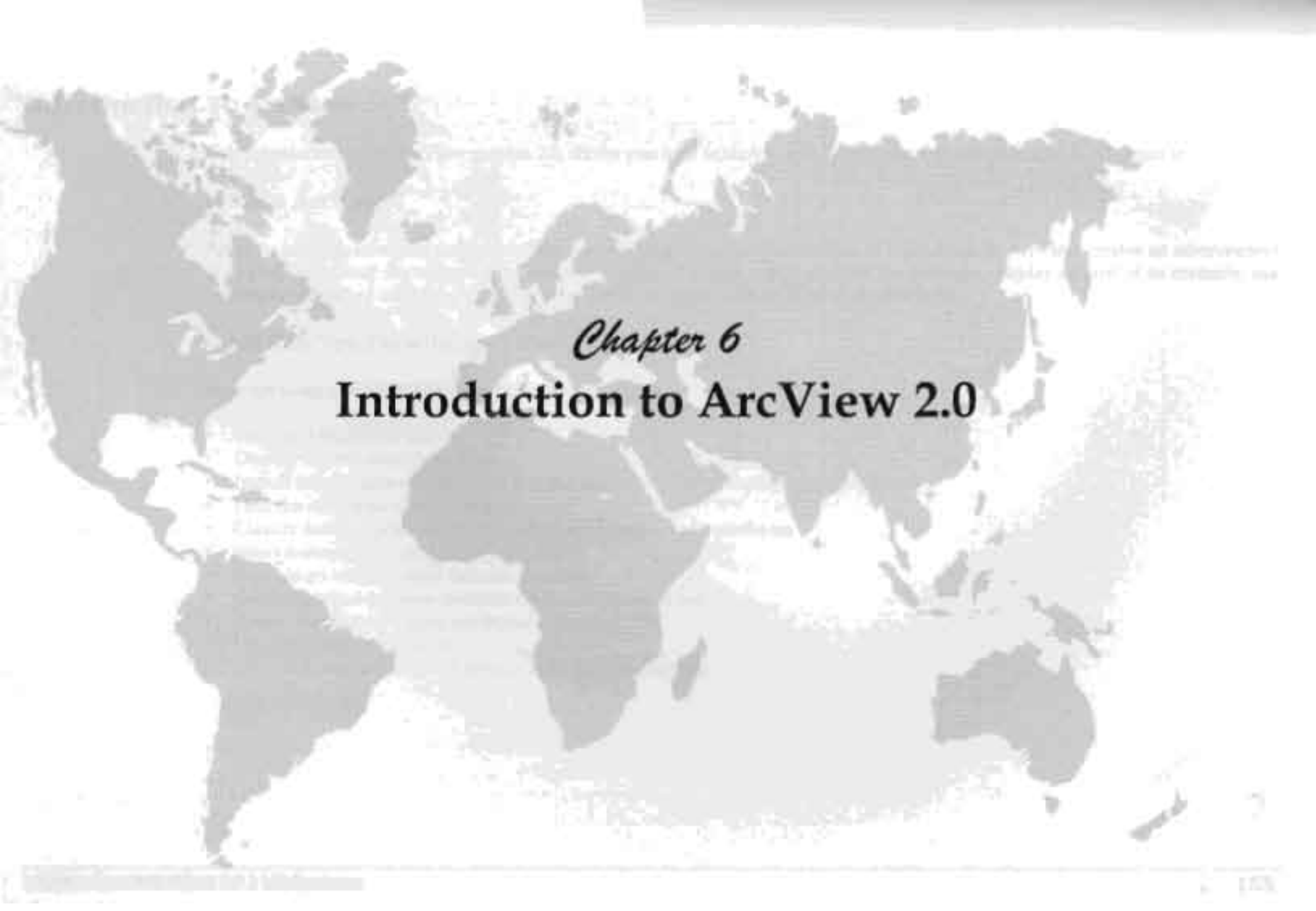


Chapter 6

Introduction to ArcView 2.0

Introduction To ArcView

This introduces you to ArcView version 2.0, shows you how to start it, and directs you to on-line sources of information.

What is ArcView ?

ArcView is a powerful and easy-to-use tool that brings geographic information to your desktop. ArcView creates an environment to display and query the contents of a spatial database. It allows you to explore the database, display all part of its contents, ask questions, display or save results, and pass information or graphics on to other applications.

What Can You Do with ArcView ?

Here are some of the key tasks you can accomplish with ArcView.

- Display ARC/INFO Data
- Display tabular data on a view
- Import tabular data and then join it to the data in a view to display it geographically
- Find the attributes of any features
- Classify features with different symbols according to their attributes
- Select features according to their attributes
- Find places where certain features coincide
- Summarise and generate statistics on the attributes of features
- Create charts showing the attributes of features
- Lay out a map and print it
- Lay out a map and export it for use in another application

Chapter 1

Projects and Views: Managing Your Work and Displaying and Querying Spatial Data

What is a Project ?

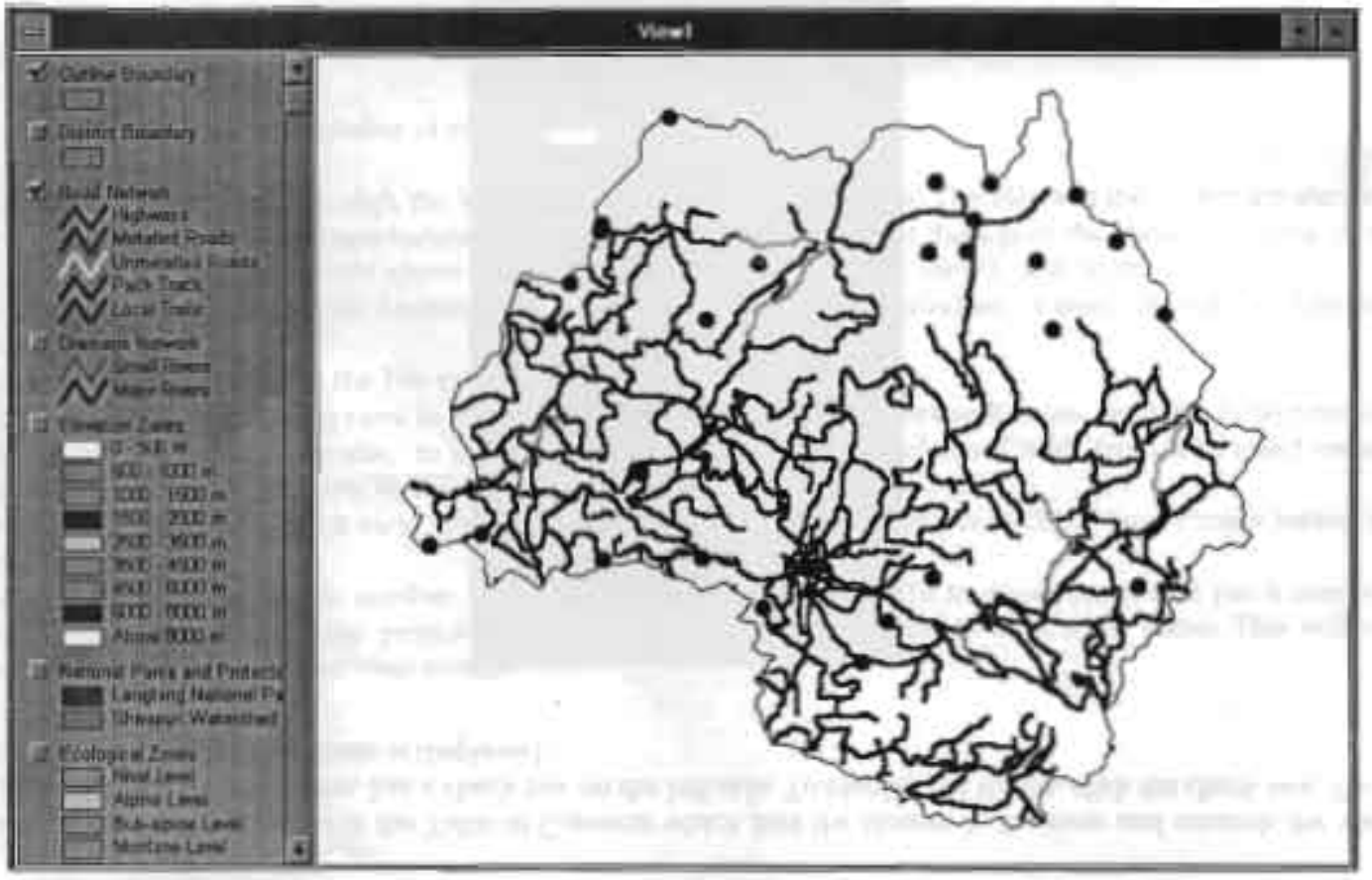
All the components of your ArcView session - views, tables, charts, layouts, and scripts - are conveniently stored in one file called a project. The project file shows you the contents of your project and makes it easy to manage all your work. Project files have the .APR extension.

When you open a project file, the components in the project are listed in the Project window. From the Project window, you can add or remove components from your project and give a component a descriptive name.

What is a View ?

A view is an interactive map that lets you display, explore, query, and analyse geographic data in ArcView. A view defines the geographic data you use and how to display it, but it does not contain the geographic data files themselves.

A view is actually a collection of themes. A theme represents a distinct set of geographic features in a particular geographic data source.



What is a theme ?

A theme is a set of geographic features in a view. A theme represents one of the following sources of geographic data:

- an spatial data source, such as an ARC/INFO coverage,
- an image data source, such as a satellite photo, and
- a tabular data source containing events, such as a table with X, Y coordinates.

The themes in a view are listed in its Table of Contents. For example, a view of a city might have one theme representing major highways, metalled roads, non-metalled roads, and one theme representing the drainage network of an area, etc.

Each theme has its own legend displayed in the Table of Contents. A theme's legend controls how the theme is displayed on the view. You can edit the colours and symbols of a theme.

