Habitat Priority Planner, Version 2: Help Document

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Habitat Priority Planner Overview and Introduction

Why Another Tool? Background for the Habitat Priority Planner

The most current version of the Habitat Priority Planner (HPP) tool is Version 2. Version 1 of the HPP tool was developed by the National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center and released to the public in September 2007. HPP is a spatial decision-support tool that assists users in the prioritization of important areas in the landscape or seascape for conservation or restoration action. It is a map-based planning tool designed with stakeholder engagement in mind. Use of the tool is intended to bring greater confidence in decisions by increasing the level of transparency, objectivity, and repeatability in the decision-making process. Many users have found HPP useful beyond its original intended purpose, making it a flexible tool for land use planning beyond conservation and restoration applications.

The Habitat Priority Planner

- Utilizes interactive mapping and prioritization methods in a wizard format;
- Creates maps, reports, and data tables; and
- Generates results that are consistent, repeatable, and transparent.

The development of the HPP tool represents over six years of work in tool design, testing, and research. In 2003, the Center, in close partnership with the Great Lakes Commission, developed the Integrated Coastal Management (ICM) tool, the immediate predecessor to the Habitat Priority Planner. Lessons learned from user experiences with the ICM tool, in addition to new information gleaned from the review of over 230 existing spatial decision-support tools, informed the design and development of the Habitat Priority Planner.

(Note: The ICM tool is no longer distributed or supported by the NOAA Coastal Services Center. ICM users should consider adopting the Habitat Priority Planner.)

Version 2 of the Habitat Priority Planner

Version 2 of the Habitat Priority Planner was developed by the Center and released to the public, Fall 2009. The upgrades to the tool include improvements to ensure that the tool successfully functions with both ArcGIS 9.2 and 9.3. Other changes include major updates to allow for a wider variety of input base datasets for Module 1, the Classify Habitats module. The new version of the tool allows users to include most commonly used raster and vector land cover datasets. The tool also allows the user to customize datasets to make them compatible with HPP. In addition, enhancements were made to the custom analyses in the Habitat Analysis module; Arc 9.3 users now have the ability

to save all output files in a Keyhole Markup Language file (KML) format for use of HPP outputs in Google Maps and Google Earth.

Note to Potential Users

Although HPP can be used with limited geographic information system (GIS) knowledge, the most accurate interpretation of analysis results requires a full understanding of the concepts and limitations of spatial analysis and strategic conservation planning. Ideally, a team of experienced staff members with varied skill sets, including spatial analysis, strategic land- and ocean-use planning, and participatory methods, would collaborate in the use of HPP to generate habitat priorities and guide the operation of the tool. This user manual includes several sources for additional information on landscape metrics and definitions of terminology (Appendix D).

Software Concept

The Habitat Priority Planner (HPP) is a toolbar for ESRI's ArcGIS platform that is designed to help planners, ecologists, and coastal managers make and prioritize decisions about habitat restoration and conservation. HPP is composed of three modules: Habitat Classification, Habitat Analysis, and Data Explorer. The tool calculates basic ecological statistics that are used to examine how habitats function within a landscape. The tool pre-packages several common landscape metrics into a user-friendly interface for intermediate GIS users. In addition, HPP allows the user to build queries interactively using a graphical interface for demonstrating criteria selections quickly in a visual manner that is useful in stakeholder interactions.

Examples of applications:

- Performing screening-level assessments of habitat for habitat restoration, land conservation, and general resource planning
- Assessing and inventorying site-specific issues and conditions
- Providing spatial support for natural resource strategic planning
- Identifying and ranking potential restoration and conservation sites
- Analyzing "what if" scenarios for proposed changes in land use or land cover

Three Modules of the Habitat Priority Planner

Module 1: Habitat Classification

The Habitat Classification module uses common raster or vector land cover data to create classified habitat "patches" based on the user's needs. The term "patch" refers to an individual polygon of a particular habitat, such as wetland or deciduous forest, as defined by the land cover layer and classification scheme used. Land cover types may be assessed individually, grouped together in a logical format, or simply classified as habitat and non-habitat for analysis. The result is a polygon feature-class layer that allows users to view the habitats they may wish to consider in their area. Habitat classification will differ between users and sites, based on project goals and objectives
(see the Module 1 – Habitat Classification section for more detail).

Defining Land Use Change Scenarios

The Habitat Classification module contains an optional step that allows for the definition of land use change scenarios. Using a polygon file, or a selection of polygons, this feature allows users to create "what-if" scenarios, changing the habitat from one type to another. For example, a parcel dataset can be used to define new land cover changes according to future growth patterns of a study area, or examine possible outcomes of a proposed habitat restoration project. If the user chooses this step, the resultant patch file will contain the user-defined classification scheme ***and*** the post-change state of the landscape (see the Module 1 – Habitat Classification section for more detail).

- Output: polygon Habitat Patch File

Module 2: Habitat Analysis

The Habitat Analysis module pre-packages several important landscape measures into a wizard interface. This second module uses the habitat patch file created in the first step to run "landscape analyses or metrics," which include core area, perimeter-area ratio, proximity, and nearest neighbor. These basic ecological analyses may provide insight into how each patch of habitat may function as part of a larger landscape. Additionally, HPP can be used to perform "custom analyses," which consider habitat patches in relation to features in the landscape that can be captured as a point, line, or polygon file. Examples of such ancillary features include roads, land ownership parcels, streams, or nesting sites (see the Module 2 – Habitat Analysis section for more detail).

- Output: Habitat Analysis Patch File
- Optional Output: Habitat Priority Planner Report

Module 3: Data Explorer

The Data Explorer module provides an interactive method for exploring, querying, and visualizing patch attribute data. Users can choose a field for analysis, view an associated histogram, and observe basic statistics related to the selected field. This will allow the user to quickly visualize the distribution of the data. Using the histogram, the user can interactively select data pertaining to a specific range of values. The patches (individual polygons) corresponding to the selected data range are then highlighted on the map.

In the advanced mode of the Data Explorer module, queries can be constructed using a selected range of data in the histogram. This process can be repeated on multiple fields, using “AND” and “OR” operators, until the desired query has been established. The histogram is updated showing the data distribution of the selected features. When a user is finished creating a query, a new data layer can be created that matches the query criteria (see the Module 3 – Data Explorer section for more detail).

- Output: Prioritized Habitat Layer
- Output: Selection Query Definition

HPP Installation and Data Requirements

System Requirements

- ESRI's ArcGIS:
- ArcGIS 9.2 or 9.3 Spatial Analyst extension
    - Service Pack 4 or greater
- Microsoft .NET support for ArcGIS
    - Microsoft .NET Framework 2.0 (see installation instructions below)

Installing the Tool

The Habitat Priority Planner (HPP) may be downloaded from the NOAA Coastal Services Center's website at the following location: www.csc.noaa.gov/digitalcoast/tools/hpp/. If you are downloading the new version of HPP, you should uninstall the old version before installing Version 2.

- Select the appropriate version of the tool to download according to the version of ArcGIS your organization supports, either ArcGIS 9.2 or 9.3.
    - The difference between the two is the automatic KML support in the 9.3 version. For version 9.2, KML support is available only with a professional license.
    - To use HPP with ArcGIS 9.2, you must have at least Service Pack 4 installed; please visit the ESRI service center for more information on service packs: http://support.esri.com/.

.NET Installation Instructions

HPP was created for ArcGIS 9.2 and 9.3 and employs Microsoft's .NET Framework 2.0. As a result, users must have the .NET Framework installed in order to run HPP. If users do not have .NET Framework 2.0 installed, the HPP installer will prompt them to do so. The HPP installer will download the necessary files from Microsoft and perform the installation.

ArcGIS arrives pre-packaged as a set of files that must be installed for any application built on the .NET Framework, such as HPP. These files are automatically installed by the ArcGIS installer if the .NET Framework 2.0 is detected on the user's computer. For more information on the ArcGIS .NET support feature, please see the excerpt from the *ArcGIS Desktop Installation Guide* below.

"A .NET Support feature is available for ArcGIS Desktop. The .NET Support feature will **only** be available to install if .NET Framework 2.0 is detected on your computer. If you do not see the .NET Support feature in the Custom installation dialog box, .NET Framework has not been detected on your machine. You can install .NET Framework after installing ArcGIS Desktop, then use **Add/Remove** to add the .NET Support feature to ArcGIS Desktop.

"The .NET resources are not required to use ArcGIS Desktop. The .NET resources are only required to develop a .NET application for ArcGIS Desktop or to use a .NET application that has been developed for ArcGIS Desktop.

".NET Framework Version 2.0 is provided in a DotNet20 folder on the DVD media for your convenience."

Source: *ArcGIS Desktop Installation Guide*, ESRI

Please Note: If your computer ***does not*** have the .NET Support files for ArcGIS, the HPP Installer ***will not*** run. You will see the following warning:

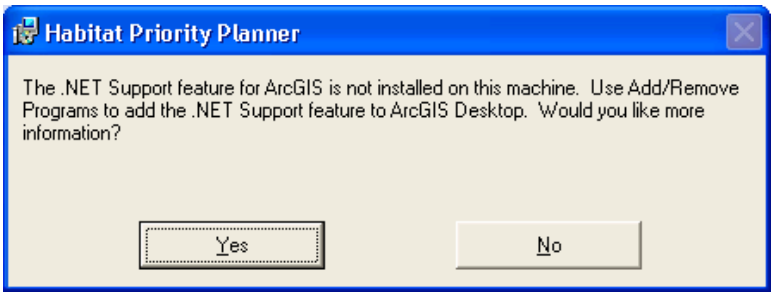


Figure 1. .NET warning for installation

You can install the .NET Support feature for ArcGIS using the steps outlined in the .NET installation instructions above.

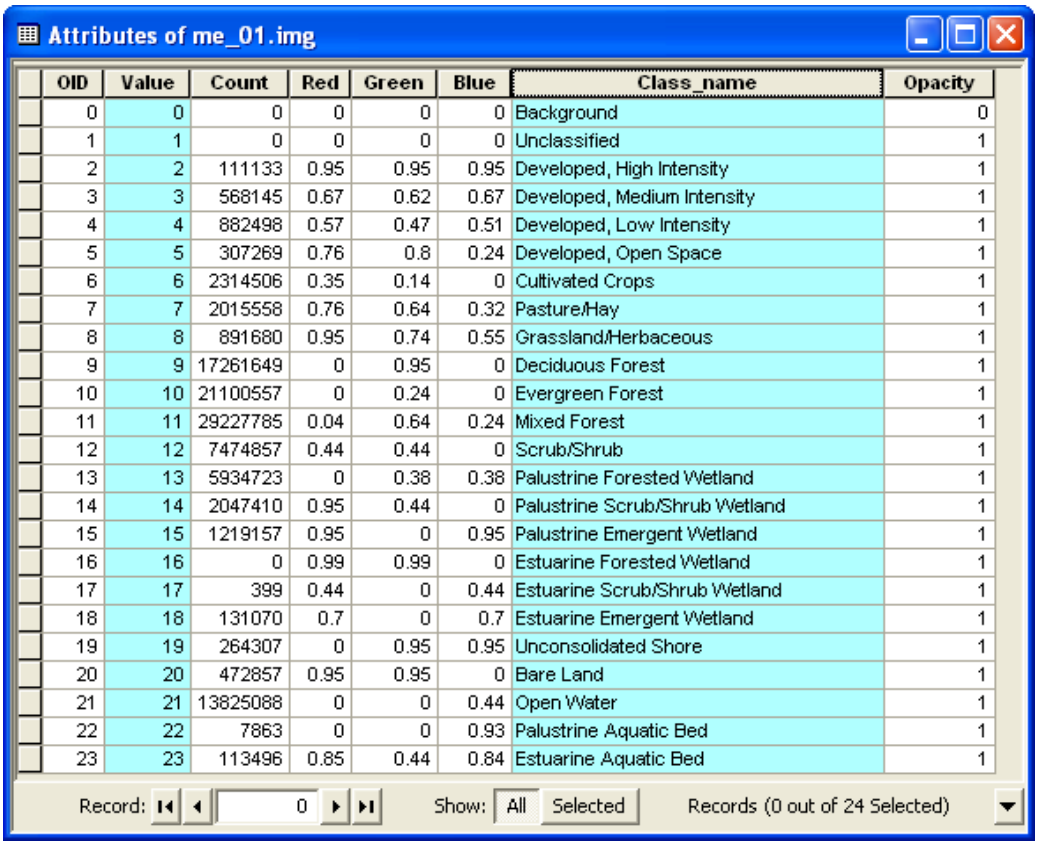
Data Requirements and Format

1. Required

- Land cover data (raster or vector formats accepted)
  - Both types of land cover files must have a ***numeric value field*** that is associated with a distinct land cover type (for example deciduous forest might be assigned a "1" value in the attribute table).
    - The Habitat Priority Planner uses a numeric class field and a corresponding descriptive text field when classifying habitats. If either one of these fields is missing, HPP can be used to generate them (this is described further in Module 1 – Habitat

Classification, Getting Started). See Figure 2 below for an example attribute table for a raster land cover data layer.

- File geodatabase
    - This will be used to store outputs.
    - HPP can be used to create a file geodatabase (See Module 1 – Habitat Classification, Window 6).



Attributes of me_01.img

OID	Value	Count	Red	Green	Blue	Class_name	Opacity
0	0	0	0	0	0	Background	0
1	1	0	0	0	0	Unclassified	1
2	2	111133	0.95	0.95	0.95	Developed, High Intensity	1
3	3	568145	0.67	0.62	0.67	Developed, Medium Intensity	1
4	4	882498	0.57	0.47	0.51	Developed, Low Intensity	1
5	5	307269	0.76	0.8	0.24	Developed, Open Space	1
6	6	2314506	0.35	0.14	0	Cultivated Crops	1
7	7	2015558	0.76	0.64	0.32	Pasture/Hay	1
8	8	891680	0.95	0.74	0.55	Grassland/Herbaceous	1
9	9	17261649	0	0.95	0	Deciduous Forest	1
10	10	21100557	0	0.24	0	Evergreen Forest	1
11	11	29227785	0.04	0.64	0.24	Mixed Forest	1
12	12	7474857	0.44	0.44	0	Scrub/Shrub	1
13	13	5934723	0	0.38	0.38	Palustrine Forested Wetland	1
14	14	2047410	0.95	0.44	0	Palustrine Scrub/Shrub Wetland	1
15	15	1219157	0.95	0	0.95	Palustrine Emergent Wetland	1
16	16	0	0.99	0.99	0	Estuarine Forested Wetland	1
17	17	399	0.44	0	0.44	Estuarine Scrub/Shrub Wetland	1
18	18	131070	0.7	0	0.7	Estuarine Emergent Wetland	1
19	19	264307	0	0.95	0.95	Unconsolidated Shore	1
20	20	472857	0.95	0.95	0	Bare Land	1
21	21	13825088	0	0	0.44	Open Water	1
22	22	7863	0	0	0.93	Palustrine Aquatic Bed	1
23	23	113496	0.85	0.44	0.84	Estuarine Aquatic Bed	1

Record: 0 Show: All Selected Records (0 out of 24 Selected)

Figure 2. Example raster layer attribute table with required fields highlighted. This example uses Coastal Change Analysis Program (CCAP) data from the NOAA Coastal Services Center.

2. Supporting Data

Users have the option of including point, line, or polygon vector data to relate their habitat(s) of interest to external features.

Examples of Supporting Data (not a comprehensive list):

Point Data Layers

- Threatened and endangered animal and plant species
- Critical vegetation
- Community-defined values (e.g., points of historical interest)
- Outfalls (e.g., pollution, treated effluent)
- Invasive species

- Important structures (e.g., schools, churches, shelters)
- Organism population study points
- Water-quality sampling point data

Line Data Layers

- Hydrologic data
- Roads
- Streams
- Elevation
- Sampling transects
- Utilities

Polygon Data Layers

- Parcel data
- Wildfire management
- Land-use types
- Zoning
- Model outputs
- Forecast outputs – threat ratings
- Communities and habitats
- Recreational use areas
- Impervious surfaces
- Flood zones
- Soils
- Census data
- Community-defined landscape values
- Political and voting boundaries
- Socioeconomic data
- Hazardous waste sites

Module 1 – Habitat Classification

Getting Started

Upon successful installation of the tool,

- ❑ Open ArcGIS,
- ❑ Select the **View** menu,
- ❑ Navigate to toolbars, and
- ❑ Select **Habitat Priority Planner**. The toolbar will then be added to the ArcGIS window.

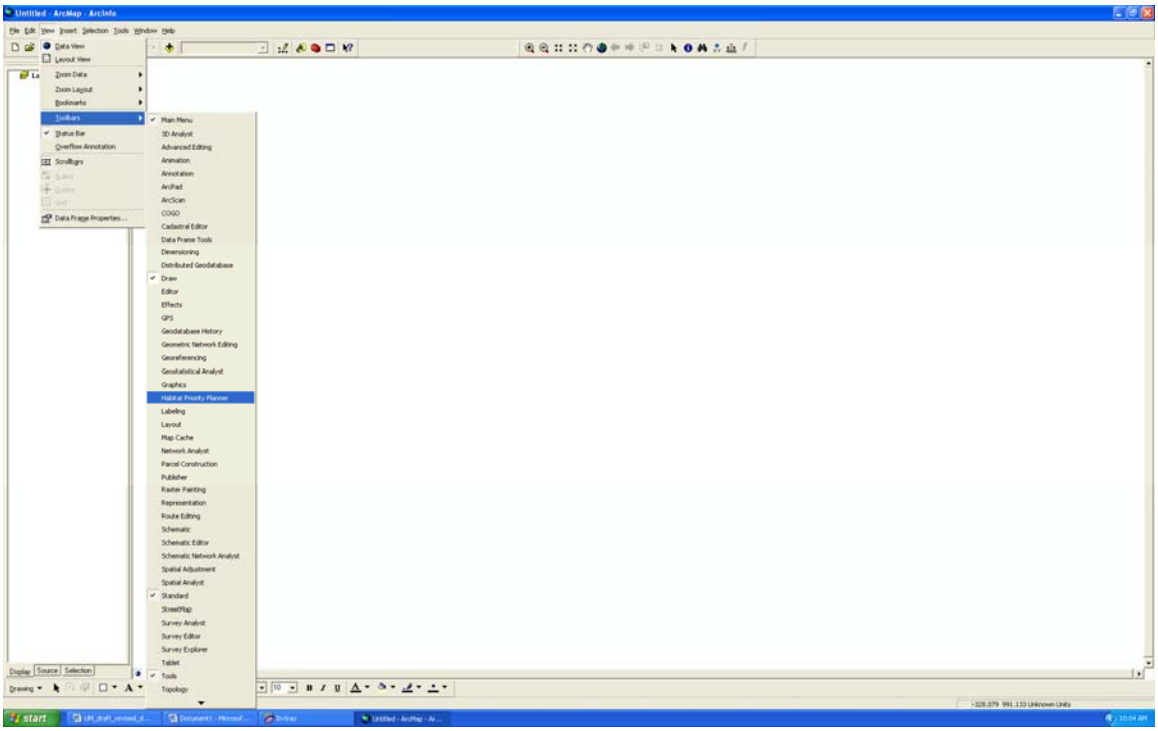


Figure 3. Adding the Habitat Priority Planner to your toolbar

- ❑ Before opening the Habitat Classification component, add the land cover layer that you wish to use to the map by using the **Add Data** icon.

Potential Data Inputs

- NOAA Coastal Change Analysis Program (www.csc.noaa.gov/digitalcoast/data/landcover.html)
- National Land Cover Data (www.usgsquads.com/prod_NLCD.htm)
- National Wetlands Inventory Data (www.fws.gov/wetlands/)
- Gap Analysis Program (http://gapanalysis.nbii.gov/portal/server.pt)

Window 1: Habitat Patch File Type

- ❑ From the Habitat Priority Planner toolbar, Select **Classify Habitats**.

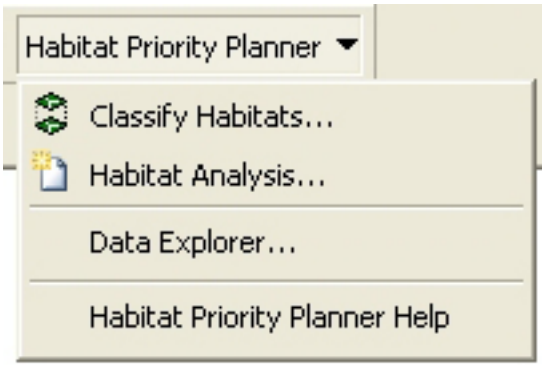
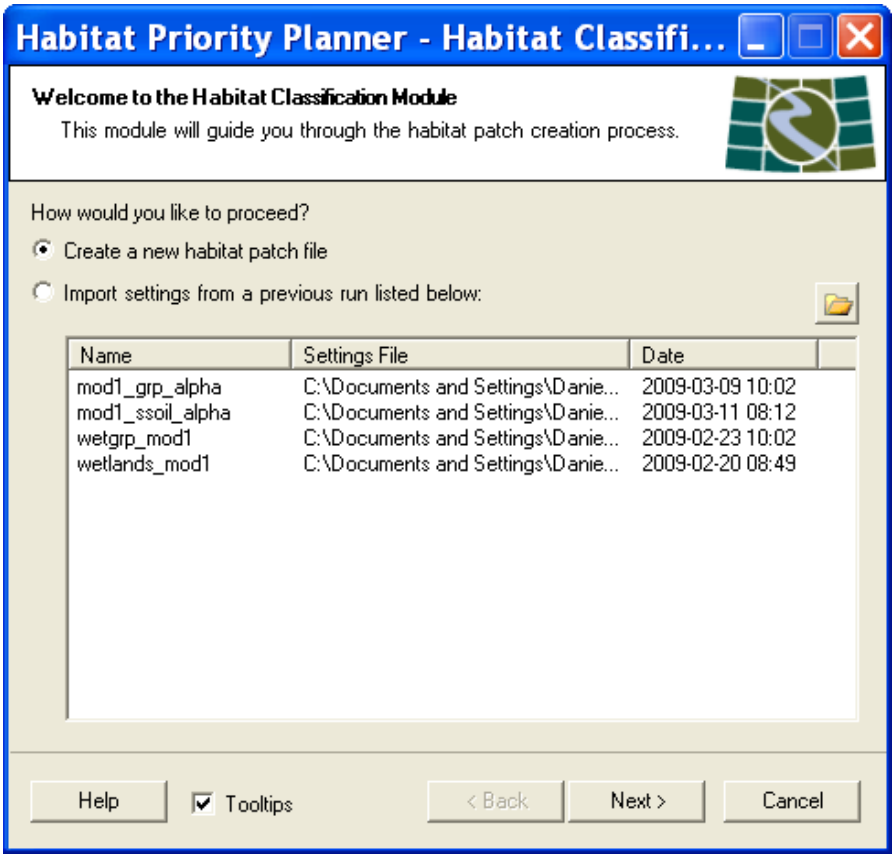


Figure 4. The Habitat Priority Planner toolbar and its three associated modules

- ❑ **Select** either "Create a new habitat patch file," or "Import setting from a previous run." Previous runs will be listed in the window, if any are available.
  - ➢ ***Note: the user has the option of turning the Tooltips on or off at the bottom of the screen.***



Importing Settings
This is a useful feature if you would like to preserve a classification type, or land-use change scenario, to be applied to a new analysis. Be sure to name the edited version a new

Figure 5. Window 1 of the Habitat Classification module

Importing Settings

- If using existing settings, HPP will retrieve those settings from a previous run that is selected.
- Existing settings are useful if you need to re-run data for reasons such as changing your classification scheme or running a land-use scenario change.
- The existing settings list will be empty until you have completed at least one run.
- Completed runs of the first module are automatically saved and will appear in this list.

❑ Click **Next**.

Window 2: Land Cover Data and Analysis Extent

The second window allows the user to select the dataset and the extent of the area to be analyzed (see figure below).

❑ Select your desired land cover layer from the Land Cover Dataset drop-down menu. This list will be pre-populated from your ArcGIS table of contents.

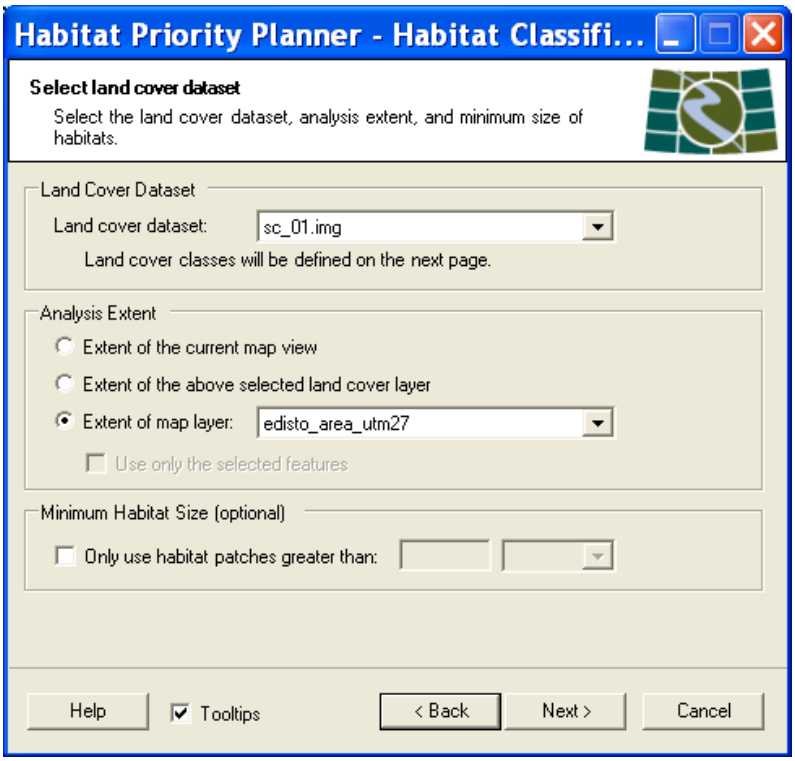


Figure 6. Window 2 of the Habitat Classification module

Accessing C-CAP Data
Coastal Change Analysis Program (C-CAP) data are a product of the NOAA Coastal Services Center. C-CAP products are part of a nationally standardized database of land cover and change information, developed using remotely sensed imagery for the coastal regions of the U.S. To download C-CAP data for free from the NOAA Web site, go to www.csc.noaa.gov/digitalcoast/data/landcover.html.

❑ Projecting your coordinate system . . .

You will only be prompted to complete this step if your data are ***not*** projected. Otherwise, skip to the next step to select your analysis extent.

- If your file is ***not*** projected, then you will receive a warning when you select the file in the land cover dataset drop-down menu. HPP will then give you the option to define the projection.

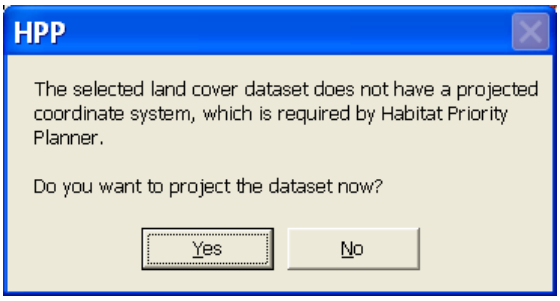


Figure 7. Define projection warning box

- If you select Yes to define your projection, the tool will take you to the ArcGIS projection toolbar (see figure below).
- Select your dataset from the Input Dataset or Feature Class drop-down list.
- The Input Coordinate System box will be automatically populated by Arc to reflect the layer's properties.
- The Output Dataset or Feature Class box will be automatically populated. This designates where the output file will be saved and what it will be named.
- You can change where the file is saved by selecting the browse tool, and you can also rename the output.
- If you allow the tool to keep the default name of the file, the original layer name will be followed by '_project.' This allows you to recognize the file as the new version.

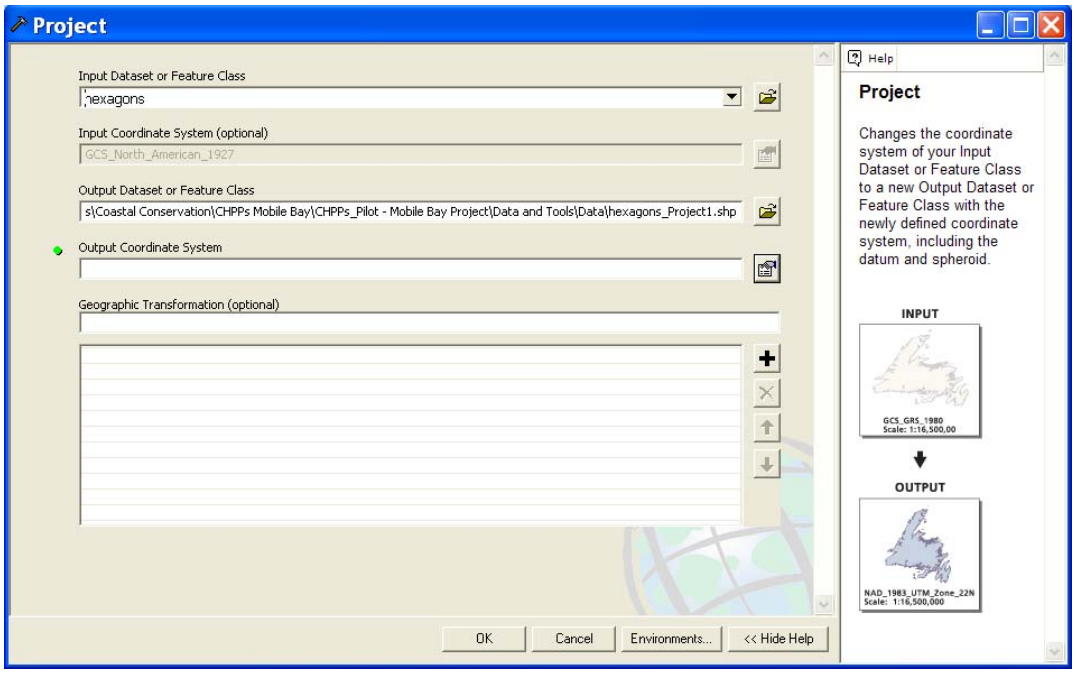


Figure 8. Projection tool from ArcGIS. HPP links users who do not have projected data to this tool.

- Click the button next to the **Output Coordinate System** box shown in the Figure 8; this allows the user to define the output projection.
- The window shown in Figure 9 will open, which allows the user to either . . .
    - Select the preferred coordinate system, or
    - Import a system from another file.

➢ ***Note: To promote accurate data management, we recommend checking each data file used in HPP for projection accuracy and consistency.***

- Click **OK** once you have selected the appropriate coordinate system.
- Click **OK** again once you are back in the Project window, unless you need to perform a transformation.

➢ ***Note: if you need more information on projecting your data for use in HPP, please access the ESRI website at http://support.esri.com/ or join the HPP e-mail list and ask the project team (www.csc.noaa.gov/mailman/listinfo/hpp-support).***

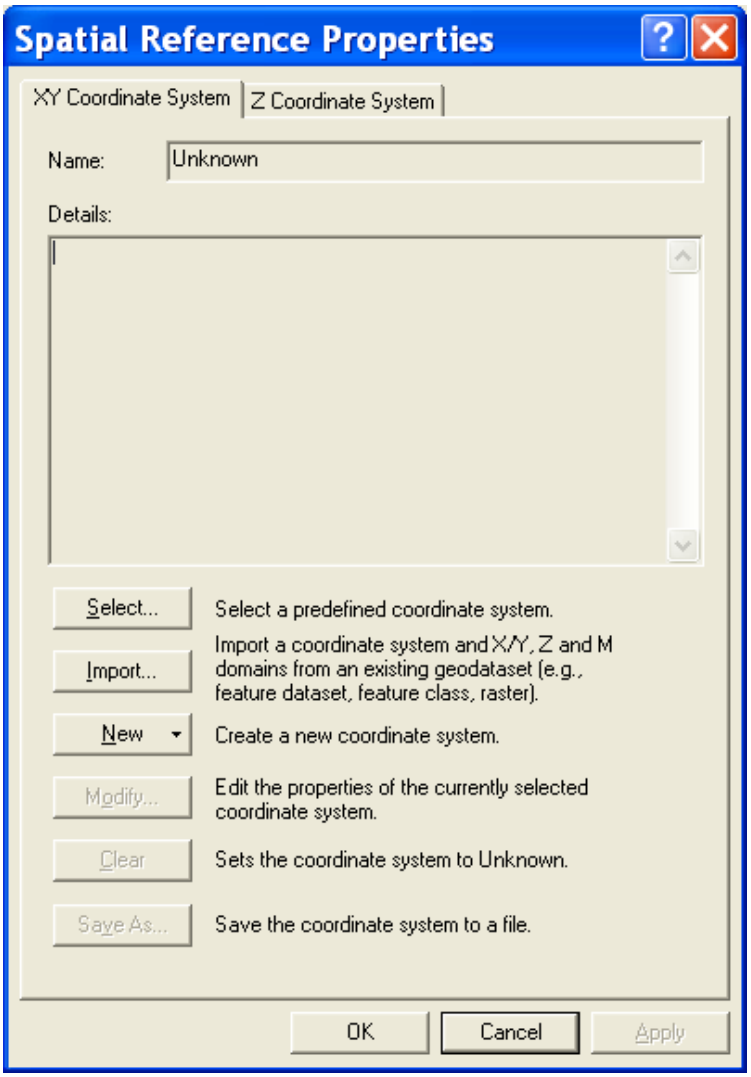
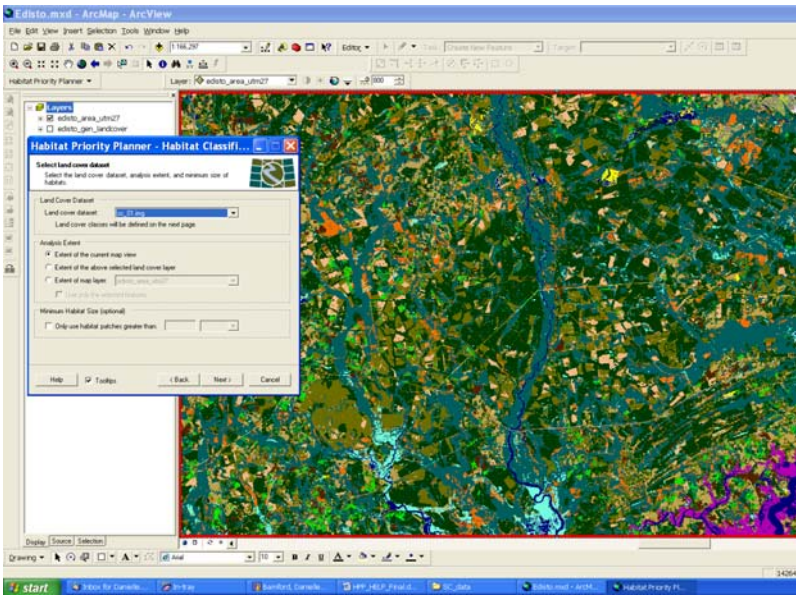


Figure 9. The output coordinate system window for designating the projection of a file

- ❑ Select your analysis extent. Users have three options for choosing the analysis extent.
  - "Extent of the current map view" creates a habitat patch file of the portion of the land cover layer visible in ArcMap, as outlined below in red (Figure 10).



