

8. Cartographic Principles & Design

Map Layout

A map conveys geographical information and relationships. The result of any analysis in GIS is communicated using maps so as to help users/readers to better understand the geographical phenomenon. The map can only fulfill its purpose when it is presented in a proper manner. There are certain points which are to be kept in mind while designing a map:

a. Objective: It is necessary to pay attention to the question why and where will the map going to be used. One should be clear about whether the map is just sharing information, depicting result of an analysis or highlighting the key issues and relationships. One should also know whether the map is going to be displayed on a wall, in a book or in some other information resource.

b. Audience: A designer/cartographer must know who will be addressed through the maps. Maps must match the level/expectations of the audience. The level of design for a technical group and for general people ought to be different.

c. Balanced design: A map must be prepared using appropriate page size, color, patterns of shading, text, and scale. Everything on the map should be legible.

Designing the map layout

The process of map composition starts with preparing a layout for the map. Apart from the data, a map has certain other things that make map a package of effective and clear communication. These provide critical information to users and are known as map elements. A layout specifies the space and positions for different map elements such as neat lines, title, North arrow, scale bar, legend etc. Preparing an effective layout often requires experimentation with the available space.

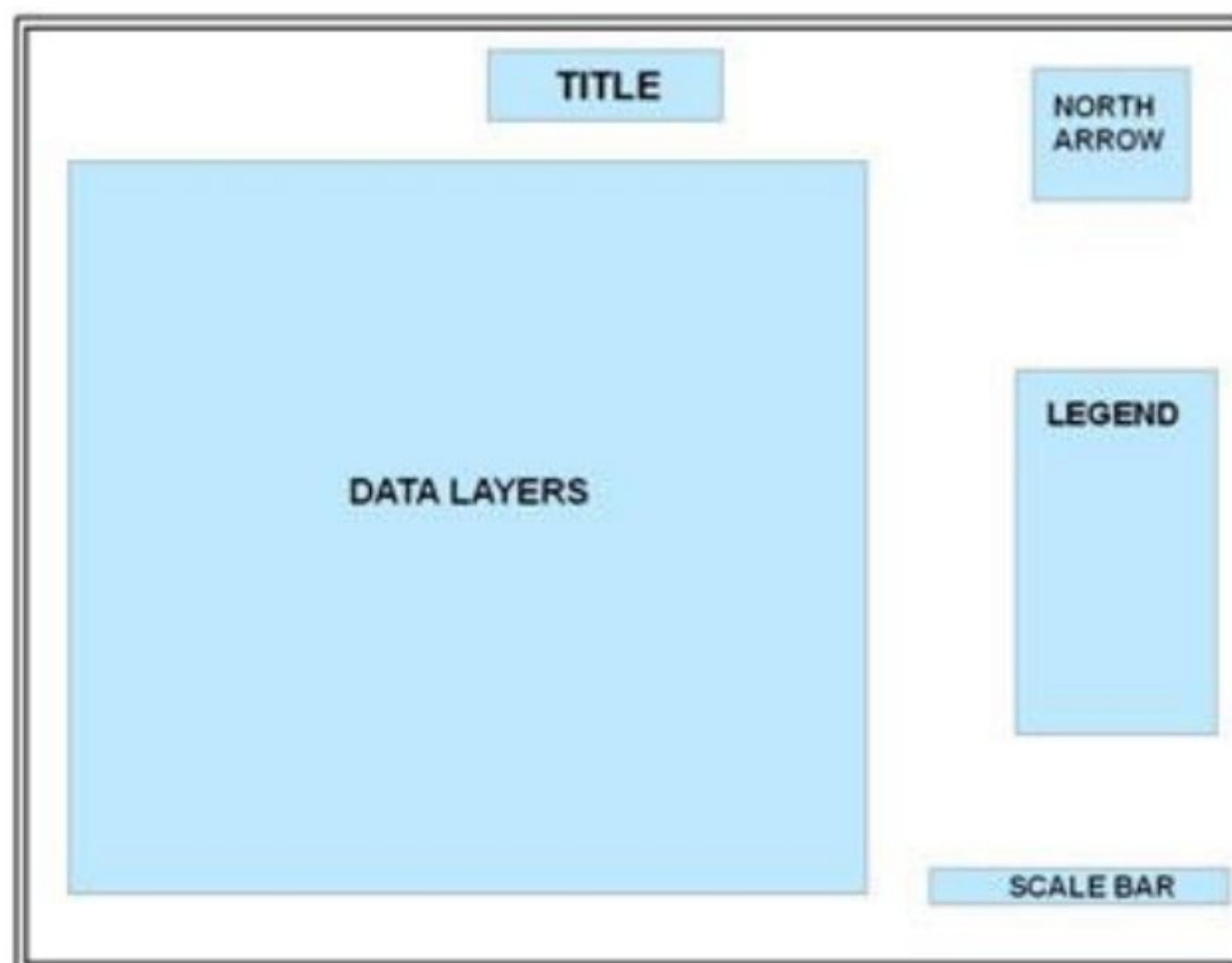


Figure 1: A map Layout

Every element in the layout has to be given a thought—whether it is important to include the respective element, does it require elaboration etc. The map elements that are generally found on a map are:

- Scale: Scale must be given in order to derive the actual size of an entity on the map or distance between two geographical entities on a map.
- Direction: True north is the direction of North Pole and it differs from the magnetic north. The magnetic north pole changes due to the changes in the geo-physical condition of the earth. Many maps indicate both the true and the magnetic north but the direction that is indicated on most of the maps is the true north.
- Legend: Legend lists all the symbols used in a map and describes what they depict.
- Title: A short suitable text that clearly defines the theme of the map.

