

Python and GIS Improving Your Workflow

DVRPC - IREG

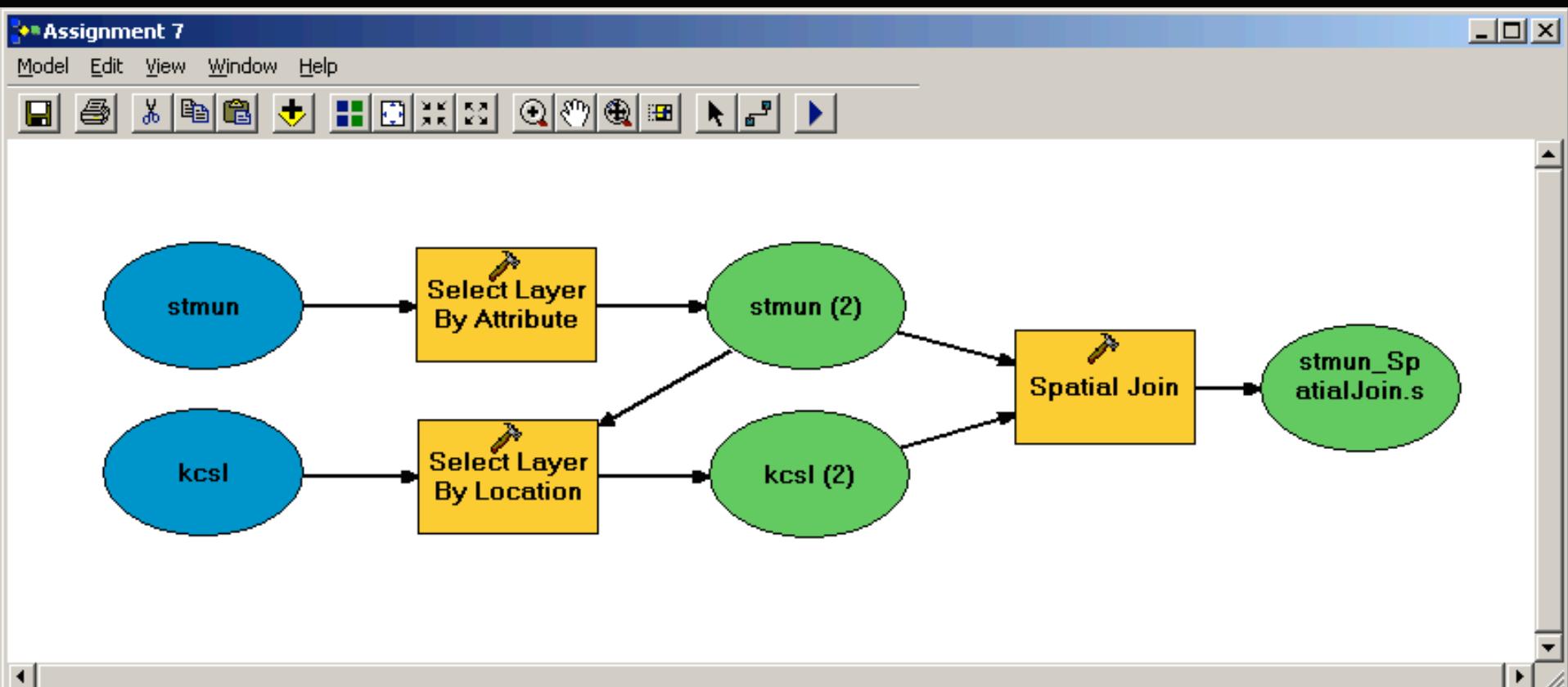
9 December 2015

Why Python?

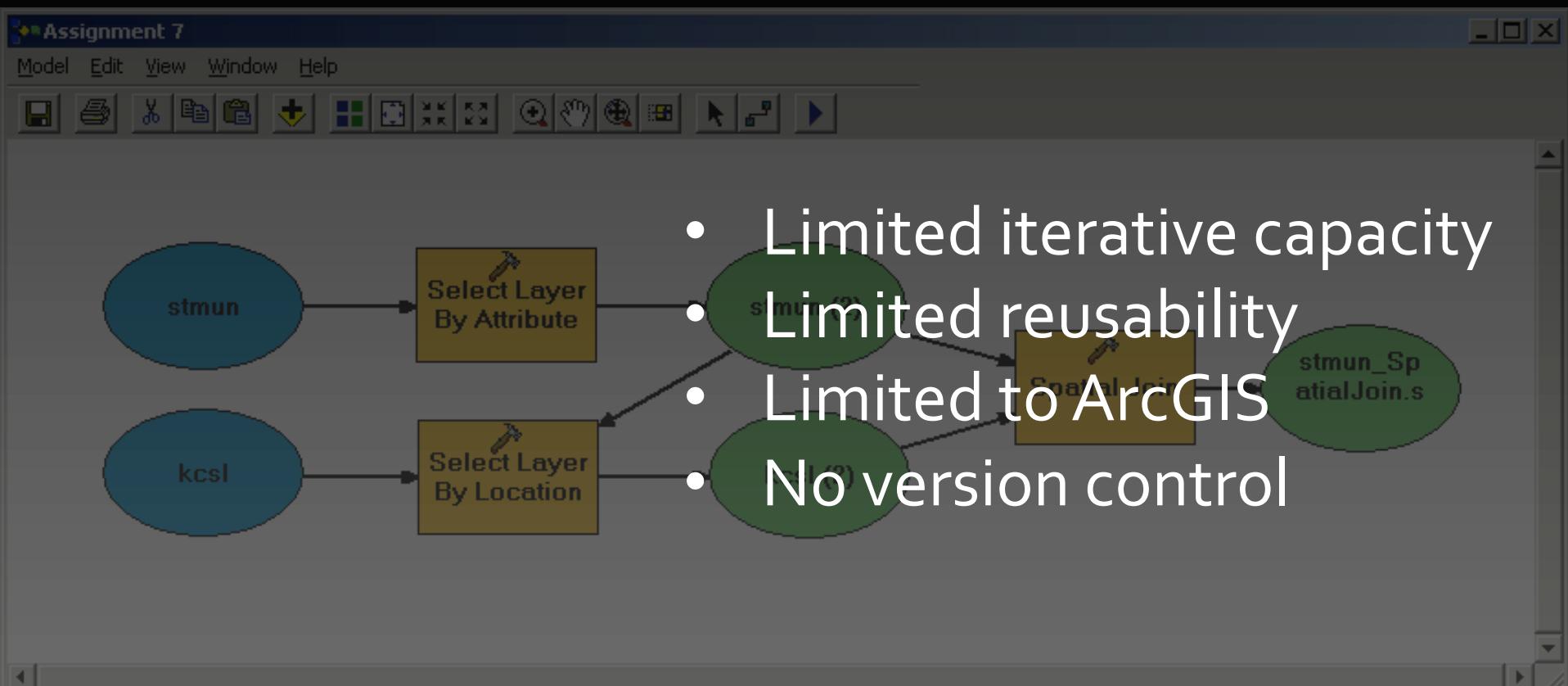


"HollerithMachine.CHM" by Adam Schuster - Flickr: Proto IBM. CC BY

Automation



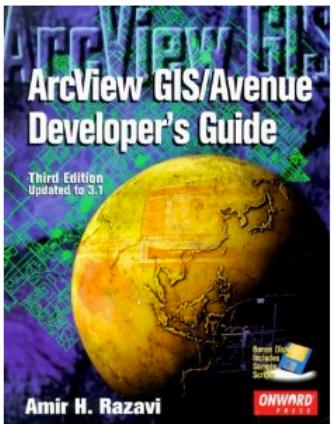
ArcGIS & ModelBuilder



ArcGIS & ModelBuilder


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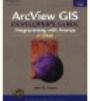
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TIOBE Index for December 2015