Table of Contents

On the left side of the view's window is the Table of Contents which lists the themes in the view and controls the visibility of the themes and drawing order. Each theme, has a check box on the left side. To display the theme, click the check box. The check mark ✓appears in the check box and the theme is displayed.

When you are working with a view, you will see the view's menus, buttons, and tools.

Working with Views in a Project

An ArcView project can contain any number of views.

- To see which views are in a project, click the Views button in the project window. The views in the project are shown in the list.
- To create a new view, with the **Views** button selected, click the New button at the top of the project window. A new empty view will appear. ArcView names new views in numerical order: View1, View2, View3, and so on.
- To open a view, double click the view's name in the list of views in the Project window, or select the view's name and click the Open button.
- To close a view, choose Close from the File menu.
- To rename a view, click once on the view in the list in the Project window and choose Rename from the Project menu.
- To delete a view: click once on the view in the list in the Project window and choose Delete from the Project menu. To select several views for deletion, hold down SHIFT and click the other views to delete.
- To save the work undertaken with a view, choose Save Project from the File menu or click the Save Project button in the View button bar.
- To copy a view from one project to another, if you want to get a view that is in another project and put it into your current project, you should import the other project into your current one using Import in the Project menu. This will copy all the components of the other project into your project.

Exercise 1

There should be an existing database for ArcView to work. For this lab exercise, you will use the Bagmati datasets on a scale of 1:250,000. The available ARC/INFO datasets of Bagmati Zone that you can practise with and incorporate into your projects are: Outline, District Boundary, Elevation, Ecological Regions, Roads, River, National Parks and Protected Areas, Settlements, and Spot Heights.

In this exercise, you will learn the following.

- How to create a project
- How to create themes
- How to edit a theme's legend
- How to classify spatial data
- How to move around the display
- How to carry out spatial analysis
- How to select features
- How to carry out logical selection
- How to define themes
- How to edit a theme

Getting Started

Click the ArcView icon  to start ArcView from the Microsoft Office Window.

Creating a Project

When you create a project, you create one file that contains the views, tables, charts, layouts, and scripts that make up the project.

To create a project, choose **New Project** from the **File** menu.

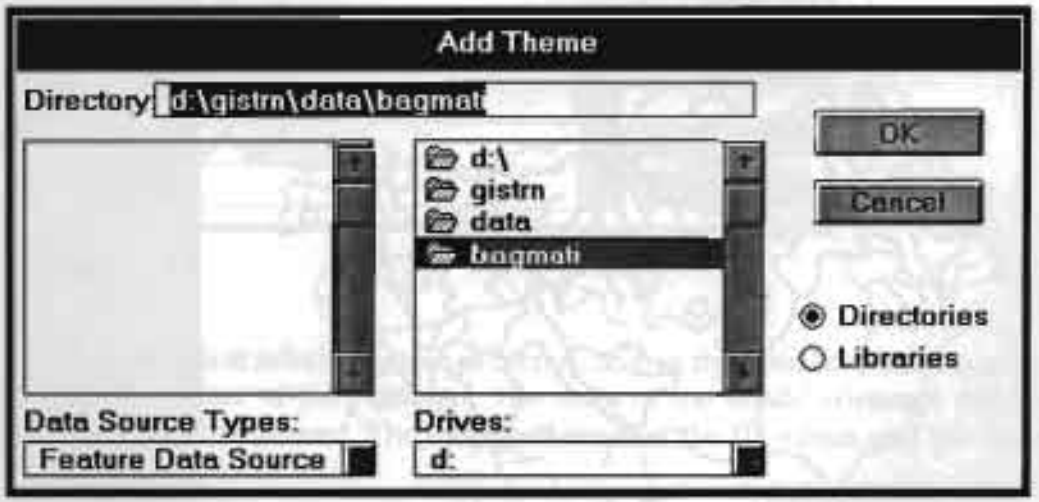
ArcView creates a new project called Untitled and opens the Project window.

Creating a Theme

You can create a theme, selecting the data source that you want it to represent. Any supported data that you have read access to can be created in a view as a theme.

To create a theme of ARC/INFO coverages of the Bagmati dataset -

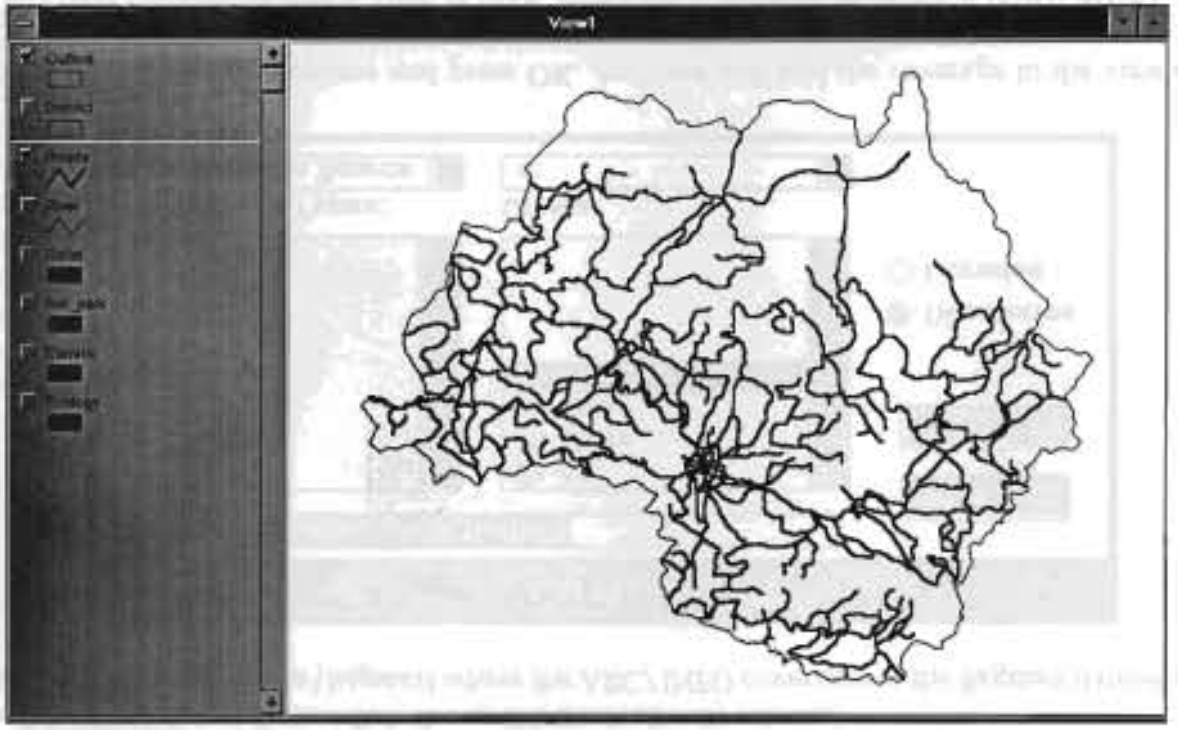
- From the **View** menu choose **Add Theme** or click the **Add Theme** button to display the Add Theme dialog box.
- In the *Data Source Types* box, choose *Feature Data Source* if it is not already selected.
- Navigate to the directory ***d:\gistrn\data\bagmati*** where the ARC/INFO coverages of the Bagmati dataset are contained.



- Now double-click all the features one-by-one and press **OK**. ArcView will add the coverage to the view's Table of Contents and choose the feature class for you.
- To add all the ARC/INFO coverages into a view at once, select the coverages by holding down **SHIFT** and clicking on the coverage, and then press **OK**.

When you create a theme, ArcView does not immediately draw it on the view. This enables you to first edit the theme's legend or change the drawing order. To draw the added theme, click on the check box next to the theme's name in the view's Table of Contents.

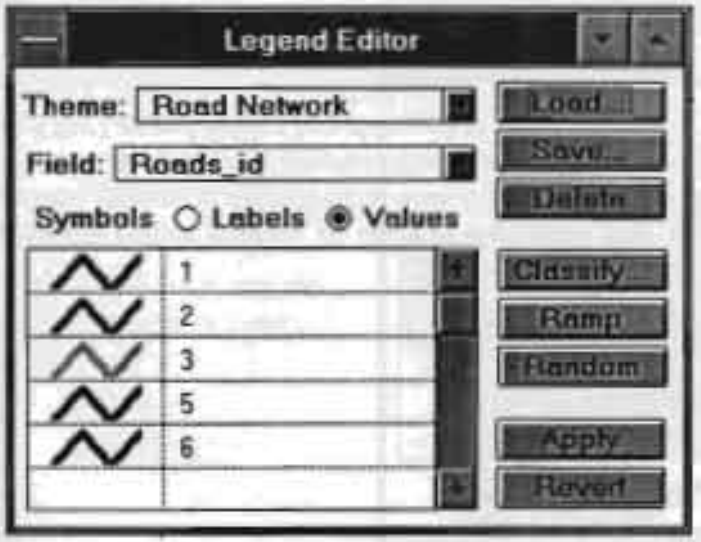
Now, to draw the roads of Bagmati, click on the Roads' theme. The roads will be displayed in a view. You will notice that all the roads are displayed in one colour, which indicates they are the same type of road. However, they are not. Five different types of road are defined in this coverage. So, to display five different types of road in a view, you need to edit the legend of the theme Roads.



