山东科技大学——测绘与空间信息学院

Python程序设计

地理信息科学系　刘洪强

J6-557　电话：86081170

2021年4月23日星期五

课程安排：

36个学时，其中授课24个学时，实验12个学时

成绩：

出勤5% + 实验报告25% + 考试70%

章节内容

第8章 地理处理工具的执行

工具查找

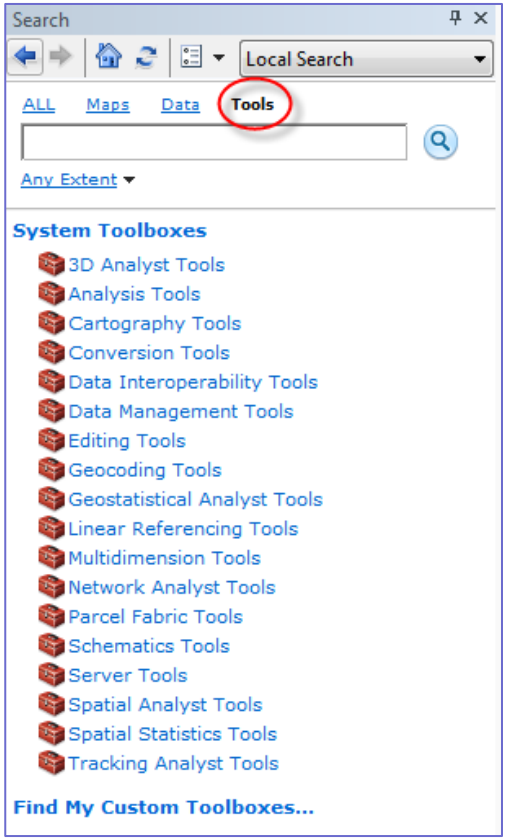
工具箱别名查看

工具使用

一个工具的输出作为另一个工具的输入

8.1 工具查找

- Geoprocessing---Search For Tools



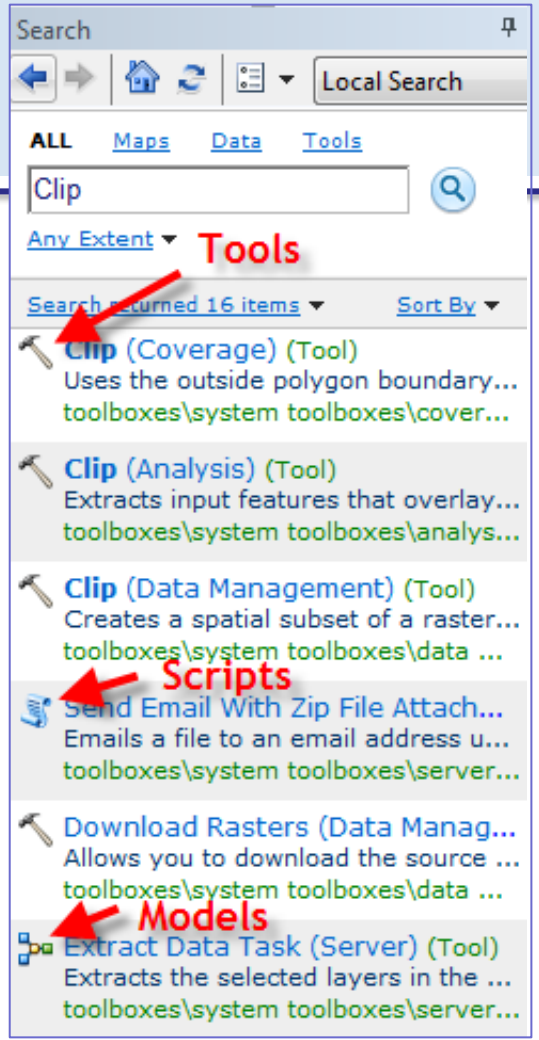
8.1 工具查找

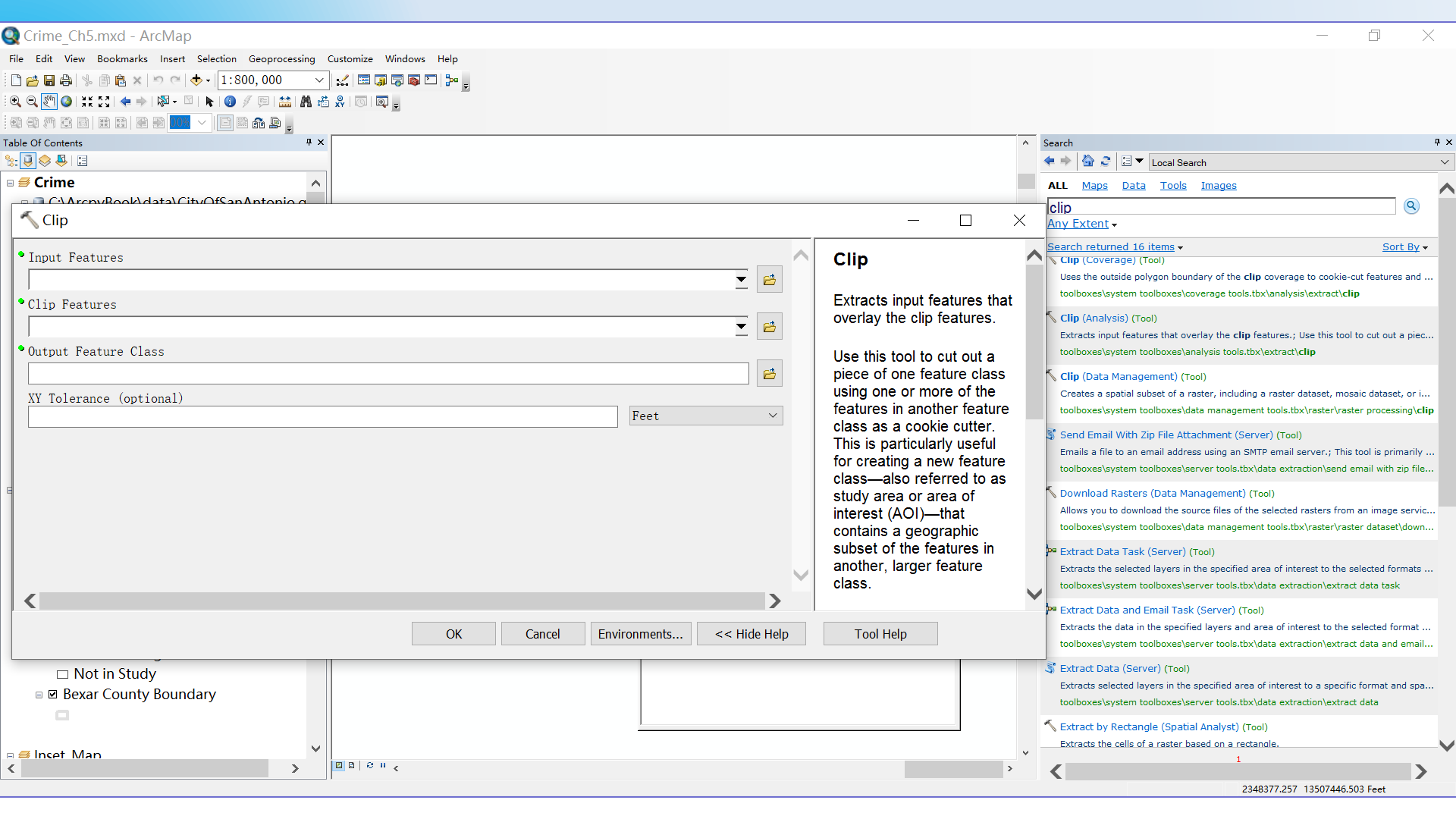
- 锤子图标：工具（Tool）
- 卷轴图标：Python脚本（Script）
- 彩色方格：模型（Model）

