



Buffering Themes

Note: To complete this exercise, you will need to download the global earthquake data for 1999 dataset designed for this tutorial. Download the file by clicking on the WinZip or Self-extracting link located just below this tutorial on the Tutorials in ArcView 3.x page.

This tutorial can **ONLY** be used with ArcView 3.1 or 3.2

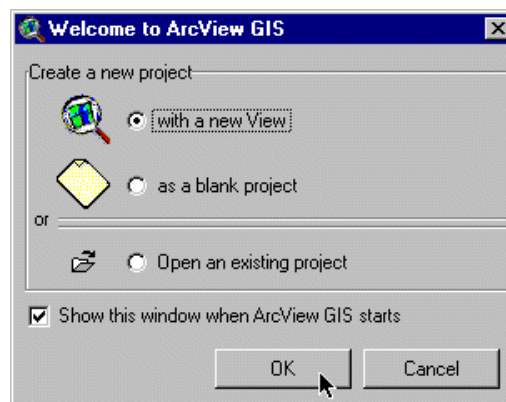
In this exercise, you will learn how to:

- Create a new **View**
- Add Themes to the **View**.
- Change the Map and Distance Units
- Add an **Event Theme**
- Create a buffer around selected features.
- Create a sub-set of selected features.

Start **ArcView** if it is not already running, and follow these steps:


1. Create a New View

In the **Welcome to ArcView GIS** dialog box that appears, make sure you select with a new **View** and click on **OK**.




You will be asked if you would like to add data to your **View**, choose **YES**.



If you do not see this dialog box, select the **View** icon  from the **Project** window and click on the **New** button.

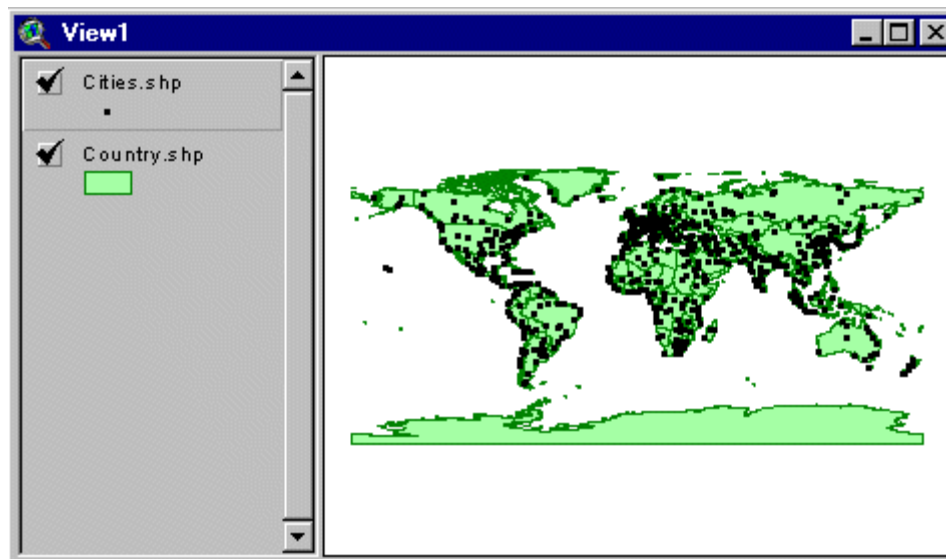
2. Add Themes to the View

From the **View Menu**, choose **Add Theme**, or click on the **Add Theme button** . This brings up the **Add Theme Dialog Box**. Navigate your way to the `ESRI\ESRIDATA\WORLD` directory. You are looking for:

COUNTRY.SHP
CITIES.SHP

To select both of these files at the same time, hold down the `SHIFT` key, and use your mouse to click on the filenames.

Arrange the themes so that the `COUNTRY.SHP` theme appears below the `CITIES.SHP` theme in the **Table of Contents**. Turn the themes on (make them visible) . You should see a map of the countries and major cities of the world.



As in the example above, you may wish to adjust the display colours, as well as the size of the dots that represent the cities, to make the map more visually appealing.

