

Crater Helper Tools *for ArcGIS 10.0*

Reference Manual



Version:	1.1
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Install Files:	CraterHelperTools.esriAddIn
Author:	Richard A Nava United States Geological Survey, Flagstaff Astrogeology Science Center E-mail: rnav@usgs.gov
Description:	Originally developed for nomenclature of craters on the Moon, Crater Helper provides a set of tools for measuring and digitizing craters and other morphologic features. Each tool stores information about the features being digitized inside a point feature class. The information stored depends on the measurements made and include: <i>location</i> , <i>diameter</i> , <i>extent</i> , <i>area</i> and <i>azimuth</i> . All Crater Helper tools employ geodesic methods for measuring lengths and areas and can be used with any well-defined coordinate system. Graphics are generated to indicate where measurements are taken, and can optionally be stored as polylines in a separate feature class. Tools for setting special morphologic attributes, such as <i>ejecta type</i> , are also available as presets a user can select from and assign to each point feature.
Requirements:	ArcGIS Desktop 10.0
Manual update:	June 13, 2011

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Installation instructions

1. Double-click the **CraterHelperTools.esriAddIn** file.
2. Select **Install Add-In** from the ESRI ArcGIS Add-In Installation Utility (Figure 1.1).
3. Click **OK** on the **Installation Succeeded** dialog to finish the installation.

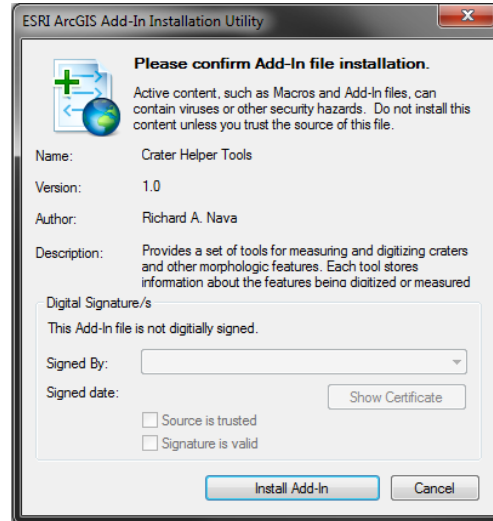


Figure 1.1. Select 'Install Add-In' button on the 'ESRI ArcGIS Add-In Installation Utility'.

Troubleshooting: If the Add-In cannot be installed, make sure to check administrative options from: Customize > Add-In Manager > Options (panel).

Adding to ArcMap

Once the Add-In has been installed:

1. Open **ArcMap**.
2. Look for the **Crater Helper Tools toolbar** somewhere on the screen.
 - a. If the toolbar has not appeared automatically: click on **Customize >> Toolbars** and make sure **Crater Helper Tools** is checked.

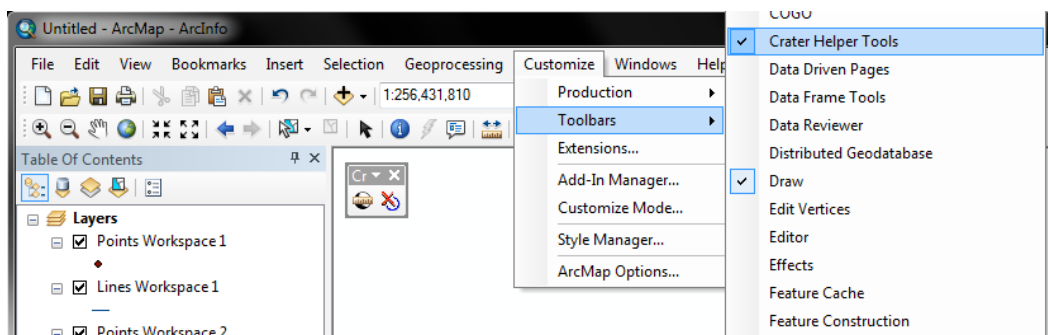


Figure 2.1. If the toolbar doesn't show up the first time you open ArcMap, click on **Customize >> Toolbars**, and make sure 'Crater Helper Tools' is checked.

