L3HARRIS™
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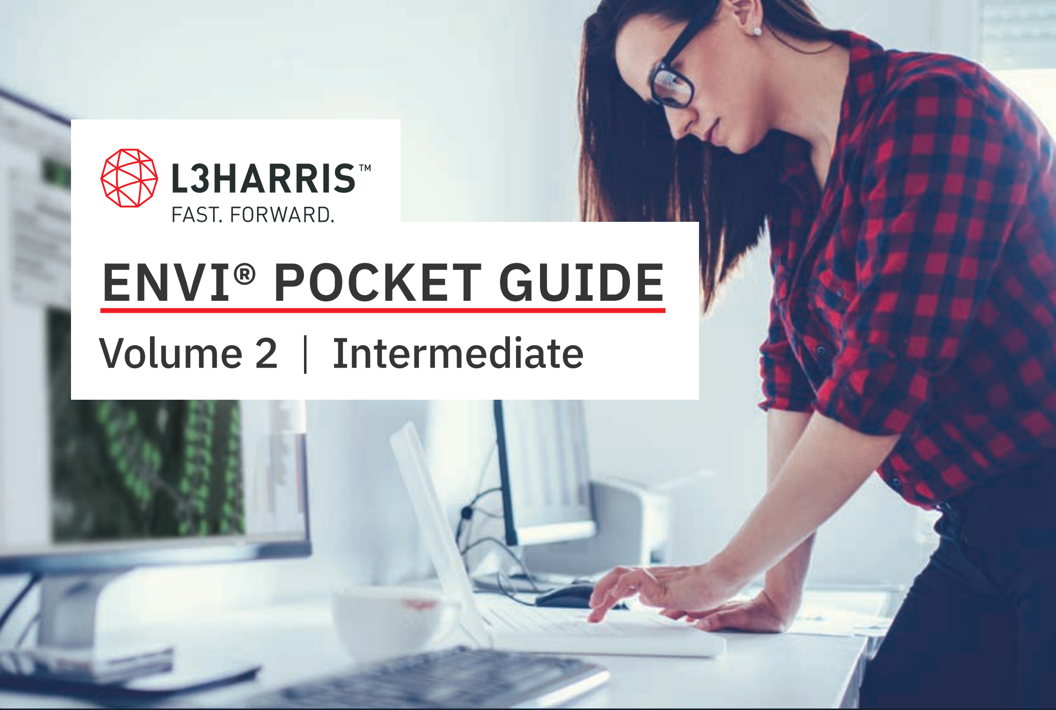
ENVI® POCKET GUIDE

Volume 2 | Intermediate



L3HarrisGeospatial.com/ENVI

Authored as a Derivative from ENVI Bootcamp & ENVI Documentation Center By:
CW3 Augustus Wright, 125D EN

In association with the U.S. Army TWI Program.

CONTENTS

The ENVI® Pocket Guide is a quick reference booklet not intended to be read from cover to cover although it can be. The intent is to provide users with succinct steps on how to accomplish common tasks in ENVI.

If you need or desire comprehensive explanations of tasks from this guide refer to the following resources:

ENVI Documentation Center
l3harrisgeospatial.com/docs

ENVI Tutorials
l3harrisgeospatial.com/docs/tutorials.html

ENVI Videos
l3harrisgeospatial/Learn/Videos

ENVI Help Articles
l3harrisgeospatial.com/Support

Tech Support
(+1)303-413-3920

Email Support
geospatialinfo@L3Harris.com

GETTING STARTED

OPENING ENVI

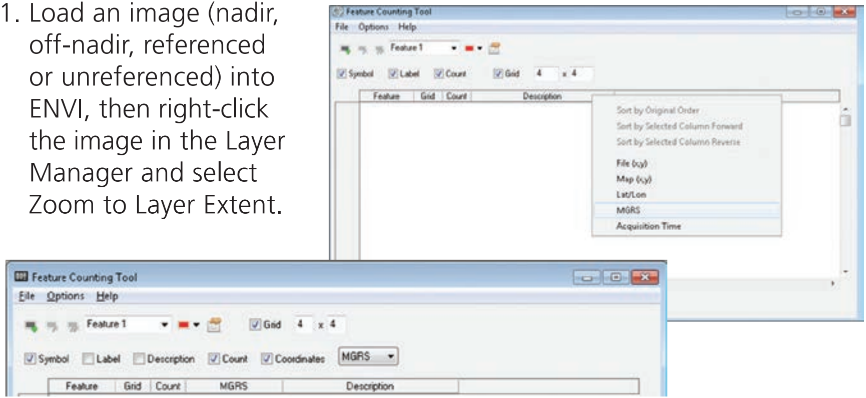
1. Please reference **ENVI Pocket Guide Volume 1 | BASIC** if you need instructions on how to open ENVI, load and remove data, descriptions of the interface components, and basic data preparation procedures.

ENVI Pocket Guide Volume 1 | BASIC
provides an introduction to familiarize users with common methods for opening ENVI, loading data, navigating, and performing stretches.

You are currently referencing
ENVI Pocket Guide Volume 2 | INTERMEDIATE
which expounds a step further on intermediate procedures using ENVI, IDL and ENVI LiDAR, assuming you have already mastered the basics.

GRID REFERENCE

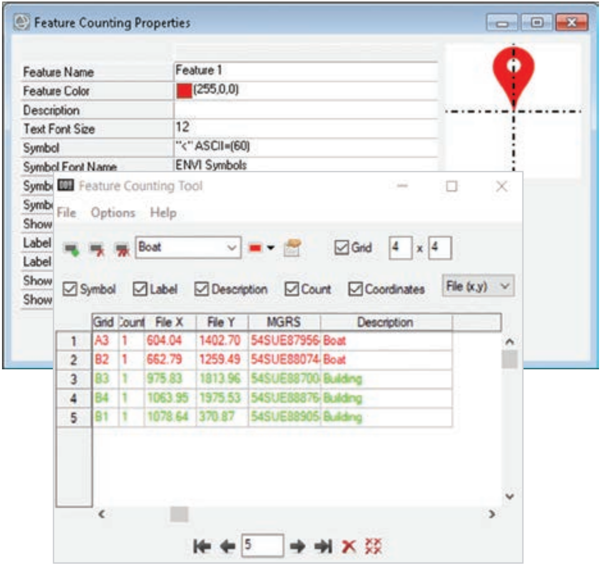
1. Load an image (nadir, off-nadir, referenced or unreferenced) into ENVI, then right-click the image in the Layer Manager and select Zoom to Layer Extent.



If your image is georeferenced, you will not be able to record coordinates. However, you will still be able to count features and record the File (x,y) values. Toggle the check boxes next to Symbol, Label, Description, Count or Coordinates to determine which attributes will be labeled.

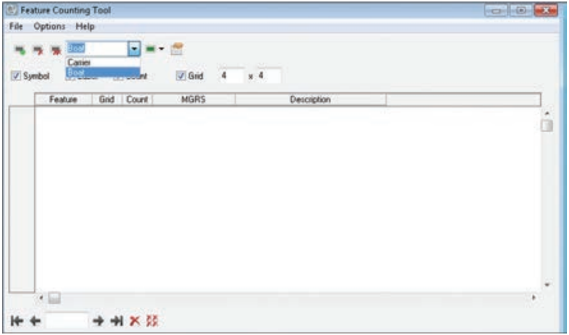
2. Click the Feature Counting Tool button to open the Feature Counting dialog. Right-click on Description to turn on coordinates or File (x,y) values for unreferenced images.

3. Enable the Grid check box. By default, the Grid is set to 4 x 4. You can adjust the grid size by entering different values in the fields provided.



4. Click the Feature Counting Properties button to edit the feature properties such as the Feature Name, Font Size, Symbol, Label Position, Show Label, and Show Count.

5. Close the Feature Counting Properties dialog. Add more features by clicking the Add Feature button . Change the default Feature Name (Feature1) in the name field.