不同的地理处理工具可能具有相同的名称

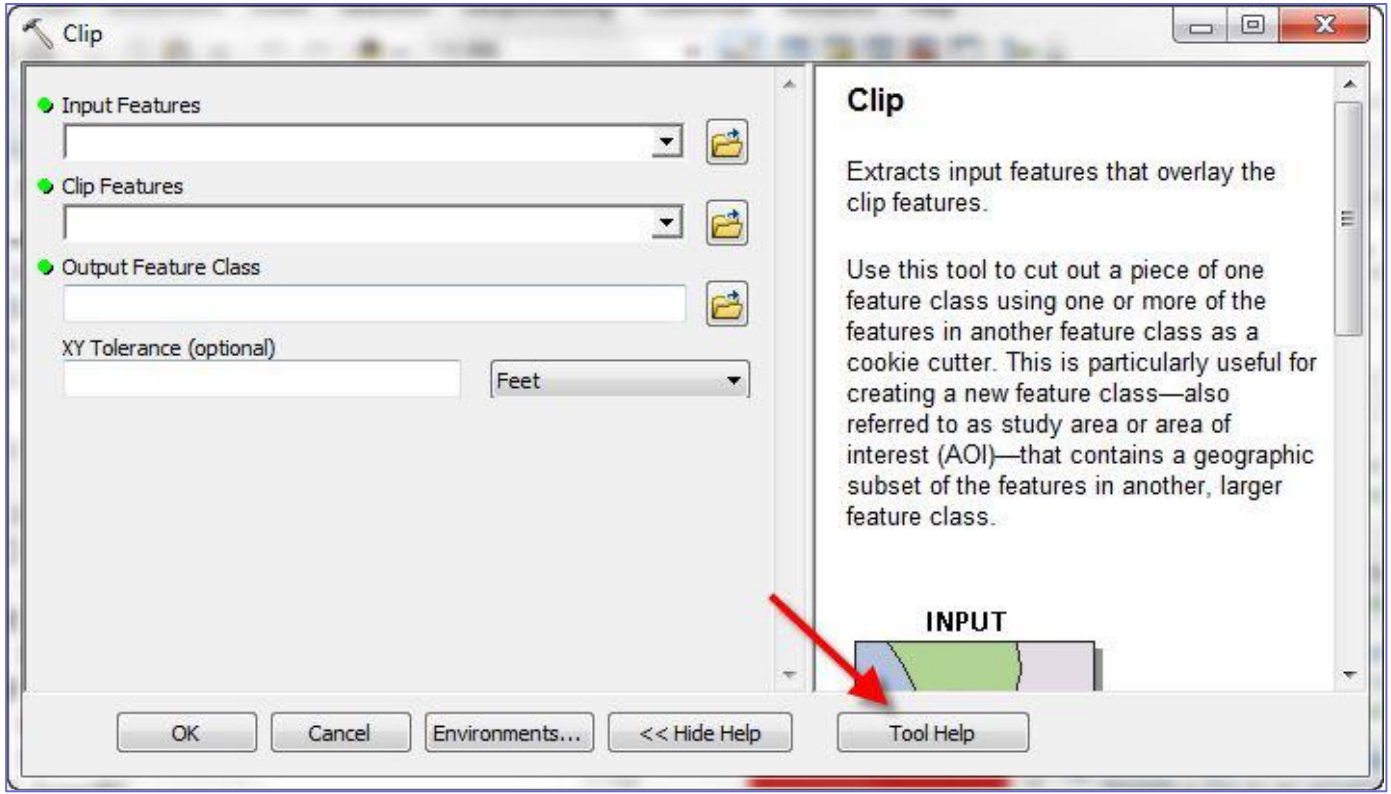
如何识别定位呢？

工具箱名称中添加工具箱别名——定义工具的唯一性




Crime_Ch5.mxd - ArcMap
File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
1:800, 000
Table Of Contents
Crime
Not in Study
Bexar County Boundary
Inset Map
Search
Local Search
ALL Maps Data Tools Images
clip
Any Extent
Search returned 16 items
Sort By
Clip (Coverage) (Tool)
Uses the outside polygon boundary of the clip coverage to cookie-cut features and ...
toolboxes\system toolboxes\coverage tools.tbx\analysis\extract\clip
Clip (Analysis) (Tool)
Extracts input features that overlay the clip features.; Use this tool to cut out a piec...
toolboxes\system toolboxes\analysis tools.tbx\extract\clip
Clip (Data Management) (Tool)
Creates a spatial subset of a raster, including a raster dataset, mosaic dataset, or i...
toolboxes\system toolboxes\data management tools.tbx\raster\raster processing\clip
Send Email With Zip File Attachment (Server) (Tool)
Emails a file to an email address using an SMTP email server.; This tool is primarily ...
toolboxes\system toolboxes\server tools.tbx\data extraction\send email with zip file...
Download Rasters (Data Management) (Tool)
Allows you to download the source files of the selected rasters from an image servic...
toolboxes\system toolboxes\data management tools.tbx\raster\raster dataset\down...
Extract Data Task (Server) (Tool)
Extracts the selected layers in the specified area of interest to the selected formats ...
toolboxes\system toolboxes\server tools.tbx\data extraction\extract data task
Extract Data and Email Task (Server) (Tool)
Extracts the data in the specified layers and area of interest to the selected format ...
toolboxes\system toolboxes\server tools.tbx\data extraction\extract data and email...
Extract Data (Server) (Tool)
Extracts selected layers in the specified area of interest to a specific format and spa...
toolboxes\system toolboxes\server tools.tbx\data extraction\extract data
Extract by Rectangle (Spatial Analyst) (Tool)
Extracts the cells of a raster based on a rectangle.
2348377.257 13507446.503 Feet
Clip
Input Features
Clip Features
Output Feature Class
XY Tolerance (optional)
Feet
Clip
Extracts input features that overlay the clip features.
Use this tool to cut out a piece of one feature class using one or more of the features in another feature class as a cookie cutter. This is particularly useful for creating a new feature class—also referred to as study area or area of interest (AOI)—that contains a geographic subset of the features in another, larger feature class.
OK
Cancel
Environments...
<< Hide Help
Tool Help

8.1 工具查找



查看桌面ArcGIS帮助系统中关于特定工具的详细描述

Clip (Analysis)

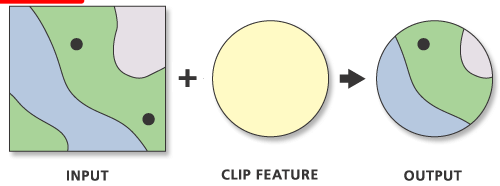
License Level: ☑ Basic ☑ Standard ☑ Advanced

Summary

Extracts input features that overlay the clip features.

