

Lesson 42: Using analysis tools to modify databases

Table of Contents

[Lesson goals](#)

[Topic: Comparison of raster and vector analysis](#)

Concepts

[When to use vector](#)

[When to use raster](#)

Exercise

[Convert vector data to grid format](#)

[Topic: Analysis properties](#)

Concepts

[Cell size](#)

[Resampling](#)

[Analysis extent](#)

[Analysis mask](#)

[Reclassify](#)

Exercises

[Resample grids](#)

[Set analysis properties and reclassify grids](#)

[Lesson summary](#)

[Lesson self test](#)

Goals

In this lesson, you will learn:

- how to choose the appropriate data structure for analysis and modeling
- how cell size affects analysis
- how to resample grid-based data
- how to set analysis properties
- how to reclassify grid-based data

Comparison of raster and vector analysis

There are several issues to consider when deciding which format is most appropriate, including the type of geographic features or phenomena being represented and stored and the type of modeling to be performed.

Use the raster (grid) theme format when you want to work with multiple data types (points, polygons, lines, or surfaces) in the same format, when you want to model attributes of locations on the Earth's surface or when you need to work with continuous surfaces and discrete data.

Use the vector (feature) theme format when precise measurements are needed (e.g., pipe, cable, or legal boundary locations). Feature themes can represent geographic features very precisely including their size, shape, and attributes.

Issue	Vector	Raster
Enumeration of individual structures	Yes	Not feasible
Analytic capabilities	Good	Excellent
Precision	High	Low
Line quality	Smooth	Jagged, stair step
Size of dataset	Smaller	High-resolution, larger

Data acquisition cost	High	Low
Projection speed	Fast	Not available in ArcView

When to use vector

The following types of analysis and modeling of geographic features are more appropriately done with vector data.

Spatial coincidence

Spatial coincidence is the comparison of two or more layers of data. Suitability analysis can be performed by querying spatial and attribute data to determine locations with common criteria.

Distance measurement

Distance or proximity analysis can measure Euclidean distance or use some abstract distance measure such as cost or time.

Linear modeling

Linear geographic features, like roads or rivers, can be modeled in the vector format. The linear features (routes) can be assigned a measurement system like river-mile and mile posting to associate linear or point events.

Least-cost path

Least-cost path analysis determines the shortest path between a series of locations along a network of linear features. The accumulated cost can be measured in travel time, feet, or a combination of factors. An optimal order to visit specified locations can also be determined.

Location-allocation

Allocation allows you to model the distribution of resources between centers and surrounding linear features (e.g., finding the nearest school for each student or determining the closest fire station for each city street). Location modeling determines the optimal location of one or more facilities to provide services in the most efficient manner.

Address matching and geocoding

Address matching identifies locations on a street map by entering addresses instead of x,y coordinates. The geocoding process assigns an x,y coordinate to that location

When to use raster

In some analyses, raster data is more appropriate than vector data. Depending on the analysis you're performing, however, vector or raster data or both may be used.

Spatial coincidence

Spatial coincidence is the comparison of two or more layers of data. Coincidence modeling is much faster with raster because no overlay is required. Vector overlays are time-consuming.

Distance measurement

If the entire surface needs to be considered for calculating the least-cost path, you should use raster data. By assigning measurements to each cell, a least-cost path can be determined between objects of interest. With a vector dataset, only the lines in the network are considered.

Surface analysis

Given a grid of elevations, terrain surfaces can be derived. These surfaces include slope, aspect, and visibility.

Hydrologic modeling

The hydrologic functions include flow accumulation, watershed delineation, downhill flow paths, and stream ordering

Exercise

Convert vector data to grid format

The objective of this exercise is to learn how to convert vector data, the Rivers.shp theme, into a grid theme of raster data. During the conversion process, the lines of the river network are converted into cells. You will control

the resolution of the output grid by setting the output cell size.

If you have not downloaded the exercise data for this module, you should [download the data now](#).

Step 1 Start ArcView

Start ArcView.

Note: If you are running ArcView GIS 3.1, you see a Welcome to ArcView GIS dialog. Click Cancel to close this dialog.

If ArcView is already running, close any open projects.

