCOUN (cont.)

code	country
ET	Ethiopia
GB	Gabon
GA	Gambia, The
GH	Ghana
GV	Guinea
PU	Guinea-Bissau
KE	Kenya
LT	Lesotho
LI	Liberia
LY	Libya
MA	Madagascar
MI	Malawi
ML	Mali
MR	Mauritania
MO	Morocco
MZ	Mozambique
WA	Namibia
NG	Niger
NI	Nigeria
RW	Rwanda
SG	Senegal
SL	Sierra Leone
SO	Somalia
SF	South Africa
SU	Sudan
WZ	Swaziland
TZ	Tanzania
TO	Togo
TS	Tunisia
UG	Uganda
CG	Zaire
ZA	Zambia
ZI	Zimbabwe

NOTES

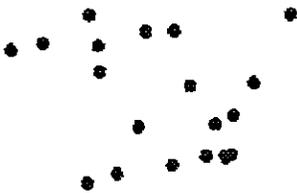
The continental data set does not include the islands of Cape Verde, Sao Tome & Principe, Mauritius, and Seychelles.

Appendix D

PC ARC/INFO Data Structure and Terminology

The data sets packaged in this Data Sampler are in PC ARC/INFO format. Each data set is stored in a series of files kept in a directory. This directory is called a coverage. Each coverage consists of encoded files describing the geographic locations and shapes of mappable features and a series of dBase format files (.DBF) that hold descriptive information about each feature.

Each coverage will contain a subset of many possible files, depending on the character of the spatial data. The character of features, as represented in PC ARC/INFO, can be broken into three major categories: Points, Lines, and Polygons. Figure 9 below describes each of these feature classes.

**Points**

A single x,y location with no area.

Examples of point features:

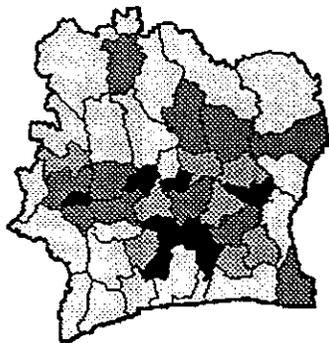
- cities
- spot elevations
- wells

**Lines**

A string of connected x,y coordinates.

Examples of line features:

- rivers
- topographic contours
- street centerlines

**Polygons**

A set of lines which bound a homogeneous region.

Examples of polygon features:

- administrative districts
- wetlands
- properties

Figure 9 Major Feature Classes in ARC/INFO

For each feature class (point, line, polygon) there is a corresponding attribute table that holds some default information such as area, perimeter, or length of features, and two Ids (a User ID and an internal ID). The default items included depend on the feature class. The tables themselves are named according to the feature class as well. For Polygon (area) features, there is the Polygon Attribute Table (the PAT.DBF file in the coverage directory); for Line (linear) features, there is an Arc Attribute Table (AAT.DBF); and for Point features, a Point Attribute Table (PAT.DBF). In addition to the default items, data sets often include descriptive information about features that have been added manually. The Data Dictionary in Appendix C gives examples of unique attribute fields.

Annotation of Terms

- annotation* descriptive text used to label coverage features. Annotation is not topologically linked with other features. It is used only for display purposes. Information stored for annotation includes a text string, the location at which it can be displayed, and a text symbol (color, font, size, etc.) for displaying the annotation.
- attribute* descriptive information about a spatial feature, such as a road, a wetland, or a city, coded in numbers or characters, or as descriptive text, typically stored in tabular format and linked to the feature by a numerical identifier.
- clip* in ARC/INFO, the process of extracting data from a coverage that resides within the boundary of another coverage.
- coverage* an ARC/INFO data set that is a digital analog of a selected feature from a single map sheet; in this document, the terms data set and coverage are used interchangeably.
- dissolve* in ARC/INFO, to remove lines between adjacent polygons having the same value for a specified attribute.
- join* in ARC/INFO, to merge coverages representing adjacent areas into a single coverage.
- layer* a component of a GIS database that contains all of the data for one theme (e.g., land use, rivers).
- projection* a representation of a spherical or curved surface, such as the Earth's surface, on a flat, two-dimensional surface; different projections preserve various spatial properties, including area, shape, distance, and direction. No one projection can preserve the integrity of all properties; usually, the preservation of one spatial property results in the distortion of another.
- registration* the relative positions of spatial features within or among data sets.
- resolution* the spatial accuracy with which the location and shape of features are depicted at a given scale (from *Understanding GIS - The ARC/INFO Method*, ESRI); for example, a data set with a resolution of 0.3 - 0.5 kilometers means that features may be located within that distance of where they are depicted in the data set.
- scale* the ratio of distance on a map to the equivalent distance on the Earth's surface; when used in reference to a geographic data set, this indicates the level at which the spatial data is useful

(for example, 1:1,000,000 scale is normally used for national level data, whereas 1:50,000 data is used for macro planning on the city level).

- spatial data* data with information about location, shape, and relationships among geographic features; sometimes used as a synonym of geometric data.
- theme* (1) "a collection of logically associated geographic features" (from *Introducing ArcCAD*, ESRI); drainage, populated places, and wetlands are all examples of themes. (2) In ArcView, a theme is the element that references a geographical data set. This can be an ARC/INFO coverage or a raster image file; a theme can display all or part of a data set and can be assigned a legend that defines how features are displayed.
- tile* the spatial unit by which geographic data can be organized, subdivided, and stored in a geographic database (from *Understanding GIS - The ARC/INFO Method*, ESRI); it is usually a logical rectangular set of digital map data based on map sheets or geographic grid coordinates.
- topology* a GIS term used to describe the spatial relationships between connecting or adjacent spatial features (from *Understanding GIS - The ARC/INFO Method*, ESRI); topological relationships include connectivity of lines, direction of lines, and contiguity between areas.
- view* a file used by the ArcView software to reference multiple ARC/INFO coverages and to control how they will be displayed within the map-view window.

Appendix E

Africa Data Sampler Production Process

Production Process

Figure 10 provides an overview of PADCO's production process for the ADS.

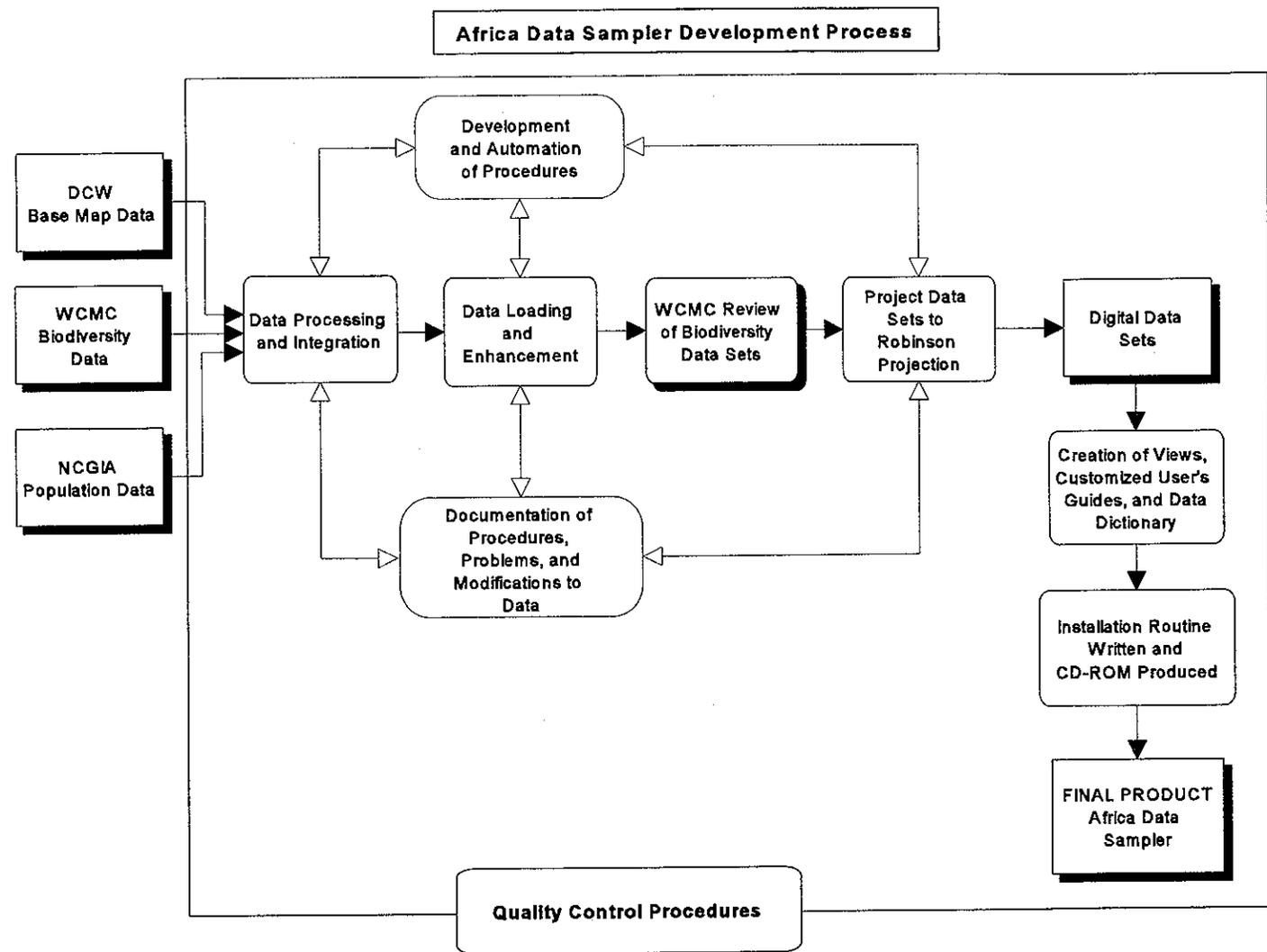
The primary source of data for the ADS is the Digital Chart of the World (DCW). For each country, appropriate tiles were extracted from a CD-ROM with the DCW data sets in Workstation ARC/INFO format. The country boundary for the country was extracted from the DCW political features layer (PONET). The resulting coverage was used to clip out features for the country from each tile. The clipped tiles were then joined for each data layer, and the topology was reconstructed. The political boundary was used to clip all layers except for hydrology (DNNET). In clipping hydrology for many countries, a 1-km buffer of the political boundary was used so as to include rivers which lie along the national border and those that inaccurately fall outside the border. Each coverage was checked for topological errors, missing data, data accuracy, and cartographic appearance. Findings were documented, and topological corrections made, checked, and documented. Because the information was in Workstation ARC/INFO format, Export files were created for each coverage and imported into PC ARC/INFO format coverages.

