

Presentation of results

Data presentation is the procedure by which information from a GIS is presented in a form suitable for the user. Remember that the results of a GIS analysis are used in planning and management. Normally, data analysis is not done by the decision makers and planners, therefore, information should be presented to them in such a way that they are able to make sound decisions. If the information is presented to them in a vague, unclear way, wrong decisions may be taken.

A map contains information, presented in a graphical form, intended for the map user. A map is a means of communication, just as spoken text, video images, graphics and sounds. A map should be well designed, so that the user can retrieve the information quickly and easily.

Although ILWIS is not a cartographic package, it does provide the basic tools for the creation of annotation and to convert digital spatial data (maps) to a hard copy print.

In the first part of this chapter, an introduction is given to the use of color, both for display on the screen and for printing. The second part of the chapter explains how to produce an output map. The selection of colors, patterns and point symbols is demonstrated, and the Annotation Editor is used to create a land use map. The procedure for printing a map is shown after that, followed by the methods for converting your data to other (cartographic) packages. The last part of this chapter deals with the generation of demos in ILWIS.

Before you can start with the exercises, you should start up ILWIS and change to the subdirectory `c:\ilwis21\data\usrguide\chap13`, where the data files for this chapter are stored.



- Double-click the ILWIS program icon in the ILWIS program group.
- Change the working drive and the working directory until you are in the directory `c:\ilwis21\data\usrguide\chap13`.

13.1 Introduction

When you prepare a map, you should be aware of the requirements of the map users. A map intended for decision makers, containing clear data without details, will be very different from one made for scientists, which should contain as much factual information as possible.

A map may be multi-purpose, such as a topographical map, which may be used by many different people, for different purposes. A map can also be a single-purpose map, displaying only one theme, for example, the annual rainfall distribution.

A map has a primary content (the main theme of the map), a secondary content (base map information, such as roads, contours, drainage), and a supportive content (legend, scale, North arrow, location map etc.).

When you prepare a map for presentation you should decide on the scale of the map you want to produce on paper. The scale of the output map should be based upon considerations, such as: The purpose of the map (regional planning versus detailed design); the requirements of the map user, the contents of the map ; the size of the area mapped; the size of the output map (paper format); and the required accuracy.

Displaying data to be used in the final map

In ILWIS, the map making-process starts with the visualization of the mapped area and the selection of the spatial and attribute data to be presented. You will first have to investigate which data you want to display on your map as primary content (main theme) and secondary content (base map information). Users should always be able to locate themselves on a map, so each map should contain sufficient base map information. On a large scale map this base map information can be quite extensive, including contour lines, drainage lines, roads and other infrastructure, and the location of villages and towns. On small scale maps, maybe only the main roads and main towns can be displayed as base information. Putting too much base information on a map is confusing.

It is possible to make use of one, or a combination of data layers (raster, segment, polygon or point maps), to compile a final output map. In the **Display Options** - dialog boxes, which appear just before a map is displayed in a Map window, you can specify how each map should be displayed.

The objective of the exercises in this chapter is to produce a land use map. The first step, of the preparation process for producing an output map in this exercise, is to display the map `Landuse`. Visualization of the map area is an important stage in the preparation of the map for final printing, since further planning of the layout can only be decided after viewing the map. For example, by visualization you are able to check whether enough space is available for annotation or the map area has to be extended and whether the contrast between colors representing different mapping units is satisfactory or not.

In this exercise the following data layers will be combined into a single map:

- The polygon map `Landuse`: Forming the primary content. The map is displayed as colored patterns.
- The point map `Labels`, containing text labels of the land use polygons.
- The raster map `Shadows`, containing the hillshading of the study area.
- The segment map `Contours`, containing the contour lines.
- The segment map `Drainage`, containing the drainage network.
- The segment map `Roads`, containing the road network.
- The point map `Places`, containing the location and names of the most important locations in the area.

The various steps required, for displaying maps and adding data layers to a map window, were explained in chapter 2.



- Display the polygon map `Landuse`.

The map `Landuse` is displayed in the map window. You can add several data layers (polygon, segment and point maps) to this Window, as long as they are using the same coordinate system.



Add the other data layers mentioned above to this Map window; e.g., the segment maps `Drainage`, `Roads`, and `Contours`, the point maps `Labels` and `Places`, and the raster map `Shadows`. Always use the default parameters of the `Display Option` dialog boxes.

It is clear that the map would become quite difficult to read, because it will contain too much base map information, if you used all layers as they are. Especially the contour lines are too densely spaced. Later on, you will make a selection of the contour lines.



- Close the map window when you have finished the exercise.

13.2 Color

One of the most important aspects in the design of presentation maps is the selection of the most appropriate colors.



In ILWIS, the colors of objects are defined in the *representation*. In chapter 2 and 4 several aspects of representations were already discussed.



- Click with the right mouse button on the representation **Colors** and select **open** from the context sensitive menu. The **Representation Editor** is opened.

You will see a display of 20 colors in the **Representation Editor**. Every color may be seen as a combination of different amounts of the primary colors: Red, green and blue. (see figure 13.1)

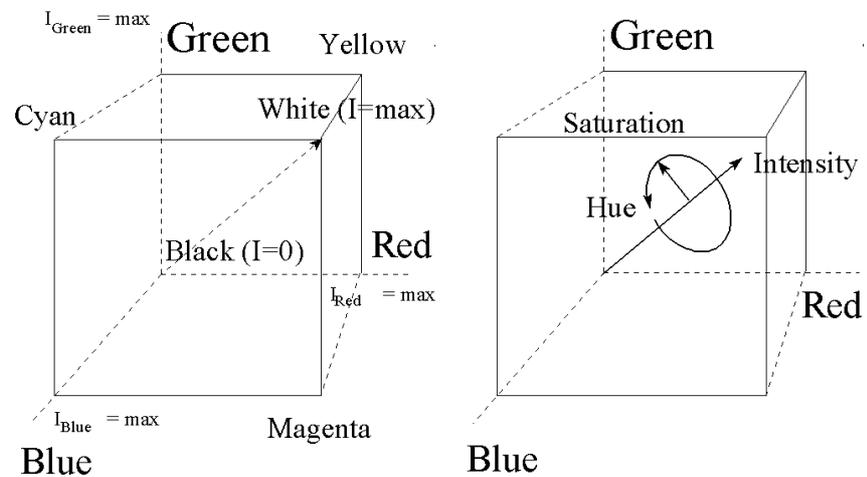


Figure 13.1: Color systems. Left: The RGB color system. Right: The IHS color system

In ILWIS, you can work with three color systems (see figure 13.1):

- The **RGB** (Red, Green, Blue) color system, which is used for display on most computer screens.
- The **YMC** (Yellow, Magenta, Cyan) color system, often used to describe the color of an image produced by several hard copy devices.
- The **IHS** (Intensity, Hue, Saturation) color system, used for image processing.

In theory there is an infinite number of colors possible. ILWIS uses, for contributions of each of the colors red, green and blue, the range from 0 to 255. The value 255 refers to the full intensity of a basic color.

The notation:

(0, 0, 0)	returns black,
(255, 255, 255)	returns white
(255, 0, 0)	returns red,
(0, 255, 0)	returns green,
(0, 0, 255)	returns blue
(255, 255, 0)	returns yellow
(255, 0, 255)	returns magenta
(0, 255, 255)	returns cyan



- Click on the color Yellow. You can see that the three bars in the lower part of the window change. Red will be 255, Green also and Blue will be 0. The status line also shows the components of RGB between brackets. In the case of yellow, that is (255 , 255 , 0) .
- Check the Red/Green/Blue components of the 15 colors.
- Close the Representation Editor.

Besides manipulation of colors in the representation of maps, ILWIS also has the possibility to retrieve and/or assign colors in calculations. Calculations on colors require maps or table columns with a color, a picture domain or representations.

You can also see the color assignments of the items represented in the representation Colors in a table.



- Click with the right mouse button on the representation Colors and select Open as Table from the context sensitive menu. The representation is now shown as a table.
- Double-click the column header button Color. The Column Properties dialog box is opened. As you can see the column Color has the domain Color.

The domain Color, is a domain in which the colors in the table are shown in the notation (red, green, blue). You can convert the colors, stated in the domain colors,

to the values of the three color systems explained earlier on, with a number of statements, listed in table 13.1.