Toolbar description

The Crater Helper Tools toolbar is composed of two buttons:





Name	Description
 Crater Helper	Show/Hide the Crater Helper window (<i>see 'The Crater Helper workflow'</i>).
 Delete Graphics	Deletes all graphics generated by the Crater Helper tools.

Table 3.1. Name and description for each of the toolbar buttons.

Crater Helper window

The *Crater Helper* window is a **dockable window** featuring five collapsible panels. Each panel provides functionality for setting up the working environment required for measuring morphologic features. The following section provides an overview of the steps implemented to successfully setup the working environment and begin digitizing morphologic features.

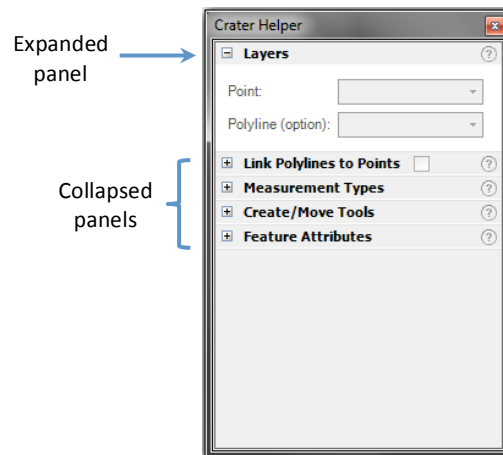


Figure 4.1. The Crater Helper dockable window's five collapsible panels are used in conjunction to digitize and measure morphologic features.

The Crater Helper workflow

Overview

Crater Helper uses the **built-in editing capabilities** of ArcGIS. The location of features such as craters, ridges, ejecta blankets, or volcanic features are stored inside shapefiles or geodatabases as points, with measurement information stored for each point inside the point attribute table. Polyline geometries are optionally stored in a separate layer.

Steps implemented to digitize and measure morphologic features using *Crater Helper*. Each step is explained in the following subsection:

1. Choose the **workspace** and data frame you want to edit. Point and polyline (optional) layers must live inside this workspace.
2. **Start editing.**
3. Select the layers you want to work with under the **Layers panel**.
4. Optionally, set automatic linking of polylines to points under the **Link Features panel**.
5. Choose the **Measurement Types** to be stored in each point.
6. Select a tool to digitize and measure the feature from the **Create/Move Tools panel**.
7. Create or Move the new feature (by digitizing it **on the map**).
8. Add or edit attributes of features using the **Feature Attributes panel** (optional).
9. Save edits and **stop editing**.

Digitizing features with Crater Helper

ArcGIS allows you to create and edit several kinds of data. You can edit feature data stored in shapefiles and geodatabases, as well as various tabular formats. This includes points, lines, polygons and other geometries.

Digitizing, the process of converting features into a digital format, is one way to create data. There are several ways to digitize new features. These include digitizing ‘on-screen’ over an image, digitizing a hard copy of a map on a digitizing board, or using automated digitization. *Crater Helper* uses interactive, or heads up digitization. In this method, you display an aerial photograph, satellite image, or orthophotograph on-screen as a basemap, then you draw features on top of it and store information about each feature as attributes.

Attributes are descriptions of a geographic feature in a GIS, usually stored as a row in a table. For example, attributes of a crater might include its diameter, extent, and location (in latitude and longitude). *Crater Helper* automatically stores measurement attributes for each feature, but you can enter new attribute values when you create features, and edit existing values manually using other ArcMap tools.

1. Choosing the workspace with the point and polyline layers

Editing applies to a **single workspace** in a **single ArcMap data frame**, where a workspace is a geodatabase or a folder of shapefiles. If you have more than one data frame in your map, you can only edit the layers in one data frame—even if all data is in the same workspace (see figure 4.3 for additional details). Although you can edit data in different coordinate systems, it is generally best if all the data you plan to edit together has the **same coordinate system** as the data frame.