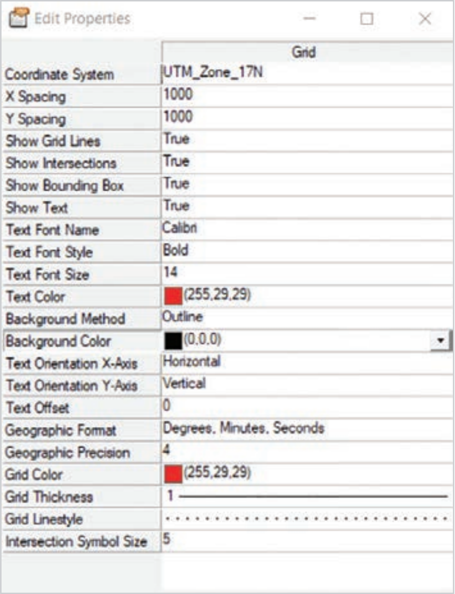
6. Select the Feature Name of the feature you want to count using the drop-down arrow in the Feature Name field. Begin counting by clicking on the features in your image.

7. As you count the features, click Description and enter in the attribute and associated information.

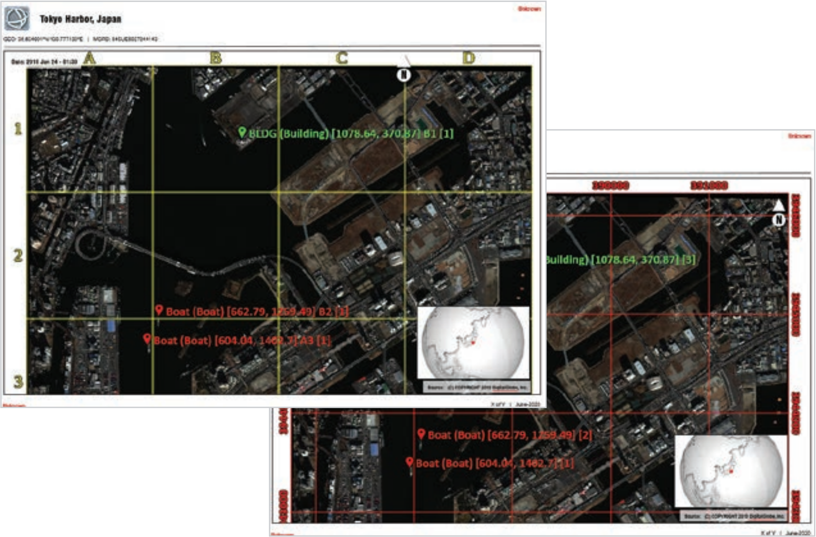
8. You can delete mistakes by highlighting the feature row(s) and clicking the Delete Point button ✕ to delete individually or the Delete All Points button to delete all.

9. To add a geographic grid, click the Annotations button [Annotations ▾] then select Add Grid Lines. The new grid often defaults to WGS 1984 Web Mercator Projection.

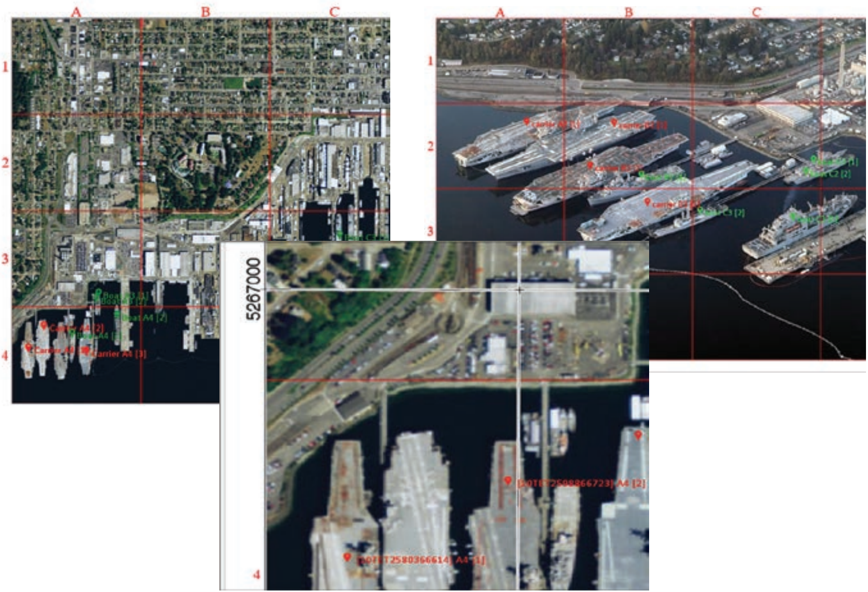
10. You can edit the grid in the Grid Edit Properties that is located directly underneath the ENVI Toolbox. Here, you can change the Coordinate System, Text and Line Color, XY Spacing and other grid properties as shown in the following example:



11. Go to the ENVI main menu and click File > Chip View To > PowerPoint or PDF for a finished product. Also known as the Report Generation Tool, chipping to PowerPoint allows you to utilize a variety of ENVI's built-in product briefing templates.



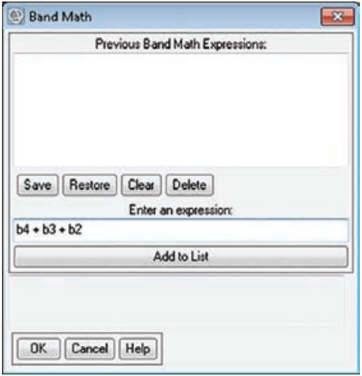
Example NADIR with Reference and Off NADIR without Reference:



BAND MATH

1. Load a multispectral or hyperspectral image into ENVI, then select Band Algebra > Band Math from the Toolbox. The Band Math dialog appears.

2. Enter a simple or complex mathematical expression using b# variables to represent the bands you want to manipulate. Replace # with the band number as shown in the example.

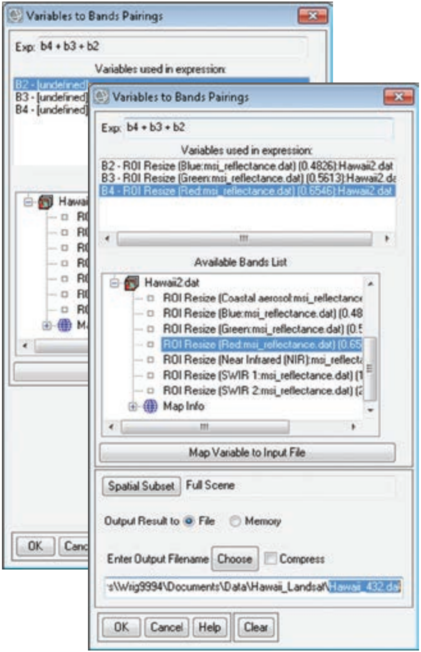


Band Math is a method used to create new raster data by performing complex or simple mathematical functions on existing bands available in one or more geographically referenced images. Analysts will be able to compress data into isolated values of interest such as NDVI (Normalized Difference Vegetation Index).

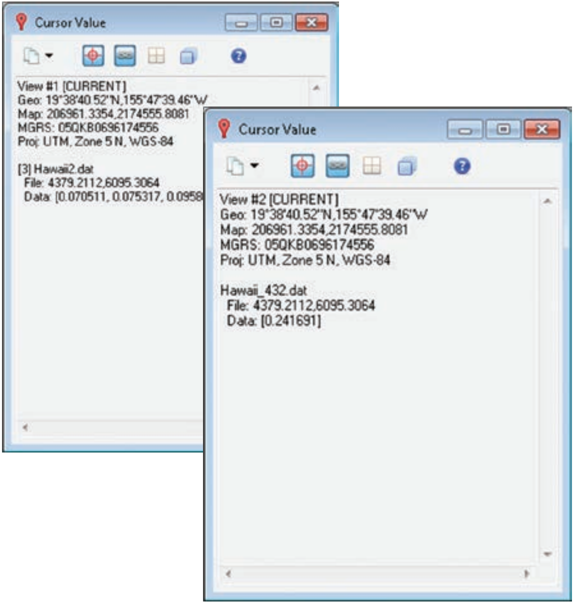
3. Next, click Add to List then OK to open the Variables to Bands Pairings dialog.

4. Initially, the variables are undefined. One by one, highlight each variable used in expression and click the corresponding band in the Available Bands List to define the variables.