Table 13.1: Expression to convert a color domain into the individual values of the color systems RGB, YMC and IHS

CLRRRED (colorexpr)	returns the red component
CLRGREEN (colorexpr)	returns the green component
CLRBLUE (colorexpr)	returns the blue component
CLRYELLOW (colorexpr)	returns the yellow component
CLRMAGENTA (colorexpr)	returns the magenta component
CLRCYAN (colorexpr)	returns the cyan component
CLRGREY (colorexpr)	returns the gray component
CLRHUE (colorexpr)	returns the hue component
CLRSAT (colorexpr)	returns the saturation component
CLRINTENS (colorexpr)	returns the intensity component

By using one of these statements you can either convert the colors in a representation, shown as a table, using map calculation formulas, or you can use them on a map with a color domain or picture domain.



- Close the **Column Properties** dialog box.
- Type the following formulas on the command line and click OK each time in the **Column Properties** dialog box:

```
Red=clrred(color) ↵  
Green=clrgreen(color) ↵  
Blue=clrblue(color) ↵  
Yellow=clryellow(color) ↵  
Magenta=clrmagenta(color) ↵  
Cyan=clrcyan(color) ↵  
Grey=clrgrey(color) ↵  
Hue=clrhue(color) ↵  
Sat=clrsat(color) ↵  
Intens=clrintens(color) ↵
```

Now you can see the 20 colors of the representation, expressed in the components of the three color systems explained earlier on. The first three columns red, green and blue, are simply the same values as in the appropriate part of the column color. The second group of three columns (yellow, magenta, and cyan), show the colors in the YMC color system. Note that the calculation is made in the following way:

yellow = 255 - blue

magenta = 255 - green

cyan = 255 - red

Next, there is a column showing the gray tones of the colors. The gray component is useful when you want to produce a gray tone map out of a color map.

The last three columns (Hue, Sat, Intens) show the values according to the IHS color system: Assigning values to Hue (direction of the color in a three-dimensional color cube), the Saturation (purity of the color), and the intensity (brightness of the color). Note that the values of Hue, Saturation and Intensity range from 0 to 240, because that is the range used as standard in Windows. For the exact conversion formulas the user is referred to the On-Line Help (Topic: Color Separation).



- Compare the values in the columns you have just calculated with the color cubes in figure 13.1, in order to get an idea of the three color systems.
- Close the table window.

Hints for appropriate use of color:

- For large areas on a map, the saturation of a color may increase apparently. A color which looks okay in the legend may be too dominating in the map.
- Two rather similar colors can only be differentiated when they appear next to each other in the map.
- Hues in the red-yellow region are said to be "warm colors". Blue colors are said to be "cold".
- There are generally accepted color order scales. For example:
 Most are evident: Blue water, green vegetation, yellow sand areas.
 Some colors are more "powerful" and are used to indicate important features:
 Red for high hazard areas.
 To indicate increasing order scales, changing values are used: Dark to light.
- It is not advisable to use more than 4 to 6 steps of the same hue.
- To indicate increasing positive and negative values use two base colors: Red/yellow & blue.
- The same colors are perceived lighter on a computer screen than on a paper map. Therefore, a so-called gamma factor is often used (see the on-line Help for more information on gamma factor).

13.3 Editing visual variables

A cartographer disposes of the following tools in the representation of information in a map:

- The basic types of spatial data, mentioned in chapter 2: points, lines and areas.
- **Volumetrical shapes:** For example an impression of the relief shown with hill shading.
- **Text,** for legend information, topographical information and codes of mapping units.
- **Symbols,** related to points, but also other symbols, such as pie graphs, or bar graphs, to display statistical information within mapping units.

For conveying relevant information of these cartographic tools, a cartographer can use several *visual variables*. With visual variables, one can manipulate how these above mentioned items will be displayed. There are seven visual variables: Position, form, orientation, texture (variation of density of graphical elements with the same overall gray expression), value (gray tones), size and color.

The visual variables that can be used in ILWIS depend on the map domain (class, ID, value, picture, color), and on the type of map (point, segment, polygon and raster).

If you make a division according to the type of maps, the following variables can be used:

- *Point maps.* Point can be displayed with different symbol types. The size, line color, line thickness and fill color can be specified. Symbols can also be displayed with text labels, or only as text labels. For the text labels you can change the font, the font type (bold, italic etc.) and the font size.
- *Segment maps.* Segments can be displayed in different colors and different line widths.
- *Polygon maps.* Polygons can be displayed in different colors and patterns, and the boundary lines around polygons can be shown in different colors and different line widths. The labels of the mapping units can be displayed as a point map on top of the polygons.
- *Raster maps.* Raster maps can be displayed using different colors and text can be displayed in different colors.

In chapter 2 the different types of representations that are available for different domains were discussed. To summarize, the ILWIS representation editor can be used to edit colors, patterns and point symbols of a map:

- *Class domains:* Colors and patterns can be assigned to the classes of the map.
- *Value domains:* For maps with a value domain you can have two types of representations:

- *Representation Gradual*, using percentage values as limits. This can be used for maps with any value domain.
- *Representation Value*, using actual values as limits. This can be used only for user-defined value domains.
- *Identifier domains*: Maps with a domain type ID have no user-defined representation. They can only be displayed in 1, 7, 15, or 31 system colors.

Assigning colors to a class map

A map using a class or group domain always has a representation. Such a representation can be edited in the *Representation class editor*. The colors or patterns of all classes in the map are shown and can be changed in the editor.

This exercise shows how to change colors in the class map by editing its Representation class.



- Display the raster map Landuse.
- From the **Edit** menu, select the **Representation** command.
- Select the raster map Landuse.

The *Representation Class Editor* is opened. The buttons in the button bar of this window can be used to see what the colors would look like in the case of a raster, polygon, segment or point map. In the central part of this window, class names and their colors can be viewed and in the lower part of the window the Red, Green and Blue color scroll bars are visible. The color of the selected class can be edited by:

- Selecting the class name, and then;
- Changing the amount of the red, green and blue which are expressed as integers between 0 and 255.

The exercise is planned in such a way to produce a simplified land use map with the main land use classes, but it won't always be the case. Note: When you change the color of a class in a map (e.g. Polygon), the color of this class is also changed in other maps using the same representation.



- Select the class bare rock.
- Use the **Red**, **Green** and **Blue** color scroll bars in the lower part of this dialog box to compose the correct color for this class.

- Move the **Red** (color) scroll bar to value 98.
- Move the **Green** (color) scroll bar to value 98.
- Move the **Blue** (color) scroll bar to value 98.
- Select the class `Agriculture (irrigated)`.
- Change the colors to: **Red** = 0 , **Green** = 170 and **Blue** = 0.
- Double-click on the class `Forest`.

The **Edit Repr. Item** dialog box is opened. The selected class is shown as text at the top of the dialog box. The color list box displays a number of pre-defined colors. If you want to define your own color, you can double-click the 'Custom' item at the bottom of the list; then the **Custom Colors** dialog box appears. To define your own custom color, you can also click the **Custom Color** command button; the **Custom Colors** dialog box appears.

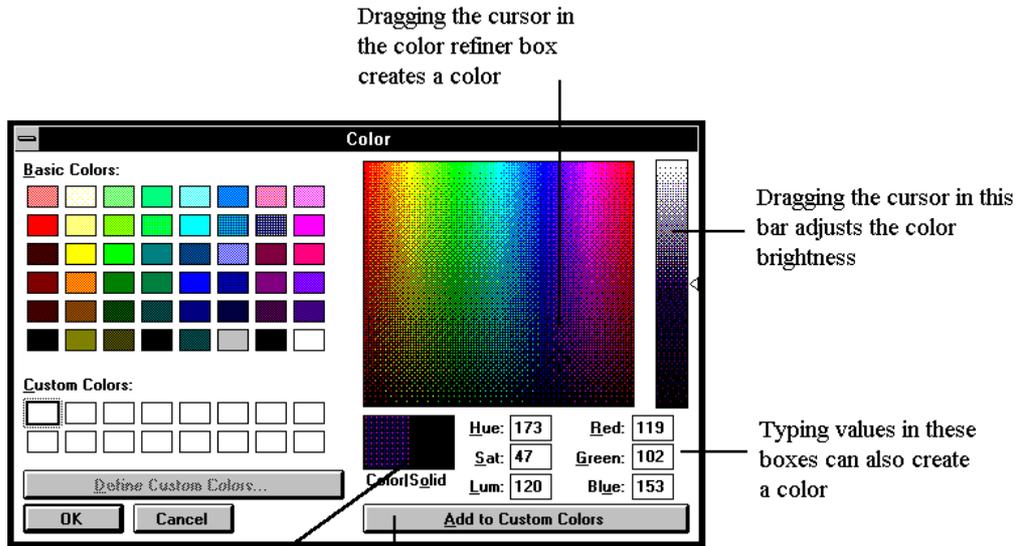


- Select the color `ForestGreen` and click **OK**.
- Double-click on the class `Urban centre`. The **Edit Repr. Item** dialog box is opened again.
- Click the button **Custom Colors**.