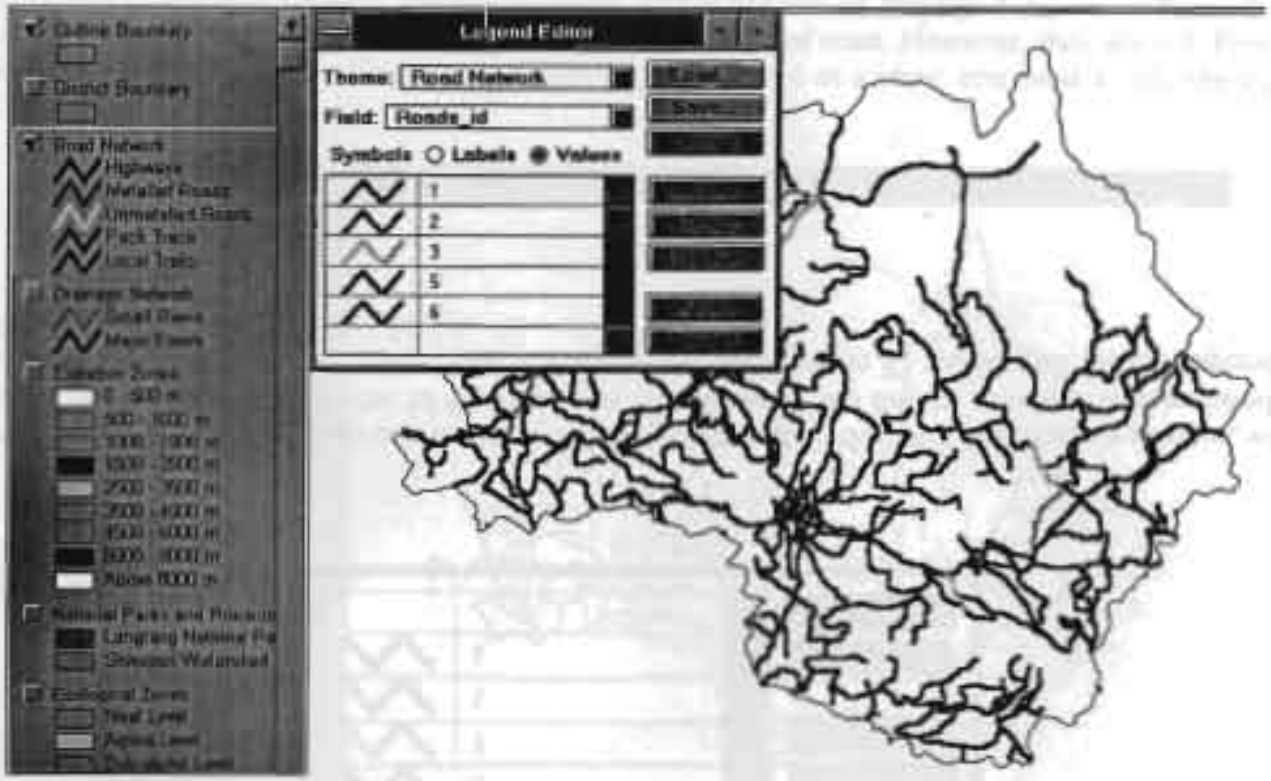
Editing a Theme's Legend

By editing a theme's legend with the Legend Editor you can change the patterns and colours of the symbols that ArcView uses to draw the theme in your view.

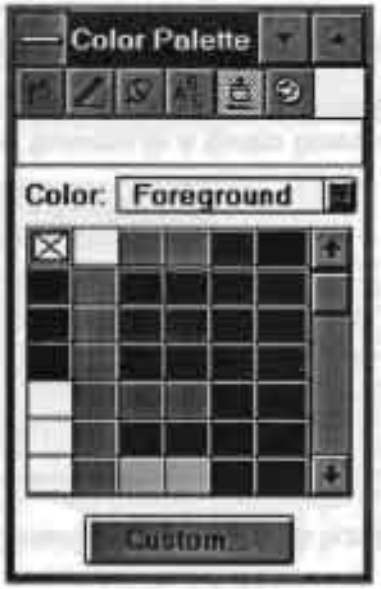
To edit the legend of Roads, first click once on the theme Roads in the Table of Contents to make it active. Then choose Edit Legend from the Theme menu or double-click the theme Roads. ArcView will display the Legend Editor.



In the Theme box, you will notice that Roads is selected, which is correct, and, in the Field box, None is selected, which you have to change. Click the **7** button in the right corner of the Field box. The items of the Roads' coverage will be listed. Select the item ROADS_ID according to which roads are categorised. Then you will see that the ID values and the corresponding symbols are displayed. Edit the ID values accordingly to 1,2,3,5,6.



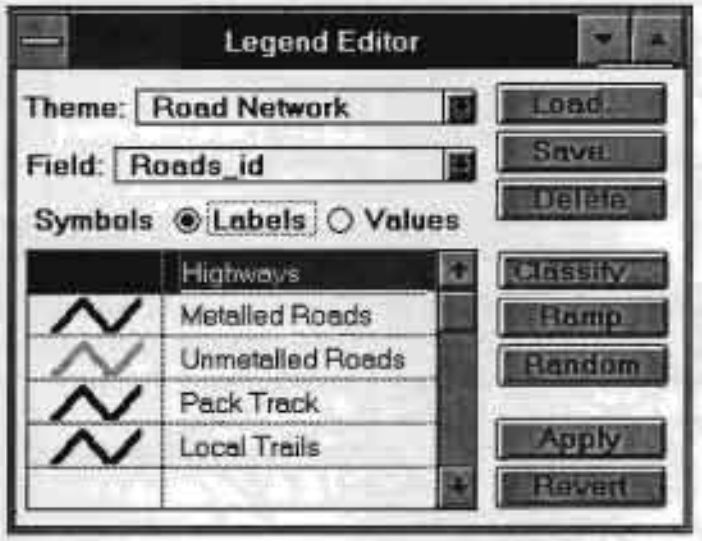
Now, change the colour of the lines using the colour palette. To display the roads with the ID value 1 in red, double-click on a symbol in the Legend Editor. The pen palette (figure) is displayed in which you can define the thickness of the line. To change the colour, click once on the colour button. The colour palette is displayed, choose red. As soon as you choose red, you will notice that the colour of the line in the symbol field of the Legend Editor has changed to red.



Similary, change the colour of the other individual lines as you desire.

After choosing the colours, the next step is adding labels. You can enter your own text label next to each symbol in the theme's legend in the Table of Contents. This allows you to describe what each symbol represents. Press the Labels' button on the Legend Editor and enter the text you want to appear next to each symbol. Add the text for each type of road as follows.

ID Value	Type of Roads
1	Highways
2	Metalled Roads
3	Non-metalled Roads
4	Pack Track
5	Local Trails



Press Apply and your labels and colours will appear in the Table of Contents. Click the check box to display your results in a view.

Hiding a Theme's Legend

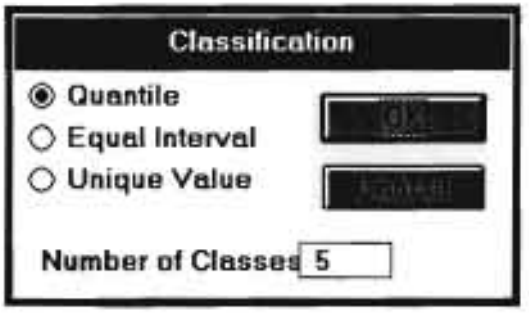
The legend of each theme in a view is normally shown in the view's Table of Contents. However, You can save space in the Table of Contents by hiding legends. To hide a theme's legend, click on the legend to make the theme active, and then choose Hide/Show Legend from the Theme menu.

Classifying Spatial Data

By specifying a range of symbols, you can symbolise and classify the features in a theme based on the values they have for any field in the theme's attribute table. You can change the classification and symbols of a theme with the Legend Editor.

To classify the features, the procedure is as follows.

- In the Legend Editor, choose the name of the field you wish to use to symbolise the theme.
- Set the number of classes or type of classification you require by pressing the Classify button to set the classification to either Quantile, Equal Interval, or Unique Value.



To choose a random range of colours, the procedure is as follows.

- Press the Random button in the Legend Editor.

Up to now, you have created a theme for the Roads' coverage. Similarly, create themes and edit the legends of other coverages.

Move Around the Display

- You can use the view button bar and tool bar to move around and zoom in on the display.

- Use this  button to zoom to the full extent of all the themes in a view which allows you to see everything.
- Click on a theme in a view's Table of Contents to make it active, and then click this button  to zoom to the area covered by the active theme.
- When you have selected the features on a view, click this button  to zoom to these features of the active themes of the view.
- Use this button  to zoom in on the centre of a view.

- Use this button  to zoom out from the centre of a view.
- Use this button  to zoom in on the position you click.
- Use this button  to pan the view by dragging it in any direction at any time.

Performing Spatial Analysis

Spatial analysis operations provide the means to look for or determine relationships between themes, to assign the attributes of another, and to perform aggregation of both features and attributes.

Spatial analysis operations available in ArcView include the following.

- Finding point features that are nearest to the selected point or line features
- Finding point features according to the polygon features they fall inside (point-in-polygon)
- Finding line features according to the polygon features they cross (intersection).
- Finding polygon features according to the polygon features with which they coincide (intersection; polygon-in-polygon)
- Finding features that are adjacent to the selected features
- Creating new features by merging a set of adjacent features into one single feature or aggregate disjunct features
- Selecting features by specifying a buffer distance

Selects the features of the active themes with the features of the theme you specify. Choose Select By Theme in the Theme menu.

To select a theme using another theme, follow this procedure.

1. Make the themes to be selected active. These are the target themes.
2. In the Theme menu, choose Select by Theme.
3. Choose the spatial relation type.

   This phrase qualifies the selection. ArcView provides several spatial relation types. The types you see depend on the selector theme's feature type. In some cases, you may want to pick the selector theme before choosing the spatial relation type.

4. Pick the theme from which the features are used to make the selection.

This is the selector theme. ArcView selects features in the target themes using the selected features of the selector theme. If no features in the selector theme are selected, ArcView uses all the selector theme's features to select.

5. If you choose Are Within Distance of, specify the selection distance.

   ArcView selects the features in the target themes whose distance to any of the features in the selector theme is less than or equal to the selection distance. The selection distance units are the distance units of the view. Set the distance units in the View Properties dialog box.