CAUTION!
The number and complexity of polygons being created in this step will increase the time required to run. We do not recommend using the option "Extent of the above selected land cover layer" for C-CAP or other large datasets. The largest set that the tool has successfully classified contained 250,000 records.

Try clipping the landcover data, or zooming in to a **small focused study area**.

Figure 10. C-CAP data showing extent of current map view. Red box around map window designates the area that will be analyzed in the "Extent of the current map view" method.

  - The "Extent of the above selected land cover layer" option analyzes the entire land cover layer that you have selected. Using this analysis extent is recommended for land cover layers covering smaller areas (a county or watershed, for example) (Figure 11).

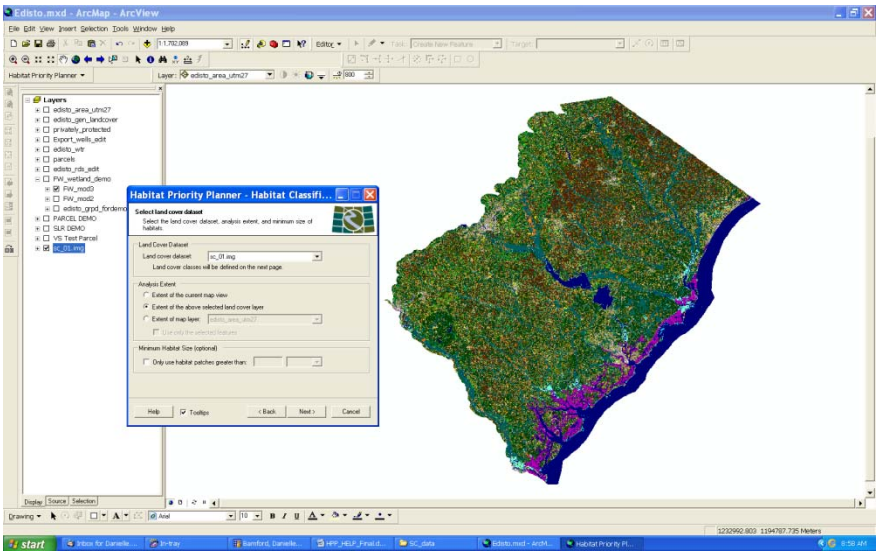


Figure 11. C-CAP data showing "Extent of the above selected land cover layer"

- "Extent of Map Layer" allows users to set the analysis extent of a polygon map layer. The polygon layer used must have a single polygon, or have multiple, adjacent polygons (see description and figures below) (Figures 12 and 13a/13b).

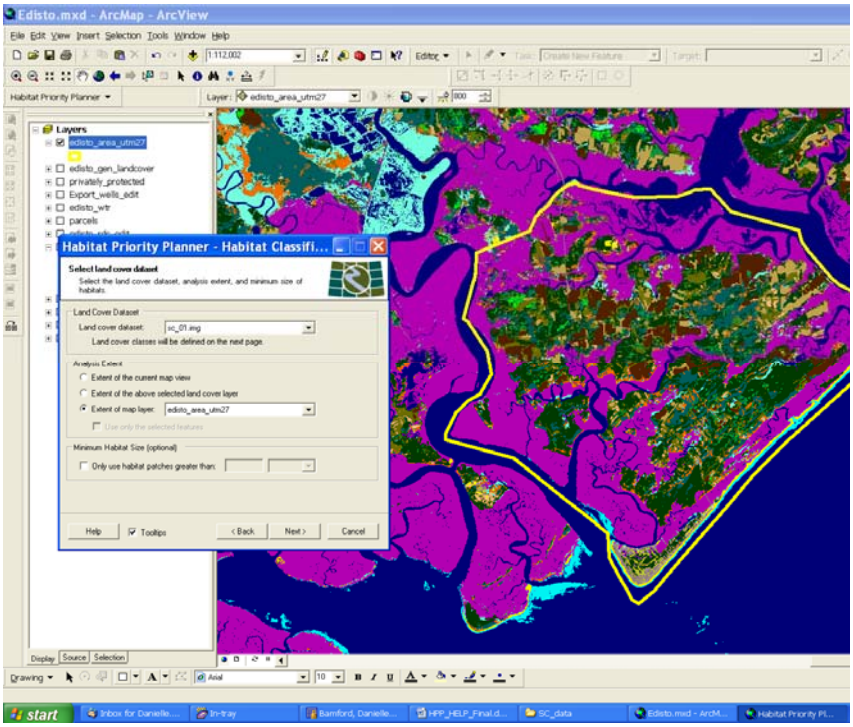


Figure 12. The yellow line outlines an appropriate "map layer" extent for analysis.

CAUTION!
Using an entire map layer may result in extended processing times similar to those encountered in using entire land cover datasets. It is recommended that you limit your study area. You also have the option of using only selected features for your layer. Selected polygons **must be adjacent**.

Using Polygon Layers for your Analysis Extent

- ❑ If you have an existing polygon layer, add it to the map. If you do not have a polygon layer, but would like to create one, see the tip below.
- ➢ ***Polygon layers can have more than one polygon, but the polygons must be <u>adjacent</u> to one another for ArcMap to make the necessary calculations.***

Creating a Shapefile
Open ArcCatalog. In the Catalog Tree, navigate to the folder where you will store your data. Click on the folder name. In the main Catalog view, right-click and select New from the menu, then select Shapefile. Give the file an appropriate name, and select whether it will be a point, polygon, line, or polyline file. To give the shapefile a spatial reference, click Edit. If you know the Coordinate System for your study area, you may click Select and locate the correct Coordinate System. If you would like to use a coordinate system established in another shapefile, click Import, and you can navigate to a shapefile in your study area.

Figure 13a. A polygon layer with non-adjacent polygons ***cannot*** be used to define the analysis

Figure 13b. A polygon layer with adjacent polygons ***can*** be use to define the analysis extent.

- ❑ **Select** a minimum patch size ***(optional)***
  - Choosing this option and entering a number and desired units will eliminate patches that the user deems too small to be useful.
  - If you want to analyze habitat patches of all sizes, simply leave the box unchecked and click **Next**.

    ***Example*:** your project goals may only specify patches of habitat that are 25 acres in size or larger. Smaller patches of habitat may not be applicable to your project.
    - Enter 25 in the text box and select Acres from the Units drop-down menu to remove analysis patches that are less than 25 acres in your final habitat patch file.

Window 3: Selecting Land Cover Classes

The third window allows the user to select the numeric, value, and description or name field associated with each of your land cover types. These values and names will vary depending on the raster or vector dataset used as your primary input for HPP (Figure 14). In the output's attribute table, the value will appear as HPP_Cls_Value and the name field will be called HPP_Cls_Name. The tool can also assist users in generating both the value and name fields associated with their data if these fields are not available in the attribute table, or if these features are associated with another, similar dataset.

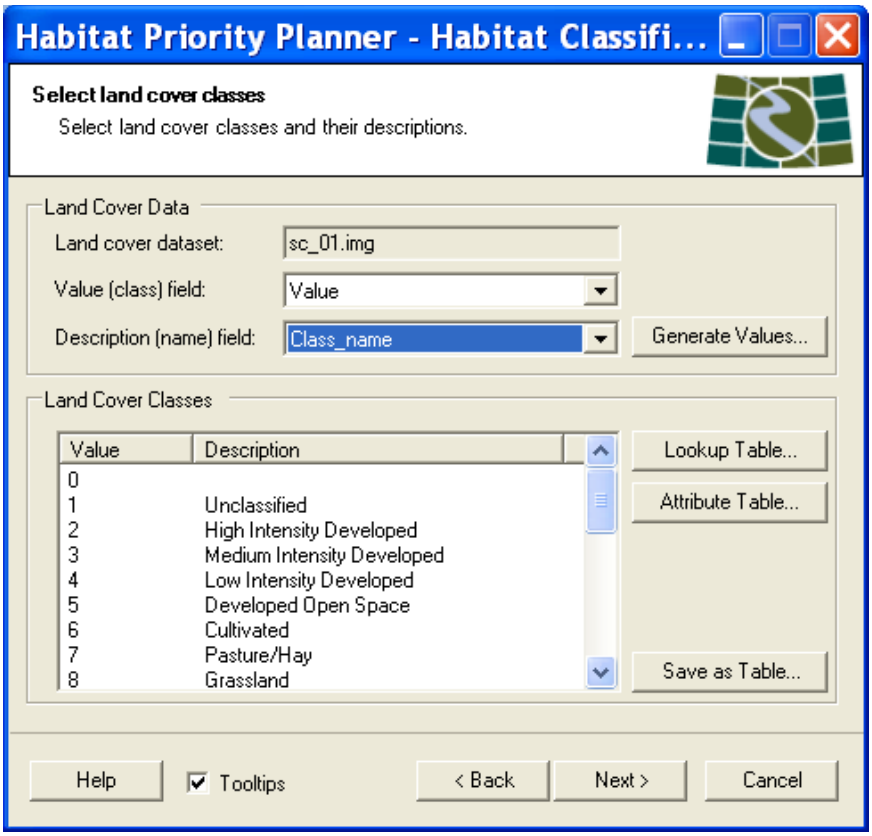


Figure 14. Window 3 allows users to designate their land cover class field of interest from the land cover dataset. The user can either use fields from the dataset attribute table or import information. In this example, a C-CAP file was used, which automatically contains a value and description field called Class_name.

- ❑ Select a **Value (class) field** from the drop-down menu if your attribute table contains this information. The value field is a numerical value assigned to each land cover type in the layer. Each land cover type must have a unique value associated with it. If you ***do not have a value field***, use the steps below to generate your values.
    - If you ***do not*** have a value or numeric field associated with your data, first, select the description field that serves as your unique identifier for your land cover classes.

        If you do not have land cover names, or codes (a mix of numbers and letters that serve as a unique identifier), skip to step 5.
    - Click **Generate Values**, and the window below will open.

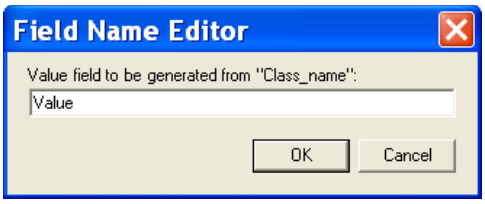


Figure 15. The add values window. This window creates a new field that HPP will use for your value. Your land cover dataset will display a new field that serves as your unique identifier.

- Name the field, or leave it as is. This field will serve as your value field for analysis.

❑ Next, select the appropriate field from the **Description (name) field** drop-down menu. This is an ***optional*** designation. If you wish to only identify your land cover classes by the unique value, you may. If you used a descriptive field to generate your value field, then this will already have been populated, and you should skip to Window 4.

- The name field is a text description corresponding to the selected value. Users can skip this step if they would like to use the numeric value field ***only*** to designate their land cover classes.
- The user also has several options for generating a description field if the dataset does not have this feature (see figure 12.)

❑ If you ***do not*** have either a ***value*** or a ***descriptive field***, then you can create them.

- Using a lookup table allows the user to load land cover class names from an external table**.** The tool allows the user to browse for this table. (See Figure 16 below)
  - Click the **Lookup Table** button.
  - Browse to the table of interest.
  - Select the value field.
  - Select the name field (optional).
  - Click **Ok**.
- Using an attribute table allows the user to compile a list of land cover classes from the attribute table of another existing map layer. The user can browse for the appropriate file.
  - **Click** the **Attribute Table** button.
  - Select the layer that contains the attribute table of interest.
  - Select the value field.
  - Select the name field (optional).
  - Click **Ok**.

- The information from your lookup or attribute table will be added to the HPP window.

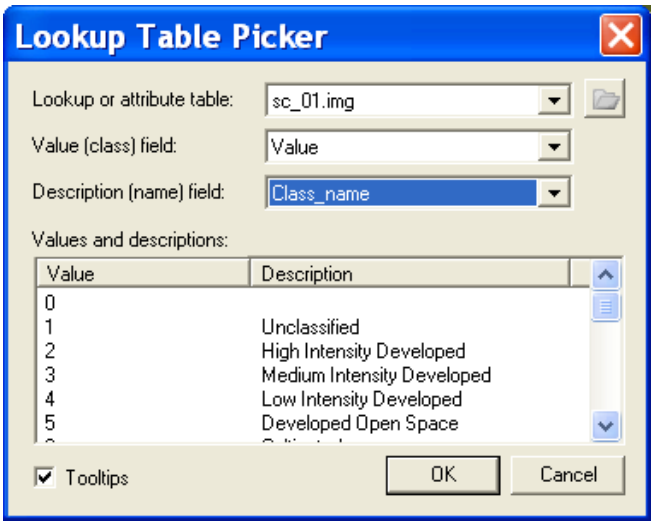


Figure 16. Lookup table or attribute table access window for developing land cover class names. This window will appear if you select Lookup Table or Attribute Table under the Land Cover Classes portion of Window 3.

❑ Click **Next** at the bottom of the third window once you have designated your value and descriptive fields.

Window 4: Classification Type

The fourth window allows users to select how they would like to classify the habitats in their study area. There are three options for habitat classification: Simple, Unique, and Grouped.

Simple Classification – The selected land cover classes are designated as "habitat." Any land cover classes that are not selected ***will not*** be analyzed (Figures 17 and 18). All habitats types selected will be grouped together in the results as habitat.

❑ Click the radio button next to **Simple**. HPP will populate a list of all available land cover types based on the name field that you selected in the previous window.

❑ Check the boxes next to land cover types that represent your desired habitats for analysis. These land covers will be considered "habitat" in the simple classification.

- *Unchecked* land cover types will ***not*** be considered in the analysis; they will be removed as non-habitat.

***Example*:** your group may be interested in conserving habitat for the endangered red-cockaded woodpecker. This bird species nests in mature pine forests, so you

may wish to choose Evergreen Forest as the type of habitat you would like to consider. All other land cover types would be excluded.

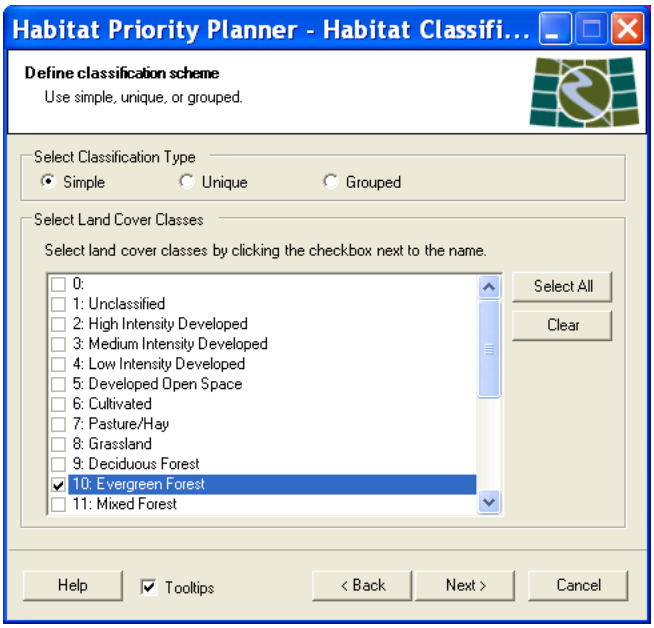


Figure 17. Simple classification window

Multiple Types and Simple Classification
If we had selected several different land cover classes during the simple analysis, for example, multiple forest types, the results would be grouped into one class called "habitat."

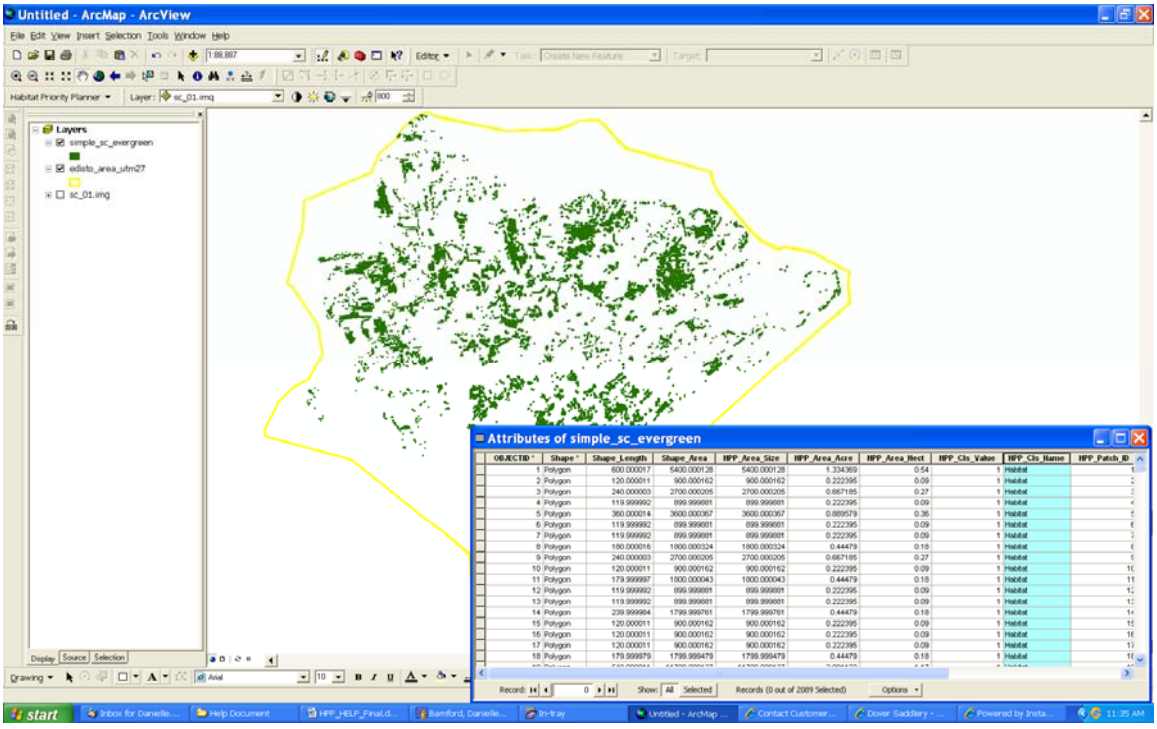


Figure 18. The output of a simple classification: a habitat patch file. The attribute table displays the "habitat" designation in the field HPP_Cls_Name.

Unique Classification – The unique classification scheme will consider all ***selected*** land cover types to be "habitat." In the final results, each type is uniquely preserved in its

native designation from the land cover dataset. This allows the user to select only those that are important to their analysis, and to maintain the designations from the original dataset. This may be used in several ways.

- ❑ Click the radio button next to **Unique**.
- ❑ Check the boxes next to land cover types that meet your habitat criteria; these land covers will be considered "habitat" in the simple classification.
    - If you wish to perform a detailed analysis of your study area, the unique classification may be used to examine ***all*** of the land cover classes, and the names will be preserved as is from the raster layer.
    - *Unchecked* land cover types will ***not*** be considered in the analysis; they will be removed as non-habitat.

***Example*:** you may wish to consider the various levels of developed spaces in your study area. Check the boxes next to High Intensity, Medium Intensity, Low Intensity and Developed Open Space if you are using C-CAP data. This will give you the maximum classification detail regarding development from your raster layer in your final classified habitat patch file.

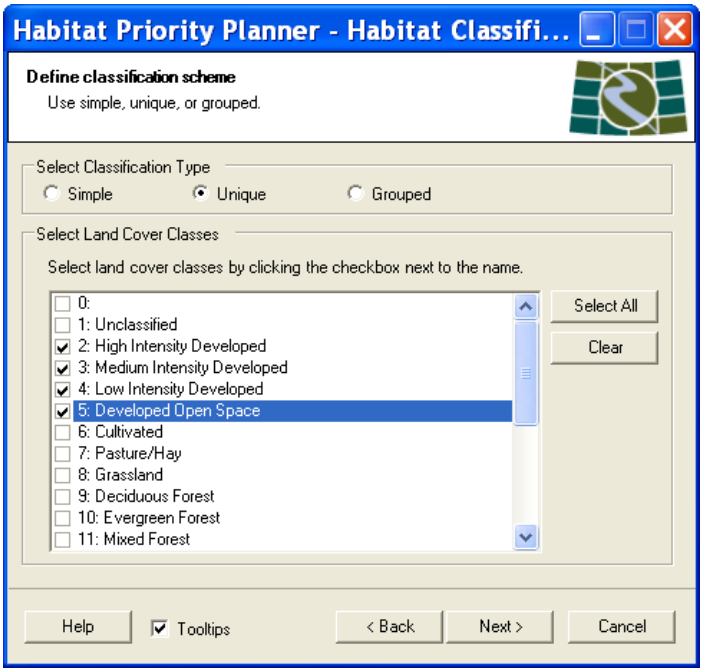


Figure 19. Unique classification

Tip
When running a detailed unique classification, processing time can be decreased by removing classes such as "background," "unclassified," or "open water."

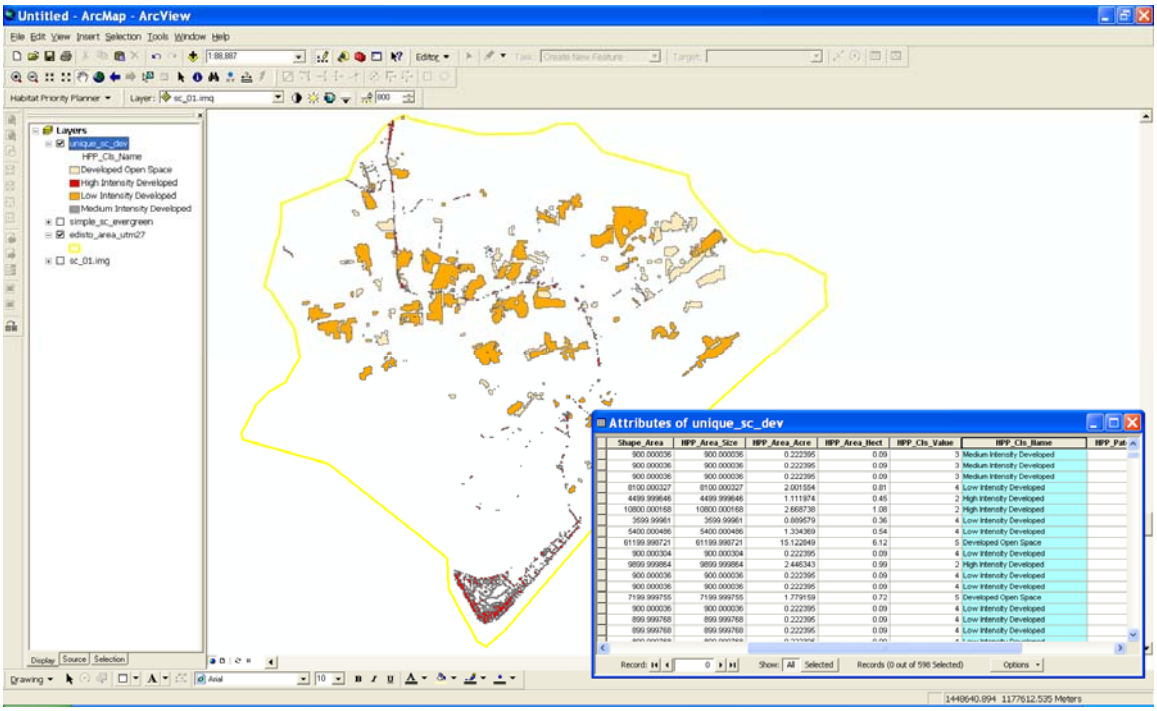
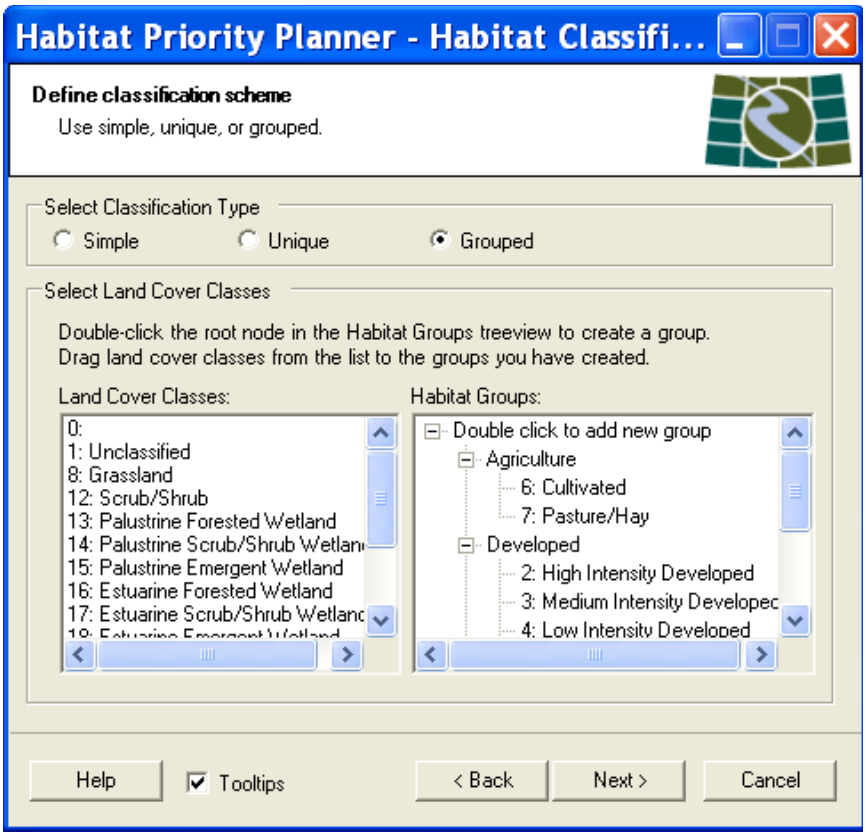


Figure 20. The output of a unique classification: a habitat patch file. The attribute table displays the text descriptions in the field HPP_Cls_Name, these are identical to the land cover layer. Note that any land cover types not selected in the wizard are not included in this output

Grouped Classification – The grouped classification gives users the opportunity to compile land cover types into logical groups.

- ❑ Click the radio button next to **Grouped**.
- ❑ In the "Habitat Groups" box, double-click to add a new group.
- ❑ Name your new group with a logical name (e.g., "forest").
    - Be sure to name each group in a unique manner, the attribute table will use this name in the HPP description field (HPP_Cls_Name).
- ❑ Drag and drop the desired land cover types over to the group name to add them to that group.
- ❑ To remove a land cover type from a group, right-click on the desired land cover type and select delete, or press the delete key on your keyboard.

***Example*:** you may wish to consider all developed land together as one class, all upland forest types together as one class, and all agricultural land cover types as one class. You would create three groups; Developed, Forest, and Agriculture. Then you would drag and drop the relevant land cover classes into each group.



Tip
When running a grouped classification, drag the land cover classes ***directly over*** your group name to add to a group.

Figure 21. Grouped classification window of HPP

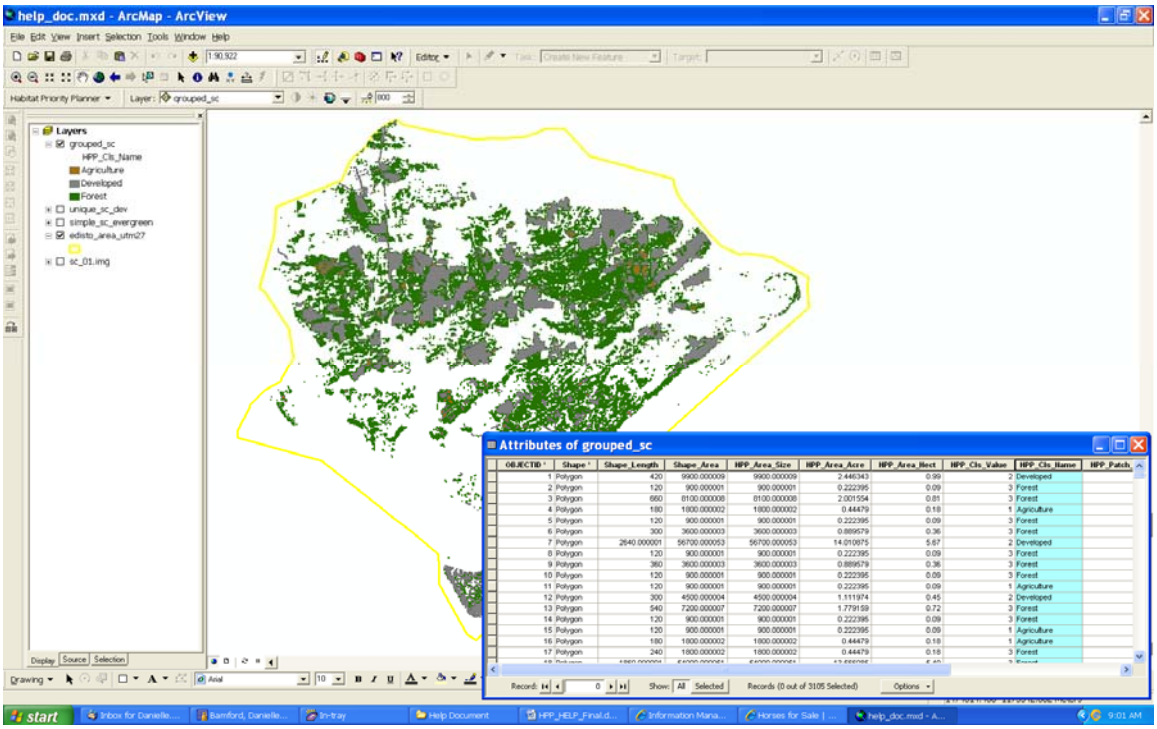


Figure 22. The output of a grouped classification: a habitat patch file. The attribute table displays the group names as designated in the field HPP_Cls_Name.

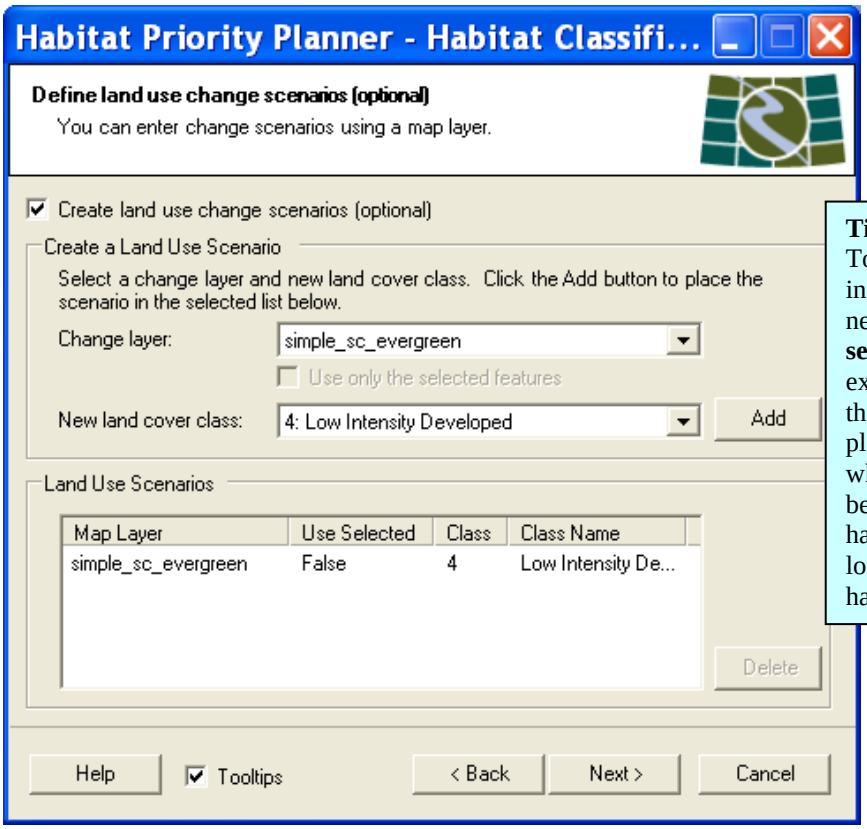
Window 5: Land Use Change Scenario (optional)

This optional feature uses a polygon layer to apply a selected change to the land cover layer. This process does not edit your raster layer; the changes are made to the habitat patch file, and the change will be displayed in the output for the Habitat Classification module.

> ***Example*:** Change scenarios may be useful for planning purposes. You may wish to examine how restoring pastures to forest will affect the landscape. Or, you may want to see how proposed development in areas with rare species may affect the landscape.

Creating a Land Use Scenario

- ❑ Click the **Create land use change scenarios** box.
- ❑ Select a polygon layer from the **Change layer** drop-down menu**.**
  - This drop-down will populate from layers already loaded into ArcMap.
  - The layer you select will denote the area to be reclassified.



Tip
To look at specific features in a layer, click the box next to **Use only the selected features**. For example, you may know that development is being planned in a specific area where rare wildlife has been sighted, so you don't have to look at every location that rare species have been sighted.

Figure 23. The land use change scenario window

- **Select** the new land cover class by selecting a value in the **New land cover class** drop-down menu. The new land cover class options will populate from the land cover raster that you loaded in the beginning of Module 1.
  - ***It is important that the new land cover class or change class be one that was included in your unique, simple, or grouped classification.***

    ***Example*:** You may be interested in what would happen to the landscape function if you restored a specific agricultural area (depicted in Figure 24, tan crosshatch) to the native forest type. On the left we have the grouped habitat results before the change: tan hatch represents agriculture, blue represents wetland, and green, forest types. On the right we can see the results of restoring select patches to forest. We can then look at the statistics and results that this land use change might have for the overall landscape.

