

Labeling Tools in ArcMap

I. Understanding the different tools

There are a several ways to add text to a map in ArcGIS because there are several reasons to have text on a map. Below is a description of the many ways of working with text on a map.

Graphic Text

Graphic text is useful for adding information on and around your map that exists in page space. This type of text sits 'on top' of your map. It is not attached to any geographic data.

Dynamic Text

Dynamic text is a type of graphic text that, when placed on a map layout, will change dynamically based on the current properties of the map document. Some examples of this include the map title, legend, and scale bar.

Annotation Text (or graphics)

Annotation text can be individually selected, positioned, and modified. Annotation may be manually entered or generated from dynamic labels. Annotation text is added to the map in Annotation groups and can be managed through the data frame properties.

Dynamic Labels

These labels will display labels for a layer (you can specify the attribute or attributes) simply by turning them 'on'. ArcMap automatically places labels on or near the features they describe. You can control the font, size, and color of the text to help differentiate labels for different types of features. The dynamic labels that appear on your map will change as you change the scale of your map, and will vary within a map based on how close or distant features are from one another.

Map Annotation Labels

Map annotation can be created when you convert dynamic labels to annotation. It converts each label into an individual piece of text that you can move and edit. Each text annotation feature has symbology including font, size, color, and any other property.

Geodatabase Annotation Labels

Geodatabase annotation is text stored in annotation feature classes. As with other feature classes, all features in an annotation feature class have a geographic location and attributes. Generally, if you are working in a multiuser GIS environment or if you have any more than a few hundred pieces of text, you should store your annotation in geodatabase annotation feature classes.

II. Map Document Annotation

Using annotation as map text

Annotation is a very powerful option for creating and storing map text. A powerful advantage in using *annotation* as map text over *dynamic labels* is that annotation can be selected and moved, and its properties managed as individual elements. You can both create annotations individually and convert labels to annotation.

There are two main types of annotation, each based on one of two storage options:

- Map document annotation
- Geodatabase annotation

Map document annotation is stored in the map document, as a property of the data frame, where it was created. *Geodatabase annotation* is stored outside the map document as a geodatabase feature class similar to geographic features.

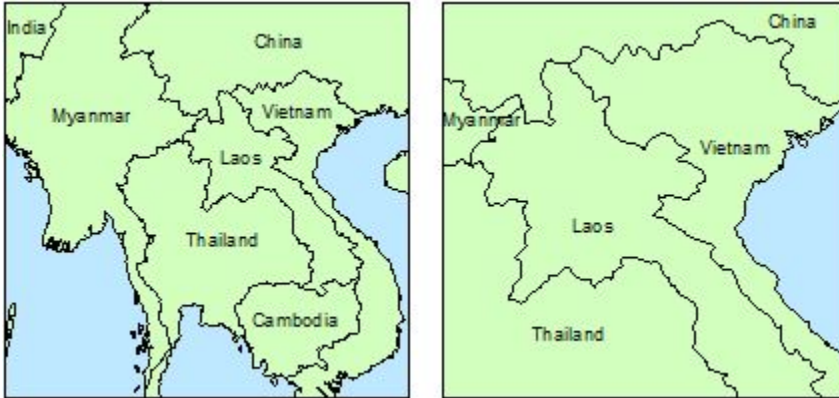


In this illustration, Hawaii is represented by a single polygon, so there are no attributes that contain the individual island names. All the text, including the island names, is stored as map document annotation.

