

- First name and surname(s)
- Sex
- Age
- Educational level
- Family members present in the shelter (e.g., father, mother, etc.)
- Sex and age of any family member who died
- Present state of health (e.g., symptoms of acute respiratory problems, diarrhea or other contagious disease)
- Losses sustained by the family (e.g., house, domestic goods, farm animals, etc.)

- Availability of cartographic data.

The countries in the region are increasingly using digital cartography at an aggregate level and at the city and town levels, as well. When analyzing the effects of a disaster, use should be made of the most up-to-date maps available. In many cases, this information comes from the national statistics office or from cartographic organizations. Also, as a result of decentralization, many local authorities have developed their own geographical information systems, so they, too, may have up-to-date maps of the areas under their jurisdiction. Part of the disaster assessment process should be to determine which material is available and how up-to-date it is.

- Need for a data-gathering strategy to assess medium-term effects of disasters.

A detailed assessment of the indirect effects of disasters in the medium-term can only be made if there is a post-disaster strategy that makes it possible both to assess the progress of the reconstruction process and to determine, say, the patterns of post-disaster migration or the effects of the disaster and subsequent aid on living conditions.

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APPENDIX III ESTIMATING THE POPULATION OF AFFECTED AREAS WITH REDATAM

There are many software packages that professionals can use to quickly and easily process data taken from censuses and other sources, organizing it into hierarchical databases for any user-defined geographical area (such as a group of city blocks). One of these programmes, which was developed in-house by CELADE, is called Redatam. Its validity and usefulness has been tested during recent ECLAC assessment missions. The main features of Redatam+G4 are described below.

What can Redatam+G4 do?

It makes it possible to process information in very large compressed databases (created in Redatam+G4 format), such as population and agricultural censuses, household surveys, etc., which contain data on millions of people, housing units and homes. Consequently, a Redatam+G4 database normally contains micro-data, that is data or variables linked to individuals, housing units, homes or other information elements from which different tables can be generated for any geographical area previously defined by the user. This data is hierarchically organized for rapid access and processed to find specific results for defined geographical areas of interest.

New variables can be derived and tables and other statistical results processed rapidly using graphic interfaces, without the assistance of a programmer.

Example of Redatam+G4 in use

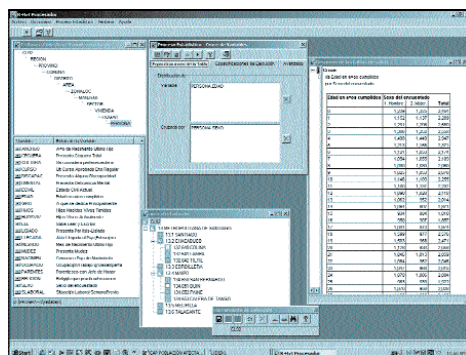
Information is needed on the age and sex of the people in an area that has been affected by a disaster.

The procedure for obtaining the required results is as follows (see figure 1):

1. Open the database dictionary (with levels and variables).
2. Create a geographical selection with the area to be analyzed. Select File/New/Selection from the main menu. Expand the area tree to display the areas to be selected and double click. Name the selection and save it.
3. Open the Statistical Process window by choosing the cross-reference variables option from the Statistical Process menu.
4. Use the mouse to select the variable to be processed from the Dictionary window.
5. Select the name of the variable and drag it to the empty box in the process window.
- 46 6. Fill in the box(es) with the variable(s) to be processed, according to whether a frequency, cross-referencing of variables, or average is required.
7. Start the statistical process by clicking on the Start icon