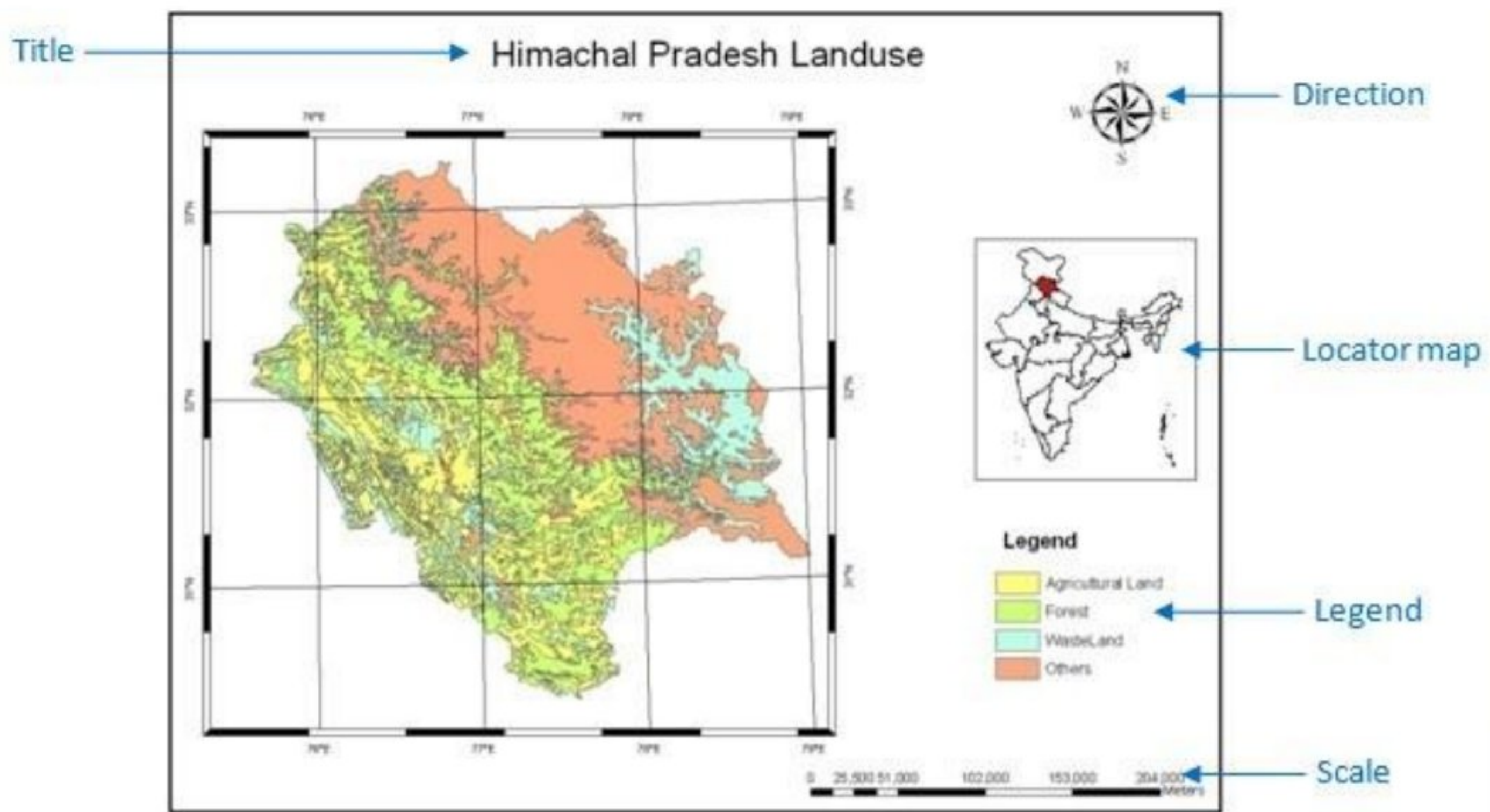


Figure 2: A map with its elements

Given below are a few other elements that are selectively used:

- Neatlines: These are lines used to frame a map to indicate where the map begins and where it ends.
- Reference grid/Graticule: A reference grid is a network of evenly spaced horizontal and vertical lines used to create context on a map. The grid can be used to show unique locations (control points) either in a geographic coordinate system or in a projected coordinate system.

- Locator map: The maps that display locations unfamiliar to users, are generally supported with locator maps which represent the locations in a larger geographic context and with which the user is expected to be familiar.
- Inset map: Sometimes the details on a part of a map are so clustered that they become difficult to read and a magnified view of that part of the map is required. These magnified view maps or close up maps are called insets.
- Source of information: The age, accuracy and reliability of the data sources are critical in carrying out any study. One can show the sources of data one has used in maps so that a user can track them and check his analysis and interpretation.
- Date of production: The representation of time on the maps is important in some cases. For example the weather map prepared on daily, weekly or monthly basis must indicate time on them. A road map to be used for a developing city must be a recent one so as to be relevant for the city etc.

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Map Elements

Color

The aim of filling colors in a map is to make visual distinction among various features thus making map more decipherable.

Hue is the dominant wavelength we usually call as color such as green, red or blue. Saturation is the purity of hue or the dominance of hue. Value measures how dark or light the color is when hue is maintained constant. Changes in hue usually indicate qualitative differences such as different administrative units whereas changes in value and saturation represent quantitative differences such as population density in a country.



Figure 3: Map showing sex ratio in different states of India

The lightness or darkness of the color represents quantitative differences. Generally, dark colors mean more and represent high values of the attribute under study. The above given map depicts the sex ratio in various states of India. The areas in dark color represent states with high sex ratio and the ones in light color represent states with low sex ratio.

There is a slight difference in color that appears when a map is displayed on a computer screen and when it is printed on a paper. The difference is attributed to the two different ways of creating colors known as additive, and subtractive models of color which are explained below.

Additive Color Model

It involves light emitted from a source and is employed on devices that use light such as camera, monitors etc. The three primary colors red, green, and blue are mixed at different levels to generate other colors. When one of

these colors is combined with the other in equal amounts the secondary colors cyan, magenta, and yellow are produced. The combination of all the three colors in equal intensities produces white