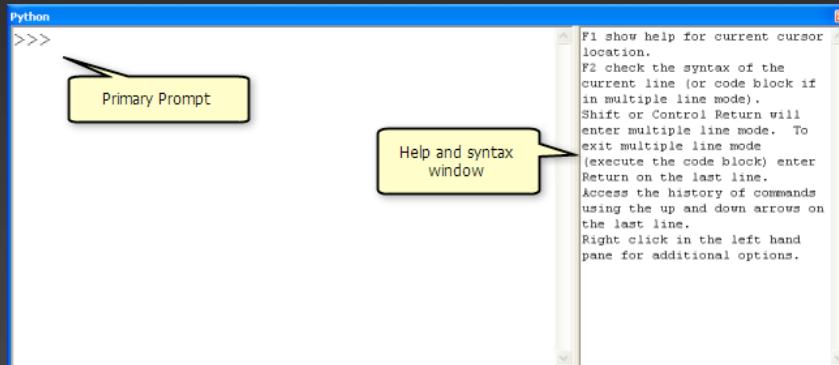
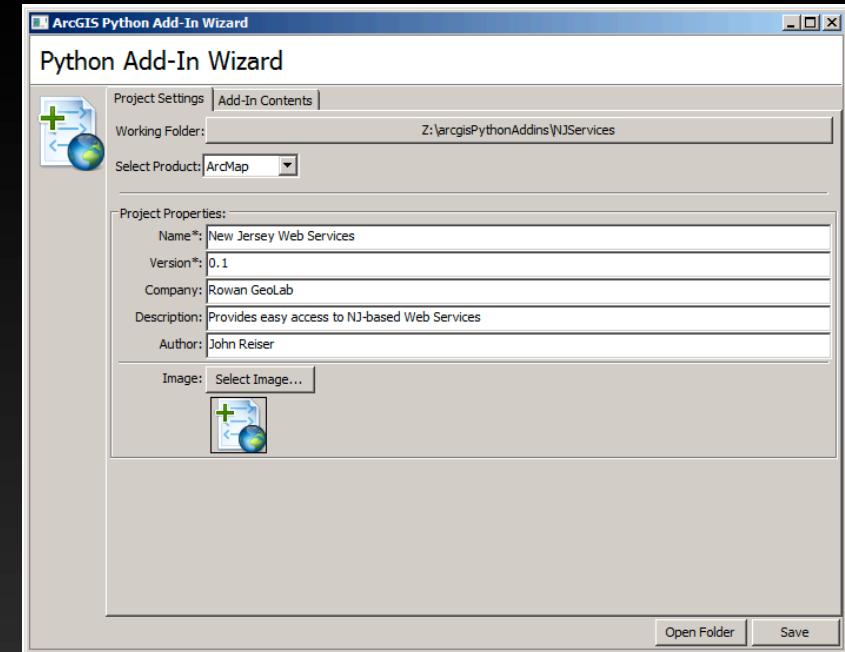
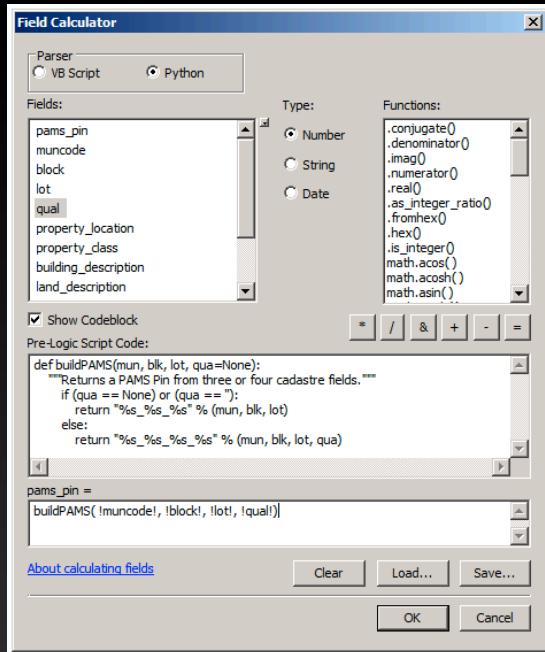
December Headline: Java's popularity is going through the roof

There is hardly any doubt about it, Java will become TIOBE's programming language of the year 2015. The steep fall of Objective-C of almost 8% this year seems to be completely absorbed by the most popular language at the moment. More about Java next month. Another interesting move concerns the rise of Python. It is currently at its all time high position. It is easy to learn, available everywhere and embraced by industry. Python is the current standard in scripting.

The TIOBE Programming Community index is an indicator of the popularity of programming languages. The index is updated once a month. The ratings are based on the number of skilled engineers world-wide, courses and third party vendors. Popular search engines such as Google, Bing, Yahoo!, Wikipedia, Amazon, YouTube and Baidu are used to calculate the ratings. It is important to note that the TIOBE index is not about the *best* programming language or the language in which *most lines of code* have been written.

The index can be used to check whether your programming skills are still up to date or to make a strategic decision about what programming language should be adopted when starting to build a new software system. The definition of the TIOBE index can be found [here](#).

Dec 2015	Dec 2014	Change	Programming Language	Ratings	Change
1	2	▲	Java	20.973%	+6.01%
2	1	▼	C	16.460%	-1.13%
3	4	▲	C++	5.943%	-0.16%
4	8	▲	Python	4.429%	+2.14%
5	5		C#	4.114%	-0.21%
6	6		PHP	2.792%	+0.05%
7	9	▲	Visual Basic .NET	2.390%	+0.16%
8	7	▼	JavaScript	2.363%	-0.07%
9	10	▲	Perl	2.209%	+0.38%
10	18	▲	Ruby	2.061%	+1.08%



```
*basic_arcpy_clip.py - C:\temp\basic_arcpy_clip.py*
File Edit Format Run Options Windows Help
# -*- coding: utf-8 -*-
#
# basic_arcpy_clip.py
# Created on: 2014-06-10 09:24:48.00000
#   (generated by ArcGIS/ModelBuilder)
# Usage: basic_arcpy_clip <Input_Features> <Clip_Features> <Output_Feature_Class>
# Description:
#
# -----
#
# Import arcpy module
import arcpy

# Script arguments
Input_Features = arcpy.GetParameterAsText(0)

Clip_Features = arcpy.GetParameterAsText(1)

Output_Feature_Class = arcpy.GetParameterAsText(2)

# Local variables:

# Process: Clip
arcpy.Clip_analysis(Input_Features, Clip_Features, Output_Feature_Class, "")

Ln: 25 Col: 0
```

Why program in Python?

- Extensible nature of the language gives you the flexibility to change it as you see fit.
- Conversely, others may have already worked on a similar problem and released their solutions on the web for you to incorporate.
- Support for various OSs and GISs means that your tools can be easily migrated to other platforms and maintained as GIS evolves.
- A strong community supports the software and its continued development.