Figure 1

REDATAM +G4 WINDOW WITH THE DICTIONARY, PROCESS, AND GEOGRPHICAL SELECTION DISPLAYED

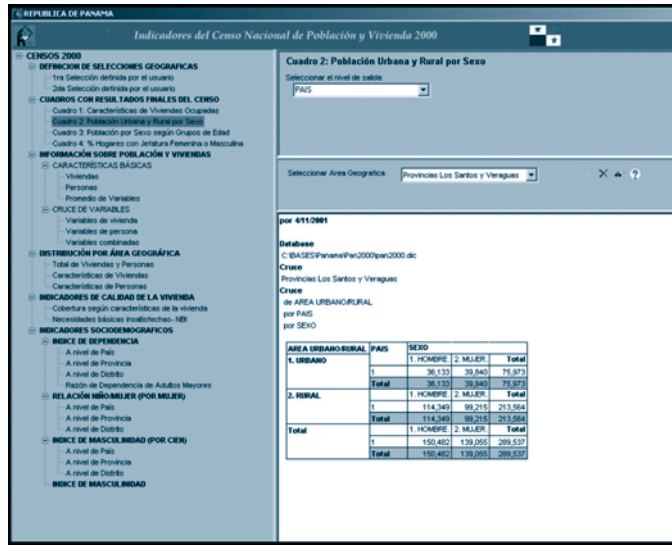


R+G4xPlan (pre-designed interfaces)

The RxPlan tool provides controlled access to the information contained in a Redatam database. No understanding of its mechanism or internal operation is needed to use this tool, which provides an easy-to-use, user-friendly interface to access the information. Its operability is commanded through the INL file.

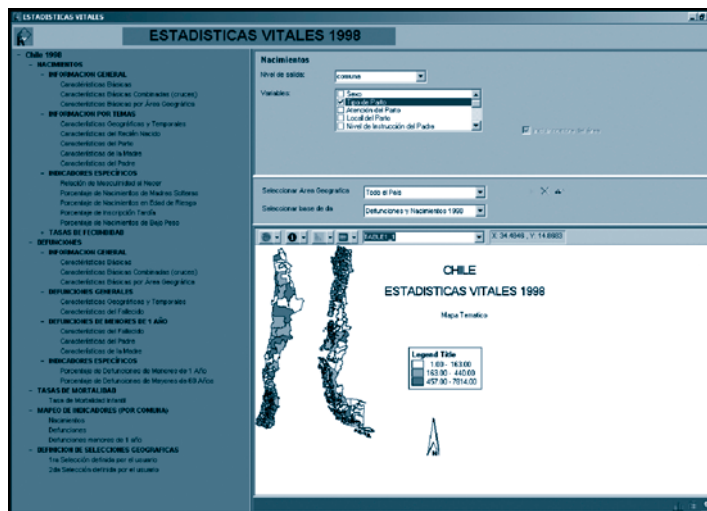
An RxPlan can be loaded with information on the existing population before a mission to assess the impact of a disaster is started. This makes it possible to use the information in the field without having to be an expert in Redatam or other software.

Figure 2
Example of a plan with a population census (Panama)



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Figure 3
Example of a plan with vital statistics (Chile)



APPENDIX IV THE USE OF GEOGRAPHICAL INFORMATION SYSTEM (GIS) TO ANALYZE INFORMATION GATHERED BY DIFFERENT SECTORS

A Geographical Information System (GIS) specifies a set of procedures in a non-graphic or descriptive database of real-world objects that can be represented graphically and whose dimensions can in some way be measured relative to the area of the world. Apart from a non-graphic specification, a GIS also has a graphic database of geo-referenced or spatial information, which is linked to the descriptive database. Information is considered geographical if it is measurable and has a location.

A GIS uses high-powered graphic and alphanumeric processing tools that are equipped with procedures and applications for inputting, storing, analyzing and visualizing geo-referenced information.

A GIS is useful mainly because of its capacity to build models or representations of the real world from information in databases. It achieves this by implementing a series of specific procedures that generate still more information for spatial analysis.

48 A valuable tool can be achieved by building simulation models that make it possible to establish the different influence factors by analyzing natural disasters or phenomena related to trends in time or space. GIS is therefore important for aiding hazard prevention and for simulating the damage that would be caused in the event of a natural disaster. GIS can also be used to interpret information by creating thematic maps that show the spatial distribution of the information. These maps show spatial patterns, trends or relationships, making it easier to analyze the information.