6. Choose a selection method.

   ArcView provides three selection methods. New Set creates a new set of selected features from all candidate features. Add to Set adds new features to the existing selected set of features. Select from Set selects features only from candidates in the currently selected set of features.

Notes

- Specifying a selection distance essentially creates a buffer polygon around the features of the selector theme; however, the buffer polygon is not visible.

- If you specify a selection distance of 0, ArcView selects the features that intersect the selector theme's features. A selection distance of 0 selects all points in the target themes that fall within a polygon, all lines that intersect, and all lines that intersect the selector theme's polygons and all polygons that intersect the selector theme's lines.

- ArcView uses the selected features of a theme to make the selection; therefore, if the active theme is the same theme as the selector theme, and you choose Intersect, you can select features that are adjacent to the selected features.

Example

To identify the Settlements that are within 1,000 Metres of the Roads

1. In this example, you are dealing with the distance. So, your first task is to set the map and distance units. To do this, choose Properties from the View menu. Set the map units and distance units to metres and press OK.
2. Activate the Settlement in the view's Table of Contents by clicking once, if it is not already activated.
3. Click the check box to display the settlements and roads.
4. Select Select by Theme from the Theme menu.
5. In the *Select features of active themes* box, select Are within Distance of.
6. In the *Selected features of* box, select Roads.
7. Select New set to exit from the Select by Theme menu and wait for a few seconds. ArcView will display the settlements within 1,000 metres of the roads in different colours (yellow).

You can check your results by measuring the distance of marked and unmarked settlement points from roads. To do this,

1. click the measurement button,
2. select any yellow marked settlement point by clicking once, and
3. stretch the measurement cursor to the roads around it.

The distances will be displayed on the lower left hand corner of the screen. Similarly, check for other points.

Example **Select Rivers that are within 200 metres of the roads.**

Selecting Features

Selecting features on a view enables you to:

- find specific geographic features that interest you or meet certain important criteria, and
- work with specific geographic features in a variety of ways to find out more about them.

There are several ways to select features on a view. You can select them according to their location, according to their attribute values, or by selecting their records from a table. You can select features from one or more themes. Before you can select features from a theme, you have to click on the theme in the Table of Contents to make it active.

Features highlights views when they are selected and they remain highlighted until a different selection is made, or until they are deselected.

Selecting Features with the Mouse

The Select Feature tool allows you to select features with the mouse by pointing at them or by dragging a selection box over them. Features that fall partly or wholly inside the box you define will be selected.

Selecting Features Using Shapes

Shapes, such as circles, boxes, lines, and polygons, drawn on a view using the Draw tool can be used to select features. Simply draw the shape and then press the Select Features Using Shape button.

Selecting a Feature Using Find

Find is a quick way to select a particular feature of interest. For example, if you are working with a theme of the settlements and you want to select *Koteswor*, simply type the name into the Find dialog box.

Selecting Features Using a Query

Use a query when you want to select features according to their attribute values. For example, you can build a query to select all the settlements in Bagmati Zone with populations of more than 10,000. You can also build more complex queries.

You can also use the Query Builder to narrow down your selection by building a query that only selects features from the set you have already selected.

Example

You Have a Theme Displaying the Point Locations of Settlements, and Want to Find Out the Settlements within a 10,000 Metre Radius of *Kathmandu Municipality*

In this case, you do the following.

1. Click on the settlement theme in the Table of Contents to make it active.
2. Use the *Draw tool* to draw a circle with a 10,000 metre radius centered on the Kathmandu Municipality location.
3. Choose the Select Features using the Shape button to select the settlements in this area.
4. Click the Query Builder button. ArcView displays the Query Builder. Build a query to select the settlements having a population greater than 10,000.
5. Press the Select From Set button on the Query Builder. From the set of settlements that is already selected, ArcView will select those that match the query.

Selecting Features by Selecting Records in a Table

A theme's attribute table contains one record for each feature in the theme. When you open a theme's attribute table containing the attributes of a theme's features, selecting records in the table automatically selects the features they represent on the view.

To select features by clicking on records in the theme's attribute table

1. Click on the theme in the Table of Contents to make it active, if it is not already.
2. From the Theme menu choose Table or click the Open Theme Table button. ArcView displays the theme's attribute table.
3. Hold down SHIFT and click on the records you want to select. The features in the theme represented by these records are also selected in the view (You can also use the keyboard to select records in the theme's attribute table.)

Selecting Features Using a Chart

A chart created from a theme's attribute table contains one data marker for each selected feature in the view. By erasing data markers in the chart, you can deselect features on the view. In this way, you can use the chart to focus on particular features of interest.

Logical Selection: The Query Builder

The Query Builder allows you to select features on a view and records in a table by defining a query based on their attribute values.

Building a Query

To build a query, choose a Field, then an Operator, and then a Value. You build a query by double-clicking on these options with the mouse or by typing your query directly into the query text box. By default, the query is contained within parentheses. However, parentheses may not be required, depending on the complexity of your query. If the Update Values choice is on, click once on a field name to list its values in the Values' list. Field names are always enclosed in square brackets ([ ]). If the value you want to use in the query is not in the Values' list, type it into the query text box.

Example

1. To select elevation zones between the range of 1,500 - 2,500 metres, you can use the query (Note: Item GRID_CODE represents the elevation value).
   ([GRID_CODE] >= 1500) and ([GRID_CODE] <= 2500)

   To do this:

   a. click the theme RELIEF to activate it,
   b. select the Query Builder button (fig) OR select Query from the Theme menu,
   c. to build the query, choose the field (GRID_CODE), then an operator (>=), then a value (1500), again an operator (and), then the field (GRID_CODE), then an operator (<=), then a value (2500), and
   d. select New Set.

   ArcView will display the zones that match the criteria.

2. Strings, such as names, are always quoted in queries. Strings are case insensitive, so you can select the VDC *Bidur* with:
   ([VDCNAME] = "BIDUR")

3. Use * as a multiple character wildcard. For example, to select *Ramche* you could use the query:
   ([VDCNAME] = "RAM*")

4. Use ? in a string as a single character wildcard. For example, to find Salyankot and Methinkot, use:
   ([VDCNAME] = "??????kot")

5. To select all the VDCs with names starting with the letters D, you could use:
   ([VDCNAME] > "D")

Defining a Feature Selection for a Theme

By default a theme represents all the features of a particular feature class in its data source. However, it is useful to be able to restrict a theme to represent only a subset of the features in a particular feature class.

For example, you might have a data source that contains arcs for all the roads in your study area, but you want to create a theme that only represents the major highways. In this case, you would first add the theme to your view and then edit its theme properties to define a feature selection consisting of the major highways.

By defining a feature selection you can control exactly which features from a theme's data source are represented in the theme. Features are selected based on the attribute values in the theme's attribute table. The feature selection is defined as a query in the Query Builder accessed from the Theme Properties dialog box.

To define a feature selection for a theme:

1. click on the theme in the Table of Contents to make it active,
2. from the Theme menu, choose Properties or click the Theme Properties button - the Theme Properties dialog box will be displayed,
3. choose the Definition category of properties if this has not already been chosen,
4. press the Query Builder button. ArcView displays the Query Builder,
5. build a query,
6. press OK on the Query Builder - your query appears in the Theme Properties definition box, and
7. press OK on the Theme Properties dialog box.

Arc View will select the features that match the query and redraw the view. Only those features that are selected in the query are now in the theme.

Example

The theme NAT_PARK actually represents National Parks. The title itself may not be clear to all. Define the theme NAT_PARK as *National Parks* to make it more clear.

1. Click the theme NAT_PARK to activate it, if not already activated.
2. Select **Properties** from the Theme menu.
3. Type *National Parks* in the **Theme Name** box and press **OK**.

Chapter 2

TABLES: Attributes of Spatial Data

What is a Table ?

A table lets you work with data from various tabular data sources in ArcView. In fact, with ArcView's tables you can access almost any tabular data resource in your organisation and work with it spatially!

- You can display, query, and analyse data in tables. You can highlight records in tables by selecting geographic features displayed on views, and vice versa.
- You can display tables on a view to reveal the geography of your data.
- You can easily create charts from tables to visualise trends, patterns, and distributions.

Working with Tables in ArcView

An ArcView project can contain any number of tables.

To See which Tables Are in a Project

Click on the Tables' icon in the Project window. The tables in the project are shown in the list.

To Open a Table

Double-click the table's name in the list of tables in the Project window, or select the table's name and click the Open button.

To Open a Theme's Attribute Table

1. Open the view containing the theme.
2. Click on the theme to make it active.
3. Choose Table from the Theme menu or click the Open Theme Table button in the View button bar.

When you open a theme's attribute table, it will appear in the list of tables in the Project window. It can also be opened using the Open button on the Project window, as described above.

To Add a Table into a Project

Use Add Table in the Project menu to open a dBASE, INFO, or delimited text file as a table in your project.

You can add an INFO, dBASE III, dBASE IV file, or a tab-delimited or comma-delimited text file to create an ArcView table in the current project.

Adding Tabular Data

To add an INFO, dBASE, or text file:

1. open a project or make the Project window active for the open project,
2. from the Project menu, choose Add Table,
3. in the List Files of Type box, choose INFO, dBASE, or Delimited Text,
4. navigate to the directory that contains the file you want to add, and
5. double-click the file you want to add or choose the file and press OK.

ArcView creates a table named after the file you selected.

Creating a New Table

You may want to create a new table in ArcView and then add data to it.

Create a New Table in Your Project

On the Project window, select the Tables' icon and then press the New button. Enter a name and a disk location for the dBASE file that ArcView will create to store the source data for the table. A new table will appear in your project. ArcView names new tables in numerical order: Table1, Table2, Table3, etc.

Add Fields to the Table

On the Table menu bar, select the Add Field choice from the Edit menu. The Field Definition dialog box will appear allowing you to define the field in the table.