From the ArcGIS perspective

- You might have already used Python within ArcGIS.
- Python can work within ArcGIS –
 - Custom field calculator functions
 - Scripts within ArcToolbox and Python Toolboxes
 - Interactively through the Python prompt
- Python can extend ArcGIS functionality –
 - Enable scheduled tasks
 - Improve upon ETL tasks
 - Talk to other software or components

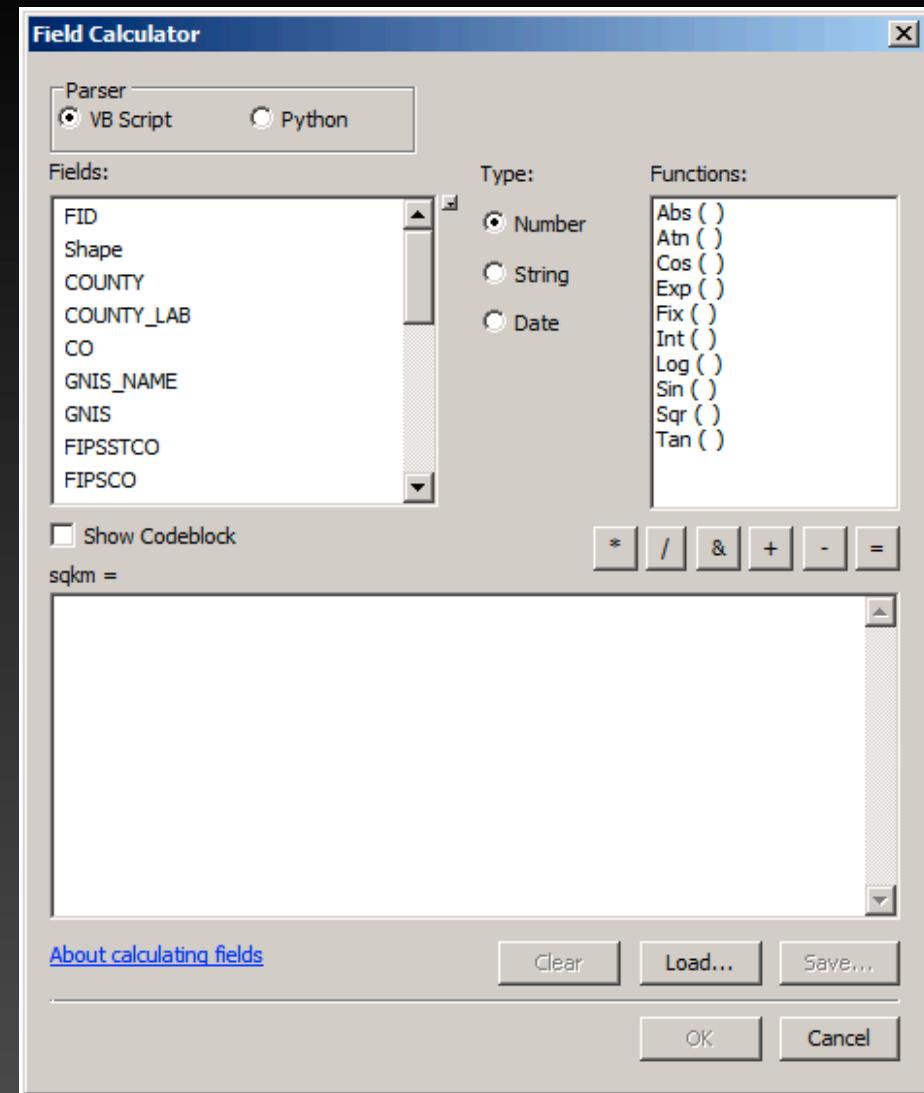
Incorporating Python into ArcGIS

Python within ArcGIS

- Python is integrated with the ArcGIS Desktop software and can be accessed in several ways:
 - Field calculator
 - ArcGIS Toolbox scripts & Python Toolboxes
 - Python Add-ins
 - Interactive Prompt
- Understanding Python can help with many operations.
- Your level of knowledge can vary; expanding your knowledge will only open up more opportunities.

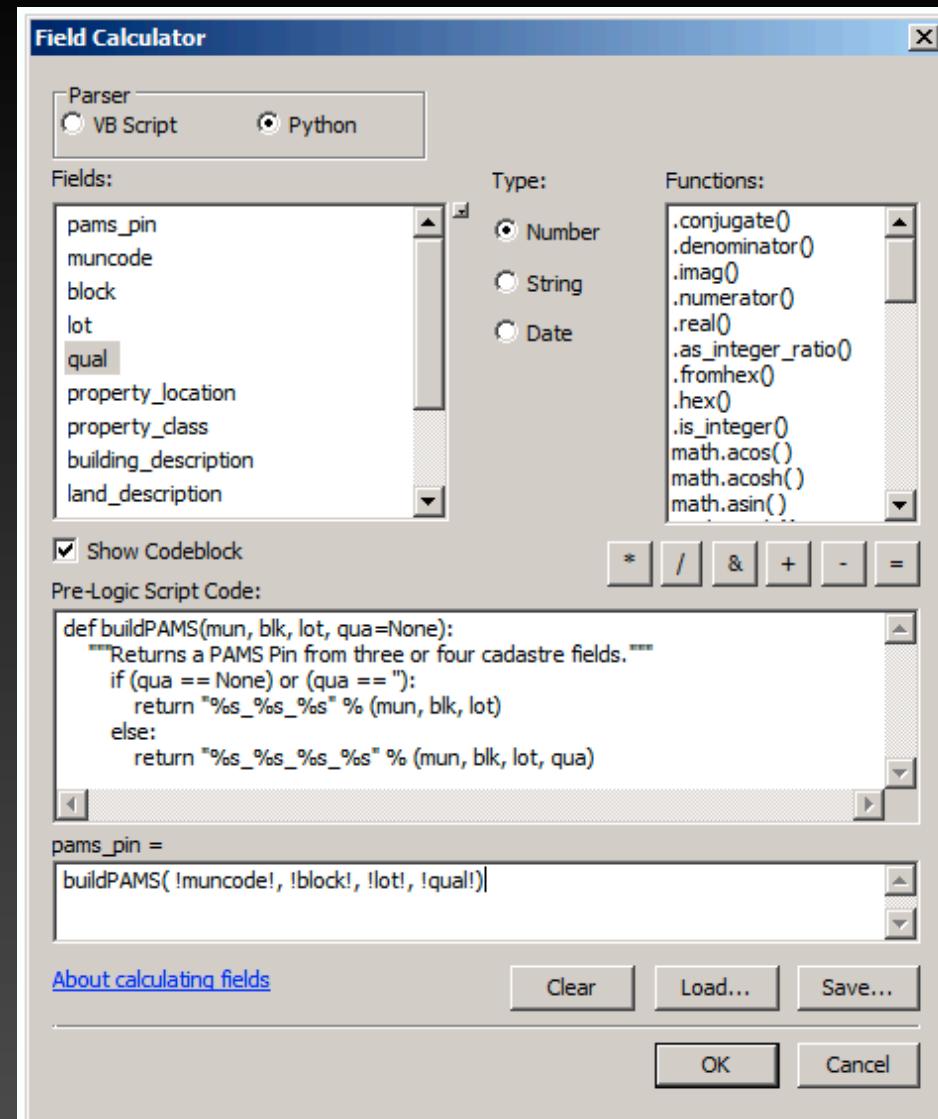
The Field Calculator

- The Field Calculator (and Calculate Field tool) allow you to programmatically change the values within a layer's or table's column.
- Python can be used to calculate new data from existing fields or other properties.



Referencing Other Fields

- Fields are delimited with exclamation marks in the Python code block.
- `!block!` refers to the Block column.
- A function can be defined to do additional processing, with fields passed as parameters.
- Creating a PAMS_PIN for NJ parcel data.





Show Codeblock

* / & + - =

Pre-Logic Script Code:

```
def buildPAMS(mun, blk, lot, qua=None):
    """Returns a PAMS Pin from three or four cadastre fields."""
    if (qua == None) or (qua == ""):
        return "%s_%s_%s" % (mun, blk, lot)
    else:
        return "%s_%s_%s_%s" % (mun, blk, lot, qua)
```



pams_pin =

```
buildPAMS( !muncode!, !block!, !lot!, !qual!)
```

Up/Down scroll bar buttons

[About calculating fields](#)

Clear

Load...

Save...