Once in PC format, fields for descriptive text were added to the attribute tables. DCW provides information, such as feature type and status as numeric codes. For example, within the Roads coverage (RDLINE), a 2 reflects that a road is a primary or secondary road, while a 3 reflects a trail or footpath. Descriptive text fields were added to make these variables self-explanatory. Finally, each coverage was checked for quality in ArcView.

WCMC coverages were provided in ARC/INFO export format. These coverages were imported into PC ARC/INFO format and checked for topological errors, missing data, and data accuracy. Findings were documented and corrections made when possible. The coverages were then processed to fit the DCW political boundaries and to fit the most prominent water bodies in Africa (such as lakes Victoria, Tumba, and Chilwa). Fields for descriptive text were added to the attribute tables for the **FOREST** and **WETLANDS** coverages.

The NCGIA population coverage for Africa was provided in ARC/INFO Export format. The coverage was imported into Workstation ARC/INFO format. The population data for each country were reselected from the population coverage for Africa. The resulting coverage was processed to fit the DCW political boundaries and checked for topological errors, missing data, and data accuracy.

In the final step of processing, the data sets were projected into the Robinson projection.



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Figure 10 Africa Data Sampler Development Process

Appendix F

Country Specific Data Sources and Processing Issues

ALGERIA DATA SOURCES**DCW**

ONC Charts	G01	G02	H01	H02	H03	J02	J03
Date Compiled	10/65	12/63	1/72	5/72	3/69	12/73	11/75
Date Revised	2/89	12/81	1/89	1/89	1/89	4/85	8/88

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Protected Areas data came from 1:1,000,000 scale maps in Guide des Parcs Nationaux d'Afrique-Afrique du Nord, Afrique de l'Ouest by B. Bosquet, Delachaux et Niestte, David Parret, (ed.), Neuchatel, Switzerland-Prais (1992).

Population Data

The original source for the population data is Europa Publications (1992), "The Middle East and North Africa-1993," 39th edition, London.

DATA ISSUES SPECIFIC TO ALGERIA

Because of PC ARC/INFO's limitation of 5,000 arcs per polygon and 5,000 polygons per coverage, the DCW drainage layer was divided into eight separate coverages that cover the eastern (DNNETE), central (DNNETC), northcentral (DNNETNC), northern (DNNETN), southcentral (DNNETSC), southeastern (DNNETSE), southern (DNNETS), and western (DNNETW) parts of the country.

Attribute data for some of the WCMC Protected Areas (points) and Wetlands coverages could not be determined, and the fields were thus left blank.

Road type 'Connector' was employed in Algeria along ONC boundaries to improve the continuity of the road network.

The contour lines on the ONC are irreconcilable across chart boundaries at -1.0 x 23.0.

ANGOLA DATA SOURCES**DCW**

ONC Charts	M03	M04	N03	N04	P03	P04
Date Compiled	6/65	3/68	12/68	11/71	4/75	1/86
Date Revised	11/84	11/87	10/87	3/83	2/86	1/86

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Protected Areas come from a Russian map, Angola (1987) at a scale of 1:2,500,000 and an unsourced map compiled in 1982 at a scale of 1:6,000,000.

Population Data

The original source of the population data is the República de Angola (1987), Boletim Demográfico #4, "Projeção da População do País por Províncias para o Período 1970/95," Instituto Nacional de Estatística, Luanda.

DATA ISSUES SPECIFIC TO ANGOLA

The political boundary was used to clip all layers except for DCW hydrology (DNNET). Here, a 1 km buffer along the political boundary was used to include rivers meandering along the national border.

Because of PC ARC/INFO's limitation of 5,000 arcs per polygon and 5,000 polygons per coverage, the DCW drainage layer was divided into three separate coverages that cover the central (DNNETC), northern (DNNETN), and southern (DNNETS) parts of the country.

The roads (RDLINE) coverage was missing values for items rdlnstyp and rdlnstat in one DCW tile (part of ONC charts N03 and P03).

Values of 9 (Roads unknown) for rdlnType and value of 99 (None) for rdlnstat were entered.

In the railroads coverage (RRLINE), some arcs were not continuous in the original data. The railroad arcs were made continuous after checking on the ONC.

The population coverage was modified slightly to simplify its use and increase the ease of understanding. This was done because population data for Angola were only available for first-level administrative units while boundaries also existed for second-level administrative units. An item POP1_94 was added to keep the original information which contains population estimates for first-level units. For each first-level unit, one second-level unit has the total population estimate for that region, and the other second-level units have a population estimate of zero.

Rough population estimates for second-level administrative units were derived from first-level population estimates based solely on respective land area. These estimates can now be found in POPEST_94. The item FLAG was modified to correspond to these changes in POPEST_94.

Two polygons in the wetlands coverage (WETLANDS) are not labeled because class information is not available.

BENIN DATA SOURCES

DCW

ONC Charts	K02	L02
Date Compiled	7/65	3/70
Date Revised	1/86	9/84

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Tropical Moist Forest data come from forest data compiled by Henrik Olesen for the European Commission TREES project. The system used to delimit forest/non-forest boundaries in West Africa using 1 km resolution NOAA/AVHRR-LAC satellite data was developed by UNEP/GEMS/GRID, with aid from the EEC and FINNIDA. These data represent an update of the data set from "The Methodology Development Project for Tropical Forest Cover Assessment in West Africa" (Paivinen and Witt, 1989).

Protected Areas data come from a 1:600,000 scale map entitled "République Populaire du Benin" published by the Institut Géographique National-France in 1984.

Population Data

Population data come from the République Populaire du Benin (1987), "Recensement Général de la Population et de l'Habitation" (Mars 1979), Institut National de la Statistique, Cotonou. The source of the first-level administrative boundaries is FAO, and the scale and accuracy of these data are unknown. Second-level administrative boundaries were added from "Carte Administrative" accompanying the 1:600,000 scale IGN map "République Populaire du Benin" (1984).

DATA ISSUES SPECIFIC TO BENIN

The population coverage was modified slightly to simplify its use and increase the ease of understanding. This was done because population data for Benin were only available for first-level administrative units while boundaries also existed for second-level administrative units. An item POP1_94 was added to keep the original information which contains population estimates for first-level units. For each first-level unit, one second-level unit has the total population estimate for that region, and the other second-level units have a population estimate of zero.

Rough population estimates for second-level administrative units were derived from first-level population estimates based solely on respective land area. These estimates can now be found in POPEST_94. The item FLAG was modified to correspond to these changes in POPEST_94.

Attribute data for some of the WCMC Protected Areas (points) coverage could not be determined, and the fields were thus left blank.

Non-English text in some data files such as Protected Areas does not display correctly in ArcView 1.

BOTSWANA DATA SOURCES**DCW**

ONC Charts	P04	P05	Q04	Q05
Date Compiled	1/86	11/71	8/77	4/87
Date Revised	1/86	11/83	6/85	5/88

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Protected Areas data were digitized from a published map, "Republic of Botswana" (1987), prepared by the Ministry of Local Government and Lands, and from data in WCMC files.

Population Data

The original source of the population data is Europa Publications (1992) "Africa South of the Sahara-1993," 22nd edition, London.

DATA ISSUES SPECIFIC TO BOTSWANA

The political boundary was used to clip all layers except for DCW hydrology (DNNET). Here, a 1 km buffer along the political boundary was used to include rivers meandering along the national border.

One line representing a bridge in TSLINE was found in an area without roads or railroads. The arc was deleted, resulting in an empty coverage. The empty coverage was removed.

BURKINA FASO DATA SOURCES**DCW**

ONC Charts	K01	K02
Date Compiled	7/65	7/65
Date Revised	7/84	1/86

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Protected Areas data were digitized from a 1:1,000,000 scale blue-line map entitled "Burkina Faso-Formations Végétales," (no date), prepared by the Ministère de l'Environnement et du Tourisme, Service de l'Aménagement Forestier.

Population Data

The original source of the population data is the République Démocratique Populaire de Burkina Faso (1988), "Annuaire Statistique 1988," Institut National de la Statistique et de la Démographie, Ouagadougou.

DATA ISSUES SPECIFIC TO BURKINA FASO

The annotation in the DCW coverage P0NET was edited to show the proper name of the country.

Attribute data for some of the WCMC Protected Areas (points) coverage could not be determined, and the fields were thus left blank.

BURUNDI DATA SOURCES**DCW**

ONC Charts	M04
Date Compiled	3/68
Date Revised	11/87

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Tropical Moist Forest and Protected Areas data were drawn from a 1:250,000 scale map entitled "Burundi" (1984).

Population Data

The original source of the population data is the République du Burundi (1990), "Résultats Provisoires, Recensement Général de la Population et de l'Habitat," Bureau Central de Recensement, Gilega.

CAMEROON DATA SOURCES**DCW**

ONC Charts	K03	L03
Date Compiled	5/62	6/74
Date Revised	12/82	10/84

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Tropical Moist Forest data were taken from the 1:500,000 map series "Carte Phytogéographique du Cameroun" (1985), prepared by R. Letouzey for the Institut de la Carte Internationale de la Végétation, Toulouse, France and the Institut de la Recherche Agronomique (Herbier National), Yaoundé, Cameroon.

Protected Areas were taken from a tourist map "Road Map of Cameroon" (1988) at a scale of 1:1,500,000 published by Macmillan and from spatial data held within WCMC files.

Population Data

The original source of the population data is the République du Cameroun (1988), "Deuxième Recensement Général de la Population et de l'Habitat du Cameroun," Yaoundé.

DATA ISSUES SPECIFIC TO CAMEROON

The political boundary was used to clip all layers except for DCW hydrology (DNNET). Here, a 1 km buffer along the political boundary was used to include rivers meandering along the national border.

Some points in HSPPOINT had no value and were therefore deleted.

Because of PC ARC/INFO's limitation of 5,000 arcs per polygon and 5,000 polygons per coverage, the DCW forest layer was divided into two separate coverages that cover the eastern (FORESTE) and western (FORESTW) parts of the country.