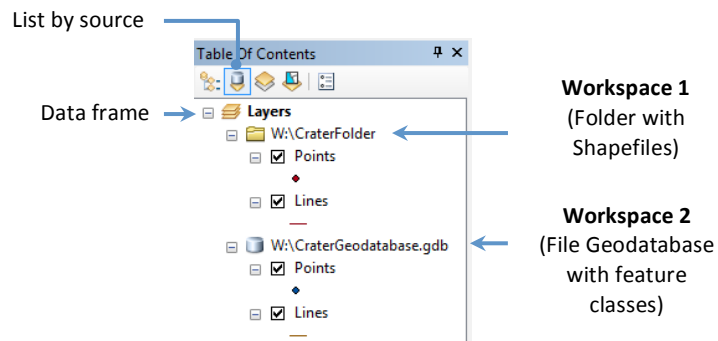


Figure 4.1. The ‘List by source’ view of the Table of Contents allows you to find out what the workspace of any layer is. This is useful when choosing a workspace to edit.

2. Starting the edit session

Editing occurs in an edit session. During an edit session, you can create or modify vector features and their attribute information. When you want to edit, you need to start an edit session, which you end when you're done. There are two ways to start an edit session: **1)** by **right-clicking a layer** in the table of contents, or **2)** by clicking the **Editor menu** on the Editor toolbar (Figure 4.2).

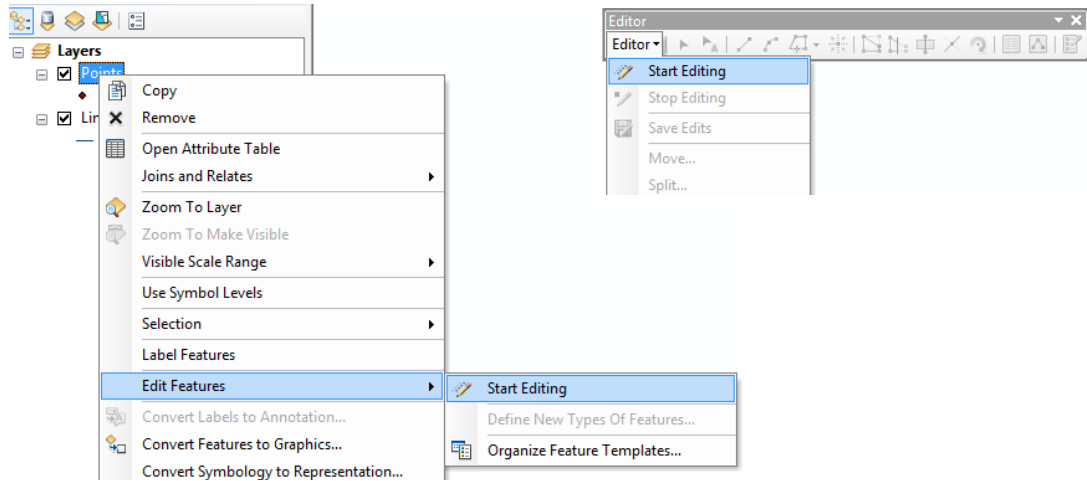


Figure 4.2. Two different options to start an edit session. Option 1: right-click a layer in the Table of Contents. Option 2: click the Editor menu on the Editor toolbar.

If you use the **Editor menu** (option 2 above) to start editing on a data frame that contains data from **multiple workspaces**, you are prompted to choose the workspace to edit (Figure 4.3). If you right-click a layer in the table of contents, you automatically start an edit session on the **entire workspace** containing that layer.