Add Records to the Table

On the Table menu bar, select the Add Record choice from the Edit menu. This will add a single record to the table. Repeat this action as many times as needed.

Add Data to the Table

On the Table tool bar, select the Edit tool. This allows you to edit the empty cells in the table.

Adding and Deleting Records

To Add a Record

In the Edit menu, choose Add Record.
If you add a record, use the Edit tool to update the values for the new record.

To Delete a Record

In the Edit menu, choose Delete Record. You must select one record before this choice becomes active.

Editing Records in a Table

By default, you are not allowed to edit a table. ArcView shows this by displaying the field names in the table in italics.

Only tables based on dBASE or INFO files on disk may be edited. Tables that have been created by connecting them to a database cannot be edited, because ArcView does not commit changes back to database servers. You cannot edit tables created from delimited text files.

If you have the write permission to the data file on which the active table is based, and you wish to edit it, you can choose Start Editing.

If you do not have the write permission to the data file, Start Editing will be unavailable.

All editing, except for deleting fields and records, are immediately written to the source data file. To finish editing (and/or commit deletion editing) use the Stop Editing control.

Calculating Field Values

You can use the Calculate dialog box to calculate the value of the active number, string, date, or boolean field.

The value is the result of an expression that you enter into the text input area of the dialog box. The calculation applies to the selected set of records. If no records are selected, the calculation applies to all records. You can enter the expression by double-clicking on field names and requests or you can type the expression yourself.

In its simplest form, an expression can just be a number, a string, a date, or a boolean value. For example, to set the value of a string field named [Zoning] to the string "Industrial", type the string enclosed in double quotes in the text input area of the dialog box. To set the value of a number field to the number 143, type the number in the text input area of the dialog box.

In addition, an expression may consist of any combination of field names, enclosed in square brackets, and valid Avenue requests that can be made on the class type of the field. The result of the expression must be a single object or value.

Sorting Records

Sorts a table on the active field. Click on a field name in a table to make it active and then choose Sort Ascending or Sort Descending.

Table Menu Bar

Sort Ascending and Sort Descending in the Field menu

Table Button Bar

Ascending Order

Using the active field, this control puts the record with the value at the beginning of the alphabet, the earliest date, or the lowest number, at the top of the table.

Descending Order

Using the active field, this control puts the record with the value at the end of the alphabet, the latest date, or the highest number, at the top of the table.

To Sort a Table

1. Click on the name of the field you wish to sort on to make it active. The name of the field will be highlighted.
2. Choose Sort Ascending or Sort Descending from the Table menu or the Table button bar.

Sorting always occurs on all the records in a table. If you want to sort the selected records, sort the table and then use Promote. Promote will display the selected records at the top of the table, in the order in which they occurred in the sorted table.

When you close a table, close the project that contains it, or export a table. Any reordering of records that you have carried out by sorting or promoting is not saved. The next time you open the table, the records will be in their original order.

Joining Tables

Joining tables enables you to attach your tabular data to the themes in a view so that you can display, identify, query, summarise, and analyse your data spatially.

Examples

You have a dBASE file containing population data for all the districts in Bagmati Zone. To display this data in a view:

1. add the dBASE file into ArcView as a new table,
2. open the attribute table of a theme representing the districts,
3. use the Join control to join the new table to the theme's attribute table, and
4. edit the theme's legend to specify which data will be displayed.

Remove Joins

To remove joined fields from a destination table, use Remove All Joins from the Table menu.

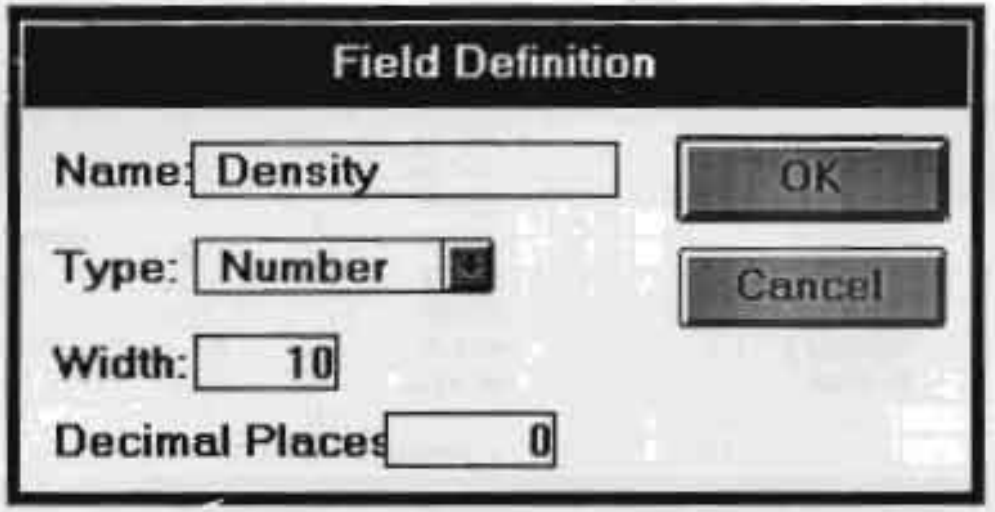
Exercise 2

In this exercise, you will calculate the population density and population growth rate of each district of Bagmati Zone using the census data from 1981 and 1991.

Add New Fields POP_91, POP_81, DENSITY, GRW_RATE in the Theme District.

For this exercise, your first task is to add the fields representing the population in 1981 and 1991, growth rate, and population density of each district. To do this,

- click on the theme District to make it active, if it is not already active,
- choose Table from the Theme menu or click Open Theme button in the view button bar,
- use Start Editing from the Table menu,
- choose Add Field from the Edit menu,
- type POP_91 in the Name box, select Number in Type box, type 10 in Width box, and type 0 in Decimal Places box, and
- similary, add fields POP_81 (*number, 10, 0*), DENSITY (*number, 6, 2*), and GRW_RATE (*number, 4, 2*).



Add Records

Add records for POP_91 and POP_81 for each district as shown.

District Name	POP_81	POP_91
Sindhupalchok	232326	261025
Kavre	307150	324329
Lalitpur	184341	257086
Kathmandu	422237	675341
Bhaktapur	159767	172952
Nuwakot	202976	245260
Dhading	243401	278068
Rasuwa	30241	36744

To do this,

- use Start Editing from the Table menu,
- in the Edit menu, choose Add Record,
- select Edit tool button to update the values in cell, and
- add the values for POP_91 and POP_81.

Calculate Values

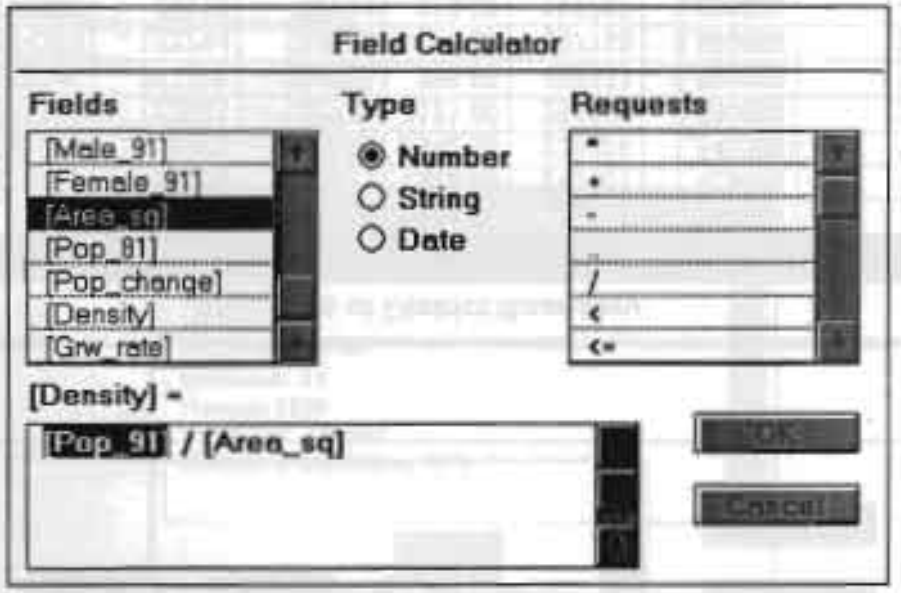
Open the attribute table for District by selecting Table from the Theme menu.

- Use Start Editing from the Table menu.
- In the table, activate the field DENSITY by clicking on it.
- Use Calculate from the Field menu.

The Field Calculator menu appears. Define the formula for density (pop_91/area_sq) in this menu.

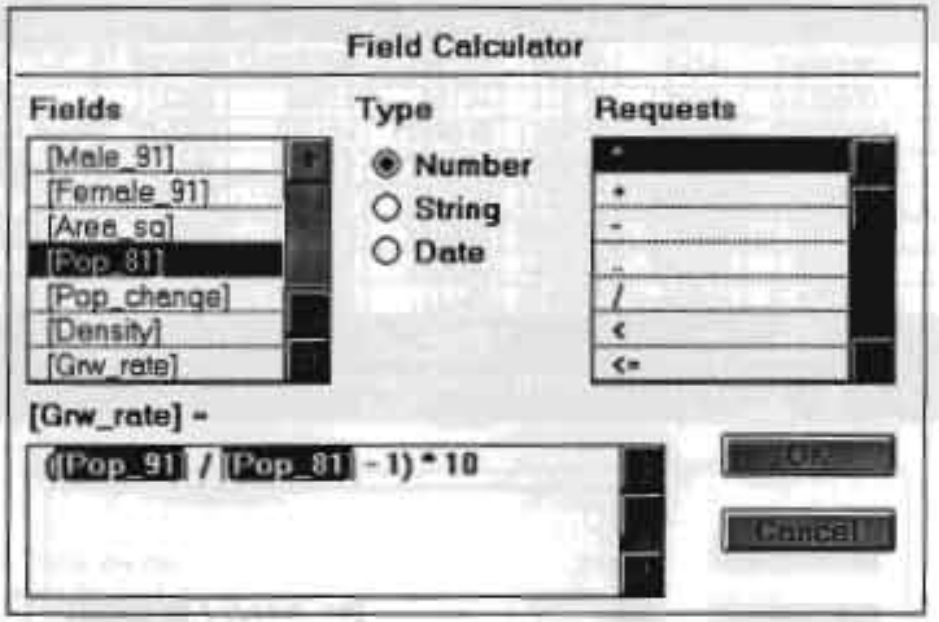
- Select area_sq (area in square kilometres) from the fields.
- Select division operator (/) from the Requests box.
- Select pop_91 from the Fields' box.