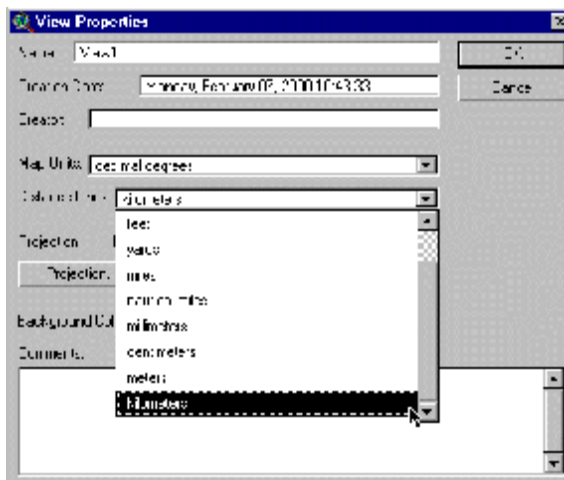
3. Change the Map and Distance Units

In this exercise, you will create a buffer based on *distance*. When **ArcView** creates a **View**, it does not automatically set the units that distance is specified in. Therefore, you will have to set these units yourself.

From the **View Menu**, choose **Properties**.



In the **View Properties Dialogue Box**, change the **Map Units** to Decimal Degrees, and the **Distance Units** to Kilometers.



Click **OK** to close this dialogue box.

4. Load a .DBF File

ArcView supports three major types of **Tables**: **ARC/INFO** INFO files, Dbase .dbf files, and text .txt files. The file that you downloaded at the beginning of the exercise (*QUAKES99.DBF*) is the .dbf file containing earthquake data from 1999. One type of information it contains is the location of the earthquakes, specified in latitude and longitude. We will use this location data to map earthquake occurrence in our **View**.

To add *QUAKES99.DBF* to your **ArcView** project, close the **View** that you are currently working in.

In the **Project Window**, click the **Tables icon** . Then click the **Add button**. The **Add Table dialog box** will appear. Navigate to the directory into which you downloaded the *QUAKES99.DBF* file. Click on the file name to highlight it, then click the **OK** button to load the file into **ArcView**.

Take a look through the **Table** to familiarize yourself with the contents. You should see the following data fields:

Date	The date that the earthquake occurred.
Time	The time of day at which the earthquake occurred.
Lat	The latitude at which the earthquake occurred.
Long	The longitude at which the earthquake occurred.
Dep	The depth at which the earthquake occurred - either descriptive text or a numerical value in kilometers.
Mag	The magnitude of the earthquake, on the Richter Scale.



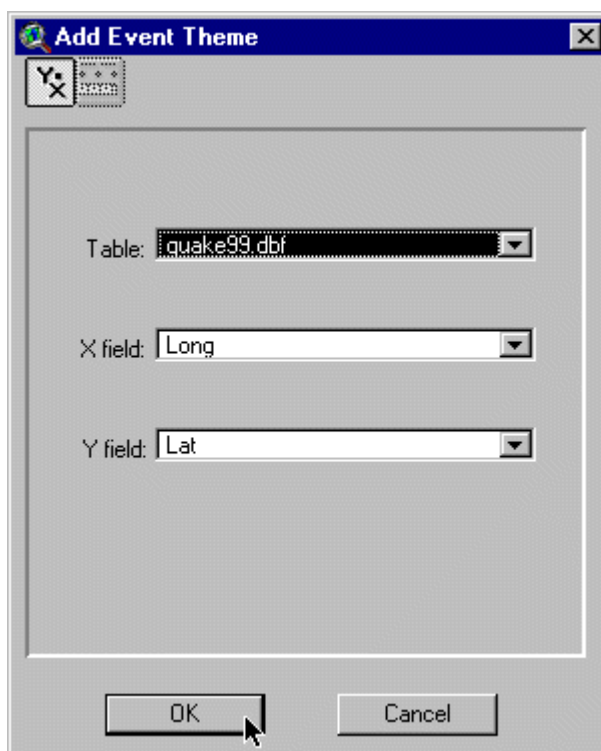
5. Add an Event Theme

Close the **Table**.

In the **Project Window**, click the **View Icon**. Choose **View1** from the list of available **Views** and click the **Open** button. The world view that you created in previous steps will appear.

In this step, you will add an **Event Theme** to your **View**. An **Event Theme** is generated from a table that contains *events*, such as `QUAKES99.DBF`. To represent these events in a **View**, each record must contain X and Y coordinates. In this case, each record represents a single event: an earthquake, whose coordinates are specified by the `Long` (X) and `Lat` (Y) fields.

