



Working with Land Use/Satellite imagery

Hands-On Exercise Notes

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Objective: Help you to use remotely sensed information, land cover and satellite data sets, in combination with other GIS data to solve problems.

Resources: Handout step-by-step notes, satellite imagery CD, Land Use image CD, ArcView GIS software, ArcView extensions (Image Analysis, Spatial Analyst)

- **Displaying and Analyzing land use imagery:**
- Using **Standard ArcView** environment
 1. Start ArcView GIS from Windows Start, Programs, ESRI, ArcView 3.2 and cancel the welcome window
 2. Open a New View in the project window and insert Land Use CD in the appropriate drive (maximize the application window and move the view to top right corner)
 3. Set the working directory from file menu to C:\window\temp
 4. Click Add Theme from the View Menu
 5. Navigate to the CD-Rom drive with the Land Use CD
 6. Under *Data Source Types* scroll down and select *Image Data Source*
 7. Double click on the *Project Folder*
 8. Select a file named *nd99nass.gis* or one ending with *.gis*, this is an image file in ERDAS format
 9. Click OK to add the image file to the view
 10. Open View properties to rename the view window “Std Arcview”, also change the background color to any color of your choice (click Select Color in the dialog)
 11. Open the Theme Properties and rename the theme “2000 Land Cover”
 12. Check the *box* next to the theme name in the view’s *Table of Contents* (TOC) to display the theme in the view window
 13. Does the TOC contain a legend for the image? Notice also that the *Open Theme Table* button is disabled (under the Theme Menu), why is that so? Open the *Legend Editor* from the Theme menu and click on *Colormap*
 14. Can you use the *Identify tool* to query image pixel information?
 15. Overlay or add County Boundaries layer to the view by Add Theme and select Feature Data Type and choose *Nd-cty.shp* file. Change the theme symbol to transparent (open legend editor + click on the symbol + **X** box). Rename the theme to County Boundary. Display the theme in the view (this is projected vector data set). You may label the counties.

□ Using **Image Analysis Extension** to extend ArcView to support image processing

1. Go to *File Menu* and select *Extensions*
2. Under *Available extensions* scroll down and *check* the *box* next to Image Analysis
3. Click OK to load the extension into the GUI, when loaded the Menu interface has an additional Image Analysis Menu as well as Align Tool, Seed Tool, etc
4. Go to View Menu and *Add Theme* and select *Image Analysis Data Source* as a data source type and choose one of the image files with .gis extension (if asked to calculate pyramids click yes?)
5. Does the TOC contain a legend for the image? Notice also that the *Open Theme Table* button is disabled (make sure the theme is active), why is that so?
6. Open legend editor (double clicking the theme name in the legend) to edit/modify the legend, delete the *zero counts* categories (do not delete the “0” value row): select symbol and delete using the X-button and click *Apply* (check what options are under Values Field). Change the zero value symbol to a different color.
7. Save the new legend for future use (legend.avl) with Image Analysis theme of the same kind. Close the legend editor
8. Make the new Theme active and go to Edit and click Copy. Open a new View from the project window and paste. Rename the View “Image Analysis” and display the theme into the view.
9. Compare the tools made available in the menu display for the two views. Also compare the image Theme Properties (image definition, information etc). Which theme gives more information?
10. Use the Identify tool to query image pixel information (zoom in closer)
11. Create a Grid Theme from the Image analysis theme:
 - Make theme active
 - Go to Image Analysis Menu and click Properties to set analysis extent by selecting “Same as Display” and click OK
 - Click on Subset in Image Analysis menu
 - Select *Grid* in *List of Files Types* to convert image to a Grid format
 - It may take some time check the status bar
 - OR
 - Theme Menu and select *Save Image As* and select *Grid* in *List of Files Types* to convert image to a Grid format. Name and save the output file
 - When asked to add new theme to the view click “YES”
12. Notice that the output Grid theme comes with a full legend

- Using **Spatial Analysis Extension** to support spatial analysis
 1. Open a new view from the project window, rename the view “Spatial Analyst”
 2. Go to File Menu and select *Extensions*
 3. Under *Available extensions* scroll down and *check* the *box* next to Spatial Analyst
 4. Click OK to load the extension into the GUI, when loaded the Menu interface changes and has *Analysis* and *Surface Menu* added. Also notice a Histogram Button and a Contour Tool on the menu
 5. In the view *Add Theme* and select *Grid Data Source* as a data source type
 6. You will notice that no Grid files exist in the CD-Rom
 7. Navigate to the directory/folder you saved the Grid File in step 11 above and select the file and add to the view
 8. Does the TOC contain a legend for the image? Notice also that the Open Theme Table button is active
 9. Display the theme into the view. Open the Legend Editor and check the options available in the Value Field
 10. Compare the identify results between the different themes. Which theme gives more attribute information?