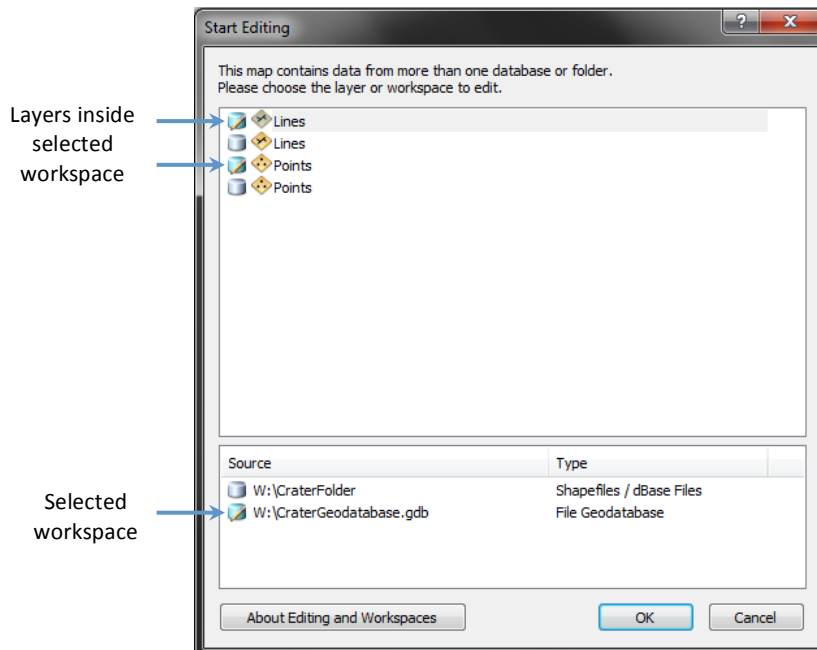


Figure 4.3. Prompt shown when starting an edit session from the Editor menu on the Editor toolbar. The workspace selected and the layers that live within it will be edited (indicated by a pencil symbol next to their names).

3. Setting the working layers in the Layers panel

Once an edit session has been started for your desired workspace and data frame, the *Crater Helper* window **becomes active** and point and polyline layers can be selected from their respective menus (Figure 4.4). Only layers of point and polyline geometry types will be shown in each dropdown, so layers with other geometry types (such as polygon layers) will not be available.

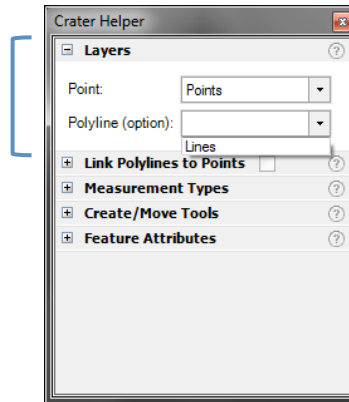


Figure 4.4. The 'Layers' panel.

The layers in this panel will hold the point and line features that you create with the 'Create/Move Tools' panel. *Crater Helper* is designed to **always generate points** when measuring morphologic features of any kind (e.g., craters, ridges, etc.). When you measure a feature on your basemap, *Crater Helper* will:

1. **Generate the necessary fields** to store selected measurements (e.g. the RIM_DIA field is created in the point attribute table to store the diameter for a crater).
2. **Create a point** feature on the center of your measurement.
3. **Store the point** in the selected point layer.
4. **Populate fields** with the measurement readings.
5. **Create polylines** depicting where measurements were taken (e.g. the rim of the crater, or crater diameter):
 - a. Polyline **graphics** are added to the map. These are not permanent, or
 - b. **Permanent** polyline features are generated and stored in the polylines layer only when:
 - ✓ A **polyline layer is set**, and
 - ✓ The **'Generate polylines'** option is selected from the 'Measurement Types' panel.

4. Linking polylines to points automatically (optional)

Crater Helper links two features by assigning a field value from the first feature to a field on the second. Fields are set by selecting the checkbox at the top of the 'Link Polylines to Points' panel and setting both the 'From point field' and 'To polyline field' (Figure 4.5).

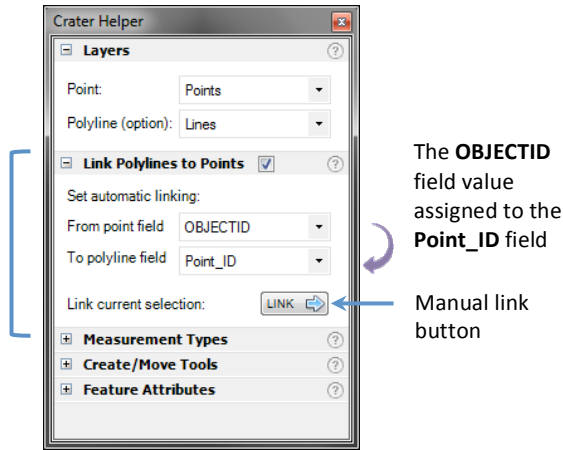


Figure 4.5. ‘Link Polylines to Points’ panel. In this example, the value of the OBJECTID field from the point will be assigned to the Point_ID field of the polyline.