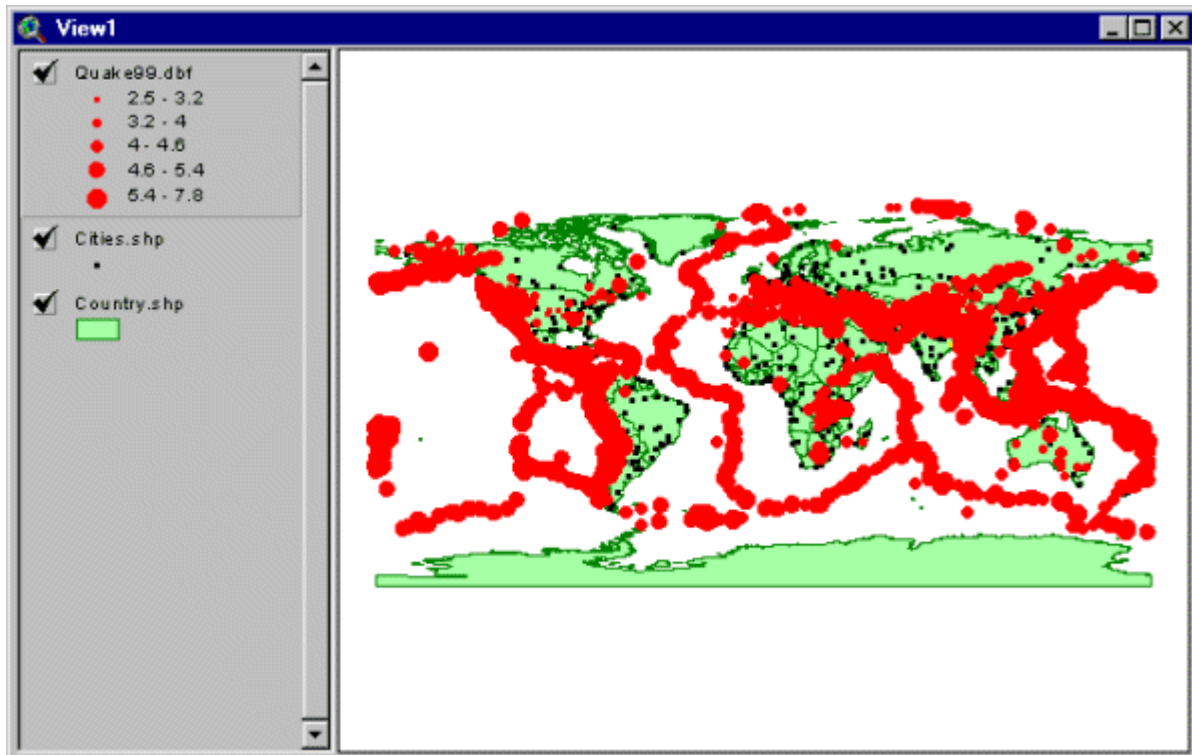
Return to **View1**. From the **View menu**, choose **Add Event Theme**. In the **Add Event Theme dialog box**, change the source **Table** to `QUAKES99.DBF`. The **X Field** should specify `Long` and the **Y Field** should specify `Lat`. If this is not the case, change these so fields so that they are correct.



Click **OK**.

The file `Quakes99.dbf` should now appear in the **View's Table of Contents** as a theme.

When you turn the theme on, you should recognize a familiar earthquake pattern -- earthquakes tend to occur at plate boundaries, creating features such as the Ring of Fire (around the Western coast of the Americas, and Eastern Asia).



If you want to, you can classify your earthquakes so your map looks similar to the one above. In this map, the earthquakes have been classified using a **Graduated Symbol** to show varying Magnitudes.


6. Create the Buffer


You are going to determine which areas of the world are affected by strong earthquakes.

We will make two assumptions about earthquakes, and their behavior.