- To calculate density, activate the DENSITY field by clicking on it.
- Define the formula ([pop_91/pop_81 - 1]* 100) in the Field menu.
- Press OK to see both the results.



Attributes of District Boundary

District	Pop_91	Male_91	Female_91	Area_sq	Pop_81	Pop_change	Density
RASUWA	36744	16985	17759	1544.00	30241	2.150000	24
DHADING	278068	138035	140033	1926.00	243401	1.420000	144
SINDHUPALCHOK	261025	131523	129502	2542.00	232326	1.240000	103
NUWAKOT	245260	122531	122729	1121.00	202976	2.080000	219
KATHMANDU	675341	351316	324025	395.00	422237	5.990000	1710
KAVRE	324329	159784	164545	1396.00	307150	0.560000	232
BHAKTAPUR	172952	86618	86134	119.00	159767	0.830000	1453
LALITPUR	257086	130326	126760	385.00	184341	3.950000	668



Attributes of District Boundary

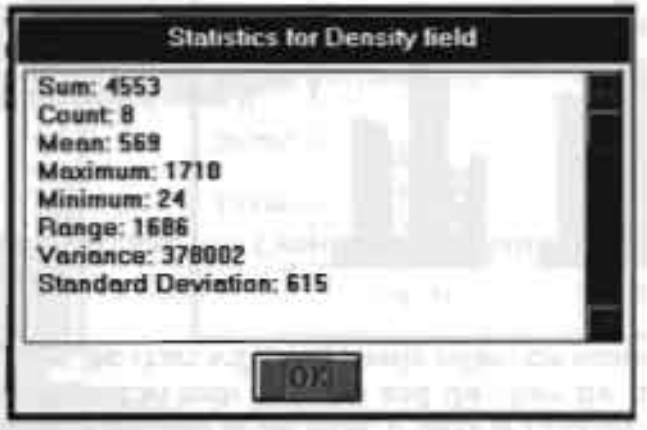
District	Pop_91	Male_91	Female_91	Area_sq	Pop_81	Pop_change	Density	Grw_rate
RASUWA	36744	18985	17759	1544.00	30241	2.150000	24	2.15
DHADING	278068	138035	140033	1926.00	243401	1.420000	144	1.42
SINDHUPALCHOK	261025	131523	129502	2542.00	232326	1.240000	103	1.24
NUWAKOT	245260	122531	122729	1121.00	202976	2.080000	219	2.08
KATHMANDU	675341	351316	324025	395.00	422237	5.990000	1710	5.99
KAVRE	324329	159784	164545	1396.00	307150	0.560000	232	0.56
BHAKTAPUR	172952	86818	86134	119.00	159767	0.830000	1453	0.83
LALITPUR	257086	130326	126760	385.00	184341	3.950000	668	3.95

View Statistics

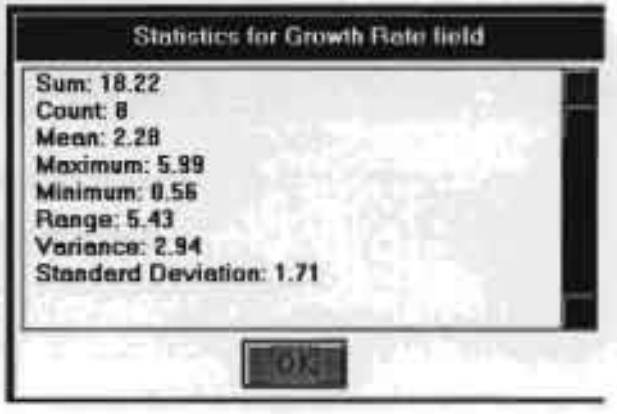
Now, you may want to view the statistics of fields that you have just calculated. To view the statistics of *Density*,

- open the attributes table for District,
- activate the field Density by clicking once on it, and
- select Statistics from the Field menu.

This will give the statistics of the field Density as shown.



Similarly, view the statistics of the field *Growth Rate* which should look as shown below.



Chapter 3

CHARTS: Visualising and Querying Data

What Is a chart ?

A chart is a graphic presentation of tabular data that provides a powerful additional visual representation of the attributes associated with geographic features. You can use a chart to display, compare, and query your geographic and tabular data effectively. Charts are fully integrated into ArcView's geographic user interface.

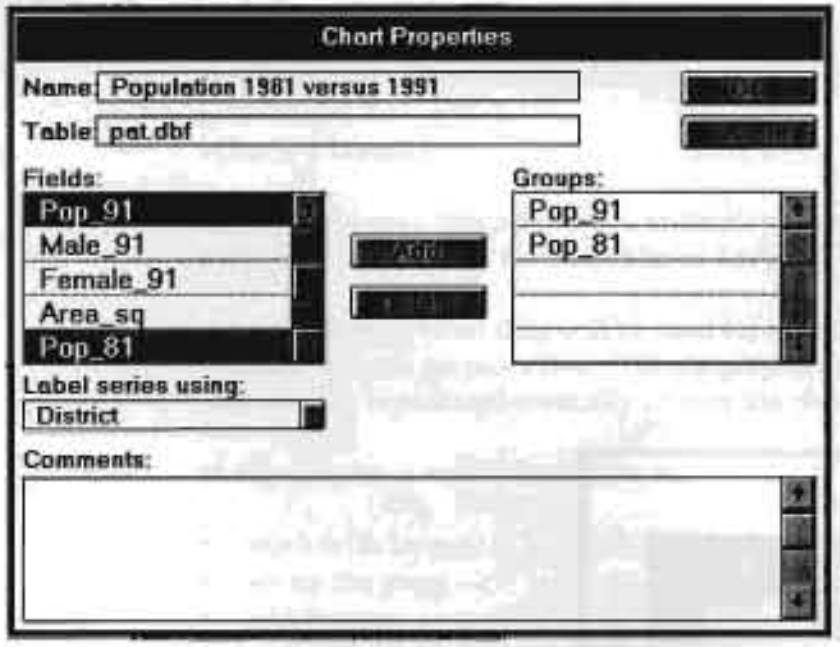
A chart references tabular data in an existing ArcView table in your project and defines how it will be displayed. A chart is dynamic, because it reflects the current status of the data in the table. If there is a change in the source data on which the table is based, this change will automatically be reflected in both the table and the chart the next time you open the project file that contains them. If you edit the table in ArcView, the chart will immediately reflect the editing.

Example 1

Create a Chart to View the Population in the 1981 and 1991 Census of Each District of Bagmati Zone.

To create a chart:

1. click on the table for District to make it active and open it,
2. choose Chart from the Table menu or the Create Chart button on the button bar to open the Chart Properties dialog box,
3. in the Pick a Table window, choose the *attributes of District boundary* table,
4. in the Chart Properties dialog box, select the fields (pop_81 and pop_91) that you want to plot on the chart and the field you want to use to label the data series, and
5. if desired, modify the data plotted on the chart and the look of the chart.



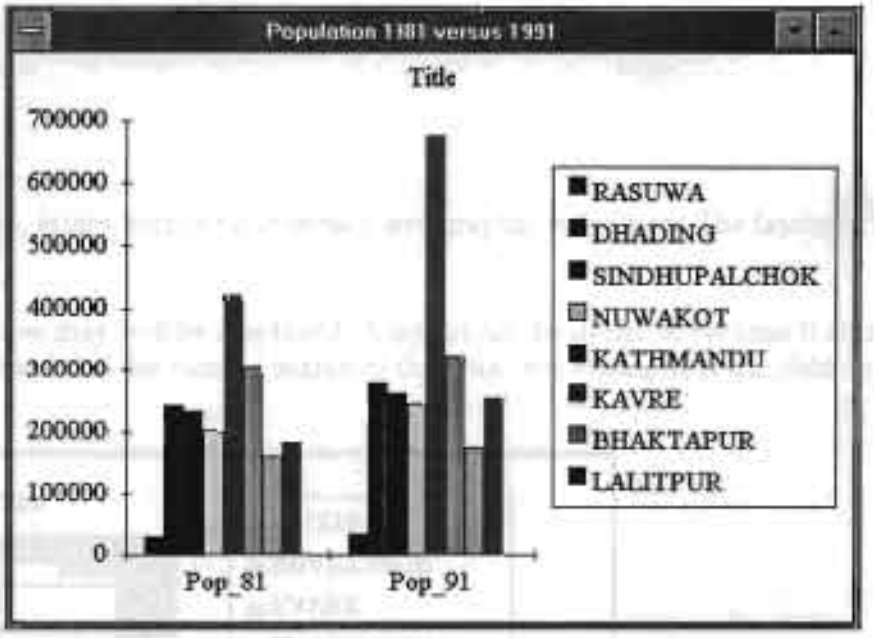
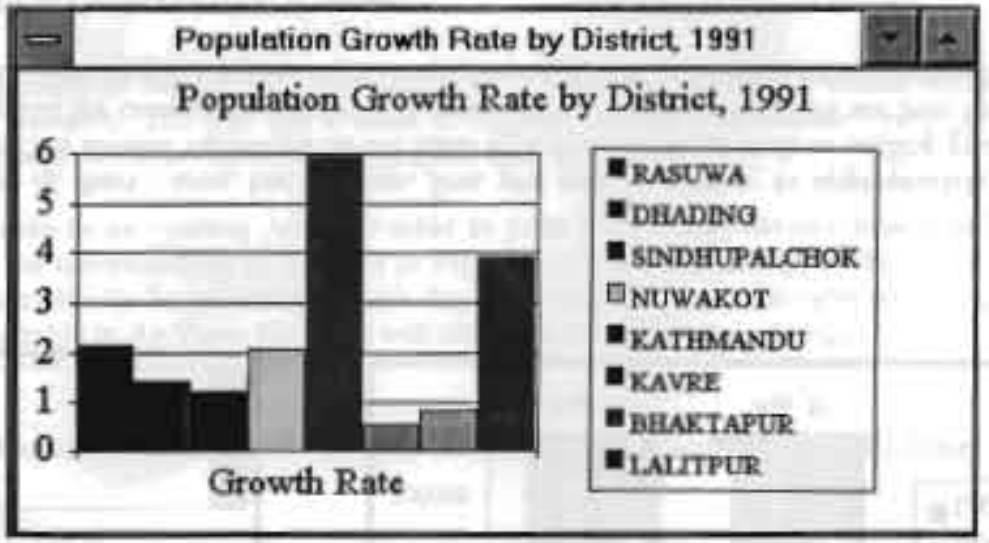