This is the case in the various successive stages of the process of assessing the damage caused by a disaster. The following possible uses of this tool are related to this point. A GIS makes it possible to modify the display of cartographic information by changing colors, symbols or values. This makes it possible to analyze the information from its spatial dimension in order to reveal patterns, relationships or trends.

A GIS is dynamic. Maps created with a GIS are not limited to just one moment in time. A map can be updated simply by updating the information linked to it. This operation is easy and quick and requires no special training.

Example:

THE JANUARY AND FEBRUARY 2001 EARTHQUAKES IN EL SALVADOR

Data gathered:

- According to the figures provided by El Salvador's National Emergency Committee, in the housing sector, 222 773 housing units (18 percent of the country's total stock of 1 259 697 urban and rural private housing units) were affected.

- Damage in the housing sector occurred throughout the country to differing degrees. The most affected provinces are Usulután, (with 74% of housing damaged), San Vicente (with 69%) and La Paz (with 64%). In other affected provinces, such as Sonsonate, La Libertad, and Cuscatlán, figures of between 20 percent and 30 percent were recorded.
- Per capita damage varied from less than 100 US dollars to more than 1,000 US dollars.

Any of these data can be displayed on a map:

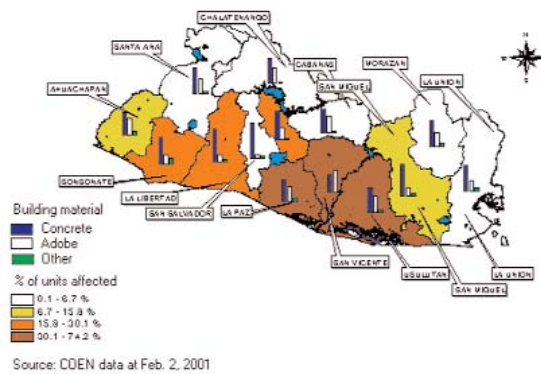
Map 1
GEOGRAPHICAL DISTRIBUTION OF EARTHQUAKE DAMAGE JANUARY - FEBRUARY 2001



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With a GIS, different information can be fed into the same map. The mapping tools can then be used to modify the graphic representation to find spatial patterns and relationships, as shown in the following examples.

Map 2
IMPACT OF JANUARY 13, 2001 EARTHQUAKE
PERCENTAGE OF HOUSING UNITS DAMAGED BY DEPARTMENT
(Bar graph indicates breakdown by building material)



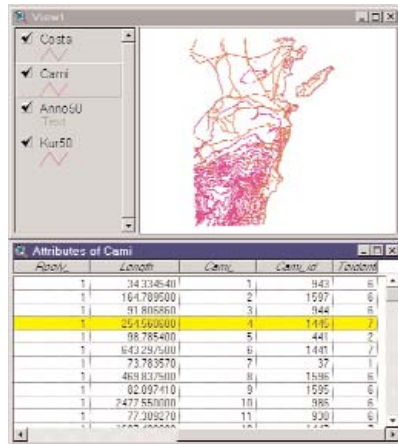
Map 3
IMPACT OF EARTHQUAKES JANUARY - FEBRUARY 2001
SPATIAL DISTRIBUTION OF 2001 HUMAN DEVELOPMENT INDEX



A GEOGRAPHICAL DATABASE

A GIS maintains a database. The database concept is an essential part of a GIS and marks the main difference between it and simple drawing or computerized cartography software, which can only produce graphic information. Every modern GIS incorporates a database management system. This database may contain coverage, images, attribute tables, etc.

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A GIS links the spatial data with descriptive information about some particular feature of a map. The information is stored as attributes or characteristics of the element that is represented graphically. For example, a road network may be represented by road centerlines, in which case a true visual representation would not provide much information about it. To obtain information about the road network, the user would consult the stored database data for roads, which might describe the class of roads, their width, type of surface, number of side roads, street names and ranking. The user can then create a display that represents all the roads according to the type of information required (see the following figure).