OK

Cancel

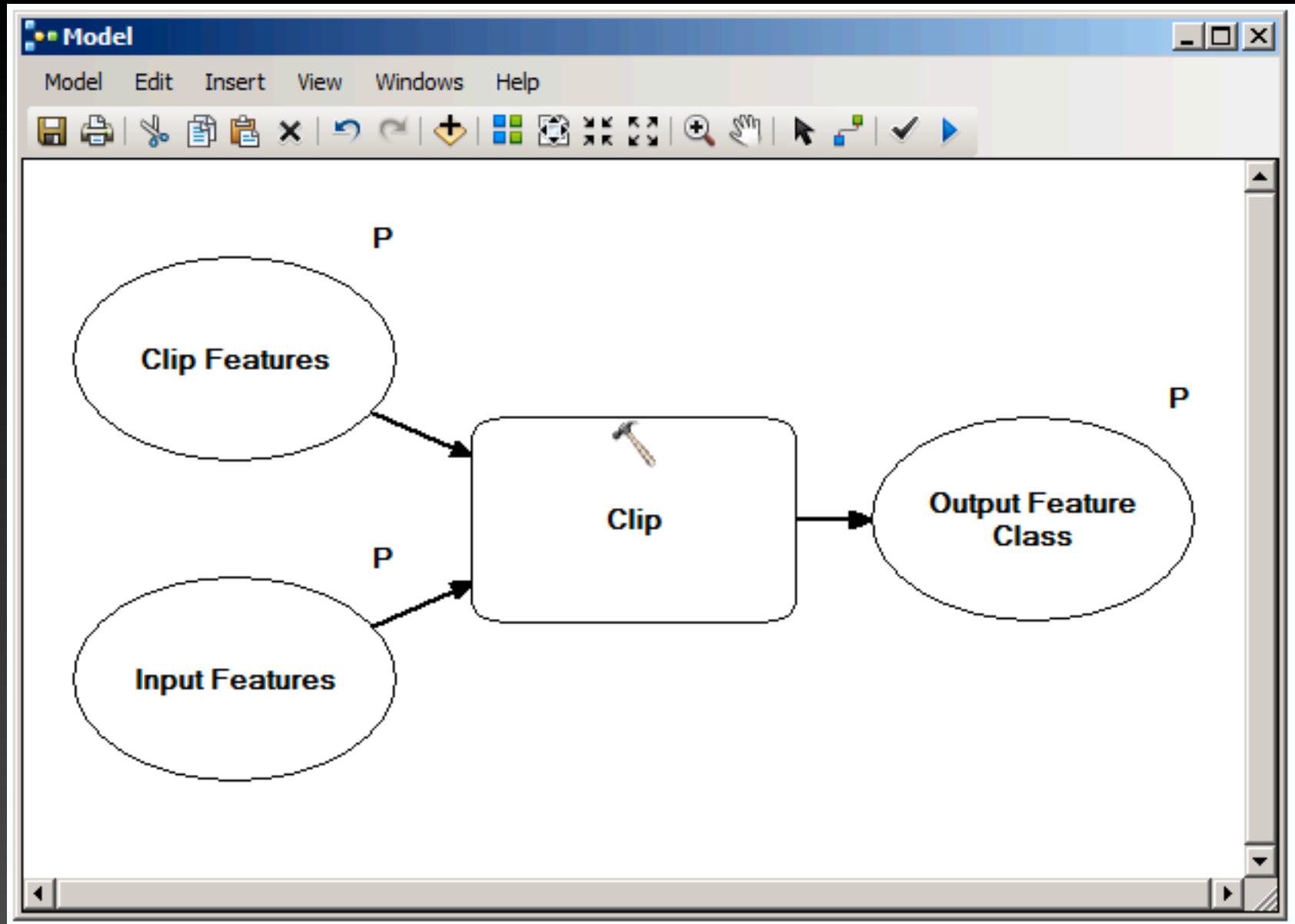
The SHAPE Field

- The SHAPE field has several methods that can be accessed within Field Calculator to retrieve attributes of the record's geometry.
- `!shape.area!`, `!shape.length!`
- Unit type is modifiable:
`!shape.area@SQUAREYARDS!`
- `!shape.partCount!`
- `!shape.pointCount!`

Moving from ModelBuilder to Python

Great Starting Point

- Exporting from ModelBuilder is a great starting point for many projects.
- Declare variables/layers/workspaces using ModelBuilder UI. Start to put the pieces together.
- Export an incomplete model to Python for final development.
- The shell will be there – it will produce a valid (though potentially nonfunctional) arcpy script.
- You can then complete and extend the functionality.



File Edit Format Run Options Windows Help

```
# -*- coding: utf-8 -*-
# -----
# basic_arcpy_clip.py
# Created on: 2014-06-10 09:24:48.00000
#   (generated by ArcGIS/ModelBuilder)
# Usage: basic_arcpy_clip <Input_Features> <Clip_Features> <Output_Feature_Class>
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# Local variables:

# Process: Clip
arcpy.Clip_analysis(Input_Features, Clip_Features, Output_Feature_Class, "")
```

Ln: 25 Col: 0

The arcpy Module

- Importing the arcpy module provides access to the ArcGIS Engine in Python.
- Functionality provided by arcpy includes the tools provided by ArcToolbox, as well as some specialized functionality such as cursors.
- Easy, pythonic way to work with ArcGIS.

```
import arcpy  
arcpy.AddField_management(  
    "c:/data/Portland.gdb/streets",  
    "LENGTH_MILES", "TEXT")  
  
arcpy.CalculateField_management(  
    "c:/data/Portland.gdb/streets",  
    "LENGTH_MILES", "!shape.length@miles!",  
    "PYTHON_9.3")
```

Standalone arcpy Scripts

- arcpy can be called from any Python program that is using the version of Python installed with ArcGIS.
- Commonly under Windows, the version installed with ArcGIS is the only Python installed.
- Python and arcpy provides access to geoprocessing functionality and tasks, with lower overhead.
- Programs using arcpy can be run without having any of the ArcGIS Desktop suite running.
- Great for scheduled or background tasks.

arcpy Cursors

- Cursors enable you to iterate through a series of rows, insert new rows, or update existing rows.
- Cursors empower you to perform analysis on the feature level, as opposed to the layer level.
- Features can be directly accessed, enabling greater functionality than possible through most tools.
- Features can also be modified individually.

Geotagged Photos

```
# argv[1]: input directory of geotagged photos
# argv[2]: output directory
# argv[3]: output feature class

if os.path.exists(sys.argv[1]):
    files = []
    for f in os.listdir(sys.argv[1]):
        if os.path.splitext(f)[1].lower() == ".jpg":
            fp = os.path.join(sys.argv[1], f)
            # nested functions to retrieve EXIF GPS data
            gpsinfo = process_gps(get_exif(fp))
            if not len(gpsinfo) == 0:
                gpsinfo["name"] = f
                gpsinfo["path"] = fp
                files.append(gpsinfo)

rows = arcpy.InsertCursor(os.path.join(sys.argv[2], sys.argv[3]))
for f in files:
    row = rows.NewRow()
    row.NAME = f["name"]
    row.PATH = f["path"]
    pnt = arcpy.CreateObject("Point")
    pnt.x = f["x"]
    pnt.y = f["y"]
    row.SetValue("shape", pnt)
    rows.InsertRow(row)
```