Step 2 Open the project

From the File menu, choose Open Project. Navigate to the **dbaseSA\lesson2** directory and open the project **I2_ex01.apr**.

Note: If you are running ArcView GIS 3.1, you see an Update I2_ex01.apr message box. Click No to dismiss this box.

When the project opens, you see a view containing a feature theme of a river network. The Rivers.shp line theme is turned on and the scale is set to about 1:90,000.

<..\graphics/t1exr1s2S2M1.cfm?CFID=847131&CFTOKEN=42944341>

<..\graphics/t1exr1s2S2M1.cfm?CFID=847131&CFTOKEN=42944341>

Step 3 Choose the theme to convert

Make the Rivers.shp theme active. From the Theme menu, choose Convert to Grid.

A dialog called Convert Rivers.shp opens.

<..\graphics/t1exr1s3S3M1.cfm?CFID=847131&CFTOKEN=42944341>

<..\graphics/t1exr1s3S3M1.cfm?CFID=847131&CFTOKEN=42944341>

Step 4 Name the output theme and choose a workspace

In the Convert Rivers.shp dialog, navigate to the **dbasesa\lesson2** directory and name the output theme **river100**.

<..\graphics/t1exr1s4S4M1.cfm?CFID=847131&CFTOKEN=42944341>

<..\graphics/t1exr1s4S4M1.cfm?CFID=847131&CFTOKEN=42944341>

Click OK.

Step 5 Choose the Conversion Extent

In the Conversion Extent dialog, set the Output Grid Extent to Same As Rivers.shp.

You can interactively type in a cell size, number of rows, or number of columns. After entering any one of these values, press Enter and see the other two values change to accommodate the new value.

Set the Cell Size to **100** and press Enter.

Notice that the number of rows is now 315 and the number of columns is 304.

[../graphics/t1exr1s5S5M1.cfm?CFID=847131&CFTOKEN=42944341](http://localhost:6080/graphics/t1exr1s5S5M1.cfm?CFID=847131&CFTOKEN=42944341)

[../graphics/t1exr1s5S5M1.cfm?CFID=847131&CFTOKEN=42944341](http://localhost:6080/graphics/t1exr1s5S5M1.cfm?CFID=847131&CFTOKEN=42944341)

Click OK.

Step 6 Choose a Conversion Field

In the Conversion Field dialog, choose Class for the conversion field.

[../graphics/t1exr1s6S6M1.cfm?CFID=847131&CFTOKEN=42944341](http://localhost:6080/graphics/t1exr1s6S6M1.cfm?CFID=847131&CFTOKEN=42944341)

[../graphics/t1exr1s6S6M1.cfm?CFID=847131&CFTOKEN=42944341](http://localhost:6080/graphics/t1exr1s6S6M1.cfm?CFID=847131&CFTOKEN=42944341)

Click OK.

The values in the selected conversion field are used to define the output cell values. There will be one zone in the output grid for each unique value in the class field.

Click Yes when prompted to join feature attributes to the grid. Click Yes again when prompted to add the grid to the view.

Step 7 Turn on the grid theme

When the River100 theme displays in the view, turn it on and turn off the Rivers.shp theme.

[../graphics/t1exr1s7S7M1.cfm?CFID=847131&CFTOKEN=42944341](http://localhost:6080/graphics/t1exr1s7S7M1.cfm?CFID=847131&CFTOKEN=42944341)

[../graphics/t1exr1s7S7M1.cfm?CFID=847131&CFTOKEN=42944341](http://localhost:6080/graphics/t1exr1s7S7M1.cfm?CFID=847131&CFTOKEN=42944341)

Notice that the River100 theme has values of 1 and 2. These values represent the class values from the input Rivers.shp theme.