Use this tool to cut out a piece of one feature class using one or more of the features in another feature class as a cookie cutter. This is particularly useful for creating a new feature class—also referred to as study area or area of interest (AOI)—that contains a geographic subset of the features in another, larger feature class.

Illustration



Usage

- The **Clip Features** can be points, lines, and polygons, depending on the **Input Features** type.
  - When the **Input Features** are polygons, the **Clip Features** must also be polygons.
  - When the **Input Features** are lines, the **Clip Features** can be lines or polygons. When clipping line features with line features, only the coincident lines or line segments are written to the output, as shown in the graphic below.
  - When the **Input Features** are points, the **Clip Features** can be points, lines, or polygons. When clipping point features with point features, only the coincident points are written to the output, as shown in the graphic below. When clipping point features with line features, only the points that are coincident with the line features are written to the output.
- The **Output Feature Class** will contain all the attributes of the **Input Features**.
- This tool will use a tiling process to handle very large datasets for better performance and scalability. For more details, see Geoprocessing with large datasets.
- Line features clipped by polygon features:

Syntax

Clip_analysis (in_features, clip_features, out_feature_class, {cluster_tolerance})

Parameter	Explanation	Data Type
in_features	The features to be clipped.	Feature Layer
clip_features	The features used to clip the input features.	Feature Layer
out_feature_class	The feature class to be created.	Feature Class
cluster_tolerance (Optional)	The minimum distance separating all feature coordinates as well as the distance a coordinate can move in X or Y (or both). Set the value to be higher for data with less coordinate accuracy and lower for data with extremely high accuracy.	Linear unit

Code Sample

Clip example (Python window)

The following Python window script demonstrates how to use the Clip function in immediate mode.

```
import arcpy
from arcpy import env

env.workspace = "C:/data"
arcpy.Clip_analysis("majorrds.shp", "study_quads.shp", "C:/output/studyarea.shp")
```

Clip example 2 (stand-alone Python script)

The following Python script demonstrates how to use the Clip function in a stand-alone script.

```
# Name: Clip_Example2.py
# Description: Clip major roads that fall within the study area.

# Import system modules
import arcpy
```

```
# Name: Clip_Example2.py
# Description: Clip major roads that fall within the study area.

# Import system modules
import arcpy
from arcpy import env

# Set workspace
env.workspace = "C:/data"

# Set local variables
in_features = "majorrds.shp"
clip_features = "study_quads.shp"
out_feature_class = "C:/output/studyarea.shp"
xy_tolerance = ""

# Execute Clip
arcpy.Clip_analysis(in_features, clip_features, out_feature_class, xy_tolerance)
```

Environments

Default Output Z Value, M Resolution, M Tolerance, Output CONFIG Keyword, Output M Domain, Output XY Domain, Output Z Domain, Output Coordinate System, Extent, Output has M values, Output has Z values, Output Spatial Grid 1, Output Spatial Grid 2, Output Spatial Grid 3, XY Resolution, XY Tolerance, Z Resolution, Z Tolerance

Related Topics

An overview of the Extract toolset

Licensing Information

ArcGIS for Desktop Basic: Yes

ArcGIS for Desktop Standard: Yes

ArcGIS for Desktop Advanced: Yes

Caution: Geoprocessing tools do not honor geodatabase feature class or table field split policies.

Syntax

Clip_analysis (in_features, clip_features, out_feature_class, {cluster_tolerance})

Parameter	Explanation	Data Type
in_features	The features to be clipped.	Feature Layer
clip_features	The features used to clip the input features.	Feature Layer
out_feature_class	The feature class to be created.	Feature Class
cluster_tolerance (Optional)	The minimum distance separating all feature coordinates as well as the distance a coordinate can move in X or Y (or both). Set the value to be higher for data with less coordinate accuracy and lower for data with extremely high accuracy.	Linear unit

Code Sample

Clip example (Python window)

The following Python window script demonstrates how to use the Clip function in immediate mode.

```
import arcpy
from arcpy import env

env.workspace = "C:/data"
arcpy.Clip_analysis("majorrds.shp", "study_quads.shp", "C:/output/studyarea.shp")
```

Clip example 2 (stand-alone Python script)

The following Python script demonstrates how to use the Clip function in a stand-alone script.

```
# Name: Clip_Example2.py
# Description: Clip major roads that fall within the study area.
```

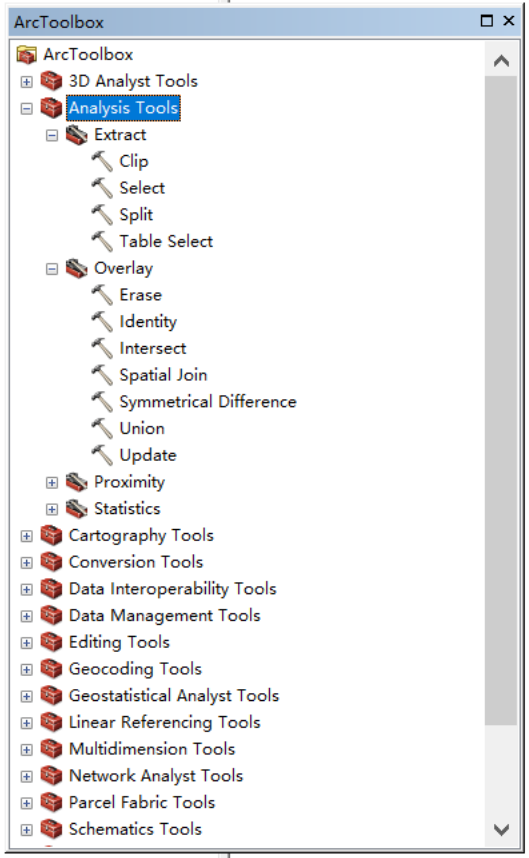
8.1 工具查找

桌面ArcGIS包含800多种可在Python脚本中运行的**地理处理工具**。通过Python脚本来运行地理处理工具，可以处理复杂的工作和执行批处理任务。应用Python脚本可以方便地调用地理处理工具。每种地理处理工具都有它唯一的特征，其执行结果会根据输入参数类型的不同而有所不同，当然，前提是输入的参数能够使工具成功运行。

