

# Quick-Start User Guide for the CAT

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## What is the CAT?

The Catchment Analysis Tool (CAT) is a custom ArcGIS Toolbox that is designed to help conservation practitioners and land managers identify land conservation opportunities specifically for the protection of water resources across New Hampshire's coastal watersheds. The tool operates at the catchment scale based on a set of user-defined criteria for six different variables. These variables are pre-populated for each catchment within the coastal watersheds, which allows users to run sequences of selection queries for the following:

- Conservation Status
- Impervious Cover
- Agricultural Land Cover
- Developed Land Cover
- Natural Land Cover
- Stormwater Runoff

The CAT allows the user to select catchments based on the variables for the entire catchment, the riparian buffer portion of the catchment, or the upland contributing area of the catchment. Riparian buffers were mapped according to Steckler et. al. (2016). The upland contributing area includes the remainder of the catchment outside of the riparian buffer (i.e. the catchment area that drains into the riparian buffer and/or toward the receiving aquatic resource). The purpose for differentiating between these areas is to allow users to tease out different characteristics and relationships between riparian buffers and their upland contributing areas. This allows users to identify lands, such as riparian buffers, that might be protected or restored to maintain and/or improve water quality.

Catchments are the base unit of analysis in the CAT. A catchment is a local drainage area for a particular mapped stream segment or surface water. Catchments are useful as a unit of analysis because they relate each of the variables with the stream segments under their immediate and direct influence.

## System Requirements to load and run the CAT and its associated GIS data

ArcMap 10.0 or later is required to access the map package included with the CAT. The CAT runs in ArcMap version 10.0 and later versions; it was not tested with earlier versions.

## How to access and load the CAT and its associated GIS data into ArcGIS

The CAT and its associated GIS data are available in the zip file located at ([CAT\\_TNC\\_20170125.zip \(open link\)](#)). Included in the zip file are folders for data, documentation, and the toolbox. The data folder contains a map package file that contains the necessary and supporting GIS data to run the CAT. The toolbox folder contains the set of CAT tools.

To use the CAT, first download and unzip the CAT zip file from the link above. Then follow the steps outlined below:

1. Open ArcGIS (version 10.0 or later).
2. Within ArcGIS, open the ArcToolbox.
3. Browse in the ArcToolbox to Data Management Tools, then Package, then open the Extract Package tool.
4. For the Input Package field, browse to the location where the zip file was unzipped to and select "CAT\_package.mpk" within the "CAT data" folder.
5. For the Output Folder (*note that you are only indicating the output folder, not the output file name*), specify the same folder as where the "CAT\_package.mpk" is stored (or another location if desired).
6. Select OK to run the tool.
7. Browse to the Output Folder location specified in step 5. A v10 folder is now contained at this location that includes GIS data and an ArcMap project file. Open the v10 folder and open the CAT\_package.mxd file.
8. Load the CAT toolbox following the sub-steps below:
  - a. In the Arc Toolbox window, right click on ArcToolbox, then select Add Toolbox.



- b. Browse to the location specified in step five, then open the CAT\_toolbox folder, then select and open the CAT toolbox.tbx file.
- c. In the ArcToolbox a new toolbox named CAT toolbox is now added. Within the CAT toolbox is the CAT toolset. Open the CAT toolbox and the CAT toolset to find the tools.



## How to use the CAT

The CAT allows a user to add, update, or remove a selection on the catchment layer based on single, multiple, or sequences of attribute queries for the six variables. For ease of use, the raw values for the variables were categorized into classes so that users can, for example, select catchments with low,

moderate, and/or high impervious cover instead of picking a particular percent threshold. Classes for impervious, agricultural, developed, and natural cover are based on relative conditions across the coastal watersheds, respectively. Stormwater runoff thresholds for classes are based on infiltration rates, while conservation status thresholds are based on percent conserved classes.

To use the CAT, open one of the six “models” within the CAT toolset. For example, open the top most model named “CAT: Conservation Status” by double clicking on it. The model opens and on the left side of the window, six user defined input options are available. The right side of the screen displays information about the tool and details about each of the user defined input options from the left side of the screen.

Each of the models are set up the same way. On the left side of the window, the top two option boxes pertain to selecting catchments based on attributes for the entire catchment. The middle two option boxes pertain to selecting catchments based on attributes for only the riparian buffer portion of the catchment. The bottom two option boxes pertain to selecting catchments based on attributes for only the upland contributing area of the catchment.

Click inside of the top most box on the left side of the window, under “CATCHMENT: Selection Type (optional)”. The right side of the window will describe the function of the “Catchment: Selection Type (optional)”, and what each of the selection types mean. The default is to “ADD\_TO\_SELECTION”, meaning that the resulting selection from the query in the following option box will be added to any existing selections in the catchment layer. You can choose any of the selection types in the drop-down.