[t1exr1s7RC1.cfm?CFID=847131&CFTOKEN=42944341](http://localhost:6080/t1exr1s7RC1.cfm?CFID=847131&CFTOKEN=42944341)

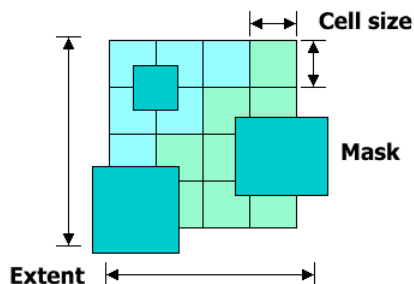
[t1exr1s7RC1.cfm?CFID=847131&CFTOKEN=42944341](http://localhost:6080/t1exr1s7RC1.cfm?CFID=847131&CFTOKEN=42944341)

Step 8 Close the project

Close the project without saving any changes. You have completed this exercise

Topic 2: Analysis properties

How do you perform analysis when some of the area covered by a grid theme is of no interest? You may want to analyze a group of cells meeting specific requirements, or need a certain resolution for the results, or even just want to cover a smaller area. ArcView Spatial Analyst has three parameters for these three things--cells to process within the extent (the mask), cell size, and extent in which to perform processing



Analysis properties include cell size, analysis extent, and analysis mask

The analysis properties can be changed at any time. Once they are set, however, Spatial Analyst operations will only process cells within the extent, consider any mask, and output resulting grid themes with the specified resolution

Analysis Properties: Mt. St. Helens

Analysis Extent: Same As View

Left: 557798.8125 Top: 5121956.5

Bottom: 5107976.5 Right: 567608.8125

Analysis Cell Size: As Specified Below

Cell Size: 30 Map Units

Number of Rows: 466

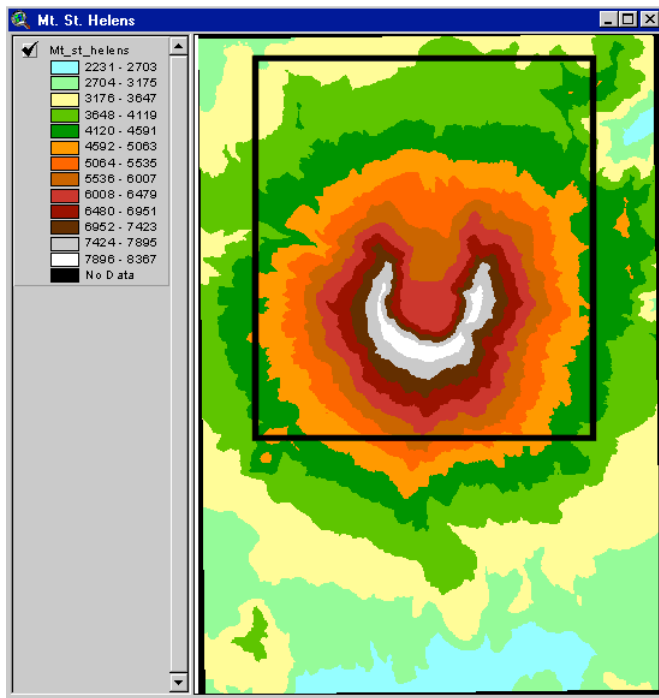
Number of Columns: 327

Analysis Mask: No Mask Set

OK Cancel

Analysis properties affect grid analysis. In the Analysis Properties dialog, you can specify analysis extent, cell size, and an analysis mask

For example, in the Mt. St. Helens grid below, you may only be interested in the northern half of the grid—the area of the volcanic eruption. You could set an analysis extent equal to that northern area

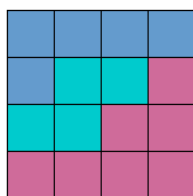


The analysis extent was set in the Analysis Properties dialog to limit analysis to the box shown on the Mt. St. Helens grid. The box shown here is for illustration purposes only and is not actually drawn on the grid.

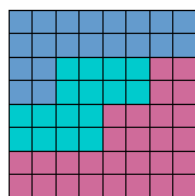
Anytime you perform a function that creates a grid, you are prompted for the Output Grid Properties. The Analysis Properties, if set, are automatically used during analysis, query, and data conversion to control the cell size and extent of the output grid. By setting the Analysis properties first, you would not be prompted for the output grid's properties

Cell size

The default cell size (or resolution) for an output grid is the largest cell size of any of the input grids. However, setting the cell size in the Analysis Properties dialog can overwrite this. The analysis cell size, which can either be larger or smaller than the default resolution, has to be specified as a floating point value. Setting an analysis cell size equal to or larger than the default cell size is usually the best choice. For example, you might choose to specify a larger cell size if your input grids have too much detail for your analysis requirements



Cell size: 100



Cell size: 50

Control resolution by setting the cell size. The smaller the cell size, the higher the resolution and the more storage space required

The analysis cell size can be reset at any time by using the Analysis Properties dialog and re-entering a new cell size.