With the checkbox checked, and the two fields set, *Crater Helper* will be able to **automatically link** each point to a polyline when **created or modified**. For example, every time you digitize a point using the ‘Create/Move tools’ panel and opt for generating polylines (see preceding step), the field value of each point will be assigned to the field of the new polyline (Figure 4.6).

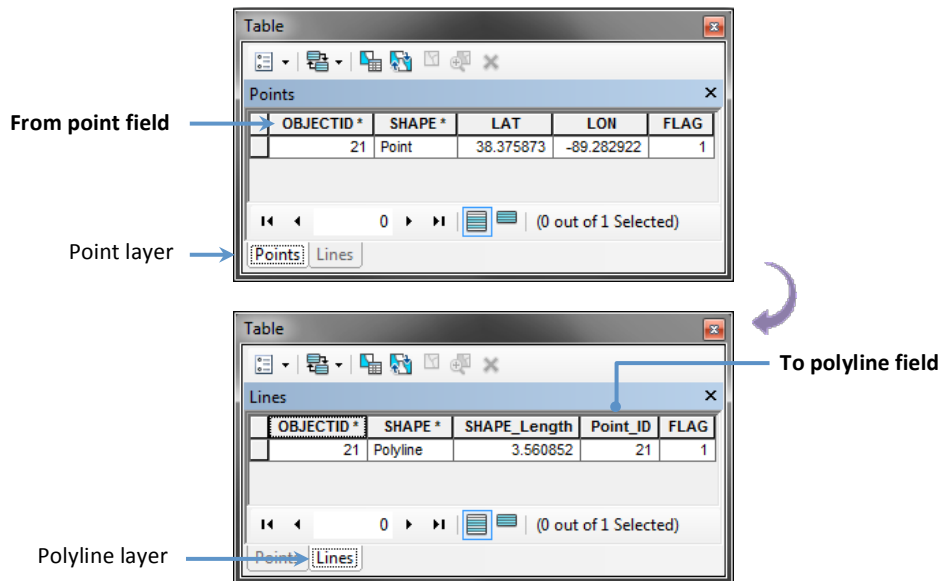



Figure 4.6. Point (top) and polyline (bottom) attribute tables showing how automatic linking takes place. An OBJECTID field value of 21 from the point layer is assigned to the Point_ID field on the polyline layer.

Polylines can also be **linked manually** to a single point using the ‘Link current selection’ button. To manually link polylines to a point:

1. Select a **single point** and **one or more polylines** from the map.
2. Click on the  button.

5. Selecting measurement types

Except for ‘Generate polylines’, measurement types are the **attributes** assigned to each point **created or modified** with the ‘Create/Move tools’ when digitizing morphologic features (Figure 4.7).

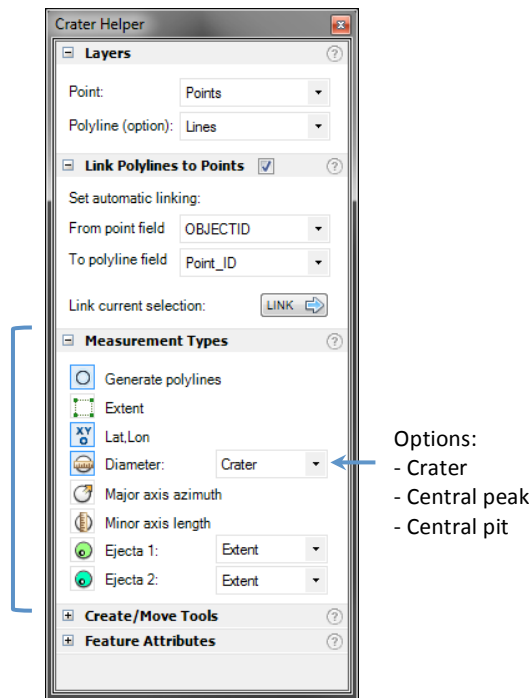


Figure 4.7. The ‘Measurement Types’ panel. Some measurement types (i.e. Diameter) have different options.