A GIS may also use stored attributes to calculate new information about a map's elements, such as the length of a given road or the total area of a particular kind of soil.

Users who want to go beyond mere drawing need to know three things about each element stored in the computer: what it is, where it is and how it is related to the other elements (for example, which roads are linked to form a road network).

Database systems deliver a means of storing a wide range of information and updating it without having to rewrite the programmes every time new data is input. In a GIS, the software handles the location of the elements, their descriptions and the way in which each characteristic is related to the rest.

A GIS allows the user to associate descriptive information with a map's elements, create new relationships that can be used to determine the layout of different sites for development, assess environmental impact, calculate crop volumes, identify the best location for new facilities, and so forth.

A GIS's capacity for data integration makes it possible to look at and analyze data in powerful new ways. Users can access information in a database table from a map or they can create maps based on the information in the table. For example, they can select a municipality on a map and display a list with all the relevant information about its population. Going the other way, users can also create a map of municipalities and display each of them according to the number of children, adults and seniors in their populations.

GIS COMPONENTS

A GIS has several components:



A GIS consists of hardware and software tools that use specific methods to perform operations on a database. The database is a simplification of the real world. The GIS user also becomes a vital part of the system when more sophisticated analyses are required. If queries about a place cannot be answered exclusively from the database screen, derived data may be required. Such derived databases are often the result of the effect of a model. A model is structured as a set of rules and procedures for deriving new information that can be analyzed by a tool such as a GIS and used to assist in problem - solving - and planning.

A GIS's analytical tools are used to build spatial models. The models may include a combination of logical expressions, mathematical procedures and criteria, which are used to simulate a process, predict an effect or imitate a phenomenon. Making the models calls for the tools found in a GIS, the ability to choose and use the right ones and great familiarity with the data being used. A GIS offers a great number of tools for analyzing the information in a spatial database.

When users wish to make a query or review a theme related to a spatial phenomenon, they can use a GIS to derive new information by creating a model that performs the analytical procedures. They can then examine the results from the model. This process, which is known as spatial analysis, is useful for evaluating suitability and capacity, estimating and predicting, and interpreting and understanding. There are many kinds of spatial analysis in a GIS, including contiguity analysis, proximity analysis, demarcation operations, surface analysis, network analysis and analysis based on the minimum element. These different forms of analysis include combined relational and spatial operations, as well as logical operations.

PROXIMITY ANALYSIS

How many houses are located less than 100 meters from a watercourse?
 How many customers live within a 10 km radius of a given shop?
 What percentage of alfalfa is within 500 meters of the silo?

To answer these questions, the GIS technology uses a process known as buffering, which determines the relationships of proximity between the elements (see the following figure).

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LINKING ELEMENTS AND ATTRIBUTES

As mentioned above, the power of a GIS lies in the link between graphic (spatial) data and tabular (descriptive) data. Three are features noteworthy in this respect:

- A one-to-one relationship is conserved between the map elements and the records in the element attributes table.
- The link between element and record is conserved by a unique identifier assigned to each element.
- The unique identifier is physically stored in two places: in the files containing the ordered pairs (x, y) and in the corresponding register in the element attributes table. A GIS automatically creates and conserves this connection.

Combined relational operations

In addition to keeping the elements and their attributes up to date, the previously described concept can be used for other functions. Either of the tables can be connected provided they share an attribute in common. A ‘relational’ uses a common item to establish temporary connections between the corresponding registers in the two tables. In a relation, each record in one table is connected to a record in another table that shares the same value for an item in common. A relation has the effect of making a table of attributes ‘larger’ by temporarily adding attributes to it, which are not really stored there. An example of this can be seen in the following figure.

A relation temporarily connects two attributes tables by using the item they have in common.

In a GIS, a database that contains descriptive attributes can be joined to an element attributes table. If a relation is used, the file of related tabular data can be kept and updated separately. For example, the registers in tax files can be applied to a map showing plots of land, provided that each plot is identified with a unique number. Census data on land can be related with polygons using the number of plots of land contained in both.