Be careful when specifying an output resolution smaller (or finer) than the input grid's resolutions. Setting a finer output cell implies resolution that does not exist in the data. (The nearest neighbor interpolation method is used to calculate values for the output cells. Module 5, *Introduction to Surface Analysis with ArcView Spatial Analyst* has more on interpolation). The resultant grid is only as precise as the coarsest (largest cell size) input grid

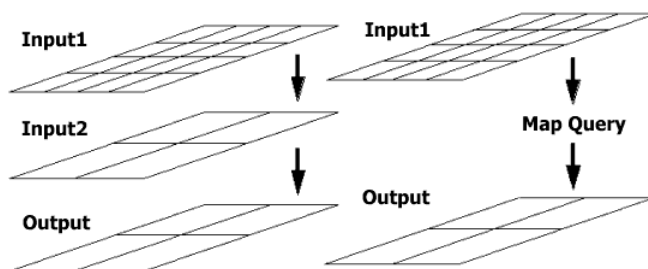
Resampling

Resampling in ArcView Spatial Analyst is the process of determining new values for cells in an output grid.

Sometimes the cells in different grids do not line up, because the input grids may have different resolutions. To determine the value each cell should receive on the output grid, the center of each cell in the output must be mapped to the original input. It is rare that any output cell center aligns exactly to any cell center in the input grid. Therefore, techniques have been developed to determine the output value depending on where the point falls relative to the center of cells of the input grid and the value associated with these points.

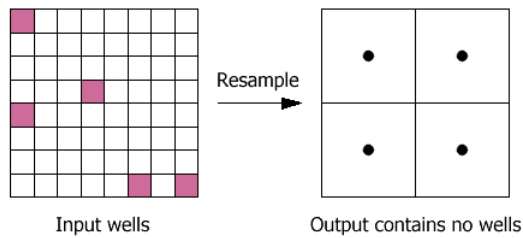
The three resampling techniques used in ArcView Spatial Analyst are nearest neighbor assignment, bilinear interpolation, and cubic convolution. The choice of technique will depend on the type of input data, analysis and use of the resultant grid. These techniques were discussed in detail in Module 3.

Resampling occurs automatically during map query and overlay operations with grids of different resolutions as input or if the analysis cell size is set. The default resampling is to the coarsest resolution of the input grids. This resampling on the fly uses the nearest neighbor assignment as the resampling method. In these cases, ArcView Spatial Analyst identifies the input cell that has the center closest to the center of the output cell, and uses the value of that input cell in the calculation. The resampling procedure is completely transparent to the user



Resampling changes the output resolution. Resampling automatically occurs in analysis when cell size is set. Output cell center identifies the input cells

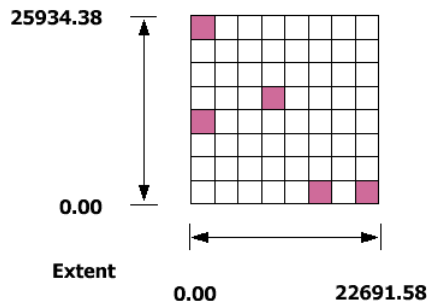
Resampling may cause data loss. If you resample well locations from small cells to larger cells, it is possible to end up with no wells represented in the output grid. During resampling, the center of the output processing cell is identified. If that output cell center does not fall inside the cell containing the well, a No Data value is assigned to the output cell



Data loss can occur when resampling from smaller to larger cells if the center of the output cell does not fall inside the cell containing a feature.