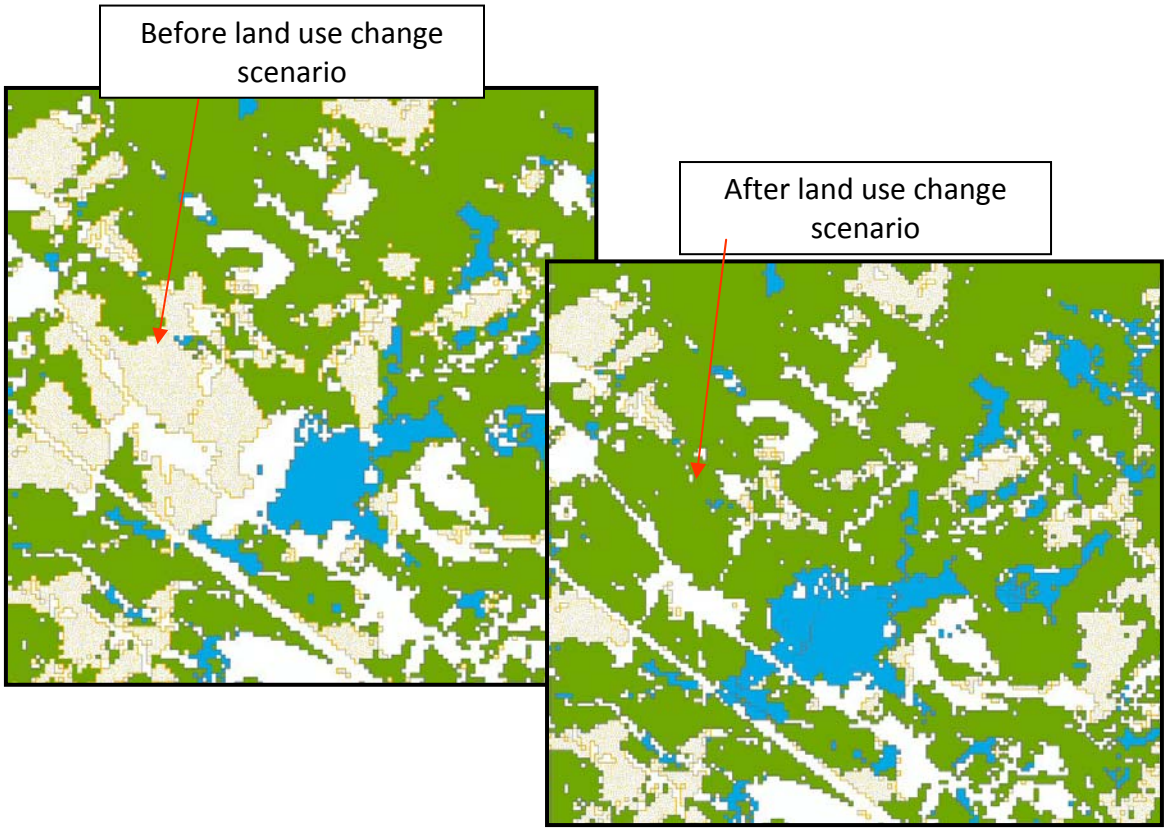


Figure 24. Land use change scenario example: the classified habitat patch file on the left is prior to change. The habitat patch file on the right is post-change, where several agricultural patches were changed to forest.

  - ***Note: Refer to Appendix C for another example application of the use of the land use change scenario.***

Window 6: Save Your Work

This window allows the user to select an output file location and designate an appropriate name for the habitat patch file.

- ***HPP outputs must be stored in a file geodatabase.***

- ❑ Name the habitat patch file using the **Patch layer name** box.
  - This will name the layer as it will appear in the table of contents of the ArcMap window.
  - Naming conventions should allow users to relocate files, and we recommend naming files based on which module the file is a result of.

    ***Example*:** if you run a unique classification on three types of developed land cover, you might name the file "unique_developed_mod1."

  - ***Note: Use a unique name for each file, even if you are re-creating a previous run, otherwise you will receive an error message!***

- ❑ Navigate to or type the location where the habitat patch file will be saved.
  - Click on the file folder to navigate to your file geodatabase to save the habitat patch file.
  - If you do not already have a file geodatabase for saving your outputs, then you can click on the **Create File Geodatabase** button. HPP will open a window allowing you to navigate to the folder where you would like to save your work, and then you can name your file in the **File name** box (Figure 26).

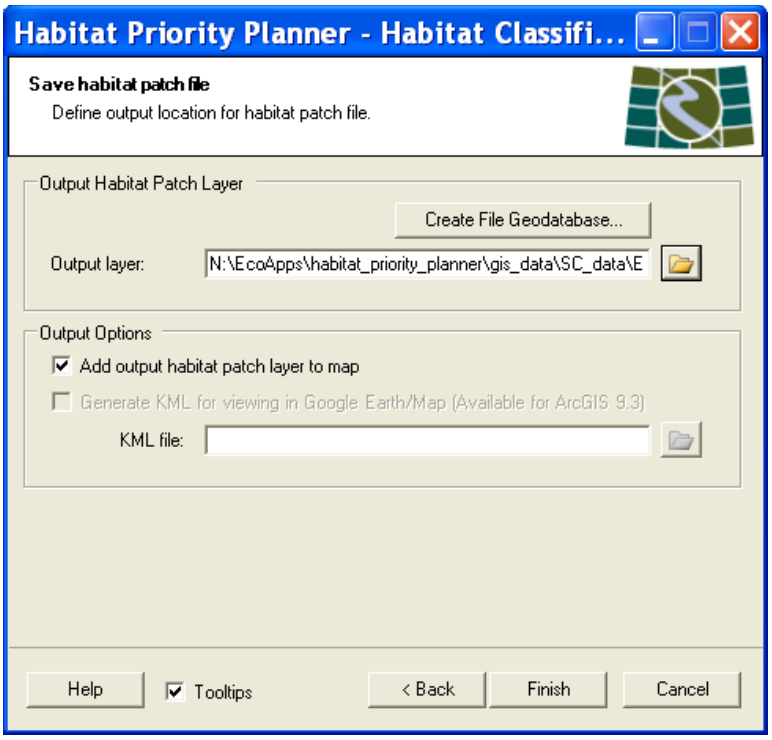


Figure 25. Saving your habitat patch file in Module 1

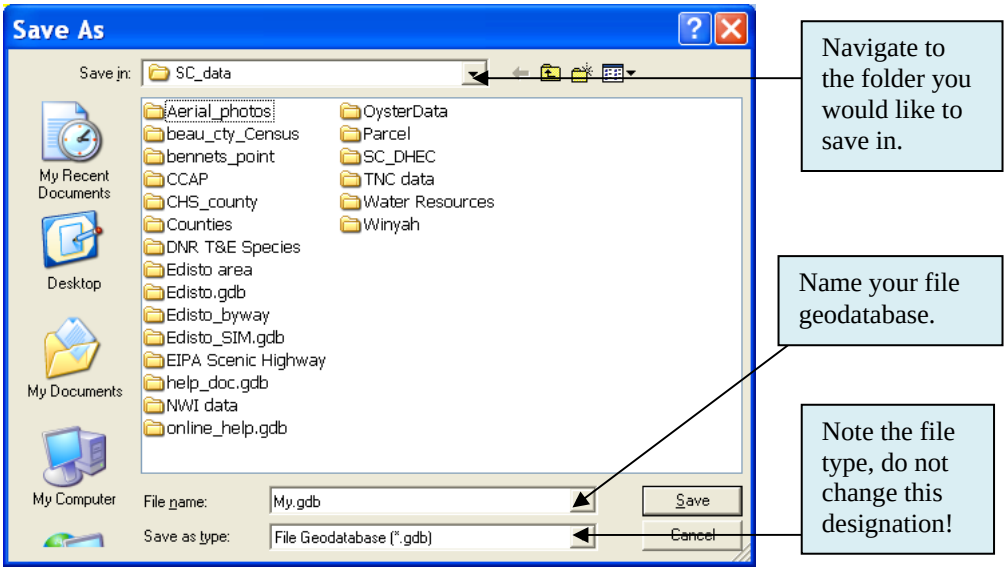


Figure 26. Creation of a file geodatabase within HPP. The window shown above will appear if you select Create File Geodatabase in HPP.

- ❑ Output Options
  - If you have ArcGIS 9.3, you can save your file as a KML file for use in GoogleEarth, as well as save a shapefile to your file geodatabase for use in ArcGIS.

- The box for “add habitat file to map” will automatically be checked and will create a new map layer of your data.

❑ Click **Finish**, and HPP will process the data to create the habitat patch file.

> **Tip**
> After clicking the Finish button, please be patient! Depending on the analysis area selected, the run may take some time. Also, limit the use of other applications at this time. If you are running a very large or complex analysis area, leave the application to run overnight.

Habitat Classification Outputs

The Habitat Patch File

- After completion of the Habitat Classification module, users will have a classified polygon layer based on their defined classification scheme.
- Figure 27 displays a grouped classified patch file, where three types of land use functional groups were created: Agriculture, Developed, and Forest.

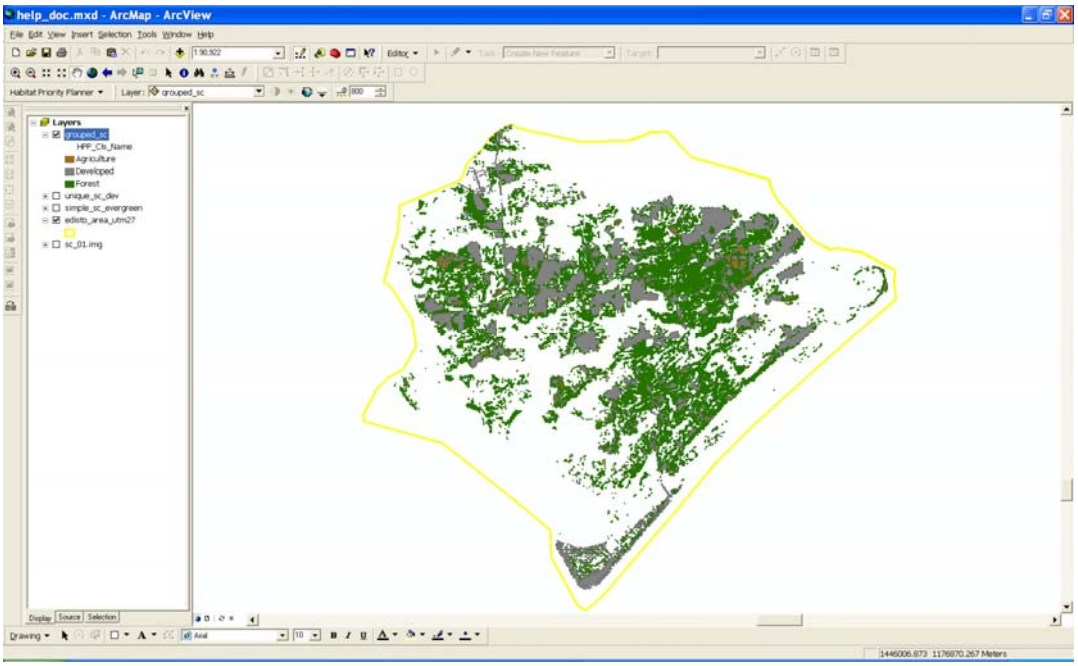
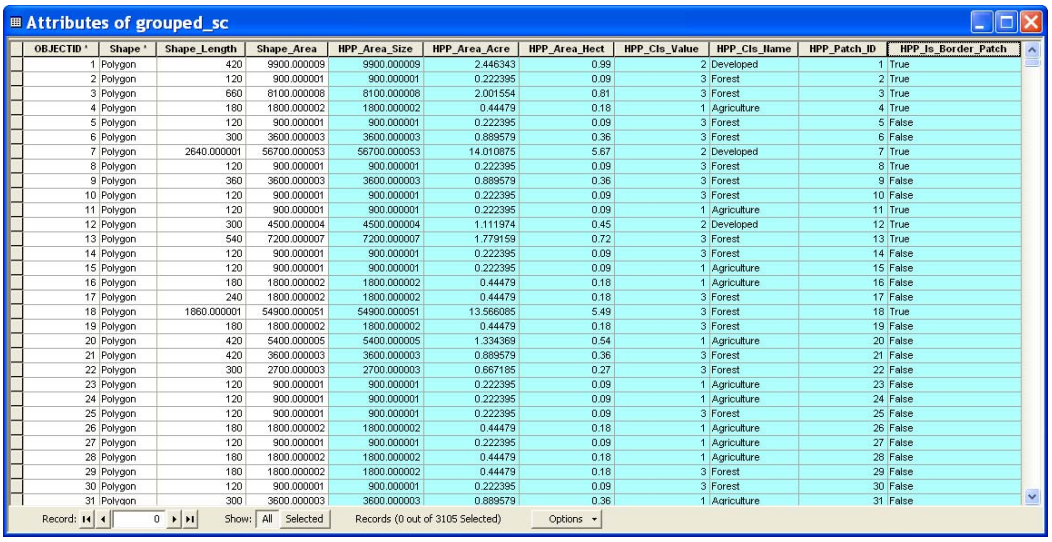


Figure 27. A completed "grouped" classified habitat patch polygon file.

- The attribute table of the patch file will now have several appended fields to reflect the additional information generated by the HPP (Figure 28).
- These appended fields provide the user with more information and the fields necessary for the Habitat Analysis module.



Attributes of grouped_sc

OBJECTID *	Shape *	Shape_Length	Shape_Area	HPP_Area_Size	HPP_Area_Acre	HPP_Area_Hect	HPP_Cls_Value	HPP_Cls_Name	HPP_Patch_ID	HPP_Is_Border_Patch
1	Polygon	420	9900.000009	9900.000009	2.446343	0.99	2	Developed	1	True
2	Polygon	120	900.000001	900.000001	0.222395	0.09	3	Forest	2	True
3	Polygon	660	8100.000008	8100.000008	2.001554	0.81	3	Forest	3	True
4	Polygon	180	1800.000002	1800.000002	0.44479	0.18	1	Agriculture	4	True
5	Polygon	120	900.000001	900.000001	0.222395	0.09	3	Forest	5	False
6	Polygon	300	3600.000003	3600.000003	0.889579	0.36	3	Forest	6	False
7	Polygon	2640.000001	56700.000053	56700.000053	14.010875	5.67	2	Developed	7	True
8	Polygon	120	900.000001	900.000001	0.222395	0.09	3	Forest	8	True
9	Polygon	360	3600.000003	3600.000003	0.889579	0.36	3	Forest	9	False
10	Polygon	120	900.000001	900.000001	0.222395	0.09	3	Forest	10	False
11	Polygon	120	900.000001	900.000001	0.222395	0.09	1	Agriculture	11	True
12	Polygon	300	4500.000004	4500.000004	1.111974	0.45	2	Developed	12	True
13	Polygon	540	7200.000007	7200.000007	1.779159	0.72	3	Forest	13	True
14	Polygon	120	900.000001	900.000001	0.222395	0.09	3	Forest	14	False
15	Polygon	120	900.000001	900.000001	0.222395	0.09	1	Agriculture	15	False
16	Polygon	180	1800.000002	1800.000002	0.44479	0.18	1	Agriculture	16	False
17	Polygon	240	1800.000002	1800.000002	0.44479	0.18	3	Forest	17	False
18	Polygon	1860.000001	54900.000051	54900.000051	13.566085	5.49	3	Forest	18	True
19	Polygon	180	1800.000002	1800.000002	0.44479	0.18	3	Forest	19	False
20	Polygon	420	5400.000005	5400.000005	1.334369	0.54	1	Agriculture	20	False
21	Polygon	420	3600.000003	3600.000003	0.889579	0.36	3	Forest	21	False
22	Polygon	300	2700.000003	2700.000003	0.667185	0.27	3	Forest	22	False
23	Polygon	120	900.000001	900.000001	0.222395	0.09	1	Agriculture	23	False
24	Polygon	120	900.000001	900.000001	0.222395	0.09	1	Agriculture	24	False
25	Polygon	120	900.000001	900.000001	0.222395	0.09	3	Forest	25	False
26	Polygon	180	1800.000002	1800.000002	0.44479	0.18	1	Agriculture	26	False
27	Polygon	120	900.000001	900.000001	0.222395	0.09	1	Agriculture	27	False
28	Polygon	180	1800.000002	1800.000002	0.44479	0.18	1	Agriculture	28	False
29	Polygon	180	1800.000002	1800.000002	0.44479	0.18	3	Forest	29	False
30	Polygon	120	900.000001	900.000001	0.222395	0.09	3	Forest	30	False
31	Polygon	300	3600.000003	3600.000003	0.889579	0.36	1	Agriculture	31	False

Record: 0 Show: All Selected Records (0 out of 3105 Selected) Options

Figure 28. The completed attribute table from a "grouped" classified habitat patch file. Note the fields that have been added by HPP.

HPP Module 1 Attribute Table Result Fields and Their Descriptions

- **HPP_Area_Size:** the area of the patch in original area units (i.e., if your land cover dataset was in meters, this represents square meters)
- **HPP_Area_Acre:** size of the patch in acres
- **HPP_Area_Hect:** size of the patch in hectares
- **HPP_Cls_Value:** the value (numeric) field of the original land cover dataset
- **HPP_Cls_Name:** the new description field; depends on type of classification selected
- **HPP_PatchID**: unique ID field
- **HPP_Is_Border_Patch:** a true/false value that determines whether a patch falls on the edge of the analysis extent

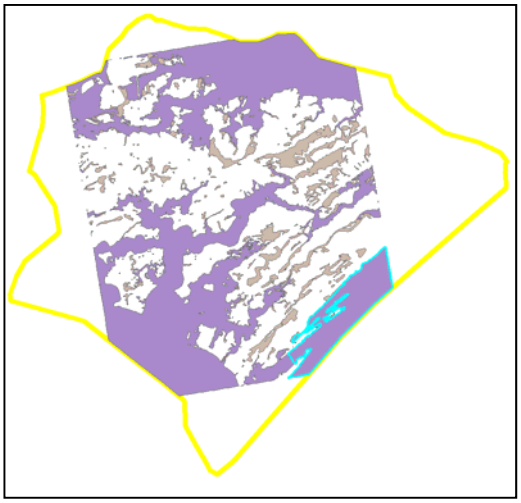


Figure 29. This "border" refers to border patches of your analysis extent. It is recommended that if your patch of interest falls on a border (meaning that the attribute table lists "true") you increase your area of analysis to obtain full statistics for these patches.

Module 2 – Habitat Analysis

As described in the introduction, the Habitat Analysis module allows the user to analyze pre-packaged ecosystem parameters, or landscape metrics, and allows the consideration of supporting data under the custom metric analysis. ***All analyses in this module are optional.***

From the Habitat Priority Planner toolbar, select **Habitat Analysis**.

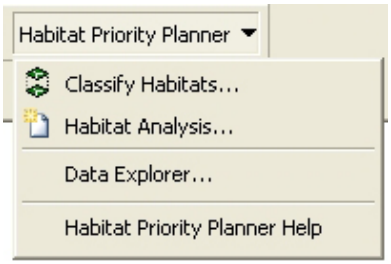
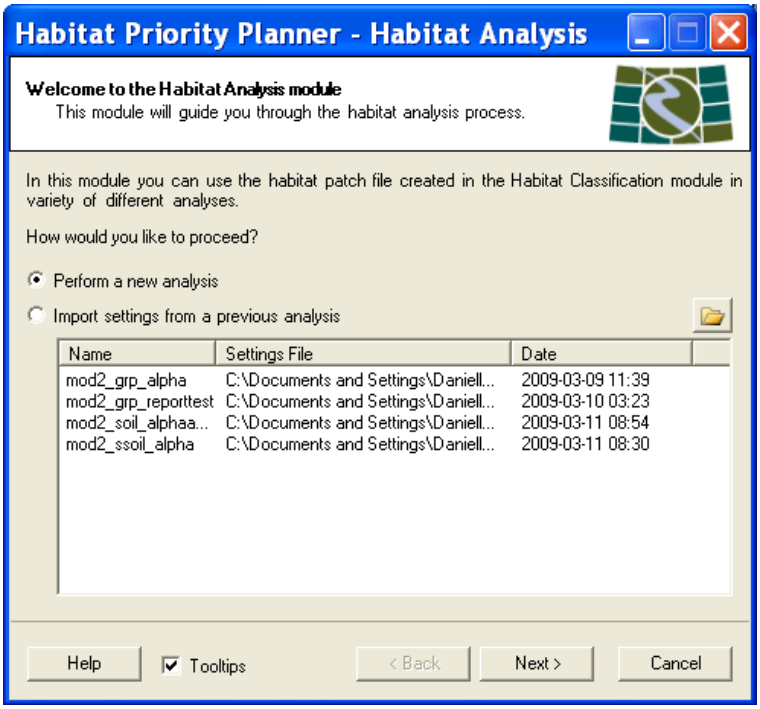


Figure 30. The Habitat Priority Planner toolbar and its three associated modules

Window 1: Analysis Type

For a new analysis,

- ❑ Select **Perform a new analysis**.
- ❑ Select **Next** to continue to Window 2.

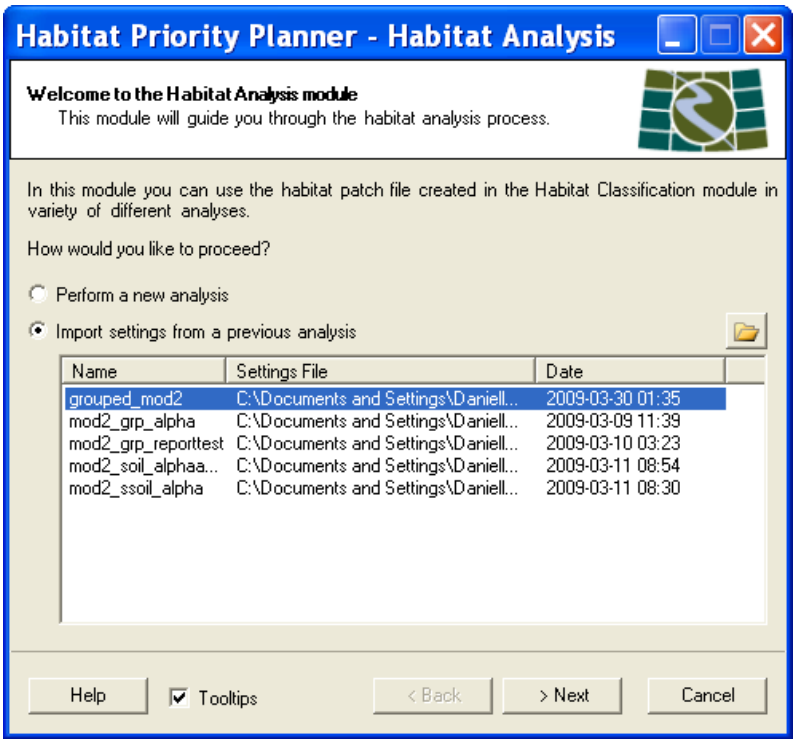


Tooltips: The user has the options of turning on or off the 'Tooltips' for user assistance at the bottom of the screen.

Figure 31. The Habitat Analysis opening window, performing a new analysis

To modify, overwrite, or import contents from an existing file,

- ❑ Select the radio button next to **Import settings from a previous analysis**, and then select the analysis file from those pre-populated in the list. All settings from the selected run will be pre-populated in the following windows of the Habitat Analysis module.
- ❑ Select **Next** to continue to Window 2.



Importing Settings
This is a useful feature if you would like to run an additional metric on a dataset or overwrite an existing analysis. Be sure to name the edited version a new name at the end of the wizard!

Figure 32. The Habitat Analysis opening window, set to import settings from a previous analysis

Window 2: Define Analysis Settings

This window allows users to select Module 1 or Module 2 outputs for habitat analysis. Module 1 file selection will result in a new output file from Module 2. If a previous analysis from Module 2 is selected, the user may re-analyze this selection by appending or overwriting one or more landscape or custom metrics.

If you are performing a new analysis,

- ❑ Select the habitats layer created in the Habitat Classification module from the drop-down menu. If you have selected features of interest for your analysis, select the layer containing the features, and the box “use selected features only” will be available.
- ❑ Select **Distance units** from the drop-down menu. The selected Distance units are used in the core and custom metric calculations.

- ❑ Select the appropriate **Area units** from the drop-down menu. The Area units selected are used in the core and custom metric calculations.
- ❑ Click **Next** to continue to Window 3.

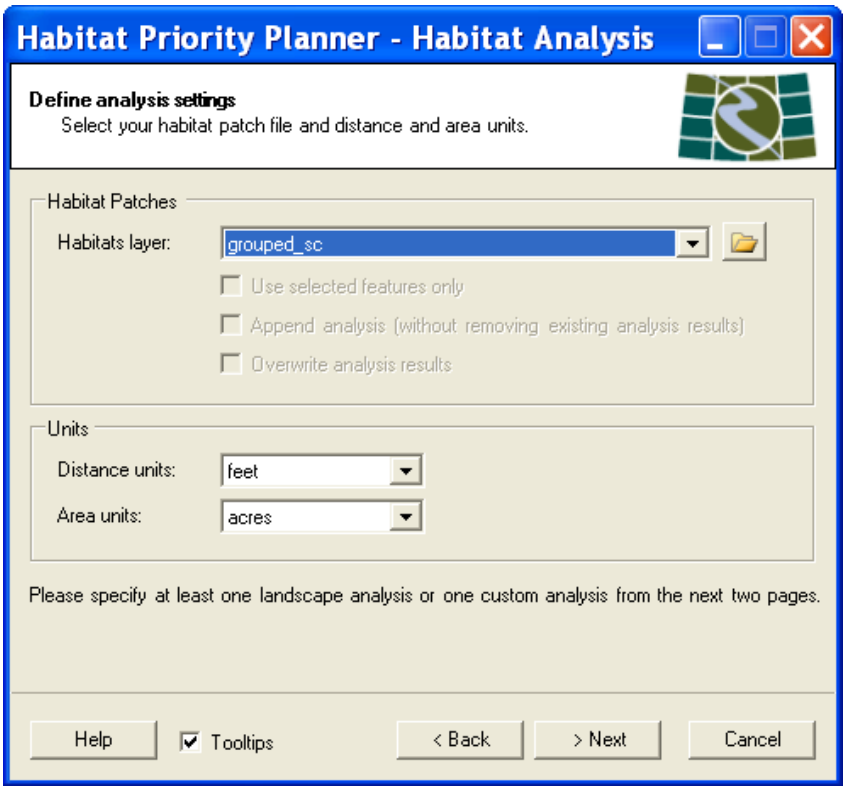


Figure 33. Define analysis settings for Module 2

If you selected "import settings from previous analysis," in order to append or overwrite a previous analysis (Figure 33),

- ❑ Select the Module 2 output layer from the drop-down list. This will allow you to further define the method of re-analysis.
    - Select either . . .
        a. **Append analysis** to add an analysis to those already completed only, or
        b. also select **overwrite analysis results** to completely re-analyze this habitat layer (both features must be selected to complete an overwrite).
    - ➢ ***The user does have the option of changing the imported parameters for the appended, or overwritten, analysis.***

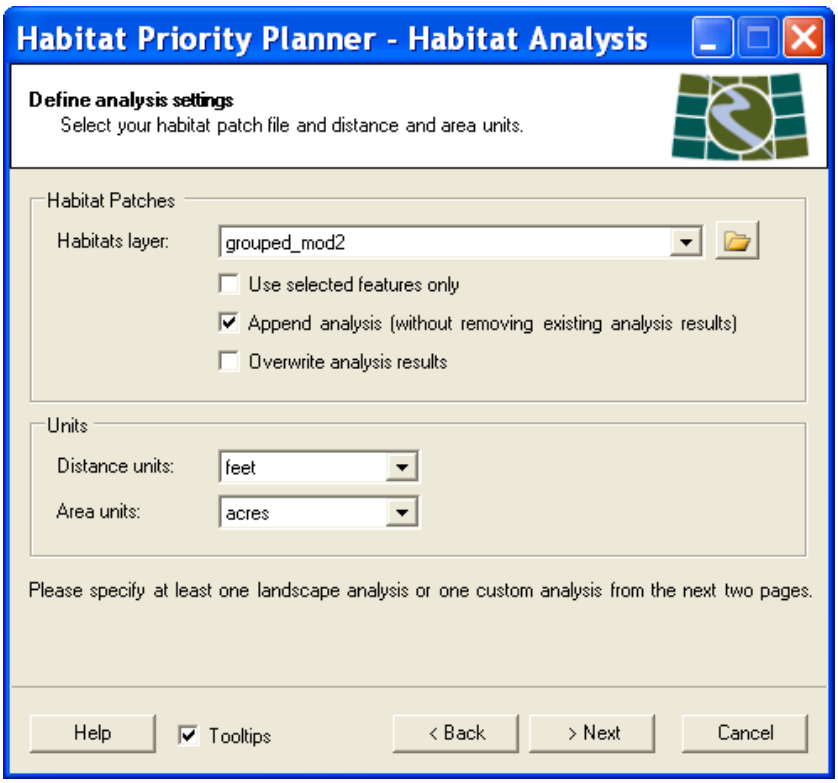


Figure 34. Results if a Module 2 output file was selected in Window 2. In this case, Append analysis was chosen to allow the user to add metrics to a completed file.

- ❑ Click **Next** to continue to Window 3

Appending and Overwriting
These are useful features if you would like to run an additional metric on a dataset or overwrite an existing analysis. The user would need to select both Append analysis and Overwrite to re-analyze the habitats layer selected above. Again, be sure to name this file a new name while saving!

Window 3: Landscape Metrics

Landscape Metric Definition

The landscape metric analyses that HPP calculates are focused on analyzing the characteristics of individual patches and their relationship to other patches of the ***same*** habitat type. Four landscape analysis metrics may be calculated in this module: Perimeter to Area Ratio, Nearest Neighbor, Core Area, and Proximity. Size was calculated during the Habitat Classification module, and is automatically available in the attribute table.

In the Habitat Analysis module, users may optionally select any of the four standard landscape metrics. Two of the optional Landscape Metrics measure characteristics internal to each habitat patch (perimeter to area ratio and core area). The last two measure connectivity of the habitat patches to other habitat patches of the same type (Proximity and Nearest Neighbor).

Habitat Quality

- **Perimeter-Area Ratio**
- **Core Area**
- **Size (calculated in Module 1)**

Habitat Connectivity

- **Proximity**
- **Nearest Neighbor**

➢ ***For detailed information on the landscape metrics included in HPP, please see Appendix A.***

Landscape Metric Window

Users may choose to calculate all the landscape metrics, or simply those that apply to their project. All landscape metric analyses are ***optional***, and the user may skip this window entirely to move on to the custom metrics.

- ❑ Select a landscape metric by clicking the associated checkbox.
- ❑ For Nearest Neighbor, select **From center of patch** or **From edge of patch**.
- ❑ For Core Area and Proximity, select the box and enter a buffer distance.
  - Units for these buffers are dependent on the distance selected in the Define Analysis Settings window.
  - ➢ ***Core Area and Proximity require a buffer designation, for more information please see Appendix A.***

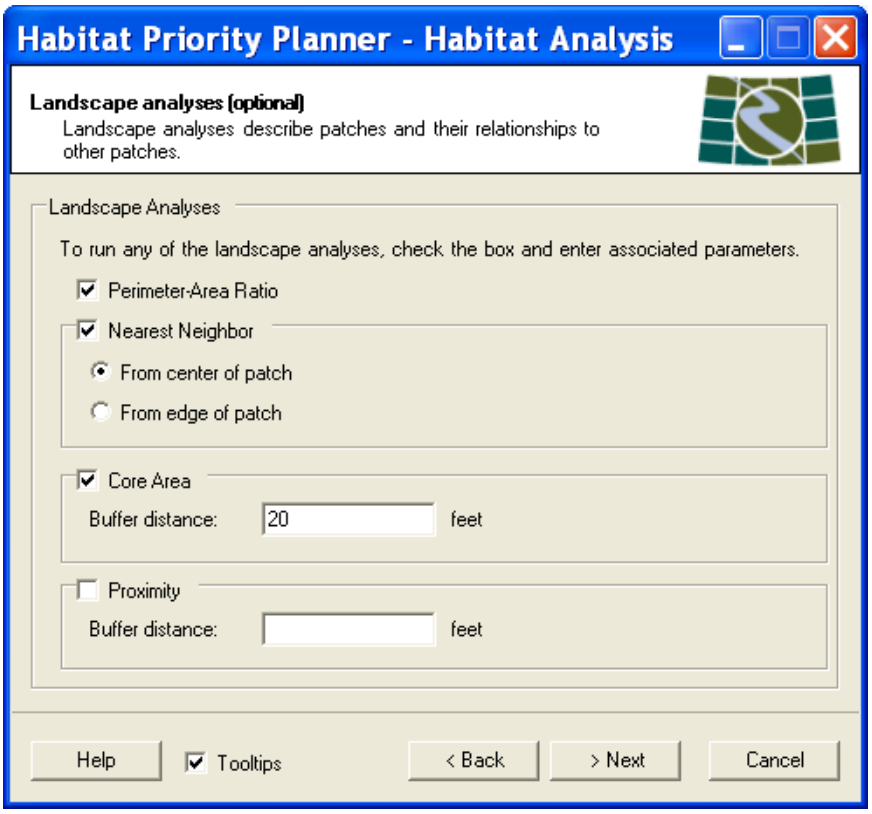


Figure 35. The landscape metrics window

> **Tip**
> Because of the long processing times required to perform buffering analyses (nearest neighbor, core area, and proximity), ***do not*** analyze extremely large datasets. Run the analyses on subsets, or areas of interest for best results. Or use the Perimeter to Area Ratio, a numeric description of size to core area, which requires shorter processing times.

Window 4: Custom Analyses

Users also have the option to create custom analyses using point, line, or polygon layers of interest. The table below lists the types of custom analyses available for point, line, and polygon layers.

Table 1. Available custom analyses

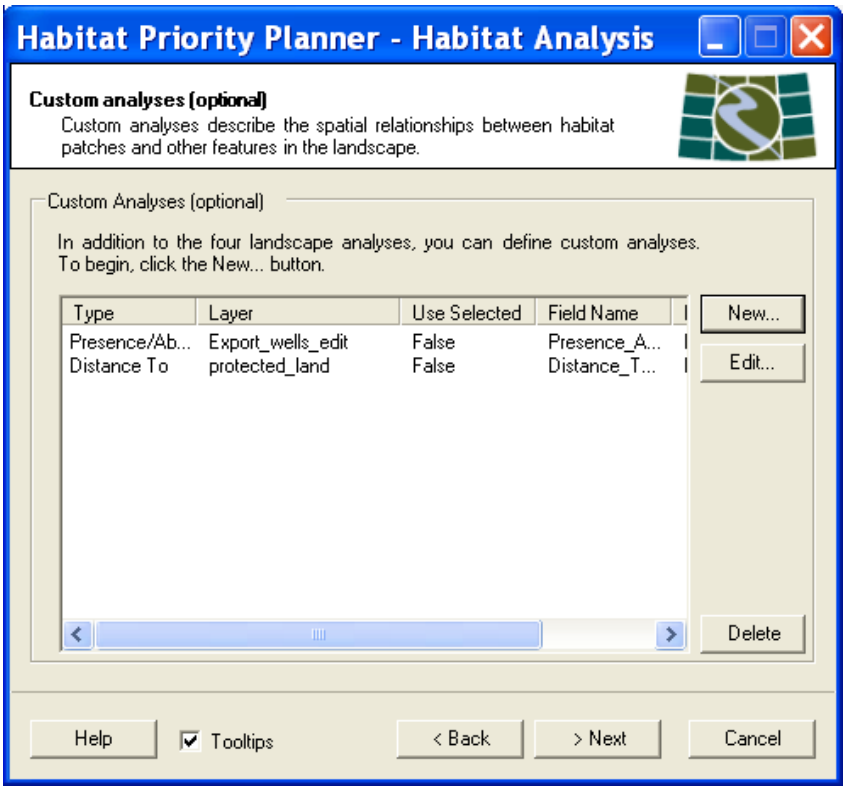
Point	**Line**	**Polygon**
Count	Linear distance within patch	Polygon overlay
Distance to feature	Distance to feature	Distance to feature
Presence/absence	Presence/absence	Presence/absence

The custom analyses help the user quantify the association between supporting data and the habitats or sites of interest. The types of supporting data are limited only by what can be represented as a point, line, or polygon file within ArcMap.