For Cameroon population, there are second-level boundaries and data for Centre, Est, Littoral, Nord-Ouest, Sud, and Sud-Ouest provinces. First-level boundaries were available for Adamaoua, Extrême-Nord, Nord, and Nord-Ouest. The second-level data source showed a considerably smaller total population (9,057,147) than later official figures, which is probably because of subsequent adjustments for undercount. For that reason all regional figures for Cameroon were inflated by a factor of 1.19483, assuming the same percentage undercount in each region.

CAPE VERDE DATA SOURCES**DCW**

ONC Charts	K00
Date Compiled	3/64
Date Revised	9/86

Biodiversity Data

Protected Areas data come from the WCMC protected areas database.

Population Data

The original source of the population data is D. Munro (ed.) "Chambers World Gazetteer" (1988), Chambers, Cambridge, UK.

DATA ISSUES SPECIFIC TO CAPE VERDE

The DCW coverage PPPOLY was not available for Cape Verde.

There are no lakes in the DCW coverage DNNET for Cape Verde.

CENTRAL AFRICAN REPUBLIC DATA SOURCES**DCW**

ONC Charts	K03	K04	L03	L04
Date Compiled	5/62	2/86	6/74	11/67
Date Revised	12/82	2/86	10/84	7/88

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Tropical Moist Forest data were taken from a 1:1,000,000 scale map entitled "Carte Phytogéographique de la République Centrafricaine" (1955), prepared for ORSTROM, Bondy, France, by Y. Boulvert, and published in association with the Ministre des Relations Extrieures (France).

Protected Areas data were taken from a 1:1,500,000 scale map "République Centrafricaine" published by the Institut Géographique National. The Dzanga-Sangha Dense Forest Faunal Reserve was taken from the unpublished manuscript "Creation, Developpement, Protection, et Aménagement du Sanctuaire de Forêt Dense de Dzanga-Sangha et Parc National Dzange-Ndoki, République Centrafricaine" (1987), WWF-US and New York Zoological Society (1987).

Population Data

Population data were taken from the République Centrafricaine (1992), "Annuaire Statistique 1991," Ministère de l'Economie, du Plan des Statistiques et de la Coopération Internationale, Bangui. Second-level units were added from "Carte Administrative" accompanying the IGN map "République Centrafricaine" (1993).

DATA ISSUES SPECIFIC TO CENTRAL AFRICAN REPUBLIC

Because of PC ARC/INFO's limitation of 5,000 arcs per polygon and 5,000 polygons per coverage, the DCW drainage layer was divided into three separate coverages that cover the central (DNNETC), eastern (DNNETE), and western (DNNETw) parts of the country.

Attribute data for some of the WCMC Wetlands coverage could not be determined, and the fields were thus left blank.

CHAD DATA SOURCES**DCW**

ONC Charts	J04	K03	K04	L03	L04
Date Compiled	11/65	5/62	2/86	6/74	11/67
Date Revised	4/84	12/82	2/86	10/84	7/88

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Protected Areas were mainly digitized from a 1:1,500,000 scale map entitled "République du Tchad-Carte Routière" (1968), published by the Institut Géographique National. Additional data came from a map "Direction des Parcs Nationaux et Réserves du Faune" (no date) and various geographical data held within files at WCMC.

Population Data

The original source for the population data is Brian Hunter (ed.), "The Statesman's Year Book 1992-93," 129th edition, St. Martin's Press, New York.

DATA ISSUES SPECIFIC TO CHAD

Because of PC ARC/INFO's limitation of 5,000 arcs per polygon and 5,000 polygons per coverage, the DCW drainage layer was divided into six separate coverages that cover the eastern (DNNETE), northern (DNNETN), southcentral (DNNETSC), southeastern (DNNETSE), southwestern (DNNETSW), and western (DNNETW) parts of the country.

Attribute data for some of the WCMC Wetlands coverage could not be determined, and the fields were thus left blank.

Non-English text in some data files such as Protected Areas does not display correctly in ArcView 1.

THE COMOROS DATA SOURCES**DCW**

ONC Charts	N06
Date Compiled	3/67
Date Revised	8/87

Biodiversity Data

Protected Areas data come from files held within the WCMC protected areas database.

Population Data

The original source of the population data is the U.S. Bureau of the Census (no date), International Database, Washington, DC. Population density for the Island of Mayotte is from the 1984 census.

DATA ISSUES SPECIFIC TO THE COMOROS

The DCW coverage DNNET does not exist for the Comoros.

The DCW coverage PPPOLY for populated places is not available for the Comoros.

The Island of Mayotte, which is labeled as a separate country in the DCW, was included with the other Comoros Islands.

The resolution of the DCW data causes some smaller islands not to be included, and some of these have protected areas on them.

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CONGO DATA SOURCES**DCW**

ONC Charts	L03	L04	M03
Date Compiled	6/74	11/67	6/65
Date Revised	10/84	7/88	11/84

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Tropical Moist Forest data were digitized from ONC 1:1,000,000 scale map on which the extent of the forests had been hand drawn by Philippe Hecketsweiler. He was able to produce a map from data gathered from field work during 1989 and 1990 and from numerous reports (Begue, 1967; Descoings, 1969 and 1975; Koechlin, 1961; and Cusset, 1989).

Protected Areas were derived from a 1:1,000,000 scale map République Populaire du Congo (1990) produced by CERGEC, Brazzaville and from spatial data held within files at WCMC.

Population Data

The original source of the population data is Europa Publications (1992), "Africa South of the Sahara-1993," 22nd edition, London.

DATA ISSUES SPECIFIC TO CONGO

The political boundary was used to clip all layers except for DCW hydrology (DNNET). Here, a 1 km buffer along the political boundary was used to include rivers meandering along the national border.

Annotation of "numerous villages" was found in CLPOINT without villages and was therefore removed.

CÔTE D'IVOIRE DATA SOURCES**DCW**

ONC Charts	K01	K02	L01	L02
Date Compiled	7/65	7/65	2/68	3/70
Date Revised	7/84	1/86	4/80	9/84

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Tropical Moist Forest data come from forest data compiled by Henrik Olesen for the European Commission TREES project. The system used to delimit forest/non-forest boundaries in West Africa using 1 km resolution NOAA/VHRR-LAC satellite data was developed by UNEP/GEMS/GRID, with aid from the EEC and FINNIDA. These data represent an update of the data set from "The Methodology Development Project for Tropical Forest Cover Assessment in West Africa" (Paivinen and Witt, 1989).

Protected Areas and Production Forest data come from a 1:1,000,000 untitled blue line map, and a 1:800,000 scale map entitled "Côte d'Ivoire" (1988) published by Michelin, Paris.

Population Data

The original source of the population data is the République de Côte d'Ivoire (1988), "Recensement Général de la Population et de l'Habitat 1988," Résultats Provisoires, Comité National de Recensement, Abidjan.

DATA ISSUES SPECIFIC TO CÔTE D'IVOIRE

In the DCW coverage HYNETP, the HYPYTYPE value for one of the polygons was 0 which is not valid. After researching the original data, the appropriate code was found and assigned to the polygon.

For the population coverage, one regional boundary was added.

Attribute data for some of the WCMC Wetlands and Production Forest coverages could not be determined, and the fields were thus left blank.

Non-English text in some data files such as Protected Areas does not display correctly in ArcView 1.

DJIBOUTI DATA SOURCES

DCW

ONC Charts	K05	K06
Date Compiled	4/77	3/89
Date Revised	5/88	3/89

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Protected Areas data come from files within the WCMC protected areas database.

Population Data

The original source of the population data is the U.S. Bureau of the Census (no date), International Database, Washington, D.C.

DATA ISSUES SPECIFIC TO DJIBOUTI

In the DCW PONENT coverage two polygons representing islands were coded as belonging to Yemen. These islands were recoded to be included with Djibouti after checking in the ArcWorld (1:3,000,000, ESRI) country coverage.

The population coverage was modified slightly to simplify its use and increase the ease of understanding. This was done because population data for Djibouti were only available for first-level administrative units while boundaries also existed for second-level administrative units. An item POP1_94 was added to keep the original information which contains population estimates for first-level units. For each first-level unit, one second-level unit has the total population estimate for that region, and the other second-level units have a population estimate of zero.

Rough population estimates for second-level administrative units were derived from first-level population estimates based solely on respective land area. These estimates can now be found in POPEST_94. The item FLAG was modified to correspond to these changes in POPEST_94.

EGYPT DATA SOURCES

DCW

ONC Charts	H04	H05	J05
Date Compiled	2/72	1/81	7/77
Date Revised	3/84	1/82	1/88

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Protected Areas data came from the WCMC protected areas database. Data for a limited number of additional sites were taken from maps in an unpublished report, Ras Mohammed National Park Sector Development Project: Definition of the Work Plan, July 1992, Arab Republic of Egypt.

Population Data

The sources of the population data are the Arab Republic of Egypt (1991), "Statistical Year Book," Central Agency for Mobilization and Statistics, Cairo; and Europa Publications (1992), "The Middle East and North Africa-1993," 39th edition, London.

DATA ISSUES SPECIFIC TO EGYPT

The Southeastern border of Egypt with Sudan is a disputed area, and the line used in the DCW PONET coverage to demarcate the border was left as is.

In the DCW PONET coverage two islands were coded as belonging to Egypt. These islands were recoded as belonging to Sudan after checking other sources.

In the DCW PPPOLY coverage some polygons do not have corresponding point features in the DCW PPPOINT coverage and thus have no names. The names for these urban polygons are not available in either the DCW or the ONC.

In the DCW PPPOINT coverage there are points classified as urbanized areas which do not have corresponding urbanized area polygons in the DCW PPPOLY coverage.

Because of PC ARC/INFO's limitation of 5,000 arcs per polygon and 5,000 polygons per coverage, the DCW drainage layer was divided into two separate coverages that cover the northern (DNNETN) and southern (DNNETS) parts of the country.

Attribute data for some of the WCMC Wetlands and Protected Areas (points) coverages could not be determined, and the fields were thus left blank.