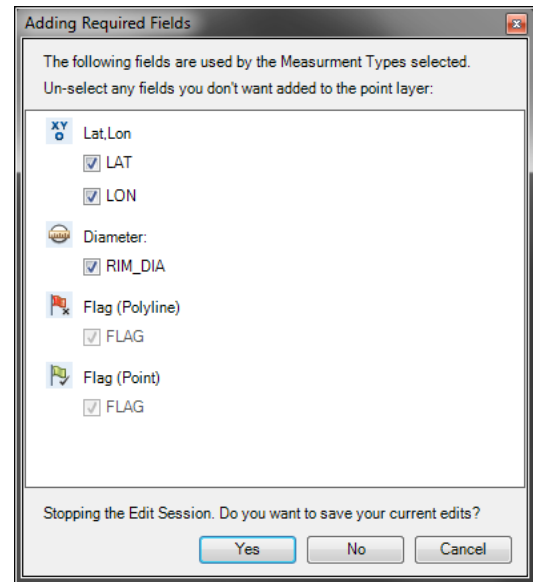


Figure 4.8. Dialog showing any missing fields required for the measurement types selected. The user is given the option to save, or discard any existing edits before *Crater Helper* restarts the edit session to add the fields.

Each type requires one or more fields to be automatically added to the point layer **before digitizing** features on the basemap (Table 4.1). If fields for the selected measurement types are missing, *Crater Helper* will try to restart the edit session and a dialog will appear asking you to un-select any fields you don’t want added to your point layer. You can save existing edits, or discard them before adding the fields (Figure 4.8).

	Name	Required fields (added by Crater Helper)	Units
	Generate polylines	(See the ‘Link Polylines to Points’ panel)	N/A
	Extent	[X_MIN], [Y_MIN], [X_MAX], [Y_MAX]	Deg.
	Lat, Lon	[LAT], [LON]	Deg.
	Diameter	Crater: [RIM_DIA] ; Central peak: [CENTER_PK] ; Central pit: [CENTER_PT]	Km
	Major axis azimuth	[MAJOR_AZIM]	Deg.
	Minor axis length	[MINOR_AXIS]	Km
	Ejecta 1	Extent: [EJEXTENT_1] ; Area: [EJAREA_1], [EJPERIM_1], [EJLOBATE_1]	Km/Km2
	Ejecta 2	Extent: [EJEXTENT_2] ; Area: [EJAREA_2], [EJPERIM_2], [EJLOBATE_2]	Km/Km2

Table 4.1. Name, required fields, and measurement units for each of the measurement types available with *Crater Helper*. The fields are automatically added to their respective layers when using *Crater Helper* tools. N/A = not available; Deg. = degrees; Km =kilometers; Km2 = square kilometers.

6. Using the tools in the Create/Move Tools panel

Digitizing and measuring morphologic features on your basemap can be done with any of the tools available in the 'Create/Move Tools' panel. Notice that some tools have a geometry type *Crater Helper* cannot store, polygons. Tools that create polygons are needed for digitizing some morphologic features. Once the feature is digitized on the map, *Crater Helper* will convert them to polylines and generate graphics (or store them in the polyline layer if set on the 'Layers' panel and 'Generate Polylines' enabled).

Tools are **not always enabled**, as they depend on which measurement types are selected. For example, if you want to store the latitude and longitude (Lat, Lon) of a morphologic feature, you can use the 'Point' tool. But if you also want to store its 'Diameter', the 'Point' tool will not be able to measure it and it will be disabled. You then have to keep in mind that *you can only use a tool when it is useful to the measuring types selected*.

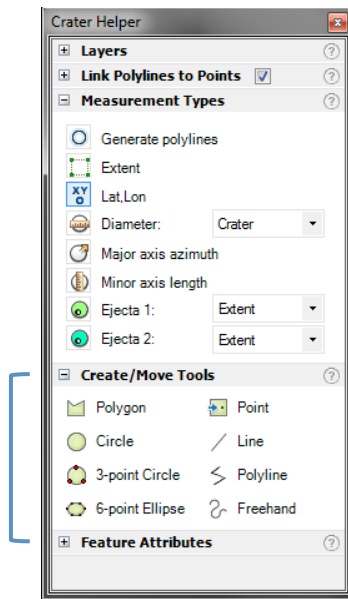


Figure 4.9. The 'Create/Move Tools' panel.