Analysis extent

The analysis extent allows for setting a window. Only cells inside that window are processed. It allows you to set the extent to a sub area within the grid's full extent. Setting the extent requires the top, bottom, left, and right extents to be expressed in real-world units



The analysis extent sets the extent of the output grid in real-world units. It defines the output grid's boundary. In this example, the analysis extent is:

Top: 25934.38, Bottom: 0.00, Left: 0.00, Right: 22691.58

When setting the analysis extent there are several settings to select from, including:

- Same As Display--sets the extent to the extent of the display at that time. If the extent of the display is changed after the analysis properties are set, the analysis extent will not change.
- Same As View--sets the extent of output themes to be the same as the view extent.
- Same as another theme in the view--sets the extent to the extent of whichever theme in the view you choose.
- Specified Value--you set the extent by typing in geographic coordinates for the top, bottom, left, and right of the extent.
- Intersection of Inputs--sets the extent to the area made by the overlap of the input theme extents.
- Union of Inputs--sets the extent to that of all input theme extents as if you had drawn a box around all the input themes

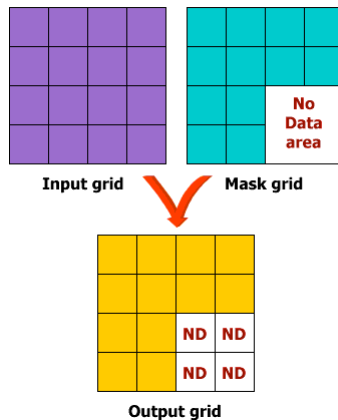
Analysis mask

An analysis mask is a grid identifying cells within the analysis window that will be considered when an expression is evaluated. Masks are useful in models to exclude certain cells from evaluation. For

example, an analysis mask could be used to mask out water bodies and steep slopes when siting a facility.

Cells of no interest are set to No Data in the analysis mask. If an analysis mask is set, the output grid will contain No Data values that correspond to the No Data cells in the mask. By setting the mask, the analysis can be focused to the areas of interest in the mask.

You can use the Map Calculator to create an analysis mask. Conditional expressions involving the Setnull and Con requests are common ways of creating a mask

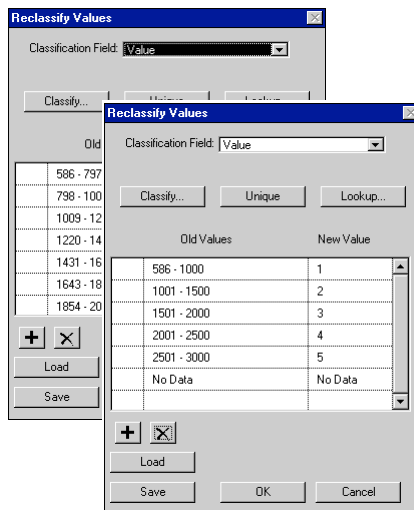


The mask defines areas where analysis should be performed. No Data in mask creates No Data in output.

Reclassify

How do you reassign values in an input grid theme to create a new output grid theme? The Reclassify option on the Analysis menu is a generalization tool that can help.

Reclassify changes the values in a grid theme from one value to another through one of two techniques, reclass (for categorical data), or slice (for continuous data)



Left: The Reclassify dialog before reclassifying. Right: The grid has been reclassified by manually entering a new range of values.

Reclass changes one value to another in a one-to-one value change. For example, while performing a deer-habitat analysis, the values on a land use grid theme, each representing a different type of land use (categorical data), need to be changed to a

preference range of 1 to 10. The types of land most preferred by deer are reclassified to higher values and those less preferred to lower values. For instance, the forest land use is reclassified to 10, the low-density residential land use to 5, and the industrial to 1. Slice considers all values and their distribution in a grid theme simultaneously and reclassifies the values into a specific number of groups. In the hypothetical analysis of deer habitat, the second theme to the suitability model is based on the preference of deer for locations far from roads. A distance map (continuous data) is created from the existing roads theme. Instead of individually reclassifying each of the thousands of distance values on a 1-to-10 deer preference scale, the values can be sliced into 10 groups. The farthest group receives the highest deer preference value, a value of 10, and the nearest group, a value of 1.