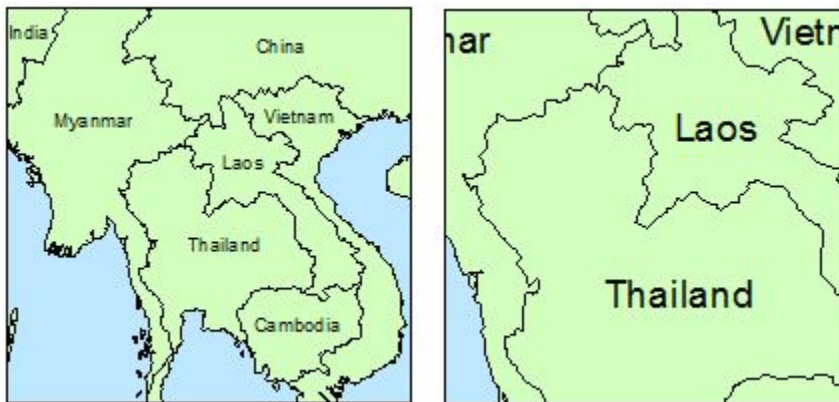
Annotation vs. dynamic labels

Dynamic labels allow you to quickly add map text to label, or describe, geographic features in a map. Label properties are stored and managed as a layer property, within a map document and, optionally, a layer file. Labels are extracted from text or numeric attributes contained in one or more of a layer's attribute table columns. When you turn on dynamic labels for a map layer, ArcMap automatically adds a label for each feature, in the layer, to the layer's display. ArcMap determines the exact placement of dynamic labels. As the user zooms in to and out from the map, the text will draw at the same size but the position changes as ArcMap determines the best placement for the labels.

Annotation placement is always fixed relative to the features on the map. Annotations will change scale along with the features when the map scale changes.



Dynamic labels before and after zooming in. Notice that the labels still draw at the same point size but have drawn in new positions.



Annotation labels before and after zooming in. Notice that the annotation has rescaled along with the features, but the positions stay the same.

Note: Scale ranges can be set for labels, and you can also use label classes to assign different sizes.

Difference between labels & Annotations

Each annotation stores its own position, text string, and display properties. Label properties are managed as a set of layer properties within one or more groups of labels.

- Annotations are selectable. Labels are not.
- Annotations are placed at fixed locations. Labels are dynamic and will be repositioned by ArcMap when zooming and panning.
- Label properties are stored as a layer property in a map document (MXD) or a layer file (LYR). Map document annotation is stored in the data frame. Geodatabase annotation is stored as a geodatabase feature class.

When to use annotation

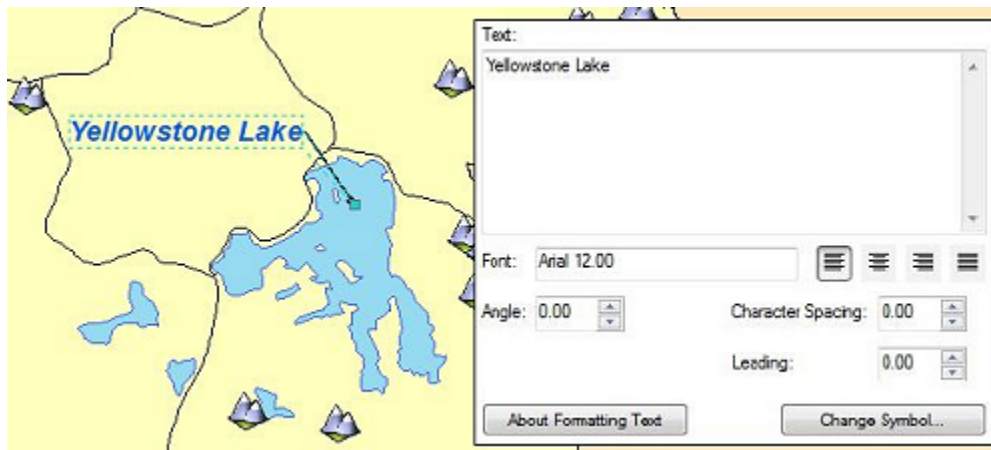
Following are circumstances in which it might be beneficial to use either map document annotation or geodatabase annotation over labels or graphic text.