The standard Windows color dialog box is opened (see figure 13.2). It provides another way to create an appropriate color for a class. The pre-defined colors are shown in the group **Basic colors**. You can make a new color by dragging the cursor in the **Cursor Refiner** box, and adjust the brightness in the bar next to it. You can also enter the color as values of **Hue/ Saturation/Luminosity (=Intensity)**, or as **Red/Green/Blue**. When you are satisfied with a certain color, you can press the **Add to Custom Colors** button: Pressing this button adds the new color to the selected box in the custom colors palette.



- Select in the **Color Refiner** box a color which is approximately red =195, green =35 and blue=35 . Click the button **Add to Custom Colors**. Click **OK**.
- Now you are back in the **Edit Repr. Item** dialog box. Click **OK**. This will bring you back to the **Representation Editor**.



Double-clicking this square selects the solid color that is closest to the new color

Choosing this button adds the new color to the selected box in the Custom Colors palette.

Figure 13.2 The standard Windows color dialog box

- Select the colors for the various units as indicated in table 13.2.
- Close the Representation Editor. Click the redraw button in the map window to see the result. Close the map window.

Select the following colors for the various mapping units:

Table 13.2: Colors of the land use units

	red	green	blue	pattern
Agriculture	91	255	0	Horizontal
Agriculture (irrigated)	0	170	0	Vertical
Airport	255	0	0	Upwards
Bare rock	98	98	98	Solid
Bare soils	187	187	184	Solid
Forest	48	128	76	Solid
Grassland	159	255	0	Solid
Lake	0	146	255	Solid
Riverbed	182	182	255	Solid
Shrubs	106	126	0	Solid
Urban centre	194	35	35	Diagonal
Urban periphery	129	40	0	Crossing

Assigning patterns to a class map

Besides colors, the Representation class editor contains a number of patterns which can be used to represent areas in a polygon map.



- Open the polygon map Landuse.
- From the Edit menu select the Representation command, and select the map Landuse.
- Select the Polygon map button in the button bar of the Representation Editor.
- Double-click class Urban centre.

The Edit Repr. Item dialog box is opened. Note that there is now an extra list-box Pattern in the lower part of the dialog box. From this check-box, you are able to select a pattern and/or a color for the selected class.



- Select the pattern Diagonal.
- Click the OK button.
- Repeat the steps and select the patterns as indicated in table 13.2.
- Press the redraw button in the map window to see the result.

You can view the results when you display the polygon map Landuse.



- Close the Representation editor when you have finished and close the map window.

Note that patterns are only possible for polygon maps.

Creating labels for a class map

In the following exercise, you will learn how you can generate text-labels for the polygons of the map landuse. This procedure requires the following steps:

Step 1: Polygon to point operation to create the point map Landuse.

Step 2: Shorten the name of the labels.

Step 3: Reclassify the point map Landuse into a point map Label.

Step 4: Display the point map label together with the polygon map landuse.

Step 5: Edit the points (move and delete).



- Click the polygon map Landuse with the right mouse button, and select the **Vectorize**, and the **Polygon to Point** commands, from the context-sensitive menu. The **Polygon to Points** dialog box is opened.
- Type the **Output Point** map name: Landuse. Click on **Show** and **OK**. The point map is made and the **Display Options** dialog box appears.
- Click the check box **Text**.
- Click the **Font** button. The **Font** dialog box is opened.
- Select the **Font** Times New Roman, the **Font Style**: Regular and the **Size**: 8 .
- Click **OK** in the **Font** dialog box. You are back in the **Display Options** dialog box.
- Clear the check box **Symbol**.
- Click **OK** in the **Display Options** dialog box. The point map Landuse is now displayed.
- Drag-and-drop the polygon map Landuse in the map window. The **Display Options** dialog box is opened. Select the check-box **Boundaries Only** and Click **OK**. The boundaries of the polygons are also displayed.
- Maximize the map window.

It is clear that the polygon labels are not yet suitable for the final map: The names are too long, some polygons are too small to have a label, and in other polygons the name is actually outside the polygon. Therefore, you need to do some editing first. The labels are shortened to only one character. This can be done by first creating a new column in the table landuse and using this column to reclassify the point map.



- Close the map window and open the table Landuse.
- Type the following formula on the command line:
`Label = left(%K,1) ↵`

This formula takes the first character of the names in the domain and stores it in the column `Label`. The `%K` is a pre-defined variable, standing for the names in the domain of the table.



- Click OK in the **Column Properties** dialog box. Note that the output domain is `String`.
- Double-click the column button `Label`. The **Column Properties** dialog box is opened.
- Click the **Create domain** button. The **Create domain** dialog box is opened. Click OK.
- Close the table window.
- Type the following expression on the command line:

```
Label.mpp:=PointMapAttribute(Landuse,Label);
```

With this expression the point map `Landuse` is renumbered with the attribute `Label` and a point map `Label` is created. This is a source map, not a dependent map (the assignment symbol `:=` was used). This is done because the point map will be edited later and you cannot edit dependent maps.

- Double-click the point map `Label`. The **Display Options** dialog box is opened.
- Repeat the steps explained before for the selection of text and symbol type. Click OK. The point map `Label` is now displayed.
- Add the polygon map `Landuse` to the map window.
- Maximize the map window.

You can see that the labels are now much smaller and fit better in the polygons. Some editing has still to be done, in order to remove the labels of polygons that are too small, or that are located outside of the polygon.



- From the **Edit** menu select the command **Edit layer** and choose the point map `Label`. The point editor is opened.

With the point editor you can move points, delete points and create new points. The use of the point editor was explained in chapter 3.



- Edit the point map `Label`, by deleting points in polygons that are too small (most of the lakes). You can move points of which the text falls outside of the polygon, and you can enter new points in very large polygons.
- When you are finished, click the **Exit Editor** button. Click **OK** in the **Display Options** dialog box and close the map window.

Visual variables for segments: Color and line width

The visual variables for segment maps are somewhat limited: You can only vary the color or the line width. For the production of the final map you will need three segment maps: `Contour`, `Drainage`, and `Roads`. The first map is a value map and the other two are class maps.



- Open the representation `Drainage`.
- From the **Options** menu select the option **Segments**. The representation now shows how the lines would be shown.
- Double-click the item `Main river`. The **Edit Repr. Item** dialog box is opened. Note that you can select the line width. Change the line width to 2 and the color to `Blue`. Change the color of the item `Drainage` to `Blue`, and the one of the item `Lake` to `Cyan`. Leave the line width 1 for these two.
- When you are finished, click **OK**.
- Open the segment map `Drainage` and look at the result.
- Change in a similar way the representation of the segment map `Roads`. Change the color of the item `Main Roads` to `White` and the line width to 2, and change the color of the item `Secondary Roads` to `White`.
- Add the segment map `Roads` to the map window.

The segment map `Contours` has a class domain (`Height`), which also has a value representation (`Height`). However, we do not want to display the contour lines in different colors. They should be shown in gray, with different line

thickness, differentiating the main contour lines (those every 100 meters) and the intermediate ones (those every 50 meters).

Unfortunately the contour interval is 20 meters, so displaying contour every 50 meters is not possible. Therefore, only the 100 meter contours will be shown.



- Drag-and-drop the segment map `Contour` to the map window. The `Display Options` dialog box is opened.
- Click the check-box `Mask` and type the following mask: `??00`. This will result in the display of the 100 meter contour lines only.
- Click the option `Single color` and select the color `Gray`. Click `OK`.
- Close the map window.