7. Digitizing and measuring features on the map









Name	Method used to digitize on map
 Polygon	Clicking several times on the map and double-clicking to finish.
 Circle	Clicking on the map, dragging a certain distance, and releasing to finish.
 3-point Circle	Clicking three times on the map.
 6-point Ellipse	Clicking six times on the map.
 Point	Single-clicking on the map.
 Line	Clicking on the map, dragging a certain distance, and releasing to finish.
 Polyline	Clicking several times on the map and double-clicking to finish.
 Freehand	Clicking once on the map, dragging to follow a path, and clicking again to finish.

Table 4.2. Name and digitizing method for each tool available on the 'Create/Move Tools' panel.

8. Adding information from the Feature Attributes panel (optional)

There are **two kinds** of feature attributes: those that can be assigned to points and polylines, and those that can only be assigned to points. The same as the ‘Measurement types’, feature attributes require one or more fields to be automatically added to the point and polyline layers before they can be assigned (Table 4.3).

FLAGS:

Every time you digitize a feature from the basemap, a value of 1 is automatically assigned to the **FLAG** field of the point and polyline attribute tables. The ‘Flag as complete’ buttons allow you to manually modify the values of points and polylines selected on the map to: 0 = incomplete or 1 = complete.

MORPHOLOGY ATTRIBUTES:

These attributes are set for **points only**. Morphology attributes are divided into three different categories: *Interior*, *Ejecta*, and *Preservation*. The *Interior* and *Preservation* menus are populated with preset values applicable to morphologic features. The *Ejecta morphology* has four different components: *Ejecta type*, *B*, *C*, and *D*. When you want to set the *Ejecta morphology* attribute, you first set any of the four components above it and then click the arrow button. Each time you set any of the components, the value of that component will be inserted into the *Ejecta morphology* field and will be used as the final attribute.

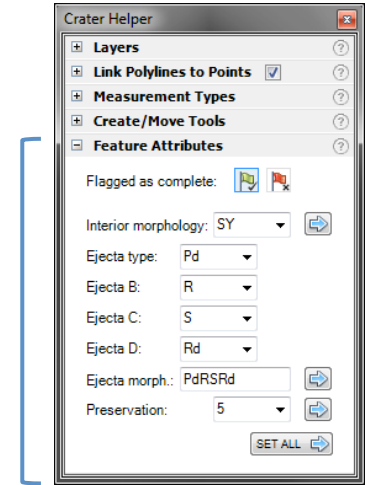


Figure 4.10. The ‘Feature Attributes’ panel.

Although all morphology attributes have menus with preset values on them, they can also be **edited manually** to include any attributes you need. To change an attribute, simply click inside the menu you want to change and type in the new value. Once you click on the arrow button, your custom value will be added to the corresponding field on the point attribute table (Figure 4.10).

Name	Required fields (added by Crater Helper)
Flag	[FLAG] (for both points and polylines)
Interior morphology	[INTERIOR_M]
Ejecta morphology	[EJECTA_M]
Preservation	[PRESERV]

Table 4.3. Name and required fields for each of the feature attributes available with *Crater Helper*. The fields are automatically added to their respective layers when using *Crater Helper* tools.

9. Saving edits and stopping the edit session

When you end an edit session, you can save any changes you have made with *Crater Helper* back to the data source, or you can quit editing without saving. You can also save the edits you have made at any time by clicking **Save Edits** on the **Editor** menu. This keeps the edit session active.

1. Click the **Editor** menu on the *Editor* toolbar and click **Stop Editing**.
2. If you have made any edits since the last time you saved edits, click **Yes** to save them. Clicking **No** discards the edits.

Note: For more information about editing in ArcGIS, visit:
http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#/What_is_editing/001t0000001000000/

Quick-start tutorial

The following is a simple tutorial to help you get started with *Crater Helper*.

