

MSBuffer
Multi-scale buffer analysis

TUTORIAL

MSBuffer toolbox v. 1.0.0

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Citation

If you are going to use or cite MSBuffer in your study or report, please refer to:

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1. Introduction

The Multi-Scale Buffer (MSBuffer) is a free and open source package developed in Python 2.7 as an ArcGIS geoprocessing tool. It performs area and length calculation and feature counting in buffers of multiple sizes around an area of interest. This tutorial aims to show the basic functions of the MSBuffer with a demonstration data set. The use of this software and tutorial requires: a) the ArcGIS software installed; b) a folder with the MSbuffer files and c) a folder with a database to run the app (DB_demo).

Note: the MSBbuffer and the DB_demo folders are compacted for download and have to be unzipped before use. The MSbuffer and DB_demo files are available in the MSBuffer github (<https://github.com/LEEClab/MSBuffer>).

2. Installing ArcGIS for Desktop

ArcGIS trial for desktop can be download and installed for free in the following link:

<http://www.esri.com/en/arcgis/products/arcgis-pro/DesktopFreeTrial>.

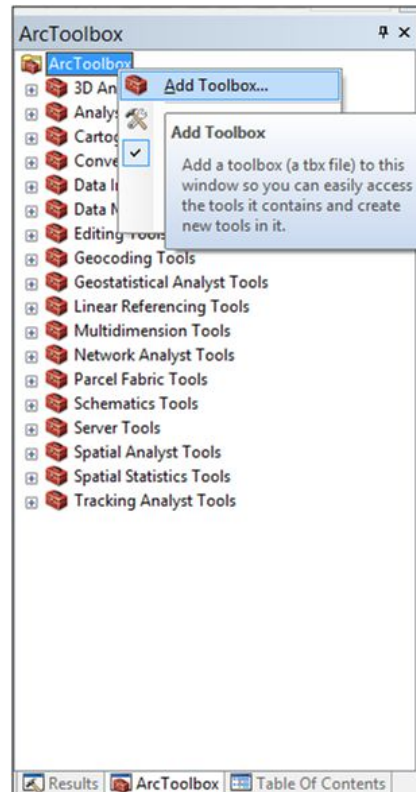
Installation overview and step-by-step process can be found in the following link:

<http://desktop.arcgis.com/en/arcmap/10.3/get-started/installation-guide/installing-on-your-computer.htm>.

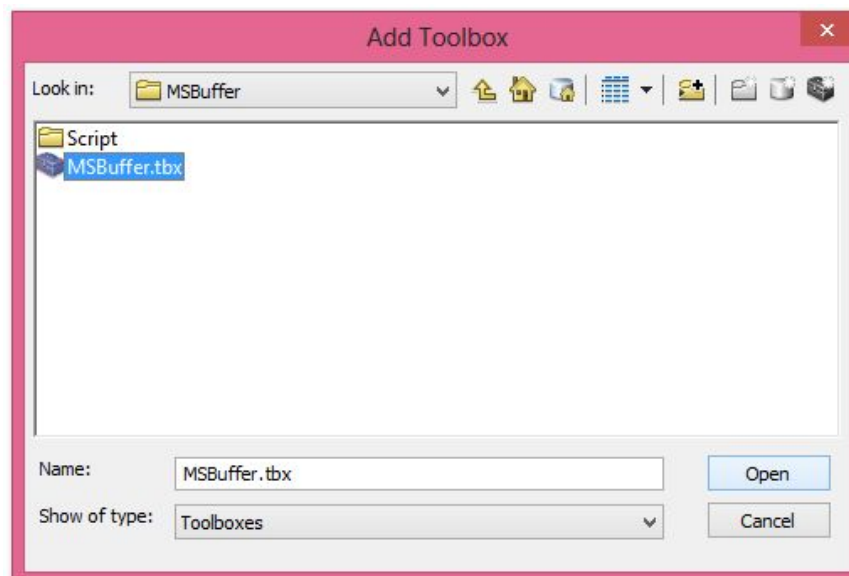
3. Adding MSBuffer as an ArcToolbox and running it

The MSBuffer can be added as ArcToolbox inside ArcMap.