8.1

Python

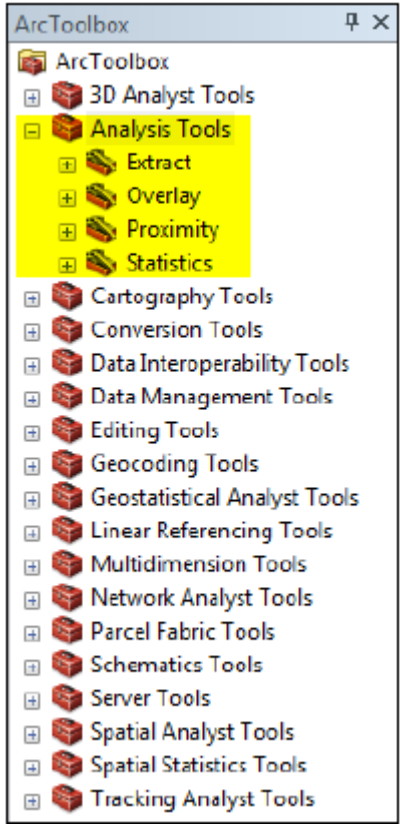
```
>>> import arcpy
>>> tools = arcpy.ListTools('*_analysis')
>>> for tool in tools:
...     print(tool)
...
Buffer_analysis
Clip_analysis
Erase_analysis
Identity_analysis
Intersect_analysis
SymDiff_analysis
Update_analysis
Split_analysis
Near_analysis
PointDistance_analysis
Select_analysis
TableSelect_analysis
Frequency_analysis
Statistics_analysis
CreateThiessenPolygons_analysis
SpatialJoin_analysis
MultipleRingBuffer_analysis
GenerateNearTable_analysis
Union_analysis
TabulateIntersection_analysis
PolygonNeighbors_analysis
>>>
```

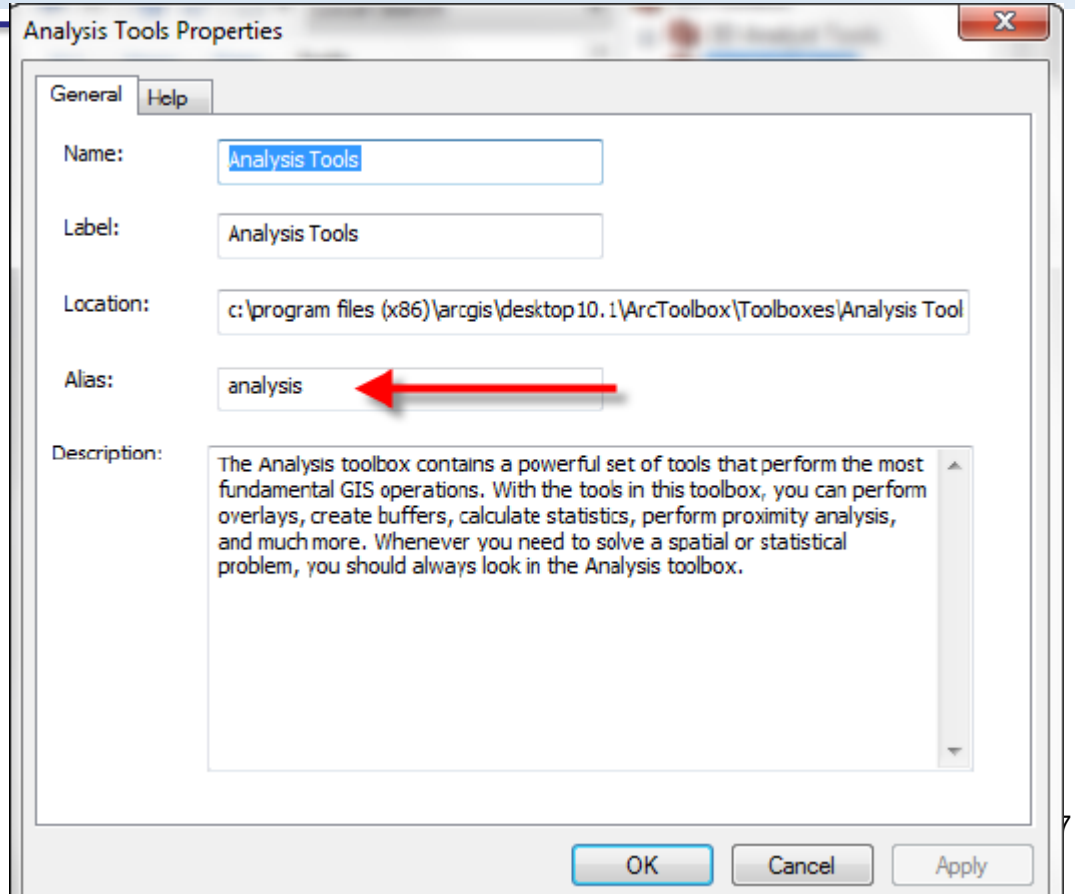


8.2 工具箱别名查看

ArcGIS中所有的工具箱都有一个别名，将工具箱别名与工具名称组合，就可以唯一地确定桌面ArcGIS引用的工具。因为存在不同的工具具有相同名称的情况，所以别名的使用就显得非常必要。当在Python脚本中引用工具时，需要同时引用工具名称和工具箱别名，以唯一地确定所引用的工具。

8.2 工具箱别名查看

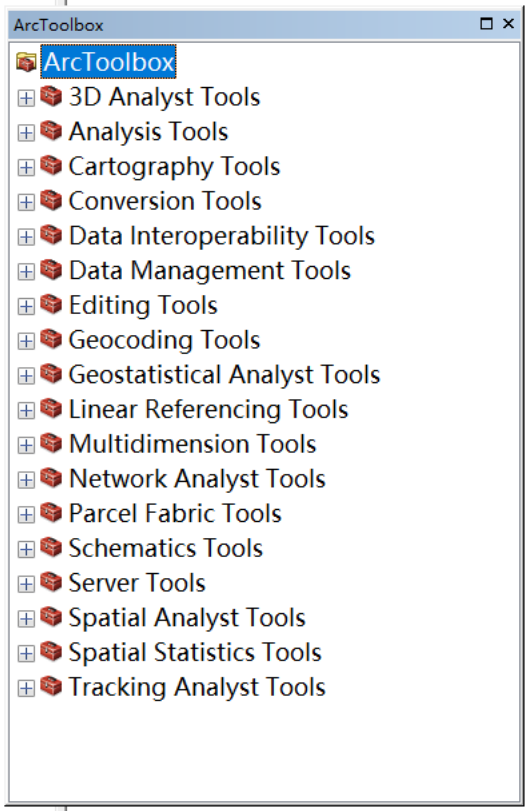

ArcToolbox
ArcToolbox
3D Analyst Tools
Analysis Tools
Extract
Overlay
Proximity
Statistics
Cartography Tools
Conversion Tools
Data Interoperability Tools
Data Management Tools
Editing Tools
Geocoding Tools
Geostatistical Analyst Tools
Linear Referencing Tools
Multidimension Tools
Network Analyst Tools
Parcel Fabric Tools
Schematics Tools
Server Tools
Spatial Analyst Tools
Spatial Statistics Tools
Tracking Analyst Tools