Visual variables for point maps

Data such as the location of villages and towns, or data that are aggregated to points such as total population per province, can be symbolized as points. When you display polygon or raster maps, you can also use points as labels, indicating the legend unit, as you have seen earlier on in this chapter. Points are visualized as symbols, and/or as text, but they may vary in size according to the quantity they represent. Different point symbol types are supported (circle, square, diamond, plus, etc.).

Point data presented in a point map with a domain type *class*, can be symbolized by editing the representation linked to the map. Point maps with the domain type *identifier* or *value* are linked to a system representation; the process of symbolizing the point data has to be done using `Display Options - Points` dialog box.

In this part of the exercise, point map `Places` with class domain is used. By editing the representation used by this map, you are able to select symbol type, size, color, line width and line color for the individual point in the map.



- Open map `Places`.
- From the `Edit` menu select the command `Representation` and select the point map `Places`. The `Representation class editor` is opened.
- From the `Options` menu select the option `Points`. Now the representation shows how points are displayed.
- Double-click on the name `Cerveceria Taquina` (the local beer brewery). The `Edit Repr. Item` dialog box is opened.

- Select a symbol type (`Circle`), symbol size (4), pen width (2), color (`yellow`) and fill color (`red`) for this point.
- Click OK.
- Select the symbol representation for the other points according to table 13.3.
- Click the **Redraw** button in the map window to see the results of the editing.
- Exit the **Editor** when you have finished the exercise.
- Close the map window.

Table 13.3: Symbol representation for the point map places

	Symbol type	Symbol size	Pen width	Color	Fill color
Cerveceria Taquina	Circle	6	1	black	red
Cochabamba	Circle	12	2	black	red
Laguna LargonMayu	Circle	4	1	black	red
Tiquipaya	Circle	8	2	black	red

Summary: Editing visual variables

- The visual variables that can be used in ILWIS, depend on the one hand on the domain of the map (class, ID, value, picture, color), and on the other hand on the type of map (point, segment, polygon and raster).
- If you make a division according to the type of maps, the following variables can be used:

Point maps. Point can be displayed with different symbol types. The size, line color, line thickness, and fill color can be specified. Symbols can also be displayed with text labels, or only as text labels. For the text labels you can change the font, the font type (bold, italic etc.) and the font size.

Segment maps. Segments can be displayed in different colors and different line widths.

Polygon maps. Polygons can be displayed in different colors and patterns, and the boundary lines around polygons can be shown in different colors and different line widths. The labels of the mapping units can be displayed as a point map on top of the polygons.

Raster maps. Raster maps can be displayed using different colors and text can be displayed in different colors.

- The ILWIS representation editor can be used to edit colors, patterns and point symbols of a map, depending on the domain type:

Class domains: Colors and patterns can be assigned to the classes of the map.

Value domains. For maps with a value domain you can have two types of representations:

- *Representation Gradual*, using percentage values as limits. This can be used for maps with any value domain.
- *Representation Value*, using actual values as limits. This can only be used for user-defined value domains.

Identifier domains. Maps with a domain type ID have no user-defined representation. They can only be displayed in 1, 7, 15, or 31 system colors.

13.4 Map views



In the previous section you have learned how the individual data layers, that will form part of the final map, can be best displayed. A data layer is a raster, polygon, segment or point map, for which the user has specified display options such as color, width, size, etc., for the display in a map window. An annotation layer is a layer containing annotations, such as text, legend, box, North arrow, scale bar, grid lines, graticule, bitmaps or pictures. The annotation layers will be treated in the next exercise. In this exercise you will combine the various data layers into a single map. The combination of data layers will be stored as a *map view*.

A map view contains the names of data layers and/or annotation layers to be displayed in one map window. The display settings of the layers are also stored; so the system knows the colors, widths etc. for the display of each layer. By opening a map view, you do not need to select any data objects or annotation nor do you have to specify their display options. The title that you give to a map view, is later visible in the title bar of the map window. If you save a map view when zoomed in on a map, the zoomed area will be displayed when opening the map view.

In this exercise the following data layers will be combined into a single map:

- The polygon map *Landuse*: Forming the primary content. The map is displayed as colored patterns.
- The point map *Labels*, containing text labels of the landuse polygons.
- The raster map *Shadows*, containing the hillshading of the study area.
- The segment map *Contours*, containing the contour lines.
- The segment map *Drainage*, containing the drainage network.
- The segment map *Roads*, containing the road network.
- The point map *Places*, containing the location and names of the most important locations in the area.



- Double-click the raster map *Shadows*. The *Display Options* dialog box is opened. Click *OK*. The map is displayed.
- Click with the right mouse button somewhere within the map and select the command *Layer management* from the context sensitive menu. The *Layer Management* dialog box is opened.
- Click the button *Add Map*. The *Add Map* dialog box is opened. Select the polygon map *Landuse* and click *OK*. The *Display Options* dialog box is opened. Click *OK*. The polygon map *Landuse* is added to the list of data layers.
- Click the *Add map* button again and select the point map *Labels*. Click *OK*. The *Display Options* dialog box is opened.



- Select the check-box **Text** and click on the **Font** button. The **Font** dialog box is opened. Select the **Font: Times New Roman**, the **Font Style: regular**, and the **Size: 8**. Click **OK**. Clear the check box **Symbol** and click **OK** in the **Display Options** dialog box. The point map **Labels** is added to the list of data layers.
- Click the **Add map** button again and select the segment map **contour**. Click **OK**. The **Display Options** dialog box is opened. Click the check box **Mask** and type the following mask: **??00**. Select the option **Single Color** and select the color **Brown**. Click **OK**. The map **contour** is now also added to the list of data layers.
- Click the button **Add Map** again and select segment map **Roads**. Click **OK**. Click **OK** in the **Display Options** dialog box. The segment map **Roads** is now also added to the list.
- Click the button **Add Map** again and select segment map **Drainage**. Click **OK**. Click **OK** in the **Display Options** dialog box. The segment map **Drainage** is now also added to the list.
- Click the **Add map** button again and select the point map **Places**. Click **OK**. The **Display Options** dialog box is opened. Select the check-box **Text** and click on the **Font** button. The **Font** dialog box is opened. Select the **Font: Times New Roman**, the **Font Style: Bold**, and the **Size: 12**. Click **OK**. Select the **Text color: Red**. Click **OK** in the **Display options** dialog box. The point map **Places** is added to the list of data layers.
- Click **OK** in the **Layer Management** dialog box. Now all added layers are displayed in the map window.

Now you can save the map window with all data layers as they are now in a map view.



- From the **Files** menu select the command **Save view as...**. The **Save view as** dialog box is opened.
- Enter the **Map view name: Landview**.
- Enter the **Title: Landuse map of the Cochabamba area**.
- Click **OK**. The view is now saved.
- Close the map window.
- Open the map view **Landview**.

As you can see, all the data layers that you have combined are now appearing in the same way as you displayed them previously. The map view contains a list of the maps that are combined as data layers, and the display options of the various maps.

Summary: Map views

- A map view contains the names of data layers and/or annotation layers to be displayed in one map window.
- The display settings of the layers are also stored; so the system knows the colors, widths etc., for the display of each layer.
- Further more, the georeference is stored, meaning that when you save a map view when zoomed in on a part of the map, this zoomed area will be displayed when opening the map view later. By opening a map view later, you do not need to select any data objects or annotation, neither do you have to specify their display options.
- The title that you give to a map view, is later visible in the title bar of the map window. If you save a map view when zoomed in on a map, the zoomed area will be displayed when opening the map view.

13.5 Annotation

A map has a primary content (the main theme of the map), a secondary content (base map information, such as roads, contours, drainage), and a supportive content (legend, scale, North arrow, location map etc.). In the previous exercise you have generated a map view (`Landview`) containing the primary content (`Landuse` polygon map and `Labels` point map) and the secondary content (raster map `Shadows`, segment maps `Contours`, `Drainage` and `Roads`, and point map `Places`). In this exercise you will see how you can add supportive content using the *Annotation editor*.