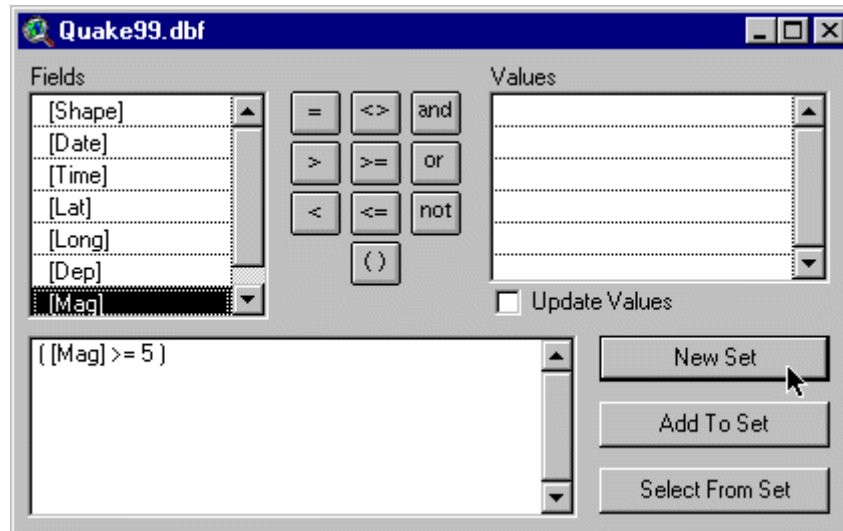
- Earthquakes over 5.0 in magnitude are considered *strong earthquakes*, and have a damaging effect on their surroundings.
- A circular area with a radius of 500 kilometers around the epicenter of an earthquake will be affected by strong earthquakes. This area is an earthquake's "zone of influence".

First, you must determine which earthquakes have a magnitude greater than 5.0 on the Richter Scale. To do this, make the `Quakes99.dbf` theme active (click on the theme's name).

Click the **Query button** . The **Query Builder dialog box** should appear. In the left side of this dialog box, under **Fields**, double click the word `[Mag]`. Then, from the middle part of the box,

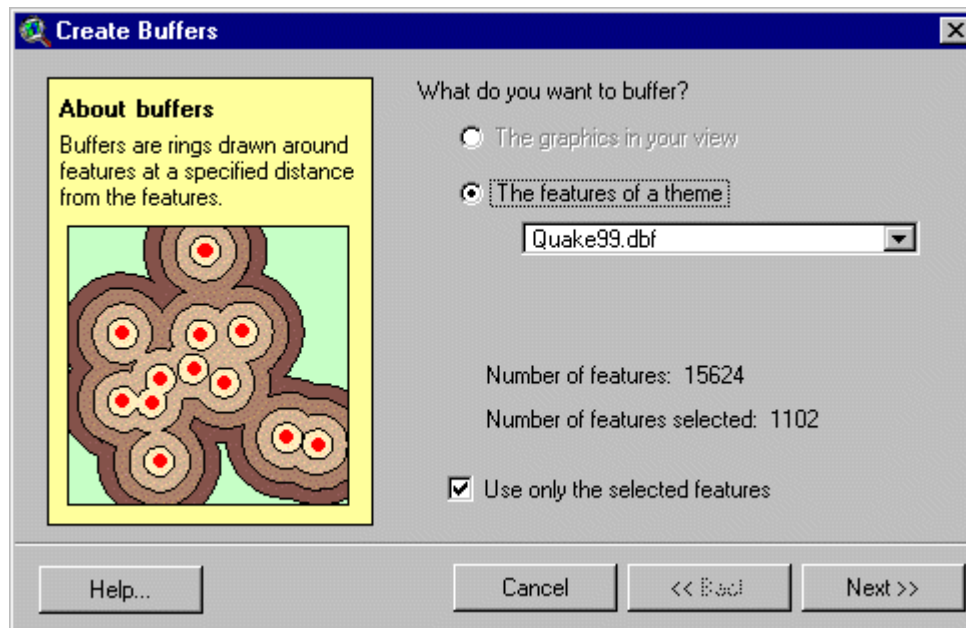
choose the **greater than or equal to button** . Click once. This symbol should now appear in the bottom of the box, next to `[Mag]`. Finally, in the bottom of the box type the number 5 at the current location of the cursor. Your final expression should read:

```
( [Mag] >= 5 )
```