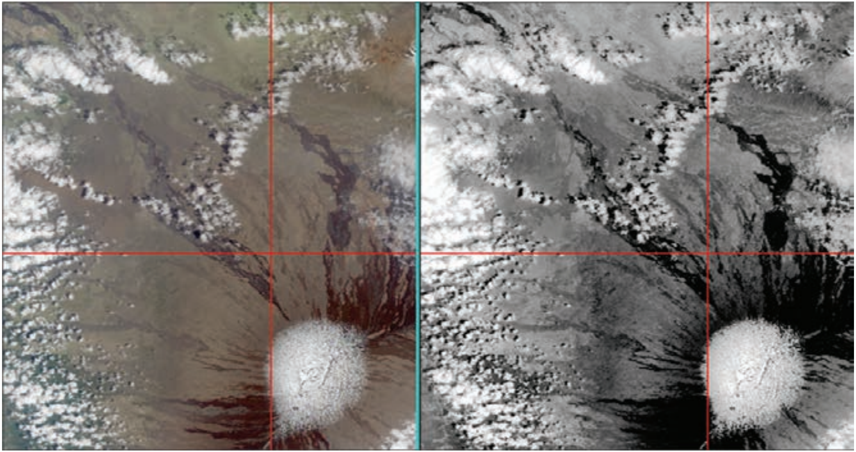
5. To save the image, click File, then click Choose and navigate to an Output Directory. Name the output file and click Open. For a memory-only output, click Memory. Click OK.



6. Check your results by linking two Views; one View with a corresponding spectral composite that matches the bands manipulated in your expression, and the other containing the output image. Use the Cursor Value button to evaluate and confirm the results.



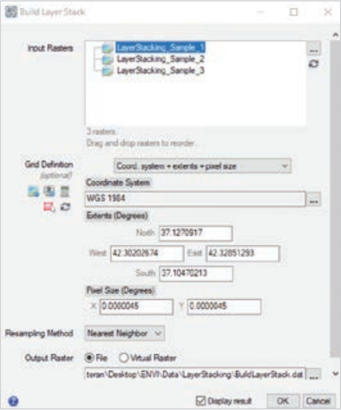
Example Band Math on Landsat 7 Input b4 + b3 + b2 = Output:



BUILD LAYER STACKS

1. Open the images you want to layer stack, then click Raster Management > Build Layer Stack in the Toolbox.

2. In the Input Rasters field, click the Browse button ... to open the Data Selection dialog. Click Select All or use the Ctrl or Shift key to select the files that will comprise the layer stack. Click OK.



The Build Layer Stack tool is used to construct a new multi-band image from georeferenced images of various pixel sizes, extents, and projections. Input bands are resampled and reprojected to a common spatial grid. The resulting image will comprise the extent of all the images or only the region of overlap.

3. Using the SHIFT or CTRL key, highlight each image you wish to stack, and then click OK.

4. Next click Reorder Files and then drag and drop the bands in the proper order from least to greatest then click OK.

5. Accept the Grid Definition default or choose a different option from the drop-down list to which the input images will be resampled and reprojected. A Grid Definition contains a known coordinate system plus any combination of other parameters such as pixel sizes, image dimensions, and tie point coordinates for the upper-left pixel.

6. Depending on what you select to define the Grid Definition, additional fields will display in the Build Layer Stack dialog such as Extents (Degrees), Pixel Size (Degrees), Image Size, and Tie Point field.

7. Use one of the following methods to define the output coordinate system of the layer stack in the Coordinate System field:

    a. Click the Browse button to manually define the coordinate system in the Select Coordinate System dialog.

    b. Click the From Dataset button to use the grid definition of an existing dataset.

    c. Click the From Current View button to use the grid definition from an existing view.

    d. Click the Calculate Union/Intersection button and select the Intersection option to include the extent encompassed by all of the rasters. Or, select the Union option to include only the extent where they overlap.

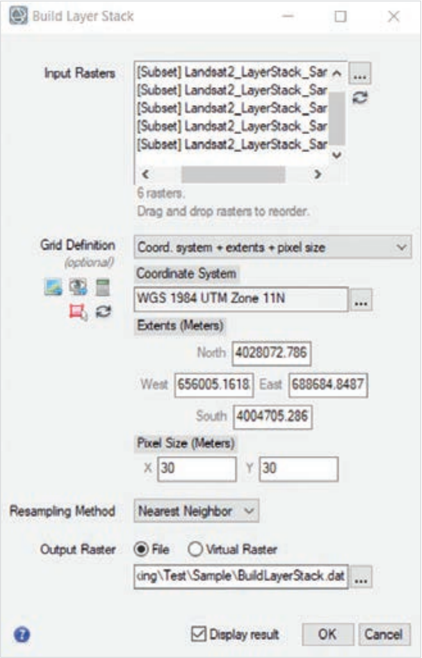
    e. Click the Draw Bounding Box button to define a box outlining the extent of the layer stack. In the view, click and drag the cursor to draw a box of the extent.

8. Select a Resampling Method from the drop-down list. Click the Help button for more information on resampling.

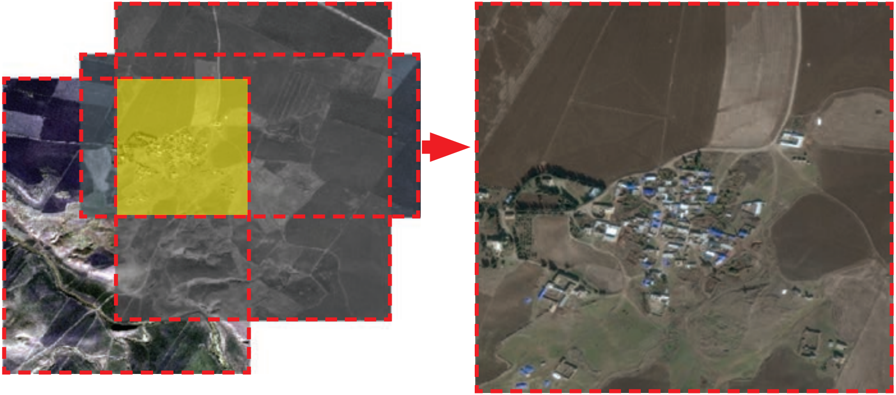
9. For the Output Raster, choose File if you want to save the output file. Next, click the Browse button to navigate to an Output Directory. Name the output, and then click Save. If you want a memory-only output, choose Virtual Raster.

10. Enable the Display result check box if you want to open the output file after processing.

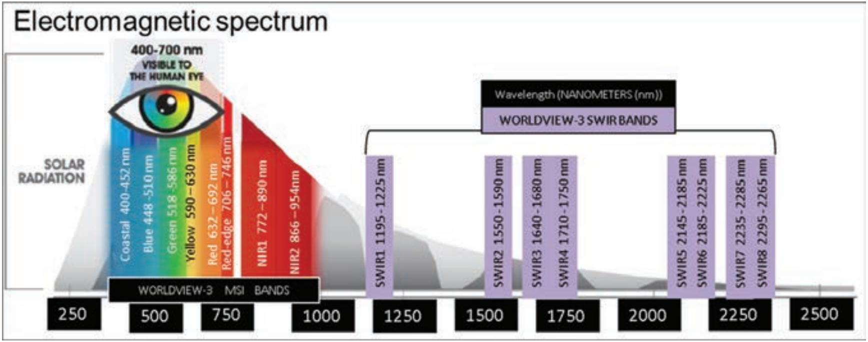
11. Click OK.



Example of a new multi-band image built from stacked images using Calculate Union:



SWIR BANDS



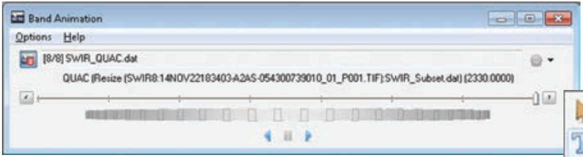
Shortwave Infrared (SWIR) bands can be exploited to detect materials that are otherwise invisible when using visible and/or other multispectral imagery (MSI) bands. The following sensors collect SWIR Information: WorldView-3, Landsat (4, 5, 7 and 8), SPOT (4 and 5), Terra & Aqua (MODIS / ASTER), GISAT-1, Sentinel (2, 5, and 5P), and VIIRS.