- ***For detailed information on the custom metrics, please see Appendix B.***

To Create a Custom Analysis

Like the landscape metrics, custom metrics are ***optional***, and there is no limit to the number of analyses that the user may add. ***Also, remember that these analyses are always conducting measurements or analyses from your classified habitat patches to the ancillary data.***



Custom Analyses
The window shown to the left displays an example of some custom metrics. Any point, line, or polygon file may be used.

Figure 36. An example Custom analysis window

- ❑ Click the **New** button. The Add New Analysis window will open.
- ❑ Select the **Analysis type** from the drop-down list.
- ❑ Select the **Analysis layer** from the drop-down list.
  - Note that only layers pertaining to the selected Analysis type will appear in the Analysis layer list (see Table 1).
  - ➢ ***For example, if you choose "count" as the Analysis type, only point layers will be listed in the Analysis layer menu.***
- ❑ HPP automatically names the field and field alias. You can edit the name if you wish in the **Field name** box.
- ❑ Click **OK**, and the Custom Analysis list will be updated.

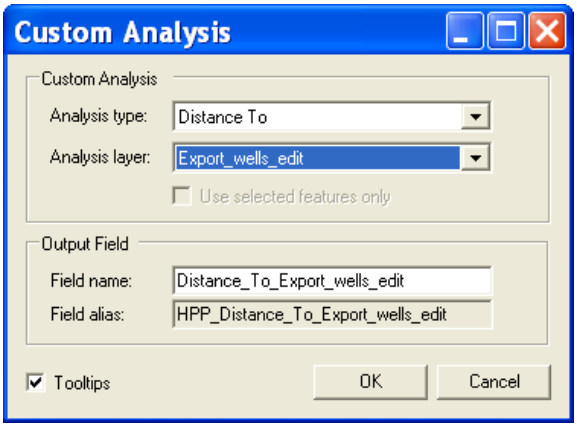


Figure 37. The window for adding a new custom analysis

- ❑ Repeat this process to add more custom analyses.
- ❑ Editing custom analyses:
    - If you wish to edit existing custom analyses, simply select the analysis in the Custom analyses window (Figure 36), and click the **Edit** button. The wizard will then open the specific custom analysis window to allow the user to edit the contents.

Window 5: Save Your Work

- ❑ Click on the **browse files** button after the Output location entry box to select a location and name for your output.
  - Save in your file geodatabase.
- ❑ Name your file in the **Layer Name** box.
- ❑ The **Add layer to map box** will automatically be checked.
  - Uncheck the box if you *do not* want to add the layer to the map.
- ❑ A report can be created that lists the files used in running landscape metrics, input parameters such as buffer distances used, and statistics on the results.
- ❑ To create a report, check the **Create report** box, and select the output location. This will save a copy of the report in PDF format. When the analysis run is complete, the report will be displayed for viewing or printing.

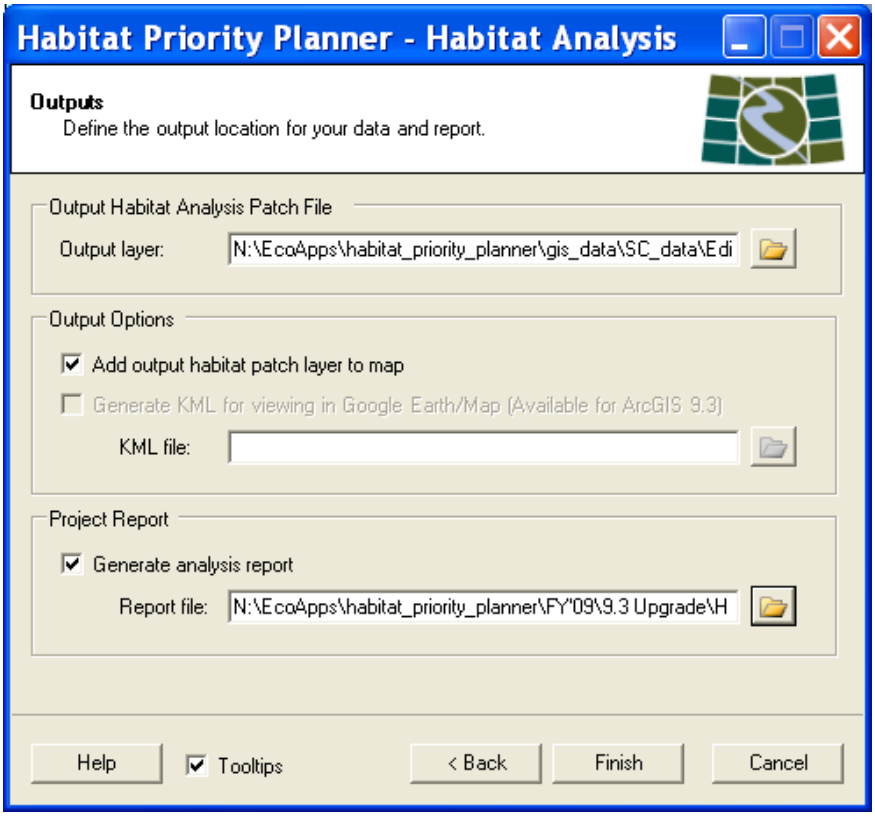


Figure 38. The final window in the Habitat Analysis module

Tip

At times during analysis, the tool may appear to stall on particular patches, but you can watch the progress on the patch counter during processing. The tool ***is still working***, so please be patient. Large patches and those that are more complex will take additional time to analyze. ***The recommendation for large analyses is to allow them to run overnight or on a separate machine.***

Habitat Analysis Outputs

Running the Habitat Analysis module results in two forms of outputs:

- Habitat Analysis patch file whose attribute table will contain the selected metrics' results
- Habitat Priority Planner Report

Habitat Analysis Patch File

The resulting patch file will look identical in the map view to the patch file that was a result of the Habitat Classification module; however, the attribute table will display several appended fields from user-specified analyses. See an example below, of the results of a Habitat Analysis patch file.

➢ ***Remember, because of the wide range of analyses available in Module 2, your results could look quite different from those highlighted in the example. Please refer to your specific patch file attribute table and report to view the results of landscape and custom analyses for your application.***

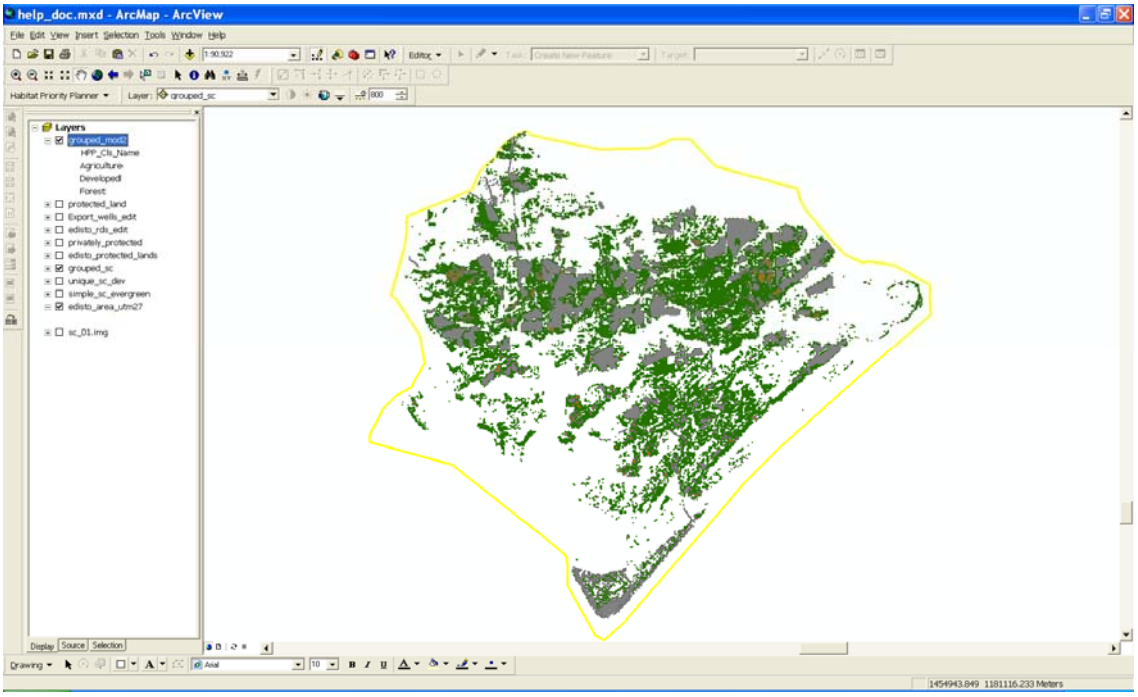


Figure 39. The habitat analysis patch file from Module2. Note that this patch file looks the same as the Module 1output file. The difference is in the attribute table.

Below is an example of what the appended attribute table might look like.

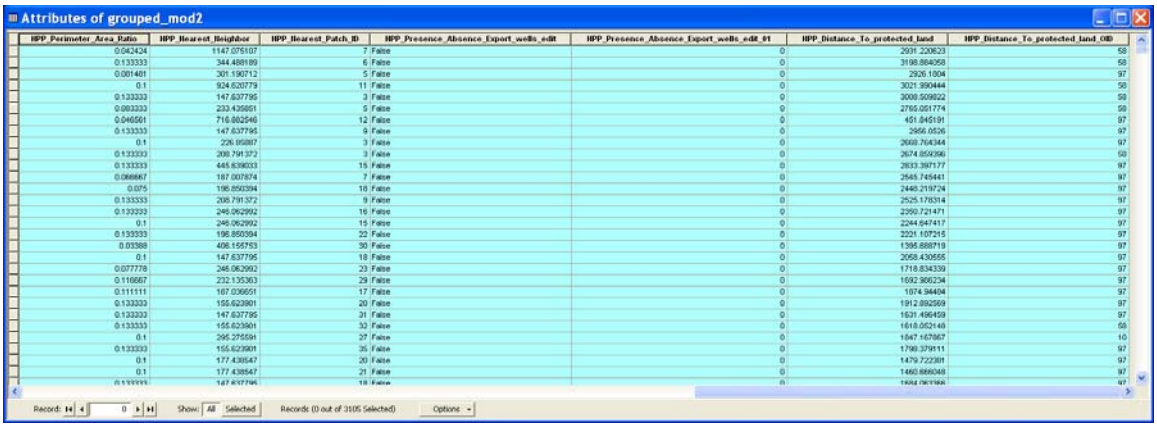


Figure 40. An example habitat analysis patch file attribute table.

Analysis Patch Results Tips
The appearance of zeros in your results does not mean that the analysis failed to run but only that the patch was outside your buffer values or that your feature is adjacent to the selected habitat type. However, "null" values may indicate a problem with data used or tool analysis.

HPP Module 2 Potential Analysis Field Results:

Note: The names of each of the fields may differ if you edited the names; however, for each analysis type, you should see some version of these designations.

- **HPP_Perimeter_Area_Ratio:** the numeric value representing the ratio for this field.
- **HPP_Nearest_Neighbor:** distance to the nearest neighbor of the same class type (units based on Window 1 user selection).
- **HPP_Nearest_Neighbor_ID:** identifies the patch that represents the nearest neighbor for each patch.
- **HPP_Core_Area:** area of each patch left over after the application of the user defined buffer (area units based on Window 1 user selection).
- **HPP_Proximity:** distance to the nearest patch after the application of the user-defined buffer amount of area of patches of the same type within a user-defined buffer
- **HPP_Count:** the number of point features that occur within each patch.
- **HPP_Distance_To:** distance from the patch to the closest feature of interest (units based on Window 1 user selection).
- **HPP_Distance_To_OID:** identifies the closest feature that is used for each patch's "distance to" calculation (units based on Window 1 user selection).

- **HPP_Linear_Distance_within**: distance that a linear feature intersects a patch, for example, how much road length runs through a patch (units based on Window 1 units selection).
- **HPP_Presence_Absence:** a true/false value that determines whether the feature is present within a patch
- **HPP_Presence_Absence:** also reported as a 1 (true) and 0 (false) value that determines whether a feature is present within a patch.
- **HPP_Polygon_Overlay:** reports the area of overlap of the patch with another polygon type of interest (area overlap units based on Window 1 user selection).
- **HPP_Polygon_Overlay_Pct:** reports the percent of overlap of the patch with another polygon type of interest.

Habitat Priority Planner Report

The report generated by the Habitat Priority Planner is very useful for documenting your work in a concise and complete manner. The report contains information from both the Habitat Classification and Habitat Analysis modules, and provides the user with the following information:

- The project name
- Where the settings and layers are saved
- The raster land cover used for analysis
- The classification type, as well as the names and values
- The landscape metric analyses run, and their corresponding buffer distances
- The custom analyses, type of analysis, and layer used
- Statistics for each land cover class
- Number of features in each class

Report generation is dependent on the Habitat Priority Planner having access to your settings files. HPP accesses settings files for Module 1 and Module 2 that are saved locally on each user's computer during analysis. If your report does not contain Module 1 settings information, then it was not saved or run locally on your computer (this may occur if you share Module outputs with colleagues). You may still have analysis information available in the report, even without all of the settings files.

Additionally, if you append or overwrite files in Module 2, your report will only represent the most recent analysis information. You must keep a copy of the initial report for previous analysis information.

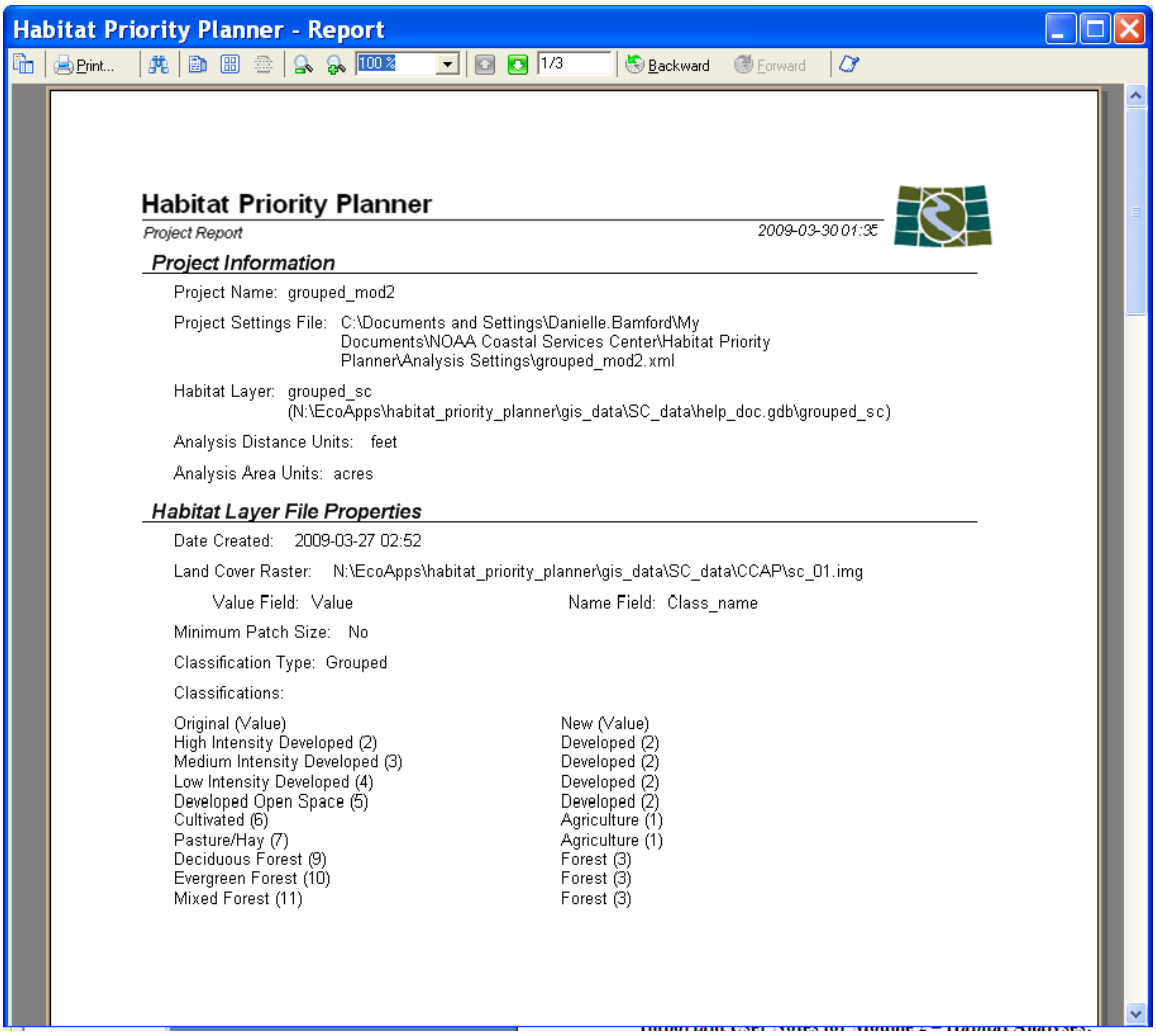


Figure 41. An example report

Module 3 – Data Explorer

The Data Explorer module allows users to visualize data created in the first and second modules in both graphical and mapping contexts. Using logical selections within fields of interest, users can create a progressive set of queries that will narrow down the data to help define project goals.

Data Input

- ❑ From the Habitat Priority Planner toolbar, select **Data Explorer**.

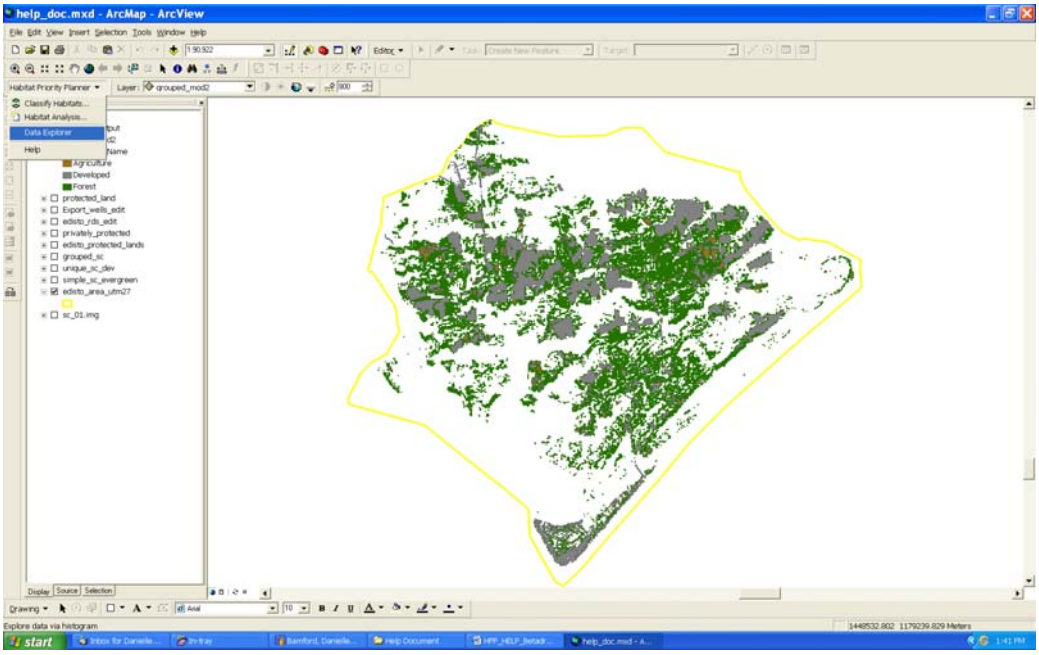


Figure 42. Opening the Data Explorer window

- ❑ Select a layer to explore from the Map Layer drop-down menu.
  - Only feature layers, or vector datasets, will be available to select. The Data Explorer module does not work on raster data.
  - Ideally, the user would select the habitat analysis patch file that contains all the landscape and custom metrics they had just created. The user may, however, apply any feature layer that is loaded into the map view.

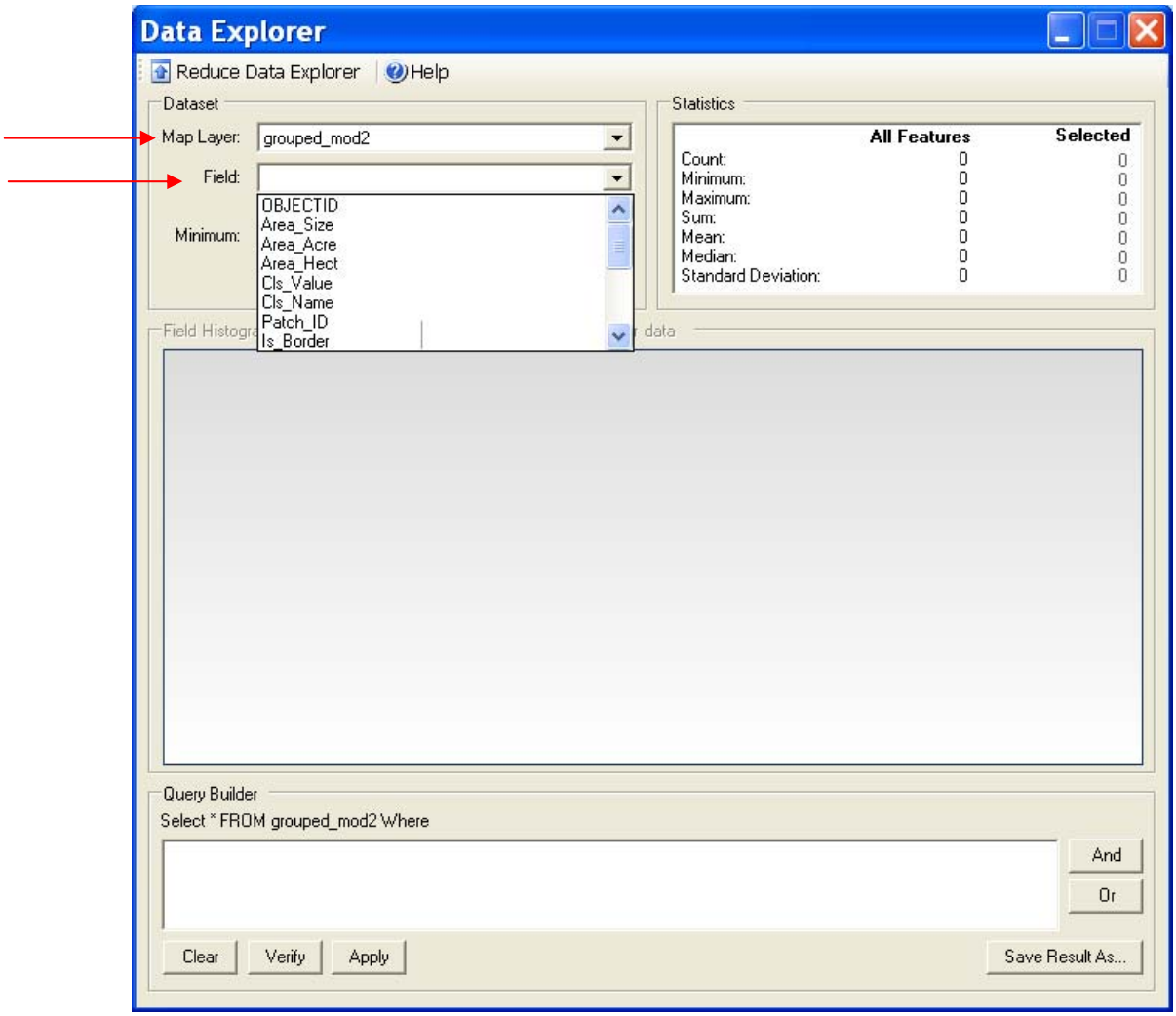


Figure 43. Data Explorer - select field name

- ❑ Select a field from the **Field** drop-down menu.
  - The fields are associated with your selected map layer and correspond to all that are listed in the attribute table.
  - When a field is selected, HPP will produce a histogram that shows the distribution of the data in this field (see Figure 44).

Using the Histogram

Histogram units for the x and y axes:

- The x (horizontal) axis represents the values of the distance of the patches to conservation areas.
- The y (vertical) axis represents the number of patches and the percent of total.

❑ Select the desired range of data by dragging the cursor over the histogram . . .
❑ *Or*, type values into the **Minimum** or **Maximum** boxes under the histogram. Click the **Update** button to display the histogram selection on the map.

➢ ***Be sure to turn on the layer on which the selections are based or you will not see the results on your map view.***

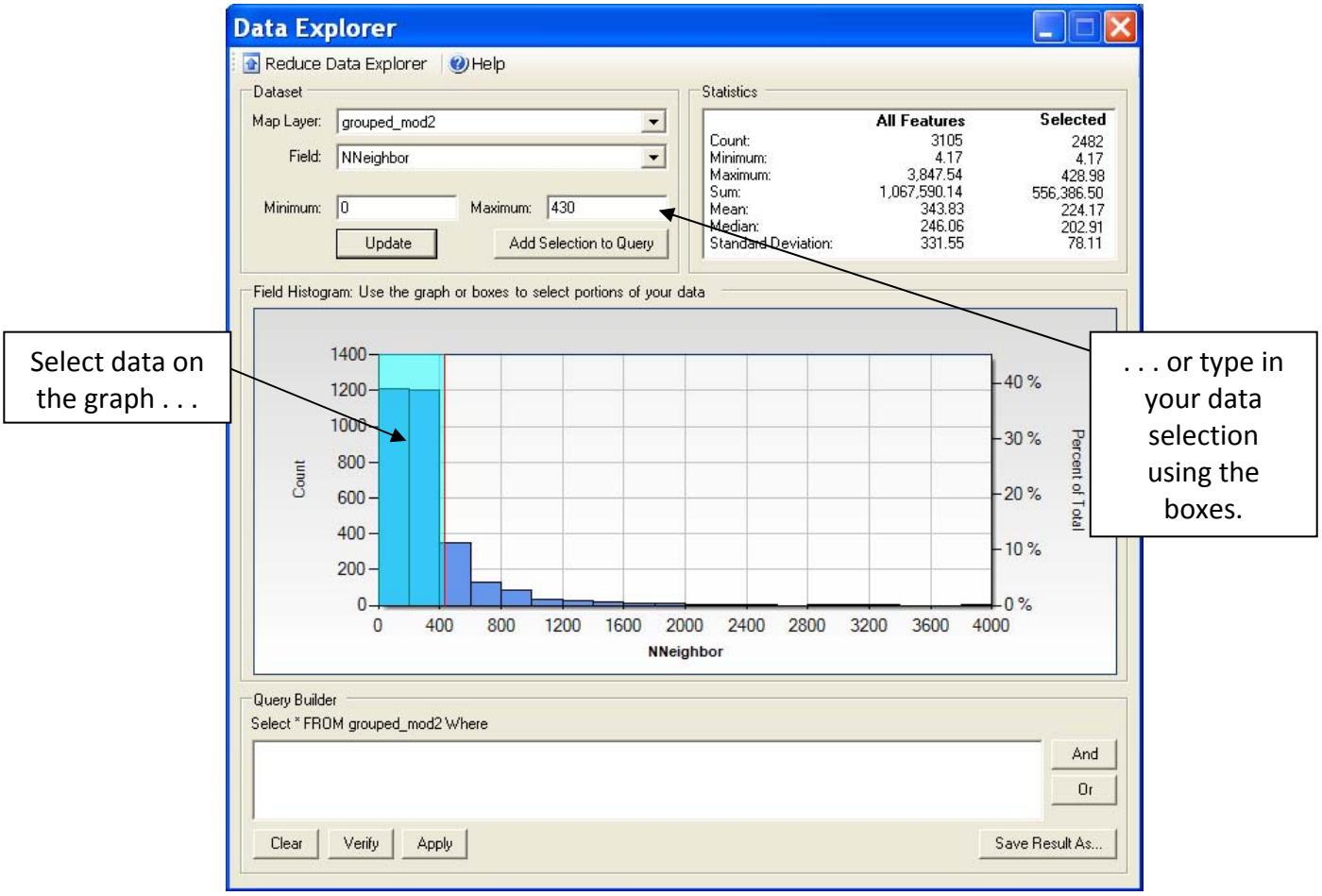


Figure 44. Selecting a range of data for your field

The map below displays the selection that was made above.

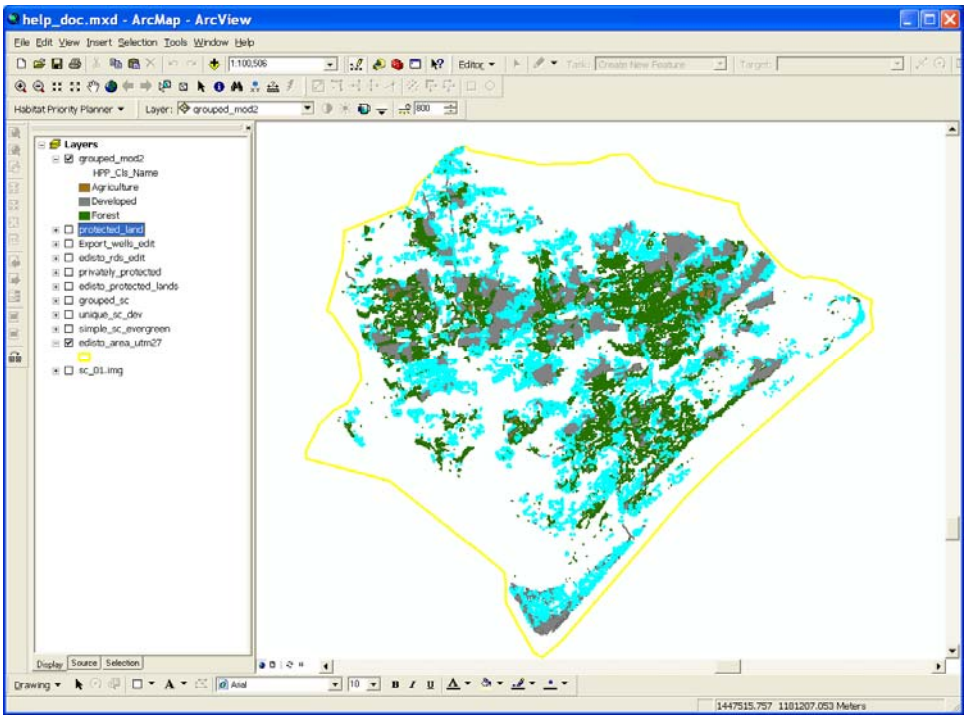


Figure 45. A completed selection in the Data Explorer module, highlighted area meeting criteria

- The Data Explorer window may be minimized using the arrows at the top left of the window. This feature is useful to reveal the map view.

The arrow is used to minimize and maximize the window view.

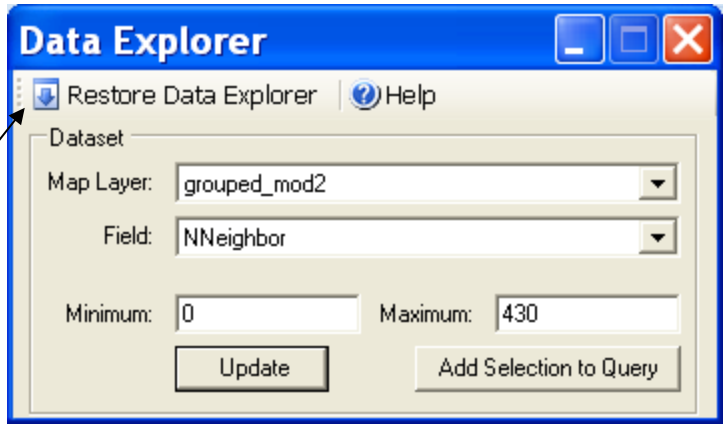


Figure 46. Data Explorer minimize button

Data Explorer Statistics and Query Builder

The Habitat Priority Planner, Data Explorer, also contains the statistics box and query builder window. The statistics displayed provide information about all the habitat patches in your map layer, as well as the statistics associated with your specific selection. The Query Builder window allows you to take the highlighted portions in your histogram and create selections on your map. This feature allows you to narrow your results according to project goals and criteria.

If you are satisfied with your selection,

- ❑ Click **Add Selection to Query Builder** below the Minimum and Maximum boxes. The selection will then appear in the Query Builder box below the histogram.