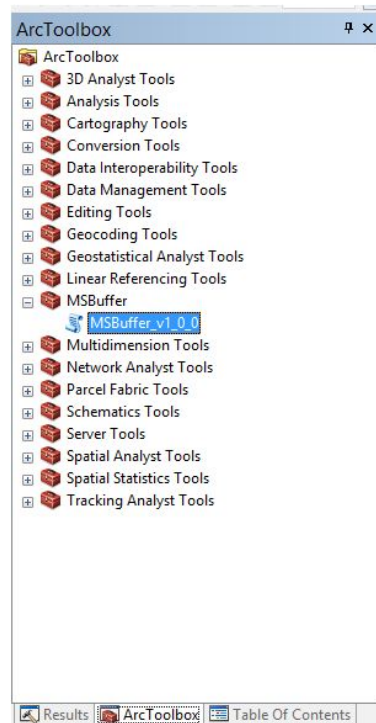
1. Open ArcMap with an empty map document file and open the ArcToolbox window.
2. Import the maps and spatial data to be analyzed to ArcMap.
3. Right-click on ArcToolbox> Add toolbox and navigate to the folder where you have saved MSBuffer.



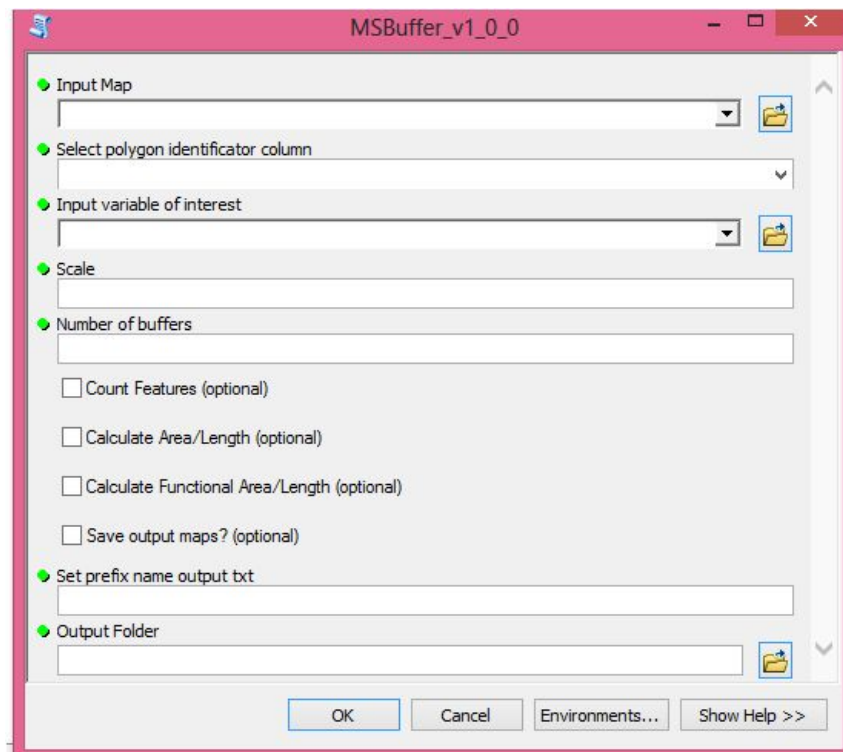
4. Open the toolbox by selecting MSBuffer.tbx and clicking on the Open button. The toolbox should now be displayed in ArcToolbox as shown in the following screenshot:



5. Open the MSBuffer script:

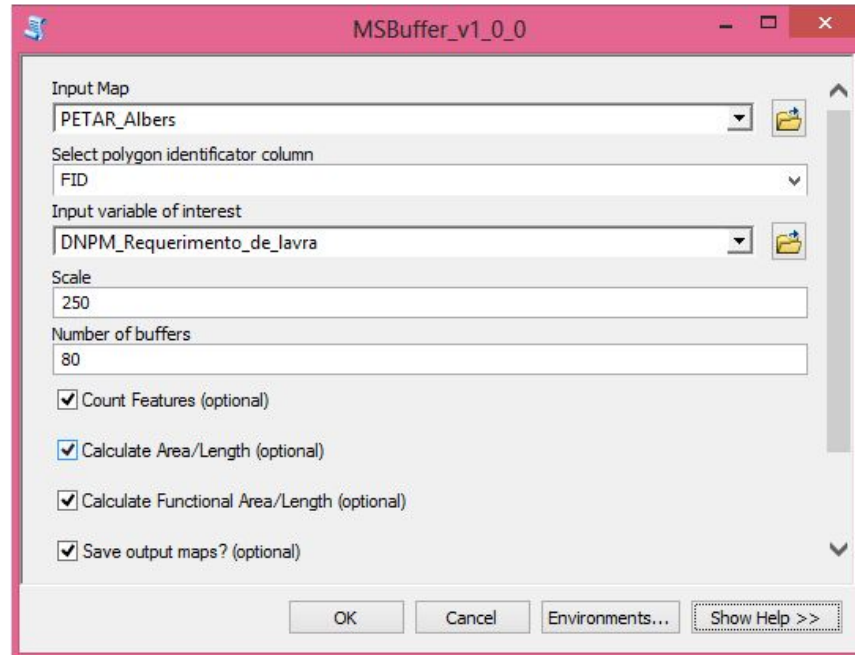


6. MSBuffer window.



7. Running MSBuffer.

1. Input the map of the area of interest in the "**Input Map**" field and select the identification column (e.g. name of the area) in the attribute table of the map (field "**Select polygon identifier column**"). In the case of the input map contains more than one polygon (e.g. multiple conservation units or areas of interest) the program will run a similar buffer analysis for each area and print the requested metrics according to the identification column specified.
2. Input the variable of interest (the response variable of the buffer analysis, e.g. forest cover area). This must be a shapefile map.
3. Set the minimum size of the buffer steps (field "**Scale**"). The unit here is the same of your map projection; therefore, we strongly recommend using map projections in which distances are measured in meters, such as UTM, Polyconic, Lambert, and Albers, and avoid using geographic projections.
4. Set how many buffers you want to run (field "**Number of buffers**").
5. Choose the metrics you want to calculate (area, count, functional area). See the description of the metrics below.



MSBuffer_v1_0_0

Input Map
PETAR_Albers

Select polygon identifier column
FID

Input variable of interest
DNPM_Requerimento_de_lavra

Scale
250

Number of buffers
80

☒ Count Features (optional)

☒ Calculate Area/Length (optional)

☒ Calculate Functional Area/Length (optional)

☒ Save output maps? (optional)

OK Cancel Environments... Show Help >>

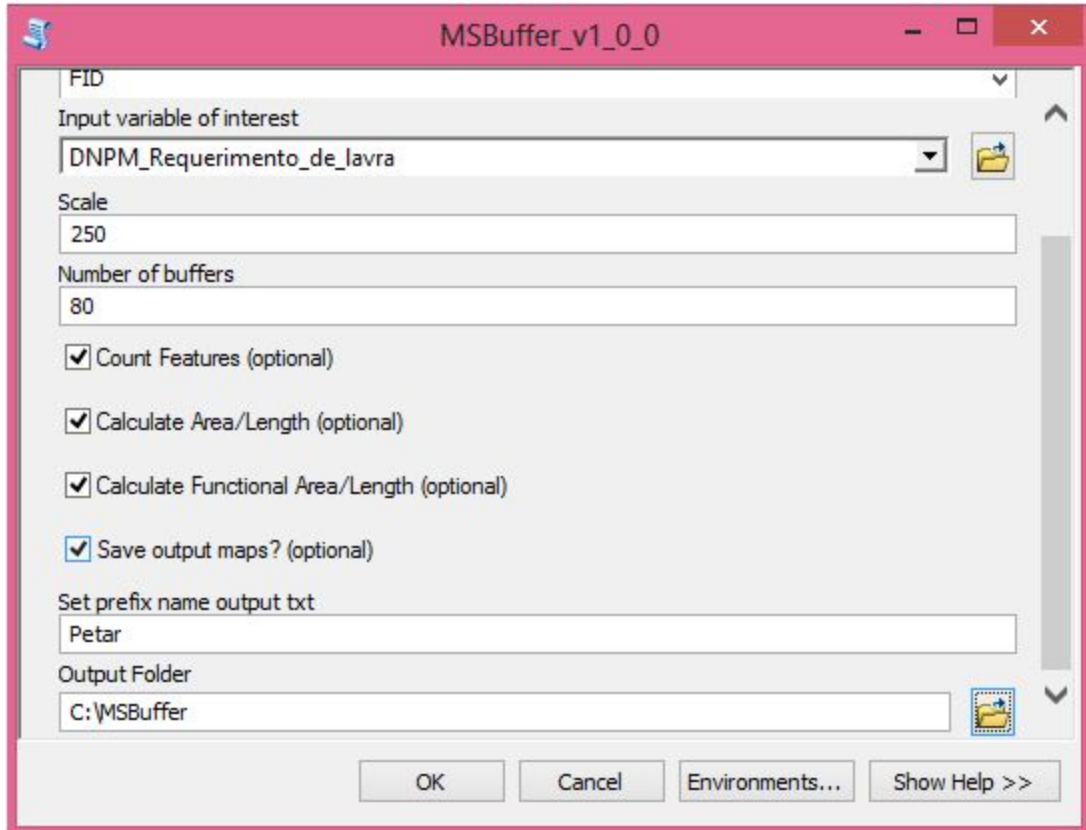
6. Define whether you want to keep the buffer maps saved; they will be saved in an ArcGIS geodatabase called “output_buffer_maps.gdb”.