Common Fields

Attributes of California Counties				
Fips	Cnty_id	Cnty_tps	Sub_region	Stat_flag
6001	1526	1	Pacific	1
6003	1384	3	Pacific	1
6005	1430	5	Pacific	1
6007	1053	7	Pacific	1
6009	1466	9	Pacific	1
6011	1139	11	Pacific	1
6013	1502	13	Pacific	0
6013	1472	13	Pacific	1
6015	636	15	Pacific	1
6017	1325	17	Pacific	1
6019	1783	19	Pacific	1
6021				

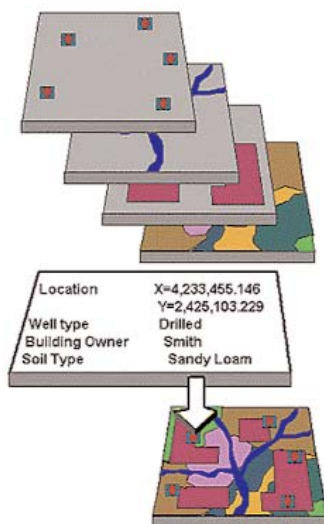
income.dbf			
Fips	Cnty_name	Inc_p_csp	
6001	Alameda	12468	
6003	Alpine	11039	
6005	Amador	9365	
6007	Butte	9047	
6009	Calaveras	9554	
6011	Colusa	8791	
6013	Contra Costa	14563	
6013	Contra Costa	14563	
6015	Del Norte	7554	
6017	El Dorado	10927	
6019	Fresno	9238	

Combined spatial operations

Relations and unions are among the basic operations of a GIS. They are simple in concept and are often used. For example, when a spatial superimposition is created, each new output element has attributes from the two sets of input elements used to create it. The superimposition of polygons is essentially a spatial union. In this case, instead of using a common item from two tables, the records are paired on the basis of the location of their associated geographical elements.

In the figure below, a coverage layer of populated centers is combined with layers for the hydrographic system, zoning and relief. When these coverage layers are superimposed, the spatial information is combined, as are the attributes, and a combined coverage is produced.

The possibilities of a GIS are based on its ability to carry out the many kinds of spatial analysis needed to answer the wide range of questions that people might have. A GIS can carry out all these operations because it uses geography or space as the common key between the data sets. Information is related only if it refers to the same geographical area.



Like other information systems, a GIS confirms the saying that better information leads to better decisions. A GIS is not, however, an automated decision-making system. On the contrary, it is a tool for analyzing, querying and displaying geographical information that can be used to assist in decision - making. GIS technology is used to create scenarios that help us to make the best decision when solving a problem.

Finally, it is important to mention that the development of personal computers has now brought GIS technology within the reach of everybody. A GIS now makes it possible to perform complex, sophisticated spatial operations with a desktop computer.

QUESTIONS THAT A GIS CAN ANSWER

A simple GIS programme, such as ArcView®, MapInfo®, IDRISI® or GISMAP®, can be run

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on a PC to answer many of your location-related questions by making use of existing data.

The following are examples of typical questions that a GIS can help to answer.

Location: What exists in ...?

The first of these questions attempts to discover what exists in a particular location. A location can be described in many ways, including place name, postal code or geographical references, such as latitude and longitude.

Condition: Where ... ?

The second question is the opposite of the above and requires spatial analysis before it can be answered. Instead of identifying what exists at a given location, you may wish to find a place where certain conditions are met (for example, a non-forested piece of land with an area of at least 2,000 square meters, 100 meters from a road and with soil that is suitable for building).

Trends: What has changed since ...?

The third question, which might include the first two, attempts to find differences within an area over a given period of time.

Patterns: What spatial patterns exist?

This question is a more complex . You might ask it to find out whether cancer is the leading cause of death among people living near a nuclear power station. Or you might want to know how many anomalies from a pattern there are and where they are located.

Creating models: What would happen if ...?