The *Annotation editor* can be used to place map elements in a map window, such as titles, text, a legend, a north arrow, a scale-bar, grid lines and boxes. Besides map elements, a picture or bitmap in the clipboard can be pasted into an ILWIS Map window. For small scale maps it is also possible to add a graticule, which are the lines that follow longitude and latitude, of a geographic projection as used by a coordinate system. Annotation can be edited by double-clicking it or through the *Layer Management*. The added annotation, together with the map, can be saved as a map view. The final map that will be made is shown in figure 13.3.

Extending the Map window

A map window should be extended (by percentage or by coordinates), when there is not enough space to position annotations. In this exercise the area of the map view `Landview` is extended in order to create space for placing a title, a legend, grid lines, a scale bar, a logo (bitmap) and a North arrow.



- Display the map view `Landview`.
- From the *Options* menu, select the commands *Extend Window* and *Extend by Percentage*.

The *Extend Window* dialog box is opened. In this dialog box you can define how far the map area should be extended in different directions (top, bottom, left and right).



- Type 10 in the text box *Percentage at Top*.
- Type 10 in the text box *Percentage at Bottom*.
- Type 20 in the text box *Percentage at Left*.
- Type 100 in the text box *Percentage at Right*.
- Click *OK*.

The map area is extended as you defined.

- From the Files menu select the command Save view.

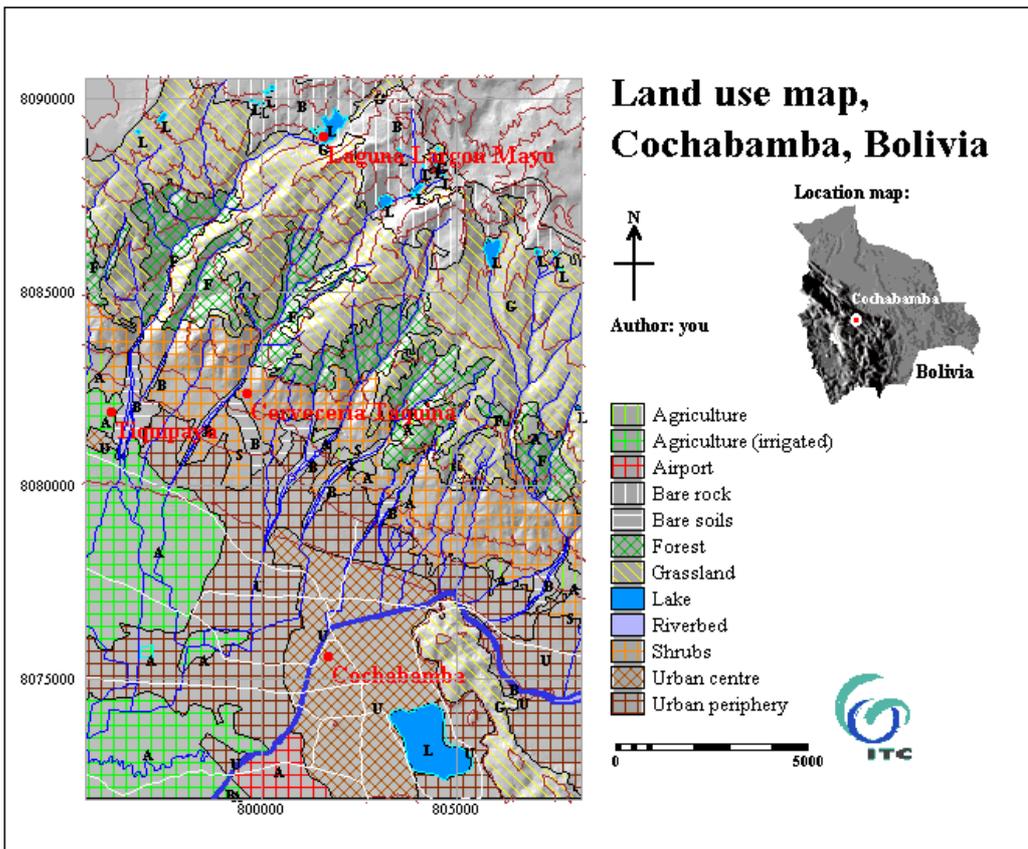


Figure 13.3: The land use map that will be made in this exercise

Opening the Annotation editor

The elements such as map title, legend, scale-bar, north arrow etc., can be added to a map window using the annotation editor.

- From the Edit menu select the Annotation command.

The Annotation Editor is opened. Annotation can be added to a map using one of the following buttons in the Button bar of the Annotation Editor:



to add text (e.g. title)



to add a legend



to add grid lines



to add a graticule



to add a box



to add a scale bar



to add a North arrow



to add a picture or a bitmap from disk.

When you are finished with editing the annotation you can exit the Annotation Editor with the Exit Annotation button.



to exit the Annotation Editor.

Adding a title

In general, a map has a title which gives a description of its contents. This exercise shows how to create a title and how to position it in the map area. The map view Landview created in the former exercise is used.



- Click the Add text button in the button bar of the Annotation Editor. The Display Options - Text dialog box is opened.
- Type the following in the text box Text:
Land use map.
Cochabamba, Bolivia
- Click the Font button. The Font dialog box is opened. Select the Font: Times New Roman, the Font Style: bold, and the Size: 14. Click OK.
- Click OK in the Display Options dialog box.

If you select the option **Transparent**, the background color of the text area will not be shown (only the text will appear). This is important when the text has to be placed on the mapping units.

The text appears in the map window. The position of the text box and the size of the box can be changed. The position of the text box and the size of the box can be changed by dragging one of its handles. You can size the text in one direction at a time or both directions at once, depending on which handle you drag. To change the position of the text:



- Select the text box.
- Drag the box and place it at the top right of the map, separated by some white area (see figure 13.3).
- Save the map view before proceeding.

Creating a legend

A legend is created based on information available in the domain of a map and the representation used by the domain. In this exercise a legend is created for the map `Landuse` and this legend is added to the map view `Landview`. This map view is created in the previous exercise.



- Press the right mouse button inside the map window.
- Select **Add Annotation** from the context-sensitive menu.

The **Add Annotation** dialog box is opened. It contains a list of the available annotation types. The selected annotation type will be added to the map window.



- Select **Legend** by clicking its option button.
- Click **OK**.

The **Map Layer Selection** dialog box is opened. It enables you to select a layer from which the legend will be created.



- Select the polygon map Landuse and click OK. The Legend dialog box is opened.
- Click on the Font button. The Font dialog box is opened. Select the Font: Times New Roman, the Font Style: regular, and the Size: 10. Click OK.
- Accept the defaults by clicking the OK button. The legend which appears in the map window is opened.
- Select the legend box.
- Drag the box and move it to the right side of the map (see figure 13.3). Make sure it is aligned with the title of the map. Leave some space open below the legend, where the scale bar should still be placed.
- Save the map view before proceeding.

Adding grid lines

Grid lines are regularly spaced, horizontal and vertical on a map area, according to the coordinate system linked to the map. In this exercise grid lines are added to the map view Landview.



- From the Edit menu, select the Add Annotation command (or press the Add Grid lines button on the button bar).
- Choose Grid Lines from the list. The Display Options - Grid dialog box is opened.
- Type 5000 in the text box Grid Distance.
- Select LightGray in the list box Color.
- Make sure the check-boxes Draw Border, Grid Lines and Coordinates are selected.
- Select the option Outside map.
- Clear the check-box Shortened coordinates.



- Click on the **Font** button. The **Font** dialog box is opened. Select the **Font**: Times New Roman, the **Font Style**: regular, and the **Size**: 10. Click **OK**.
- Click **OK** in the **Display Options- Grid** dialog box.
- Save the map view.

Adding a North arrow

A North arrow points to the North of a map, based on the coordinate system or georeference that is used by the map. In this exercise, a North arrow is added anyway to the map view Landview.



- Click the **North-arrow** button in the **Annotation Editor**. The **Display Options - North Arrow** dialog box is opened.
- Select the option **Cross**.
- Select the **Line Width**: 5.
- Select the check-box **Text**.
- Click on the **Font** button. The **Font** dialog box is opened. Select the **Font**: Times New Roman, the **Font Style**: regular, and the **Size**: 16. Click **OK**.
- Click **OK** in the **Display Options - North Arrow** dialog box. The North arrow is displayed in the map window.
- Drag the arrow and position it below the title of the map (see figure 13.3).
- Resize the North arrow and make it smaller.
- Save the map view.