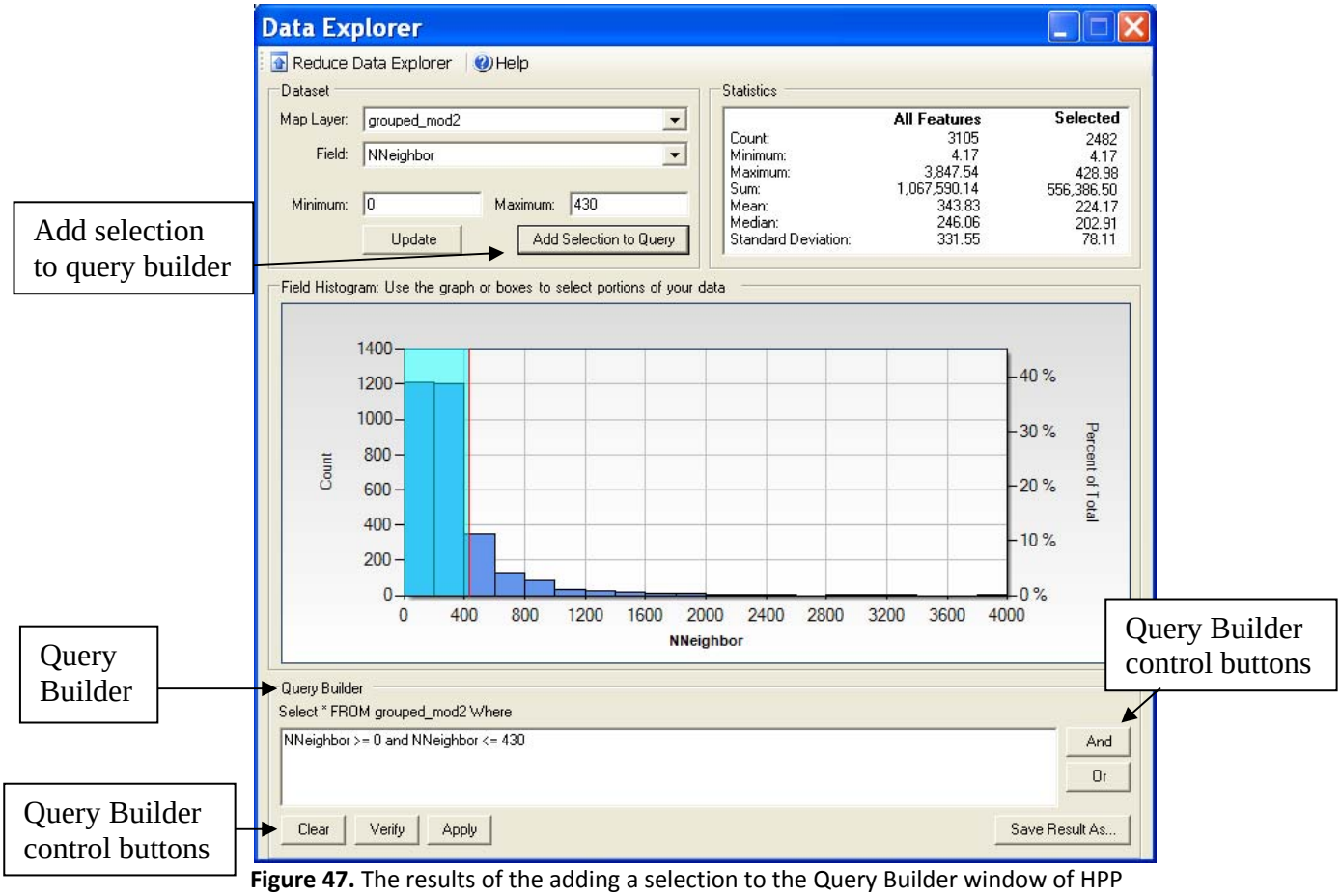


Figure 47. The results of the adding a selection to the Query Builder window of HPP

- ❑ Click **Verify** to ensure that the query was written correctly. The window below will be displayed.

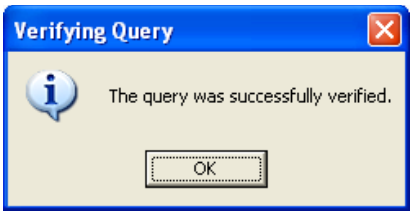


Figure 48. Successful verification

- ❑ Click **Apply** to confirm the selection on your dataset. Instead of a visual outlined in blue, you now have a live selection displaying ***only those patches*** that fit the user-specified criteria.

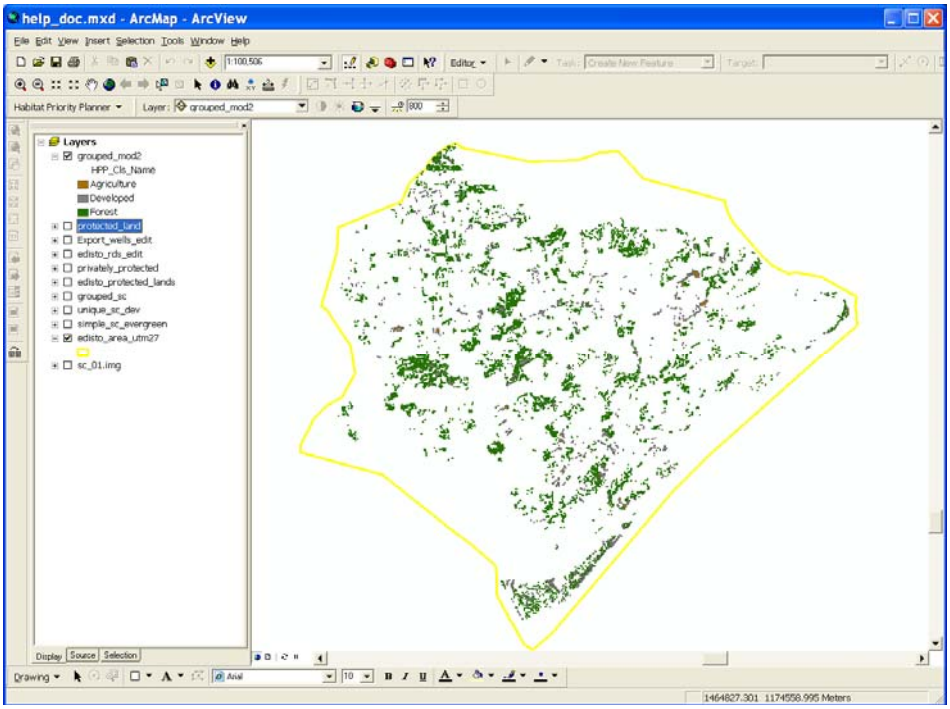


Figure 49. The applied selection in Data Explorer. Refer to figure 45 to compare the selection with the final results.

- ❑ At this stage you would either add additional criteria to the query builder to continue narrowing your selection, or save the file and complete your analysis.
- ❑ To complete additional analyses,
  - Follow the procedure above to add criteria. Be sure to insert an **And** or **Or** operator between each criterion selection by clicking on the corresponding button to the right of the Query Builder window.
- ❑ To complete your analysis,
  - Click **Save Result As** and save the new layer in your file geodatabase.
  - Click **OK** to create your new Data Explorer Selection layer.
  - Choose whether or not you would like the Data Explorer to generate a report containing your selection criteria, and statistics associated with your selection.

Data Explorer Outputs

The result of this module is the selection-based polygon patch file.

- Your results will be displayed in the table of contents as a new layer. These results will look the same as the selection you made using Module 3. The attribute table will display only those data that meet your selection criteria.
- If you view the Layer Properties of this file, you will see the query that was applied by HPP to your dataset to create this output file. This serves as an excellent resource for keeping track of your analyses.
- You also have the option of creating a Data Explorer Report. This report contains important information regarding where the layer is saved, the selection query and the associated statistics for your selection. See an example below.

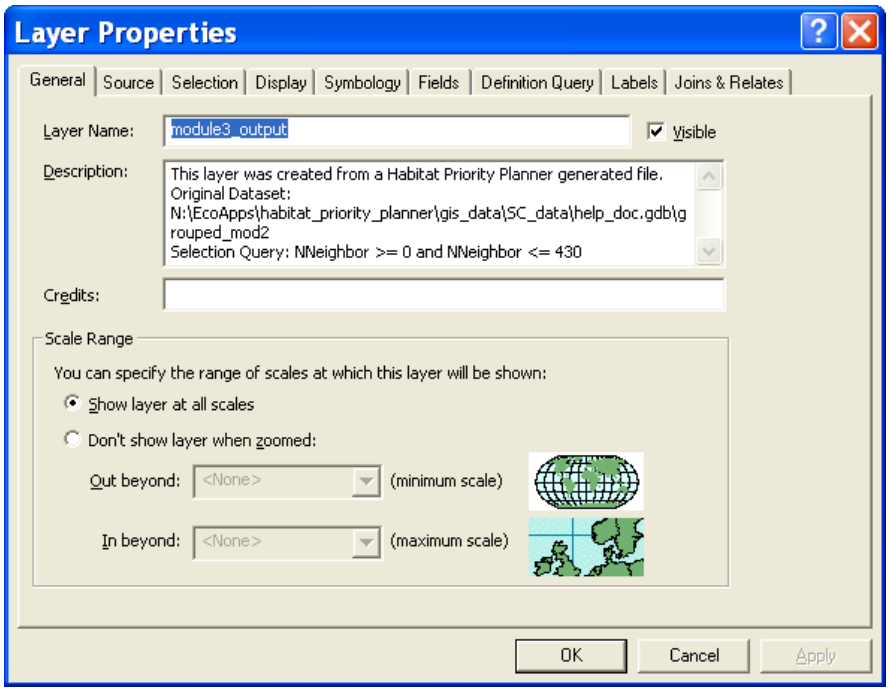
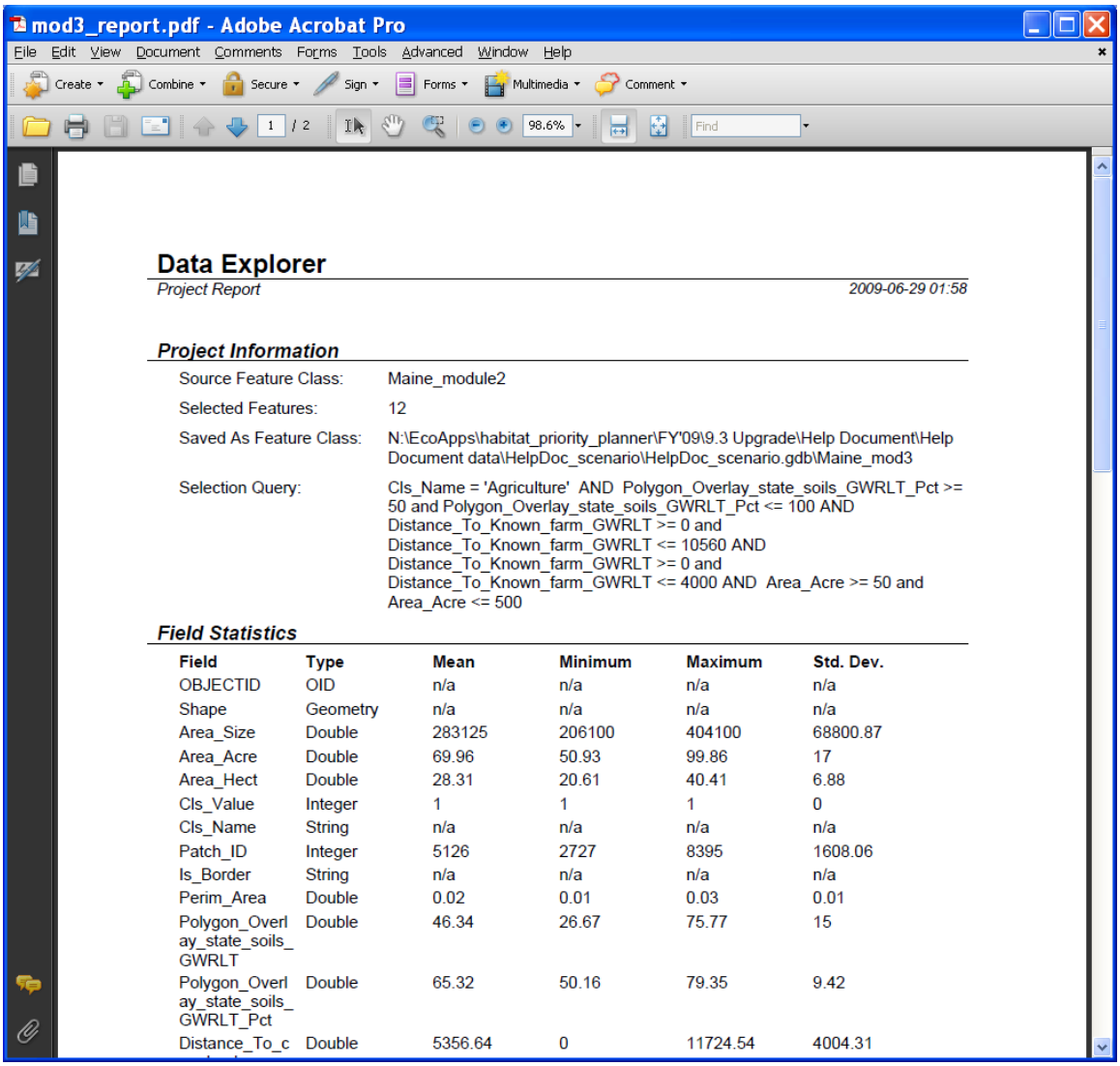


Figure 50. The Layer Properties of a successful Module 3 analysis. Note the description containing the file location and the applied query.



Data Explorer

Project Report *2009-06-29 01:58*

Project Information

Source Feature Class:	Maine_module2
Selected Features:	12
Saved As Feature Class:	N:\EcoApps\habitat_priority_planner\FY'09\9.3 Upgrade\Help Document\Help Document data\HelpDoc_scenario\HelpDoc_scenario.gdb\Maine_mod3
Selection Query:	Cls_Name = 'Agriculture' AND Polygon_Overlay_state_soils_GWRLT_Pct >= 50 and Polygon_Overlay_state_soils_GWRLT_Pct <= 100 AND Distance_To_Known_farm_GWRLT >= 0 and Distance_To_Known_farm_GWRLT <= 10560 AND Distance_To_Known_farm_GWRLT >= 0 and Distance_To_Known_farm_GWRLT <= 4000 AND Area_Acre >= 50 and Area_Acre <= 500

Field Statistics

Field	Type	Mean	Minimum	Maximum	Std. Dev.
OBJECTID	OID	n/a	n/a	n/a	n/a
Shape	Geometry	n/a	n/a	n/a	n/a
Area_Size	Double	283125	206100	404100	68800.87
Area_Acre	Double	69.96	50.93	99.86	17
Area_Hect	Double	28.31	20.61	40.41	6.88
Cls_Value	Integer	1	1	1	0
Cls_Name	String	n/a	n/a	n/a	n/a
Patch_ID	Integer	5126	2727	8395	1608.06
Is_Border	String	n/a	n/a	n/a	n/a
Perim_Area	Double	0.02	0.01	0.03	0.01
Polygon_Overlay_state_soils_GWRLT	Double	46.34	26.67	75.77	15
Polygon_Overlay_state_soils_GWRLT_Pct	Double	65.32	50.16	79.35	9.42
Distance_To_c	Double	5356.64	0	11724.54	4004.31

Figure 51. The Report of a Module 3 analysis. Note the preserved selection query.

➢ ***To view another application scenario of the tool from start to finish, see Appendix C.***

Interpreting Results from the Habitat Priority Planner

Although HPP can be used with limited geographic information system (GIS) knowledge, the most accurate interpretation of analysis results requires a full understanding of the concepts and limitations of spatial analysis and strategic conservation planning. Ideally, a team of experienced staff members with varied skill sets, including spatial analysis, strategic land- and ocean-use planning, and participatory methods, would collaborate in the use of HPP to generate habitat priorities and guide the operation of the tool.

With the selection of desired criteria, the Data Explorer module can produce a map of priority habitat areas in the landscape or seascape. This map can help target only those geographic areas deemed important by managers and stakeholder groups to inform ongoing conservation and restoration action planning. HPP helps users focus on specific locations for planning "on the ground" actions, ultimately saving time and money by performing "screening" assessments.

The interpretation of Habitat Priority Planner results will vary by user purpose, the classified land cover layer used, supporting data, and metrics used for analysis. The NOAA Coastal Services Center is willing to provide limited assistance to partner organizations and users in application development, where appropriate.

- ***For tool support and to connect with other users, please join our electronic mailing list, or list server, on the HPP website(http://csc.noaa.gov/digitalcoast/tools/hpp/index.html). For general help questions, the Center strongly recommends that you refer to the help document before contacting the tool developers.***

Error Reporting

When using GIS tools there may come a time that a user receives an error during tool operation. The cause of errors can be wide ranging, from incompatible data sets to actual tool malfunction, to hardware failure. There have been errors reported for the Habitat Priority Planner in the past, and the development team strives to address errors quickly and to support users in finding solutions. If the tool itself is found to have a functionality error the development team will address the error and if necessary release a new version of the tool containing corrections. In order to find potential solutions to user encountered errors the Habitat Priority Planner development team needs user feedback. Your assistance in this process is critical and should not be excessively time consuming.

To report a tool error:

1. Leave the error window open, do not automatically close the window, as it contains important information to diagnose and correct the error
2. Use one of the three HPP Error Report forms listed below depending on which module of HPP your error occurred within
    - Module 1, Habitat Classification Error Report
    - Module 2, Habitat Analysis Error Report
    - Module 3, Data Explorer Error Report
2. Copy and paste the appropriate form to a new word document
3. Complete the Error Report with your specific analysis information
4. Follow the instructions to copy the error information into the document (found at the bottom of your Error Report)
5. Send the completed error report to **nos.csc.hpp@noaa.gov**

After submitting the error report:

1. An HPP representative will contact you via email
2. You may be asked to provide the data in which your error occurred
3. A solution or work around will be found for your issue

The development team will attempt to address your error in a quick and efficient amount of time, but please be patient as each error requires individual attention! If you have trouble with any of the steps above, please contact us at, **nos.csc.hpp@noaa.gov**, and a development team member will assist you in reporting your error.

Habitat Priority Planner 2.0 Error Report Form for Module 1, Habitat Classification

Parameters	Input Values
Window 1: Habitat Patch File type	
New patch file	
Import from previous run	
Window 2: Land Cover Data and Analysis Extent	
Land cover dataset	
Analysis extent type	
If map layer, use selected	
Limit patch size	
Minimal patch size & units	
Window 3: Selecting Land Cover Classes	
Value (class) field	
Generated from field	
Description (name) field	
Imported from lookup table	
Imported from attribute table	
Window 4: Classification Type	
Classification type	
Land cover classes	**Old Class Name** | **Value** | **Reclass** | **New Class Name** | **Value** Add more rows if necessary. Classes that are not reclassified may be ignored for this table.
Window 5: Land Use Change Scenario (optional)	
Land use scenarios	**Map Layer** | **Use Selected** | **Class** Add more rows if necessary.
Window 6: Save Your Work	
Create file geo-database	
Output layer	
Add output layer to map	
Generate KML	
KML File	
Error Details: ***(Please click the "Copy" button on the Error Report dialog and paste below.)***	

Please send this error report form to **nos.csc.hpp@noaa.gov**.

Habitat Priority Planner 2.0 Error Report Form for Module 2, Habitat Analysis

Parameters	**Input Values**
Window 1: Analysis Type	
New analysis	
Import from previous analysis	
Window 2: Define analysis settings	
Habitat layer	
Use selected features only	
Append analysis	
Overwrite analysis results	
Distance units	
Area units	
Window 3: Landscape Metrics	
Perimeter-area ratio	
Nearest neighbor	
From center/edge of patch	
Core area	
Buffer distance	
Proximity	
Buffer distance	
Window 4: Custom Analyses	
Custom Analyses	**Type** / **Layer** / **Use Selected** / **Field Name** (5 empty rows) Add more rows if necessary.
Window 5: Save Your Work	
Output layer	
Add output layer to map	
Generate KML	
KML file	
Generate analysis report	
Report file	
Error Details: ***(Please click the "Copy" button on the Error Report dialog and paste below.)***	

Please send this error report form to **nos.csc.hpp@noaa.gov**.

Data Explorer - Error Report Form

Parameters	**Input Values**
Section 1: Dataset	
Map layer	
Field	
Minimum	
Maximum	
Window 4: Query Builder	
Query	

Error Details:

*Please click the "**Copy**" button on the Error Report dialog and paste below.*

Screen Shot:

*Click **[ALT] + [Print Screen]** to take a shot of the top most window, ideally the Data Explorer form, or click **[Print Screen]** for the full screen, then paste below. You may do so right after or before the error.*

Please send this error report form to **nos.csc.hpp@noaa.gov**.

Appendix A: Landscape Metrics

This appendix contains a description of each of the landscape and custom metrics that are available for analysis in the Habitat Priority Planner. The basic model that was used to build these queries is also available for several metrics.

A.1 Size

Ecological Importance:

- The size of a contiguous habitat patch helps determine the contribution of the patch to overall ecosystem and species health.
- Generally, the larger the area of continuous habitat, the better the habitat quality.

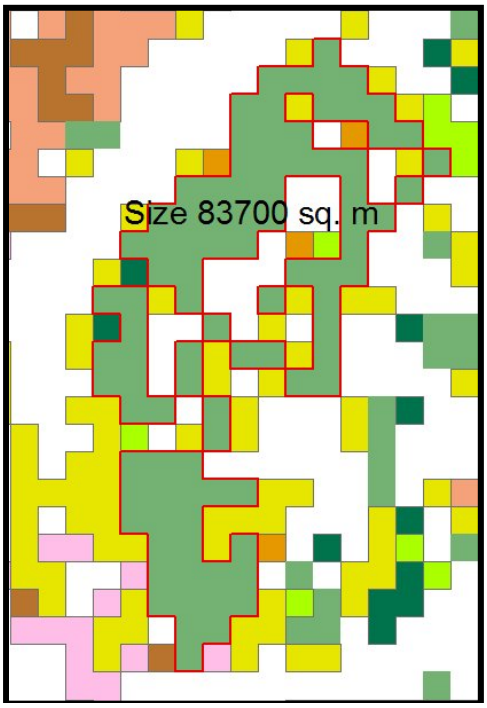


Figure 1. Size of the patch outlined in red

Process:

- Size is automatically calculated during the raster to polygon conversion in the Habitat Classification module. In the attribute table, both metric (hectares) and English (acres) area units are available for the size calculation.

A.2 Core Area

Ecological Importance:

- For many species, the core area of connected habitat patches (the area inside an exterior buffer) is critical.
- Core area provides information about patch shape, and the ratios of patch edge to internal area. A patch may have a substantial size but no significant core area (e.g., a patch shape which is long and narrow).

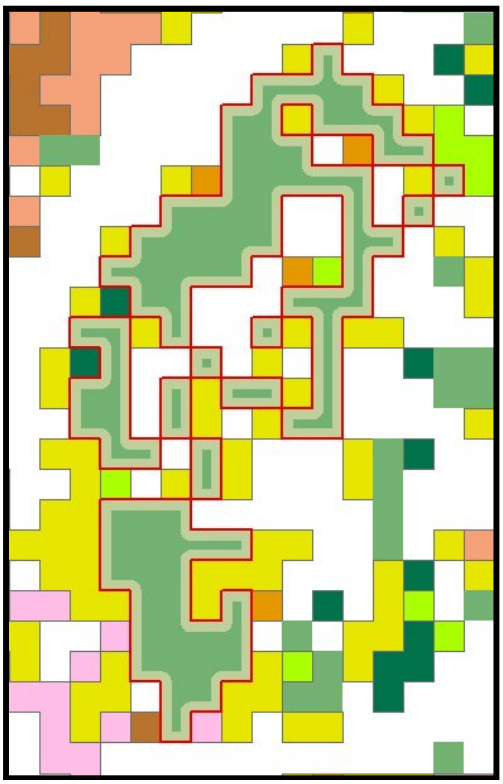


Figure 2. Core area graphic

Example
Core area is calculated from the remaining green area of the patch after subtracting the area of the user-defined internal buffer.

Process:

- Core area is calculated by performing an internal buffer on each patch polygon and then subtracting the area of that buffer from the area of the original polygon. The units for this metric is returned in the units (hectares or acres) defined by the user in the wizard.

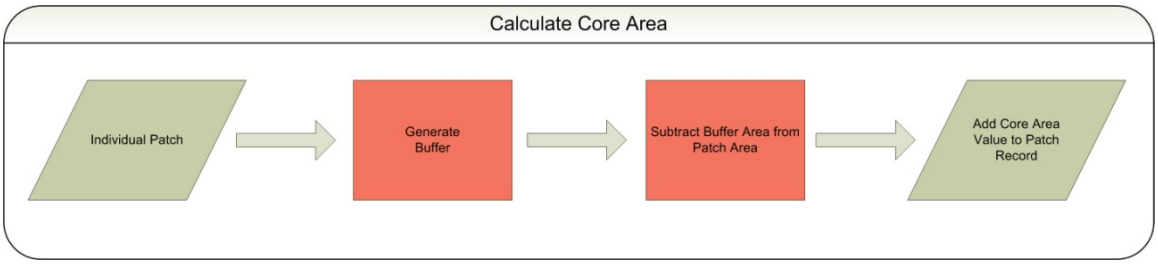
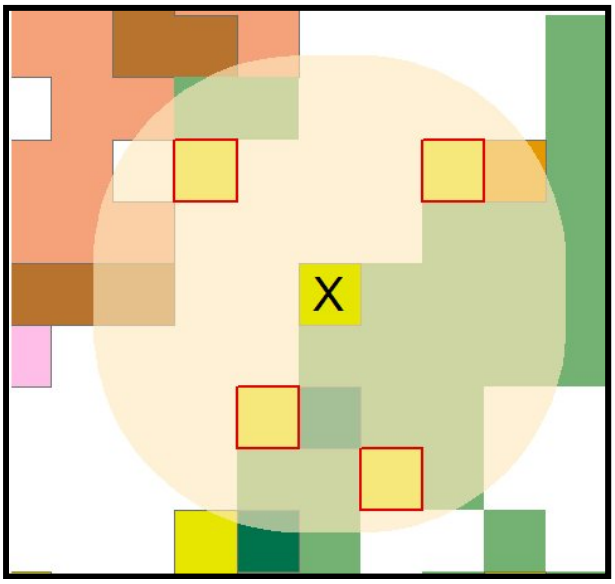


Figure 3. Core area logic model

A.3 Proximity

Ecological Importance

- This metric assesses the quantity of like-typed habitats within a user-defined buffer distance from the patch of interest, a robust measure of connectivity among habitats.
- Proximity is one measure of landscape configuration; in this case how dispersed or clumped the patches are on the landscape.



Example
Proximity buffer of 100 meters from the yellow patch with the X in it.

Figure 4. Proximity graphic

Process:

The proximity measurement is generated by creating a buffer (the radius of the buffer is defined by the user in the wizard) around the edge of each patch polygon. The intersected area of like-typed patches inside the resulting buffer is used to generate the raw area value returned in this metric. The percent area of like-typed habitat in the buffer is calculated by dividing the raw area identified above by the area of the buffer. The values returned for this measure are the raw area (acres or hectares) of like-typed habitat within the buffer and the percent area of the buffer that is like-typed habitat.

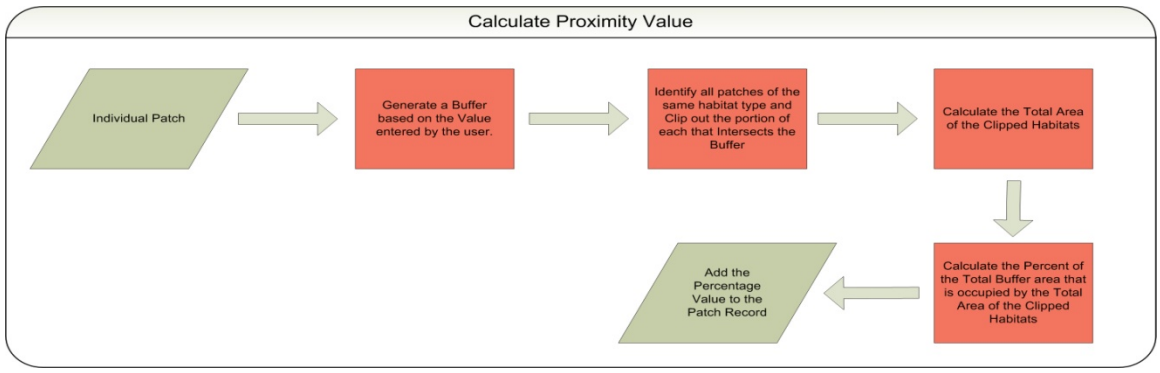
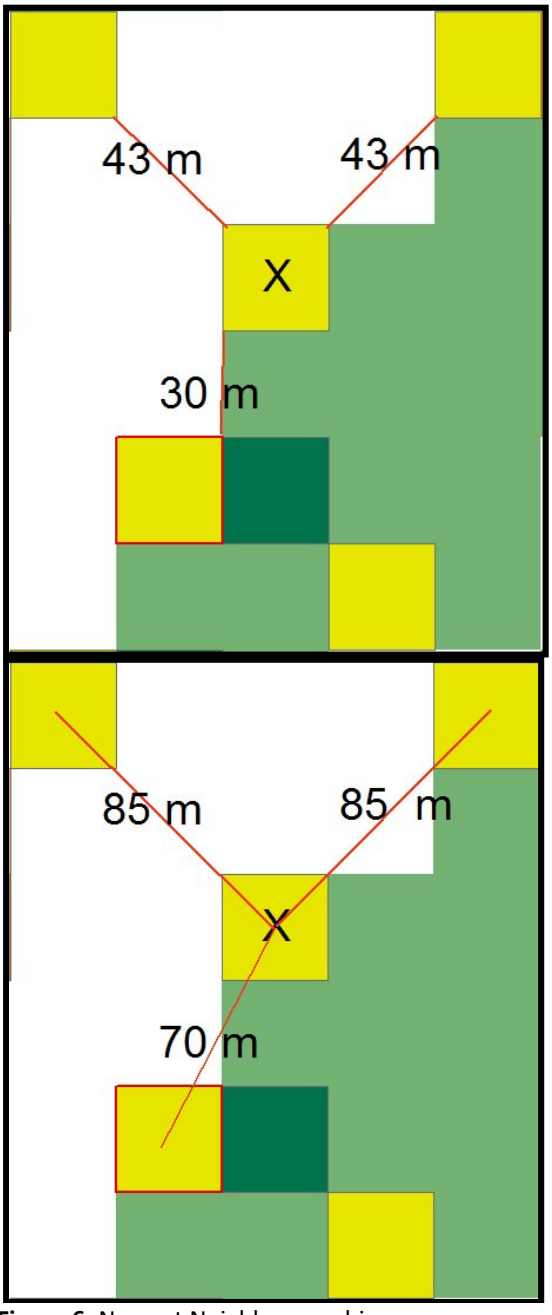


Figure 5. Proximity logic model

A.4 Nearest Neighbor

Ecological Importance:

- This metric answers the question, "How close is the nearest habitat that matches the type of habitat in the focal patch?"
- A nearest neighbor is the neighbor with the least physical separation by a straight line distance



Example
Edge to edge measurement.

Example
Center to center measurement.

Figure 6. Nearest Neighbor graphic

Process:

- The unit for this metric is returned in the unit (hectares or acres) defined by the user in the wizard.
    - Nearest neighbor is reported either from the center of the patch or edge as designated by the user.
    - The Habitat Priority Planner (HPP) reports both the distance from the patch to the nearest neighbor of like type, as well as identifying the patch that meets these requirements in the resultant Module 2 file attribute table (designated in the attribute table with a label of _OID).

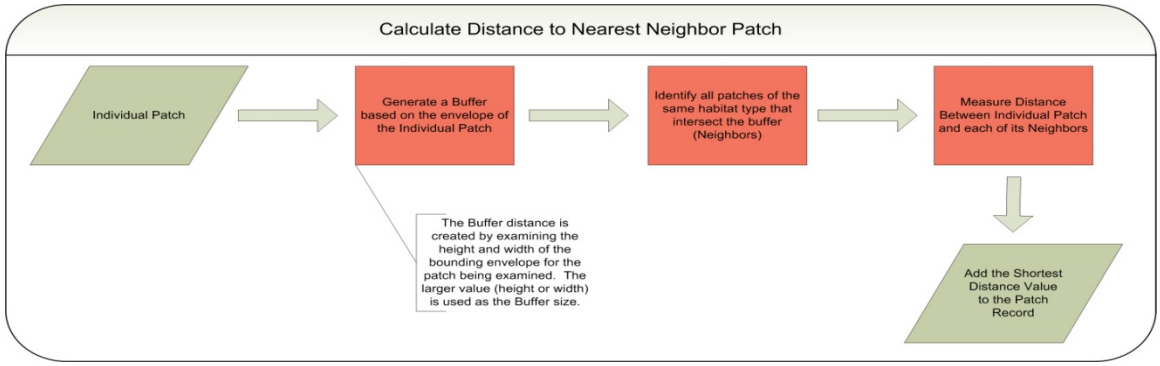


Figure 7. Nearest Neighbor logic model

A.5 Perimeter to Area Ratio

Ecological Importance:

- Reflects both the area and shape of a patch, and is a strong predictor of both individual species presence and overall species richness.
- Perimeter to area ratio is calculated by dividing the perimeter of the patch by the area of the patch. Larger values of this ratio denote with more edge habitat and less interior habitat.

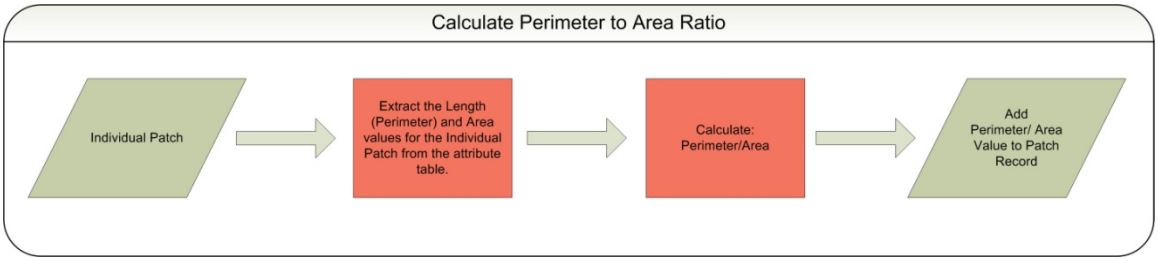


Figure 8. Perimeter to area logic model

Appendix B: Custom Metrics

B.1 Definitions by Feature Type

- **Point**

  Count: A count of the number of points from the user-defined point layer that fall within the patch.

  Distance to feature: Linear distance from the edge of the patch to the nearest point feature.
    - The Habitat Priority Planner (HPP) reports both the distance from the patch to the feature of interest, as well as identifying the patch that meets these requirements (designated in the attribute table with a label of _OID).

  Presence/Absence: Indicates whether a user-defined point feature is present *within* the boundary of the patch. Values: True or False as well as 1 (true) or 0 (false); user can determine preference since both are reported.

- **Line**

  Linear distance within patch: Summation of the length of user-defined linear feature that falls entirely within the patch. The value is listed in user-defined units of feet or meters.

  Distance to Feature: Linear distance from the edge of the patch to the nearest user-defined linear feature. The value is listed in user-defined units of feet or meters.
    - HPP reports both the distance from the patch to the feature of interest, as well as identifying the patch that meets these requirements (designated in the attribute table with a label of _OID).

  Presence/Absence: Indicates whether a user-defined linear feature is present *within* the boundary of the patch. Values: True or False as well as 1 (true) or 0 (false); user can determine preference since both are reported.

- **Polygon**

  Polygon Overlay: Summation of the area of overlap between the patch and a user-defined polygon file. This area is provided in either acres or hectares and percentage of overlap.

Distance to feature: Linear distance from the edge of the patch to the edge of the nearest user-defined polygon. The value is listed in user-defined units of feet or meters.

- HPP reports both the distance from the patch to the feature of interest, as well as identifying the patch that meets these requirements (designated in the attribute table with a label of _OID).

Presence/Absence: Indicates whether a user-defined polygon feature intersects the boundary of the patch. Values: True or False as well as 1 (true) or 0 (false); user can determine preference since both are reported.