- When you need to add map text manually to a few specific locations that need to be tied to map coordinates
- When you need to edit label placement
- When you need to manage individual text display properties

- When you need to add text to a map that has been automatically removed by the software because of crowding
- When you want to create map text specifically for printing, and consistent placement of the text is very important

What is map document annotation?

Map document annotation is stored with the map document and managed as a property of the data frame. Each time the map document is opened, the annotation draws exactly where you left it. When you share the map with someone else, the annotation automatically comes with it; the recipient need not worry about loading annotation data sources. Of course, you still need to include the geographic feature data sources when you share a map document.



Map annotation (unlike dynamic labels) draws at a fixed location on the map. The text can be selected and moved. The text display settings and properties can be modified in a properties dialog box.

When to use map document annotation

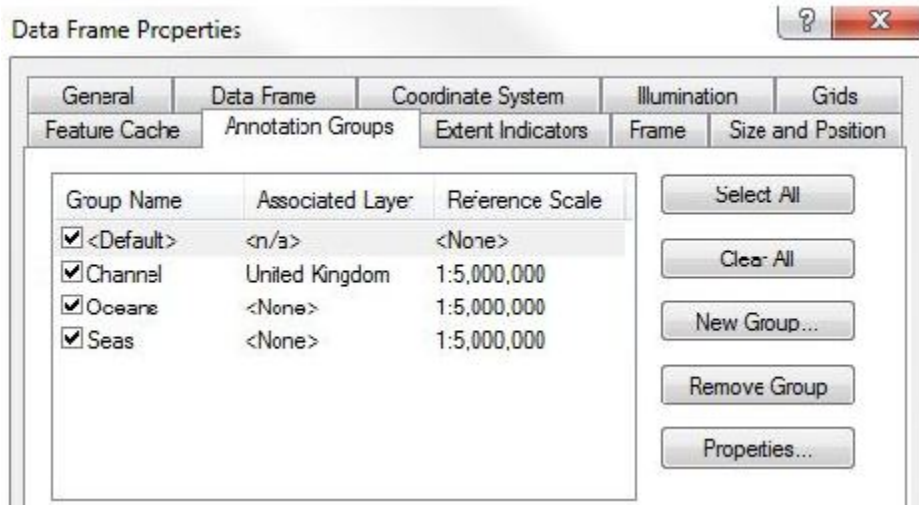
The fundamental difference between map document annotation and geodatabase annotation is the text storage method. Geodatabase annotation is stored in a geodatabase as a feature class and can be added to any map document. Map document annotation is stored as a property of a data frame and can only be used within the current map document.

You should use map document annotation (instead of geodatabase annotation) when you do not need to reuse your annotation outside the current map document (or a copy of it).

Annotation groups

You have learned that map document annotation is stored in a map document. But how is the storage managed within the map document?

Map document annotation is stored within annotation groups as a property of the data frame to which it belongs. For each data frame within a map document, there is always at least one default annotation group, plus any user-created annotation groups.