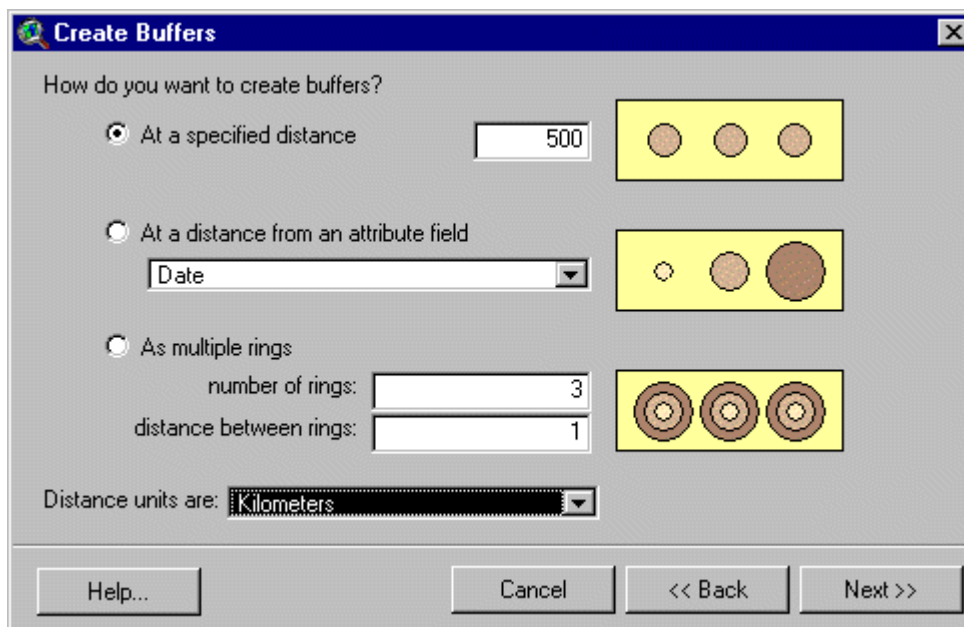
Click the **New Set** button to execute this query, then close the **Query Builder dialog box**. All earthquakes greater than or equal to 5.0 in magnitude should now be highlighted in your **View**.

To create the buffer, from the **Theme menu** select **Create Buffers...** The **Create Buffers Wizard** dialog box appears. You want to buffer the features of a theme, in this case **QUAKES99.DBF**, using only the selected features (that is, the earthquakes with a magnitude greater than or equal to 5), so your dialog box should look like this:

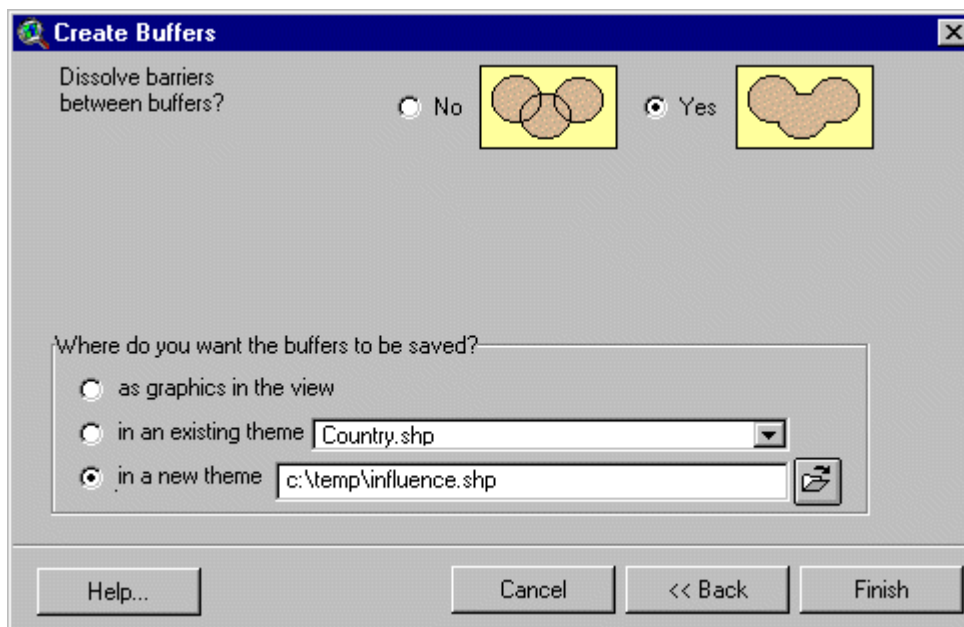




Click **Next**. You want to create buffers **at a specified distance** of, in this case, **500**. Make sure that the distance units are: **kilometers**.