B.2 Custom Metric Logic Models

1. *Count*

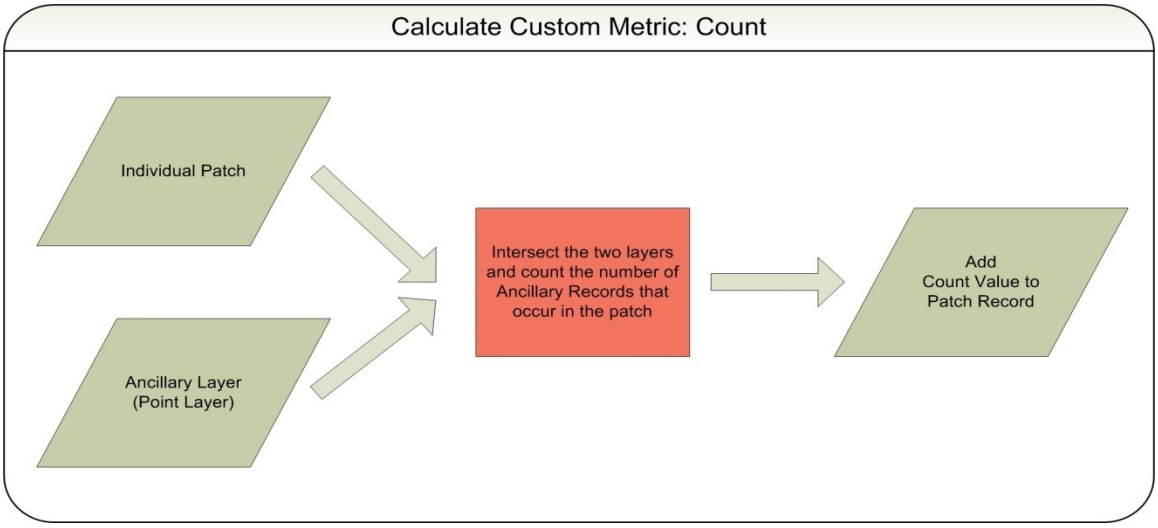


Figure 1. Custom metric, count, model calculation

2. *Distance To*

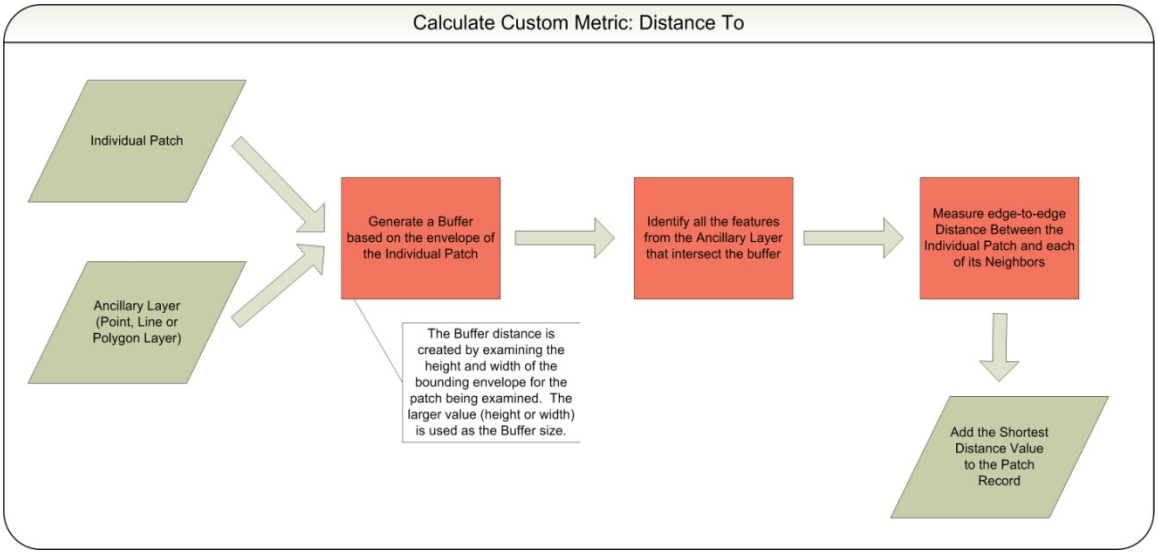


Figure 2. Custom metric, distance to, model calculation

3. *Presence/Absence*

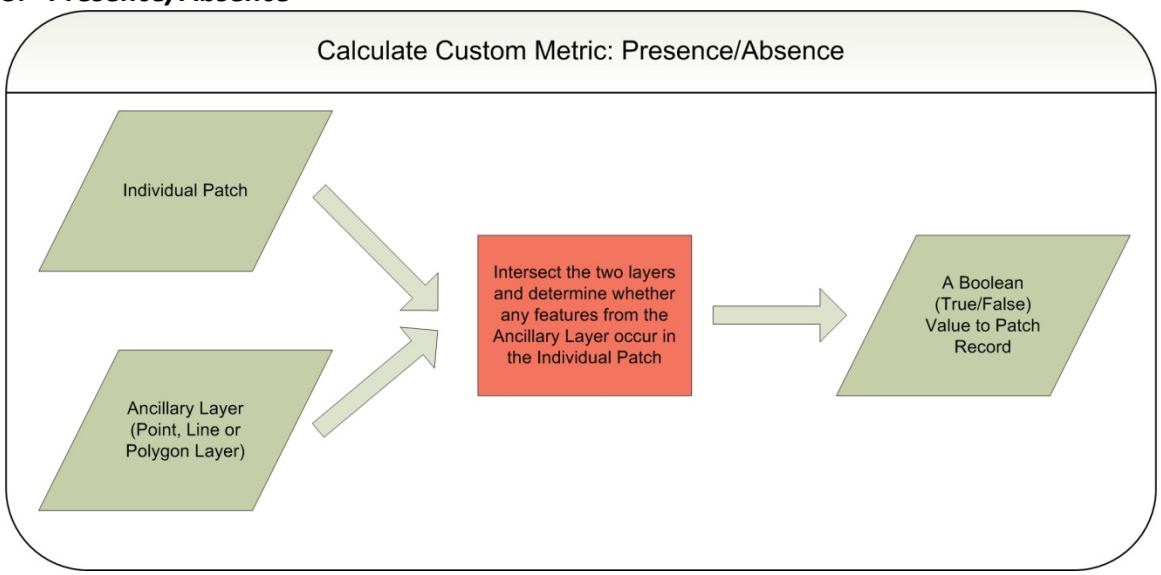


Figure 3. Custom metric, presence/absence, model calculation

4. *Polygon Overlay*

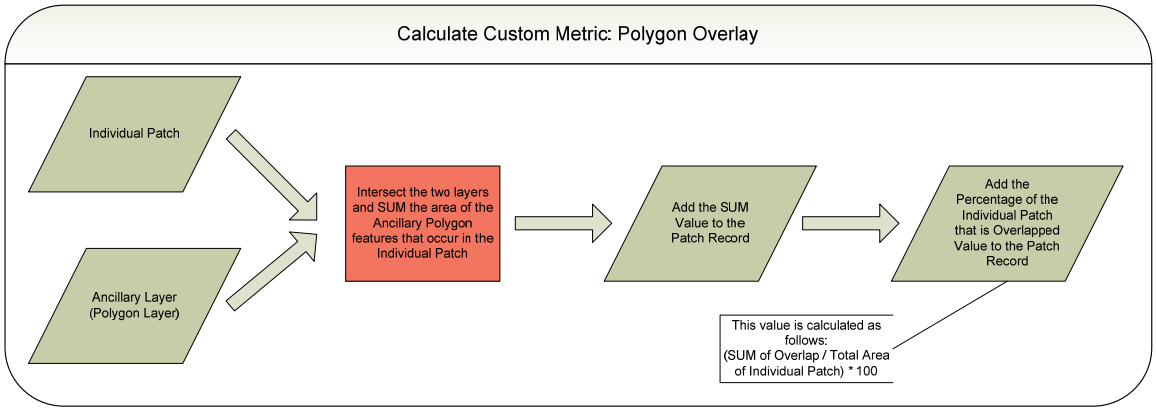


Figure 4. Custom metric, polygon overlay, model calculation

Appendix C: Habitat Priority Planner Example Scenario

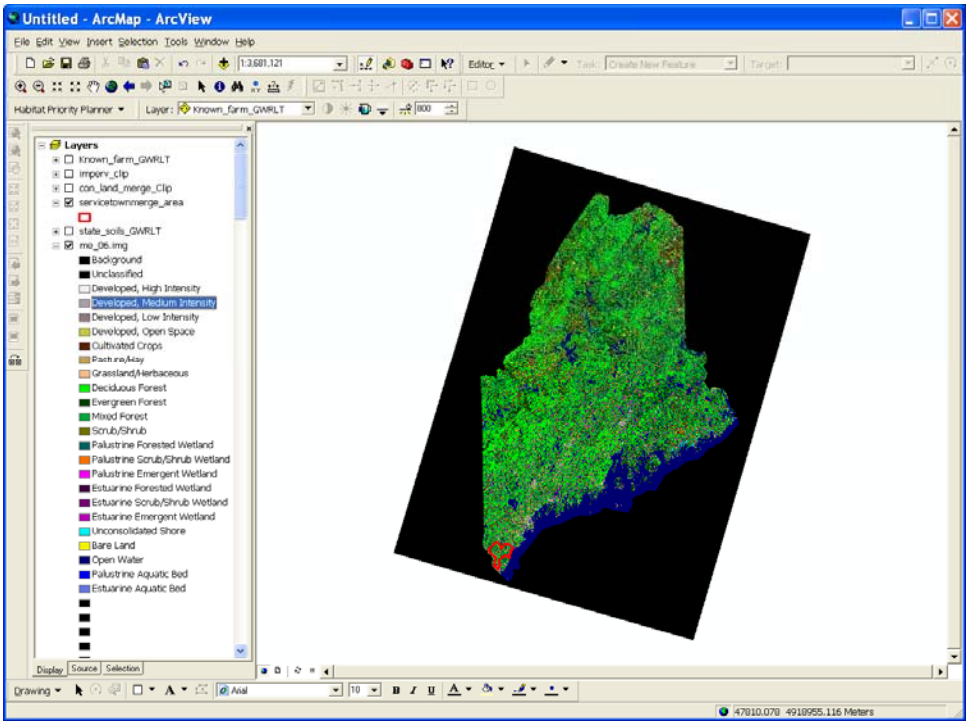
C.1 Scenario Description and Data

Below is a simple example scenario illustrating a Habitat Priority Planner analysis from start to finish with associated visuals. The scenario is an example demonstration of the tool function and does not necessarily reflect a final management decision.

This scenario focuses on an area in southern Maine where a large local land trust is working on its conservation strategic planning efforts. The first goal is to group the habitat types by four land use categories: forest, agricultural, developed, and wetland. Next, we will narrow our focus for this example, by considering agricultural areas that meet several preservation criteria. The target agricultural areas must be composed of 50% of a specialized soil type, must occur within 2 miles of known and operational farms, must be close to currently conserved lands to allow for the local land trust to consider them for conservation or easement, and must be of a substantial acreage. Continue through this step-by-step process to see how we address this issue in the Habitat Priority Planner (HPP).

Necessary Data for Scenario:

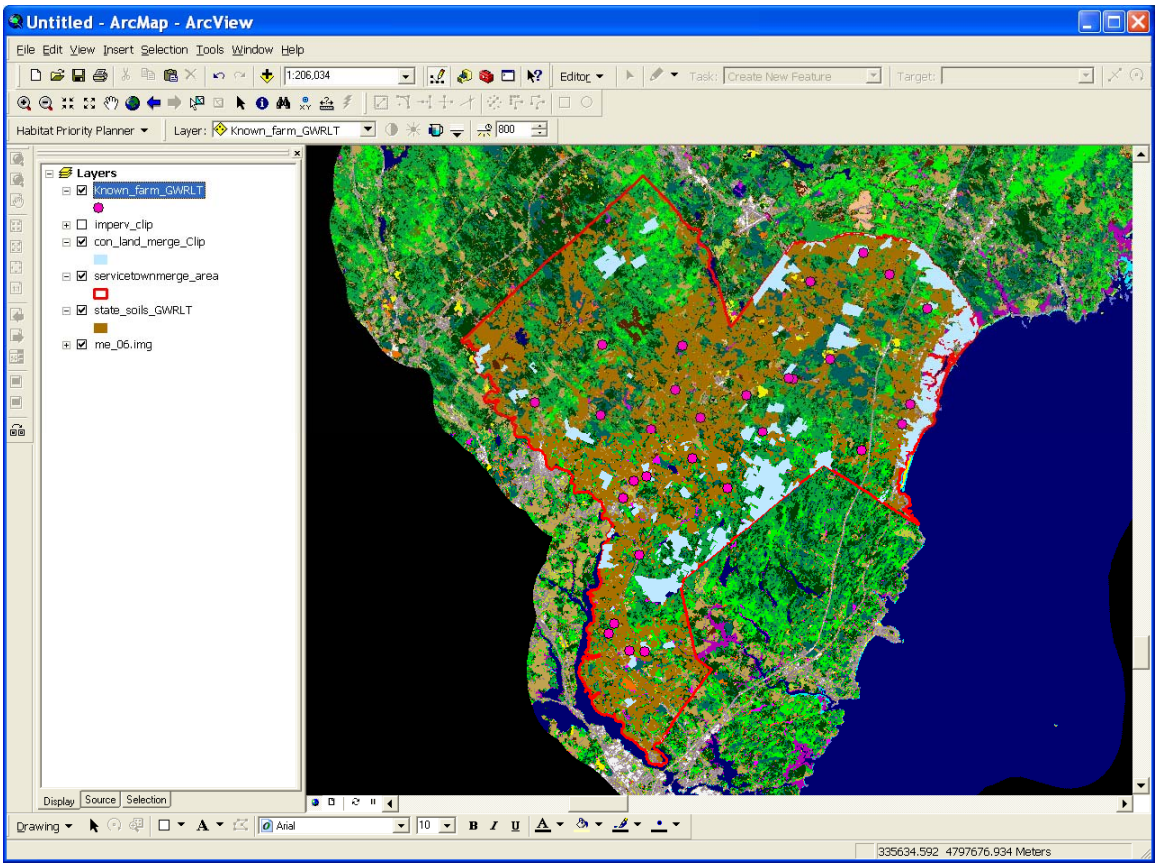
- Maine Coastal Change Analysis Program (C-CAP) (raster layer)
- Analysis area (supporting vector data)
- Updated impervious surface data (supporting vector data)
- Specialized soil type data (supporting vector data)
- Existing conservation areas (supporting vector data)



Scenario Figure 1. Maine C-CAP layer with area of interest outlined in red

A View of the Supporting Datasets:

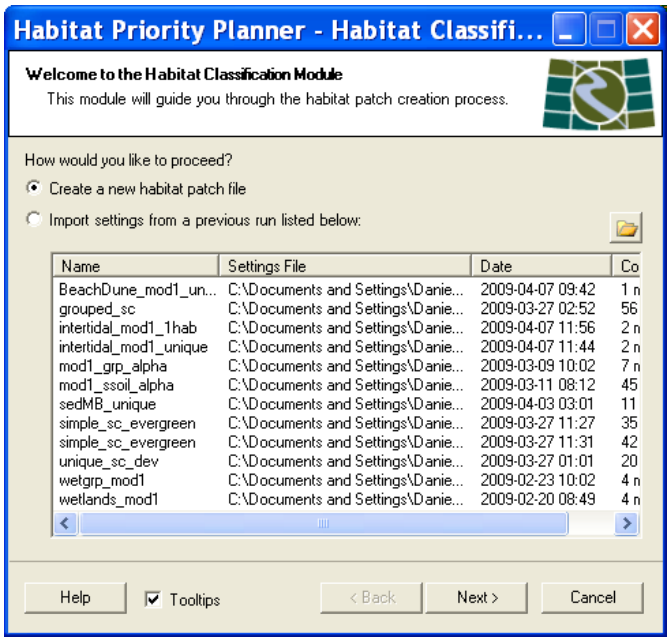
- The soils of interest are designated in brown.
- The farms are show in the pink dots.
- The conservation lands for southern Maine are shown by blue polygons.
- The red polygon surrounding the area designates the study area.



Scenario Figure 2. Supporting datasets

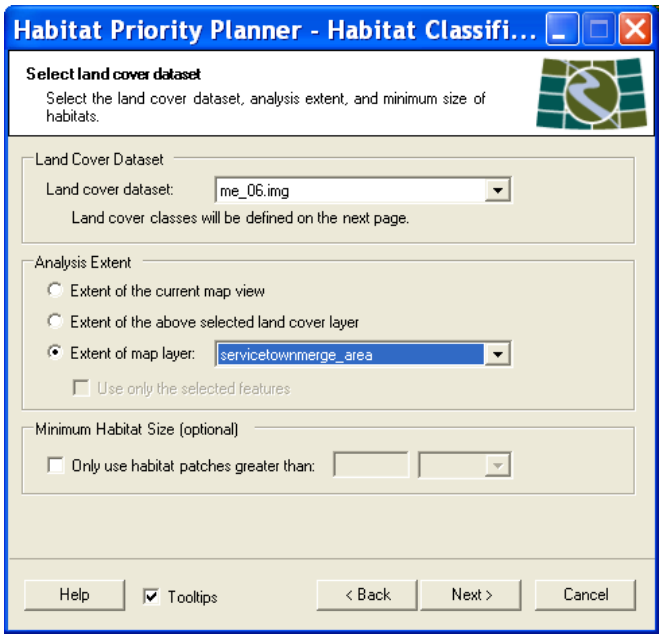
C.2 Habitat Classification – Module 1

1. This is a new classification; select the **Create a new habitat patch file** radio button.



Scenario Figure 3. Select new file

2. Click **Next**.

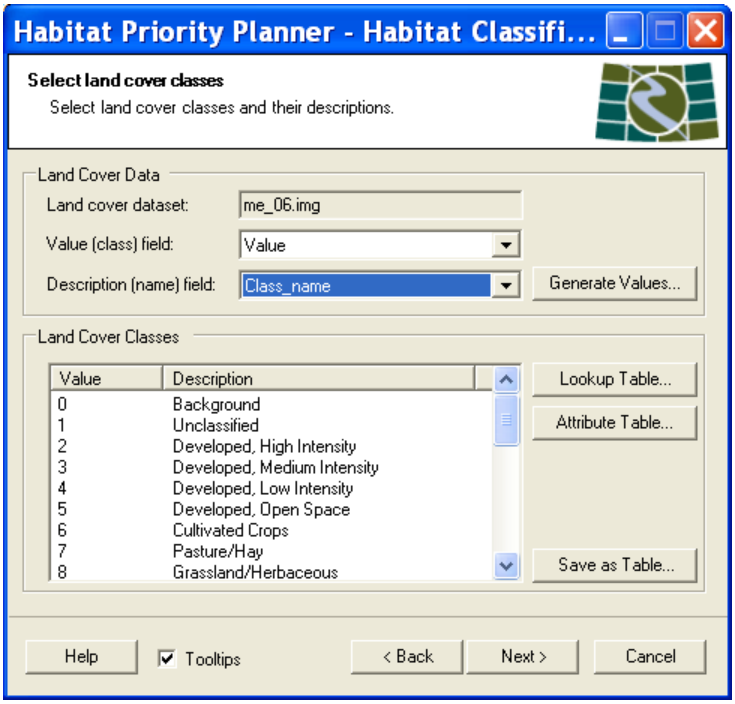


Scenario Figure 4. Selecting the land cover layer

3. Select the **Land cover dataset**, in this case the Maine C-CAP, **me_06.img**.
    - For C-CAP data, the number listed in the title is the year of the data; you will most likely be able to find multiple years of C-CAP for your coastal study area.
4. For the Analysis Extent, select **Extent of map layer** as the extent. Select the polygon layer from the associated drop-down menu.
    - We used a combined set of polygons delineating a land trust service area of 6 towns.
    - Only patches within this polygon will be available for analysis, and any patches falling on the border of this polygon will be clipped.
5. Click **Next**.

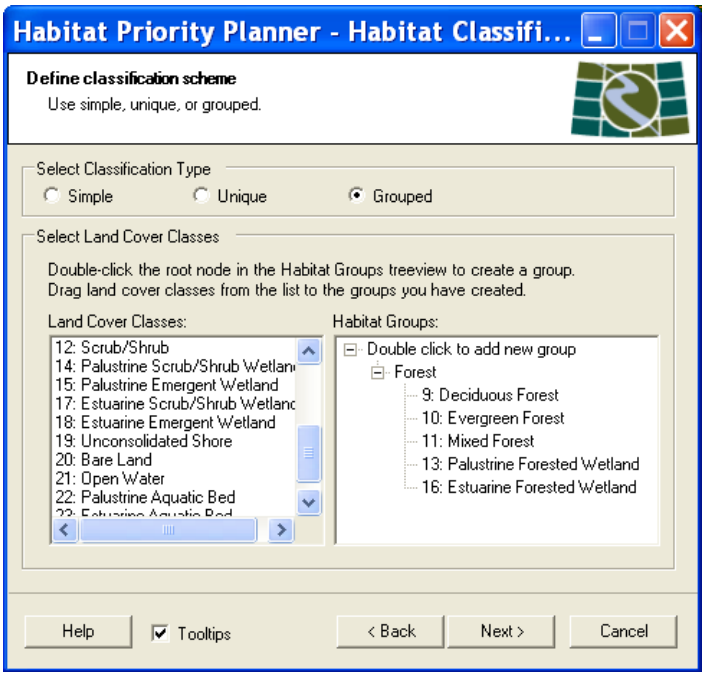
In window 3, the land cover dataset is automatically populated from the previous window.

6. Select the **Value (class) field** (since this is C-CAP data, we have a value field available).
7. Select the **Class_name** field for the description field.
8. Click **Next**.



Scenario Figure 5. Window 3, selecting the value and descriptive fields

9. In window 4, Select the **Grouped** classification.
10. Double-click to create the following groups; as you create a group, drag and drop the appropriate classes into each group.
    - Forest
        - Deciduous Forest, Evergreen Forest, Mixed Forest, Palustrine Forested Wetland, and Estuarine Wetland
    - Agriculture
        - Pasture/Hay and Cultivated Crops
    - Wetland
        - Palustrine Scrub/Shrub Wetland, Palustrine Emergent Wetland, Estuarine Scrub/Shrub Wetland, and Estuarine Emergent Wetland
    - Developed
        - Developed-High Intensity, Developed-Medium Intensity, Developed-Low Intensity, and Developed Open Space



Scenario Figure 6. Grouped classification for the first group in the scenario

11. Click **Next**.

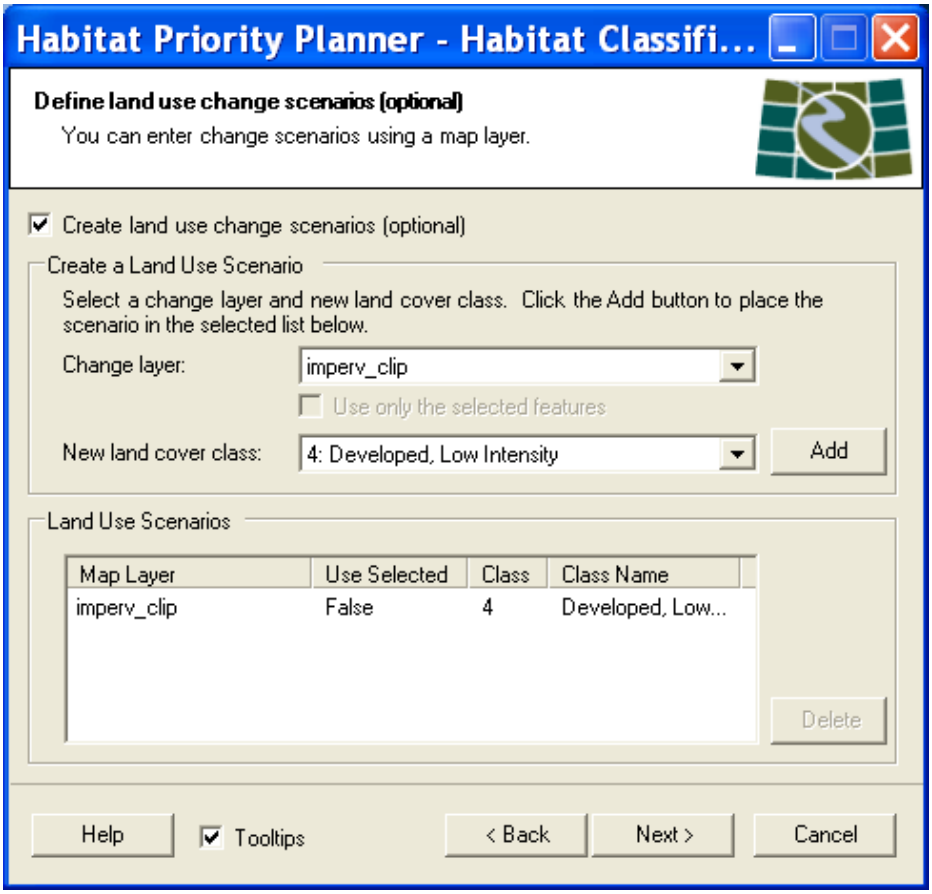
12. In the next box, we will be completing a change scenario. Click the **Create Land Use Change Scenario** checkbox to unhide the window contents.
- For this example we will be using a newer impervious surface file to update our C-CAP data file. The impervious file is a newer and higher-resolution file and will give us a more recent view of our area.
- ➢ ***Remember, when HPP executes a land-use scenario change, the resultant patch file layer will be edited to reflect the change polygons designated by the user.***

13. Select the **Change layer** from the drop-down menu.

14. Select the **New land cover class** for analysis. We are updating developed areas for this example.
- ➢ ***Remember you must have selected this land cover type as one of your analysis types in the previous window.***

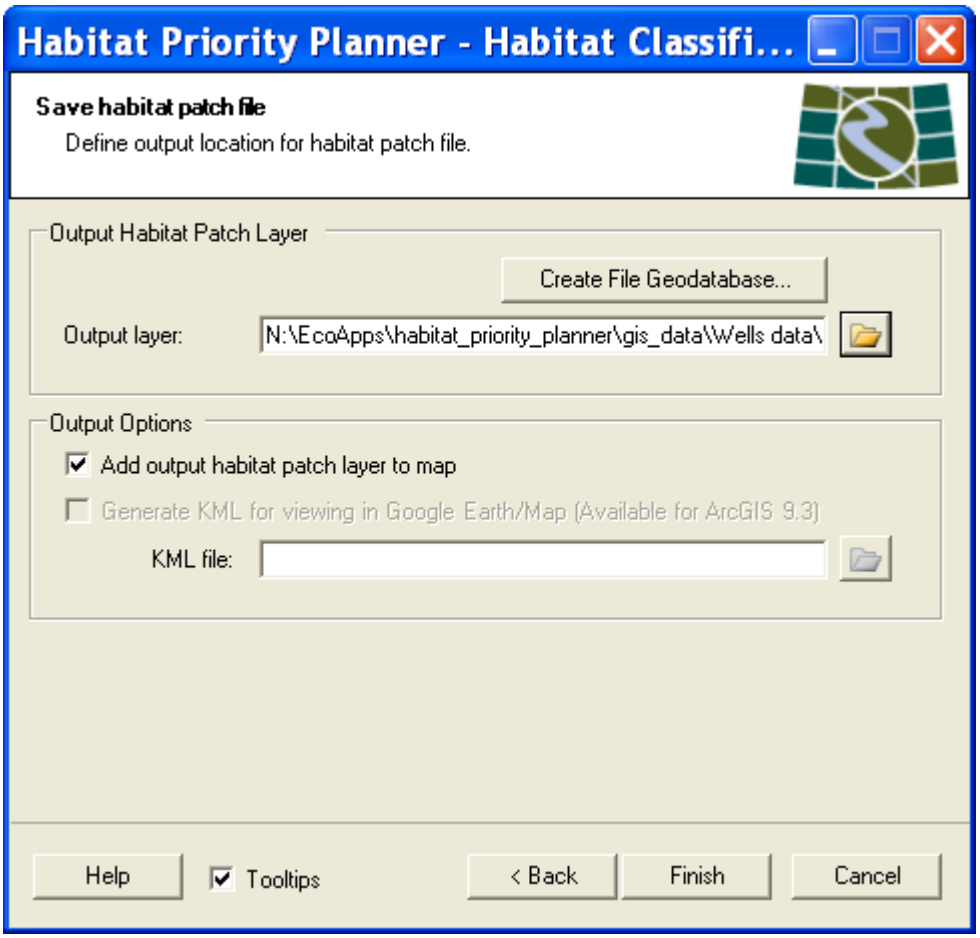
15. Click the **Add** button to add the scenario to your analysis.
- ➢ ***The user may have multiple land use scenario changes if desired. To create additional analyses, repeat steps 13-16.***

16. Click **Next**.



Scenario Figure 7. The land use change scenario

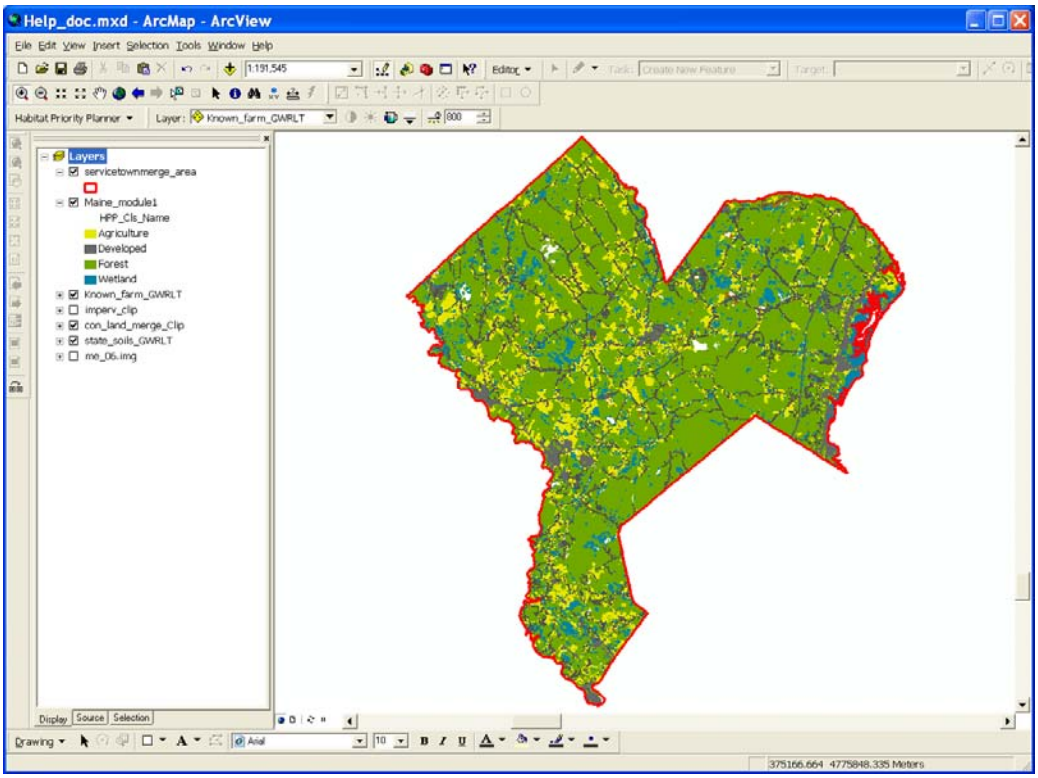
18. For the final window, we will save our file; first create a file geodatabase using HPP for this new application.
19. Navigate to your new file geodatabase and name the file using the **Patch file location** browser and box.
20. Name your **Patch layer name**. This name will be displayed in your ArcGIS table of contents, in the main map view.
21. **Add output habitat patch layer to map** will be checked. Leave this as is.
22. If you have ArcGIS 9.2 Professional, or ArcGIS 9.3, the kml functionality will be available. You can designate to save this file in the same area as your other files but not within your file geodatabase.



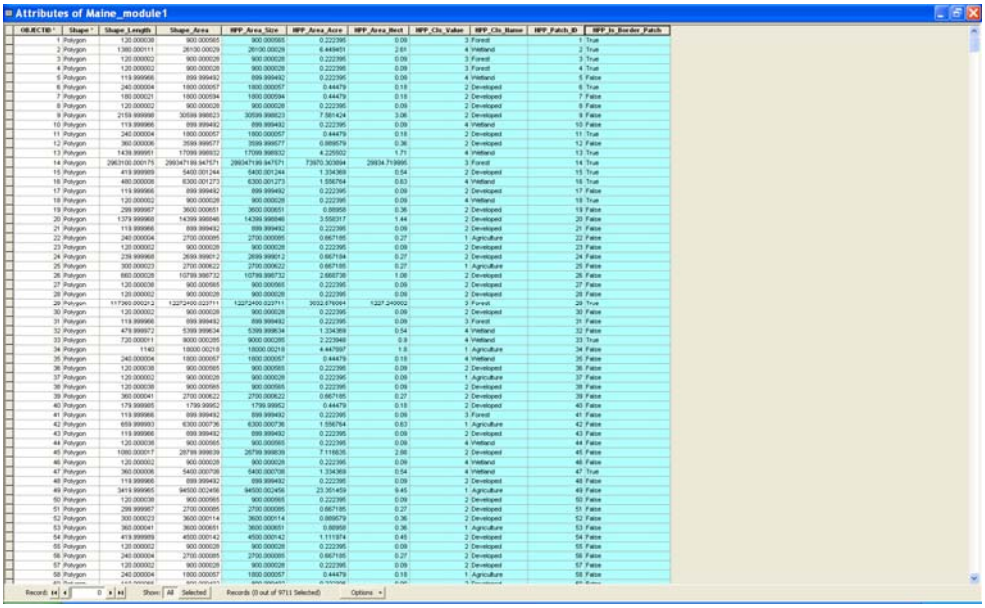
Scenario Figure 8. Saving your work, and completing the Module 1 analysis

Module 1 Results:

1. From Module 1, HPP will provide as an output a new habitat patch file containing the specified land use change scenario. The outputs for this example are shown below.



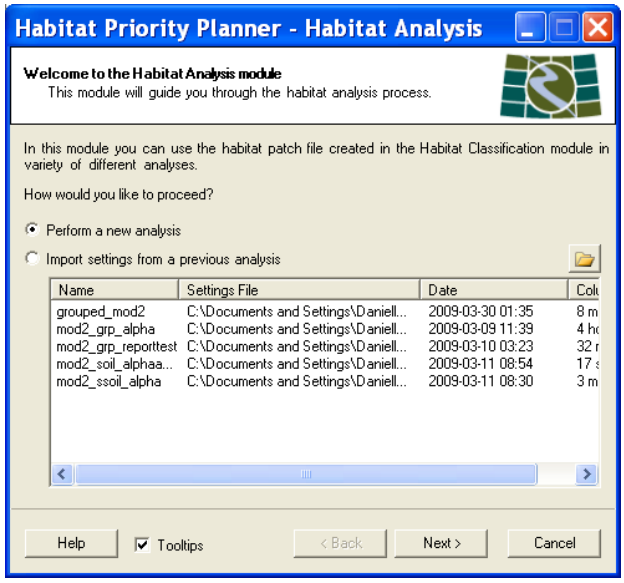
Scenario Figure 9. The completed Module 1 classified habitat patch file. Note the four grouped classes; refer to the Arc table of contents.