Chart Types

ArcView provides six types of chart - area, bar, column, line, pie, and xy scatter- to appropriately display different kinds of information. Each chart type has several variations on the basic type to select from such as adding gridlines or exploding the first pie slice. Some charts are good for comparing values and representing trends and others are best for emphasising a significant element. Choosing a suitable chart format for your data allows you to present your information more effectively.

Press the buttons for the type of charts you want to create.

Example: **Create a Graph to Show the Trend in Population Growth Rate by District, 1981 - 1991.**



LAYOUTS: Producing Maps

What is a layout ?

A layout is a map that allows you to display views, charts, tables, imported graphics, and graphic primitives. The layout is used to prepare these graphics for output from ArcView.

A layout defines what data will be used for output and how they will be displayed. A layout can be dynamic because it allows you to make specific graphics live. When a graphic is live, it reflects the current status of the data. For example, if the data in a view changes, the layout automatically reflects the change.

In this chapter, you will learn how to:

- work with layouts in a project,
- set up the page,
- add frames,
- add scale bars and north arrows, and
- add graphics and text.

Working with Layouts in a Project

An ArcView project can contain any number of layouts.

To See which Layouts Are in a Project

Click on the Layouts' icon in the Project window. The layouts in the current project are shown in the list.

To Create a New Layout

With the Layouts' icon selected, click the New button at the top of the Project window. ArcView creates a new layout and its name will appear in the list of layouts in the project. ArcView names new layouts in numerical order: Layout1, Layout2, Layout3, etc. See the Overview for creating a layout. You can also double click the Layouts' icon to create a new layout.

To Open a Layout

Double click the layout's name in the list of layouts in the Project window, or select the layout's name and click the Open button.

To Close a Layout

From the File menu, choose Close, or click the close option on the layout's window (This option varies according to the GUI you are using).

To Rename a Layout

Click once on the layout in the list in the Project window and choose Rename from the Project menu. A layout's name is also a layout property you can edit.

To Save the Work You Do with a Layout

In ArcView, you save the work you do with any project component by saving the project. To save your project, choose Save Project from the File menu or click the Save Project button in the Layout button bar.

To Copy a Layout from One Project to Another

If you want to copy a layout from another project into your current project, you should import the other project into your current one using Import in the Project menu. This will copy all the components of the other project into your current project. You can then delete the components that you do not require using Delete from the Project menu.

Defining the Layout Page

When you want to create a map using a layout, you will need to define some characteristics of the layout page. These include page size, page units, orientation, and margins.

Page size

There are a number of large and small format sizes provided by the default in ArcView. If you need a size other than these, you can use a custom page size and define its width and height. The default page size is derived from your printer.

Page units

Select page units from a list of choices. The default page units are inches.

Orientation

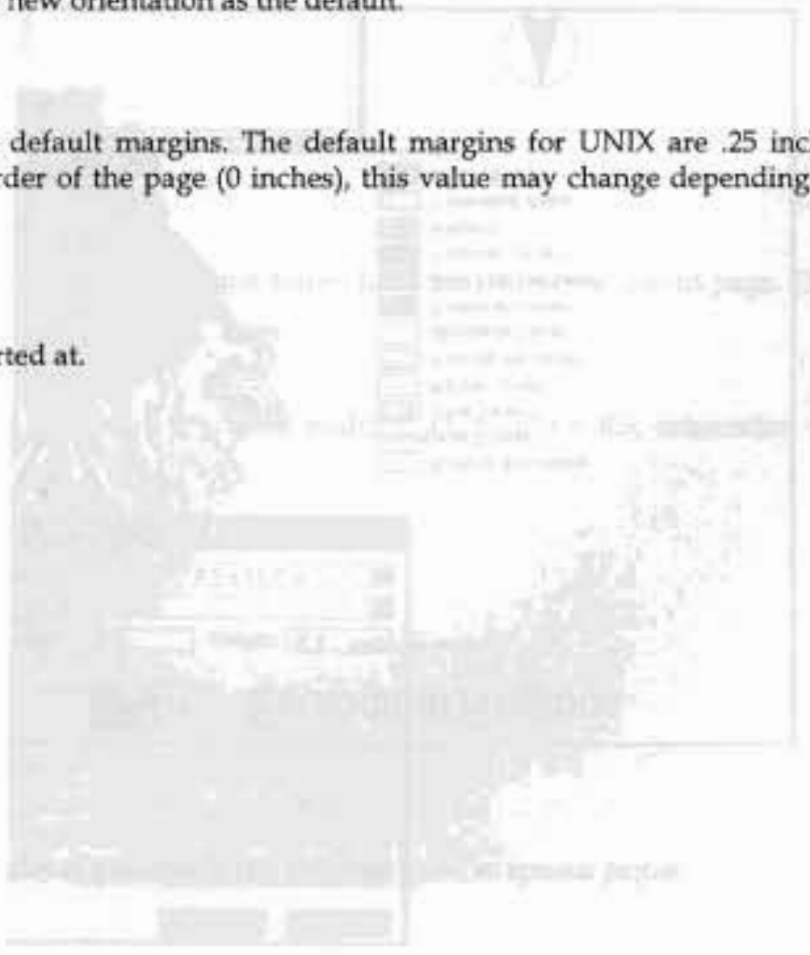
Choose between landscape and portrait orientation for the layout page. The default orientation is derived from your printer. If you change the orientation, any new layouts will use the new orientation as the default.

Margins

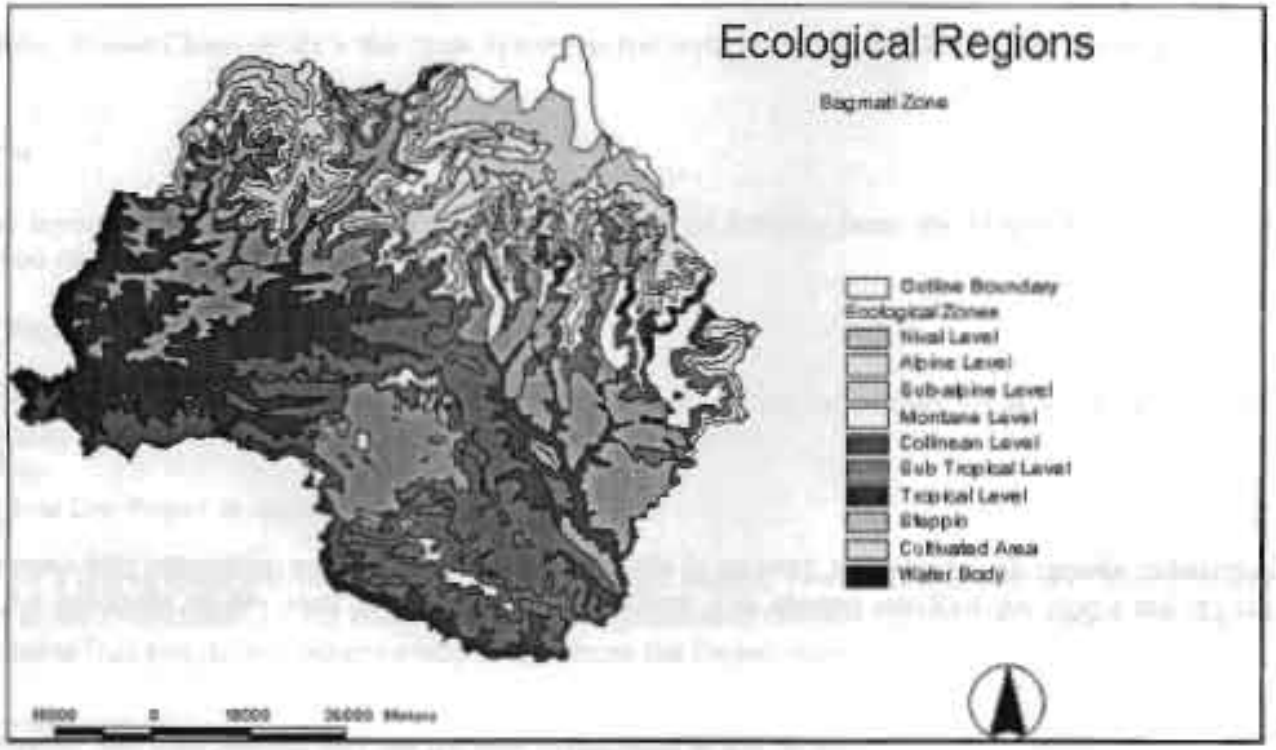
Define margins for the page or use your printer's default margins. The default margins for UNIX are .25 inches. The default margins on Windows and Macintosh are at the border of the page (0 inches), this value may change depending on your default printer.

Output resolution

Define the resolution the layout is printed and exported at.