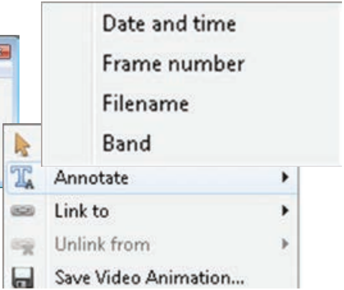
1. Load an atmospherically corrected SWIR image into ENVI. If your image is not atmospherically corrected , use the Quick Atmospheric Correction (QUAC) Tool in the ENVI Toolbox to perform the atmospheric correction.

2. Take some time to get familiar with the image using the Navigation Tools. Next, explore each SWIR band.

3. Right-click the SWIR image in the Layer Manager and select Band Animation. Toggle and drag the corners of the Band Animation dialog to expand it if necessary.

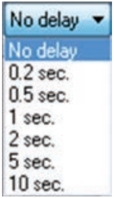
4. The Play buttons allow you to Play backward, Pause, or Play forward through each of the SWIR bands to visualize which ones show high reflectance for the feature(s) of which you are interested.





5. Click the Tool button , then > Annotate > Frame number to dynamically display the SWIR bands using Band Animation. Click and hold the top of the Band Animation dialog and drag away from the center of the View so it does not obscure the image.

6. Once you click Play forward or Play backward, you can adjust the playback speed using the Delay dropdown menu.

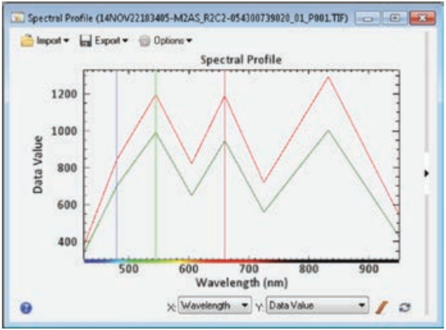


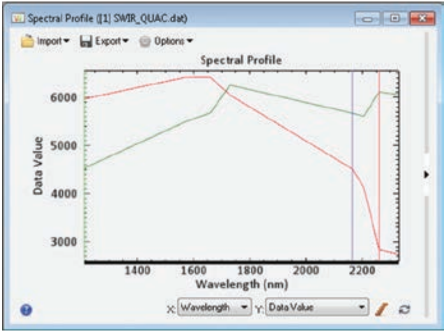
7. Right-click the SWIR_<your image name>.series in the Layer Manager and select Change Color Table > Rainbow. This technique makes it easier to identify high reflectance pixels per SWIR band. Once you have identified the high reflectance bands for the material of which you are interested, close the Band Animation dialog.

8. Click the Data Manager and load a SWIR False Color Composite using the bands you have previously identified. The example in this guide displays SWIR 7 as Red, SWIR 1 as Green, and SWIR 5 as Blue. Click Load Data to open the composite in the same View or enable the Load in New View check box prior to clicking Load Data to open in a separate View. Press Ctrl+L or go to Views in the main menu to link the Views.

9. If you have a multispectral image over the same region, load it as a True Color Composite into the same View or Linked Views.

10. Highlight the MSI True Color Composite in the Layer Manager and press Alt+Z to open a Spectral Profile dialog. This dialog can also be opened by clicking the Spectral Profile button in the main menu or right-clicking on the composite in the Layer Manager and selecting Profiles > Spectral. Repeat these steps and open the Spectral Profile for the SWIR False Color Composite (SWIR 715).





11. Position the two Spectral Profile dialogs side-by-side for easy comparison. Use the Shift+left-click keystroke to select and compare the spectra.

12. In the above example, the image to the left is an MSI True Color Composite and the image to the right is a SWIR 715 False Color Composite. Notice that in the true color image, the roof in the cross hair appears to be of the same materials as the left adjacent roof. However, in the SWIR false color image, the two roofs are of different materials.

13. If you wish to classify your SWIR image at this point, type "Spectral" in the Toolbox search window and double-click the Spectral Angle Mapper Classification Tool. For a comprehensive tutorial and explanation of this tool, visit the ENVI online Documentation Center at:

    www.l3harrisgeospatial.com/docs/spectralanglemapper.html

Visit http://speclab.cr.usgs.gov for a comprehensive list of materials in association with best SWIR bands used to identify specific materials.

SPECTRAL ANALYSIS

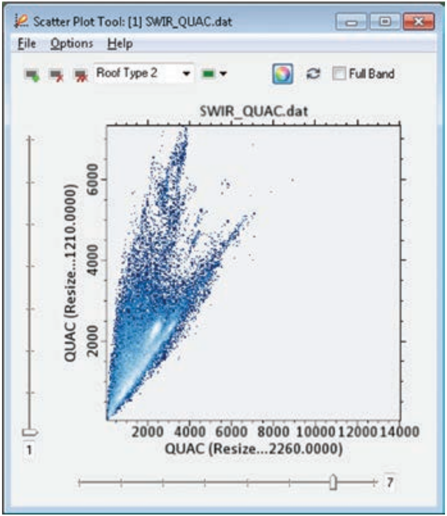
Spectral Profile Interface

Some numbers represent GUI groups separated by commas from left to right.

1. Spectral Profile with X & Y axis
2. Remove selected curve, Remove all curves, Edit data value
3. Show/Hide Properties
4. List of collected spectra/ classes
5. Show/Hide extra info, General Properties, Curve/ Spectra properties
6. Stack plots, Reset plot range
7. Choose Y axis
8. Choose X axis
9. (X) Electromagnetic Spectrum/ Wavelengths in nanometers
10. (Y) Data Value
11. Import ASCII or Spectral library, Export ASCII, Spectral Library, PDF, Image or PPT, Profile Window Options
12. 1 x sample spectra plot (select multiple by clicking image while holding Shift)

Spectral Profile (652 CIR)
Import
Export
Options
Spectral Profile
Data Value
300
250
200
150
500
600
700
800
900
Wavelength (nm)
Wavelength
Data Value
Roof type 1
General
Curve
Name
Roof type 1
Color
(255,0,0)
Line Style
Thickness
1
Symbol
No symbol
Symbol Color
(0,0,0)
Symbol Size
2
1
2
3
4
5
6
7
8
9
10
11
12

1. Load a SWIR 715 False Color Composite image into ENVI. Highlight it in the Layer Manager, then go to the main menu and click Display > 2D Scatter Plot. The Scatter Plot Tool appears.



Shortwave Infrared (SWIR) bands will be used again in this section to further investigate the differences in materials using the 2D Scatter Plot together with the Spectral Profile. These methods can be applied on any image containing more than one band.

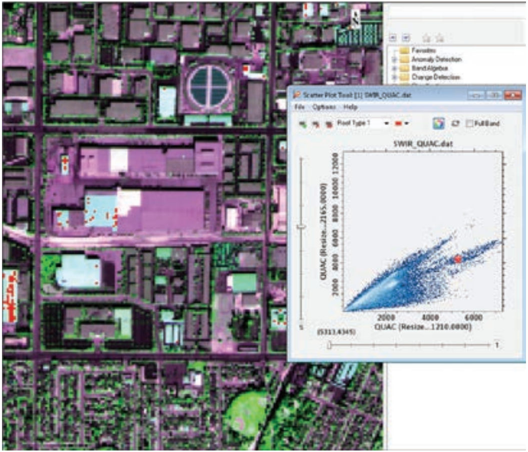
2. In the Class value field, highlight the default Class 1 and define it according the material you want to compare. Type a feature name and assign it an appropriate color. Click the Add Class button  to add and define more spectral classes for comparison. The class examples used in this guide are Roof Type 1 and Roof Type 2.

3. Click the Toggle Density Slice button  to apply a color slice to your plot. You can change the color scheme by clicking Options > Change Density Slice Lookup.

4. Leave Full Band unchecked. The Full Band option allows you to utilize the pixel statistics from the entire image. Left unchecked, the Scatter Plot Tool will only show the statistics contained within the current extent within the View.

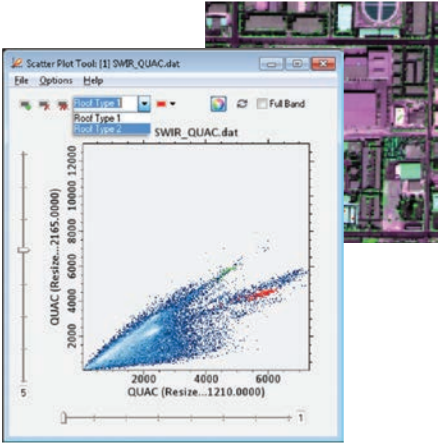
5. Change the Scatter Plot bands by clicking File > Select New Band > X-Axis or Y-Axis. The plot example in this guide shows SWIR 1 on the X-Axis and SWIR 5 on the Y-Axis.