EQUATORIAL GUINEA DATA SOURCES**DCW**

ONC Charts	L03
Date Compiled	6/74
Date Revised	10/84

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes. "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Tropical Moist Forest data for Rio Muni has been extracted from an untitled national forest map series produced in 1960 at a scale of 1:100,000, and prepared for the Servicio Geográfico del Ejército. The data for Biorko came from a sketch map accompanying a report written by Butrynski and Kosfer (1989). Data were not available for Annobon. There is no recent vegetation map of Equatorial Guinea available.

Protected Areas were based on data on file at WCMC and a published work "Conservación de los ecosistemas forestales de Guinea Equatorial," prepared by John Fa (1991) for IUCN, Gland, Switzerland.

Population Data

The original source of the population data is the República de Guinea Equatorial (1990), "Boletín Estadística Anual 1990." Dirección General de Estadísticas, Malabo.

DATA ISSUES SPECIFIC TO EQUATORIAL GUINEA

In the WCMC PARKPY coverage, the protected area Isla de Annolon is located on an island which does not have a corresponding polygon in the DCW PONET coverage.

ERITREA DATA SOURCES**DCW**

ONC Charts	J06	K05	K06
Date Compiled	1/80	4/77	3/89
Date Revised	1/80	5/88	3/89

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Tropical Moist Forest data were taken from the National Atlas of Ethiopia (1988) compiled by the Ethiopian Mapping Authority, Addis Ababa.

Protected Areas data were taken from the WCMC protected areas database.

Population Data

The boundaries and data files were produced by USGS and obtained from the International Food Policy Research Institute, Washington, DC via ILRAD, Nairobi. Additional data came from the Government of Ethiopia (1988), "Population of Weredas and Towns by Sex and Average Household Size," Central Statistical Office, Addis Ababa.

DATA ISSUES SPECIFIC TO ERITREA

The political boundary dividing Eritrea and Ethiopia was taken from ArcWorld (1:3,000,000, ESRI) to update the DCW PONET coverage.

In the DCW POPOINT coverage the value for the item POPTCOUN was changed from ET (Ethiopia) to ER (Eritrea).

Attribute data for some of the WCMC Wetlands coverage could not be determined, and the fields were thus left blank.

ETHIOPIA DATA SOURCES**DCW**

ONC Charts	K05	K06	L05	L06
Date Compiled	4/77	3/89	4/66	8/78
Date Revised	5/88	3/89	2/88	11/85

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Tropical Moist Forest and Production Forest data were taken from the Ethiopian Mapping Authority "National Atlas of Ethiopia" (1988), Addis Ababa.

Protected Areas data were extracted from various sources at WCMC. Forest reserves were kindly provided by Kindane Mengitsu (1991) from the State Forest Conservation and Development Department, Ethiopia. Boundaries of the reserves were hand drawn onto ONC charts (K05, L05, and L06) and later digitized.

Population Data

The original source of the boundaries and data files is the USGS. These boundaries and files were obtained from the International Food Policy Research Institute, Washington, DC via ILRAD, Nairobi.

DATA ISSUES SPECIFIC TO ETHIOPIA

The political boundary dividing Ethiopia and Eritrea was taken from ArcWorld (1:3,000,000, ESRI) to update this DCW coverage.

The Akobo River forms the political boundary between Ethiopia and Sudan. Within the DCW, however, the drainage feature and the political feature differed. The corresponding line feature in the DCW PONET coverage was used to replace the drainage line feature in DNNETS.

Because of PC ARC/INFO's limitation of 5,000 arcs per polygon and 5,000 polygons per coverage, the DCW drainage layer was divided into three separate coverages that cover the central (DNNETC), northern (DNNETN), and southern (DNNETS) parts of the country.

The DCW DNNET coverages include some segments which were taken from tile or ONC sheet boundaries to maintain connectivity among features.

Some topographic contours were missing in western Ethiopia. The DCW HYNETL coverage includes some segments which were taken from tile or ONC sheet boundaries to maintain connectivity among features, and to define which areas have missing data.

Within the WCMC PROD_FOR coverage, polygons which are not assigned a Class, Name or Description are areas which are enclosed by classified polygons (e.g. areas within production forests that are not production forests).

GABON DATA SOURCES

DCW

ONC Charts	L03	M03
Date Compiled	6/74	6/65
Date Revised	10/84	11/84

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Protected Areas and Tropical Moist Forest data were taken from a 1:1,000,000 generalized published map "Gabon" (1987) which was prepared by the Institut Géographique National-France in collaboration with the Institut National de Cartographie, Libreville.

Population Data

The original source of the population data is "Annuaire Statistique du Gabon," Direction Générale de la Statistique et des Etudes Economiques, Libreville. Additional data came from "Carte Administrative," accompanying the 1:1,000,000 scale IGN map "Gabon" (1987).

DATA ISSUES SPECIFIC TO GABON

The DCW drainage coverage DNNET was clipped by a buffer of 1 km from the political boundary to include rivers meandering along the national border.

The DCW DNNET coverages include some segments which were taken from tile or ONC sheet boundaries to maintain connectivity among features.

THE GAMBIA DATA SOURCES

DCW

ONC Charts	K01
Date Compiled	6/65
Date Revised	6/85

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Tropical Moist Forest data were taken from a 1:1,000,000 scale digital map entitled "Range and Forest Resources of Senegal" (1985), prepared by the US Geological Survey, National Mapping Division, EROS Data Center.

Protected Areas are mapped from a circa 1:350,000 scale map entitled "The Gambia" (1987).

Population Data

The original source of the population data is the U.S. Bureau of the Census (no date), International Database, Washington, DC.

DATA ISSUES SPECIFIC TO THE GAMBIA

There were no line values for the DCW coverage HYNET, therefore HYNETL was not created.

Attribute data for some of the WCMC Wetlands and Protected Areas coverages could not be determined, and the fields were thus left blank.

The discrepancies between Mangroves in the Wetlands and the Tropical Moist Forest coverages from WCMC are a result of different original data sources.

GHANA DATA SOURCES

DCW

ONC Charts	K02	L02
Date Compiled	7/65	3/70
Date Revised	1/86	9/84

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Tropical Moist Forest data come from forest data compiled by Henrik Olesen for the European Commission TREES project. The system used to delimit forest/non-forest boundaries in West Africa using 1 km resolution NOAA/AVHRR-LAC satellite data was developed by UNEP/GEMS/GRID, with aid from the EEC and FINNIDA. These data represent an update of the data set from "The Methodology Development Project for Tropical Forest Cover Assessment in West Africa" (Paivinen and Witt, 1989).

Protected Areas data come from a 1:1,000,000 scale map "Ghana" (1989). Forest reserves were derived from an unpublished dyeline map "Map of Forest Reserves in Ghana" (1990) at a scale of 1:500,000, prepared by the Forestry Department, Ghana.

Population Data

The original population data come from the Republic of Ghana, "1984 Population Census of Ghana—Preliminary Report," Central Bureau of Statistics, Accra.

DATA ISSUES SPECIFIC TO GHANA

The political boundary was used to clip all layers except for DCW hydrology (DNNET). Here, a 1 km buffer along the political boundary was used to include rivers meandering along the national border.

GUINEA DATA SOURCES

DCW

ONC Charts	K01	L01
Data Compiled	7/65	2/68
Data Revised	7/84	4/80

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Tropical Moist Forest and **Protected Areas** for Guinea are taken from a vegetation map which accompanies the report entitled "Potentialités et Possibilités de Relance de l'Activité Forestière," CTFT/BDPA-SCET AGRI (1989); Synthèse Régionale et Nationale. The land use map, drawn by CTFT/BDPA-SCET AGRI in 1989 at a scale of 1:700,000, is a synthesis of work carried out in 1985, 1986, and 1987. The data are derived from 1979-80 aerial photography taken by the Japan International Cooperation Agency (JICA) and updated using Landsat MSS 1984-1985-1986 imagery to compile the forest data set categories.

Population Data

The original source of the population data is CIAT (1989), Secondary Administrative Units, Africa, Version 1. Centro Internacional de Agricultura Tropical, Cali, Colombia.

DATA ISSUES SPECIFIC TO GUINEA

The political boundary was used to clip all layers except for DCW hydrology (DNNET). Here, a 1 km buffer along the political boundary was used to include rivers meandering along the national border.

The capital of Guinea, Conakry, was not represented as a polygon in the urbanized areas coverage (PPPOLY). PADCO added a polygon for Conakry based on the ONC.

In the railroads coverage (RRLINE), some arcs were not continuous in the original data. The railroad arcs were made continuous after checking on the ONC.

The population coverage was modified slightly to simplify its use and increase the ease of understanding. This was done because population data for Guinea were only available for first-level administrative units while boundaries also existed for second-level administrative units. An item POP1_94 was added to keep the original information which contains population estimates for first-level units. For each first-level unit, one second-level unit has the total population estimate for that region, and the other second-level units have a population estimate of zero.

Rough population estimates for second-level administrative units were derived from first-level population estimates based solely on respective land area. These estimates can now be found in POPEST_94. The item FLAG was modified to correspond to these changes in POPEST_94.

GUINEA BISSAU DATA SOURCES**DCW**

ONC Charts	K01
Date Compiled	7/65
Date Revised	7/84

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Tropical Moist Forest data come from a 1:1,000,000 scale hand-drawn generalized map by Scott Jones based on a 1981 1:500,000 Instituto Geográfico Nacional land use chart and his personal experience in the region.

Protected Areas data come from the WCMC protected areas database.

Population Data

The original source of the population data is the U.S. Bureau of the Census (no date), International Database, Washington, DC.

DATA ISSUES SPECIFIC TO GUINEA BISSAU

The capital of Guinea Bissau, Bissau, is not represented by a polygon in the DCW PPPOLY coverage because the outline of the city is unknown.

In the DCW PPPOLY coverage includes a polygon representing an urban area that does not have a corresponding point representation in the DCW PPPPOINT coverage. Normally, this point would have been added because the names of urban areas are stored in the PPPPOINT coverage. Since the name of this urban area is not available on the ONC, the point was not created.

Elevation data are available only in elevation ranges, and therefore the DCW HYNETL coverage, which shows elevation contour lines, is not available.

The population coverage was modified slightly to simplify its use and increase the ease of understanding. This was done because population data for Guinea Bissau were only available for first-level administrative units while boundaries also existed for second-level administrative units. An item POP1_94 was added to keep the original information which contains population estimates for first-level units. For each first-level unit, one second-level unit has the total population estimate for that region, and the other second-level units have a population estimate of zero.