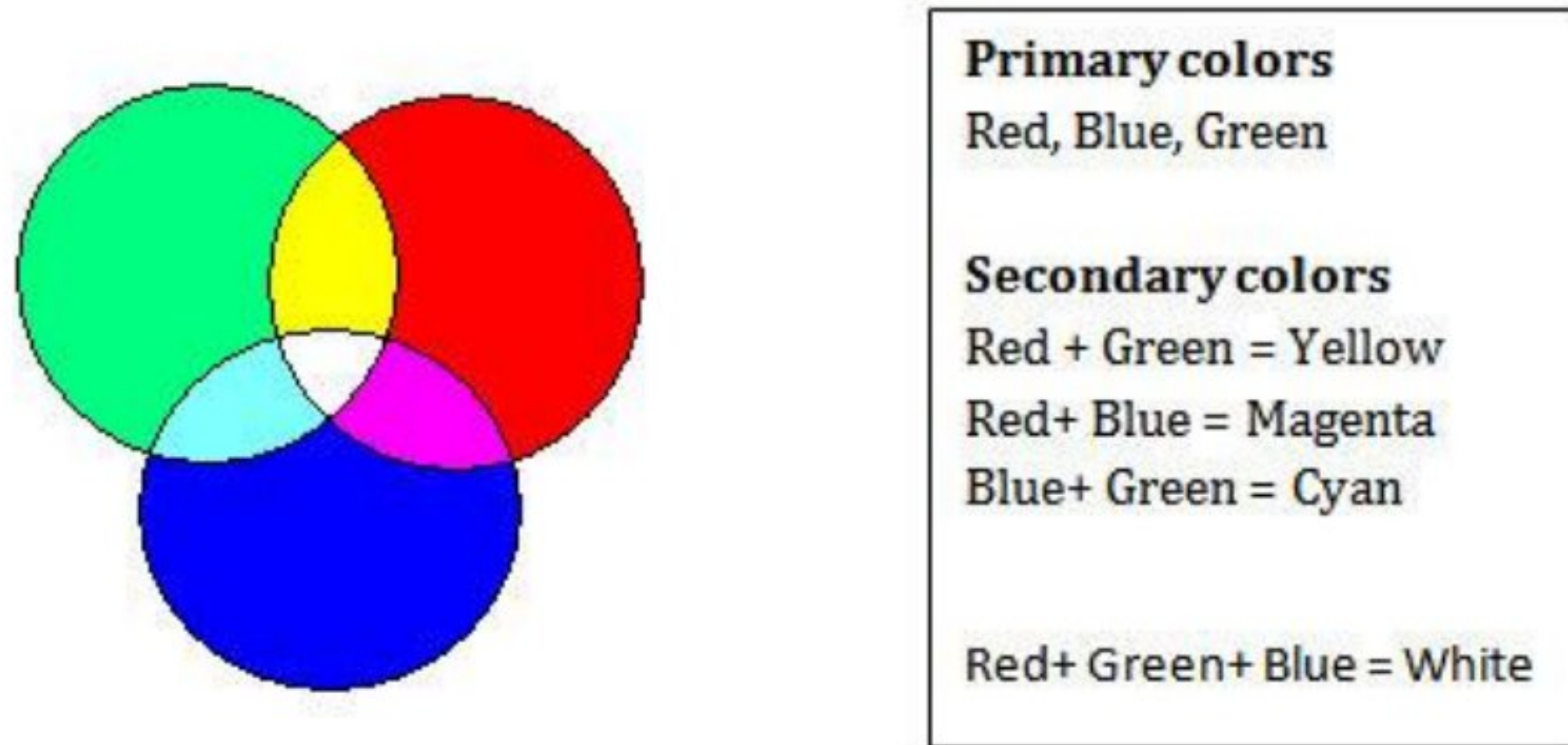


Figure 4: Additive color mixing

Subtractive Color Model

A subtractive color model explains the mixing of dyes, inks etc. to create a range of colors, each formed by subtracting i.e. absorbing some wavelengths of light and reflecting the others. A printer works on this color model. It uses three colors—cyan, magenta and yellow. When these are mixed together black is seen to be formed but the color is actually dark brown. This is why most printers add a black ink to print black text.