Scenario Figure 10. The completed Module 1 classified habitat patch file attribute table

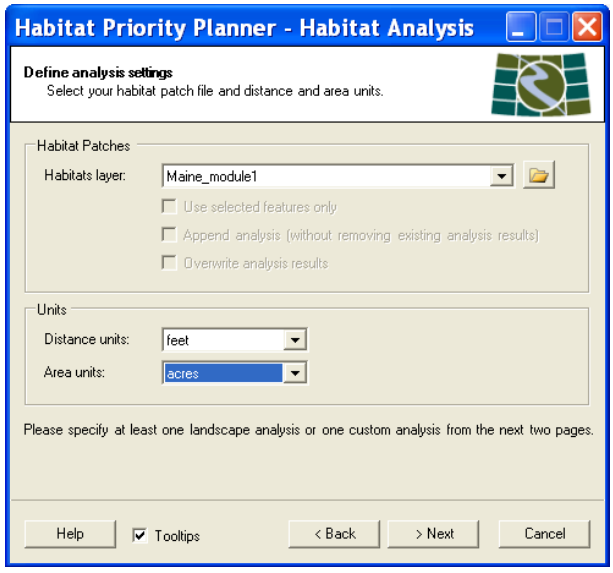
C.3 Habitat Analysis – Module 2

1. Select **Perform a new analysis** on the first window of the Habitat Analysis module.
2. Click **Next**.



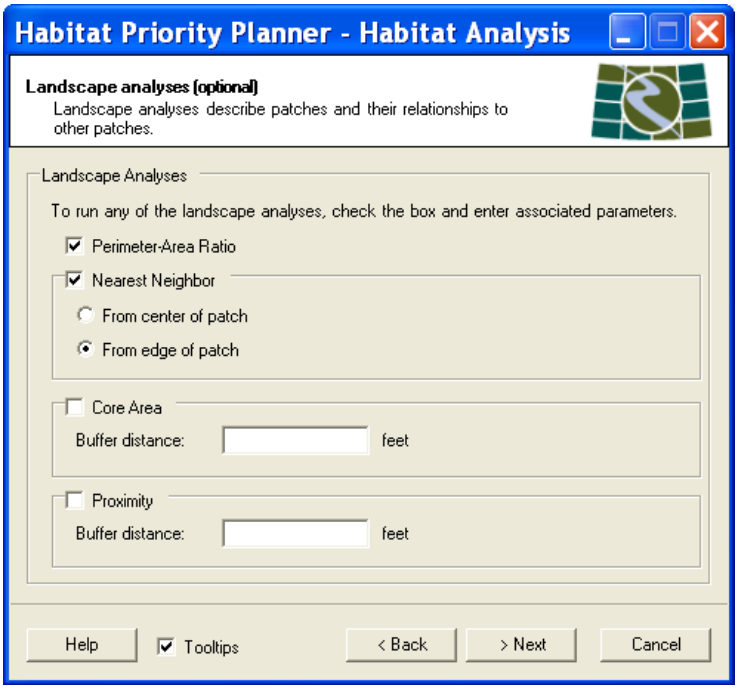
Scenario Figure 11. The first window of the Habitat Analysis wizard

3. In window 2, select the Module 1 file that was created in the previous steps, **Maine_module1**.
4. Select the appropriate distance and area units, here **feet** and **acres**.
5. Click **Next**.



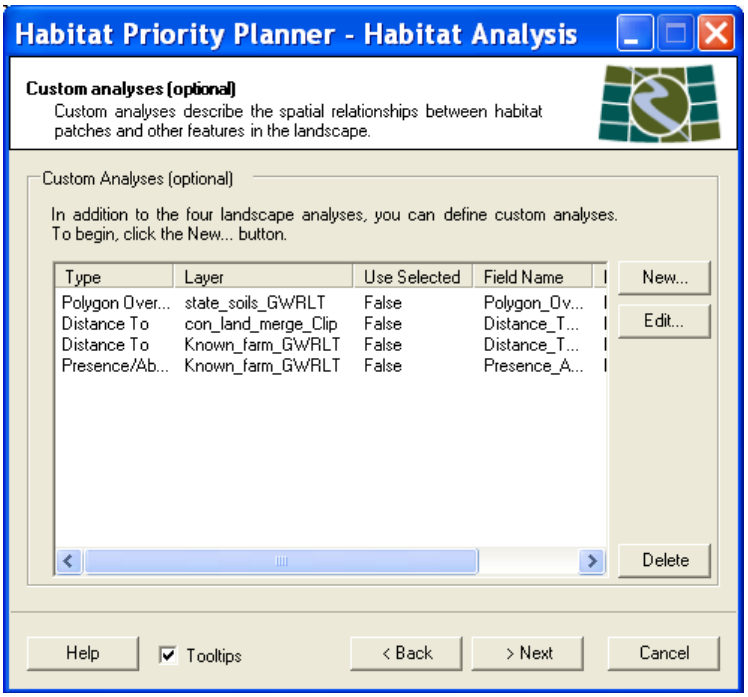
Scenario Figure 12. Selecting your analysis file and units

6. In the Landscape Metrics Analysis Window, Select **Perimeter-Area Ratio**, and **Nearest Neighbor** (from edge of patch).
7. Skip the other two analyses for this example (remember they are all optional).
8. Click **Next**.

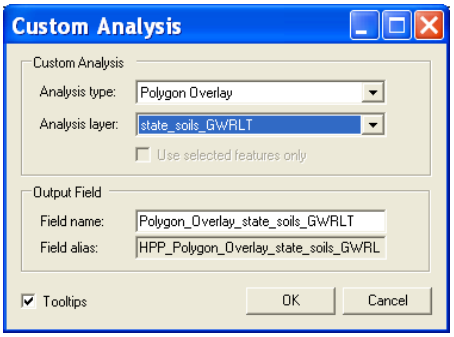


Scenario Figure 13. Landscape metrics for this analysis

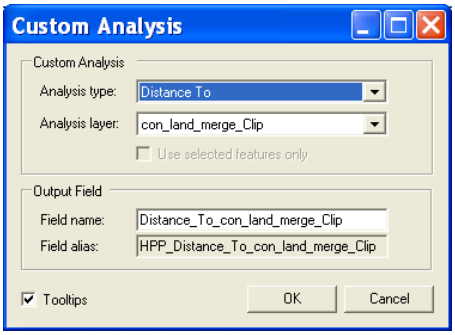
9. Listed below are the example custom analyses used for this scenario.



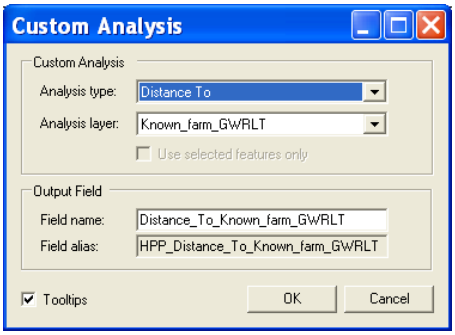
Scenario Figure 14. Custom analysis window, with four analyses chosen; see each in detail in the figures below.



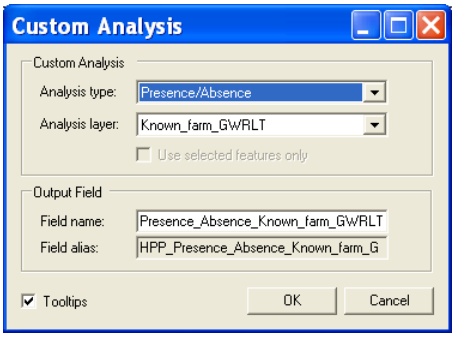
Scenario Figure 15. The Polygon Overlay analysis for the soils of interest



Scenario Figure 16. The Distance To analysis for the conserved lands

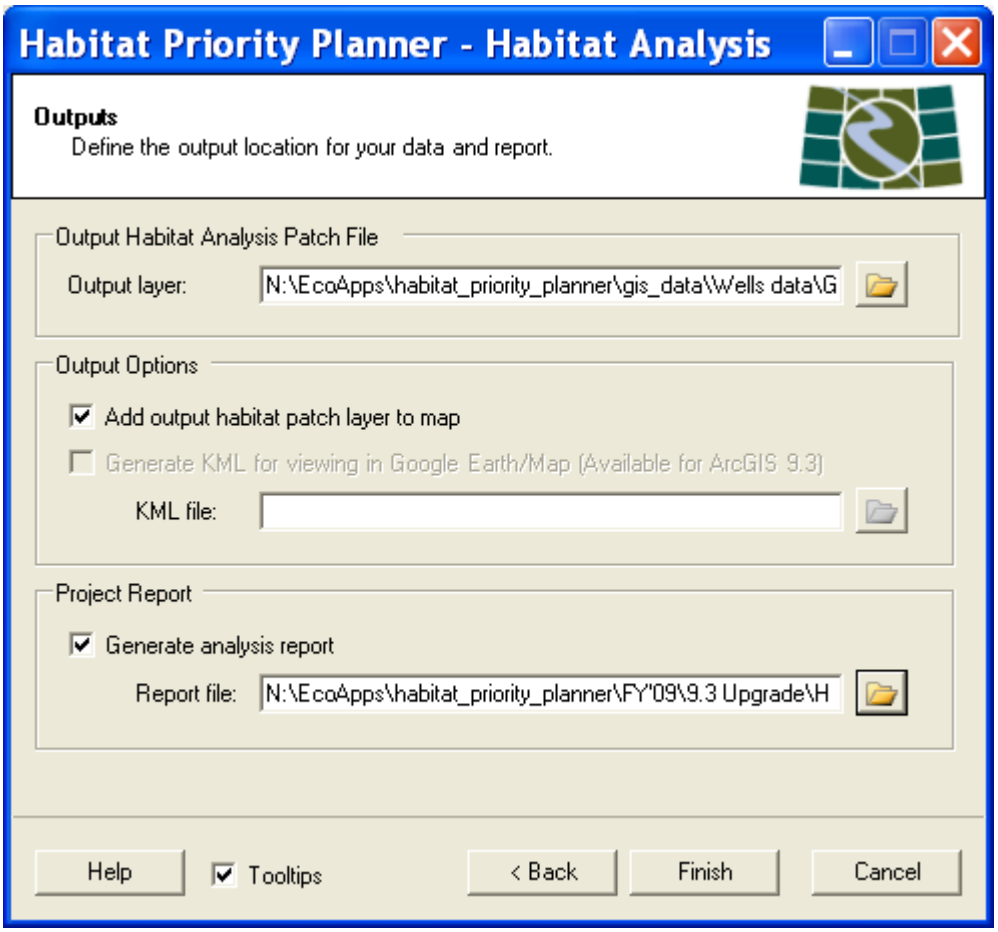


Scenario Figure 17. The Distance To analysis for the current farms



Scenario Figure 18. The Presence/Absence analysis for the current farms, as an alternate method of viewing the data.

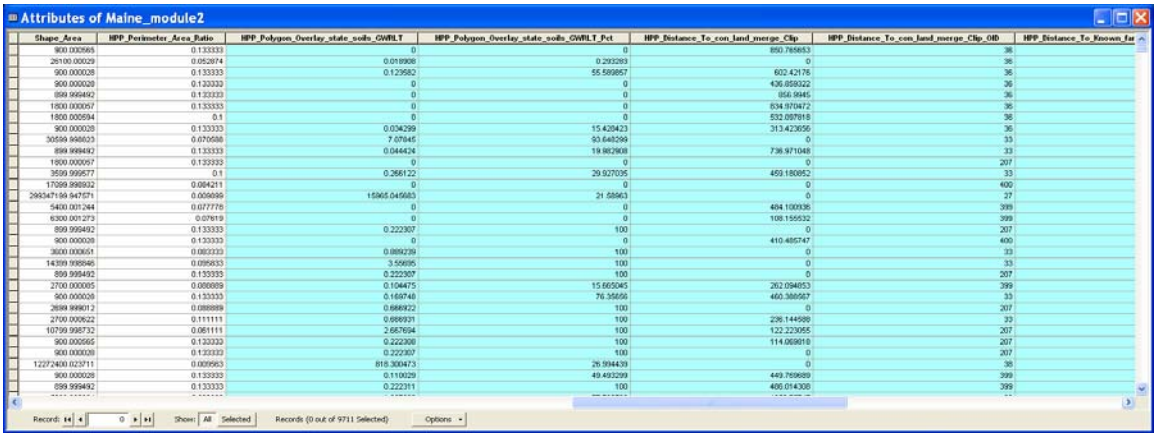
10. In the final window in Module 2, we will save our files in the same file geodatabase. Navigate to the file geodatabase, and name the file.
11. Name your layer as it will appear in the table of contents in ArcGIS; here we named it **Maine_module2**.
12. Leave the **Add output habitat patch layer to map** checked.
13. Create a report. Navigate to an appropriate saving location, we recommend in an area near your file geodatabase; however, the pdf ***cannot*** be saved in a geodatabase.)
14. Name your report appropriately.
15. Click **Next**.



Scenario Figure 19. The final window in Module 2, saving your data and creating a report

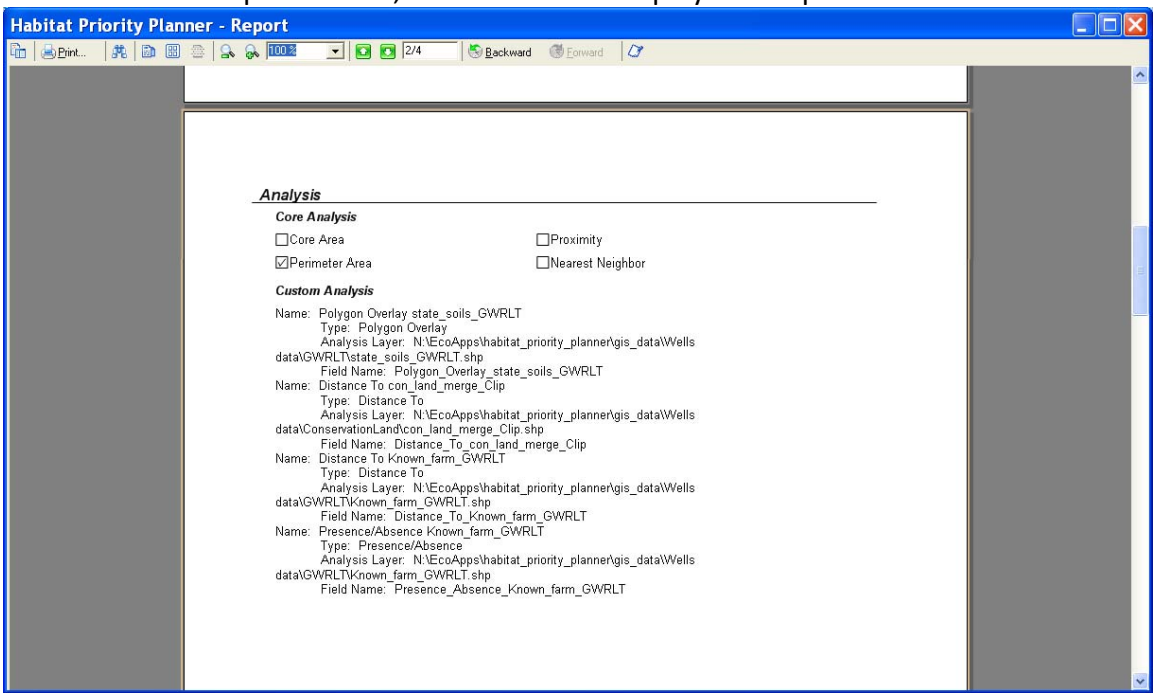
Module 2 Results:

1. From Module 2, HPP will provide as an output a new habitat patch file containing the specified landscape and custom metrics. Remember, the patch file will look the same as the Module 1 analysis. The attribute table is shown below, where we can see the appended fields.

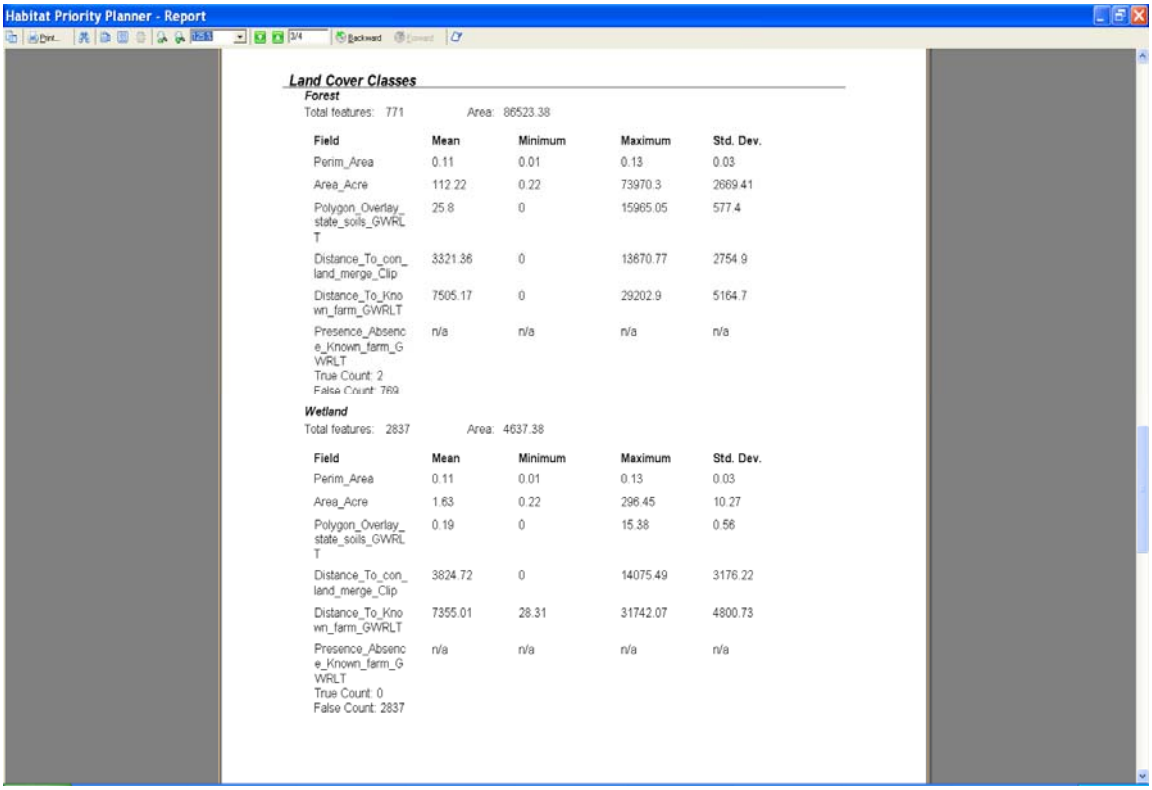


Scenario Figure 20. Output of Module 2, the habitat analysis patch file with the new fields

2. From Module 2, we also have the report file. Remember that the report contains all settings parameters, as well as the metrics run and the statistics for each land cover type.
    - Below we can look at two portions of the report; the first focuses on the run parameters, and the second displays a sample of the class statistics.



Scenario Figure 21. Output of Module 2, the report page delineating the analysis metrics



Scenario Figure 22. Output of Module 2, a sample of the report statistics, reported by land cover class type

C.4 Data Explorer – Module 3

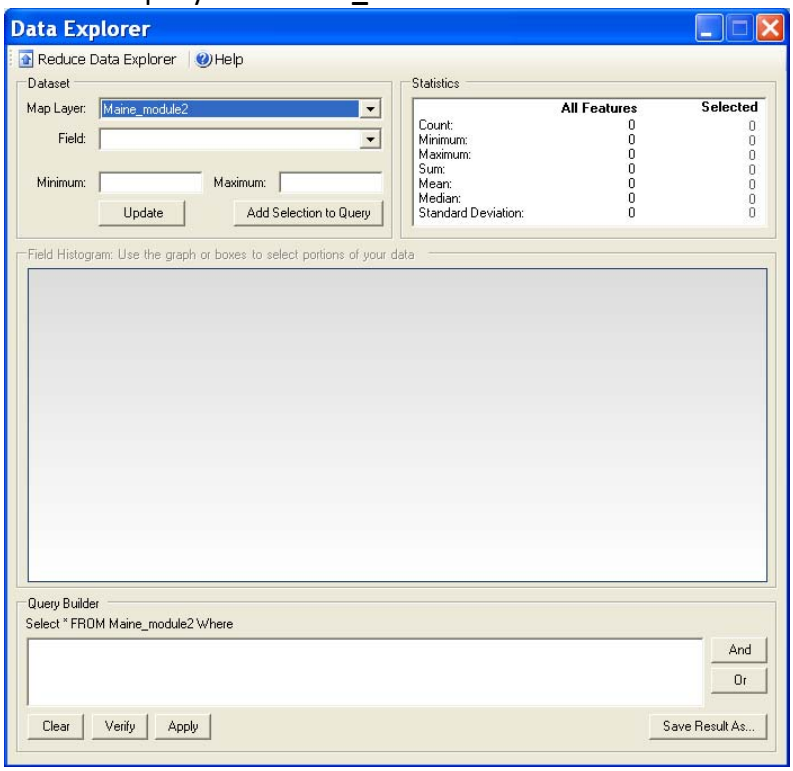
In the Habitat Classification module, we ran a grouped classification to capture the four functional groups of interest for our goal. Then, in the Habitat Analysis module, we completed two landscape metrics and four custom analyses in which we determined the distance to conservation areas, distance to operational farms, presence/absence of operational farms, and polygon overlay of our habitat types with specific soil types.

Now, we want to identify habitat patches with the following criteria:

- Focusing on Agricultural areas (for this particular sub-goal)
- Containing 50% specific state soils (this soil type is important for agricultural preservation grant qualification)
- Within 2 miles of known farms
- Within close proximity of currently conserved lands

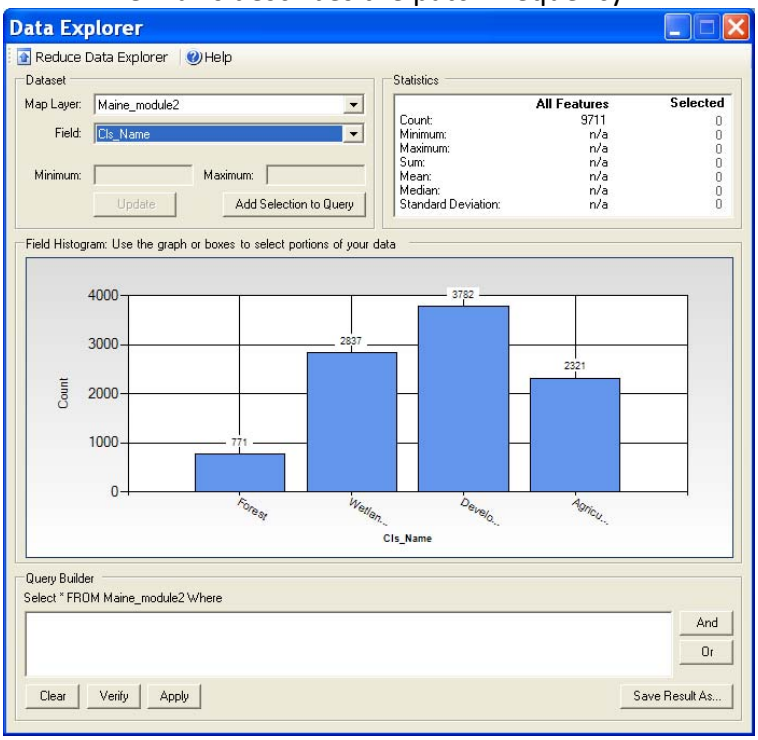
The Data Explorer module allows us to prioritize habitat patches to address the above criteria.

1. Select the patch layer from the **Map Layer** drop-down menu.
   - The map layer is **Maine_module2**.



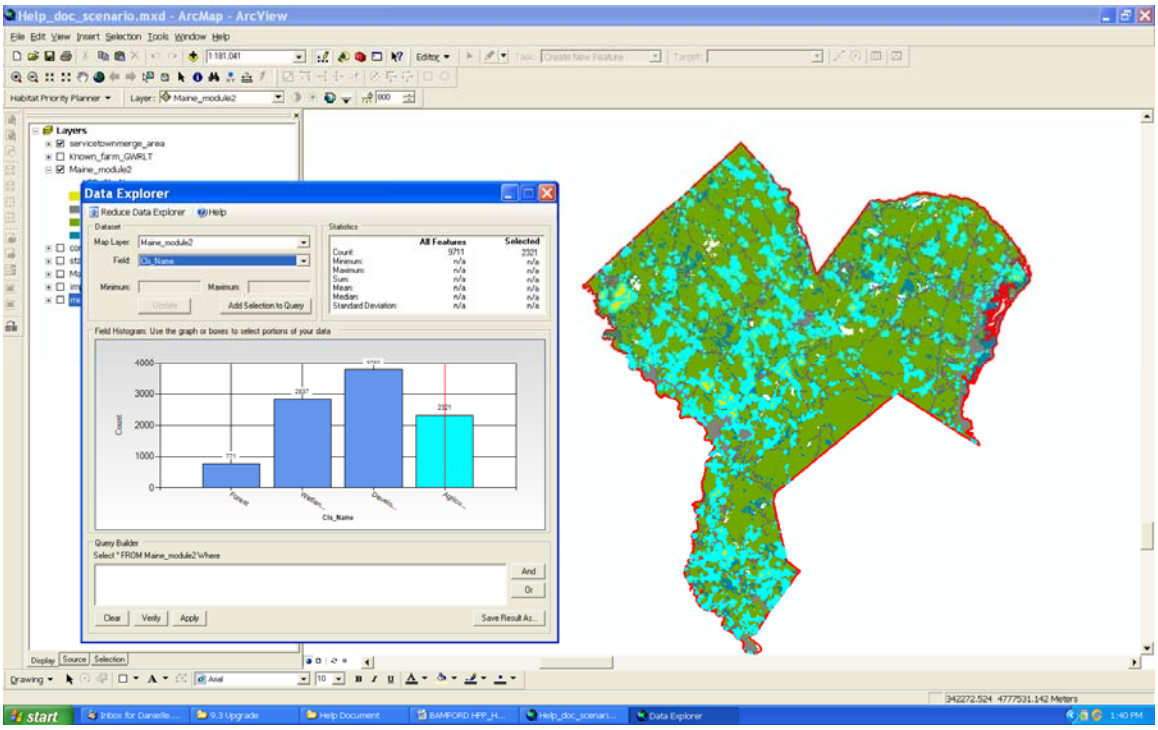
Scenario Figure 23. Selecting the map layer of interest in the Data Explorer module

2. Select the field that contains the question criterion for "focusing on agricultural areas." In this case, we would choose the field, **Cls_Name**.
3. The histogram is updated with the textual representations for each group.
    - Note that the fields can be either text or numerical for the graphical selection in HPP.
    - The X-axis shows each group.
    - The Y-axis describes the patch frequency.



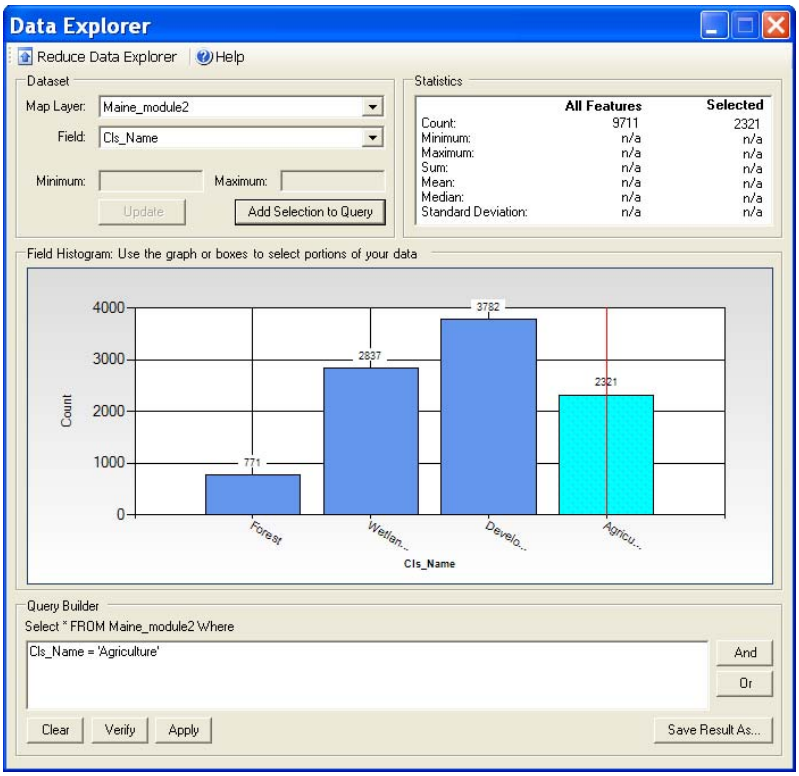
Scenario Figure 24. Selecting the field of interest; note the histogram is now shown for the corresponding field.

4. In the histogram, click on the **Agricultural** group.
5. The corresponding map results display the agricultural class patches.

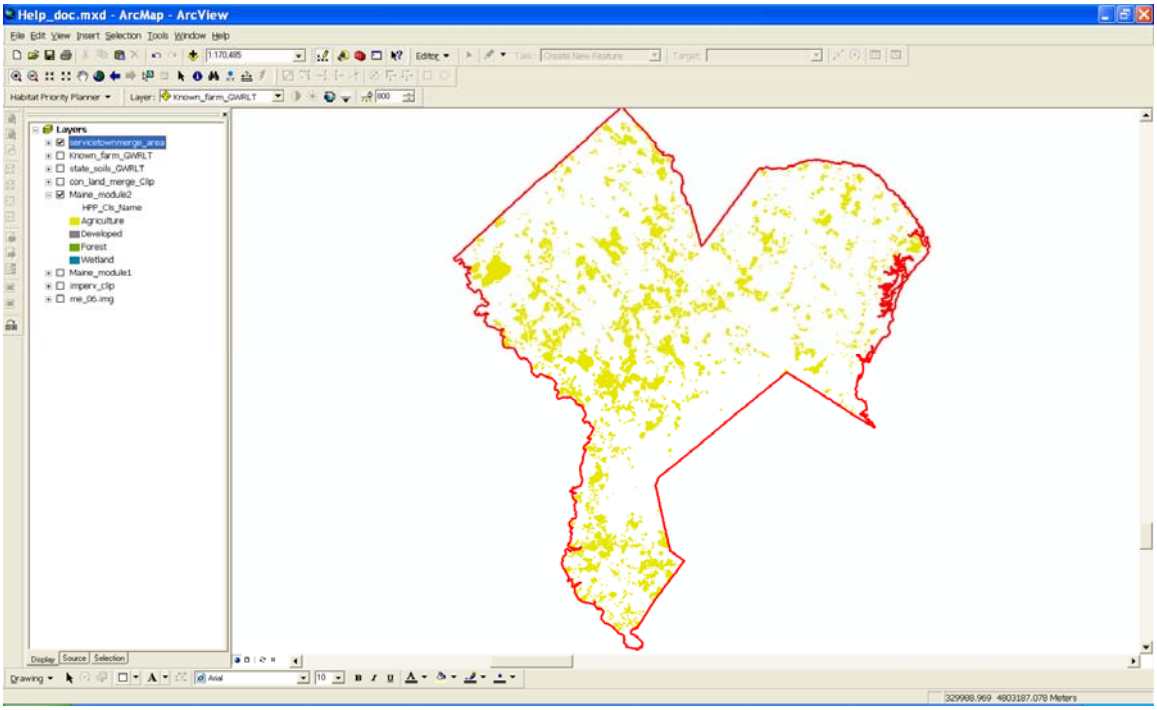


Scenario Figure 25. Selecting the group of interest, agricultural, and the corresponding map results

6. Note the statistics associated with this selection:
    - The total number of patches. In this case 9,711, which would include the results for all four groups.
    - The number of agricultural patches. In this case, 2,321 patches are designated as agricultural.
    - ➢ ***Note: since this is a textual selection, we do not have full statistics to accompany our selection.***
7. Click the **Add Selection to Query Builder** button to confirm the selection of the agricultural patches.
    - ➢ ***Note: this functionality uses a definition query within ArcMap. No data are deleted, and the query can be cleared at any time by clicking the Clear button.***
8. **Verify** your selection to confirm the syntax.
9. View your results (see the next figure).



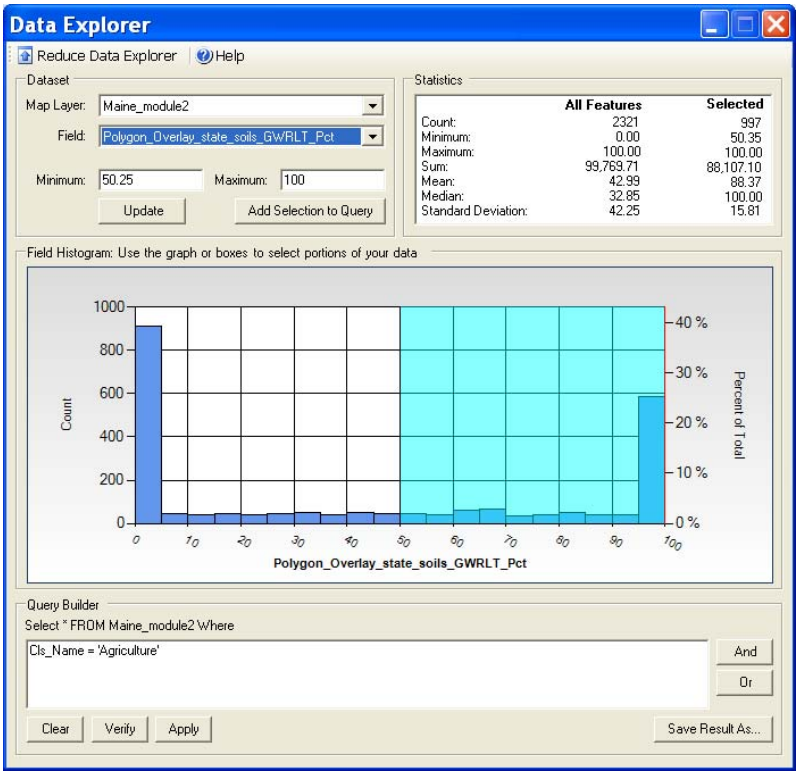
Scenario Figure 26. The advanced mode of HPP, and our first selection, class name equals agriculture



Scenario Figure 27. Selecting the group of interest, agricultural, and the corresponding map results after applying the selection

10. Select a new Field, polygon overlay with state soils (**Polygon_Overlay_state_soils_GWRLT_Pct**), to meet the second criterion, "containing 50% specific state soils."

