



EUROPEAN COMMISSION  
DIRECTORATE-GENERAL  
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## MSPA-Toolbox for ArcGIS

Homepage: <https://forest.jrc.ec.europa.eu/en/activities/lpa/mspa/>

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### Background

This document provides installation and usage instructions for the MSPA-Toolbox in [ArcGIS](#). MSPA (Morphological Spatial Pattern Analysis) is a customized sequence of mathematical morphological operators targeted at the description of the geometry and connectivity of the image components. Based on geometric concepts only, this methodology can be applied at any scale and to any type of digital raster images in any application field. The foreground of a binary image is divided into seven generic MSPA classes: Core, Islet, Perforation, Edge, Loop, Bridge, and Branch. This segmentation results in mutually exclusive classes which, when merged, exactly correspond to the initial foreground coverage. Further details and examples are provided in the MSPA\_Guide.pdf available in the MSPA-folder of this Toolbox, or at the [MSPA homepage](#).

**Note:** The information provided here will only be updated if new features are added in any future version. The Toolbox will automatically test for and you will be notified if a newer version becomes available.

### Limitations

Compared to the original version inside the image processing software [GTB](#) or [GWB](#), the functionality of the ArcGIS MSPA-Toolbox version has the following limitations:

- 32bit processing is not supported.
- Maximum size of EdgeWidth is limited to 5.
- Input image size is constraint to ~ 65 MB of uncompressed data equivalent to a square image with dimensions of 8,000 x 8,000 pixels.
- Statistical MSPA summary analysis is not available.
- Automated buffered tiling and batch-processing of several files is not available.
- No support for non-geotiff images.
- Export to Google Earth image overlay is not available.
- The ArcGIS MSPA-Toolbox is limited to 64-bit MS-Windows.

Please install the free image processing software [GTB](#) or [GWB](#) for full functionality.

## Installation

Download the archive [MSPA-ArcGIS.zip](#) from the [MSPA](#) website. Next, extract the archive and open the new folder [MSPA-ArcGIS](#). This folder contains the current document, a sample input image [input.tif](#), the [MSPA\\_Guide.pdf](#) with detailed information on MSPA input requirements and output features, the folder [MSPA](#) (all Toolbox-related routines) and the [MSPA](#) installation script. The script will install the MSPA Toolbox into ArcGIS >= 10.3 and/or ArcGIS PRO >= 2.0.

a) **ArcGISPro**: Ensure **to insert a Map for your project**. Next, link the MSPA Toolbox via Toolboxes → **Add Toolbox** → [MSPA.pyt](#) from the [MSPA-ArcGIS\mspa](#) folder:

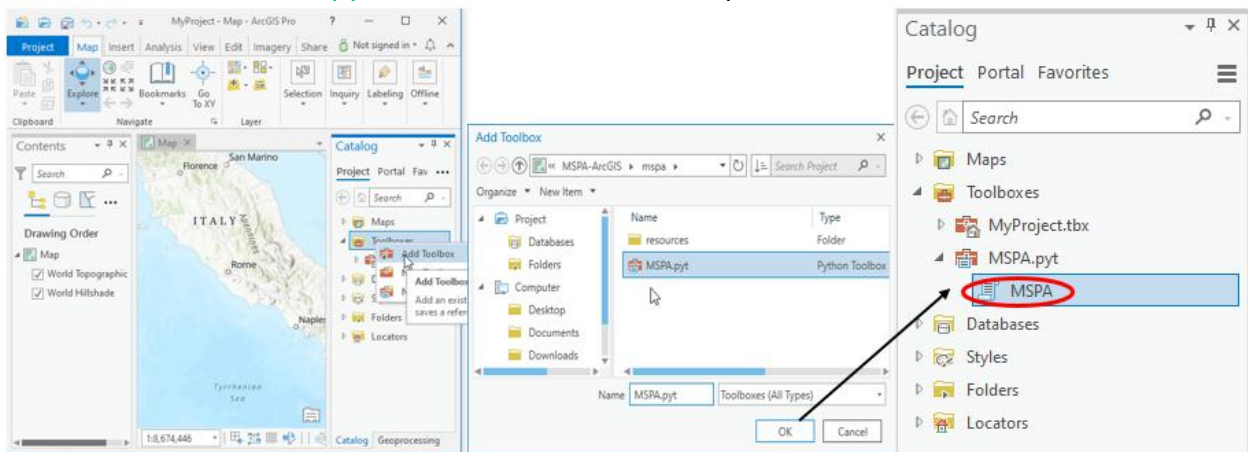


Figure 1: Adding (top) and location of the MSPA Toolbox (bottom) in ArcGIS Pro.

b) **ArcGIS 10.3 and newer**: the MSPA toolbox in the *My Toolboxes* folder in the ArcMap Catalog window:

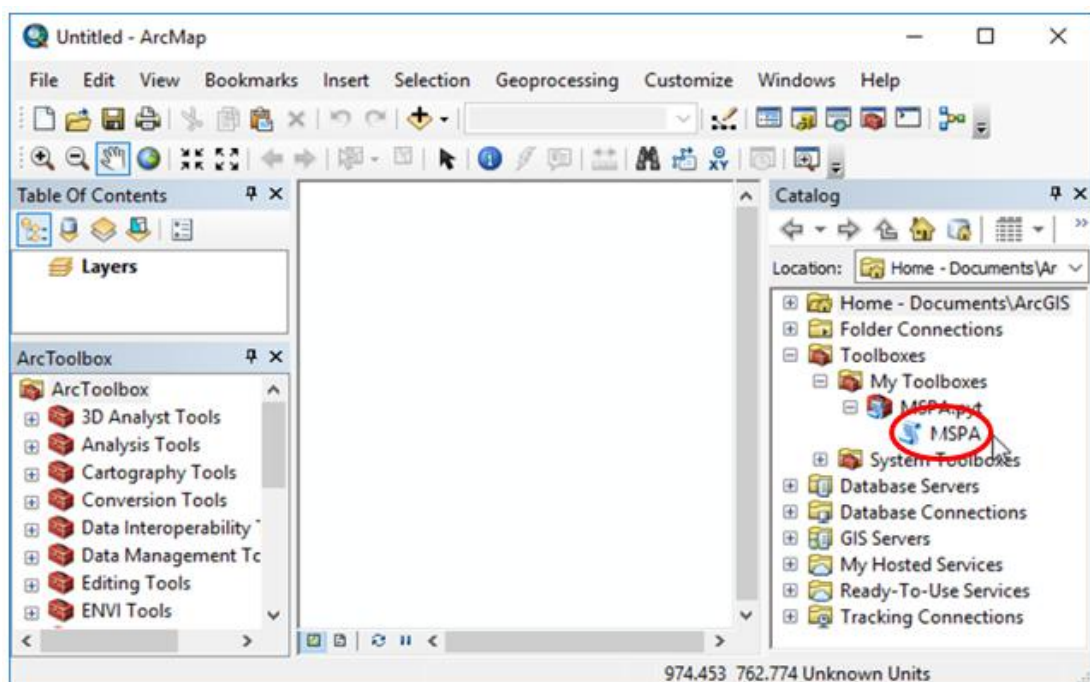
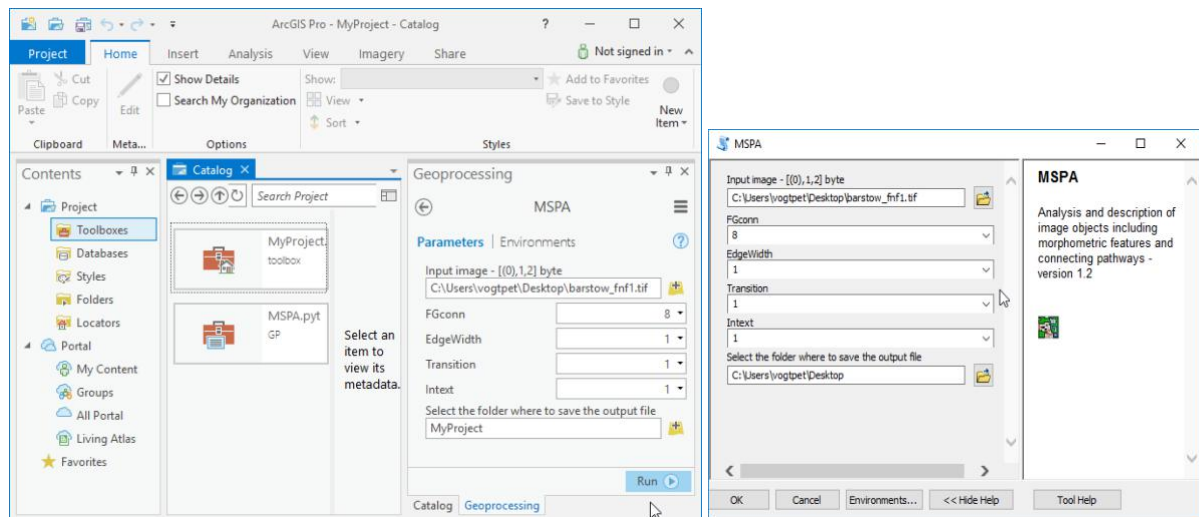


Figure 2: Location of the MSPA Toolbox in ArcMap 10.x (Windows → Catalog).

Next, double-click on the script *MSPA* (red circle in Figure 1/2) to start the MSPA-GUI:



**Figure 3: The MSPA GUI in ArcGIS Pro (left) or ArcMap (right).**

## Using the MSPA-Toolbox

MSPA processing requires three steps (Figure 1, right):

**Step 1:** Select a (pseudo) binary input image having mandatory Background (1 byte) and Foreground (2 byte), i.e., the input image *input.tif*. Optional missing data must be assigned to 0 byte. The toolbox will verify the MSPA-compatibility of the user-selected input image.