The Reclassify dialog has several options:

- **Classification Field**--the field in the input grid theme's table that will be used to supply the Old Values. If the grid theme does not have a table, like floating point grid themes, the only field shown is Value.
- **Classify**--presents the Classification dialog for filling out the parameters to classify the Old Values.
- **Unique**--sets the Old Values to the unique values found in the Classification Field. Only available for integer grid themes.
- **Lookup**--sets the New Value to a value found in a field in the input grid theme's table or from a field in any joined table. In the Lookup Values dialog you can pick the field to use as the New Value. Lookup is only available for integer grid themes.
- **Old Values**--the range, list, or single value to be changed to the New Value. Any combination of ranges, lists, or single values can be used. Separate ranges with a dash (-), lists with a comma (.). To edit an entry click on it and type in the new specification.
- **New Value**--the new value can be either a single value or "No Data."

There are also several things to keep in mind when using the Reclassify Values dialog:

- **Negative values**--if negative values are needed when specifying a range, use a dash in front of the number. For example, a range may be -200 – -100 (negative 200 to negative 100).
- **Delete classes**--to delete a class, click within the selection column, which is to the left of the Old Values column. Selecting a class highlights the entire row. Next click the delete button (the one with the X on it). Select multiple classes by holding down the Shift key as you click.
- **Setting lists**--set a list of old values by using commas (e.g., 1, 2, 7, 8).

Resample grids

In this exercise, you will examine how grids are resampled during analysis. You will use Map Query to query two themes, each at a different resolution.

If you have not downloaded the exercise data for this module, you should [download the data now](#).

Step 1 Start ArcView

Start ArcView and load the Spatial Analyst Extension.

Note: If you are running ArcView GIS 3.1, you see a Welcome to ArcView GIS dialog. Click Cancel to close this box.

If ArcView is already running, close any open projects.

Step 2 Open the project

From the File menu, choose Open Project. Navigate to the **dbaseSA\lesson2** directory and open the project **I2_ex02.apr**.

Note: If you are running ArcView GIS 3.1, you see an Update I2_ex02.apr message box. Click No to dismiss this box.

You see a Streams view containing a Streams theme and an Elevation theme. Streams has a cell size of 30 meters while Elevation has a cell size of 50 meters.

[..\graphics\t2exr1s2S2M1.cfm?CFID=847131&CFTOKEN=42944341](..\graphics/t2exr1s2S2M1.cfm?CFID=847131&CFTOKEN=42944341)

[..\graphics\t2exr1s2S2M1.cfm?CFID=847131&CFTOKEN=42944341](..\graphics/t2exr1s2S2M1.cfm?CFID=847131&CFTOKEN=42944341)

Step 3 Examine theme properties before analysis

With Streams active, choose Properties from the Theme menu.

Notice that Streams has a cell size of 30 and has 473 rows and 395 columns.

[..\graphics\t2exr1s3S3M1.cfm?CFID=847131&CFTOKEN=42944341](..\graphics/t2exr1s3S3M1.cfm?CFID=847131&CFTOKEN=42944341)

[..\graphics\t2exr1s3S3M1.cfm?CFID=847131&CFTOKEN=42944341](..\graphics/t2exr1s3S3M1.cfm?CFID=847131&CFTOKEN=42944341)

Click OK when you're finished examining theme properties for Streams.

Now examine the theme properties for Elevation.

Notice that Elevation has a cell size of 50 and has 284 rows and 237 columns.

[..\graphics\t2exr1s3S3M2.cfm?CFID=847131&CFTOKEN=42944341](..\graphics/t2exr1s3S3M2.cfm?CFID=847131&CFTOKEN=42944341)

[..\graphics\t2exr1s3S3M2.cfm?CFID=847131&CFTOKEN=42944341](..\graphics/t2exr1s3S3M2.cfm?CFID=847131&CFTOKEN=42944341)

Close the Theme Properties dialog when you're finished examining theme properties for Elevation.

The Streams and Elevation themes occupy the same coordinate space and extent, but each is at a different resolution. Elevation has a larger cell size, and hence, fewer rows and columns.

<t2exr1s3RC1.cfm?CFID=847131&CFTOKEN=42944341>

<t2exr1s3RC1.cfm?CFID=847131&CFTOKEN=42944341>

Step 4 Use Map Query

In this step, you will query both themes and examine the resolution of the output grid. You'll use Map Query to select the portions of the streams greater than 200 meters in elevation. From the Analysis menu, choose Map Query. In the Map Query dialog, enter the following expression.

