Crater Helper Tools *for ArcMap*

Last Update:	May 26, 2010
Install Files:	Setup.exe
	CraterHelperSetup.msi
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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 or measured in a point feature class. The information stored depends on the measurements made and include: location, diameter, extent, area and azimuth. All tools on the Crater Helper toolbar employ geodesic methods for measuring lengths and areas so they can be used with any well-defined map projection. Graphics are added to the map each time a tool is used to indicate where measurements were taken, and can optionally be stored as polylines in a separate feature class and linked to the original point features where the measurements are stored. Other attributes can be added to each point relating to a specific feature. These include several categories for: feature "Interior" and "Ejecta" morphologies, and feature "Preservation" index.

Requirements: ArcGIS 9.3 (ArcInfo, ArcEditor, ArcView license levels)

> This custom ArcGIS Desktop add-on requires ".NET Framework" support. Please check the PIGWAD website for a document on how to install the support feature before installing this add-on.
>
> (*ftp://pdsimage2.wr.usgs.gov/pub/pigpen/ArcMap_addons/Installing_ ArcGIS_NET_Support.pdf*)

1. Installation instructions:

Install the Crater Helper Tools by double clicking the Setup.exe file and following the installation instructions in the "Crater Helper Tools Setup Wizard". *NOTE: Make sure both the .msi and .exe files are in the same folder, and at the same level.* The installation routine will register the CraterHelperClassLibrary.dll with the required ArcMap components.
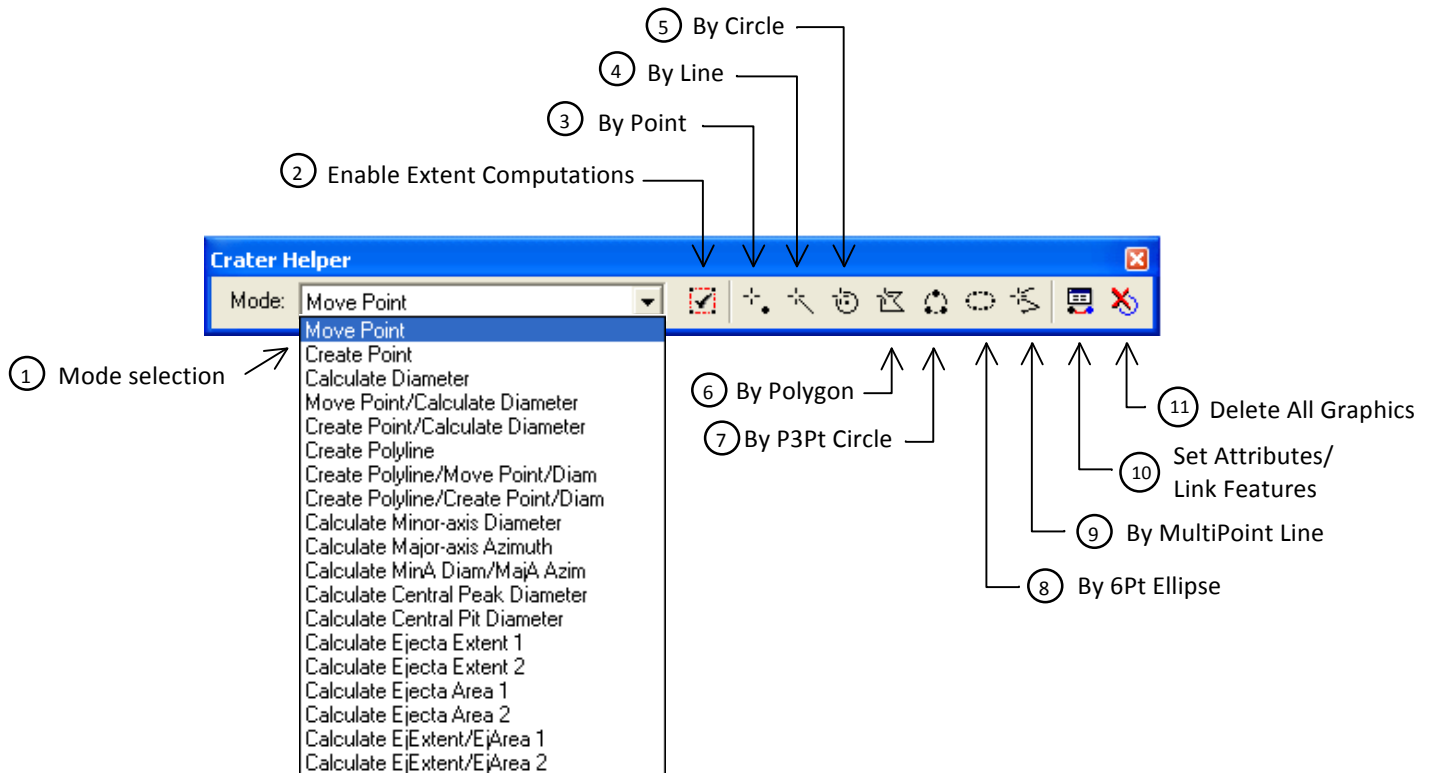
The default install folder is: "C:\Program Files\USGS Astro\Crater Helper Tools".