Click inside the second option box on the right side of the window just below “CATCHMENT: Conservation Status Expression (optional)”. Again, the right side of the window provides a description of the function and directions for selecting a conservation status class or set of classes for the entire catchment. The right side of the window also defines the classes. Once you know what conservation status class you want to select for the catchment, use your cursor to highlight the respective expression (e.g. **Cons\_Catch\_Class IN ('Very Low')**), then copy the selection using your keyboard (Ctrl+C) and paste into the “CATCHMENT: Conservation Status Expression (optional)” box (Ctrl+V) replacing the default expression.

Assuming this is the only selection query you want to run for the time being, select the “OK” button at the bottom of the screen. The tool will run briefly. You may encounter a window that tells you that the process is completed. If so, select the “Close” button. You will likely need to refresh your screen to see the selected catchments that met your expression. To do so, press F5 on your keyboard or go to the “View” menu and select “Refresh”.

From here, you can run any number of models for the different variables and for the different portions of the catchments (entire, buffer, upland) using different selection types, such as adding to, removing from, and subset selections.

## Demonstration Query:

Below is demonstration of how to run a series of queries to identify catchments with riparian buffers that have a high percentage of natural land cover and that have high stormwater runoff potential. The riparian buffers in these catchments are important conservation targets because they are already largely in a natural state and they have soil characteristics that limit the infiltration of stormwater; developing these areas will likely result in greater stormwater runoff to their receiving water body than areas with lower stormwater runoff potential.

Step 1: Open the “CAT: Land Cover – Natural” model.

- a. In the third option box from the top under “BUFFER: Selection Type (optional)”, click on the dropdown box arrow and select “NEW\_SELECTION”.
- b. Click inside the fourth option box from the top under “BUFFER: Natural Land Cover Expression (optional)”. In the tool help window on the right, highlight the third query option with your cursor “Nat\_Buf\_Class IN ('High')”, copy the selection using your keyboard (Ctrl+C) and paste into the “BUFFER: Natural Land Cover Expression (optional)” box (Ctrl+V) replacing the default expression.
- c. Select the “OK” button at the bottom of the model window to run the tool, then press F5 on your keyboard to refresh the view to see the catchments you selected. If F5 doesn’t refresh the screen, go to the “View” menu and select “Refresh”.
- d. The “CAT: Land Cover – Natural” model selected 637 catchments that meets the criteria of having high natural land cover within their riparian buffers.

Step 2: Open the “CAT: Stormwater Runoff” model.

- a. In the third option box from the top under “BUFFER: Selection Type (optional)”, click on the dropdown box arrow and select “SUBSET\_SELECTION”. The definition of a subset selection is: “The resulting selection is combined with the existing selection. Only records that are common to both remain selected.”
- b. Click inside the fourth option box from the top under “BUFFER: Curve Number Expression (optional)”. In the tool help window on the right, highlight the third query option with your cursor “CN\_Buf\_Class IN ('High')”, copy the selection using your keyboard (Ctrl+C) and paste into the “BUFFER: Curve Number Expression (optional)” box (Ctrl+V) replacing the default expression.
- c. Select the “OK” button at the bottom of the model window to run the tool, then press F5 on your keyboard to refresh the view to see the catchments you selected. If F5 doesn’t refresh the screen, go to the “View” menu and select “Refresh”.
- d. The subset selection from the “CAT: Stormwater Runoff” model selected 75 catchments that meets the criteria of having both high natural land cover and high stormwater runoff potential within their riparian buffers.

You can also customize your queries to use catchment attributes and thresholds of your own choosing. Refer to the CAT\_catchments metadata or the CAT\_documentation.docx file in the documents folder for details on each of the attributes in the CAT\_catchments shapefile.

To create your customized query, you can use any of the models in the CAT, or you can use the “Select By Attributes” tool (on the main menu, go to “Selection”, then “Select by Attributes”). For example, you might be interested in identifying all catchments whose buffers are 50% or more protected. To do this in the CAT, open any one of the six models. In the first option box, click on the dropdown box arrow and select “NEW\_SELECTION”. In the second option box, click on the “SQL” button. In the Query Builder window, scroll down in the top box and double click on “Cons\_Buf”. This is the attribute for the percent of each catchment’s riparian buffer that is conserved. Then click on the equal or greater than sign “>=”, then type in 50. The definition query should look like this “Cons\_Buf >= 50”. Select the “OK” button on the Query Builder window, and then select the “OK” button in the next window as well. Refresh your screen to see all catchments with riparian buffers that are greater than 50% conserved.

## Literature Cited:

Steckler, P., Glode, J., and Flanagan, S. 2016. Land Conservation Priorities for the Protection of Coastal Water Resources: A Supplement to The Land Conservation Plan for New Hampshire’s Coastal Watersheds. The Nature Conservancy. Prepared for the New Hampshire Department of Environmental Services Coastal Program, Concord, NH.