Analysis Tools Properties
General
Help
Name:
Analysis Tools
Label:
Analysis Tools
Location:
c:\program files (x86)\arcgis\desktop10.1\ArcToolbox\Toolboxes\Analysis Tool
Alias:
analysis
Description:
The Analysis toolbox contains a powerful set of tools that perform the most fundamental GIS operations. With the tools in this toolbox, you can perform overlays, create buffers, calculate statistics, perform proximity analysis, and much more. Whenever you need to solve a spatial or statistical problem, you should always look in the Analysis toolbox.
OK
Cancel
Apply

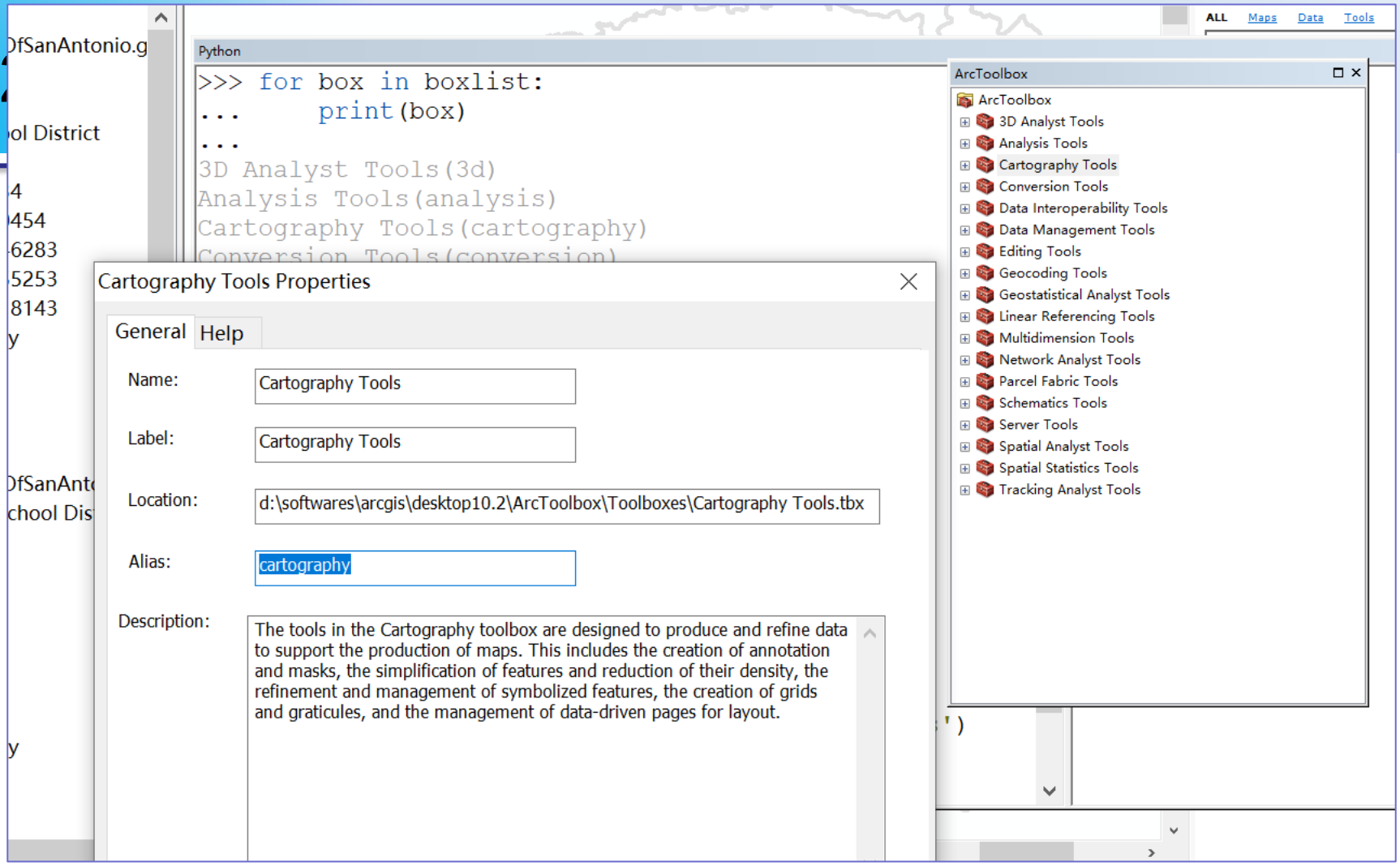
8.2

Python

```
>>> import arcpy
>>> boxlist = arcpy.ListToolboxes()
>>> for box in boxlist:
...     print(box)
...
3D Analyst Tools(3d)
Analysis Tools(analysis)
Cartography Tools(cartography)
Conversion Tools(conversion)
Data Interoperability Tools(interop)
Data Management Tools(management)
Editing Tools(edit)
Geocoding Tools(geocoding)
Geostatistical Analyst Tools(ga)
Linear Referencing Tools(lr)
Multidimension Tools(md)
Network Analyst Tools(na)
Parcel Fabric Tools(fabric)
Samples(samples)
Schematics Tools(schematics)
Server Tools(server)
Spatial Analyst Tools(sa)
Spatial Statistics Tools(stats)
Tracking Analyst Tools(ta)
>>>
```



8.


Python
>>> for box in boxlist:
...   print(box)
...
3D Analyst Tools(3d)
Analysis Tools(analysis)
Cartography Tools(cartography)
ALL
Maps
Data
Tools
ArcToolbox
ArcToolbox
3D Analyst Tools
Analysis Tools
Cartography Tools
Conversion Tools
Data Interoperability Tools
Data Management Tools
Editing Tools
Geocoding Tools
Geostatistical Analyst Tools
Linear Referencing Tools
Multidimension Tools
Network Analyst Tools
Parcel Fabric Tools
Schematics Tools
Server Tools
Spatial Analyst Tools
Spatial Statistics Tools
Tracking Analyst Tools
Cartography Tools Properties
General
Help
Name:
Cartography Tools
Label:
Cartography Tools
Location:
d:\softwares\arcgis\desktop10.2\ArcToolbox\Toolboxes\Cartography Tools.tbx
Alias:
cartography
Description:
The tools in the Cartography toolbox are designed to produce and refine data to support the production of maps. This includes the creation of annotation and masks, the simplification of features and reduction of their density, the refinement and management of symbolized features, the creation of grids and graticules, and the management of data-driven pages for layout.