If this option is selected, one map for each buffer size will be saved, named “name_output_ID_variable_interest_inside_donut_buffer”. The “name_output” in the name of the map is defined by the user (see below); the ID corresponds to the name of the area (extracted from the identification column in the input map attribute table); and the variable_interest will be replaced by the name of the variable of interest selected.

WARNING: If you re-run a buffer analysis choosing the same Output folder, the maps will be replaced. Take care!

7. Name your output .txt file (field “**Set prefix name for output txt**”).

8. Set the path for the output folder where text files and maps will be saved.



MSBuffer_v1_0_0

FID

Input variable of interest
DNPM_Requerimento_de_lavra

Scale
250

Number of buffers
80

☒ Count Features (optional)

☒ Calculate Area/Length (optional)

☒ Calculate Functional Area/Length (optional)

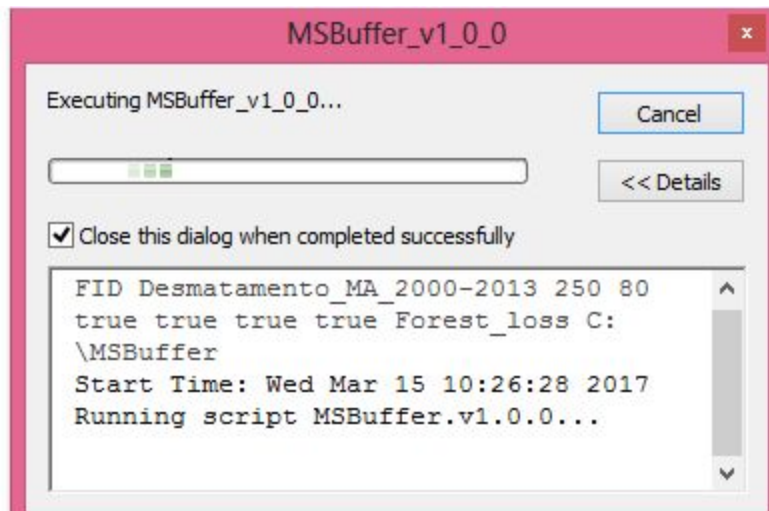
☒ Save output maps? (optional)

Set prefix name output txt
Petar

Output Folder
C:\MSBuffer

OK Cancel Environments... Show Help >>

8. Click "OK" to run.



MSBuffer_v1_0_0

Executing MSBuffer_v1_0_0...






Cancel

<< Details

☒ Close this dialog when completed successfully

```
FID Desmatamento_MA_2000-2013 250 80
true true true true Forest_loss C:
\MSBuffer
Start Time: Wed Mar 15 10:26:28 2017
Running script MSBuffer.v1.0.0...
```


8. Check the output folder. It contains the folder with maps saved in the analysis (if you selected to save the maps), the output files (a csv file for each requested metric) and the _BufferArea file containing the total area in the buffer ring.

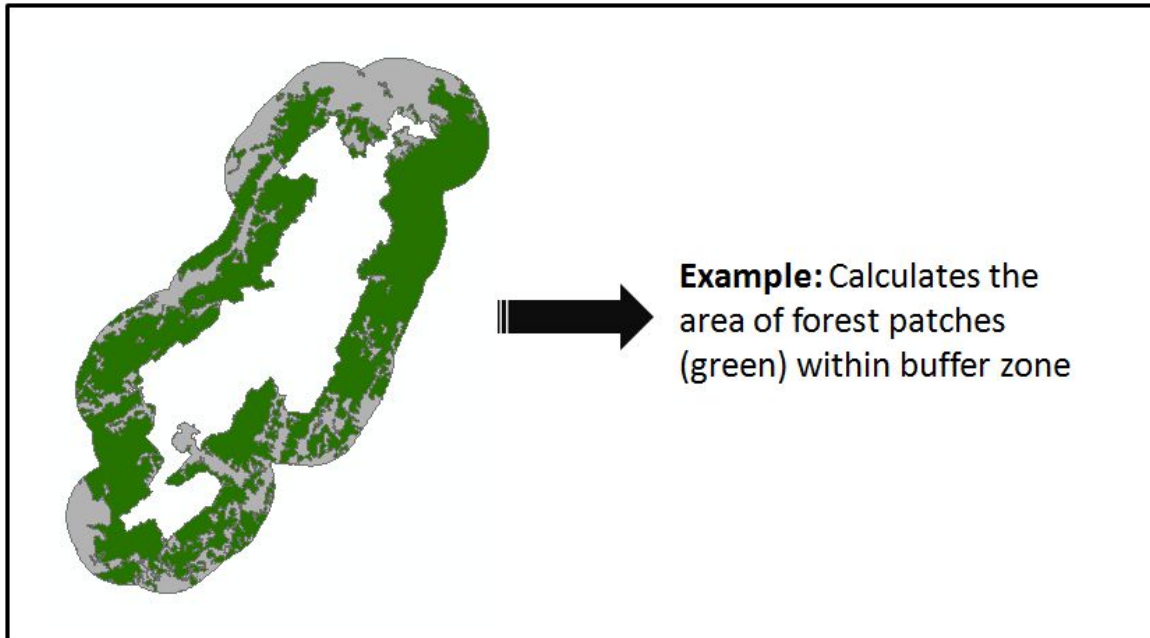
Nome	Data de modificaç.
 output_buffer_maps.gdb	3/15/2017 4:06 PM
 Petar_DNPM_Requerimento_de_lavra_Area	3/15/2017 4:06 PM
 Petar_DNPM_Requerimento_de_lavra_BufferArea	3/15/2017 4:06 PM
 Petar_DNPM_Requerimento_de_lavra_Count	3/15/2017 4:06 PM
 Petar_DNPM_Requerimento_de_lavra_FunctionalArea	3/15/2017 4:06 PM