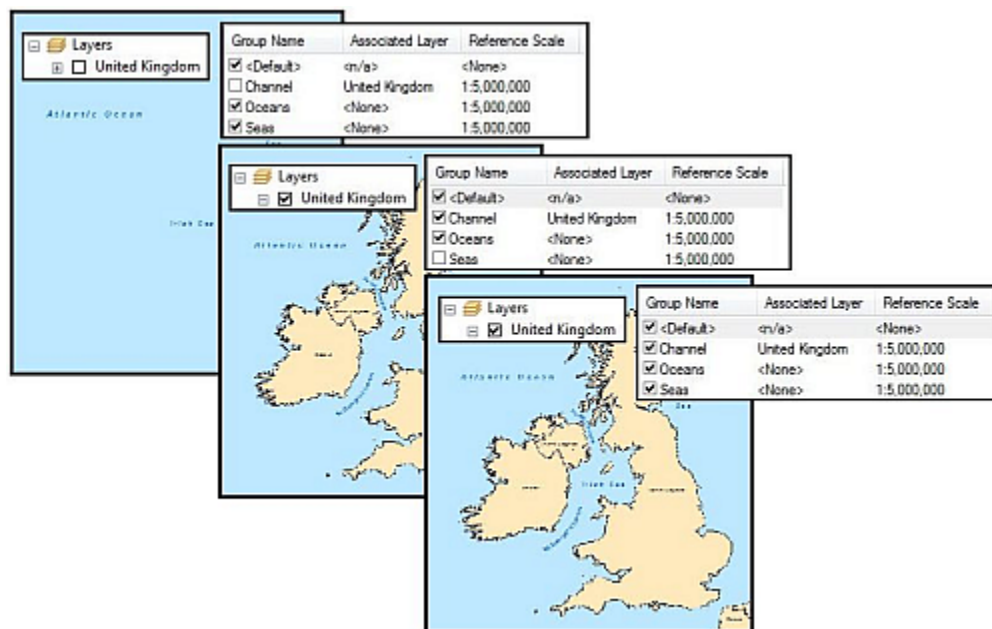


Separate map annotation groups have been created for the channels, oceans, and seas around the United Kingdom.

Typically, you group annotation text that shares a characteristic or a theme. For example, on a map of the earth's countries, you might symbolize oceans with one font style and seas with another. This distinction in symbology suggests that you might want to organize the text into two annotation groups.

Working with annotation groups is useful because you can toggle the display for each individual group. Annotation groups can be toggled off and on even if the associated layer (if there is one) is toggled off.

Each annotation group has its own reference scale and visible scale range. All the annotation groups within the data frame have the same coordinate system.



Annotation groups give you the flexibility to make maps that show just one group or several groups of annotation. You can choose to display combinations of annotation groups. You can also associate an annotation group with a particular layer so that it will automatically turn on and off with the layer's visibility.

Although you can add annotation to a group whose display is turned off, the new annotation will not be visible in the map until its group is displayed.

Reference scale

The reference scale, for all types of annotation, is the scale at which annotation will appear on the screen at its true symbol size.

When you convert labels to annotation, the annotation reference scale for the new annotation group is taken from the data frame reference scale. If you do not set a reference scale for the data frame, ArcMap will use the current map scale as the reference scale for the new annotation group.

All annotation types scale with the map and require a reference scale. The industry best practice is to set the reference scale for labels *before* converting to annotation.



The graphic at left shows Massachusetts with labels turned on but with no reference scale set. The center graphic shows how the label size remains unchanged when the map is zoomed in and no reference scale is set. The graphic at right shows how the labels scale with the features when the map is zoomed in with a reference scale set before zooming in.

III. Geodatabase Annotation

What is geodatabase annotation?

Geodatabase annotation is a type of annotation that is stored in a geodatabase as an annotation feature class, where it can be used for other map documents. Map document annotation is stored in a map document and can be used only within the map document where it was created.



Geodatabase annotation is added to a map as a layer in the table of contents. It can be turned on and off like any other layer.



Geodatabase annotation properties are stored as attributes in an attribute table. In addition to the text itself, annotation attributes store a variety of values, including symbology, font, and size.

OBJECTID	SHAPE	FeatureID	ZOrder	SymbolID	Status	TextString	FontName	FontSize	Bold	Italic	Underline	VerticalAlignment
1	Polygon	17	<Null>	0	Placed	Caspian Sea	Arial	8	No	No	No	Bottom
2	Polygon	16	<Null>	0	Placed	Lake Superior	Arial	8	No	No	No	Bottom
3	Polygon	20	<Null>	0	Placed	Lake Huron	Arial	8	No	No	No	Bottom
4	Polygon	35	<Null>	0	Placed	Lake Victoria	Arial	8	No	No	No	Bottom
5	Polygon	22	<Null>	0	Placed	Lake Michigan	Arial	8	No	No	No	Bottom
6	Polygon	9	<Null>	0	Placed	Lake Baikal	Arial	8	No	No	No	Bottom
7	Polygon	24	<Null>	0	Placed	Lake Erie	Arial	8	No	No	No	Bottom
8	Polygon	21	<Null>	0	Placed	Aral Sea	Arial	8	No	No	No	Bottom
9	Polygon	37	<Null>	0	Placed	Lake Nyasa	Arial	8	No	No	No	Bottom