Feature Shifting

```
import arcpy

def shift_features(in_features, x_shift=None, y_shift=None):
    """
    Shifts features by an x and/or y value. The shift values are in
    the units of the in_features coordinate system.

    Parameters:
    in_features: string
        An existing feature class or feature layer. If using a
        feature layer with a selection, only the selected features
        will be modified.

    x_shift: float
        The distance the x coordinates will be shifted.

    y_shift: float
        The distance the y coordinates will be shifted.
    """

    with arcpy.da.UpdateCursor(in_features, ['SHAPE@XY']) as cursor:
        for row in cursor:
            cursor.updateRow([[row[0][0] + (x_shift or 0),
                               row[0][1] + (y_shift or 0)]])

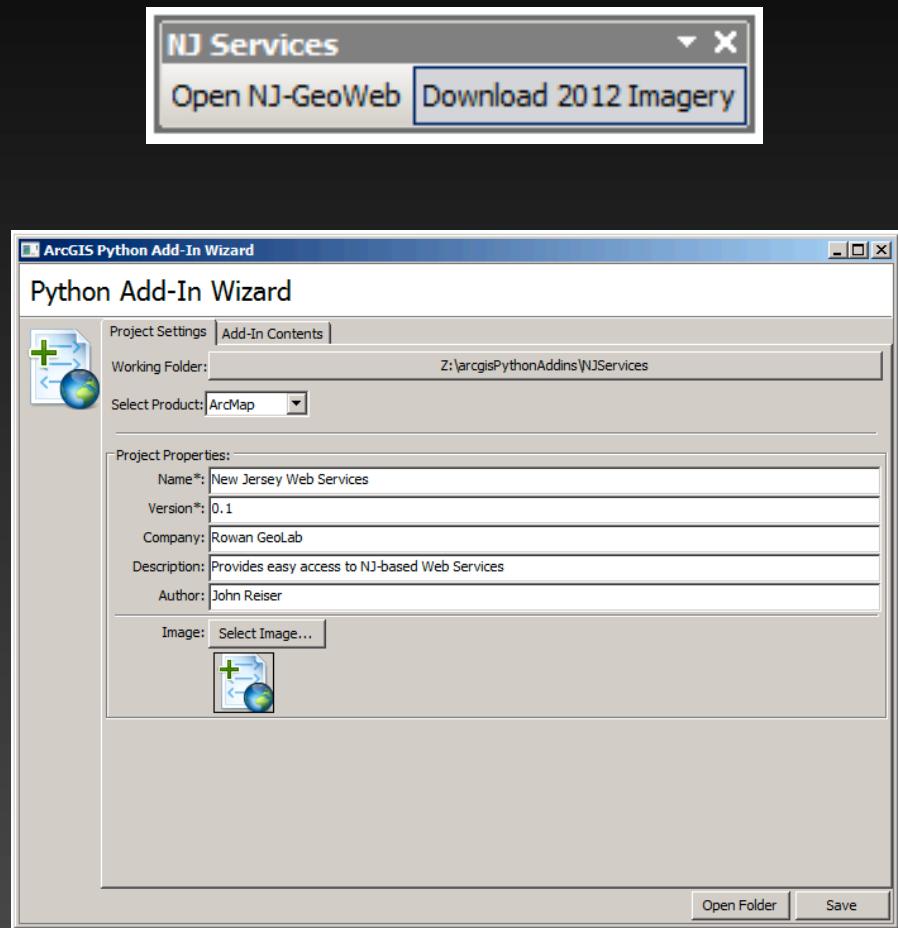
    return
```



Extending ArcGIS tools using Python

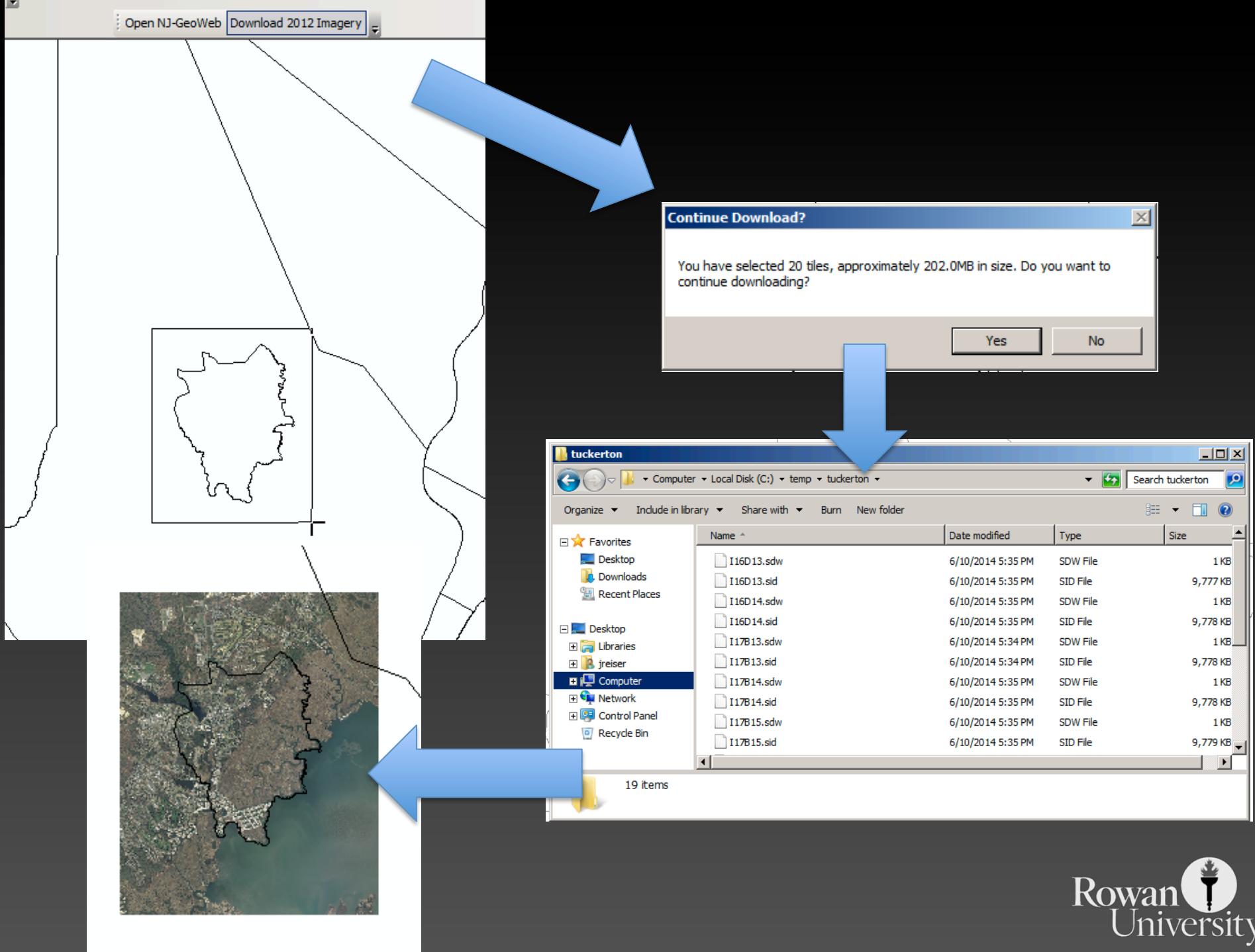
Python Add-Ins

- At 10.1, ESRI introduced Python Add-Ins.
- Replacing VBA as the method for creating UI tools.
- ESRI provides an Add-In Wizard to help create these tools.
- ESRI training: "Creating Desktop Add-ins Using Python"



Download Imagery

- NJ OIT-OGIS's WMS services are great, but what if you want the source tiles?
- Python Add-Ins allow you to pull the data down, extract it and load it into ArcGIS.
- Allows for interactive selection within a your map frame, with the data automatically added to the map once the download is complete.



branch: master ▾

arcgisPythonAddins / NJServices / +

History

fixed Census tool for symbology; fixed makeaddin.py ...

johnjreiser authored on Dec 4, 2013

latest commit 39ed448117

..

Install	fixed duplicate layer issue in the download imagery tool	6 months ago
README.md	add the NJServices toolbar & tools	6 months ago
config.xml	add the NJServices toolbar & tools	6 months ago
makeaddin.py	fixed Census tool for symbology; fixed makeaddin.py	6 months ago

[README.md](#)

NJ Services

Python-based Add-in for ArcGIS Desktop. Adds the following tools to your ArcMap environment:

- Open NJ-GeoWeb
- Download 2012 Imagery

You do not need to download any shapefiles or geodatabases for these tools to work. Using Python and available web services, all the necessary data will be pulled in dynamically.