6. Right-click anywhere in the Scatter Plot and select a Patch Size. Select your first class in the Class value field. Next, use any of the following keystrokes and hover over an area in the Scatter Plot with a dense collection of pixels: Ctrl+left-click, Shift+left-click, or Alt+left-click. Notice that as you move the mouse over the pixels in the Scatter Plot, the corresponding pixels in the image in the View are dynamically highlighted. Back in the Class value field, select the next class and repeat these steps to evaluate the plot pixels and Spectral Analysis their correlating data values in the View. Conversely, click and hold the left mouse button in the View to dynamically highlight the corresponding Scatter Plot.

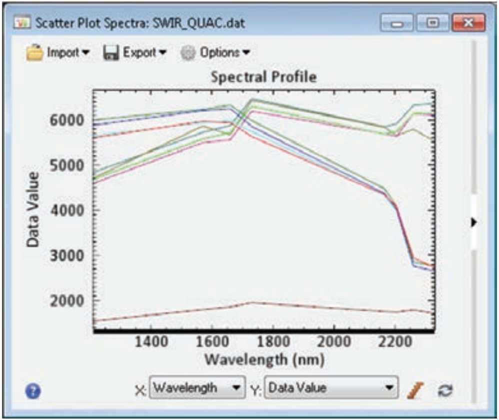


7. Left-click and hold inside the Scatter Plot and draw a polygon around the same general area with a dense collection of pixels to select them. If you need to delete and redraw your polygon, right-click on it, then select Clear All. Once you are satisfied with the polygon for your first class, go to the Class value field and select the next class. Then draw its corresponding polygon. Repeat these steps to create spectral samples for all of your classes.

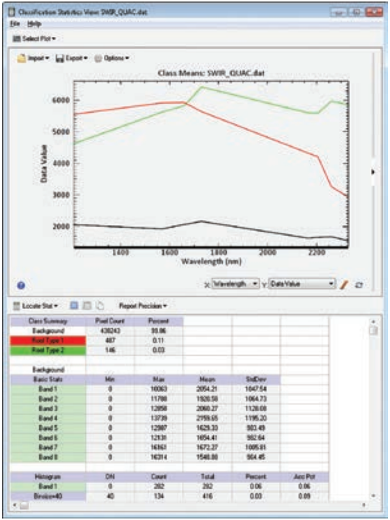
8. Right-click in the Scatter Plot and select Export all Classes to ROIs. The ROI Spectral Analysis Classes will automatically be added under the False Color Composite in the Layer Manager.



9. Back in the Scatter Plot, right-click and select Mean All. This gives you the statistical mean for all the spectra captured within the ROI classes. Press and hold the Shift key and right-click on several disparate pixels in the plot to show the graphical comparison of the mean deviation among the spectra. This indicates the degree of correlation between the X and Y band choice.



10. In the Layer Manager, right-click the ROI Classes and select Statistics for All Classes. Select the SWIR 715 False Color Composite band combination in the Data Selection dialog and click OK.

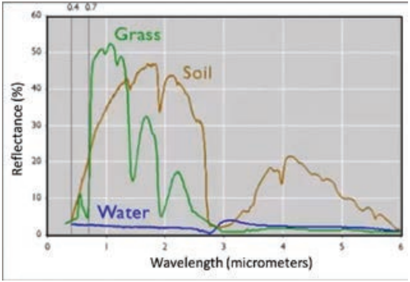


Standard Deviation is the average distance from the mean for the spectral material in question. You may save your findings to a Spectral Library for future comparisons. Go to File > Export to Text File to save your findings as a report.

IMAGE CALIBRATE

1. Open the metadata file (*_MTL.txt) in ENVI.

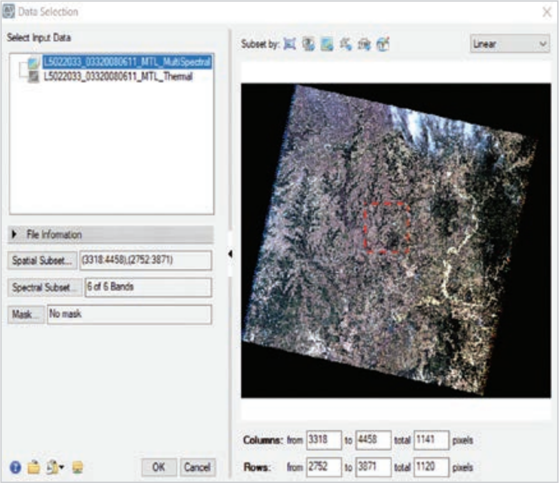
2. Type "QUAC" in the Toolbox search window and double-click QUick Atmospheric Correction (QUAC).



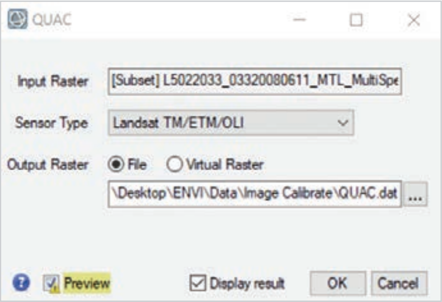
Spectral reflectance curves are used to distinguish materials that make up the earth's surface. Spectral libraries are primarily created in the field using a spectrometer instrument. Satellite images require calibration before comparing against spectral libraries because satellites measure radiances, which are often tainted by atmospheric variables such as aerosols, shadows, clouds, and the sun's position, thus resulting in distortion.

2. Type "QUAC" in the Toolbox search window and double-click QUick Atmospheric Correction (QUAC).

3. Select the multispectral image in the Select Input Data dialog, then click Spatial Subset. Draw a box around the region you will analyze, avoiding heavily clouded areas and large bodies of water. Click OK.

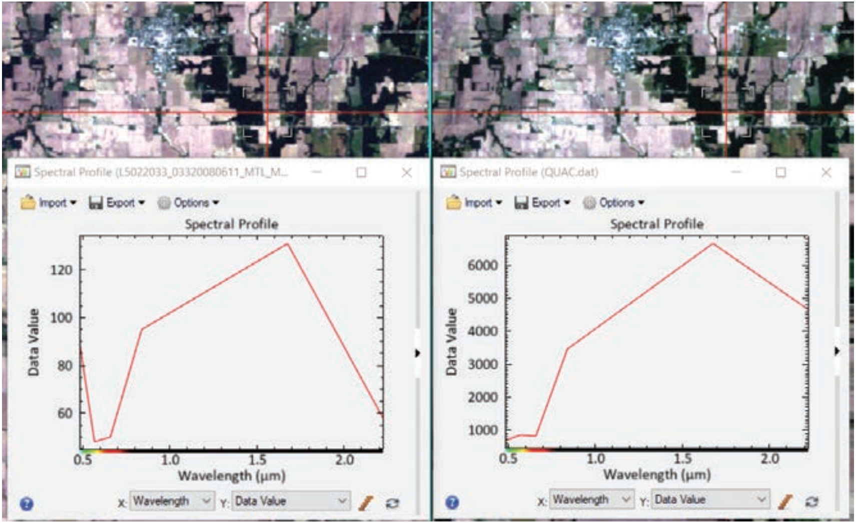


4. In the QUAC dialog, the Input Raster field and Sensor Type are already populated. The Sensor Type is derived from the metadata. If ENVI cannot recognize the sensor, you can select Generic/Unknown Sensor. For the Output Raster, select Virtual Raster for a memory-only output. To save, browse to an Output Directory and name the output file. Click Save. Enable the Preview check box and a preview of your subsetted image will open in a new View. If you are satisfied with the preview, enable the Display result check box and click OK.



5. Link your Views and inspect the results by analyzing the Spectral Profiles.

LANDSAT before and after atmospheric correction:



LIDAR FEATURE EXTRACTION

ENVI LiDAR Interface

Some numbers represent GUI groups separated by commas from left to right.