Types of geodatabase annotation

The two types of geodatabase annotation feature classes are:

- Standard annotation
- Feature-linked annotation

Standard annotation is stored in a geodatabase as a stand-alone feature class. The annotation elements within the standard annotation feature class have no relationship to any corresponding features in a geographic feature class. For example, assume that within the same geodatabase, there is a GolfCourses feature class and a standard annotation class—GolfCoursesAnno—containing golf course names. No relationship would exist between the features in the GolfCourses feature class and the GolfCoursesAnno features.



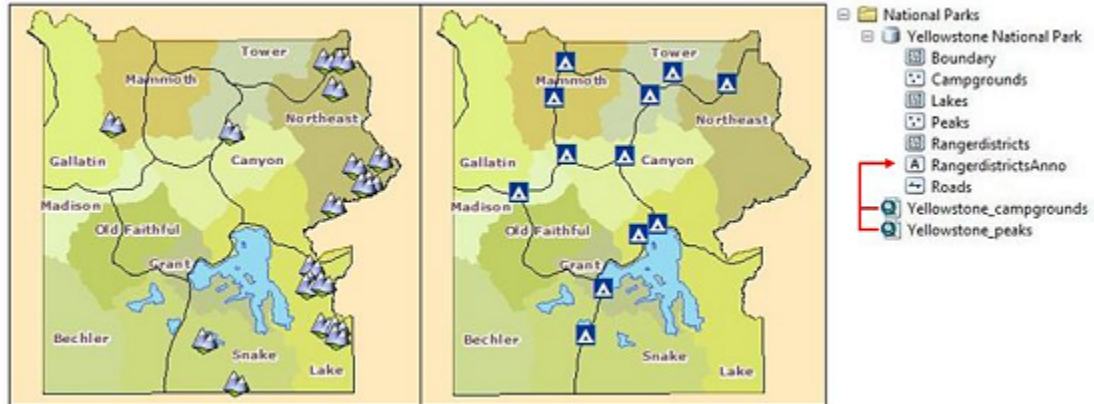
A standard geodatabase is stored as a single element within a geodatabase.

You can also create standard annotation for features that do not exist in the map. For example, if you have several point features that represent individual mountains, you can create standard annotation to display the name of the mountain range.

Feature-linked annotation is a special type of geodatabase annotation that allows you to maintain a relationship between the annotation records and the corresponding geographic features they describe.

When to use standard geodatabase annotation

The main advantage in using geodatabase annotation instead of map annotation is that the former is reusable. Geodatabase annotation can be added to a map document as a map layer just like any geographic layer. It can also be referenced from multiple map documents.



The same Ranger District annotation has been added to both a map of Yellowstone National Park campgrounds and another map of park mountain peaks. The annotations were first created and edited for the best positions relative to other features, and then added to each of the thematic map documents separately.

Working with geodatabase annotation in ArcMap will generally be faster than working with map document annotation. Geodatabase annotation is indexed spatially, meaning that it will draw and select much faster.

It is a best practice to use geodatabase annotation instead of map document annotation in the following situations:

- You need to reuse your annotation in another map document.
- You want to share annotation as a geodatabase feature class with others.
- You want to maintain a relationship between features and geodatabase annotations that were converted from labels (feature-linked annotation only).
- Performance is critical.

Converting labels to geodatabase annotation

Converting labels to geodatabase annotation creates a new annotation feature class within a geodatabase. A copy of the label properties is stored with each new annotation as feature attributes.