Exercise: In this Exercise, You will create a Layout Map of Ecological Regions of the Bagmati Zone as shown below.



Note: Before you proceed, make sure to set up the map units and the distance units of the view to metres as described in chapter 1 of this manual.

Create a New Layout

- Select the Layout icon from the Project window.
- Click the new button at the top of the Project window.
- ArcView creates a new layout.

Set-up Page

When you want to create a map using a layout, you will need to define some characteristics of the layout page. These include page size, page units, orientation, and margins.

- Select Page Set-up from the Layout menu.
- Set up the page size = Letter 8.5 x 11.0 inches, page units = inches, width = 11, height = 8.5, orientation = landscape, and margins (top/bottom = 0.17; left/right = 0.2).

Define Layout Properties

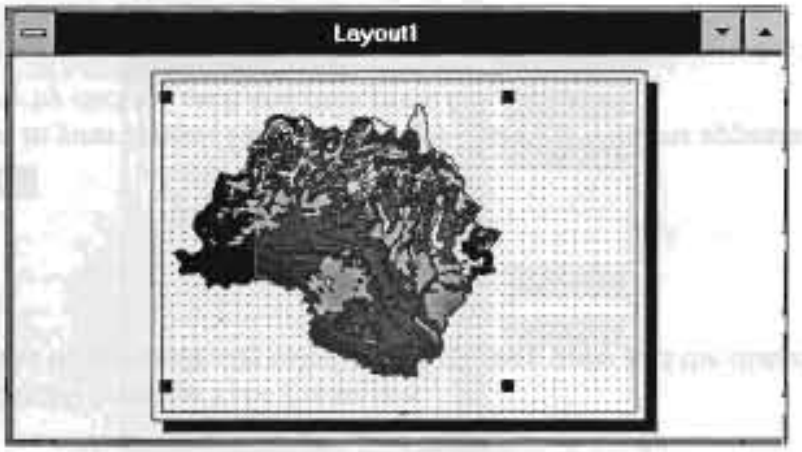
Before creating the layout, it is a good idea to define the layout that you are going to create.

- Select Properties from the Layout menu. The Layout Properties' window appears.
- Since you are going to create a map of the Ecological Regions, type *Ecological Regions* in the Name box and press OK.

Add View

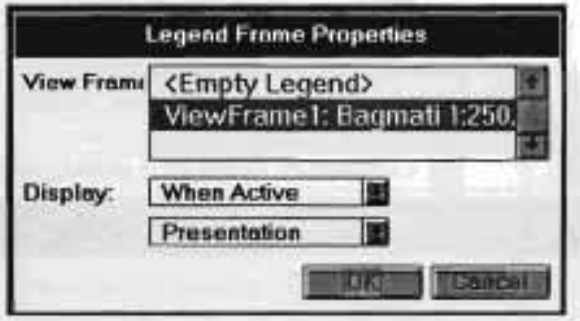
- Make sure that the theme *Ecological Regions* is displayed in the view.
- Now, to add this view into your new layout, click the view button. The shape of the cursor becomes +, use this cursor to define the area (make a box) to be plotted in the view in your new layout. After you define the area, the view frame properties' window appears

- Select *Bagmati 1:250,000* (the name of your project) from the View box and press OK. The map is displayed in your layout.



Add Legends

- Select the legend button by clicking the view button.
- Define the legend area (making a box) in the layout. Legend Frame Properties appears.



- Select the ViewFrame1: Bagmati 1:250,000 from the View Frame box and press OK. The legends are displayed in your layout.

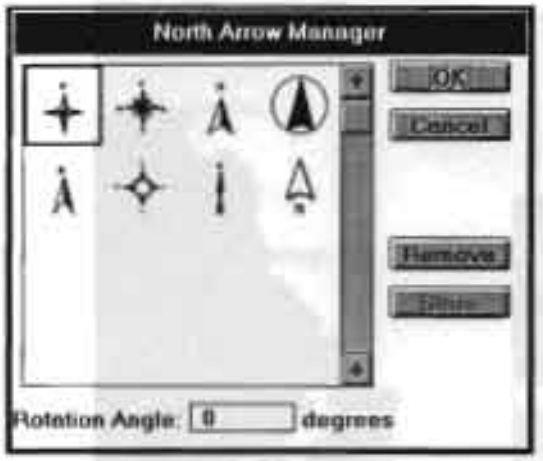
Add Scale Bar

- Select the the scale bar button.
- Define the area for the scale bar in your layout. The Scale Bar Properties' window appears.

- Select ViewFrame1 Bagmati 1:250,000 from the View Frame box.
- The Units and Interval box should be automatically calculated if the map units and the distance units are set up properly.
- Press OK.

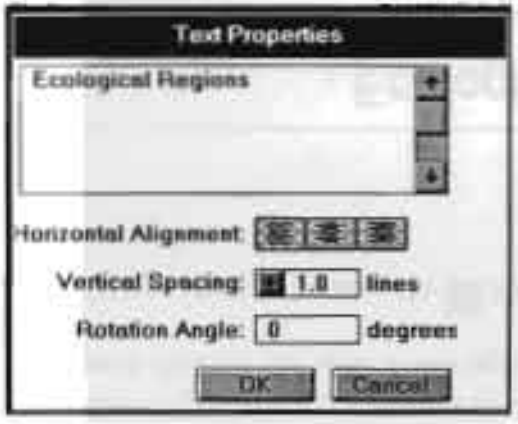
Add North Arrow

- Select the North Arrow button.
- Define the area for North Arrow in your layout. The North Arrow Manager window appears.
- Choose a symbol for north arrow by clicking on it and then press OK.



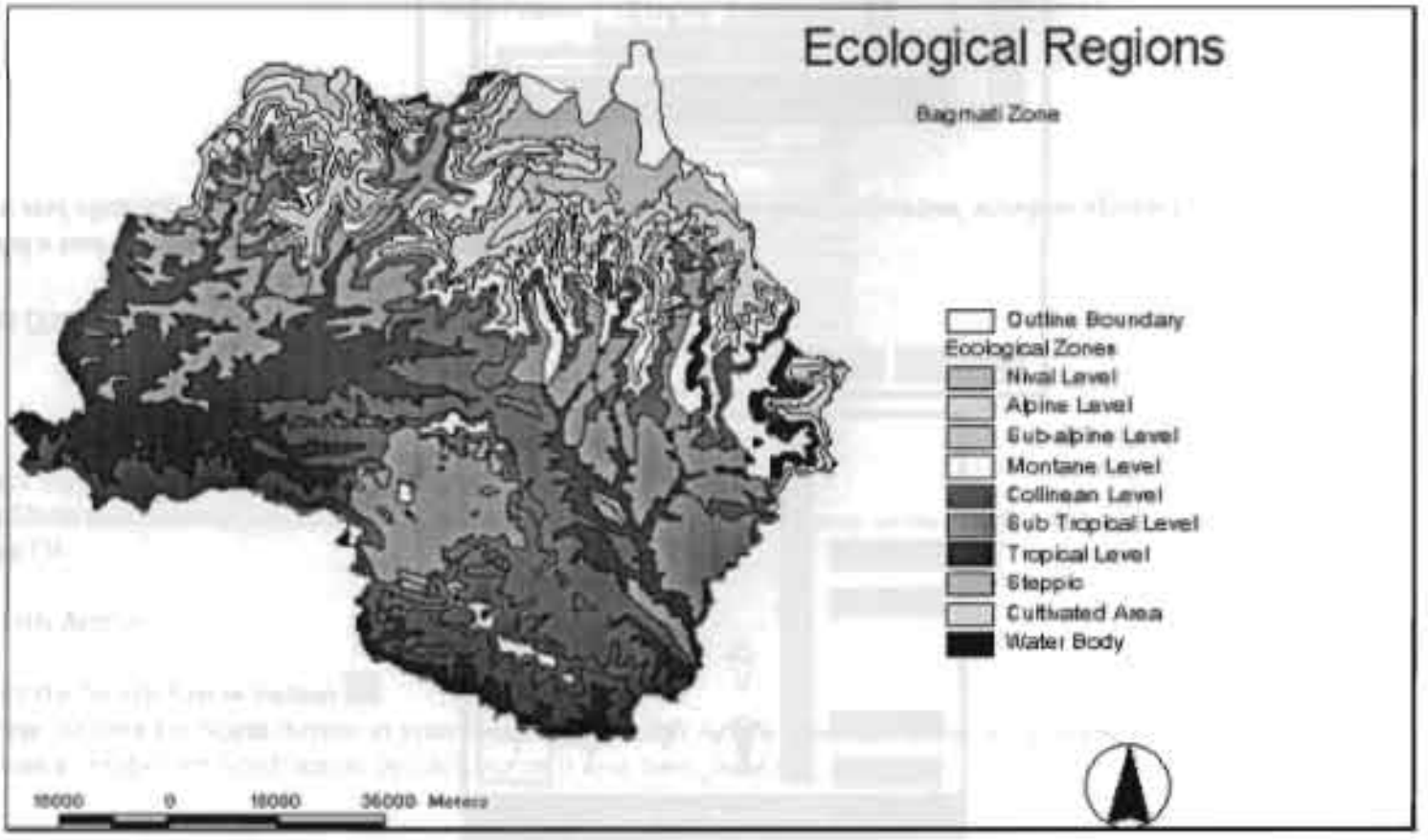
Add Text (Titles and sub-titles)

- To add a text for the title of the map, click the text button.
- Move and click the cursor where you want to place your title. The Text Properties' window appears.



- Type text Ecological Regions as the title of your map. Repeat the same process to add other text.
- To resize your text, select the cursor button and click on the text. A box appears around the text. Then resize the box to resize your text.
- To move your text or any other elements of your layout, click on it using the button. Move the box by dragging it.

Now your final map layout should look like this.



Printing

Finally to print your map layout, select Print from the File menu.

Note: Before using **Print**, you may have to use the **Print Setup** to configure your printer, if it is not already configured.