1. New Project, Open Project or LAS, Process Data, QA Mode, QA Mode with Center Line, 3D Viewer, Select Cross Section, Cross Section Top View, Reset Perspective View, Reset Isometric View, Measurement Tool, Height Palette Editor, Color by Height, Color by Classification, Shade by Intensity, Color by RGB, Color by Viewshed Analysis, Filter Points by Height, Launch Products in ENVI, Launch Products in ArcMap, Screenshot to PowerPoint

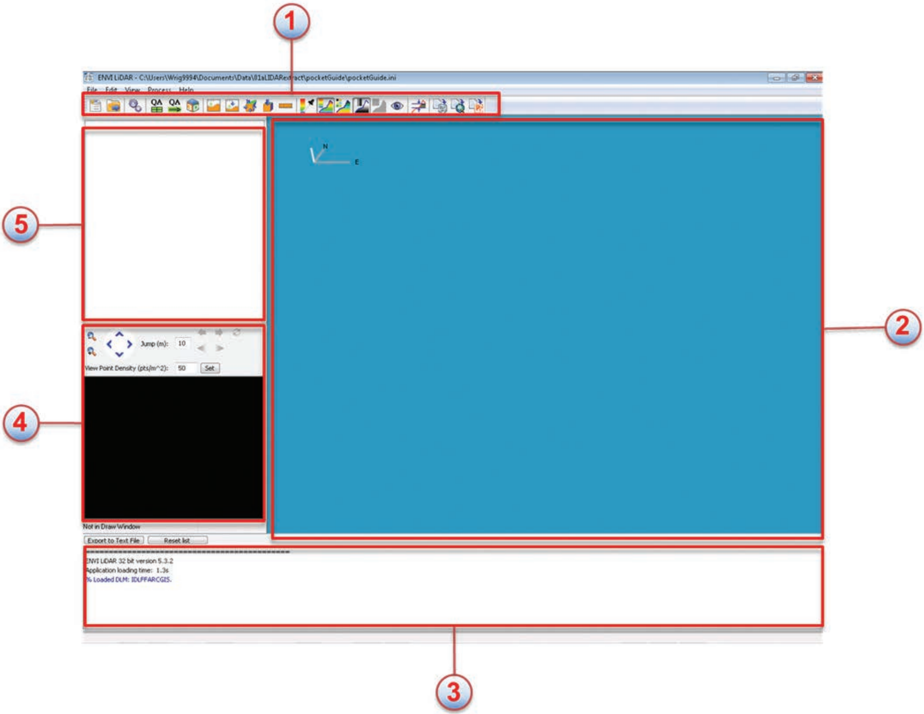
2. Main Viewer Window

3. Session Operations Log

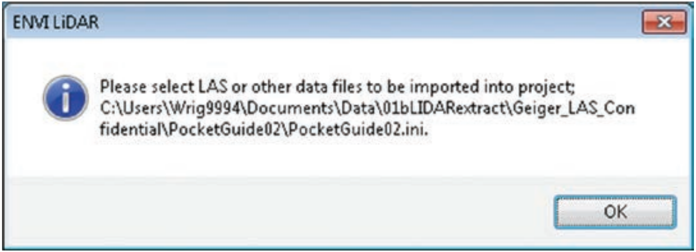
4. Navigation Tools, Navigation Window

5. Layer Manager

For a more comprehensive understanding of ENVI LiDAR, visit the online Documentation Center, Videos and Tutorials.

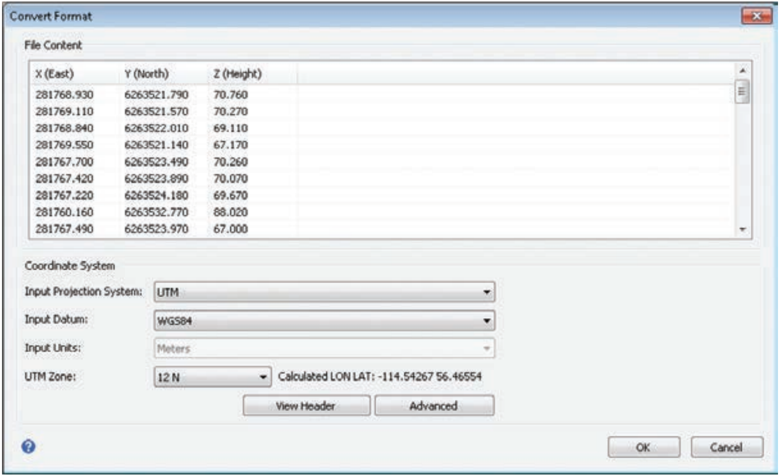

1
2
3
4
5
ENVI LiDAR - C:\Users\Wrig9994\Documents\Data\01aLIDARextract\pocketGuide\pocketGuide.ini
File Edit View Process Help
N
E
Jump (m): 10
View Point Density (pts/m^2): 50 Set
Not in Draw Window
Export to Text File
Reset list
ENVI LiDAR 32 bit version 5.3.2
Application loading time: 1.3s
% Loaded DLM: IDLFFARCGIS.

1. Open ENVI LiDAR by clicking Start > All Programs > ENVI 5.x > ENVI LiDAR 5.x (32-bit).



2. Click File > New Project and navigate to the directory where you wish to save your ENVI LiDAR project. Name your project with *.ini extension, such as yourProjectName.ini. The .ini is the file extension used to save LiDAR Project sessions. You may open existing projects by locating .ini files via File > Open.

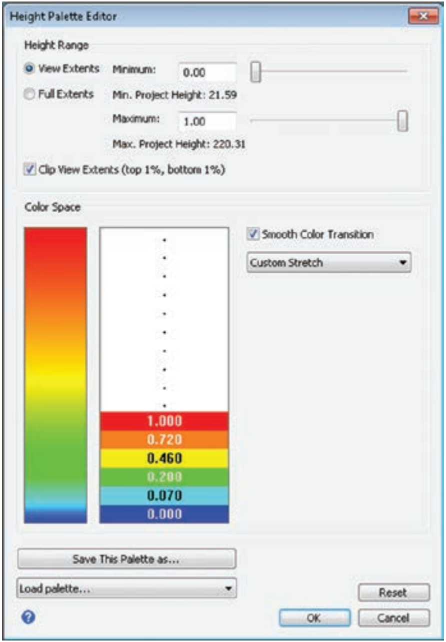
3. Click OK when prompted to select the LAS or other data to be imported for your project. Navigate to the directory containing your LAS file and open it.



4. The next prompt asks if you want to import more raw material data files into the project. Click Yes if you want to add more data, otherwise click No. The final prompt asks if you want to use the Projection information read from file. Click Yes.

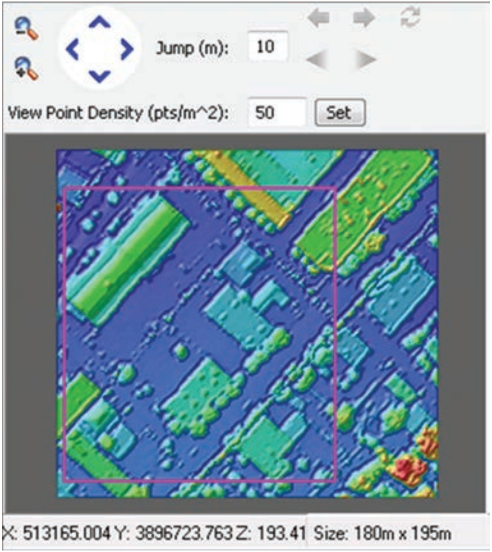
5. The Convert Format dialog will appear if you need to change the coordinate system of your input file. Define your coordinate system and click OK.

6. You may change the point cloud symbology using one of the following: Height Palette Editor, Color by Height, Color by Classification, Shade by Intensity, or Color by RGB if the LAS file contains the necessary metadata.



7. Click the Height Palette Editor. At the bottom of the dialog, click the Load palette drop-down menu and select Earthtones. Click OK.

8. In the Navigation Window, left-click and drag a rectangle around the region where you will extract features. You may use the entire frame, but the larger the area, the longer it will take to process.