Rough population estimates for second-level administrative units were derived from first-level population estimates based solely on respective land area. These estimates can now be found in POPEST_94. The item FLAG was modified to correspond to these changes in POPEST_94.

Attribute data for some of the WCMC Wetlands coverage could not be determined, and the fields were thus left blank.

KENYA DATA SOURCES

DCW

ONC Charts	L05	M05
Date Compiled	4/66	10/69
Date Revised	2/88	2/87

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Tropical Moist Forest data come from a 1:1,000,000 scale map "Land Use Map of Kenya" (1983), published by the Kenya Rangeland Ecological Monitoring Unit (KREMU), Ministry of Environmental and Natural Resources. This map was compiled from remotely sensed data from 1972 - 1980 by KREMU.

Protected Areas data come from a 1:1,250,000 scale map entitled "Kenya," published by Bartholomew & Son, and a 1:1,000,000 scale map entitled "Forest Administrative Boundaries and Stations" (1980) compiled by the Survey Branch of the Kenya Forest Department.

Population Data

The original source of the population data is the Republic of Kenya (1989), "Census of Kenya," Nairobi.

DATA ISSUES SPECIFIC TO KENYA

In the DCW RDLINE coverage roads near Nairobi are disconnected. The ONC chart shows that these roads are covered by annotations and therefore, their actual path could not be determined.

In the WCMC PARKPT coverage, the point representing Western Mau, which is a forest reserve, is located within a forest reserve polygon named Londcani. This is because of the inaccuracy between two different data sources, and the polygon position is likely to be more accurate than the point.

Inconsistencies in data are seen when DCW lakes are compared with WCMC lakes in the Wetlands coverage. Lake Naiuasha is an example of this.

Attribute data for some of the WCMC coverages could not be determined, and the fields were thus left blank.

LESOTHO DATA SOURCES

DCW

ONC Charts	Q05
Date Compiled	4/67
Date Revised	8/87

Biodiversity Data

Wetlands and Protected Areas were taken from "Nature Conservation in Lesotho" by Dr. Donald N. McVean (June 1977, IUCN). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Population Data

The original source of the population data is the Government of Lesotho (1987), "1986 Population Census--Preliminary Results," Bureau of Statistics, Maseru.

DATA ISSUES SPECIFIC TO LESOTHO

There are no non-perennial hydrological (DNNET) features in Lesotho.

The DCW coverage PPPOLY for populated places is not available for Lesotho.

Attribute data for some of the WCMC coverages could not be determined, and the fields were thus left blank.

LIBERIA DATA SOURCES

DCW

ONC Charts	K01	L01
Date Compiled	7/65	2/68
Date Revised	7/84	4/80

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Tropical Moist Forest data come from forest data compiled by Henrik Olesen for the European Commission TREES project. The system used to delimit forest/non-forest boundaries in West Africa using 1 km resolution NOAA/AVHRR-LAC satellite data was developed by UNEP/GEMS/GRID, with aid from the EEC and FINNIDA. These data represent an update of the data set from "The Methodology Development Project for Tropical Forest Cover Assessment in West Africa" (Paivinen and Witt, 1989).

Protected Areas data are taken from an unpublished sketch map produced by the Forestry Development Authority "National Forest and Parks" (Liberia) and from spatial data held within files at WCMC.

Population Data

The original source of the population data was the "1984 Population and Housing Census of Liberia--Summary Results...." Ministry of Planning and Economic Affairs, Monrovia.

DATA ISSUES SPECIFIC TO LIBERIA

The capital of Liberia, Monrovia, was not represented as a polygon in Urbanized Areas (PPPOLY). PADCO added an Urbanized Areas polygon for Monrovia based on ONC.

The population coverage was modified slightly to simplify its use and increase the ease of understanding. This was done because population data for Liberia were only available for first-level administrative units while boundaries also existed for second-level administrative units. An item POPI_94 was added to keep the original information which contains population estimates for first-level units. For each first-level unit, one second-level unit has the total population estimate for that region, and the other second-level units have a population estimate of zero.

Rough population estimates for second-level administrative units were derived from first-level population estimates based solely on respective land area. These estimates can now be found in POPEST_94. The item FLAG was modified to correspond to these changes in POPEST_94.

LIBYA DATA SOURCES

DCW

ONC Charts	G02	G03	H03	H04	J03	J04	J05
Date Compiled	12/63	8/73	3/69	2/72	11/75	11/65	7/77
Date Revised	12/81	3/86	1/89	3/84	8/88	4/84	1/88

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Protected Areas data came from the WCMC protected areas database.

Population Data

The original source of the population data is Europa Publications (1992), "The Middle East and North Africa--1993," 39th edition, London.

DATA ISSUES SPECIFIC TO LIBYA

Because of PC ARC/INFO's limitation of 5,000 arcs per polygon and 5,000 polygons per coverage, the DCW drainage layer was divided into four separate coverages that cover the eastern (DNNETE), northwestern (DNNETNW), southwestern (DNNETSW), and western (DNNETW) parts of the country.

The DCW DNNET coverage is not complete for northern Libya. The DCW is missing DNNET data from ONC chart G03.

Attribute data for some of the WCMC coverages could not be determined, and the fields were thus left blank.

MADAGASCAR DATA SOURCES

DCW

ONC Charts	N06	P06	Q06
Date Compiled	3/67	12/67	8/66
Date Revised	8/87	3/86	12/83

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Tropical Moist Forest data for mangroves were digitized from "Carte des Formations Végétales de Madagascar," a 1:1,000,000 scale unpublished map by Faramalala Miadana Harisva - I.C.I.V. (no date). The eastern rain forests are from a map compiled from 1985 satellite imagery which accompanies Green and Sussman (1990). G. Green supplied a photocopy of this map. Because of the poor quality of the photocopy and generalization during digitizing, the total forest cover is 25 percent greater than Green and Sussman reported from the same data.

Protected Areas data were taken from a map series "Carte de Madagascar" in 12 sheets at a scale of 1:500,000 (1963), published by the Institut Géographique National, and from spatial data held within files at WCMC.

Population Data

The population data for first-level administrative units come from Brian Hunter (ed.), "The Statesman's Year Book 1992-93," 129th edition, St. Martin's Press, New York, which were distributed in proportion to the 1975 census figures for second-level units, and from the Republika Demokratika Malagasy (1975), "Recensement 1975-Analyse des Données Démographiques," Antananarivo.

DATA ISSUES SPECIFIC TO MADAGASCAR

Because of PC ARC/INFO's limitation of 5,000 arcs per polygon and 5,000 polygons per coverage, the DCW drainage layer was divided into three separate coverages that cover the central (DNNETC), northern (DNNETN), and southern (DNNETS) parts of the country.

An arc in DNNETN, in the northeast of the country, near a river mouth, was incorrectly coded as a tile boundary. Its code was changed to connector.

Numerous islands in the WCMC Wetlands coverage did not exist as polygons in the DCW PONET coverage. After clipping Wetlands with PONET, islands not present in PONET were added. In cases where these islands overlapped with the mainland or seemed improperly positioned with regard to the shoreline, the islands were repositioned based upon visual approximation.

MALAWI DATA SOURCES

DCW

ONC Charts	N05	P05
Date Compiled	4/73	11/71
Date Revised	1/86	11/83

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Protected Areas were drawn from a 1:1,000,000 scale map "Malawi" (1979).

Population Data

The original source of the population data is the Government of Malawi (1991), "Malawi Population and Housing Census 1987." Summary of Final Results, Vol. 1, National Statistical Office, Zomba.

DATA ISSUES SPECIFIC TO MALAWI

Attribute data for some of the WCMC coverages could not be determined, and the fields were thus left blank.

MALI DATA SOURCES**DCW**

ONC Charts	H02	J02	J03	K01	K02
Date Compiled	6/72	12/73	11/75	7/65	7/65
Date Revised	1/89	4/85	8/88	7/84	1/86

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Protected Areas data came from the maps in Guide des Parcs Nationaux d'Afrique du Nord, Afrique de l'Ouest by B. Bosquet, Delachaux et Niestle, David Parret (ed.), Neuchatel, Switzerland-Prais (1992) at a scale of 1:1,000,000.

Population Data

First-level population data came from the République du Mali, "Recensement Général de la Population et de l'Habitat au Mali-1987." Direction National de la Statistique et de l'Information, Bamako. Second-level population data came from ESRI (1984), UNEP/FAO African Database, Final Report, Environmental Systems Research Institute, Redlands.

DATA ISSUES SPECIFIC TO MALI

Because of PC ARC/INFO's limitation of 5,000 arcs per polygon and 5,000 polygons per coverage, the DCW drainage layer was divided into four separate coverages that cover the central (DNNETC), eastern (DNNETE), northern (DNNETN), and southwestern (DNNETSW) parts of the country.

Attribute data for some of the WCMC Wetlands and Protected Areas (points) coverages could not be determined, and the fields were thus left blank.

Non-English text in some data files such as Protected Areas does not display correctly in ArcView 1.

MAURITANIA DATA SOURCES**DCW**

ONC Charts	H01	H02	J01	J02	K01
Date Compiled	1/72	6/72	8/73	12/73	7/65
Date Revised	1/89	1/89	11/79	4/85	7/84

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Protected Areas were mapped from the 1:2,500,000 scale map "Mauritanie" (1980) published by the Institut Géographique National, Paris.

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Population Data

The original source of the population data is the République Islamique de Mauritanie (1986), "Annuaire Statistique," Direction de la Statistique et de la Comptaibilité Nationale, Nouakchott. Population estimates were based on the 1983 census.

DATA ISSUES SPECIFIC TO MAURITANIA

Because of PC ARC/INFO's limitation of 5,000 arcs per polygon and 5,000 polygons per coverage, the DCW drainage layer was divided into two separate coverages that cover the eastern (DNNETE) and western (DNNETW) parts of the country.

Attribute data for some of the WCMC Wetlands coverage could not be determined, and the fields were thus left blank.

MAURITIUS DATA SOURCES**DCW**

ONC Charts	P07
Date Compiled	4/69
Date Revised	6/89

Biodiversity Data

Protected Areas were mapped from sketch maps held within WCMC files.