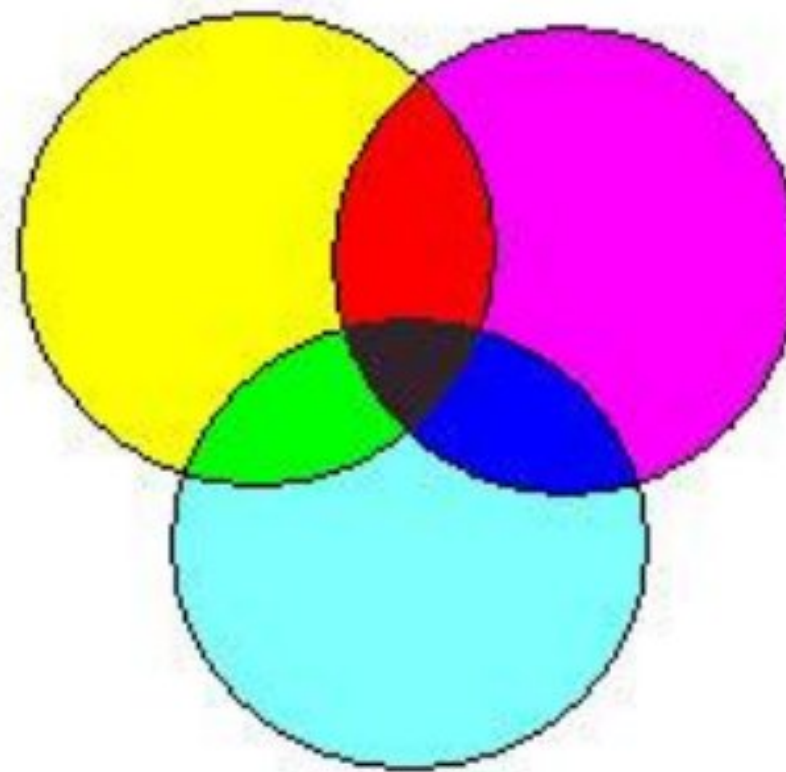


Figure 5: Subtractive color mixing

Text

The use of text on maps enhances the information one wishes to convey. Displaying geographic features and symbols alone on the map doesn't convey the full meaning until and unless it is supported with the relevant text. Inserting text on maps can serve various purposes such as:

- To label the features on map layers, e.g. labeling the name of the states in the political map of India
- To use text as graphic so as to highlight a particular area, e.g. labeling the location of Taj Mahal

- To add information such as title, author, data source references to the map layout.

Placement of Labels

Labeling refers to placing of a descriptive text onto a feature on the map. The placement of labels is an important part of cartographic design because labeling affects the readability of a map. Placing labels at appropriate positions facilitates users to associate labels with the features being described. Sometimes, a part of map becomes overcrowded with labels making it difficult for a user to distinguish which label is used for which feature. This situation can be taken care of in a dynamic map, by adjusting labels in such a manner that they only appear on the map after it is viewed on a particular scale. For static maps, call outs are used for labeling features in such a situation.