Getting Census Data

RowanGeolab/ArcGISCensusDownload

GitHub, Inc. [US] https://github.com/RowanGeolab/ArcGISCensusDownload

GitHub This repository Search or type a command Explore Features Enterprise Blog Sign up Sign in

RowanGeolab / ArcGISCensusDownload ★ Star 2 Fork 0

Census download tools for ArcGIS

6 commits 1 branch 0 releases 1 contributor

branch: master + ArcGISCensusDownload / +

fixed screenshot

johnreiser authored on Apr 23 latest commit 8a105a336b

CensusDownload.pyt added a few more census tables to the script a month ago

LICENSE.txt added license and to-do list a month ago

README.md fixed screenshot a month ago

TODO.md added license and to-do list a month ago

arcgispythontoolbox.png updated readme with default tables and screenshot a month ago

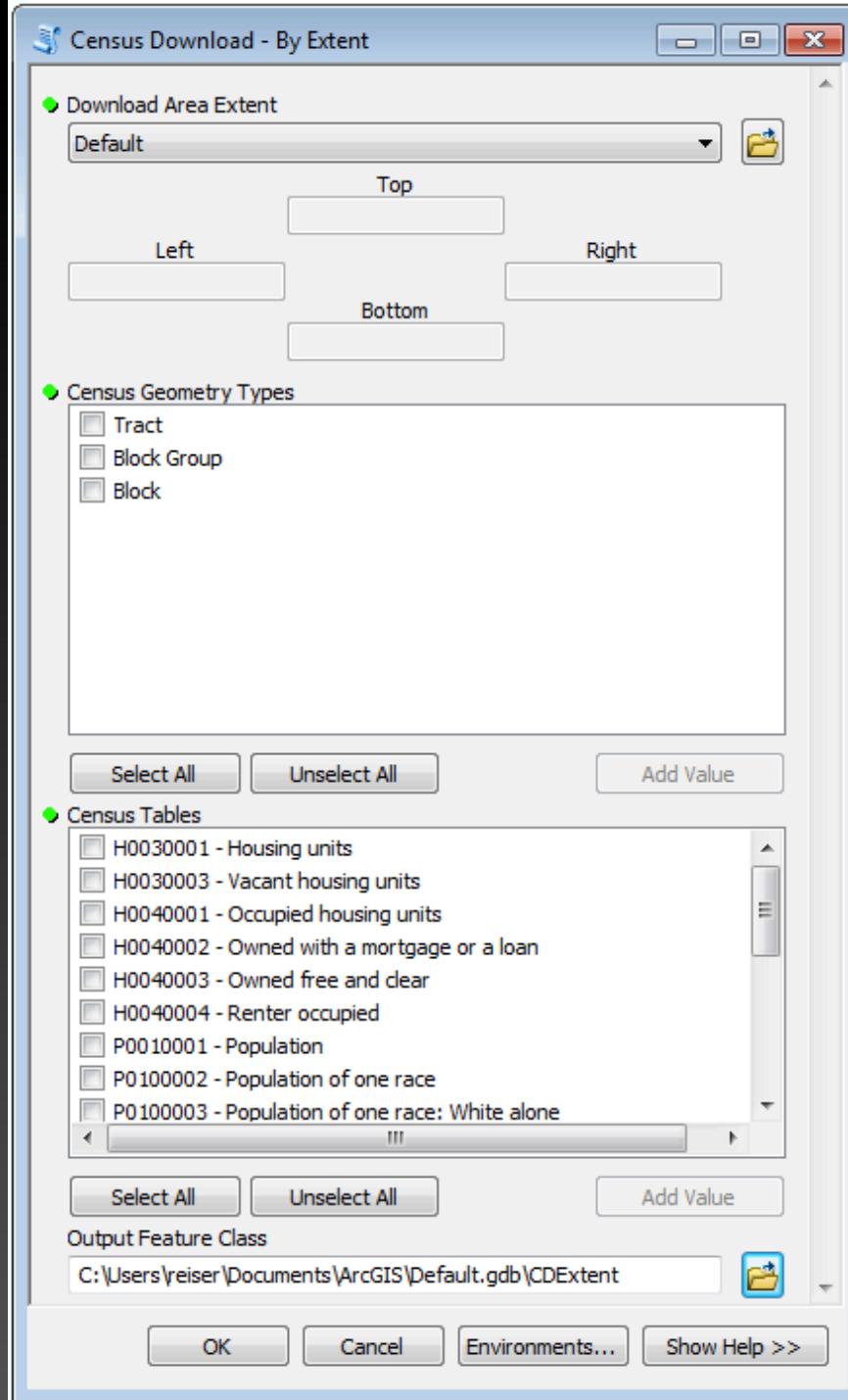
README.md

Census Download Toolbox for ArcGIS

A Python Toolbox for ArcGIS Desktop (specifically ArcMap) to make quick retrieval of Census information.