Population Data

The original source of the population data is the Government of Mauritius (1991), "Annual Digest of Statistics 1990," Central Statistical Office, Port Louis. These are official estimates only for the Island of Mauritius.

DATA ISSUES SPECIFIC TO MAURITIUS

In the DCW coverage RDLINE there were no values given for RDLNTYPE and RDLNSTAT for one arc representing a road. Therefore, a value of 9 (unknown) was given for RDLNTYPE, and a value of 99 (none) was given for the RDLNSTAT.

In the DCW coverage DNNET, the boundaries for five lakes were classified as rivers. To correct this, the classification was changed to inland shore lines. Since the status of these lines were not known they were given a value of 99 (none).

In the WCMC coverage PARKPT, two points representing parks were moved to match the island features in POPOINT. These are Pearle Island and Frigale Island.

The resolution of the DCW data causes some smaller islands not to be included, and some of these have protected areas on them.

Attribute data for some of the WCMC Protected Areas (points) coverage could not be determined, and the fields were thus left blank.

MOROCCO AND WESTERN SAHARA DATA SOURCES**DCW**

ONC Charts	G01	H01	H02	J01
Date Compiled	10/65	1/72	6/72	8/73
Date Revised	2/89	1/89	1/89	11/79

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Protected Areas for Morocco came from Guide des Parcs Nationaux d'Afrique du Nord, Afrique de l'Ouest by B. Bosquet, Delachaux et Niestte, David Parret (ed.), Neuchatel, Switzerland-Prais (1992) at a scale of 1:1,000,000. Protected Areas for Western Sahara came from the WCMC protected areas database.

Population Data

The original source of the population data is Europa Publications (1992). "The Middle East and North Africa-1993," 39th edition. London.

DATA ISSUES SPECIFIC TO MOROCCO AND WESTERN SAHARA

In the NCGIA population coverage, some second-level administrative units have the same values for their POP2, POPEST94, and POPDENS94 items. This is because these administrative units are new and the accompanying new population data were not available.

Attribute data for some of the WCMC coverages could not be determined, and the fields were thus left blank.

Because of PC ARC/INFO's limitation of 5,000 arcs per polygon and 5,000 polygons per coverage, the DCW drainage layer was divided into two separate coverages that cover the northern (DNNETN) and southern (DNNETS) parts of the country.

MOZAMBIQUE DATA SOURCES**DCW**

ONC Charts	N05	P05	Q05
Date Compiled	4/73	11/71	4/67
Date Revised	1/86	11/83	8/87

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Protected Areas data have been extracted from various sources on file at WCMC and from a 1:2,500,000 Russian map entitled "Mozambique" (1987).

Population Data

The original source of the population data is Europa Publications (1992). "Africa South of the Sahara-1993," 22nd edition. London. Population estimates are based on the 1980 census.

DATA ISSUES SPECIFIC TO MOZAMBIQUE

The Niassa game reserve in the WCMC Protected Areas (PARKPY) coverage is proposed to be a national park and its name changed to Rovuma. Therefore, this national park is represented by a point in the Protected Areas (PARKPT) coverage.

Because of PC ARC/INFO's limitation of 5,000 arcs per polygon and 5,000 polygons per coverage, the DCW drainage layer was divided into four separate coverages that cover the central (DNNETC), northeastern (DNNETNE), northwestern (DNNETNW), and southern (DNNETS) parts of the country.

In the WCMC Protected Areas (PARKPY) coverage, the marine park Bazaruto includes the islands to the south of Bazaruto Island, but Bazaruto Island itself is unprotected.

Attribute data for some of the WCMC Wetlands and Protected Areas (points) coverages could not be determined, and the fields were thus left blank.

NAMIBIA DATA SOURCES**DCW**

ONC Charts	P03	P04	Q04
Date Compiled	4/75	1/86	8/77
Date Revised	2/86	1/86	12/84

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Protected Areas were derived from a tourist map "Namibia-Traveller's Map" (no date), published by Macmillan at a scale of 1:2,400,000. Namib-Naukluft Park and Etosha National Park were also shown on this map as inserts, mapped at a larger scale to show more detail.

Population Data

Population data were available from "Statistical Abstract 1993," Num. 2, National Planning Commission (1993), Center for Statistics, Windhoek; except for Walvis Bay where population data were available for South Africa ["Population Census 1991," Adjustment for Undercount, Central Statistical Service, Pretoria, 1991 and 1992 South African Statistics, Central Statistical Office (1992), Pretoria].

DATA ISSUES SPECIFIC TO NAMIBIA

The roads (RDLINE) coverage was missing values for items `rdlnstype` and `rdlnstat` in one DCW tile (part of ONC charts N03 and P03). Values of 9 (roads unknown) for `rdlnstype` and value of 99 (none) for `rdlnstat` were entered.

In the railroad coverage (RRLINE), some arcs were not continuous in the original data. The railroad arcs were made continuous after checking on the ONC.

According to the DCW data set, Walvis Bay belongs to South Africa. Since the creation of the DCW data set, Walvis Bay has become recognized by South Africa as Namibian territory. PADCO has therefore included it as Namibian territory.

NIGER DATA SOURCES**DCW**

ONC Charts	J03	J04	K02	K03
Date Compiled	11/75	11/65	7/65	5/62
Date Revised	8/88	4/84	1/86	12/82

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Protected Areas data were digitized from information drawn into a base map by C. Magin (1992) and from a published map showing reserves of parts of five neighboring countries "Carte Touristique-Parcs Nationaux des Pays de l'Entente," and also from various sketch maps and data on file at WCMC.

Population Data

The original source of the population data is République du Niger (1989), 2ème Recensement Général de la Population 1988, Bureau Central du Recensement, Niamey. République du Niger (1991), "Annuaire Statistique" Series Longues, Direction de la Statistique et de la Démographie, Niamey.

DATA ISSUES SPECIFIC TO NIGER

Because of PC ARC/INFO's limitation of 5,000 arcs per polygon and 5,000 polygons per coverage, the DCW drainage layer was divided into four separate coverages that cover the central (DNNETC), northern (DNNETN), southern (DNNETS), and western (DNNETW) parts of the country.

In the WCMC PARKPY coverage a national nature reserve area named Aor Tiniri is represented by two polygons. The boundaries of the inside polygon, which is officially called the Addax Sanctuary, were maintained because it has a stricter protection than the surrounding zone, but the level of its protection is not known.

NIGERIA DATA SOURCES**DCW**

ONC Charts	K02	K03	L02	L03
Date Compiled	7/65	5/82	3/70	6/74
Date Revised	1/86	12/82	9/84	10/84

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Tropical Moist Forest data come from forest data compiled by Henrik Olesen for the European Commission TREES project. The system used to delimit forest/non-forest boundaries in West Africa using 1 km resolution NOAA/AVHRR-LAC satellite data was developed by UNEP/GEMS/GRID, with aid from the EEC and FINNIDA. These data represent an update of the data set from "The Methodology Development Project for Tropical Forest Cover Assessment in West Africa" (Paivinen and Witt, 1989).

Production Forest reserves have been digitized from a published series of maps entitled "Vegetation and Land Use" (1978), prepared for the Government of Nigeria, Ministry of Agriculture and Rural Development, Federal Department of Forestry, Lagos, by Hunting Technical Services Limited, Borehamwood, Herts, UK.

Population Data

The original source of the population data is Europa Publications (1992), "Africa South of the Sahara-1993," 22nd edition, London.

DATA ISSUES SPECIFIC TO NIGERIA

The DCW drainage coverage DNNET was clipped by a buffer of 1 km from the political boundary to include rivers meandering along the national border.

Some areas representing railroad in the DCW RRLINE coverage were broken up. They were made continuous after checking on the ONC charts.

The new capital of Nigeria, Abuja, was missing in the DCW PPPOINT and PPPOLY coverages. As the spatial extent of the capital city was unknown, Abuja was added to the PPPOINT coverage only.

The WCMC Tropical Moist Forest coverage does not include the northern and eastern sections of the country because these data are not available.

Because of PC ARC/INFO's limitation of 5,000 arcs per polygon and 5,000 polygons per coverage, the WCMC forest layer was divided into two separate coverages that cover the eastern (FORESTE) and western (FORESTW) parts of the country.

Because of PC ARC/INFO's limitation of 5,000 arcs per polygon and 5,000 polygons per coverage, the DCW drainage layer was divided into four separate coverages that cover the eastern (DNNETE), northern (DNNETN), southern (DNNETS), and western (DNNETW) parts of the country.

RWANDA DATA SOURCES**DCW**

ONC Charts	M04
Date Compiled	3/68
Date Revised	11/87

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Tropical Moist Forest and Protected Areas were drawn from the 1:250,000 map "République Rwandaise, Carte Administrative et Routière" published by the Service de Cartographie, Kigali.

Population Data

The original source of the population data is the République Rwandaise (1991), "Recensement Général de la Population et de l'Habitat au 15 Août 1991," Résultats Provisoires, Service National de Recensement, Kigali.

DATA ISSUES SPECIFIC TO RWANDA

In the DCW coverage PPOINT, no point represented the urban area of Cyangugu, and therefore this point was digitized and attributes inferred based on the ONC chart.

Attribute data for some of the WCMC Protected Areas coverage could not be determined, and the fields were thus left blank.

SAO TOME AND PRINCIPE DATA SOURCES**DCW**

ONC Charts	L03	M02
Date Compiled	6/74	1/75
Date Revised	10/84	1/75

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Tropical Moist Forest data for Sao Tome and Principe were obtained from a photocopy of a map by the Bureau pour la Développement de la Production Agricole (BDPA, 1985).

Protected Areas data came from the WCMC protected areas database.

Population Data

The original source of the population data is D. Munro (ed.) "Chambers World Gazetteer" (1988), 5th edition, Chambers, Cambridge, UK.

DATA ISSUES SPECIFIC TO SAO TOME AND PRINCIPE

The DCW coverage PPPOLY for urbanized areas is not available for Sao Tome and Principe.

There are no lakes in the DCW coverage DNNET for Sao Tome and Principe.

SENEGAL DATA SOURCES**DCW**

ONC Charts	J01	K00	K01
Date Compiled	8/73	3/64	6/65
Date Revised	11/79	9/86	6/84

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Tropical Moist Forest data are taken from a 1:1,000,000 scale map entitled "Range and Forest Resources of Senegal" (1985), prepared by the US Geological Survey, National Mapping Division, EROS Data Center.