8.2 工具箱别名查看

```
>>> boxlist = arcpy.ListToolboxes('Analysis Tools')
>>> for box in boxlist:
...     print(box)
...
Analysis Tools(analysis)
>>> boxlist = arcpy.ListToolboxes('analysis')
>>> for box in boxlist:
...     print(box)
...
Analysis Tools(analysis)
>>>
```

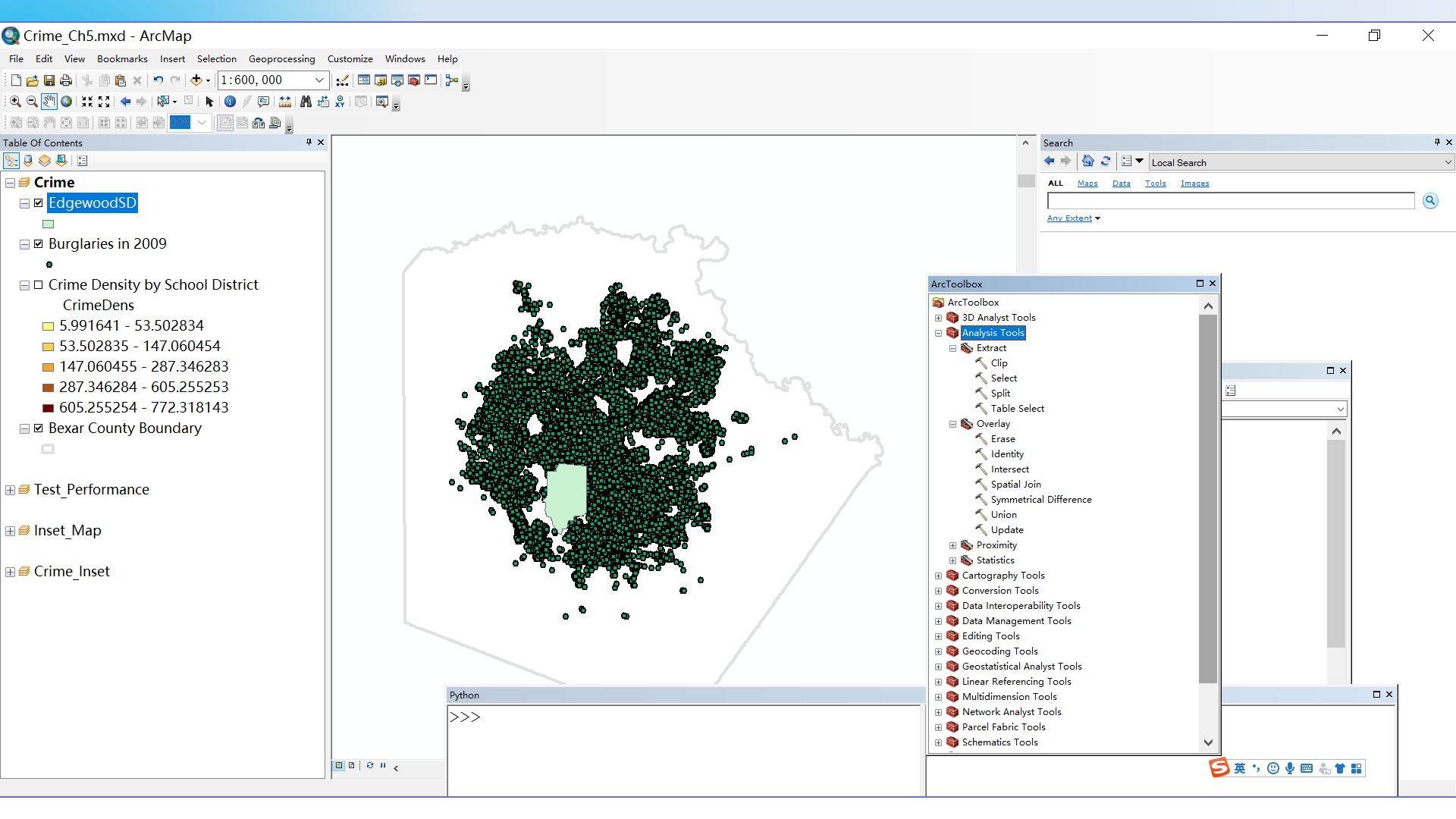
8.2 工具箱别名查看

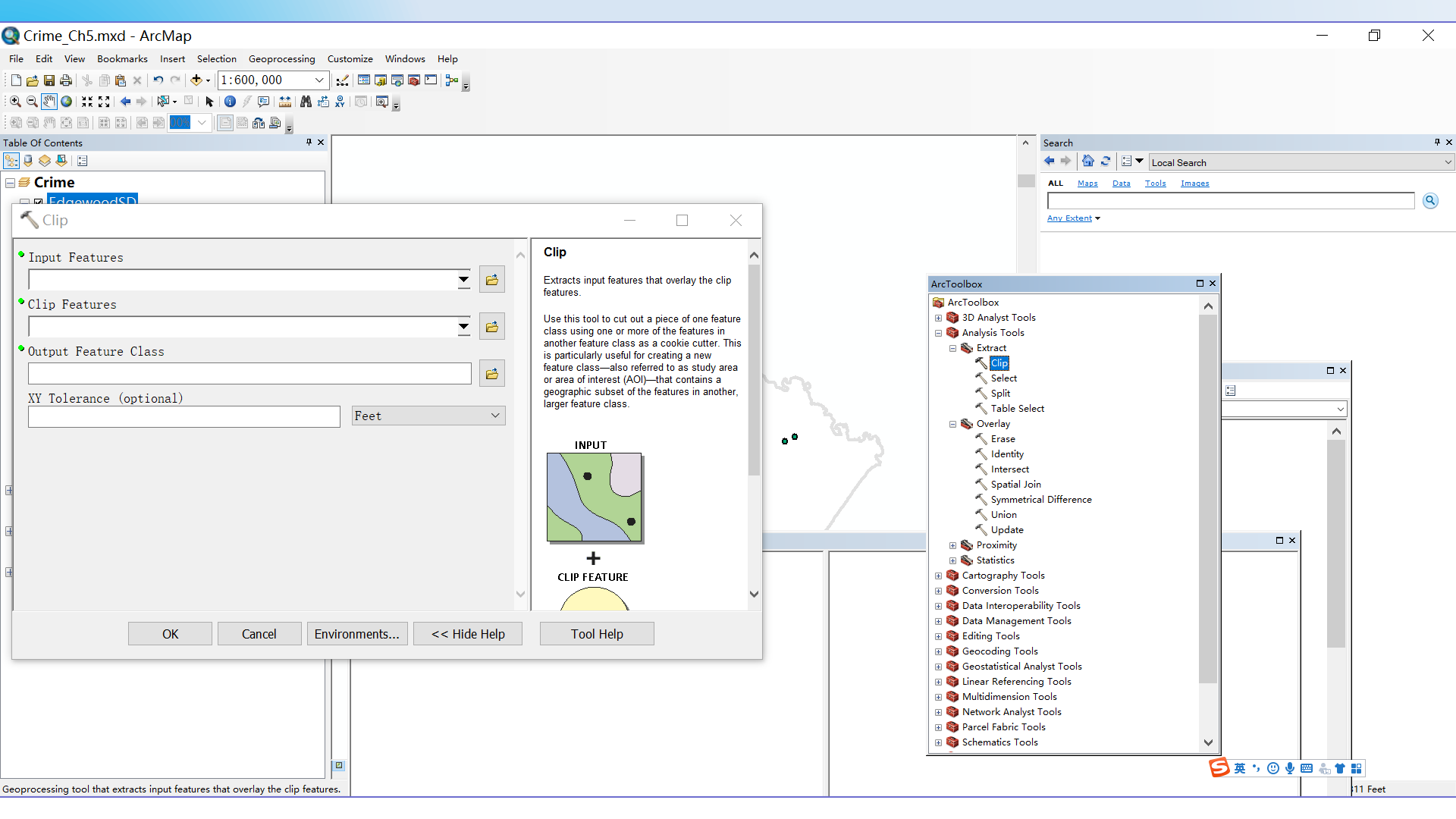
工具箱的别名都很简单，通常只是一个单词，并且不包括破折号或特殊字符。

在Python脚本中，可以参照<toolname>_<toolboxalias>语法来调用工具。

8.3 工具使用

确定工具箱的别名，查看当前使用的桌面ArcGIS的许可级别，确保工具的可访问性之后，即可将该工具添加到脚本中执行地理处理任务。


Crime_Ch5.mxd - ArcMap
File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
1:600, 000
Table Of Contents
Crime
EdgewoodSD
Burglaries in 2009
Crime Density by School District
CrimeDens
5.991641 - 53.502834
53.502835 - 147.060454
147.060455 - 287.346283
287.346284 - 605.255253
605.255254 - 772.318143
Bexar County Boundary
Test_Performance
Inset_Map
Crime_Inset
Search
Local Search
ALL Maps Data Tools Images
Any Extent
ArcToolbox
ArcToolbox
3D Analyst Tools
Analysis Tools
Extract
Clip
Select
Split
Table Select
Overlay
Erase
Identity
Intersect
Spatial Join
Symmetrical Difference
Union
Update
Proximity
Statistics
Cartography Tools
Conversion Tools
Data Interoperability Tools
Data Management Tools
Editing Tools
Geocoding Tools
Geostatistical Analyst Tools
Linear Referencing Tools
Multidimension Tools
Network Analyst Tools
Parcel Fabric Tools
Schematics Tools
Python
>>>


Crime_Ch5.mxd - ArcMap
File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
1:600, 000
Table Of Contents
Crime
EdgewoodSD
Search
Local Search
ALL Maps Data Tools Images
Any Extent
Clip
Input Features
Clip Features
Output Feature Class
XY Tolerance (optional)
Feet
Clip
Extracts input features that overlay the clip features.
Use this tool to cut out a piece of one feature class using one or more of the features in another feature class as a cookie cutter. This is particularly useful for creating a new feature class—also referred to as study area or area of interest (AOI)—that contains a geographic subset of the features in another, larger feature class.
INPUT
CLIP FEATURE
OK
Cancel
Environments...
<< Hide Help
Tool Help
ArcToolbox
ArcToolbox
3D Analyst Tools
Analysis Tools
Extract
Clip
Select
Split
Table Select
Overlay
Erase
Identity
Intersect
Spatial Join
Symmetrical Difference
Union
Update
Proximity
Statistics
Cartography Tools
Conversion Tools
Data Interoperability Tools
Data Management Tools
Editing Tools
Geocoding Tools
Geostatistical Analyst Tools
Linear Referencing Tools
Multidimension Tools
Network Analyst Tools
Parcel Fabric Tools
Schematics Tools
Geoprocessing tool that extracts input features that overlay the clip features.
Feet

Crime_Ch5.mxd - ArcMap

File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help

1:600, 000

Table Of Contents

Crime

EdgewoodSD

Clip

Input Features

Clip Features

Output Feature Class