Figure 6: Proper placement of labels that mark the dams on Himachal Pradesh map

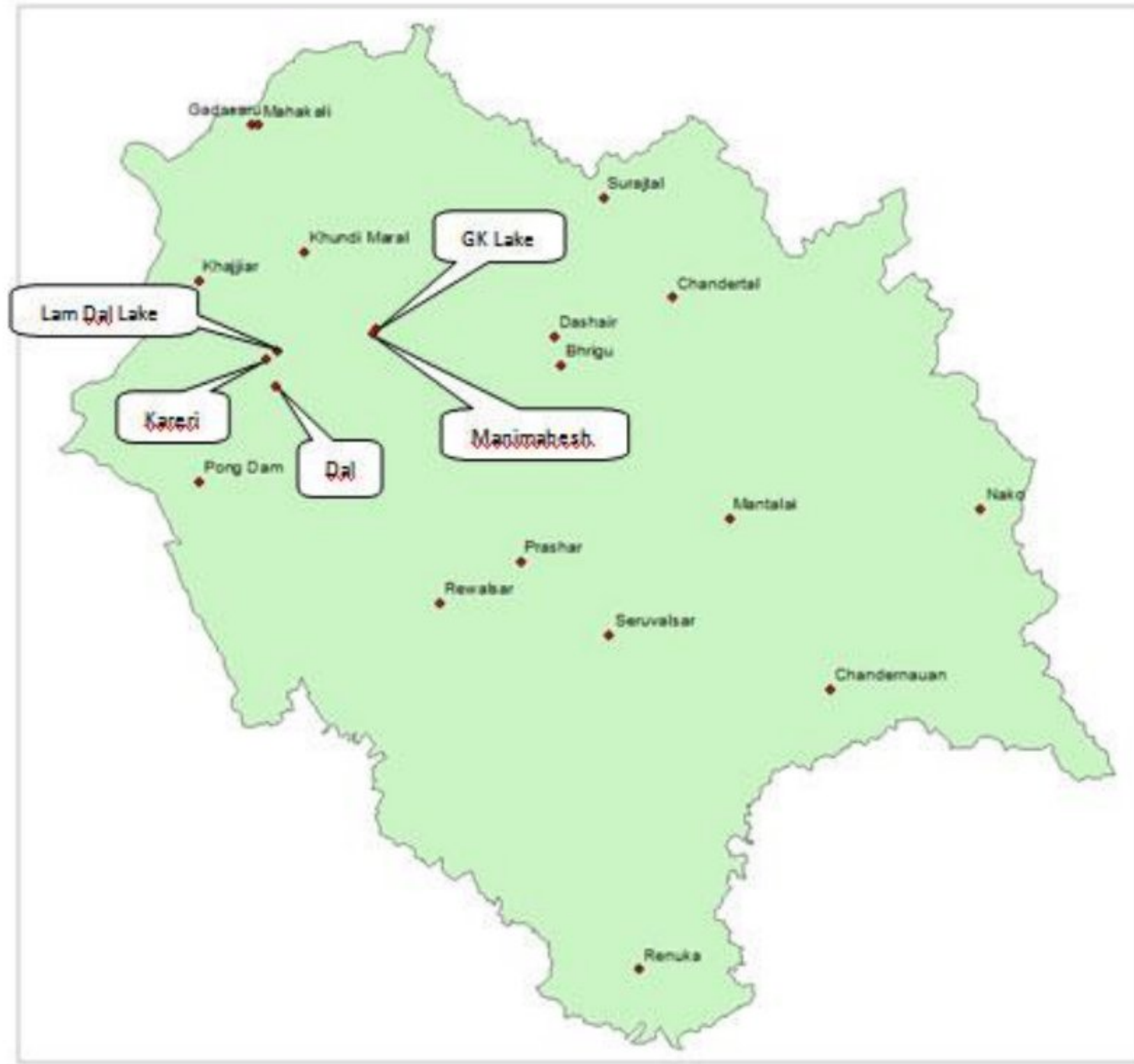


Figure 7: Placement of labels using call outs that mark lakes in Himachal Pradesh map

Symbols

A symbol is a graphic or a pictorial element used to represent a feature on map. Various types of symbols are used for representing objects or features belonging to any of the three themes viz. point, line and polygon. Every symbol has a set of properties associated with it. These include its shape, size, color, angle, pattern etc