Click **Next**. When asked if you want to **dissolve barriers between buffers**, select **Yes**. **Save** the buffers in a **new theme**, called `influence.shp`

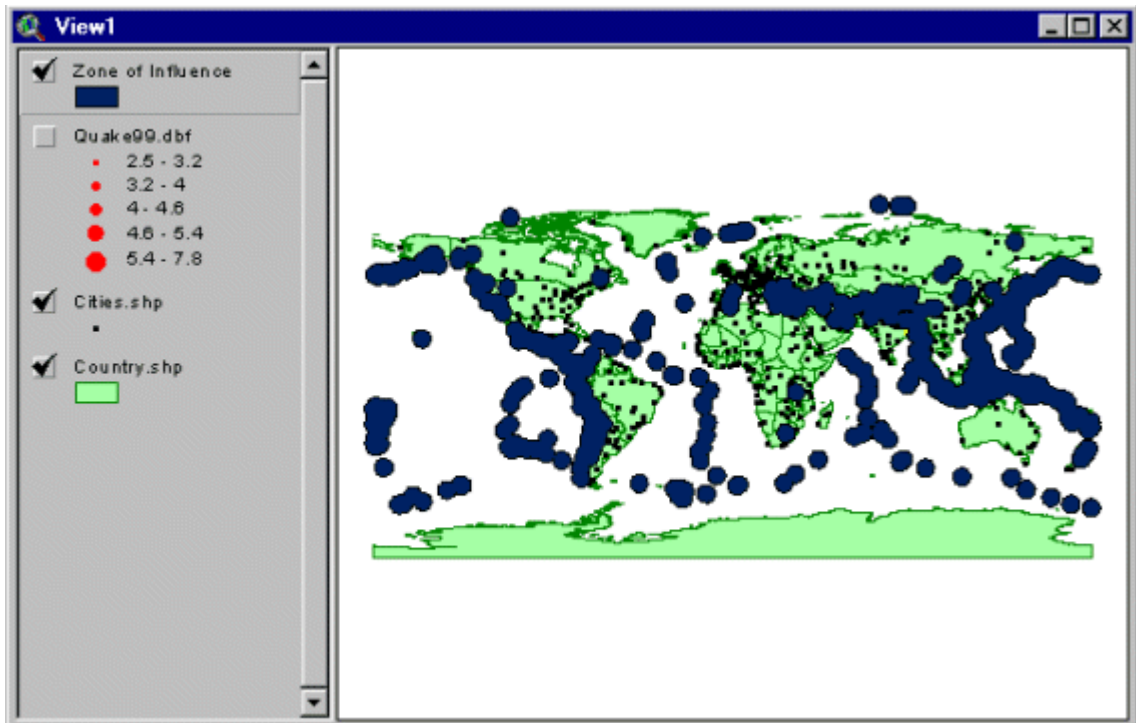


Click **Finish**. Once the buffers have been created, a new theme will appear in your table of contents. The theme is called **Buffer 1 of Quakes99.dbf**. You are going to change the theme name to something more meaningful

Make **Buffer 1 of Quakes99.dbf** the active **theme** by clicking once on the theme name (it will appear raised). From the **Theme menu** select **Properties**. Change the **Theme name** to **Zone of Influence**. Click **OK**. You will see that the theme name has changed in your **Table of Contents**.



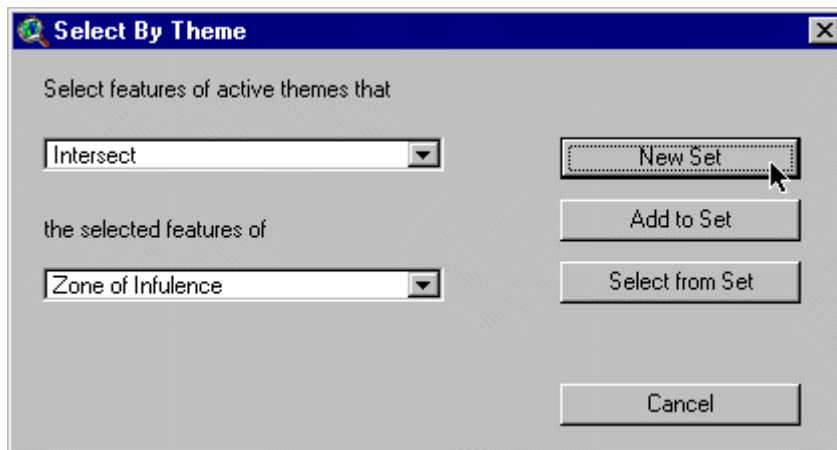
To more clearly see the effects of the next step, turn off the earthquakes theme (make it non-visible).