Adding a scale bar

Map scale is a ratio indicating the relationship between the distance on the map and the distance on the ground. In ILWIS the map scale can be expressed in the following ways:

- Graphically in the form of a scale bar.
- As scale indication (e.g. 1:50000).
- As a verbal statement (e.g. One centimeter equals 10 kilometers).



- Click the **Scale bar** button. The **Display Options - Scale Bar** dialog box is opened.
- Click on the **Font** button. The **Font** dialog box is opened. Select the **Font: Times New Roman**, the **Font Style: regular**, and the **Size: 10**. Click **OK**
- Click **OK** in the **Display Options - Scale bar** dialog box. The scale bar is displayed in the map window.
- Drag the scale box and position it below the legend (see figure 13.3).
- Save the map view.

Adding an inset map

Graphic files such as Windows Meta file (pictures), specified with extension **.WMF** and bitmaps, with extension **.BMP**, can be added to a Map window. Furthermore, any picture or bitmap in the clipboard (copied into the clipboard from any Windows application), can be pasted into an ILWIS Map window. In this exercise, a bitmap with the ITC logo will be added to the map window.



- Click the **Add Bitmap or Picture** button. The **Add Bitmap or Picture** dialog box is opened.
- Select the bitmap `Itclogo2` from the list. Click **OK**. The **Display Options-Bitmap** dialog box is opened. Click **OK**. The contents of the file are displayed in the map window.
- Click the logo and drag it to the position as in figure 13.3.
- Save the map view.

It is also possible to paste a picture from the clipboard in the map window.



- Open the map **Bolivia**.
- Open the **Edit** menu.
- Select the **Copy** command.

The **Copy to Clipboard** dialog box is opened. The options in this dialog box can be used to copy the entire map, or a selected window from the map to the clipboard.



- Select Entire Map. Click OK.
- Close the map Bolivia.

The map is now copied to the clipboard. You may open the clipboard viewer in the Windows main window. To paste this picture in a map window:



- Activate the map window with the map view Landview.
- Open the Edit menu. Select the Paste command.
- Select Bitmap from Paste As dialog box. Click OK.

The Annotation Editor is active and the map Bolivia is pasted to the window.



- Drag the bitmap and position it on a suitable place to the right of the North arrow, below the title (see figure 13.3).
- Size the bitmap.
- Save the map view.

Adding a box

Finally, you will add a box to the map window that encloses the entire map. Boxes can also be used to place around an annotation (e.g. text, legend, map area, etc.), highlight certain areas, emphasize features, etc.



- Click the Add Box button. The Display Options - Box1 dialog box is opened.
- Accept the defaults by clicking the OK button. A box is added to the map.
- Position the box on the upper left corner of the map and resize it so that it encloses the entire map.
- Click the Exit Annotation Editor button.
- Click Yes to save the map view.

Presentation of results

- Click the Redraw button. Now the map is finished.
- Close the map window.

Editing map annotation

In this exercise, the map view Landview is used to show the steps on editing annotations in an ILWIS. This map view was created in the previous exercises.



- Open the map view Landview.
- From the Edit menu select the Annotation command.

The Annotation Editor is opened. Existing annotation (text, legend, scale bar, box, North arrow, bitmap or picture) can be edited by double-clicking it. Grid lines or graticule can be edited using the menu (Layers, Display Options or Layer Management) or context-sensitive menu (Layer Management).



- Double-click the North-Arrow in the map. The Display Options - North Arrow dialog box is opened.
- Select Simple for the Arrow Type. Click OK.

To edit the grid lines:



- Open the Layers menu. Select the Display Options command.
- Select Grid line from the list. The Display Options - Grid lines dialog box is opened.
- Edit the Grid Lines as you wish. Click OK.

Existing annotation can be deleted or removed, using mouse together with the Keyboard or the Layer Management menu command. To delete an annotation layer:



- Select an annotation layer.
- Press Delete on the Keyboard. Confirm the deletion.

To hide an annotation layer:



- In the Layer Management dialog box, select an annotation layer that you wish to hide.
- Clear the Show check box.
- Click the OK button in the Layer Management dialog box.
- Exit the Annotation Editor and save the map view.
- Close the map window when you have finished the exercise.

Summary: Annotation

A map has a primary content (the main theme of the map), a secondary content (base map information, such as roads, contours, drainage), and a supportive content (legend, scale, North arrow, location map etc.).

You can add supportive content using the *Annotation editor*.

- The ILWIS Annotation editor can be used to place map elements in a map window and edit these later.
- The following elements can be made:

Title: To add text (e.g. title) to the map and select a font type and color for the created text.

Legend: To create a legend from the domain of a map and the representation used by the domain. The number of records to appear per column in the legend, font type, font size, font color, etc. can be specified.

North-arrow: To show the North orientation of a map from the georeference that is used by the map window.

Scale bar: To add either a representative fraction scale (1 : 100000) or a graphic scale (scale bar). The intervals in the scale bar, font and colors, are user-defined.

Grid lines: To overlay the map with regular horizontal and vertical lines with a certain spacing. Coordinates of the grid lines can be visualized inside or outside the map area. The spacing, line width and color of grid lines is user-defined.

Graticule: To overlay the map with the lines that follow longitude and latitude of a geographic projection, as used by a coordinate system.

- Besides the items listed above, a picture or bitmap in the clipboard can be pasted into an ILWIS map window.
- The added annotation together with the map can be saved as a map view.

13.6 Printing a map

ILWIS enables you to produce paper copies of raster and vector maps, accompanied by annotation layers and attribute data. Paper copies can be created in black and white or color. It is also possible to print only attribute data in the form of a table. Before you can print, you should make sure that you have a printer connected to your computer, and that the printer is correctly installed under Windows.



- Open the map view Viewland.
- From the File menu, select the Printer setup command. The Windows Print setup dialog box is opened.
- Select the printer (either the default printer or a specific printer, depending on the type of printers you have available).
- Select the Orientation: Landscape.
- Select the appropriate paper size, depending on the type of printer you have available.
- Click OK.
- From the File menu, select the Print command.

The Print dialog box is opened. The options in this dialog box are:

Entire Map: Select this option button to print the entire map.

Current Window: Select this option button to print only the part currently displayed in the Map window.

Fit on Page: Select this option button to print a map on one page.

Scale: Select this option button to specify a scale at which the map should be printed. This may result in printing the map on more than one page, depending on the specified scale and size of the map.

Gamma Factor: This text box can be used to suggest a gamma correction factor. The gamma correction factor is used to optimize the contrast in a print and to match screen colors to printed colors. If you have already specified a gamma factor in the printer setup, specify factor 1, to prevent a double correction.



- Select Entire Map.
- Select Fit on Page and click OK.

- The map is now printed.
- Repeat the steps, but now print the map at a scale of 1:50.000.
- Close the **Map** window when you have finished the exercise.

Summary: Printing maps

- ILWIS enables to produce paper copies of raster and vector maps accompanied by annotation layers and attribute data.
- Paper copies can be created in black and white or color.
- It is also possible to print only attribute data in the form of a table.
- Before you can print you should make sure that you have a printer connected to your computer, and that the printer is correctly installed under Windows.
- It is possible to print a map so that it fits on one page, or to print it with a certain scale.

13.7 Exporting maps (to cartographic software)

Although ILWIS has sufficient tools to produce simple output maps, it is advisable to use specialized cartographic software for producing high quality output maps. Software packages that can be used for cartographic map production have become fairly easy to use, and cost effective, during the last decade. Some examples of such software packages are ACE and Aldus Freehand.

In order to be able to use the data generated in ILWIS in such a package, you will have to export it to an interchangeable file format. For raster maps, the easiest way is to convert to either *Windows Bitmap* format, or *TIFF* format. Nearly all software packages dealing with maps and images are able to read these file formats. These formats have the major disadvantage, however, that the coordinate information is not converted. The imported files will lose their coordinates. This will lead to problems when you want to combine a converted raster map with vector information in the cartographic software. When working with older versions of Freehand, for example, you will need to include crosses in each map, and later match the maps using the crosses. The latest version of Freehand, with the Map publisher module, allows you to work with georeferenced data, as does the ACE package. To make sure that the exported file from ILWIS doesn't lose its coordinates, the conversion to Erdas LAN is often used (in ACE for example), in which the coordinates are preserved.