Protected Areas were digitized from a 1:1,000,000 scale map entitled "Senegal" (1980) by the Institut Géographique National-France, and from data held within files at WCMC.

Population Data

The original source for the population data is the République du Senegal (1988), "Les Principaux Résultats Provisoires du Recensement de la Population et de l'Habitat du Senegal 1988," Direction de la Statistique, Dakar.

DATA ISSUES SPECIFIC TO SENEGAL

Features crossing the boundary between ONC charts J01 and K01 in northwestern Senegal are poorly rectified.

Along the Senegal River and elsewhere, there are discrepancies between WCMC Wetlands coverage and DCW drainage (DNNET) coverage.

The population coverage was modified slightly to simplify its use and increase the ease of understanding. This was done because population data for Senegal were only available for first-level administrative units while boundaries also existed for second-level administrative units. An item POP1_94 was added to keep the original information which contains population estimates for first-level units. For each first-level unit, one second-level unit has the total population estimate for that region, and the other second-level units have a population estimate of zero.

Rough population estimates for second-level administrative units were derived from first-level population estimates based solely on respective land area. These estimates can now be found in POPEST_94. The item FLAG was modified to correspond to these changes in POPEST_94.

The data source for the WCMC forest coverage had a very different coastline from that used by WCMC which is Mundocarte. In fitting the forest coverage to Mundocarte, a severe shift in registration occurred which becomes apparent when the forest coverage is viewed with other coverages such as wetlands.

In the DCW PONET coverage, the coastline between charts J01 and K01 are not aligned.

In the DCW POPOINT coverage, four points representing islands were mistakenly coded as belonging to Senegal and were therefore removed.

Attribute data for some of the WCMC Wetlands and Protected Areas coverages could not be determined, and the fields were thus left blank.

Several Utility Lines in Senegal appeared on the ONC but were omitted in the DCW.

THE SEYCHELLES DATA SOURCES**DCW**

ONC Charts	M06	M07	N06
Date Compiled	1/70	1/70	3/67
Date Revised	7/81	7/70	8/87

Biodiversity Data

Protected Areas data come from files held within the WCMC protected areas database.

Population Data

The original source of the population data is the United Nations (1993), "World Population Prospects," The 1992 Revision, Department for Economic and Social Information and Policy Analysis, New York.

DATA ISSUES SPECIFIC TO THE SEYCHELLES

The DCW coverage DNNET does not exist for the Seychelles.

The resolution of the DCW data causes some smaller islands not to be included, and some of these have protected areas on them.

Attribute data for some of the WCMC Protected Areas (points) coverage could not be determined, and the fields were thus left blank.

SIERRA LEONE DATA SOURCES

DCW

ONC Charts	K01	L01
Date Compiled	7/65	2/68
Date Revised	7/84	4/80

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Tropical Moist Forest data come from forest data compiled by Henrik Olesen for the European Commission TREES project. The system used to delimit forest/non-forest boundaries in West Africa using 1 km resolution NOAA/AVHRR-LAC satellite data was developed by UNEP/GEMS/GRID, with aid from the EEC and FINNIDA. These data represent an update of the data set from "The Methodology Development Project for Tropical Forest Cover Assessment in West Africa" (Paivinen and Witt, 1989).

Production Forest and Protected Areas data were mapped from a 1:950,000 scale map entitled "The Forest State at 31st March 1961," compiled by the Directorate of Overseas Surveys; and from a 1:500,000 scale map entitled "Vegetation and Land Use of Sierra Leone," provided by Prince Palmer, Deputy Chief Conservator of Forests, Forestry Division, Freetown.

Population Data

The original source of the population data is the Sierra Leone Government (1986), "The Preliminary Report on the 1985 National Population Census of Sierra Leone," Freetown.

DATA ISSUES SPECIFIC TO SIERRA LEONE

The Freetown city outline in DCW PPPOLY coverage did not follow the coastline. The outline was digitized to match the one on the ONC chart.

Some arcs representing railroads in the DCW RRLINE coverage were broken up. They were made continuous after checking on the ONC charts.

In the DCW TSLINE coverage, arcs representing a ferry line at the mouth of the Sierra Leone River were clipped off during processing because they fell outside the country boundary. These arcs were later restored.

SOMALIA DATA SOURCES

DCW

ONC Charts	K05	K06	L05	L06	M05
Date Compiled	4/77	3/89	4/66	8/78	11/69
Date Revised	5/88	3/89	2/88	11/85	2/87

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Protected Areas data have been taken from various sketch maps and data on file at WCMC.

Population Data

The original source of the population data is the Somali Democratic Republic (1984), "1982 Statistical Abstract," Central Statistical Department, State Planning Commission, Mogadishu.

DATA ISSUES SPECIFIC TO SOMALIA

For Somalia, official total population for 1980 was 5,074,000, while the U.N. estimate for that year was 6,713,000. As the NCGIA deems the U.N. probably to be more reliable, all regional population totals were increased using the factor 1.32302. Second-level administrative boundaries are available, while the accompanying population data are not.

In the DCW coverage RRLINE, areas were found that did not correspond to the railroad line on the ONC chart and thus were deleted.

The population coverage was modified slightly to simplify its use and increase the ease of understanding. This was done because population data for Somalia were only available for first-level administrative units while boundaries also existed for second-level administrative units. An item POP1_94 was added to keep the original information which contains population estimates for first-level units. For each first-level unit, one second-level unit has the total population estimate for that region, and the other second-level units have a population estimate of zero.

Rough population estimates for second-level administrative units were derived from first-level population estimates based solely on respective land area. These estimates can now be found in POPEST_94. The item FLAG was modified to correspond to these changes in POPEST_94.

Attribute data for some of the WCMC coverages could not be determined, and the fields were thus left blank.

SOUTH AFRICA DATA SOURCES

DCW

ONC Charts	P04	P05	Q04	Q05	R04
Date Compiled	11/86	11/71	8/77	4/67	4/67
Date Revised	11/86	11/71	12/84	8/87	2/82

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Population Data

Population data came from the Republic of South Africa (1992), "1992 South African Statistics," Central Statistical Office, Pretoria; the Republic of South Africa (1991), "Population Census 1991," Adjustment for Undercount, Central Statistical Office, Pretoria; Ciskei Central Statistical Service (1988), "Statistical Abstract of Ciskei 1988," No. 1; and Brian Hunter (ed.), "The Statesman's Year Book 1992-93," 129th edition, St. Martin's Press, New York.

DATA ISSUES SPECIFIC TO SOUTH AFRICA

In the WCMC protected areas coverage, the nature reserve area named Mt. Thesiger has been de-classified by IUCN, but was left in the coverage because it retains some legitimacy nationally.

Because of PC ARC/INFO's limitation of 5,000 arcs per polygon and 5,000 polygons per coverage, the DCW drainage layer was divided into five separate coverages that cover the northeastern (DNNETNE), northern (DNNETN), southeastern (DNNETSE), southern (DNNETS), and western (DNNETW) parts of the country.

Attribute data for some of the WCMC coverages could not be determined, and the fields were thus left blank.

SUDAN DATA SOURCES

DCW

ONC Charts	J05	J06	K04	K05	L04	L05
Date Compiled	7/77	1/80	2/86	4/77	11/67	4/66
Date Revised	1/88	1/80	2/86	5/88	7/88	2/88

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Protected Areas were digitized from the 1:4,000,000 scale map "Sudan" (1987), and from spatial data held within WCMC files.

Population Data

The original source for the population data is the University of Gezira (1983), "Population of the Sudan and its Regions," Population Studies Centre, Gezira.

DATA ISSUES SPECIFIC TO SUDAN

The Akobo River forms the political boundary between Sudan and Ethiopia. However, within the DCW, the drainage feature (Akobo River) and the political boundary differed. The corresponding line feature in the DCW PONET coverage was used to replace the drainage line feature in DNNETS and DNNETSC.

The Southeastern border of Egypt with Sudan is a disputed area, and the line used in the DCW PONET coverage to demarcate the border was left as is.

Because of PC ARC/INFO's limitation of 5,000 arcs per polygon and 5,000 polygons per coverage, the DCW drainage layer was divided into six separate coverages that cover the central (DNNETC), eastern (DNNETE), northern (DNNETN), southcentral (DNNETSC), southern (DNNETS), and western (DNNETW) parts of the country.

Because of the complexity of the HYNETP coverage, the elevation ranges had to be shown using a hatch pattern. When a solid pattern is used, the correct data are not seen.

Two islands that were mistakenly coded as belonging to Egypt in the DCW PONET coverage were recoded to belong to Sudan after checking other sources.

Attribute data for some of the WCMC Wetlands and Protected Areas (points) coverages could not be determined, and the fields were thus left blank.

SWAZILAND DATA SOURCES**DCW**

ONC Charts	Q05
Date Compiled	4/67
Date Revised	8/87

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Protected Areas data came from the WCMC protected areas database.

Population Data

The original source of the population data is the Government of Swaziland (1986), "Report on the 1986 Swaziland Population Census," Vol.1, Central Statistical Office, Mbabane.

DATA ISSUES SPECIFIC TO SWAZILAND

The DCW coverage PPPOLY for populated places is not available for Swaziland.

The WCMC coverage Production Forest has no attribute information.

For the WCMC coverage Production Forest, a SITE_CODE of 999 was given to island polygons in order to differentiate them from the Production Forest that enclose them.

Attribute data for some of the WCMC coverages could not be determined, and the fields were thus left blank.

TANZANIA DATA SOURCES**DCW**

ONC Charts	M04	M05	N05
Date Compiled	3/68	11/69	4/73
Date Revised	11/87	2/87	1/86

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Tropical Moist Forest data have been taken from a 1:2,000,000 scale map entitled "Forest Cover in Tanzania" which accompanies a report evaluating the extent of forest cover in Tanzania using 1973-1979 satellite imagery (Rodgers et al., 1985). Mangroves were mapped from various sketch and topographic maps, but these data are not precise. Additional sources were referenced as well, including the 1:2,000,000 scale map "Tanzania Vegetation Cover Types" (1974), prepared by the Forest Division, Ministry of Lands, Natural Resources and Tourism, Dar-es-Salaam.