- **Querying grids:** create a map query
 1. Open the Grid theme table and with the select tool click on a record to highlight it. All grid cells with the selected value are highlighted in the view.
 2. If you want to create a new image containing the highlighted categories go to Theme menu and select *Convert to grid*
 3. Resymbolize the grid theme by changing fields in values field the legend editor. Also remove the no data with the null values button
 4. Find areas of particular land use, from Analysis menu, choose Map Query and create an expression (by double clicking a layer of your choice, click an operation sign =, and double click unique value of choice)
e.g. ([grid name]=”sunflowers”)
 5. Click Evaluate
 6. You can edit the expression to modify the query
e.g. ([grid name]=”sunflowers”) and (acres>=amount)

- **Importing satellite imagery into ArcView:** in this exercise we will import LANDSAT 7 Satellite image using the following steps:
 7. Open the CD content using any *Text Editor* and find the *image format* as well as *registration* information
 8. Open a new view in the project window
 9. Click on the *File Menu* and select *Import Image*
 10. Navigate to the CD-Rom drive
 11. Under *List Files of Type* select Landsat 7 Multispectral EROS

12. Select the file
13. Save the output image in a directory of your choice in C:
14. Name the output file Landsat7 and click OK
15. When the processing is done ArcView by default will add a set of selected bands in the view as a theme
16. Try to zoom in and out to have a closer look at the earth surface as recorded by satellite, also use zoom to image resolution menu button
17. You may add vector data and align with the image
18. Close the view window when done

□ **Additional specialized analysis tools:**

1. Creating image subset for analysis
 - Make the Image Analysis theme active in the legend
 - Define the Area of Interest (AOI) by zooming in and drawing a polygon (rectangle, cycle etc.) or add a feature theme e.g. county boundary theme to define AOI. You can also digitize a custom polygon themes (watershed, aquifer, soil class) using View Menu to create a polygon New Theme and use drawing tools
 - Open Image Analysis properties menu and indicate *Same As Display* to clip image according to size in the view OR as the feature theme defining AOI
 - Click on Subset in Image Analysis Menu (you can also achieve the same with Go to Theme menu and choose *Save Image As* and click OK)
 - Try to query the attributes of the new image
2. Creating histogram and charts from Grid theme attribute table
 - Make grid theme active
 - Click Histogram button to create a histogram of the land use theme
 - Use identify tool to query information in histogram column
 - To create a Chart, open active Grid theme table
 - Use Table Theme menu to select type of chart
 - Select field to be displayed in the chart
 - Maximize window to display full chart
 - Use identify tool to query the chart
3. Generalizing land cover imagery data: This process involves making data sets more uniform or homogeneous for interpretation, sometimes called “cleaning”.
 - You will work with a small grid of land use clipped from the state land cover image.

- Make the clipped grid active
 - From the *Analysis menu*, choose Neighborhood Statistics
 - In the Statistics drop-down list, choose *Majority*, in the Neighborhood list choose *Circle*, and put a *Cell radius* of 3 and make sure the cell radio button is selected
 - Click OK. Turn the new theme on and compare with the original (you may need to zoom in to evaluate the change).
 - To remove the no data values (black cells) go to analysis menu and choose map calculator. In the dialogue, create the expression:
 - ([name of new image].IsNull.Con ([original image],[new image])
 - Click Evaluate and when the new theme is added to the view close the dialogue and turn on the theme
4. Creating a new image for a selected number of land use from the existing image
- Make Grid Theme active
 - Open Theme Table and select land use of interest
 - Notice that the selected land use is highlighted in the display
 - Go to Theme and select Save Image As and click OK
5. Producing Reports: Turning data from tables into reports using Report Writer Extension:
- Load Report Writer Extension
 - Make the Grid Theme in the Spatial Analyst View active (you don't need to display)
 - Open Theme Table
 - Under table menu select create report
 - Choose fields to be included in the final report, check column layout, preview and click OK (you may print the report)

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