([Streams]) and ([Elevation] > 200)

Rename the new theme to **High Streams** and turn it on. Streams meeting the criteria are shown in red.

Zoom in to see how close High Streams approximates Streams. In the scale input box on the toolbar, type in **50,000** (1:50,000). Press Enter.

The view zooms in to give you a better look.

<..\graphics/t2exr1s4S4M1.cfm?CFID=847131&CFTOKEN=42944341>

<..\graphics/t2exr1s4S4M1.cfm?CFID=847131&CFTOKEN=42944341>

Notice that there are some gaps in the High Streams theme in relation to the Streams theme. It appears that some data has been lost. This is due to resampling from 30-meter cells to 50-meter cells. In the next step, you'll confirm the increase in cell size by looking at the theme properties for High Streams.

Step 5 Examine theme properties after Map Query

With High Streams active, choose Properties from the Theme menu to open the Theme Properties dialog.

Notice that High Streams has a cell size of 50 and 284 rows and 237 columns.

<..\graphics/t2exr1s5S5M1.cfm?CFID=847131&CFTOKEN=42944341>

<..\graphics/t2exr1s5S5M1.cfm?CFID=847131&CFTOKEN=42944341>

By default, Spatial Analyst automatically resamples data to the largest cell size of the input grids. You can override the default resolution by setting the cell size in the Analysis Properties dialog. For example, you may have chosen to retain an output resolution of 30 meters. Just remember that you cannot gain data by using a resolution smaller than the input grids' resolutions.

Click OK when you're finished examining theme properties for High Streams.

Step 6 Close the project

Close the project without saving any changes. You have completed this exercise

Exercise

Set analysis properties and reclassify grids

In this exercise, you will create a mask grid out of two river basins. The mask theme will help to focus analysis on the two selected basins. No analysis will be performed outside the selected basins.

If you have not downloaded the exercise data for this module, you should [download the data now](#).

Step 1 Start ArcView

Start ArcView and load the Spatial Analyst Extension.

Note: If you are running ArcView GIS 3.1, you see a Welcome to ArcView GIS dialog. Click Cancel to close this dialog.

If ArcView is already running, close any open projects.

Step 2 Open the project

From the File menu, choose Open Project. Navigate to the **dbaseSA\lesson2** directory and open the project **I2_ex03.apr**.

Note: If you are running ArcView GIS 3.1, you see an Update l2_ex03.apr message box. Click No to dismiss this box.

You see a Basins view containing a Basins and a theme called River50.

<..\graphics/t2exr2s2S2M1.cfm?CFID=847131&CFTOKEN=42944341>

<..\graphics/t2exr2s2S2M1.cfm?CFID=847131&CFTOKEN=42944341>

Step 3 Select basins

With the Basins theme active, open its theme table by clicking the Open Theme Table button . Click the Select Record tool , then select the two largest basins, 6 and 8. The two largest basins are highlighted in the view and in the table.

<..\graphics/t2exr2s3S3M1.cfm?CFID=847131&CFTOKEN=42944341>

<..\graphics/t2exr2s3S3M1.cfm?CFID=847131&CFTOKEN=42944341>

Step 4 Create a mask theme

Next, you will create a mask theme out of the two largest basins.

Make the view window active. From the Theme menu, choose Convert to Grid. Name the new grid **bigbasin** and save it in the work directory.

Answer Yes when prompted to add the grid as a theme to the view.

Turn off Basins and turn on Bigbasin, then move it below River50 in the Table of Contents.

<..\graphics/t2exr2s4S4M1.cfm?CFID=847131&CFTOKEN=42944341>

<..\graphics/t2exr2s4S4M1.cfm?CFID=847131&CFTOKEN=42944341>

Notice that Bigbasin contains only values of 6 and 8 and has No Data values for all other cells. The Bigbasin theme will be used as the mask grid in the next step. When using a mask grid, analysis takes place only in areas where the cells have a value. All No Data areas are ignored. Any analysis in the No Data areas is masked out.

<t2exr2s4RC1.cfm?CFID=847131&CFTOKEN=42944341>

<t2exr2s4RC1.cfm?CFID=847131&CFTOKEN=42944341>

Step 5 Set analysis properties

Next, you will set the analysis mask to the Bigbasin theme.