XY Tolerance (optional)

Feet

OK Cancel Environments... << Hide Help Tool Help

Clip

Extracts input fea
features.

Use this tool to c
class using one o
another feature cl
is particularly use
feature class—als
or area of interest
geographic subse
larger feature clas

INPUT

CLIP FEATUR

Geoprocessing tool that extracts input features that overlay the clip features.

ArcGIS 10.2 Help

隐藏 上一步 前进 主页 选项(O) Resource Center

目录(C) 收藏夹(I) Search

- Welcome to the ArcGIS Help Library
- What's new
- Desktop
- Geodata
- Services
- Extensions
- Guide Books
- Mobile
- Developing
- ArcGIS Tutorials
- Copyright information
- License agreement
- ArcGIS Acknowledgments

INPUT POINTS CLIP POINTS OUTPUT POINTS

- Attribute values from the input feature classes will be copied to the output fea
Ratio Policy is checked, then a ratio of the input attribute value is calculated fo
split, the attributes of the resulting features are a ratio of the attribute value o
example, If the input geometry was divided equally, each new feature's attribut
numeric field types.

Caution: Geoprocessing tools do not honor geodatabase feature class or ta

Syntax

Clip_analysis (in_features, clip_features, out_feature_class, {cluster_tolerance})

Parameter	Explanation
in_features	The features to be clipped.
clip_features	The features used to clip the input features.
out_feature_class	The feature class to be created.
cluster_tolerance (Optional)	The minimum distance separating all feature coo Y (or both). Set the value to be higher for data high accuracy.

Code Sample

Clip example (Python window)

The following Python window script demonstrates how to use the Clip function in imm

```
import arcpy
from arcpy import env

env.workspace = "C:/data"
arcpy.Clip_analysis("majorrds.shp", "study_quads.shp", "C:/output/stu
```

Clip example 2 (stand-alone Python script)

The following Python script demonstrates how to use the Clip function in a stand-alo

```
# Name: Clip_Example2.py
```

8.

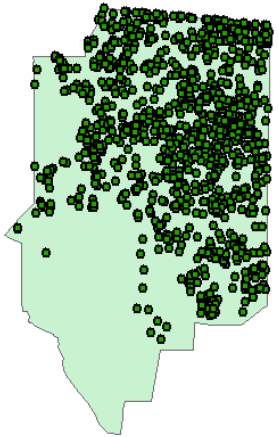
Crime_Ch5.mxd - ArcMap

File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help

1:150, 000

Table Of Contents

- Crime
  - ClpBurglary2
  - EdgewoodSD
  - Burglaries in 2009
  - Crime Density by School District
    - CrimeDens
    - 5.991641 - 53.502834
    - 53.502835 - 147.060454
    - 147.060455 - 287.346283
    - 287.346284 - 605.255253
    - 605.255254 - 772.318143
  - Bexar County Boundary
- Test_Performance
- Inset_Map
- Crime_Inset



Python

```
>>> import arcpy
>>> in_features = r'C:\ArcpyBook\data
 \CityOfSanAntonio.gdb\Burglary'
>>> clip_features = r'C:\ArcpyBook\Ch5
 \EdgewoodSD.shp'
>>> out_feature_class = r'C:\ArcpyBook\Ch5
 \ClpBurglary2.shp'
>>> arcpy.Clip_analysis
 (in_features,clip_features,out_feature_cl
 ass)
<Result 'C:\\ArcpyBook\\Ch5
 \\ClpBurglary2.shp'>
>>>
>>>
>>>
>>>
>>>
>>>
>>>
>>>
>>>
>>>
>>>
>>>
>>>
>>>
>>>
```