Converting labels for layers that reference a shapefile

You can also convert labels to geodatabase annotation for layers that reference a shapefile. However, doing so runs the risk that the shapefile and your geodatabase with the annotation could become separated. For this reason, consider exporting the shapefile features to the same geodatabase in which you store the annotation.

Name	Type
AdminBnd	File Geodatabase Feature Class
CanadaMuni	File Geodatabase Feature Class
Cntry07	File Geodatabase Feature Class
GreatLakes	File Geodatabase Feature Class
Mjcities	File Geodatabase Feature Class
ProvincesAnno	File Geodatabase Feature Class
RegionalMuni	File Geodatabase Feature Class
World30	File Geodatabase Feature Class

ProvincesAnno							
OBJECTID	SHAPE	Status	TextString	FontName	FontSize	Bold	
1	Polygon	Placed	Québec	Arial	7	No	
2	Polygon	Placed	Ontario	Arial	7	No	
3	Polygon	Placed	Alberta	Arial	7	No	
4	Polygon	Placed	Nunavut	Arial	7	No	

Annotation properties are stored as feature attributes in the annotation feature class attribute table.

When you convert labels for a layer that references a geodatabase feature class, the new annotation feature class is automatically stored within the same geodatabase.

You have additional options when you convert labels to *standard* annotation. You can:

- store the annotation in a different geodatabase than the data referenced by the map layer.
- add the new annotations to a pre-existing annotation feature class. (You cannot add the new annotation to an existing *feature-linked* annotation feature class.)

Because geodatabase annotations are features, they scale with the surrounding geographic features. Therefore, before you convert the labels, you need to set the map scale and optionally, a reference scale for the data frame. Doing so will ensure that, at different scales, the annotations will draw best relative to other map features.

If you do not set a reference scale for the data frame, ArcMap will use the current map scale as the reference scale for the new annotation feature class.

Annotation classes

Map document annotation is organized into annotation groups. Similarly, geodatabase annotation feature classes can be organized into annotation *classes*.

Each annotation class contains the following properties, which determine how a subset of annotation in the feature class appears:

- Default symbology applied when new annotation is created
- A visible scale range

When an annotation feature class is added to the ArcMap table of contents, the annotation classes are listed with the annotation feature class. The display for each individual annotation class can be toggled off and on independently of the other annotation classes. The feature class has to be toggled on for any of the annotation classes to appear.



IV. Feature-linked annotation

With a Standard or Advanced license, you can link annotation in a geodatabase directly to the feature it annotates, creating what is called feature-linked annotation. The geodatabase structure for feature-linked annotation differs from that for standard annotation. Feature-linked annotation includes a Relationship class that manages the relationship between the features and the annotations describing them.



MajorRoads is a line feature class containing road geography. The Major_RoadsAnno feature class is a feature-linked annotation feature class containing the annotations for the roads. The Anno_11_42 is a relationship class that manages the relationship between the roads and the annotations. The arrow points in one direction as it represents a composite relationship from MajorRoads to Major_RoadsAnno.

When to use feature-linked annotation

Feature-linked annotation reflects the current state of features in the geodatabase. The related annotation is automatically updated when its linked features are moved, edited, or deleted.

The relationship is a composite relationship from the geographic feature to the annotation. This means that if a linked geographic feature is updated, the annotation text is updated. If the linked geographic feature is moved, the annotation text is moved. If you create a new geographic feature, a new annotation is automatically generated from the attributes of the feature.

But the opposite is not true. Changes made directly to the annotation text or position **will not** be reflected back in the linked geographic feature. If the annotation feature is deleted, the linked geography is not deleted.

An example of when to use feature-linked annotation

Suppose that you are in charge of managing a regional GIS transportation database. The road features are stored as geodatabase line features and the road text is stored as geodatabase annotation features. It would be advantageous to store the road names as feature-linked annotation so that when road features are added, moved, or deleted, the changes are automatically applied to the annotations, as well.