2. Adding to ArcMap:
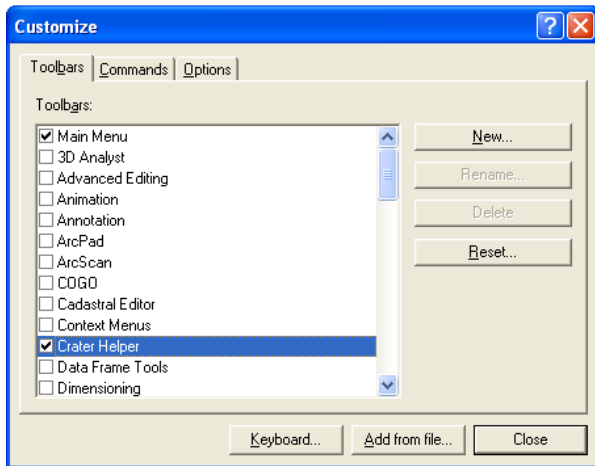
1) After install, open ArcMap. On the main menu, click on Tools > Customize…
2) Under the Toolbars tab, look for "Crater Helper" and click on the check box. The Crater Helper toolbar should appear somewhere on the screen or docked along with the other toolbars.
3) Close the Customize dialog.

3. Toolbar Description:

- ⑤ By Circle
- ④ By Line
- ③ By Point
- ② Enable Extent Computations
- ① Mode selection
- ⑥ By Polygon
- ⑦ By P3Pt Circle
- ⑪ Delete All Graphics
- ⑩ Set Attributes/ Link Features
- ⑨ By MultiPoint Line
- ⑧ By 6Pt Ellipse

Mode: Move Point

Move Point
Create Point
Calculate Diameter
Move Point/Calculate Diameter
Create Point/Calculate Diameter
Create Polyline
Create Polyline/Move Point/Diam
Create Polyline/Create Point/Diam
Calculate Minor-axis Diameter
Calculate Major-axis Azimuth
Calculate MinA Diam/MajA Azim
Calculate Central Peak Diameter
Calculate Central Pit Diameter
Calculate Ejecta Extent 1
Calculate Ejecta Extent 2
Calculate Ejecta Area 1
Calculate Ejecta Area 2
Calculate EjExtent/EjArea 1
Calculate EjExtent/EjArea 2

	Name	Description
1	Mode	Menu of actions to be performed. See **Table 2.**
2	Enable Extent Computations	If checked when measuring/modifying a feature, the minimum and maximum X and Y values will be stored in the attribute table in degree units, and a graphic depicting the extents added to the map. Fields used: [X_MIN], [X_MAX], [Y_MIN], [Y_MAX]
3	By Point	The mode/action selected will be performed by a single-click on the map (e.g. *Mode: Create Point*)
4	By Line	The mode/action selected will be performed by clicking once on the map, dragging a certain distance, and releasing to create a two-point line geometry (e.g. *Mode: Calculate Diameter*)
5	By Circle	The mode/action selected will be performed by clicking once on the map, dragging a certain distance, and releasing to create a circle geometry (e.g. *Mode: Create Point/Calculate Diameter*)
6	By Polygon	The mode/action selected will be performed by clicking several times on the map to trace a polygon and double-clicking to finish the geometry (e.g. *Mode: Calculate Ejecta Area 1*)
7	By 3Pt Circle	The mode/action selected will be performed by clicking six times on the map to trace a triangle and double-clicking to finish the circle geometry (e.g. *Mode: Move Point/Calculate Diameter*)
8	By 6Pt Ellipse	The mode/action selected will be performed by clicking three times on the map to trace an elongated hexagon and double-clicking to finish the ellipse geometry (e.g. *Mode: Calculate Major-axis Azimuth*)
9	By MultiPoint Line	The mode/action selected will be performed by clicking several times on the map to trace a polyline and double-clicking to finish the geometry (e.g. *Mode: Create Polyline*)
10	Set Attributes/ Link Features	Show/Hide window. Optional attributes and Link actions available. See **Table 3.**
11	Delete All Graphics	Deletes all graphics present on the active map.