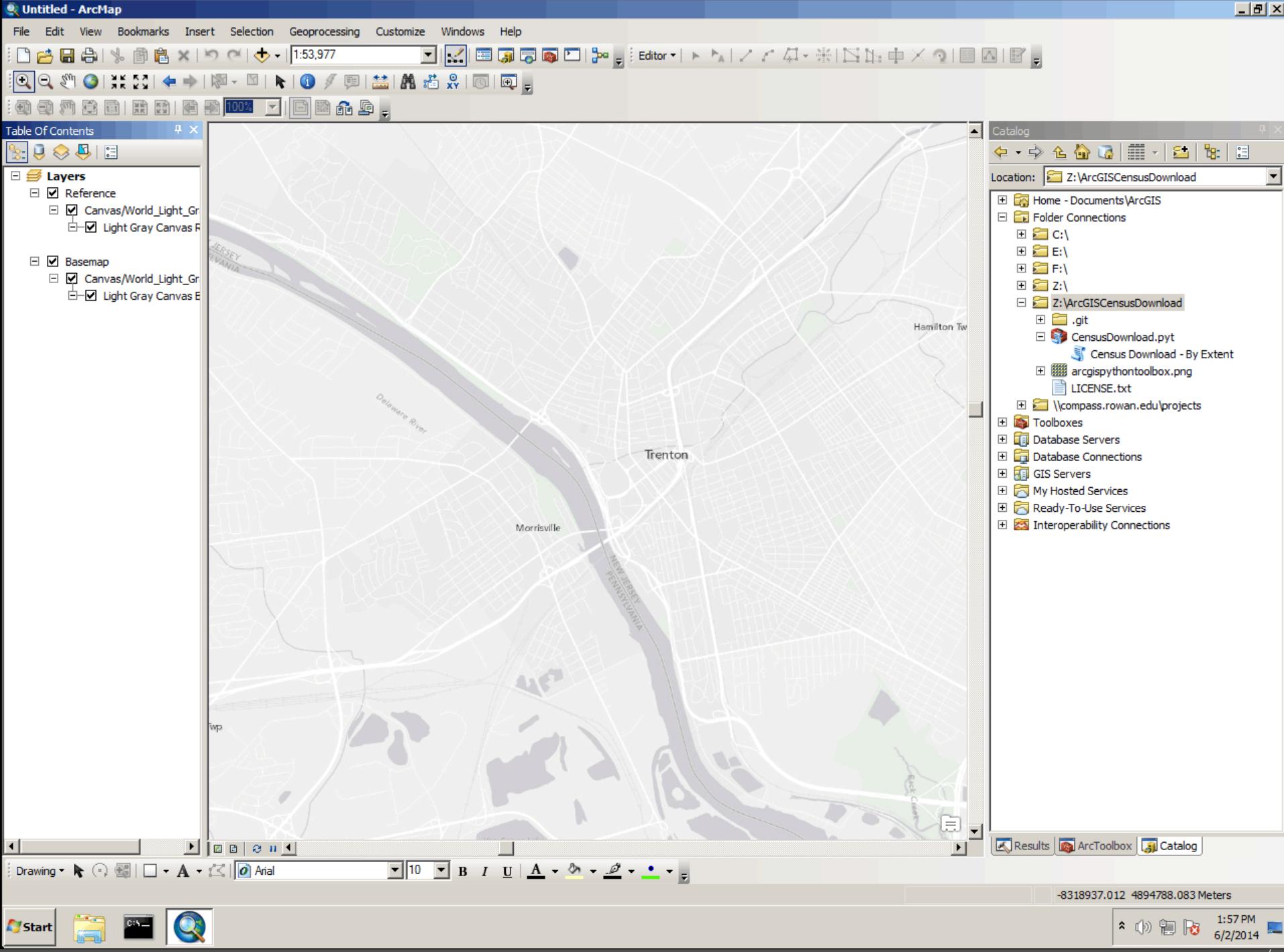
Census API Key

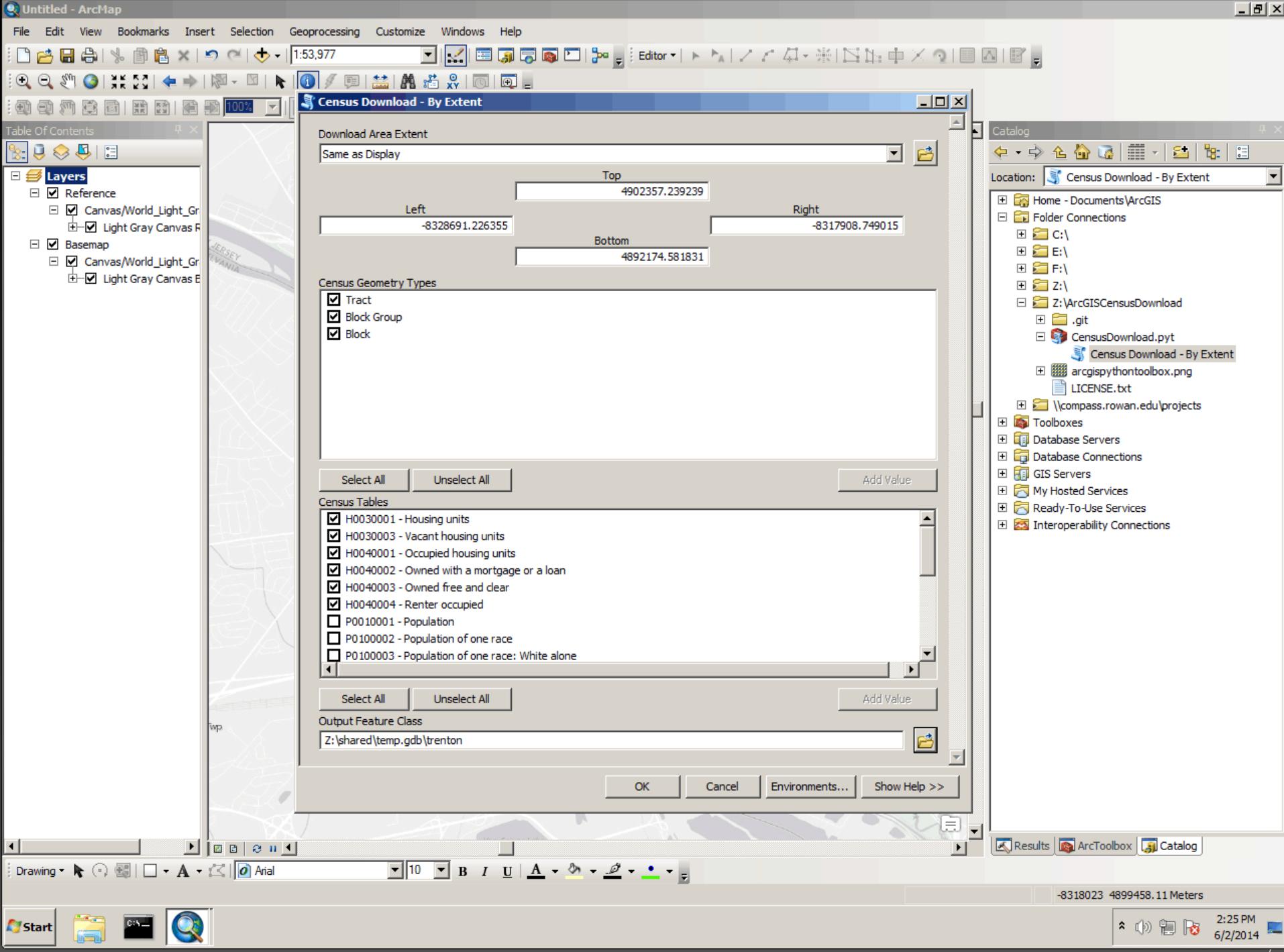
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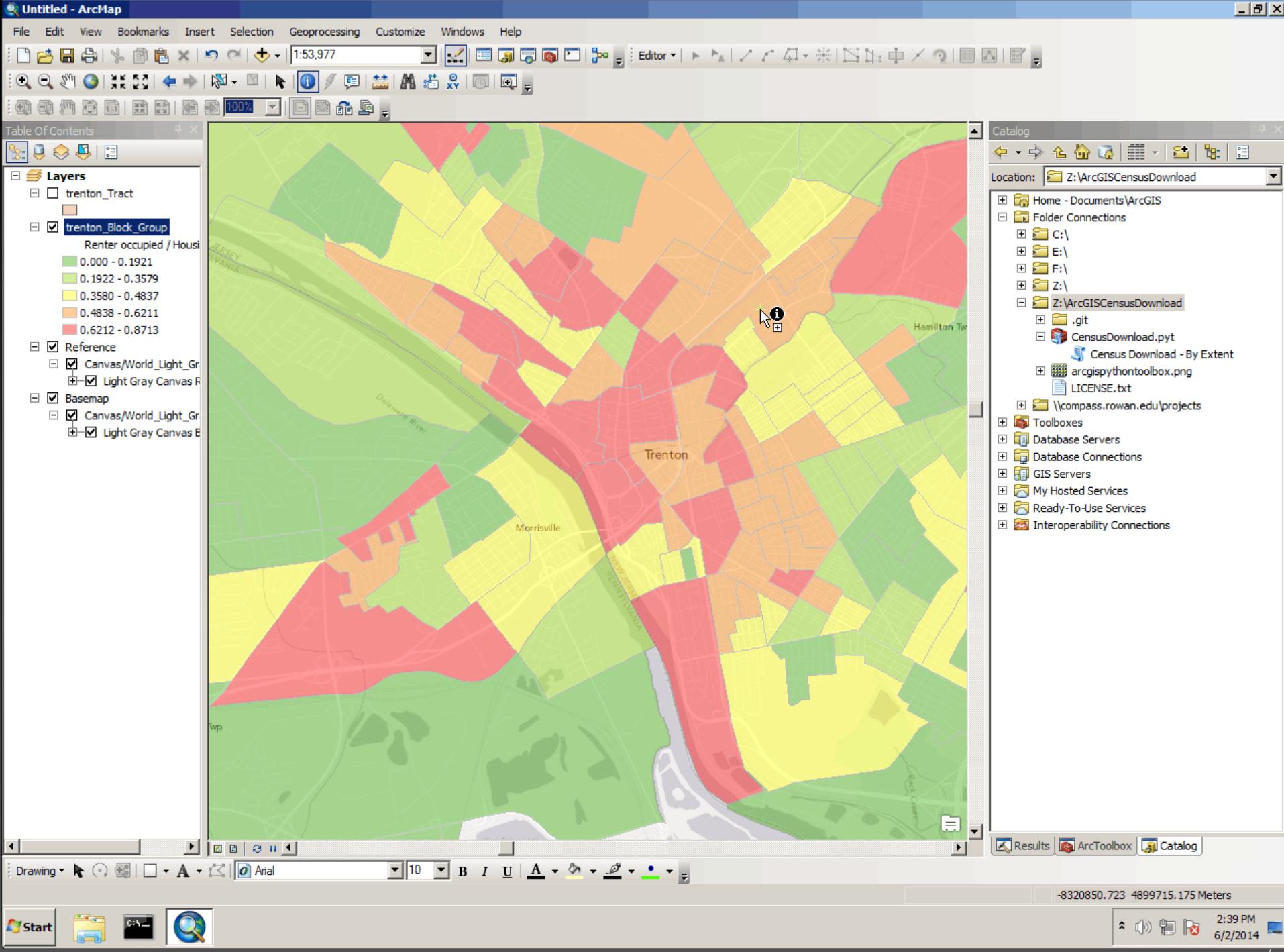


Python Toolbox

- Python Toolboxes are pure-Python files that appear as ArcToolbox toolboxes.
- Tools are defined as subclasses.
- A toolbox containing several independent tools can exist as one text-based file.
- Great format for transparency and version control.
- Uses .pyt as a file extension.