For vector data the most common file format is DXF, which is defined by AutoCad. In this exercise you will practice the conversion of raster and vector data. For raster maps, conversion is fairly simple.



- From the **File** menu of the Main window, select the **Export** command. The **Export** dialog box is opened.
- Select the raster map **Shadows** from the list-box.
- Select the **Export Format: Tiff format .TIF**
- Type the **Output map name: Shadow1**
- Click **OK**. The raster map **Shadows** is exported to TIF format.

Exporting point maps and segment maps is also quite simple.



- From the **File** menu of the Main window, select the **Export** command. The **Export** dialog box is opened.
- Select the point map **Labels** from the list-box.

- Select the **Export Format:** AutoCad.DXF
- Type the **Output map name:** Label1
- Click **OK**. The point map Label1 is exported to DXF format.
- Repeat the operation for the segment map Drainage. Export it to Drain1.DXF

For polygon maps the situation is more complex, due to topological differences between a GIS and a cartographic system. In ILWIS there is only one segment as boundary line between two polygons, while in most cartographic packages it is assumed that each polygon is enclosed by boundary lines, so there are in fact two lines forming the boundary of two polygons. During the conversion of a polygon map to DXF format, each polygon will be made so that it is enclosed by boundary lines.



- From the **File** menu of the Main window, select the **Export** command. The **Export** dialog box is opened.
- Select the polygon map Landuse from the list-box.
- Select the **Export Format:** AutoCad.DXF
- Type the **Output map name:** Landuse .
- Click **OK**. The polygon map Landuse is exported to DXF format.

Summary: File conversion to cartographic software

- Although ILWIS has sufficient tools to produce simple output maps, it is advisable to use specialized cartographic software for producing high quality output maps.
- Raster maps are converted to Windows bitmap or TIFF format, or to ERDAS LAN format, when coordinate information should be preserved.
- Vector files are mostly converted to Autocad DXF format.

13.8 Creating demos with ILWIS

In this section, some examples are shown of how to create computer demonstrations.

You can show ILWIS maps, a GIF image, a bitmap, play a sound or a video, etc., when a mapping unit in a domain Class map or an element in a domain ID map is double-clicked. In an attribute table linked to the map, there should be a column called `Action`, which should have a *string* domain. In this `Action` column, you specify a file name of a map or table and its extension (.MPR, .MPA, .MPS, .MPP, .TBT), or a GIF image, picture, sound or video, that you want to see/hear when double-clicking a mapping unit, in a domain class map or an element in a domain ID map.

Windows' File Manager should be used to associate non-ILWIS files with a program that can open these files. Native ILWIS extensions are already associated with ILWIS during the Setup of ILWIS. Associations can be found in the WIN.INI file.

Make sure that:

- An attribute table is linked to the map.
- This attribute table has a column `Action` (column of domain string type).
- You have typed in this column file names inclusive of path and extension of the map, table, GIF image, picture, sound or video, that should be opened when you double-click a certain mapping unit or element.
- You used the File Manager (File menu, Associate), to associate non-ILWIS extensions with a program that can open files with these extensions.

When you double-click in the map window and a class name or identifier is found, the double-click action is set to `Execute Action`, and an attribute table is found with a column `Action`, in which a filename is found that has a known association, then that file is opened (map or table is shown, audio or video is played, etc.). If another non-undefined value is found, nothing happens.

Demo example: Use of field-photos

In this exercise, you will learn how you can make a demo, using a number of scanned photographs from the Cochabamba area, and a point map showing the locations where the photos were taken, represented as red dots. When you double-click on a red dot, the appropriate photo is shown. The photos were obtained through the scanning of snapshots and slides, using a simple scanner. These files are available in TIF format (`Photo1.tif` to `Photo9.tif`). The locations where the photos were approximately taken are stored in a point map.

The first thing that should be done is to import the TIF files.



- From the **File** menu of the Main window, select the **Import** command. The **Import** dialog box is opened.
- Select the **Import format**: **Tag Image File Format .TIF**. The list of TIF files appears in the list box.
- Select the file: **Photo1.tif**. The output format is set to **Photo1**.
- Click **OK**. The file is converted.
- Repeat this for the other photos.
- Display the various photos. Close all map windows.

As you can see the last photo (Photo9) is rotated. To rotate it into the normal position you can use the operation **MirrorRotate**.



- Click the image **Photo9** with the right mouse button and select the commands **Raster Operations** and **Mirror Rotate** from the context-sensitive menu. The **Mirror Rotate** dialog box is opened.
- Select the option **Rotate 90 degrees**, type as output map name: **Photo9r**. Click on **show** and **OK**. The **Display Options** dialog box is opened. Click **OK**. The image is rotated and the result is displayed. Close the map window.

The next step is to create a map view for each photo. The advantage of a map view is that it will be displayed without showing first a **Display Options** dialog box, since the display options are already stored in the map view. Another advantage of using map views is that you can give each map view a descriptive title, which will be shown on the title bar.



- Open the image **Photo1**. Select from the file menu the **Save view as..** command. The **Save View As** dialog box is opened. Type the **Map view name**: **Photo1**, and the **Title**: **Country school in the mountains**.
- Close the map window.
- Repeat this for the other photos (**Photo2** to **Photo8**, and **Photo9r**), and create views with the same names. Type the descriptions as given in table 13.4.

Table 13.4: Description of photos used in the demo

View	Title
photo2	Cochabamba seen from the Colina de San Sebastian
photo3	Indian village in the mountains
photo4	Llamas grazing in the mountains
photo5	Cochabamba by night
photo6	Transporting Chicha and Coca
photo7	Geologic fault
photo8	Central park of Cochabamba
photo9r	Cochabamba wants to be Rio de Janeiro

Now the photos are finished. The next thing to do is to work with the file containing the location of the photos. This is a point map, with the name `photos`.



- Double-click the point map `photos`. The Display Options dialog box is opened.
- Press the **Symbol** button. The Symbol dialog box is opened. Select the **Symbol type**: `Simple`, the **Symbol**: `Circle`, the **Size**: `10`, the **Fill color**: `red`, **Line width**: `1` and the **Color**: `red`. Click **OK**.
- Select the check-box **Text** and press the **Font** button. Select the **Font type**: `Times new roman`, the **Font style**: `bold`, and the **Size**: `12`. Click **OK**. Select the **Text color**: `red`. Click **OK** in the Display Options dialog box. The point map is displayed.
- Drag-and-drop the raster map `Shadows` to the map window. The Display Options dialog box is opened. Select the option `light` and click **OK**. The hillshading map is now also displayed in the map window.
- Resize the map window, so that it is not too small.
- Select from the file menu the **Save view as..** command. The **Save View As** dialog box is opened. Type the **Map view name**: `photos`, and the **Title**: `Photos from the Cochabamba area`. Click **OK**.
- Close the map window.

The last thing that should be done is to create a table, linked to the point map `photos`, that contains a column **Action**, and in which the names of the map views of the photos are written.



- From the **File** menu of the Main window, select the commands, **Create** and **Create table**. The **Create table** dialog box is opened.
- Enter the **Table name**: `photos` and select the domain `photos`. Click **OK**. The table is opened.
- From the **Columns** menu in the table window, select the command **Add column**. The **Add column** dialog box is opened.
- Type the **Column name**: `Action` and select the domain `String`. Click **OK**.
- Type the names of the map views in the column `Action`, including the extension. So for the first record, with the domain item `Photo1`, you type `Photo1.mpv` in the column `Action`. Make sure that the name of the last field in the column `Action` should read: `Photo9r.mpv`. The extension `.mpv` stands for map view.
- Close the table window.
- Click the point map `photos` with the right mouse button and select **Properties**. The **Properties** dialog box is opened. Make sure that the check-box **Attribute Table** is selected and select the table `photos`.
- Click **OK**.

Now all input data is ready, so you can do the actual demo.



- Open the map view `Photos`.
- Click with the right mouse button somewhere within the map and select the command **Double Click Action**. The **Double-click action** dialog box is opened. Select the option: `Execute Action`. Click **OK**.
- Double-click on any of the red dots, to see the map view of the photos. The explanation of each photo is shown in the title bar.
- Make sure to close all map windows when you have finished the exercise.