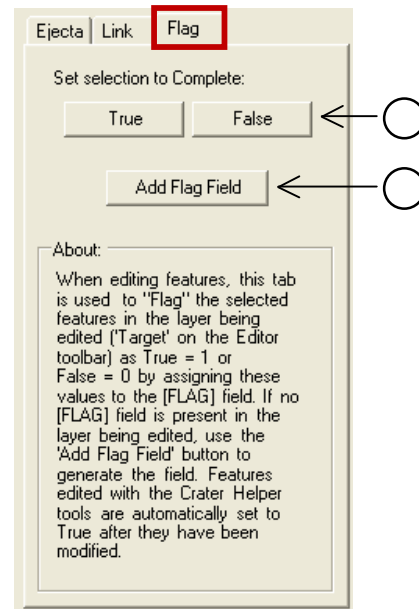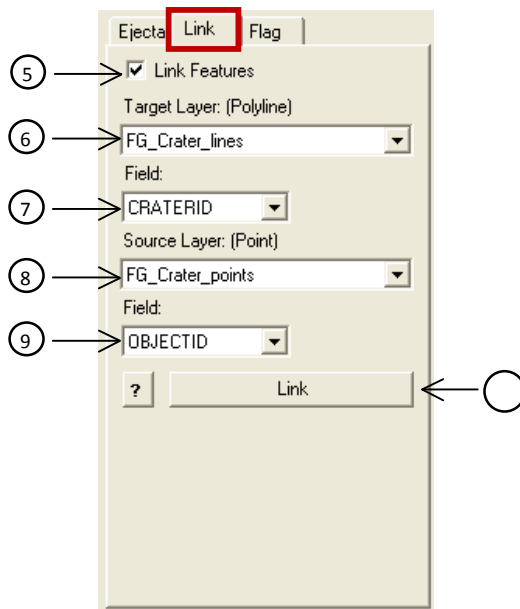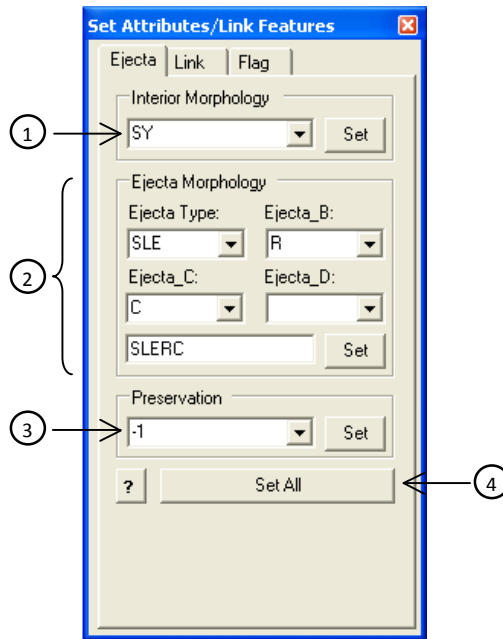**Table 1**: Toolbar items.

	Name	Point Layer Fields	Polyline Layer Fields*
1	Move Point	[LAT], [LON]	
2	Create Point	[LAT], [LON]	
3	Calculate Diameter	[RIM_DIA]	
4	Move Point/ Calculate Diameter	[LAT], [LON], [RIM_DIA]	
5	Create Point/ Calculate Diameter	[LAT], [LON], [RIM_DIA]	
6	Create Polyline		
7	Create Polyline/ Move Point/ Diam	[LAT], [LON], [RIM_DIA]	(user-specified field)
8	Create Polyline/ Create Point/ Diam	[LAT], [LON], [RIM_DIA]	(user-specified field)
9	Calculate Minor-axis Diameter	[MINOR_AXIS]	
10	Calculate Major-axis Azimuth	[MAJOR_AZIM]	
11	Calculate MinA Diam/ MajA Azimuth	[MINOR_AXIS], [MAJOR_AZIM]	
12	Calculate Central Peak Diameter	[CENTER_PK]	
13	Calculate Central Pit Diameter	[CENTER_PT]	
14	Calculate Ejecta Extent 1	[EJEXTENT_1]	
15	Calculate Ejecta Extent 2	[EJEXTENT_2]	
16	Calculate Ejecta Area 1	[EJAREA_1], [EJPERIM_1], [EJLOBATE_1]	
17	Calculate Ejecta Area 2	[EJAREA_2], [EJPERIM_2], [EJLOBATE_2]	
18	Calculate EjExtent /EjArea 1	[EJEXTENT_1], [EJAREA_1], [EJPERIM_1], [EJLOBATE_1]	
19	Calculate EjExtent /EjArea 2	[EJEXTENT_2], [EJAREA_2], [EJPERIM_2], [EJLOBATE_2]	

Table 2: Modes and the fields they add/modify on the point and polyline layers.