- Note: you will have two choices for this field, the polygon overlay by area, and the polygon overlay by percent.
  - For this scenario we want percent, so choose the analysis with **Pct** following the name (Pct designates percent in HPP).
- Select 50 to 100% on the histogram to designate the patches of interest.
  - Complete this by clicking on the histogram at 50% and dragging to the end of the graph.
  - Or type the numbers **50** and **100** in the minimum and maximum boxes.



Scenario Figure 28. Viewing the Data Explorer window for the second criterion

- In the Statistics window, you will see that of the 2,321 agricultural patches, 1,000 overlay 50% or more with state important soils.

11. To display the features in both the histogram and the map, first click on the **And** button to add this statement to the Query Builder.

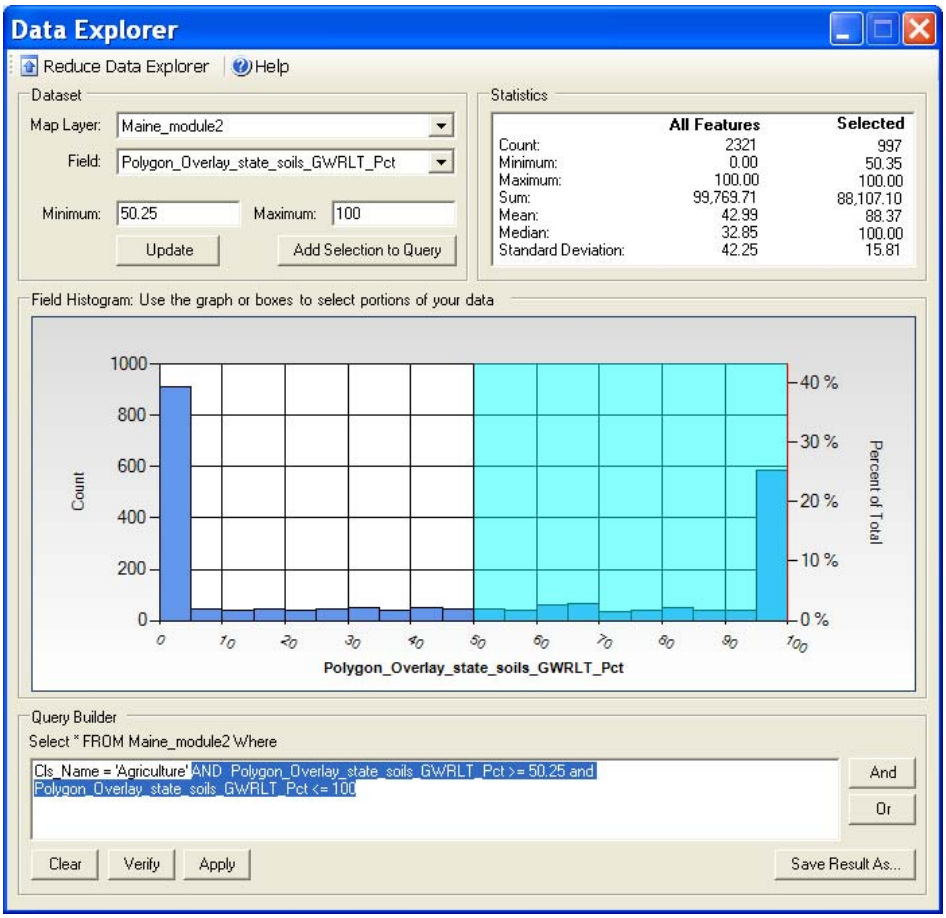
- ***Note: 'And' statements allow users to select multiple criteria and continue to narrow their patch selection according to user goals.***

12. Click the **Add Selection to Query Builder** button. This adds the appropriate syntax to the Query Builder that is based on your histogram.

- In this case the selection equals

Polygon_Overlay_state_soils_GWRLT_Pct >= 50 and
Polygon_Overlay_state_soils_GWRLT_Pct <= 100

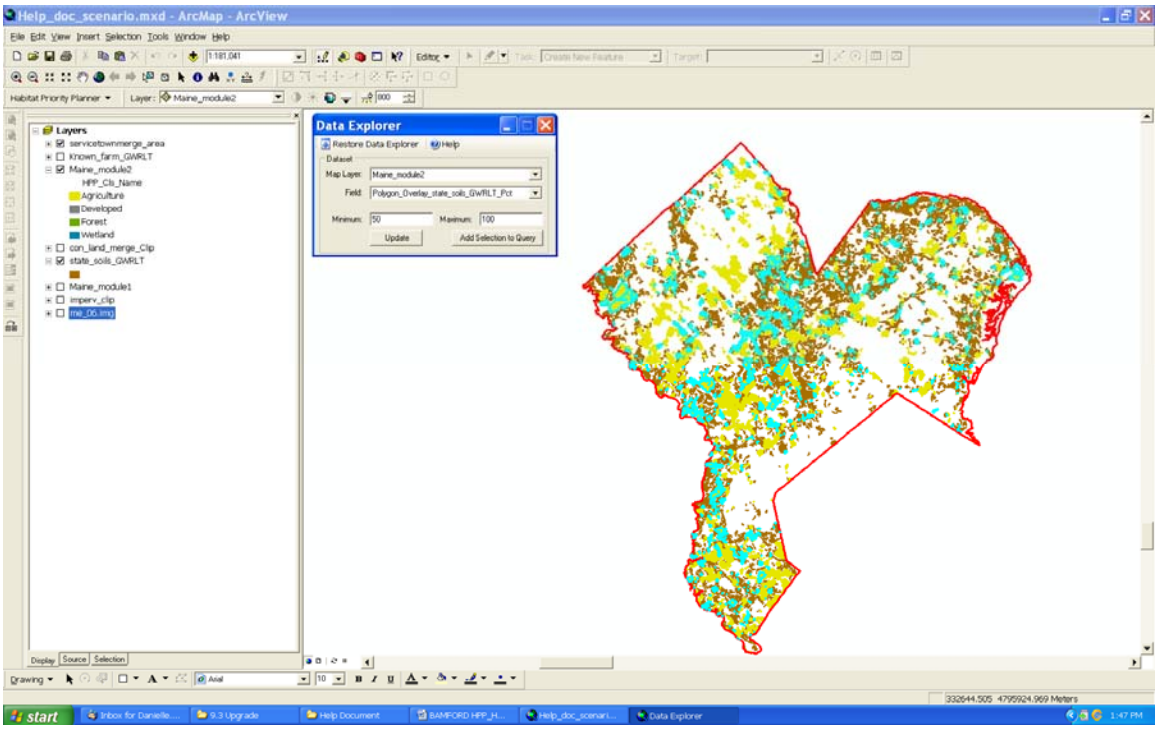
13. Verify the Query.



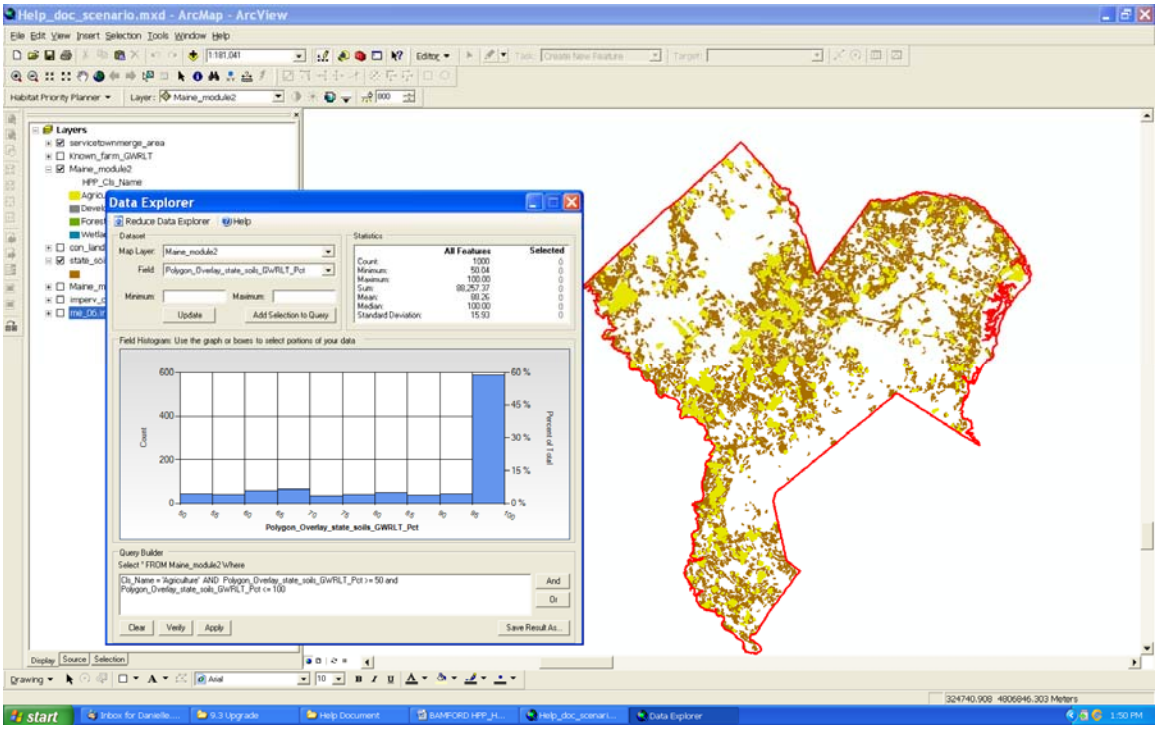
Scenario Figure 29. Viewing the Data Explorer window for the second criterion as it is added to the Query Builder

14. Apply the Query. The patches visible on the map below and represented in the histogram will only be those that are both agricultural and containing 50% or more state important soils.

The maps below display both before and after the query is applied. Be sure to turn on the ancillary dataset that the agricultural habitats are being related to, in this case the state important soils, shown in brown.



Scenario Figure 30. Viewing the Data Explorer window and the corresponding map selection before applying the query. The agricultural areas are shown in yellow, the state soils in brown.

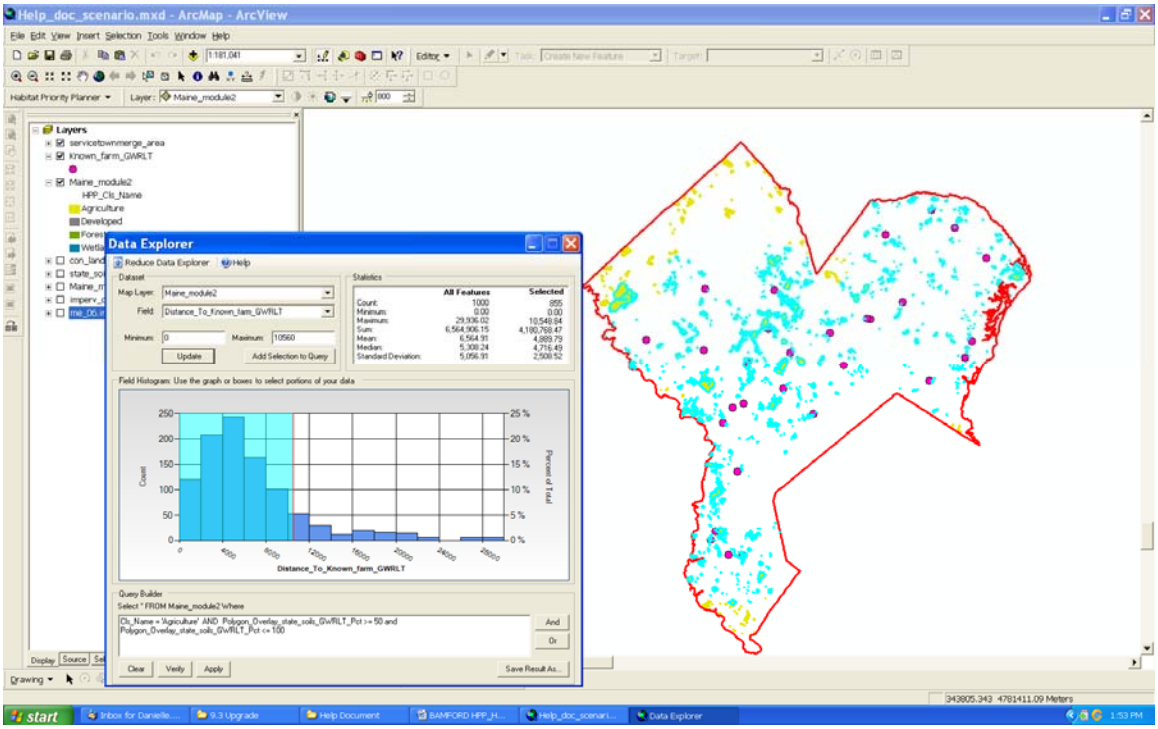


Scenario Figure 31. Viewing the applied selection; note the redistribution of the histogram to reflect the selection of 50% or greater. The agricultural areas are shown in yellow, the state soils in brown.

15. To further investigate this dataset, we will next identify those patches that meet the third criterion, "within 2 miles of known farms."

- Select from the **Field** drop-down menu **Distance_to_Known_Farm_GWRLT** (distance to operational farms).
- Select the range of **0** to **10,560** feet to fulfill the criterion that allows leasing farmers to drive to these agricultural areas in their tractors.

➢ ***Remember, you can complete this operation by either selecting on the histogram or typing the values in the boxes.***



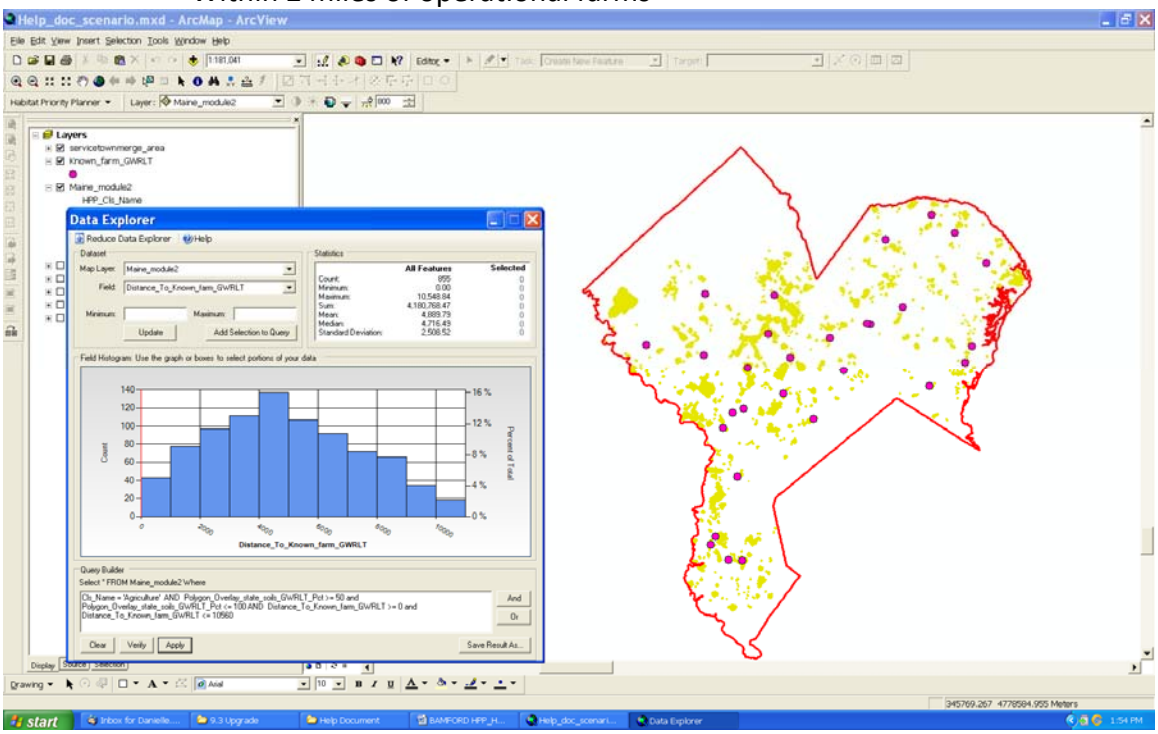
Scenario Figure 32. The new section based on agricultural areas within 2 miles of operational farms

16. Adding the selection to the Query Builder, first click the **And** button. This will insert the "AND" constructor into your query.

17. Click the **Add Selection to Query Builder** button. The query will be updated.

18. The results now contain three of the selection criteria:

- Agricultural areas
- Composed of 50% or more state soils
- Within 2 miles of operational farms



Scenario Figure 33. The applied query with the first three criteria

19. The next criterion will limit the agricultural patches to those that are within 4000 feet of currently conserved lands. This enables the land trust to lease the lands to farmers, but potentially convert these holdings to conservation lands at a later date to link its holdings.

20. In the **Fields** drop-down menu, select the distance to conserved lands.

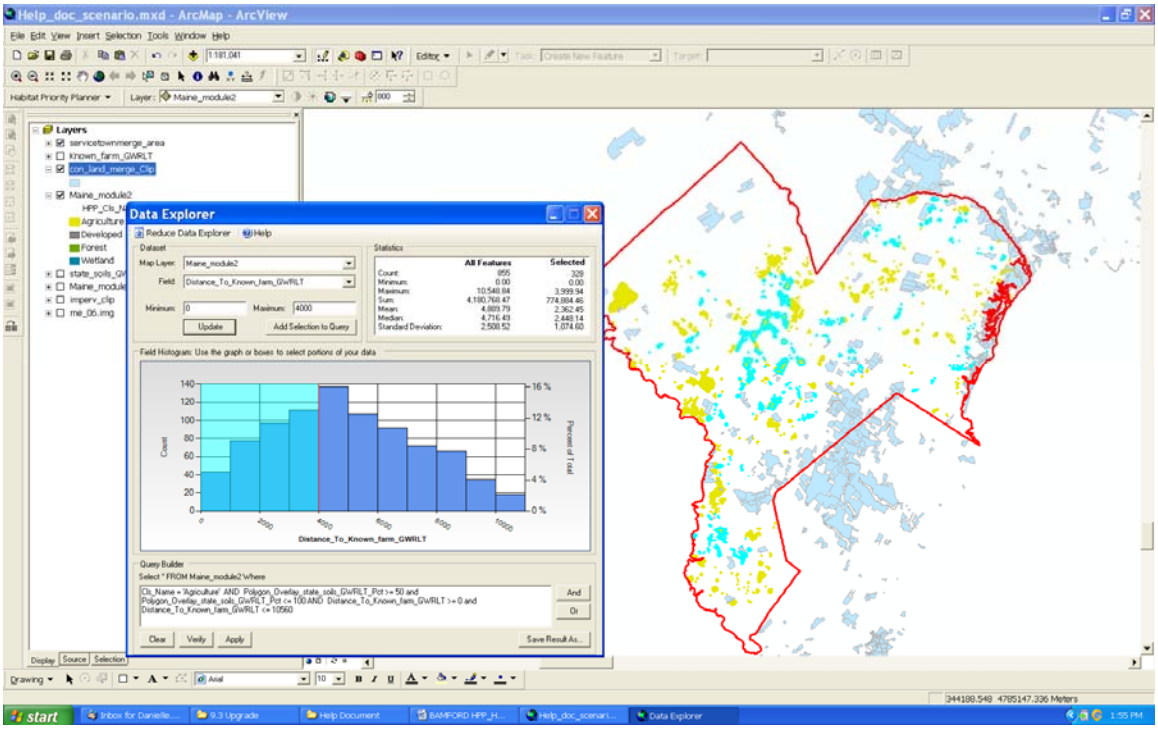
21. Select on the histogram, **0** to **4000** feet.

22. Add an **And** statement.

23. Add the selection to the Query Builder.

24. Apply the selection.

25. View the results.



Scenario Figure 34. The query now contains a distance to conserved lands parameter of 0 to 4000 feet

26. The final criterion will revisit internal patch characteristics or landscape metrics.
- Thus far, our scenario has focused on relating external features, or data, to our patches.
- The final parameter will focus on the internal characteristic of patch size, or acreage.

27. Select, **Area_acre** as the field of interest.

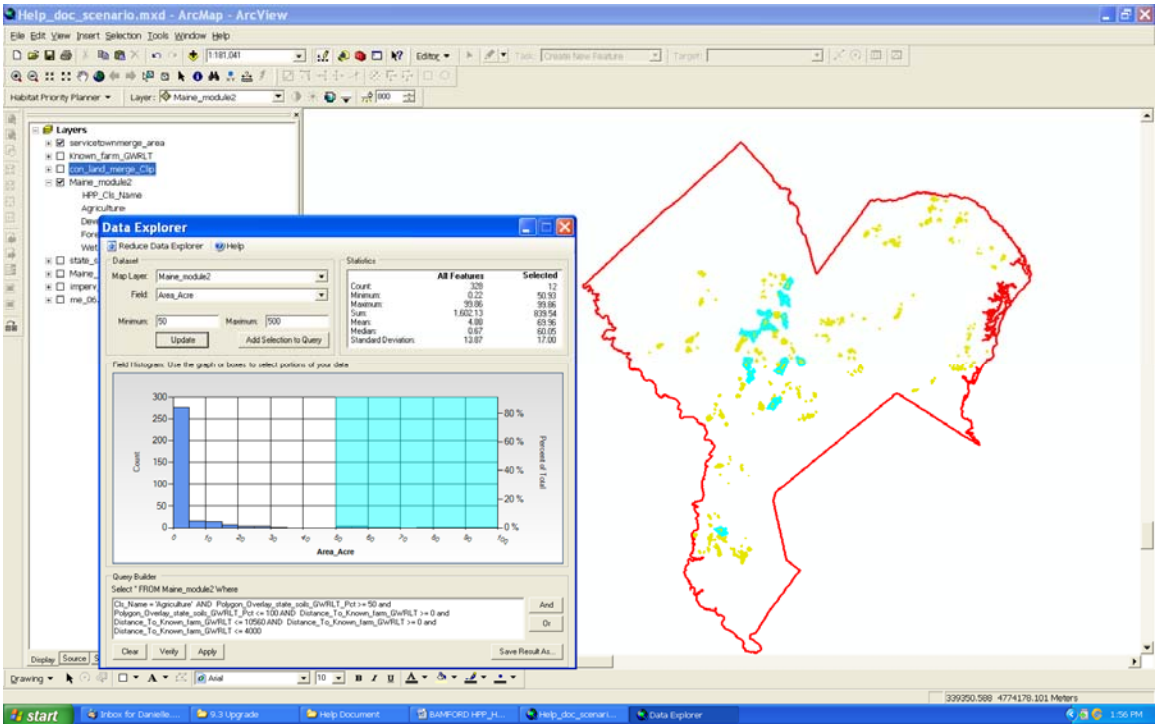
28. Select, **50** to **500** acres as the size of interest. This allows the group to focus on large projects.

29. Add an **And** statement to your Query Builder.

30. Add the selection to your Query Builder.

31. Apply the selection.

32. View the results.



Scenario Figure 35. The final selection based on all criteria

33. Save the file using the **Save As** button to create a final layer containing the results.
- This saved file will contain the applied query and represent your Data Explorer Analysis. Your original data files will not have been edited.
  - ***Note: To view the applied query for any Module 3 output, simply open the Layer Properties and view the General tab. Here you will see the applied query in the layer description.***
  - ***If you created a Data Explorer report you will also have access to your selection query here.***

C.5 What Does This Selection Mean?

We have completed our prioritization scenario according to the outlined criteria. Let's review the project goals.

1. Goal: Preserve farmland based on land trust parameters
    - Agricultural areas composed of cultivated crops and pasture lands
    - Containing specific soils by 50% or more to meet grant requirements
    - Within 2 miles of operational farms to ensure leasing options
    - Within 4,000 feet of currently conserved lands to allow for linking of conserved lands at later dates
    - Patch acreage of 50 acres or more to ensure large land holdings
2. After completing our analysis, we have narrowed our results from 9,711 total agricultural patches for this study area to 12 patches that met the scenario goals.
    - This is a much more manageable set of priorities for the land trust to investigate based on their resources. This selected set
        - Meets management goals
        - Represents a repeatable process
        - Allows the land trust to work **strategically rather than opportunistically.**
    - This selected set does not compose a final answer. Because of the ease and speed of using the Data Explorer module, the group could come back and rerun or adjust parameters to accommodate further information!
        - The group could obtain parcel information and further narrow the results if desired.

This scenario is an example of one of the many applications of the Habitat Priority Planner. User applications will vary by available data, available land use layers, user-specified criteria for analysis, and application type.

Appendix D: A List of Resources to Get You Going

D.1 FRAGSTATS: Giving Credit Where It Is Due

Most of the inspiration of exploring landscape pattern metrics in a computer-based analysis environment goes to Dr. Kevin McGarigal and Barbara Marks and their seminal software tool called FRAGSTATS, originally developed in 1995. Please visit the FRAGSTATS Web site to learn more about this tool. Those users who wish to further explore the world of landscape metrics will want to download and use FRAGSTATS.

The Habitat Priority Planner (HPP) tool computes a very simplified subset of the habitat metrics available in FRAGSTATS, but unlike FRAGSTATS it allows the user to bring a number of other spatial datasets into the analysis. Most importantly, HPP provides an easy way to explore the data with a group of stakeholders in a map-based environment, a much-needed enhancement to assist with tool deployment in the field.

D.2 Landscape and Ecological Spatial Resources

The following list of resources is meant to provide a basic introduction to the concepts that are incorporated into the Habitat Priority Planner. These resources are also provided to generate confidence in the use of spatially centric methods and to provide avenues for further exploration.

Non-NOAA Web Resources

- Landscape Ecology from Wikipedia
- An Overview of Landscape Metrics
- Glossary of Landscape Ecology Terms
- The Nature Conservancy's Conservation By Design Gateway
- Conservation Measures Partnership

Supporting Literature

Overview and Introductory Materials

Meffe, G.K., L.A. Nielsen, R.L. Knight, and D.A. Schenborn. 2002. *Ecosystem Management: Adaptive Community-Based Conservation*. Island Press. ISBN 1-55963-824-9. See Chapter 8: Landscape Level Conservation.

Andren, H. 1994. "Effects of Habitat Fragmentation on Birds and Mammals in Landscapes with Different Proportions of Suitable Habitat: A Review." *Oikos.* Volume 71. Pages 355 to 365.

Allen W.J., and M.J. Kilvington. 2005. "Getting Technical Environmental Information into Watershed Decision Making." In *The Farmer's Decision: Balancing Successful Agricultural Production with Environmental Quality*. Ed. J.L. Hatfield. Soil and Water Conservation Society. Pages 45 to 61.

Calabrese, J.M., and W.F. Fagan. 2004. "A Comparison-Shopper's Guide to Connectivity Metrics." *Frontiers in Ecology and Environment*. Volume 2. Number 10. Pages 529 to 536.

Dale, V.H. and others. 2000. "Ecological Prinicples and Guidelines for Managing the Use of Land." *Ecological Applications*. Volume 10. Number 3.

Forman, R.T.T. 1995. "Some General Principles of Landscape and Regional Ecology." *Landscape Ecology.* Volume 10. Number 3.

Salafsky, N., and others. 2002. "Improving the Practice of Conservation: A Conceptual Framework and Research Agenda for Conservation Science." *Conservation Biology.* Volume 16. Number 6.

Journal Articles Exploring the Spatial Approach to Habitat Prioritization

Balram, S., and others. 2004. "A Collaborative GIS Method for Integrating Local and Technical Knowledge in Establishing Biodiversity Conservation Priorities." *Journal of Biodiversity and Conservation*. Volume 13. Number 6.

Bart, H.L. 1989. "Fish Habitat Association in an Ozark Stream." *Journal of Environmental Biology of Fishes*. Volume 24. Number 3.

Beisel, J., and others. 1998. "Stream Community Structure in Relation to Spatial Variation: the Influence of Mesohabitat Characteristics." *Journal Hydrobiologia*. Volume 389. Numbers 1 to 3.

Bonte, D., and others. 2003. "Patch Quality and Connectivity Influence Spatial Dynamics in a Dune Wolfspider." *Journal Oecologia*. Volume 135. Number 2.

Boone, R.B., and W.B. Krohn. 2000. "Predicting Broad-Scale Occurrences of Vertebrates in Patchy Landscapes." *Journal of Landscape Ecology*. Volume 15. Number 1.

Bowne, D.R., and M.A. Bowers. 2004. "Interpatch Movements in Spatially Structured Populations: a Literature Review." *Journal of Landscape Ecology*. Volume 19. Number 1.

Clark, F.S., and R.B. Slusher. 2000. "Using Spatial Analysis to Drive Reserve Design: A Case Study of a National Wildlife Refuge in Indiana and Illinois (USA)." *Landscape Ecology*. Volume 15. Pages 75 to 84.

Darcy, M.C., and D.B. Eggleston. 2005. "Do Habitat Corridors Influence Animal Dispersal and Colonization in Estuarine Systems?" *Journal of Landscape Ecology*. Volume 20. Number 7.

Dennis, R.L., and others. 2006. "The Need for a Resource-Based Definition to Conserve Butterflies." *Journal of Biodiversity and Conservation*. Volume 15. Number 6.

Dennis, R.L.H. "Just How Important Are Structural Elements As Habitat Components? Indications from a Declining Lycaenid Butterfly with Priority Conservation Status." *Journal of Insect Conservation*. Volume 8. Number 1.

Fred, M.S., and J.E. Brommer. 2003. "Influence of Habitat Quality and Patch Size on Occupancy and Persistence in Two Populations of the Apollo Butterfly (*Parnassius apollo*)." *Journal of Insect Conservation*. Volume 7. Number 2.

Freudenberger, D., and L. Brooker. 2004. "Development of the Focal Species Approach for Biodiversity Conservation in the Temperate Agricultural Zones of Australia." *Journal of Biodiversity and Conservation*. Volume 13. Number 1.

Grober-Dunsmore R., and others. 2007. "Reef Fish and Habitat Relationships in a Caribbean Seascape: The Importance of Reef Context." *Coral Reefs*. Volume 26. Number 1.

Guerrini, A., and others. 1998. "Recolonisation Patterns of Meiobenthic Communities in Brackish Vegetated and Unvegetated Habitats after Induced Hypoxia/Anoxia." *Journal Hydrobiologia*. Volumes 375 to 376.

Helzer C.J., and D.E. Jelinski. 1999. "The Relative Importance of Patch Area and Perimeter-Area Ratio to Grassland Breeding Birds." *Ecological Applications*. Volume 9. Number 4.

Hines, J., and others. 2005. "Sap-Feeding Insect Communities as Indicators of Habitat Fragmentation and Nutrient Subsidies." *Journal of Insect Conservation*. Volume 9. Number 4.

Holomuzki, J.R., and A.S. Van Loan. 2002. "Effects of Structural Habitat on Drift Distance and Benthic Settlement of the Caddisfly, *Ceratopsyche sparna*." *Journal Hydrobiologia*. Volume 477. Numbers 1 to 3.

Howard, R.K. 1989. "The Structure of a Nearshore Fish Community of Western Australia: Diel Pattern and the Habitat Role of Limestone Reefs." *Journal of Environmental Biology of Fishes*. Volume 24. Number 2.

Huettmann, F., and A.W. Diamond. 2006. "Large-Scale Effects on the Spatial Distribution of Seabirds in the Northwest Atlantic." *Journal of Landscape Ecology*. Volume 21. Number 7.

Iguchi, K., and S. Kitano. "Local Specialists Among Endangered Populations of Medaka, *Oryzias latipes*, Harboring Fragmented Patches." *Journal of Environmental Biology of Fishes*.

Jordán, F. 2003. "Characterizing the Importance of Habitat Patches and Corridors in Maintaining the Landscape Connectivity of a *Pholidoptera transsylvanica* (Orthoptera) metapopulation." *Landscape Ecology*. Volume 18.

Korsu, K. 2004. "Response of Benthic Invertebrates to Disturbance from Stream Restoration: The Importance of Bryophytes." *Journal Hydrobiologia* 523(1-3).

Lamberti, P., and others. 2006. "Use of Space and Habitat Selection by Roe Deer (*Capreolus capreolus*) in a Mediterranean Coastal Area: How Does Woods Landscape Affect Home Range?" *Journal of Ethology*. Volume 24. Number 2.

Lancaster, J. 1996."Scaling the Effects of Predation and Disturbance in a Patchy Environment." *Journal Oceologia*. Volume 107. Number 3.

Le Pichon, C., and others. 2006. "A Spatially Explicit Resource-Based Approach for Managing Stream Fisheries in Riverscapes." *Journal of Environmental Management*. Volume 37. Number 3.

Lecchini, D., and others. 2005."Experimental Assessment of Sensory Modalities of Coral-Reef Fish Larvae in the Recognition of Their Settlement Habitat." *Journal of Behavioral Ecology and Sociobiology*. Volume 58. Number 1.

Levin, P.S. 1993. "Habitat Structure, Conspecific Presence and Spatial Variation in the Recruitment of a Temperate Reef Fish." *Journal Oecologia*. Volume 94. Number 2.

Lidicker, W.Z. 1999. "Responses of Mammals to Habitat Edges: An Overview." *Journal of Landscape Ecology*. Volume 14. Number 4.

Pfister, C.A. 1998. “Extinction, Colonization, and Species Occupancy in Tidepool Fishes.” *Journal Oecologia*. Volume 114. Number 1.

Ribe, R., and others. 1998. “A Management Driven Investigation of Landscape Pattern of Northern Spotted Owl Nesting Territories in the High Cascades of Oregon.” *Journal of Landscape Ecology*. Volume 13. Number 1.

Riffell, S.K., and others. 2003. “Birds in North American Great Lakes Coastal Wet Meadows: Is Landscape Context Important?” *Journal of Landscape Ecology*. Volume 18. Number 2.

Scheibling, R.E., and J. Lauzon-Guay. 2007. “Feeding Aggregations of Sea Stars (*Asteria* spp. and *Henricia sanguinolenta*) Associated with Sea Urchin (*Strongylocentrotus droebachiensis*) Grazing Fronts in Novia Scotia.” *Journal of Marine Biology*. Volume 151. Number 3.

Smith, F., and A.V. Brown. 2006. “Effects of Flow on Meiofauna Colonization in Artificial Streams and Reference Sites within the Illinois River, Arkansas.” *Journal Hydrobiologia*. Volume 571. Number 1.

Swenson, J.J., and J. Franklin. 2000. “The Effects of Future Urban Development on Habitat Fragmentation in the Santa Monica Mountains.” *Journal of Landscape Ecology*. Volume 15. Number 8.

Zollner, P.A. “Comparing the Landscape Level Perceptual Abilities of Forest Sciurids in Fragmented Agricultural Landscapes.” *Journal of Landscape Ecology*. Volume 15. Number 6.