Production Forest and Protected Areas data were extracted from a 1:2,000,000 map entitled "Tanzania" (1974) published by the Ministry of Lands, Natural Resources and Tourism. A complete digitized data set of the forest reserves of Tanzania was provided by Tanzania Wildlife Conservation Monitoring.

Population Data

The original source of the population data is the United Republic of Tanzania (1988), "1988 Population Census: Preliminary Report." Bureau of Statistics, Ministry of Finance, Dar-es-Salaam.

DATA ISSUES SPECIFIC TO TANZANIA

The DCW drainage coverage DNNET was clipped by a buffer of 1 km from the political boundary to include rivers meandering along the national border.

Some arcs representing railroads in the DCW RRLINE coverage were broken up. They were made continuous after checking on the ONC charts.

Because of PC ARC/INFO's limitation of 5,000 arcs per polygon and 5,000 polygons per coverage, the DCW drainage layer was divided into four separate coverages that cover the eastern (DNNETE), northern (DNNETN), southern (DNNETS), and western (DNNETW) parts of the country.

In the WCMC Tropical Moist Forest coverage some polygons coded as water bodies in areas without rivers or lakes were deleted. Some polygons inside Lake Victoria coded as land area were deleted as well.

In the NCGIA Population data coverage two small polygons between Coast and Lindi administrative units that were coded as part of Mtwara administrative unit were deleted after checking on a Tanzanian administrative map.

The polygons in the WCMC Production Forest coverage do not have any attribute information.

TOGO DATA SOURCES**DCW**

ONC Charts	K02	L02
Date Compiled	7/65	3/70
Date Revised	1/86	9/84

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Tropical Moist Forest data come from forest data compiled by Henrik Olesen for the European Commission TREES project. The system used to delimit forest/non-forest boundaries in West Africa using 1 km resolution NOAA/AVHRR-LAC satellite data was developed by UNEP/GEMS/GRID, with aid from the EEC and FINNIDA. These data represent an update of the data set from "The Methodology Development Project for Tropical Forest Cover Assessment in West Africa" (Paivinen and Witt, 1989).

Production Forest and Protected Areas data were extracted from a 1:200,000 scale unpublished blueline map entitled "Forêts Classées du Togo" and a 1:500,000 scale published map "Togo" (1977) produced by the Institut Géographique National.

Population Data

The original source of the population data is "Aperçu des Résultats d'Ensemble du Recensement Général de la Population et de l'Habitat au Togo 1981," Bureau Central du Recensement, Lomé.

DATA ISSUES SPECIFIC TO TOGO

The DCW drainage coverage DNNET was clipped by a buffer of 1 km from the political boundary to include rivers meandering along the national border.

In the DCW HYNETP coverage, small silver polygons were found with values of "no data" for elevation ranges, and these values were recalculated to match the values of surrounding polygons.

Within the WCMC Production Forest coverage, there are some polygons which do not have detailed attribute information and therefore were classified as unspecified production forest.

TUNISIA DATA SOURCES

DCW

ONC Charts	G02	H03
Date Compiled	12/63	3/69
Date Revised	12/81	1/89

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Protected Areas data came from the maps in Guide des Parcs Nationaux d'Afrique-Afrique du Nord, Afrique de l'Ouest (1992) by B. Bosquet, Delachaux et Niestte, David Parret (ed.), Neuchatel, Switzerland-Prais at a scale of 1:1,000,000.

Population Data

The original source of the data is the U.S. Bureau of the Census (no date), International Database, Washington, DC.

DATA ISSUES SPECIFIC TO TUNISIA

Some data from the original ONCs were not coded accurately when producing the DCW. This is seen in the omission of the urbanized areas Matfur and Melita, the failure to classify roads that travel through some urbanized areas as Connectors, and the omission of railroad stations in the Cultural Landmarks theme.

Attribute data for some of the WCMC coverages could not be determined, and the fields were thus left blank.

UGANDA DATA SOURCES

DCW

ONC Charts	L04	L05	M04	M05
Date Compiled	11/67	4/86	3/68	11/69
Date Revised	7/88	2/88	11/87	2/87

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Tropical Moist Forest data were taken from the 1:500,000 scale "Uganda Vegetation Map" (1964, reprinted in 1972), Department of Lands and Surveys, Uganda. "The Vegetation of Africa" (White, 1983) was overlaid onto the source map to distinguish lowland and montane forests.

Production Forest has been taken from the map Uganda Forest Reserves (1967) from the Atlas of Uganda (1967).

Protected Areas were digitized from a 1:1,500,000 scale map entitled Uganda Game Conservation, printed by the Department of Land and Surveys, Entebbe which is an extract from the Atlas of Uganda (1967).

Population Data

The original source of the population data is the "Provisional Results of the 1991 Population and Housing Census," Statistical Department, Ministry of Planning and Economic Development, Kampala.

DATA ISSUES SPECIFIC TO UGANDA

The DCW drainage coverage DNNET was clipped by a buffer of 1 km from the political boundary to include rivers meandering along the national border.

Within the DCW source data, some parts of Zaire and Sudan were coded as Uganda. These polygons were recoded before PONENT was used to clip all of the layers.

ZAIRE DATA SOURCES**DCW**

ONC Charts	L03	L04	L05	M03	M04	N03	N04	N05
Date Compiled	6/74	11/67	4/66	6/65	3/68	12/68	11/71	4/73
Date Revised	10/84	7/88	2/88	11/84	11/87	10/87	3/83	1/86

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Tropical Moist Forest data came from a vegetation map derived from 1 km resolution NOAA/ AVHRR satellite data and from NASA and the University of Maryland. This is a preliminary version of the data set and is being evaluated by FAO and the Service Permanent d'Inventaire et d'Amangement Forestier (SPIAF) in Zaire.

Protected Areas data have been taken from a 1:2,500,000 published Russian map entitled "Zaire" (1987), compiled by the Main Administration of Geodesy under the Council of Ministers of the USSR and from data held within files at WCMC.

Population Data

Population data come from the République du Zaire (1984), "Combien Sommes-Nous? Recensement Scientifique de la Population," 1er juillet 1984, Kinshasa.

DATA ISSUES SPECIFIC TO ZAIRE

The DCW drainage coverage DNNET was clipped by a buffer of 1 km from the political boundary to include rivers meandering along the national border.

Within the DCW source data, some parts of Uganda were coded as Zaire. These polygons were recoded before PONENT was used to clip all of the layers.

In the DCW RRLINE coverage, arcs representing railroads were cut off along the Southeastern border of the country. These arcs were made continuous after checking on the ONC chart.

Because of PC ARC/INFO's limitation of 5,000 arcs per polygon and 5,000 polygons per coverage, the DCW drainage layer was divided into nine separate coverages that cover the eastern (DNNETE), northcentral (DNNETNC), northeastern (DNNETNE), northern (DNNETN), northwestern (DNNETNW), southeastern (DNNETSE), southern (DNNETS), southwestern (DNNETSW), and western (DNNETW) parts of the country.

After the Protected Areas coverage (PARKPY) was adjusted to DCW water bodies, Lake Edwards in the WCMC Wetlands coverage was found to overlap with the PARKPY coverage. Therefore the WCMC polygon representing Lake Edwards was substituted with its DCW (DNNET) counterpart.

Because the WCMC park coverages were adjusted for DCW lakes, there was some overlap between a WCMC lake (Lake Albert) and a park polygon next to this lake. Therefore, the WCMC lake polygon representing Lake Albert was substituted by its DCW equivalent.

Because of PC ARC/INFO's limitation of 5,000 arcs per polygon and 5,000 polygons per coverage, the WCMC forest layer was divided into six separate coverages that cover the east (FORESTE), northeast (FORESTNE), northwest (FORESTNW), south (FORESTS), southwest (FORESTSW), and west (FORESTW) parts of the country.

ZAMBIA DATA SOURCES

DCW

ONC Charts	N04	N05	P04
Date Compiled	11/71	4/73	1/86
Date Revised	3/83	1/85	1/86

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Tropical Moist Forest data come from "Republic of Zambia-Forest Estate 1988," Surveyor General, Ministry of Lands and Natural Resources, Lusaka, Zambia (1988).

Protected Areas data come from "Republic of Zambia," Surveyor General, Ministry of Lands and Natural Resources, Lusaka, Zambia (1986); and an unspecified photocopied sketch map indicating national parks and game management areas.

Population Data

The original source of the population data is the "1990 Census of Population, Housing, and Agriculture," Preliminary Report, Central Statistical Office, Lusaka.

DATA ISSUES SPECIFIC TO ZAMBIA

The political boundary was used to clip all layers except for DCW hydrology (DNNET). Here, a 1 km buffer along the political boundary was used to include rivers meandering along the national border.

Because of PC ARC/INFO's limitation of 5,000 arcs per polygon and 5,000 polygons per coverage, the DCW drainage layer was divided into three separate coverages that cover the northeast (DNNETNE), central (DNNETC), and southwest (DNNETSW) parts of the country.

In the railroads coverage (RRLINE), some arcs were not continuous in the original data. The railroad arcs were made continuous after checking on the ONC.

ZIMBABWE DATA SOURCES

DCW

ONC Charts	N04	N05	P04	P05
Date Compiled	11/71	4/73	1/86	11/71
Date Revised	3/83	1/86	1/86	11/83

Biodiversity Data

Wetlands were drawn onto ONC charts at 1:1,000,000 by R.H. Hughes and directly related to Hughes and Hughes, "A Directory of African Wetlands" (1991). These were digitized at WCMC and linked to a database compiled by the IUCN Wetlands Programme.

Protected Areas data have been digitized from a map entitled "Zimbabwe-Relief" published by the Government of Zimbabwe, and with additions of geographical data held within files at WCMC.

Population Data

The original source of the population data is the Government of Zimbabwe (1984), "1982 Population Census-Preliminary Assessment," Central Statistical Office, Harare. Detailed population data were assigned to administrative units using a 1:10,000,000 scale Zimbabwe Land Classification Map (1979) as a reference.

DATA ISSUES SPECIFIC TO ZIMBABWE

The DCW drainage coverage DNNET was clipped by a buffer of 1 km from the political boundary to include rivers meandering along the national border.

Some arcs representing bridges in the DCW TSLINE coverage were found in areas without transportation lines, and therefore, were deleted.

The capital city in the DCW PPPOINT coverage was named as Salisbury and was corrected to Harare.