> ** NOTE: The polyline layer has to be specified on the "Set Attributes/Link Features" window under the "Link" tab. The user specifies a field where the point ID will be stored; linking each polyline to a point once this feature is enabled by the "Link Features" check-box. See section 4: "Set Attributes/Link Features Window Description" for more information.*

4. "Set Attributes/Link Features" Window Description

The "Set Attributes/Link Features" window is a 'Dockable' window composed of three different tabs: *Ejecta, Link, and Flag*. These tabs provide functionality to assign morphology attributes to point features, link polylines to points based on selected fields in each layer, and "Flag" features as 'complete = 1' or 'incomplete = 0'.

	Name	*Description & Fields added/modified*
1	Interior Morphology	Sets the selected value to point layer attribute table. Field: [INTERIOR_M] *
2	Ejecta Morphology	Sets the selected value to point layer attribute table. Field: [EJECTA_M] *
3	Preservation	Sets the selected value to point layer attribute table. Field: [PRESERV] *
4	Set All	Sets the above values at once. Fields: [INTERIOR_M], [EJECTA_M], [PRESERV] *
5	Link Features	Checkbox used to enable the linking of existing/new polylines to existing/new points. Once enabled and all parameters under the "Link" tab selected, using the toolbar modes that include "Create Polyline" will automatically assign the point value from the selected field (source) to the polyline field (target) selected.
6	Target Layer	The polyline layer that will be used to store the linked polyline features to be linked
7	(Target) Field	The polyline layer field that will be used to store the point ID from the source layer
8	Source Layer	The point layer that will be used to provide the ID for linking polylines to the layer points
9	(Source) Field	The point layer field that will be used to provide the point ID
10	Link	Used to manually link one or many selected polylines to a single point
11	True/ False	Used to flag selected features (any geometry type) as complete = 1 or incomplete= 0. An edit session and "Target" layer (on the Editor toolbar) are required in order to use this functionality. Field: [FLAG]
12	Add Flag Field	Used to add the [FLAG] to the "Target:" layer on the "Editor" toolbar

Table 3: "Set Attributes/Link Features" tab controls.

* NOTE: The pre-set Ejecta attributes available from the dropdown menus under the "Ejecta" tab are included by request of Nadine Barlow. No full description of these abbreviations is provided in this documentation.

5. Sample Workflow for the Moon

Created by: R. Hayward, USGS Astrogeology on 01/09/2010
Edited by: R. Nava, USGS Astrogeology on 06/25/2010

NOTES: This example uses shapefiles as the means to store point and polyline features. Feature classes within a File or Personal Geodatabases can also be used. This is a SAMPLE workflow; the parameters chosen here were selected for the specific purpose portrayed in the steps that follow. Refer to the descriptions at the beginning of this document for any questions on tool, windows, or tab names included below.

Workflow:

If making new craters:

1. In ArcCatalog, create a new point shapefile. Give it the Moon 2000 projection.
2. In ArcCatalog, in the same location that you created the point file, create a new polyline shapefile. Give it the Moon 2000 projection.
3. Close ArcCatalog.
4. Add both new shapefiles to ArcMap project that has a Moon 2000 data frame.
5. Start the Editor in the folder with the new shapefiles.
6. If the Crater Tool is not already added, add the Crater Tool to your Toolbar area.
7. In the link tab, link the new polyline file to the new point file.
   a. Check the Link Features box.
   b. Choose the new line file in the Target Layer drop down box.
   c. Choose Id for Field.
   d. Choose the new Point layer for the Source Layer.
   e. Choose FID (or OBJECTID) for the field. I am not sure that this is really a good idea. I would add a new Id field that remains static for this – but this requires more detail than I want to put here at this moment.
8. Now you want to force the tool to create all the fields that you will need.
9. Do this by choosing Calculate Diameter.
   a. It will ask if you want to add Flag field, say yes.
   b. Then it will ask if you want to create Rim_Dia field, say yes.
   c. It will also ask if you want X_MIN, X_MAX, Y_MIN, and Y_MAX, If you want to keep track of the extent of the feature in lat and lon, say yes to all of these, then remember that each time you start a new session, you must click on the checkmark logo that collects the extents.
10. Choose Calculate EjExtent/EjArea 1 in the Mode drop down box. This will force the tool to ask if you want to create EJEXTENT_1, EJAREA_1, EJPERIM_1 and EJLOBATE_1. Say yes to each.
11. Now you are ready to create some craters and calculate diameters, ejecta area, etc.
12. Click on the ejecta tab. This is where you will enter information about the crater and ejecta morphology.