Linear Referenc
Multidimension
Network Analys
Parcel Fabric Tc

8.3 工具使用

◆调用地理处理工具的两种方法：

- 以arcpy函数的形式访问工具：
  - ✓ arcpy.Clip_analysis (in_features, clip_features, out_feature_class)
- 以模块的函数访问工具：
  - ✓ arcpy.analysis.Clip(in_features, clip_features, out_feature_class)

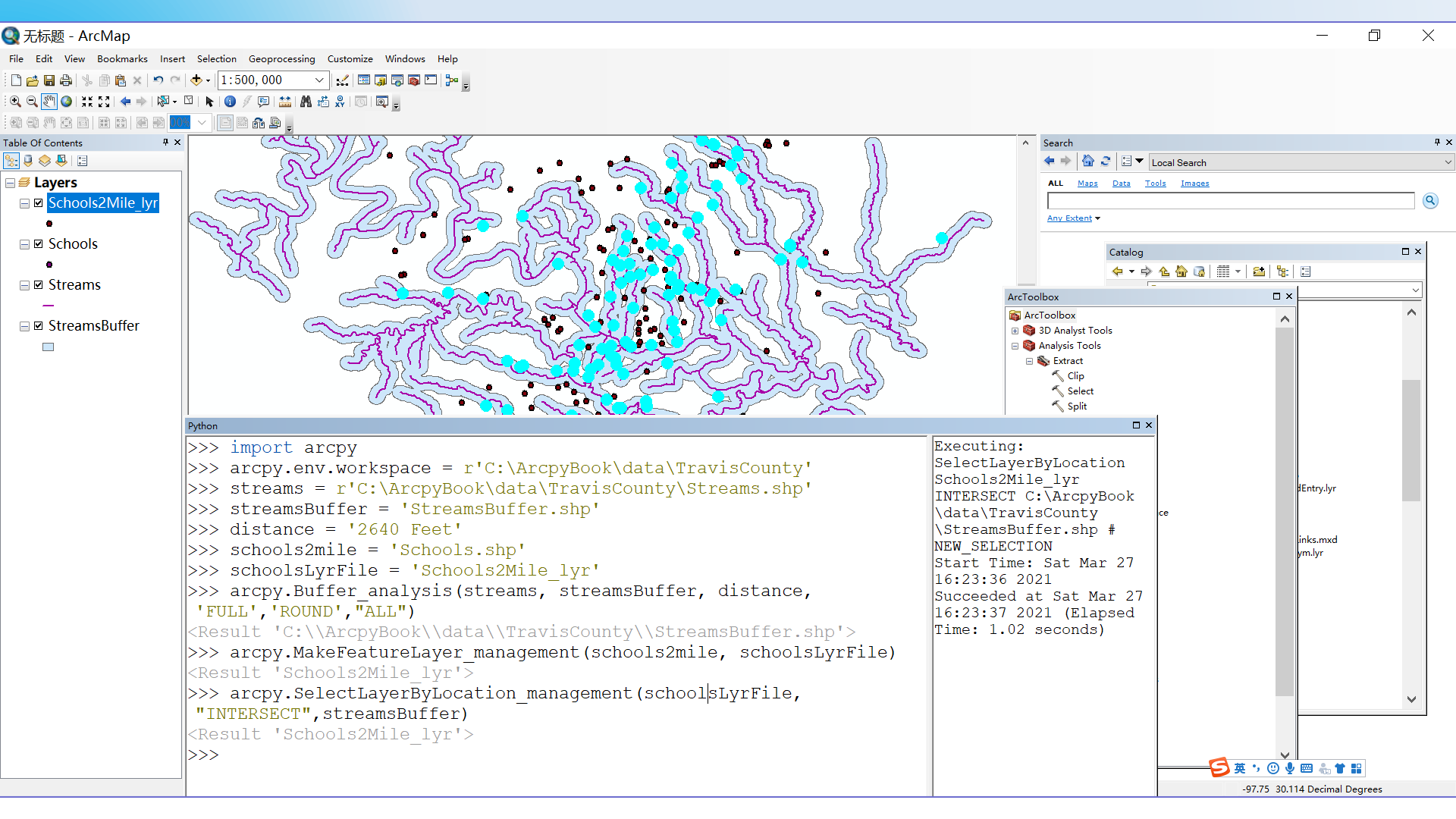
8.3 工具使用

arcpy.<工具名称>_<工具箱别名>

- 分析工具箱 -->arcpy.<toolname>_analysis
- 制图工具箱 -->arcpy.<toolname>_cartography
- 转换工具箱 -->arcpy.<toolname>_conversion
- 数据管理工具箱 -->arcpy.<toolname>_management
- 编辑工具箱 -->arcpy.<toolname>_edit
- 地理编码工具箱 -->arcpy.<toolname>_geocoding
- 线性参考工具箱 -->arcpy.<toolname>_lr
- 多维工具箱 -->arcpy.<toolname>_md
- 空间统计工具箱 -->arcpy.<toolname>_stats

8.4 一个工具的输出作为另一个工具的输入

在很多情况下都需要将一个工具的输出结果作为另一个工具的输入数据，称之为工具链。例如，对一个名为stream的图层进行缓冲区分析，然后分析落入缓冲区内的住房情况。在这个例子中，使用“Buffer”工具输出一个新图层，这个新图层将作为“Select Layer by Location”工具或其他叠加分析工具的输入图层。


无标题 - ArcMap
File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
1:500, 000
Table Of Contents
Layers
Schools2Mile_lyr
Schools
Streams
StreamsBuffer
Search
Local Search
ALL Maps Data Tools Images
Any Extent
Catalog
ArcToolbox
ArcToolbox
3D Analyst Tools
Analysis Tools
Extract
Clip
Select
Split
Python
>>> import arcpy
>>> arcpy.env.workspace = r'C:\ArcpyBook\data\TravisCounty'
>>> streams = r'C:\ArcpyBook\data\TravisCounty\Streams.shp'
>>> streamsBuffer = 'StreamsBuffer.shp'
>>> distance = '2640 Feet'
>>> schools2mile = 'Schools.shp'
>>> schoolsLyrFile = 'Schools2Mile_lyr'
>>> arcpy.Buffer_analysis(streams, streamsBuffer, distance,
'FULL','ROUND',"ALL")
<Result 'C:\\ArcpyBook\\data\\TravisCounty\\StreamsBuffer.shp'>
>>> arcpy.MakeFeatureLayer_management(schools2mile, schoolsLyrFile)
<Result 'Schools2Mile_lyr'>
>>> arcpy.SelectLayerByLocation_management(schoolsLyrFile,
"INTERSECT",streamsBuffer)
<Result 'Schools2Mile_lyr'>
>>>
Executing:
SelectLayerByLocation
Schools2Mile_lyr
INTERSECT C:\ArcpyBook
\data\TravisCounty
\StreamsBuffer.shp #
NEW_SELECTION
Start Time: Sat Mar 27
16:23:36 2021
Succeeded at Sat Mar 27
16:23:37 2021 (Elapsed
Time: 1.02 seconds)
-97.75 30.114 Decimal Degrees

The End