Shape is the geometric form of the symbol. It is used to differentiate between the object classes. The closer the shapes of the symbols resemble the features they represent, the better is the map perceived by the users.

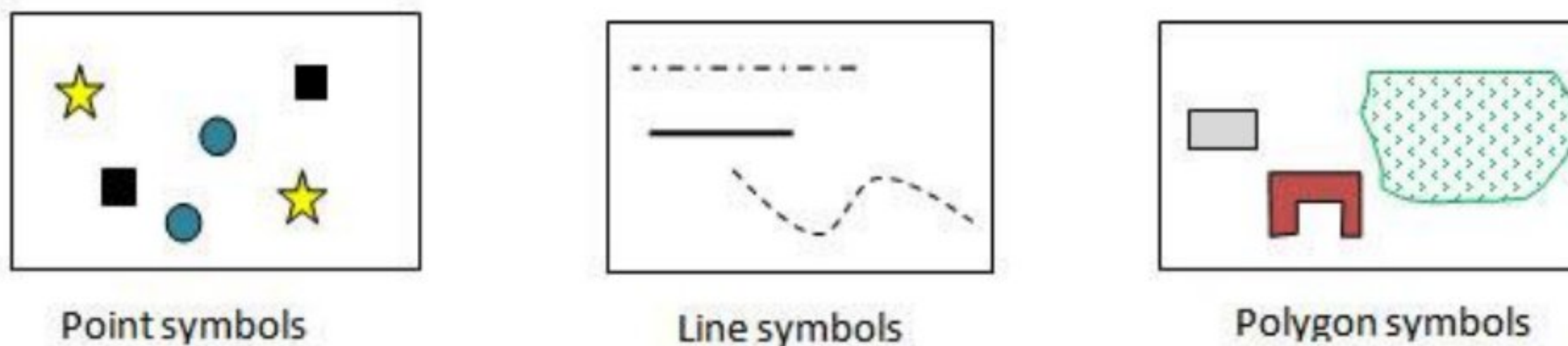


Figure 8: Symbols for different features

The **size** of symbols depicts a quantitative difference in the distribution of an attribute. Given below is a map showing petrol pump sites in an area. The difference in size of symbols that represent petrol pump stations corresponds to the number of people working in the particular petrol pump station. The biggest sized symbol represents that the station has the highest manpower as compared to the other stations.