ArcCatalog


1. Open *ArcCatalog* from: **Start > All programs > ArcGIS > ArcCatalog 10.**
2. Navigate to a folder (or create a new one) for your data.
3. Open that folder by double-clicking it.
4. From the top menu, select: **File > New > Shapefile...**
5. On the **Create New Shapefile** window, type:
 - Name: **Points**
 - Feature Type: **Point**
 - Spatial Reference:
 - Click on **Edit...**
 - On the **Spatial Reference Properties**: click **Select...**
 - Browse for a coordinate system.
e.g.: Geographic Coordinate Systems\Solar System\Earth\Moon 2000.prj
 - Select the coordinate system and click **Add**.
 - Click **OK** on the **Spatial Reference Properties** window.
 - Click **OK** back on the **Create New Shapefile** window to generate the shapefile.

Repeat the same process for adding a *Polyline* shapefile:

On the **Create New Shapefile** window, type:

- Name: **Lines**
- Feature Type: **Polyline**
- Spatial Reference:
 - Click on **Edit...**
 - On the **Spatial Reference Properties** window: click **Select...**
 - Browse for a coordinate system.
e.g.: Geographic Coordinate Systems\Solar System\Earth\Moon 2000.prj
 - Select the coordinate system and click **Add**.
 - Click **OK** on the **Spatial Reference Properties** window.
- Click **OK** back on the **Create New Shapefile** window to generate the shapefile.

ArcMap

1. Open *ArcMap* from: **Start > All programs > ArcGIS > ArcMap 10.**
2. Open a **new** map by selecting **New Maps** from the tree (left), and selecting **Blank Map** under **My Templates**. Click **OK**.
3. Click on the **Add data** button  located on the 'Standard' toolbar.
4. On the **Add Data** window: navigate to the location of your folder and select the shapefiles we created.
5. Click **Add**.

6. Bring up the **Editor** and **Crater Helper Tools** toolbars. From the top menus select: **Customize > Toolbars >** make sure **Editor** and **Crater Helper Tools** are checked.
7. Follow the steps outlined on *The Crater Helper workflow* section of this document.

Uninstalling Crater Helper Tools

ArcMap

1. From the top menu select: **Customize > Add-In Manager** (Figure 6.1).
2. On the **Add-In Manager** window: select the **Crater Helper Tools** Add-In and click **Delete this Add-In**.
3. Click **Yes** on the **Delete Add-In** window to confirm.
4. Close the **Add-In Manager** window by clicking **Close**.
5. The Add-In will not be present the **next time** you open ArcMap.

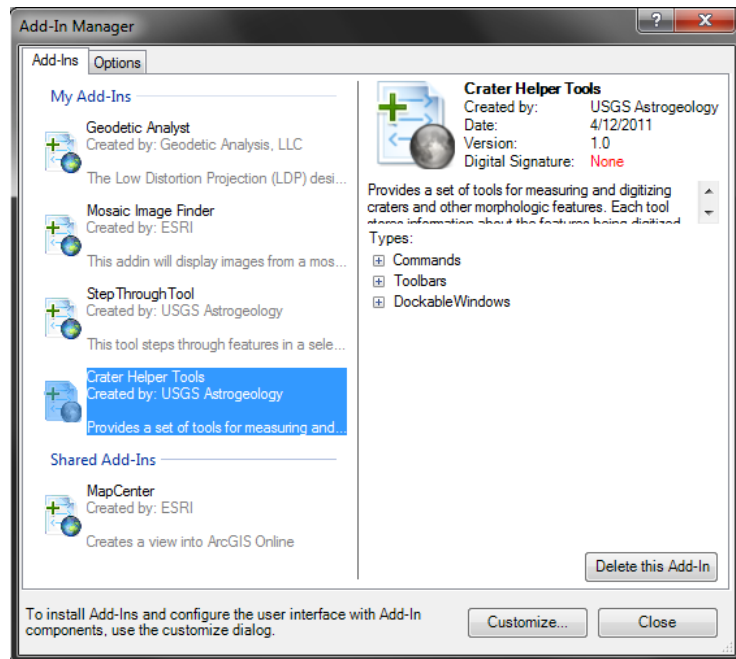


Figure 6.1. The 'Add-In Manager' is used to uninstall Crater Helper Tools in ArcGIS 10.0.

Contact Info:

Please email any bugs, comments, and feedback to:

rnava@usgs.gov