**Step 2:** Select the four MSPA parameters (FGconn, EdgeWidth, Transition, Intext) to fine-tune the MSPA pattern analysis. More details are available in the MSPA-Guide in the folder MSPA-ArcGIS. The default MSPA parameters are 8-1-1-1.

**Step 3:** Select the folder where to save the output file and then click the *OK/Run* button to begin processing.

**Note:** You must specify/select **each of the 6 entry fields** in the MSPA-GUI until all green dots will disappear. Invalid entries will prompt an error message. You may need to add an exception for MSPA-processing in your antivirus software.

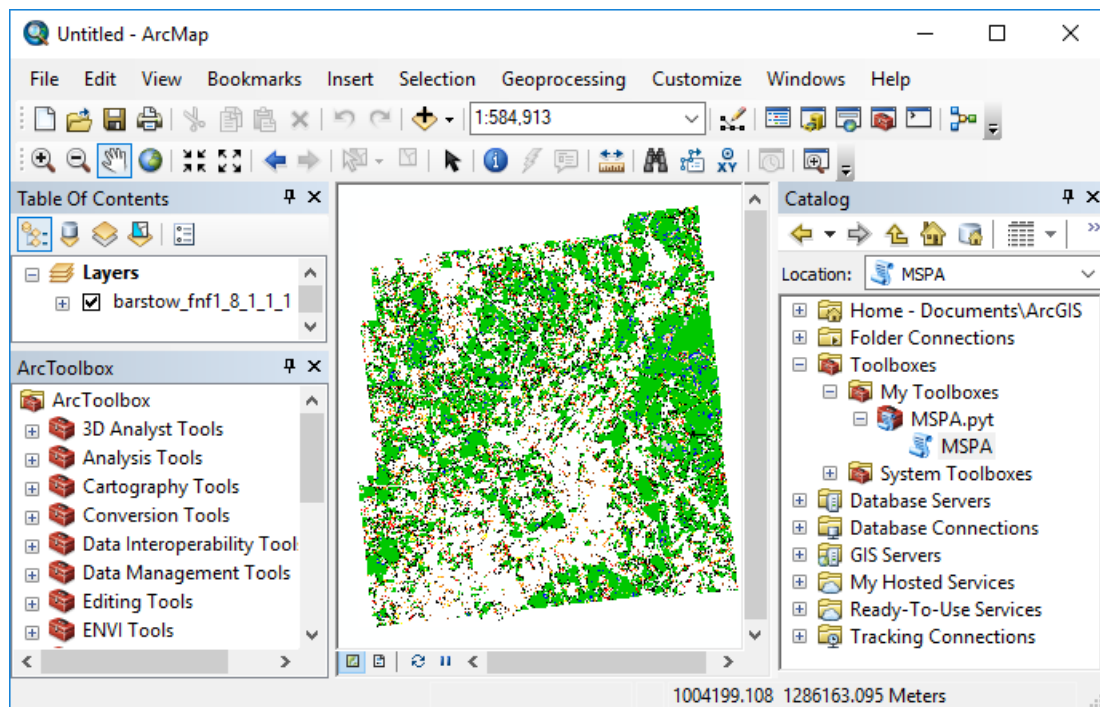
During processing, a popup message will appear providing further information on

- the potential availability of a newer MSPA-ArcGIS version,
- erroneous MSPA settings,
- progress of the calculation

We suggest to keep this popup window enabled in order to remain informed about future updated versions of the Toolbox.

The MSPA parameters settings are added automatically to the name of the resulting MSPA image, which is then loaded as a new layer into ArcMap (Figure 4).

**Note:** Images saved via this MSPA-Toolbox are recognized by GTB and the selected MSPA parameters are automatically loaded into GTB.



**Figure 4: Example of MSPA-result loaded as a new layer into ArcMap.**

## References:

- Soille P. and Vogt P. (2009). Morphological segmentation of binary patterns. Pattern Recognition Letters. DOI: [10.1016/j.patrec.2008.10.015](https://doi.org/10.1016/j.patrec.2008.10.015) (Alternative download [here](#)).
- Vogt P. and Riitters K. (2017). GuidosToolbox: universal digital image object analysis. European Journal of Remote Sensing 50:1, 352-361, DOI: [10.1080/22797254.2017.1330650](https://doi.org/10.1080/22797254.2017.1330650).
- Vogt P., Riitters K., Rambaud P., d'Annunzio R., Lindquist E., Pekkarinen A. (2022). GuidosToolbox Workbench: spatial analysis of raster maps for ecological applications. DOI: [10.1111/ecog.05864](https://doi.org/10.1111/ecog.05864).
- Soille P. and Vogt P. (2022). [Morphological spatial pattern analysis: open source release](#). The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, Volume XLVIII-4/W1-2022 Free and Open Source Software for Geospatial (FOSS4G) 2022 – Academic Track, 22–28 August 2022, Florence, Italy. pp. 427-433, DOI: 10.5194/isprs-archives-XLVIII-4-W1-2022-427-2022.