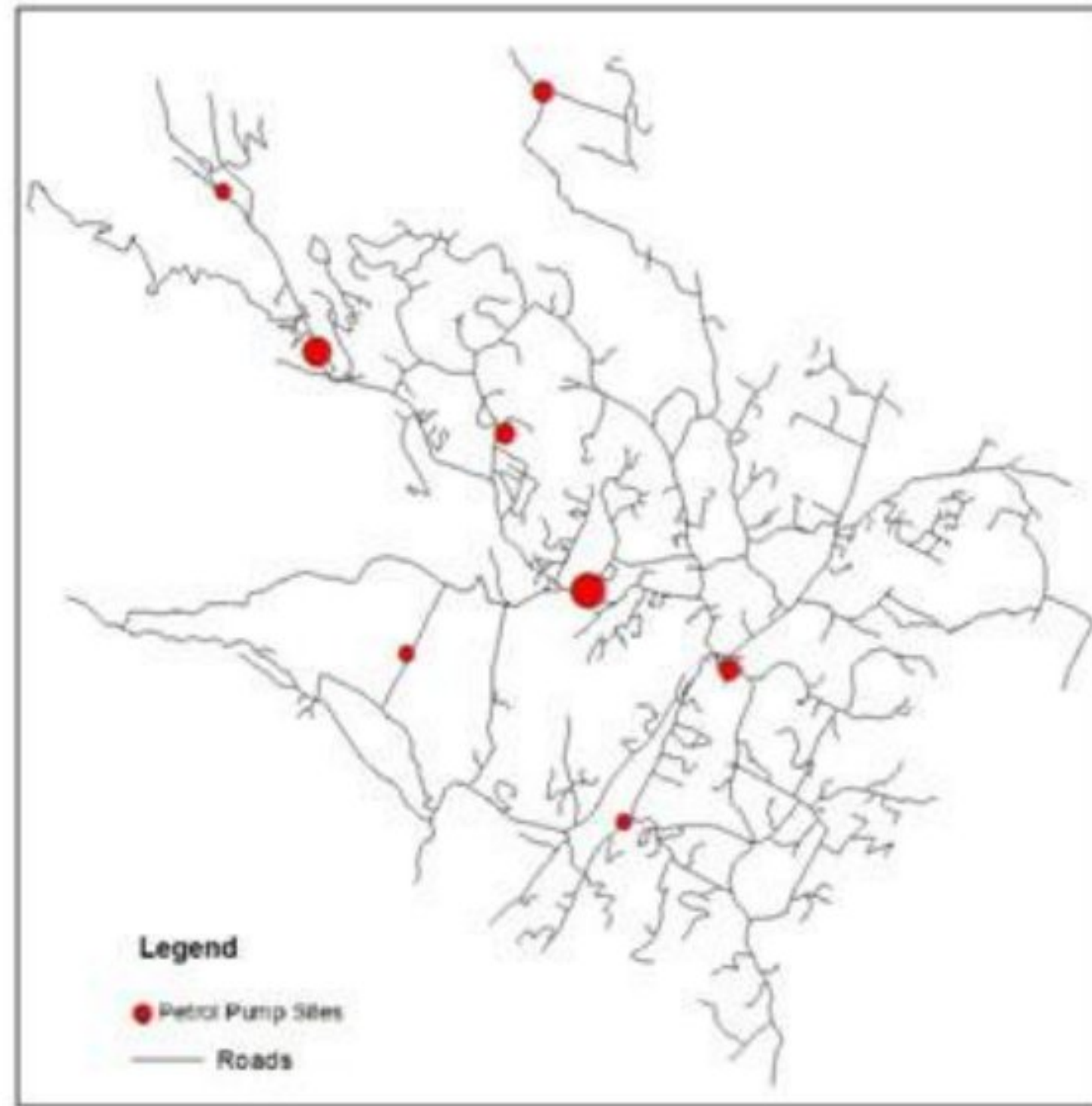


Figure 9: Attribute (manpower) representation by size of symbol

In the following map bars have been used to show the comparison and distribution of male and female populations in different states of India. The size of a bar corresponds to the number of individuals (male or female, whatever the bar represents) existing in a particular state.