This type of question is asked to find out things such as what would happen if a new road were added to a highway system or if a toxic substance were introduced into the underground water supply system. Specific geographical and other information is needed to answer this type of question.

The questions included when creating models call for the generation of additional data (using a complete GIS, such as ARC/INFO), based on existing geographical data. The following are some typical question-asking techniques.

Proximity: What are the characteristics of the area around the existing elements?

Provide a summary of the types of vegetation to be cleared within 100 meters of a fire cut-off for a high-voltage power line; inform the fire brigades about the nearest watercourse at the time of fighting a forest fire; notify the owners of wells within three miles of a toxic waste dumping site of possible pollution; warn all owners within 500 meters of a proposed change of site. All these problems can be solved with the proximity analysis tool: generation of intermediate memory areas or calculations of "intra-characteristic distance".

Limiting operations: What exists within a specific region?

Examine a problem, test a hypothesis and define alternative courses of action for the prototype areas in order to apply a model to an entire area of interest. You will sometimes wish to create data for specific areas of study. The limit operation tools can separate specific areas or they can extract elements from within a particular area.

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Logical operations: What is unique for a region or a set of elements?

Examine soils with a particular alkalinity; study roads built with a specific kind of surface; study wells that are deeper than their design depth. The answers to some questions about spatial elements can be found in their tabular attributes rather than their location. Elements can be extracted from databases or introduced into them by using logical operations.

Spatial union: Where is something?

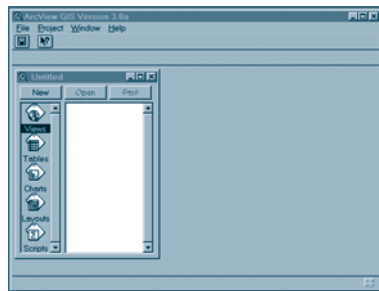
Establish area division discrepancies; establish wildlife habitat requirements; determine which parts of a right-of-way fall inside land whose ownership is in dispute. Many questions can be answered with spatial union operations, which are often referred to as the "superimposition of polygons". Spatial union operations provide new elements for the existing attributes.

NOTES ON USING ARCVIEW©

A spatial database may contain information about natural phenomena, artificial characteristics, limits, properties, etc. ArcView is a utility that creates an onscreen environment and queries the contents of a spatial database. ArcView allows users to explore the database, show all or part of its contents, query, display or save results and feed information to graphic and other applications.

THE ARCVIEW INTERFACE

The ArcView interface consists of windows, menus, a tool bar and a status bar. Like all programmes that run under Windows, ArcView is driven by menus that are activated by selecting options or clicking on icons. It is also extremely intuitive and user-friendly in its operating sequence.



ArcView's main window is the applications window. All ArcView operations are executed from there. This window can be resized, minimized and maximized with the mouse.

To load and display a coverage, an ArcView project must first be created, since every working session is saved in projects (file extension .apr). A project contains all the views, tables, graphics, cartographic compositions and macros that you need for a

given application. This means that all your work is saved in the same place.

The projects window organizes and lists the contents of the active project and makes it easier to manage and control work. A new project will be named 'untitled' until given a new name. See left figure.

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The tool bar is just below the menu bar. The icon buttons are used to activate given functions immediately without having to access them through a menu option. When the cursor passes over an icon on the tool bar, a description of its function appears in the bar at the bottom of the screen. At the start of an ArcView session, the main applications window contains only two buttons: one to save a project, the other to access the online help.



As you work with ArcView, the tool bars at the top of the screen change according to which window is active (a view, a table of attributes, graphics, etc.).

The following figure is a screenshot of several buttons grouped together. Each set of icons or buttons is used to activate different functions. For example, the tool bar in the second row beneath the main menu is used for operations that you might want to carry out on a map displayed in a view: request information about an element in the map, select an element, edit vertices, select a set of elements, zoom in and out, pan, measure, etc.