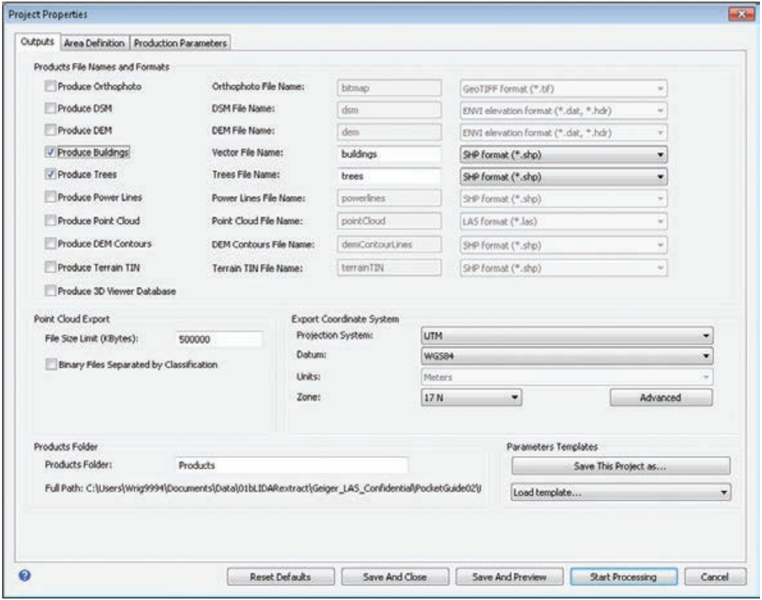


9. Click the Process Data button . The Project Properties dialog appears.

10. If you check Produce Point Cloud, ENVI LiDAR will generate a new classified Point Cloud which adheres to the classification standard and format specification set forth by the American Society for Photogrammetry and Remote Sensing (ASPRS) LAS Specification 1.x.

Computed Classification Value*	Description
0	*Not Processed*
1	*Unclassified*
2	*Terrain*
3	*Near terrain*
5	*Trees*
6	*Buildings*
14	*Power line*
15	*Power pole*

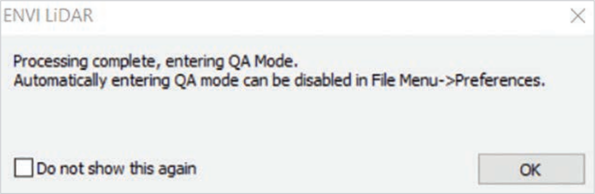
11. This exercise will extract buildings and trees. Check Produce Buildings and Produce Trees.



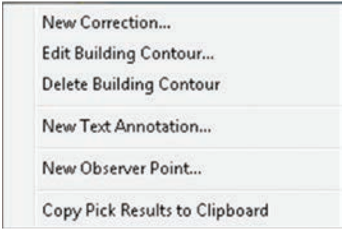
12. Accept SHP format (*.shp) as the file formats for both features. Adjust the File Size Limit if necessary or accept the default value of 500MB. The output data will be saved to the Products Folder that was automatically generated within the directory containing your ENVI LiDAR project.

13. Click Start Processing.

14. ENVI LiDAR will default to QA Mode once processing is complete. Click OK.



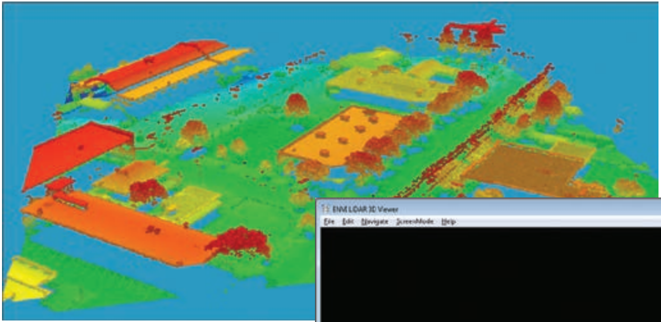
15. While in QA Mode, double-click any of the vector layers within the Main Viewer Window and select from the following options to make any necessary corrections:

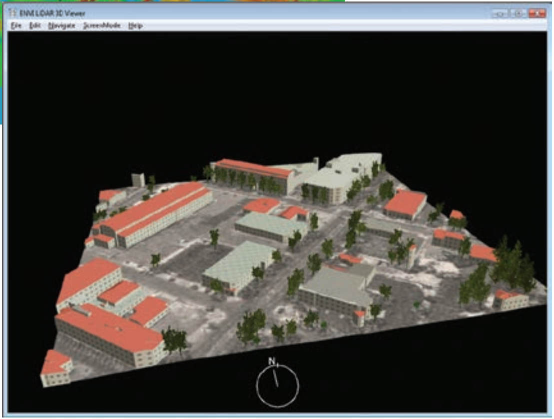


16. Once satisfied with edits, you may Launch Products in ENVI, Launch Products in ArcMap, or Screenshot to PowerPoint for a finished product.

17. Click the 3D Viewer button to display a 3D Model of your data. In the ENVI LiDAR 3D Viewer, select File > Screenshot to PowerPoint to create a finished product.

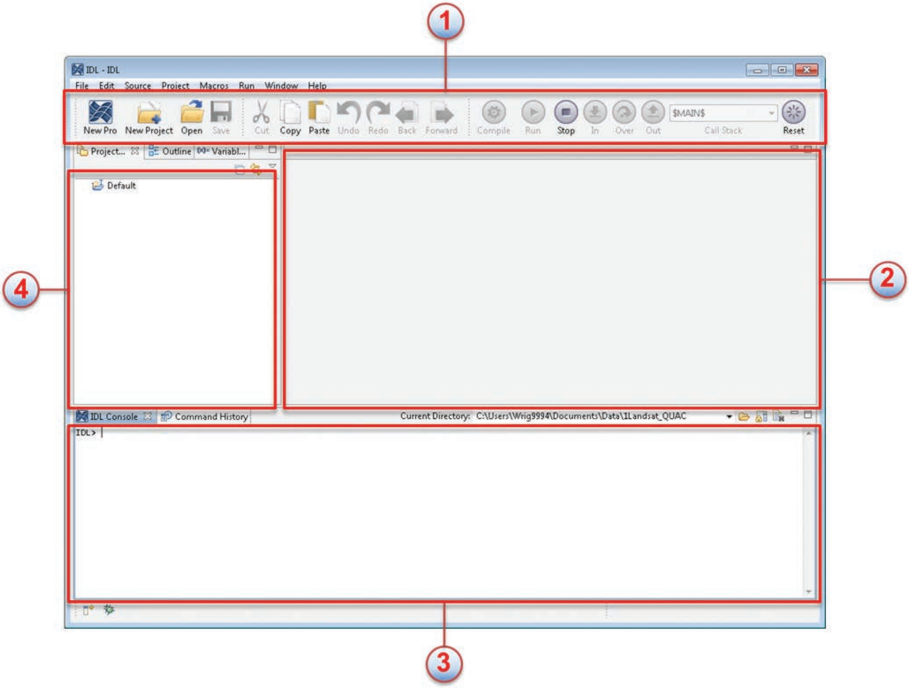
Sample 3D view from point cloud:





BATCH PROCESSING

Interactive Data Language (IDL) is the programming language that drives ENVI. Users can use IDL alone or in tandem with ENVI by use of the ENVI API. The ENVI API uses an object oriented methodology to manage and manipulate data, views and the overall state of the application. Many workflows require routine steps that users must perform whenever they want a particular product or result. Such workflows can be automated using ENVITasks, thus improving efficiency while mitigating user error. This approach is commonly referred to as batch processing, *which generally means to collect a set of instructions or jobs and then execute the set without user intervention. The IDL code example shown in this section demonstrates how to batch subset and reproject every image in a specified directory.*


1
2
3
4
IDL - IDL
File Edit Source Project Macros Run Window Help
New Pro New Project Open Save Cut Copy Paste Undo Redo Back Forward Compile Run Stop In Over Out
$MAIN$
Call Stack
Reset
Project... Outline Variabl...
Default
IDL Console Command History
Current Directory: C:\Users\Wrig9994\Documents\Data\1Landsat_QUAC
IDL>

IDL Workbench Interface

Some numbers represent GUI groups separated by commas from left to right.