7. Select the Cities

Now that you know the geographic areas that will be affected by earthquakes, you can determine which cities will be affected.


To do this, make `Cities.shp` the active theme (click on this theme's name in the **Table of Contents**). Next, from the **Theme menu**, choose **Select By Theme...** You want to **select** the cities that **Intersect the Zone of Influence**.

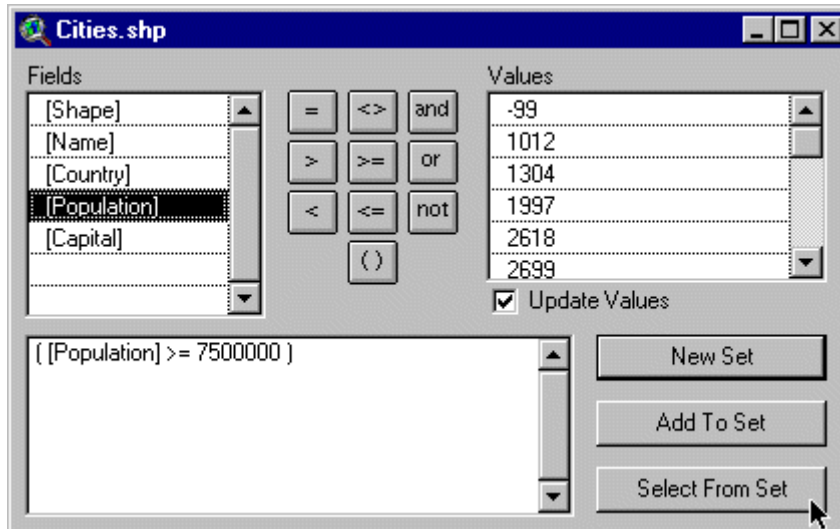


Click **New Set**. Click, hold and drag the `Cities.shp` theme to the top of the **Table of Contents**, so you can see which cities have been selected (they will be yellow). All the cities that fall within the Zone of Influence have been selected.

However, we only wish to know the *major cities* that are affected by earthquakes. For our purposes, a major city can be defined as having a population over 7,500,000.




Make sure `Cities.shp` is still the active theme. Click the **Query button**  and the **Query Builder** dialog box will appear. Create a query that will select the cities with a population greater than or equal to 7,500,000.



The screenshot shows the Query Builder dialog box for the `Cities.shp` theme. The `[Population]` field is selected in the Fields list. The Values list contains several values, with `7500000` being the target value for the query. The query text is `[Population] >= 7500000`. The `Select From Set` button is highlighted.

This time, click the **Select From Set** button: you want to select the cities from your currently selected set (those within the buffer zone) that have a population over 7,500,000. If you clicked the **New Set** button, do not worry. Just quickly repeat step 7 until you get back to this point.

Close the **Query Builder dialog box**. Those cities with a population of over 7,500,000 that are affected by earthquakes should now be selected. It may be difficult to see these cities. Therefore, to find out exactly which cities are selected, click the **Open Theme Table button** .

When the table is the active document, click the **Promote button**  to bring the selected cities to the top of the list.

If you wish, you can create a new theme containing only these cities. In the **View**, with the `Cities.shp` active, choose **Convert to Shapefile** from the **Theme menu**. Choose an appropriate name for the new shapefile, and click **OK** to save it. When asked if you want to add the new shapefile to the **View**, say **Yes**.

To make the new theme easily visible, turn the `Cities.shp` theme off. Choose an appropriate symbol for the cities.

You will notice that all of these cities are located around the Ring of Fire, with the exception of Cairo, which is located near an expanding rift valley.

Just so you know, this problem can also be accomplished in a different manner. See if you can get the same results by selecting those cities that are **Within A Certain Distance** of the stronger earthquakes! (*Hint: try **Selecting By Theme!***)