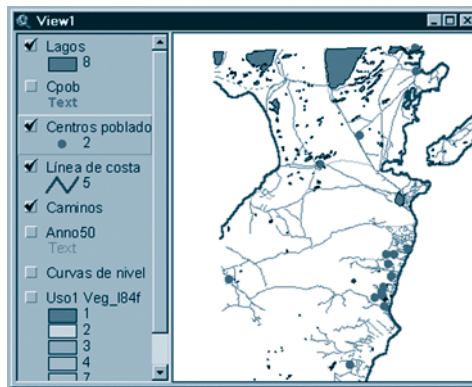
TYPES OF ARCVIEW DOCUMENTS

Boxes, tables, diagrams, schemes and macros handled in ArcView are known as documents. Each kind of document is briefly described below.

Views

A view is an interactive map that displays, explores, queries and analyzes geographical data. A view defines how the geographical data you are using will be displayed, but does not itself contain the geographical information.

A view can be thought of as a collection of themes. A theme is a collection of geographical phenomena defined by the user. The figure at right shows the view titled ‘View 1’, which shows the Punta Arenas sector in Region XII of Magallanes, Chile.



The view has a table of contents (or legend), which lists the themes being reviewed. The components of the view can be determined by looking at the table of contents. In the figure above, the window displays and lists the contents of the view.

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Rcvlv	Length	Cami	Cami_id	Teclens
1	34.334540	1	943	6
1	164.789500	2	1597	6
1	91.806860	3	944	6
1	254.558900	4	1445	7
1	98.785400	5	441	2
1	643.297500	6	1441	7
1	73.783570	7	37	1
1	468.837500	8	1596	6
1	82.097410	9	1595	6
1	2477.550000	10	986	6
1	77.309270	11	938	6
1	1607.422000	12	1447	7
1	1113.690000	13	1595	6
2	932.719700	14	1590	6
1	1902.576000	15	947	6
1	1508.057000	16	1464	7

Table of Attributes

Tabular data are stored in a table. You can display, query and also analyze almost any kind of tabular data, such as geographical aspects, types of soil, road conditions and so forth.

Graphs

Graphs allow the user to show numerical information in a graphic form. A graph makes it possible to visually compare the behavior of one variable with that of another. ArcView provides several options for creating graphs that can accompany the display of attributes in a map

Cartographic compositions

Cartographic compositions allow users to locate every type of document in a single window and produce a final map. Instead of being copied directly, views, tables and maps can be referenced within a cartographic composition. In this way, changes to any of the elements are automatically reflected in the composition. You can add elements (titles, legends, bar scale, texts, arrow to indicate North, etc.) to the cartographic composition.



Macros

A macro is a set of commands written in the language known as Avenue that allows users to manage the database in ArcView transparently. You can use Avenue to design your own interface to access ArcView.

All documents are managed through the project control window. Each type of document is represented by an icon, which, when selected, will display a list of all the documents of this type contained in the project.

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REPRESENTATION OF ELEMENTS ON THE MAP

Geographical phenomena are represented in the database by geometrical elements like polygons, lines, and points.

The geographical phenomena are known as classes of elements:

- Polygons might, for example, represent plots of land whose rateable value is within a certain range or parts of forests that contain particular species.
- Lines might represent paved roads, paths or drains of a specific diameter.
- Points might represent the location of warehouses, customers, wells or significant places.

AN ARC/INFO® COVERAGE

A coverage is a digital version of a map. It is the basic object that stores the geographical data (geographical elements and their attributes) in ARC/INFO®. A coverage may contain one or more classes of geographical elements. For example, a coverage whose elements are areas or polygons also contains labeled points that identify each polygon. In addition, a coverage containing polygons that represent plots of land may also contain linear elements (arcs) that contain information on the boundaries between the plots. When we add ARC/INFO® coverage to a view, the class of element to be used can be chosen.

ARCVIEW PROJECTS

A project is a space (with an .apr extension) that ArcView creates so that you can organize your work and documents in one place (or file). A project makes it easy to maintain and manage any combination of interrelated ArcView components. Views, tables, maps, cartographic compositions and macros can all be worked on and saved simultaneously in one file.