1. Main Menu/Toolbar: New Program, New Project, Open, Save, Cut, Copy, Paste, Undo, Redo, Back, Forward, Compile, Run, Stop, Step In, Step Over, Step Out, Call Stack, Reset

2. Program Editor Window

3. IDL Console/ Sandbox

4. Tabs: Project, Outline, Variables | List of Project Variables

[*Refer to the online IDL documentation for a more comprehensive explanation of the IDL Workbench.*]

1. Open IDL by clicking Start > All Programs > IDL 8.x > IDL 8.x.

2. Click the New Pro File button New Pro to create a new empty program script.

3. Select File > Save As and navigate to an Output Directory. Name the program batchReprojectDirectory.pro. Click Save.

A general understanding of object oriented programming and coding conventions are useful when working with IDL. The following resources will be of use in building your understanding:

Object Oriented Programming:
www.geo.mtu.edu/geoschem/docs/IDL_Manuals/OBJECT%20PROGRAMMING.pdf

Coding Conventions:
www.harrisgeospatial.com/docs/case_versus_switch.html

4. Right-click in the Program Editor Window, select Preferences, then check Show line numbers. This will help identify errors if debugging is necessary. Click OK.

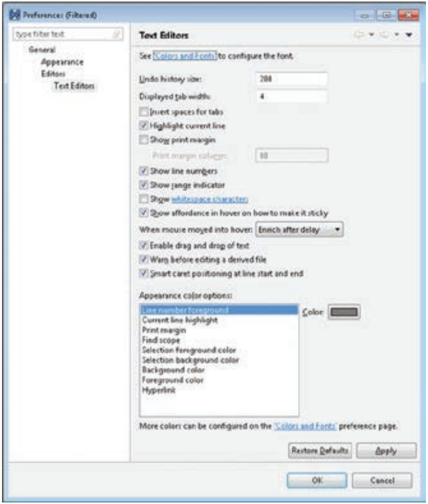
5. In the Program Editor Window, enter the following lines of code:

```
pro batchReprojectDirectory
  compile_opt idl2, hidden




end
```

6. The code in blue must match the filename. All IDL programs start and end in this way.



7. Use a semicolon (;) to comment your code. This ensures good logic and code readability for other users.

8. Begin writing actual code to accomplish each commented step.

```
pro batchReprojectDirectory
  compile_opt idl2, hidden

  ; Start the application

  ; Set directory Path

  ; Set output Path

  ; list of images in path

  ; Loop through and Reproject each image in directory Path

    ; Process a spatial subset: Upper Left (X,Y), Lower Right (X,Y)

    ; Get the task from the catalog of ENVITasks

    ; save result to TIFF appended with new projection

end
```

Note: The input \01Batch and output \Reprojected directories must be created ahead of time.

9. The first four commands start the ENVI application, set the input directory, set the output directory, and create an array of input files. IDL will search the input directory for all TIFF files.

```
; Start the application
e = ENVI()

; Set directory Path
Path = 'C:\Users\Wrig9994\Documents\Data\01Batch'

; Set output Path
OutDIR = Path + '\Reprojected\'

; list of images in path
fileList = file_search(Path, '*.tif')

; Loop through and Reproject each image in directory Path

  ; Process a spatial subset: Upper Left (X,Y), Lower Right (X,Y)

  ; Get the task from the catalog of ENVITasks

  ; save result to TIFF appended with new projection

```

10. Use a FOR loop to iterate through the list of files stored in the fileList variable. Use comments to add placeholders for code that will subset and reproject the files with each iteration.

```
; Loop through and Reproject each image in directory Path
for i=0, n_elements(fileList)-1 do begin

  File = fileList[i]

  ; Process a spatial subset: Upper Left (X,Y), Lower Right (X,Y)

  ; Get the task from the catalog of ENVITasks

  ; save result to TIFF appended with new projection
```

11. Use ENVITasks to manipulate data in ENVI, such as subsetting and reprojection. Take advantage of code examples provided in the ENVITask documentation. Go to www.l3harrisgeospatial.com/docs/envitask.html. Scroll below TaskName until you find a task applicable to the problem you need to solve. For this exercise, click ReprojectRaster and notice there is a code snippet that already accomplishes 90% of what you need to do. Highlight and copy the ENVITask snippet from Raster = e.OpenRaster(File) to the last line.

12. Go back to the IDL Program Editor Window and highlight the last three comments. Then paste the ENVITask snippet. Highlight any of the newly pasted codes not indented properly and hit the Tab key until they are properly indented under the for loop. Then type endfor as shown.

```
; Loop through and Reproject each image in directory Path
for i=0, n_elements(fileList)-1 do begin

  File = fileList[i]

  Raster = e.OpenRaster(File)

  ; Process a spatial subset
  Subset = ENVISubsetRaster(Raster, Sub_Rect=[600,200,799,399])

  ; Get the task from the catalog of ENVITasks
  Task = ENVITask('ReprojectRaster')

  ; Get the
  ; NAD_1983_StatePlane_Colorado_North_FIPS_0501_Feet
  ; coordinate system
  CoordSys = ENVICoordSys(COORD_SYS_CODE=2231)

  ; Define inputs
  Task.COORD_SYS = CoordSys
  Task.INPUT_RASTER = Subset

  ; Define outputs
  Task.OUTPUT_RASTER_URI = e.GetTemporaryFilename()

  ; Run the task
  Task.Execute

  ; Get the data collection
  DataColl = e.Data

  ; Add the output to the data collection
  DataColl.Add, Task.Output_Raster

  ; Display the result
  View = e.GetView()
  Layer = View.CreateLayer(Task.Output_Raster)
  endfor
```

13. Modify the ENVITask snippet by changing parameters such as Sub_Rect and COORD_SYS_CODE to coincide with your data. The subset rectangle's upper left and lower right can be obtained using the Cursor Value in ENVI. To obtain your desired COORD_SYS_CODE, navigate to C:\Program Files\Harris\ENVIxx\IDLxx\resource\pedata\predefined. The coordinate systems are "…Strings.txt" files. DO NOT modify these files.

14. Add the following lines of code to write the new output rasters, then click the Compile button. Check the IDL Console/ Sandbox for any errors. Red in the Console indicates errors and green indicates a successful compile:

```
; save result to TIFF appended with new projection
append = "_subset_WGS84_UTM_11N.tif"
out_filename = OutDIR + FILE_BASENAME(Raster.name, '.tif') + append
Task.OUTPUT_RASTER.export, out_filename, 'tiff'
```

15. If your program has errors, use the line number in the error message to address the issue. Otherwise click the Run button to execute the program.

Complete Batch Subset & Reproject Directory Example:

```
; Description:
;   - Searches a directory and reprojects every image
;   - then appends new projection to end of filename

pro batchReprojectDirectory
  compile_opt idl2, hidden

  ; Start the application
  e = ENVI()

  ; Set directory Path
  Path = 'C:\Users\Wrig9994\Documents\Data\01Batch'

  ; Set output Path
  OutDIR = Path + '\Reprojected\'

  ; list of images in path
  fileList = file_search(Path, '*.tif')


  ; Loop through and Reproject each image in directory Path
  for i=0, n_elements(fileList)-1 do begin
```

```
File = fileList[i]

Raster = e.OpenRaster(File)

; Process a spatial subset: Upper Left (X,Y), Lower Right (X,Y)
Subset = ENVISubsetRaster(Raster, Sub_Rect=[ 2428,4002,4018,526

; Get the task from the catalog of ENVITasks
Task = ENVITask('ReprojectRaster')

; Get the
; "WGS_1984_UTM_Zone_11N"
; coordinate system
CoordSys = ENVICoordSys(COORD_SYS_CODE = 32611)

; Define inputs
Task.COORD_SYS = CoordSys
Task.INPUT_RASTER = Subset

; Run the task
Task.Execute
```

```
    ; save result to TIFF appended with new projection
    append = "_subset_WGS84_UTM_11N.tif"
    out_filename = OutDIR + FILE_BASENAME(Raster.name, '.tif') +
append
    Task.OUTPUT_RASTER.export, out_filename, 'tiff'

    ; Get the data collection
    DataColl = e.Data

    ; Add the output to the data collection
    DataColl.Add, Task.Output_Raster

    ; Display the result
    newRaster = e.OpenRaster(out_filename)
    View = e.GetView()
    Layer = View.CreateLayer(newRaster)
    endfor

end
```

ANALYTICS, INSIGHTS, ANSWERS YOU CAN TRUST.

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