Demo: Showing a flowchart

In this second exercise, you will see that you can use the same principle (double-clicking a part of a map, which is linked to an attribute table containing an `Action` column), to display maps in the form of a flowchart. As an example, we have used a flowchart of the map making operations which were done in the first part of this chapter. We have created a flowchart with a drawing package, in which we inserted the various ILWIS icons.



- Open the raster map `Flowchar`, have a look at it (double-clicking the icons now will not have any effect).
- Close the map window.
- Open the georeference of this map (`Flowchar`).

As you can see the map `Flowchar` has coordinate system `Unknown` and the minimum `X` and `Y` are 0, while the maximum `X` and `Y` are 640 and 480.

Besides this flowchart you need a point map, with a point at the centre of each icon in the flowchart.



- Close the georeference `Flowchar`.
- From the `File` menu of the Main window select the `Create` and `Create Point map` commands. The `Create Point map` dialog box is opened.
- Enter the `Map Name`: `Flowch`. Select the coordinate system: `unknown`. Type the `Min X`, `Y`: 0 and 0. Type the `Max X`, `Y`: 640 and 480.
- Click the `Create` button of the domain list box. The `Create domain` dialog box is opened.
- Enter the domain name: `Flowch`. Select the option `Identifier`. Select the `Nr of items`: 8, and the `Prefix`: `map`. Click `OK`.
- The `Domain editor` is opened. Close this again. Now you are back in the `Create Point map` dialog box. Click `OK`.
- The `Display Options` dialog box is opened. Click `OK`.
- The `Point editor` is opened.

- Drag and drop the raster map Flowchar to the map window. Click OK in the Display Options dialog box.
- The raster map Flowchar is added to the map window.
- Now you can digitize the point in the centre of each icon. Click the Add Points button in the button bar.
- Click in the centre of the icon below the word Shadows, and enter the name: map 1. Digitize points for the other icons also, and name them map 2 to map 8.
- Press the Exit Editor button when you have digitized all 8 points. The Display Options dialog box is opened.
- Click the Symbol button. The Symbol dialog box is opened.
- Select the Symbol type: Symbol, and select the upper left symbol from the list (it is in fact an empty space). Select the Size 20. Click OK.
- Click OK in the Display Options dialog box.

The points are now invisible. They are there, because when you click any of the icons you will get the name of the point. What should be done now is to save the map window as a view.



- Select from the file menu the Save view as.. command. The Save View As dialog box is opened. Type the Map view name: Flowchar, and the Title: Flowchart for the production of a land use map for the Cochabamba area. Click OK.
- Close the map window.

To speed up the process, and also to allow you to see how your own landuse map, generated earlier on in this chapter, corresponds with the one that we have made, the maps required for the flowchart are already stored as map views. The relationship between the map views and the points that you have digitized is shown in table 13.5.



- From the File menu of the Main window, select the commands, Create and Create table. The Create table dialog box is opened.

- Enter the Table name: `Flowch`, and select the domain `Flowch`. Click OK. The table is opened.
- From the Columns menu in the table window, select the command Add column. The Add column dialog box is opened.
- Type the Column name: `Action`, and select the domain `String`. Click OK.
- Type the names of the map views in the column `Action`, including the extension, as shown in table 13.5.
- Close the table window.
- Click the point map `Flowch` with the right mouse button and select Properties. The Properties dialog box is opened. Make sure that the check-box `Attribute Table` is selected, and select the table `Flowch`. Click OK.

Table 13.5: The names of the map views, corresponding to the data layers for the construction of the landuse map, and the points in the point map flowch

Point in point map flowch	Map made earlier on in this exercise	Map view name that we have made for you
map 1	shadows	flowshad.mpv
map 2	landuse	flowlan.mpv
map 3	labels	flowlabe.mpv
map 4	contours	flowcont.mpv
map 5	drainage	flowdrai.mpv
map 6	roads	flowroad.mpv
map 7	places	flowplac.mpv
map 8	landview	viewland.mpv

Now all input data is ready, so you can do the actual demo.



- Open the map view `Flowchar`. Click with the right mouse button somewhere within the map, and select the command `Double Click Action`. The `Double-click action` dialog box is opened. Select the option: `Execute Action`. Click OK.
- Double-click on any of the icons, to see the map view of the data layers.
- Make sure to close all map windows when you have finished the exercise.

Creating a slide show

The last example of the preparation of a demo with ILWIS, is the creation of a slide show, that can be used to display multi-temporal maps, in order to evaluate changes through time. The operation **Slide show** is meant for this purpose.

In Slide show, a map window shows multiple raster maps like a slide show. It is in fact the same as repeatedly replacing the raster map in a map window, e.g. by dragging the raster maps into the map window. The raster maps to be displayed are stored in a *map list*.



A map list is a data object and stores the names of a set of raster maps, for example of the multi-spectral bands of a satellite image that you want to classify. A map list may also store the names of several raster maps of a time series which you can display as a slide show. All raster maps in a map list must have the same domain and georeference.

In the slide show only one set of display options will be used. The defaults are based on the first map in the map list. The parameters set for this map in the map list, also define the display options for the other maps in the map list.

Slide show is, therefore, useful for multi-temporal monitoring, where data regarding a site is collected on more than one occasion. It can, for example, be used for observing a series of satellite images of the same area in time, derived products such as NDVI, or classified maps, such as land use maps. In this way you get a clear view of the general changes in time.

In this example, you will work with multi-temporal maps showing the growth of the city of Manizales, located in central Colombia, with a set of 8 maps from 1851 till 1989. These maps are available as bitmaps. So the first step is to convert them to ILWIS.



- From the **File** menu of the Main window, select the **Import** command. The **Import** dialog box is opened.
- Select the Import format: `Windows bitmap .BMP`. The list of BMP files appears in the list box.
- Select the file: `M1851.bmp`. The output format is set to `m1851`.
- Click **OK**. The file is converted.
- Repeat this for the other maps (`m1930`, `m1949`, `m1960`, `m1970`, `m1977` and `m1989`).
- Display the various maps. Close all map windows.

In order to show these maps as a slide show, you should first create a maplist, containing the names of these maps.



- From the **File** menu of the Main window, select the **Create** and the **Create Map List** commands. The **Create Map List** dialog box is opened.
- Enter the **Map List Name**: Manizal.
- Enter the **Description**: Growth of the city of Manizales (Colombia).
- Select the raster maps m1851, m1930, m1949, m1960, m1970, m1977, and m1989 (use the multiple selection option by clicking a while keeping the Ctrl key pressed). Click **OK**.

Now you can run the slide show.



- From the **Operations** menu of the Main window, select the **Visualization** and the **Slide show** commands. The **Show Map List** dialog box is opened.
- Select the **Map List** Manizal and click **OK**.
- The **Display Options Raster map** dialog box is opened, with the display options for the first map (m1851). Click **OK**.
- The **Display Options Map List** dialog box is opened. In this dialog box you can change the refresh rate, indicating how many times per minute the display will be changed. Change the refresh rate to 60. Click **OK**.

Now the maps are displayed in the map window one by one, so that you can evaluate the changes more easily. You can change the refresh rate, to make the display more slowly or more rapidly.



- When you have finished seeing the slide show, close the map window by double-clicking the control-menu box.

Summary: Creating demos in ILWIS

- You can show ILWIS maps, a GIF image, a bitmap, play a sound or a video, etc., when a mapping unit in a domain class map or an element in a domain ID map is double-clicked.
- In an attribute table linked to the map, there should be a column called `Action`, which should have a string domain. In this `Action` column, you specify a file name of a map or table and its extension (`.MPR`, `.MPA`, `.MPS`, `.MPP`, `.TBT`), or a GIF image, picture, sound or video, that you want to see/hear when double-clicking a mapping unit in a domain class map, or an element in a domain ID map.
- Another way of using demos with ILWIS is the creation of a slide show, that can be used to display multi-temporal maps, in order to evaluate changes through time. The operation `Slide show` is meant for this purpose.
- In `Slide show` a map window shows multiple raster maps like a slide show. It is in fact the same as repeatedly replacing the raster map in a map window, e.g. by dragging the raster maps into the map window. The raster maps to be displayed are stored in a *map list*.