When you create an ArcView project, you create a file that contains the views, maps, plans and documents that make up the project.

THEMES IN A VIEW

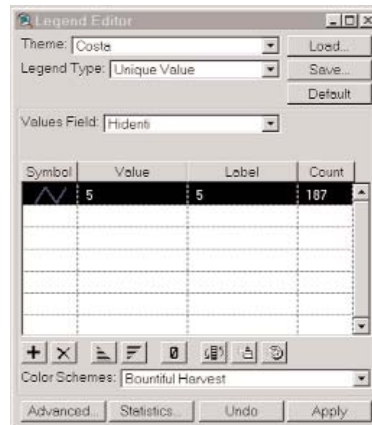
ArcView uses geographical information from a variety of databases to display a given geographical characteristic or theme in a view. Examples are spatial databases, including ARC/INFO coverage, configured ArcView files and satellite image data. ArcView also supports tabular (alphanumeric) databases that contain geographical information, such as street addresses and x,y coordinates.

The definition of the theme might simply be a request to display the complete database referred to in the theme, or it might be a set of criteria applied to the database to identify which part of the data should be displayed. A database is an ARC/INFO coverage or an image file. The image may have been scanned, or it may come from a satellite.

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Themes can be given any name. A theme might be named according to the database to which it refers, such as, USENOW (present use of land), P3716 or COV143. It might also be named according to the criterion that it meets, as in, "Appropriate areas for development," "Soil code = 5," or "Model 2 results."

Each theme represents a set of geographical elements that have a given characteristic or attribute. This characteristic or attribute is reflected cartographically by means of a determined symbology that is shown in a legend. A legend controls the way in which the elements in a theme are drawn. It consists of symbols, such as patterns that fill an area, types of lines that trace a linear feature or marks that show the specific location of a point (see right figure).



The symbols can be drawn with a great variety of colors. A theme can be displayed by using the same symbol and a different color or vice versa. For example, all the roads can be drawn with a broad red line or shopping centers can be represented with a yellow flag. ArcView provides a color palette for this purpose (see following figure).



Since themes are derived from a geographical database, they generally contain geographical elements associated with a table of attributes. All the elements of a theme can be drawn on the basis of a particular attribute value. For example, each water main can be drawn in a different color or with a different thickness according to its diameter if diameter is an attribute of the linear elements that represent pipelines.

Elements can be classified and then symbolized in accordance with the classification scheme, or each unique value for an attribute can be drawn. For example, types of soil can be shaded according to their alkalinity; regions can be colored according their net migration figures; or plots of land can be shaded with a unique pattern or color according to existing holdings.

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As you get used to ArcView, you will learn how to use the table of contents to control which themes are visible. It is possible to display all or just some of the themes on one screen. You can also control the order in which the themes are displayed. Each theme points to a coverage stored in a database somewhere in the system. The data can be stored on a local disk or on a disk in a network. Although many themes can be derived from the same coverage, an individual theme can only refer to one attribute of that coverage.

Although a theme can contain only one class of element (polygon, line, point or text), it can be derived from a coverage that has more than one type of element. For example, a coverage formed by censused city blocks (polygons) and the fronts of each block (lines) has a topology for the polygons and the linear elements, but the theme based on this characteristic can only display one of them. Another theme can be created to display the attributes of the other class of element.

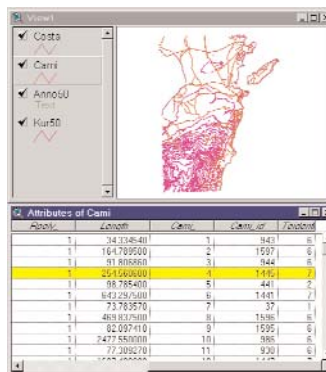


TABLE OF ATTRIBUTES

Spatial databases (e.g., ARC/INFO©) have a table of attributes associated with the geographical elements, which contains descriptive information. When a theme is displayed in a view, a table of attributes is immediately associated with the displayed elements (polygon, line, point or text).