13. In mode, choose Crate Polyline/Create Point/Diam. Be sure that the Source layer is your point layer. If it is not you will be quite frustrated when you attempt to draw a circle and nothing happens. The point file is where the important information is stored.

14. If you want to record max and min lats and lons that define the extent of the work area, click on the checkmark icon, so that the extent calculations will be made. This is not automatically enabled. You have to click on the icon every time that you start a new session.

15. Choose the 3 point circle, 6 point ellipse, polygon, or polyline icon to draw your crater.

16. The Crater tool will prompt you to create new fields: Crater_ID and FLAG.

17. After you create your first crater, go to the ejecta tab and use the dropdown boxes to describe the crater. When you use the Set or Set All button to populate those fields, you will be prompted to create the fields. Say yes to all of them. Now that the fields exist, you may have to re-create the first crater over again and delete the first one that you made.

18. Now you can make craters and attribute them.

19. In order to calculate ejecta extent, area etc. you will change the mode to Calculate EjExtent/EjArea 1.

20. When you map the ejecta (using the circle tool, polygon tool etc), it will calculate the extent, area, perimeter and lobateness, but be aware that the graphic that you create is temporary – it does not exist in a shapefile – it is only a screen graphic). If you use the erase graphic (red X) icon, or if Arc crashes, those graphics will be lost. The graphics also cause labels to not display sometimes, so you may want to erase the graphics for that reason.

21. If you need those graphics, you can save them to a shapefile using the Graphics and shapes tool (use Graphics to Shapes). If you think it is important to save the ejecta shapes you might want to see if Richard Nava can incorporate that into the tool. I don't have much experience with saving the graphics to a shapefile, but .

22. If you are not happy with your outline, you can do it over and the newer values will be saved.

23. Whatever comes next

6. Uninstalling the Crater Helper Tools:

1) Open the Control Panel.
2) Double-click "Add-Remove Programs".
3) Find "Crater Helper Tools".
4) Click the "Remove" button and follow the directions.
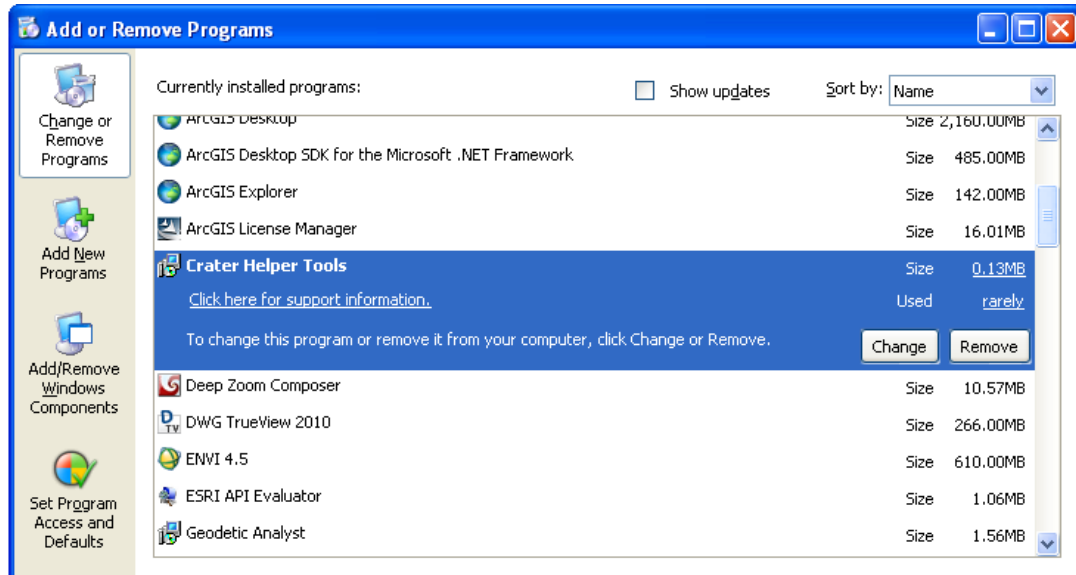
Contact Info:

Please send any bugs, comments, or feedback to:

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