From the Analysis menu, choose Properties.

In the Analysis Properties dialog, set the Analysis Extent to Same as River50, the Analysis Cell Size to Maximum of Inputs, and the Analysis Mask to Bigbasin.

<..\graphics/t2exr2s5S5M1.cfm?CFID=847131&CFTOKEN=42944341>

<..\graphics/t2exr2s5S5M1.cfm?CFID=847131&CFTOKEN=42944341>

Notice that the cell size and number of rows and columns input fields are blank. By setting Analysis Cell Size to Maximum of Inputs, one or many themes must be entered into an analysis expression before these values can be determined. The cell size will be equal to the largest cell size of any of the input themes.

Click OK.

Now any analysis that you perform will use the Bigbasin theme as a mask grid. No Data areas

are masked out and analysis takes place in areas where the mask has data values.

Step 6 Use the analysis properties

You will now perform an analysis to extract the rivers that are part of the two large river basins. From the Analysis menu, choose Map Calculator. For the expression, enter only the [River50] theme and click Evaluate. After the new theme is added to the view, close the Map Calculator. Map Calculator analysis expressions can be very complex and involve many themes. In this example, only River50 is entered as the expression. River50 is filtered through the mask grid and the new theme contains only rivers in the two largest basins.

Change the name of the new theme from Map Calculation 1 to **BigRiver** and turn it on. Turn off River50.

[../graphics/t2exr2s6S6M1.cfm?CFID=847131&CFTOKEN=42944341](http://localhost:6080/arcgis/rest/services/MapCalculation1/MapServer?CFID=847131&CFTOKEN=42944341)

[../graphics/t2exr2s6S6M1.cfm?CFID=847131&CFTOKEN=42944341](http://localhost:6080/arcgis/rest/services/MapCalculation1/MapServer?CFID=847131&CFTOKEN=42944341)

Notice that any river areas outside of Bigbasin are clipped off (masked) and not included in the output theme, BigRiver.

In this exercise, you created an analysis mask by querying the Basins theme for the two largest watershed basins. You then used that Bigbasin mask to extract the rivers inside the two large basins. While the Bigbasin theme is set as the analysis mask, any new themes created will only contain data within the two large watershed basins. Masks help to focus analysis.

Step 7 Close the project

Close the project without saving any changes. You have completed this exercise

Summary

In this lesson you learned about the issues involved in selecting the appropriate data structure. The raster format is best for working with multiple data type simultaneously, modeling attributes of locations, or working with continuous surfaces and discrete data. The vector format is best when precise measurements and representation are needed.

You can set analysis properties before analysis to control cell size, analysis extent, and mask areas. Cell size controls resolution, analysis extent defines the extent of the output grid in real-world units, and the analysis mask defines areas where analysis should be performed.

Resampling is the process of reducing a grid's size by representing a group of cells with a single cell.

Thus, cell count is lowered, individual cell size is increased, and overall geographic extent is retained.

Grids may be reclassified by reassigning a value, a range of values, or a list of values to another value in a new grid theme

Reclassify results in a new grid theme.

3251	True
3252	False

2. When you want to work with points, lines, polygons, and surfaces in the same format, you should use the grid theme format.

3220	True
3221	False

3. The feature theme should be used when precise measurements are needed.

3228	True
------	------

False

4. Data acquisition costs are typically higher for vector data than for raster data.

True

False

5. To control an output grid's boundary, you should set an:

Analysis extent

Analysis mask

Analysis boundary

Analysis cell size

6. What is the default cell size for an output grid?

The largest cell size of any of the input grids

The smallest cell size of any of the input grids

The average cell size of all the input grids

30 meters

7. In the Analysis Properties dialog, the cell size can only be set to a value larger than the default resolution.

True

False

8. Masked cells in an Analysis mask are set to:

0

1

Negative values

No Data

9. The ArcView Spatial Analyst process of determining new values for cells in an output grid is called:

Reclassification

Masking

Resampling

Recalculation

10. Resampling occurs automatically if needed during map query and overlay operation using:

Nearest neighbor assignment

3237	Bilinear interpolation
3238	Cubic convolution
3239	Kriging