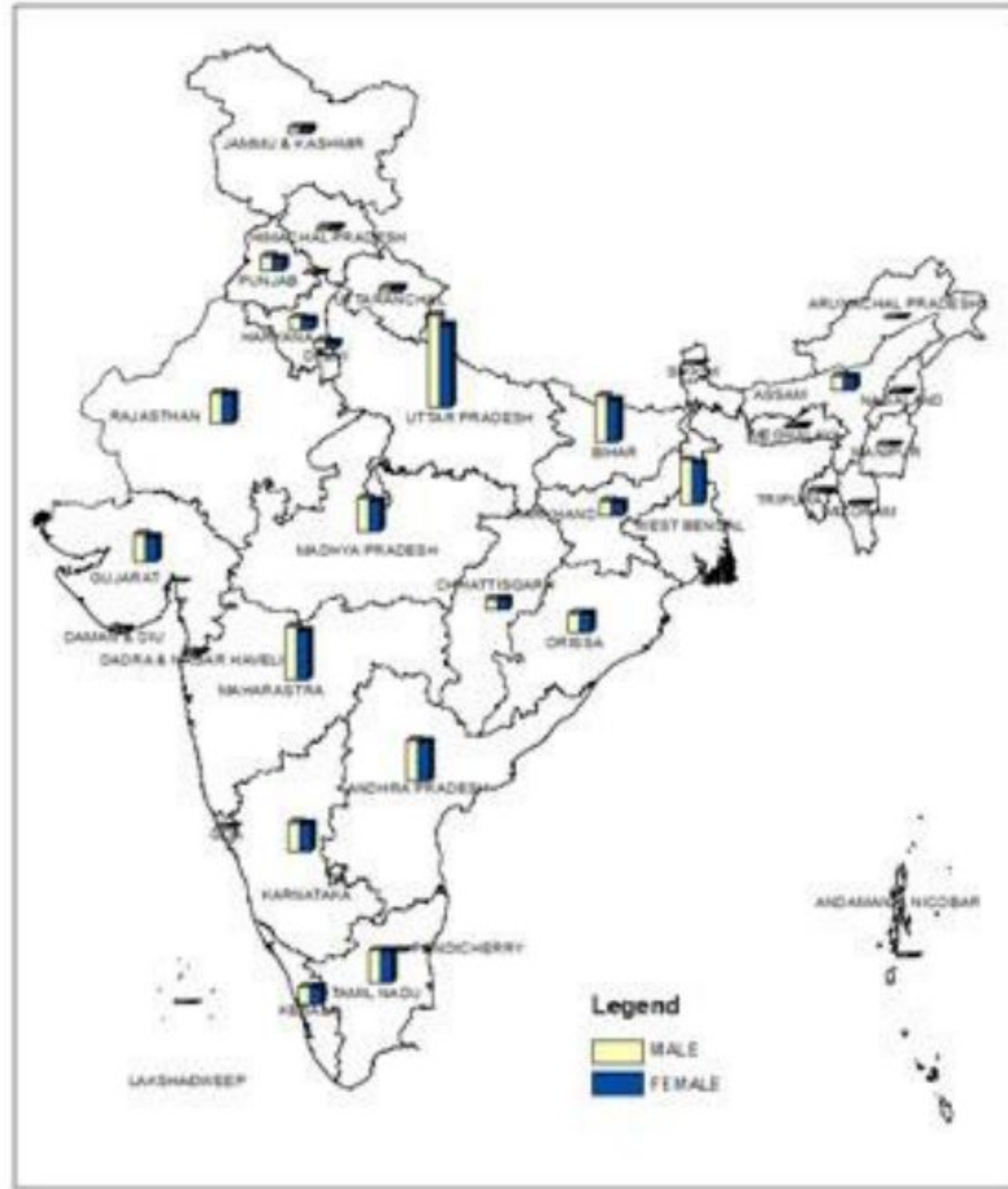


Figure 10: Attribute (male/female population) representation by bar size

Sometimes a **combination of symbol and color** exhibit the attribute of interest. In the example shown below, the elevation gradation of a landscape is marked by the simultaneous use of contours (lines) and colors.



Figure 11: Elevation gradation of a landscape

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