4. Description of the metrics calculated by MSBuffer

MSBuffer calculates three metrics:

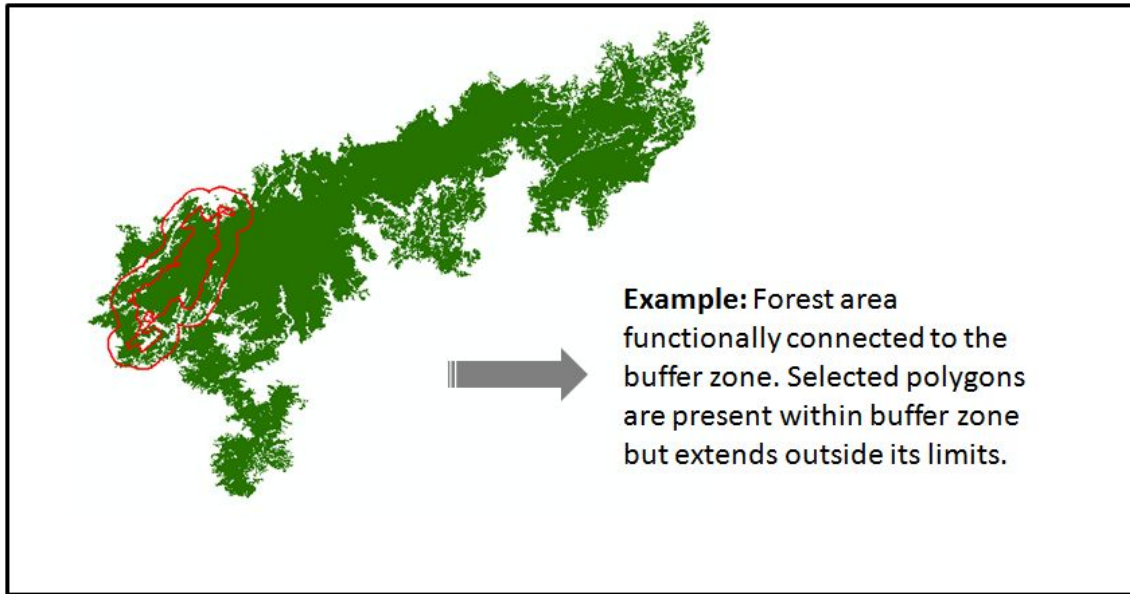
- 1) Area (in hectares)/Length (in meters)

The analysis will provide the calculation of the area of the specified variable of interest within each buffer size. To perform the calculation, the MSBuffer clips the variable of interest using the buffer zone and calculates the area of the variable of interest. The same is valid for length, when the variable of interest is a linear shapefile, e.g. representing rivers or roads. The algorithm clips the variable of interest using the buffer zone and calculates the length of this variable inside the buffer.



2) Functional Area (in hectares)/Functional Length (in meters)

The functional area is the total area functionally connected to the buffer even though this area extends outside the buffer limits. To perform the calculation MSBuffer selects the polygons of the variable of interest that intersects the buffer zone and calculates the area of these polygons. The functional area is the sum of the areas of these polygons. Therefore, this metric takes into account the area of the selected polygons that are present inside the buffer zone, but also their parts that extends outside its limits. The same is valid for the functional length, for linear maps.



3) Count features

The count feature option counts the number of polygons, lines, or points of the variable of interest that intersect the buffer zone.