Moving Beyond ArcGIS using Python

Make ETL Easy

- Extract, transform, load processes can be tedious, especially if they are complex and frequent.
- Python can help assist you with bringing in outside data, conforming it to your needs and loading it into your database/storage.
- Python can connect to the web and databases, as well as process and convert GIS data.
- Python can also be run from Scheduled Tasks/cron, enabling you to fully automate these operations.

Fiona

- Fiona is a Python wrapper for the GDAL/OGR library.
- <https://pypi.python.org/pypi/Fiona>
- Enables you to convert/project/process a multitude of spatial data formats.
- Expanding on the previous example, the downloaded data can then be processed, converted to/from a specific format, reprojected, etc.

Web Retrieval & Extraction

- Several modules exist to enable easy downloading of remote resources.
- `urllib` (plus `urllib2`, `urllib3`, `httplib`, etc...)
- `zipfile` is a module for working with PKZIP files.
- Let's look at some code to automate downloads and extraction.

chupaESRI

psycopg2

- psycopg2 module provides a Pythonic way of querying a PostgreSQL database.
- PostgreSQL-specific, enables accessing ArcSDE or PostGIS-formatted data.
- Full, secure access to your databases.
- Very easy to use the records returned from a database query in your Python programs.

johnreiser/chupaESRI · GitHub

GitHub, Inc. [US] https://github.com/johnreiser/chupaESRI

GitHub

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johnreiser / chupaESRI

Tool to suck data from ArcGIS Server and spit it into PostgreSQL

1 commit 1 branch 0 releases 1 contributor

branch: master chupaESRI / +

initial commit

johnreiser authored on May 12 latest commit 6c165c6db

LICENSE.txt initial commit 21 days ago

README.md initial commit 21 days ago

chupaESRI.py initial commit 21 days ago

README.md

chupaESRI

About

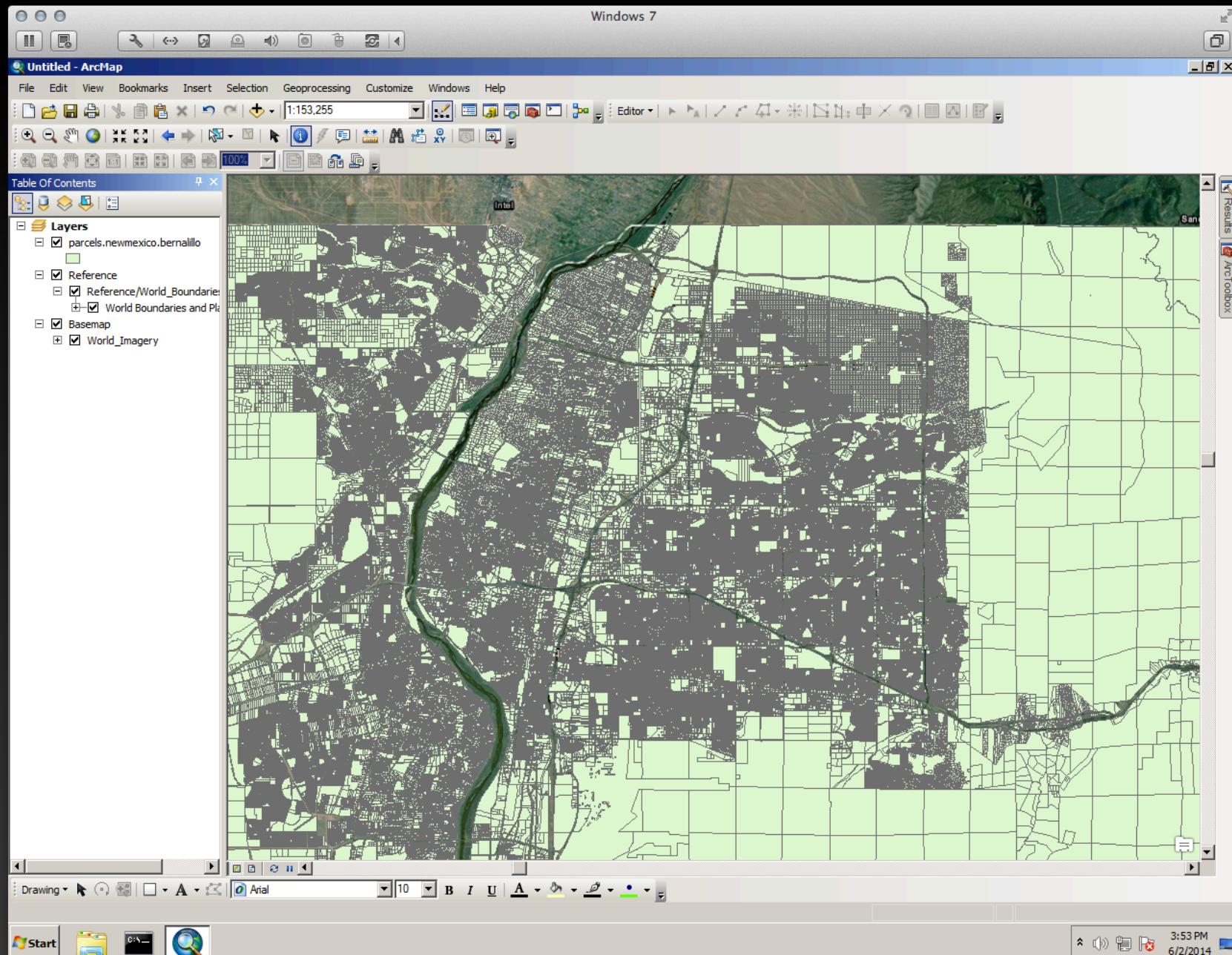
ChupaESRI is a Python module/command line tool to extract features from ArcGIS Server map services.

Name?



jreiser — Python — 80x48

```
sh-3.2$ ~/scripts/EsriJSON2Pg.py http://amus.bernco.gov/ArcGIS/rest/services/AdvancedPublic/MapServer/63/query "host=localhost dbname=parcels user=gisadmin" newmexico.bernalillo  
amus.bernco.gov  
Requesting 0 <= objectid <= 999  
Requesting 1000 <= objectid <= 1999  
Requesting 2000 <= objectid <= 2999  
Requesting 3000 <= objectid <= 3999
```



Recent Property Sales

1087 SPRINGDALE RD, NJ 08003

njparcels.com/property/0409/524.17/3

John

NJ Parcels Search Terms Redaction

1087 SPRINGDALE RD

New Jersey / Cherry Hill Twp / 524.17 / 3

1087 SPRINGDALE RD is Block 524.17, Lot 3 in Cherry Hill Twp, Camden County.

Your Property's Worth

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Owner Information

NORCROSS, GEORGE III & SANDRA
1087 SPRINGDALE RD
CHERRY HILL, NJ, 08003

Other Property by Owner

Explore Data

Sales Records
Comparable Sales Report
Compare Taxes to Nearby

Bird's Eye Neighborhood Map



Recent Comparable Sales

1133 WINDING DR (5455 ft²)
Sold for \$994,999.00 on 2015-07-29.

13 SIGNAL HILL RD (3071 ft²)
Sold for \$535,000.00 on 2015-07-16.

10 STEEPLE CHASE CT (2462 ft²)
Sold for \$442,500.00 on 2015-07-31.

15 COOPERS RUN DR (3464 ft²)
Sold for \$512,650.00 on 2015-07-30.

11 OAKLEY DR (2156 ft²)
Sold for \$352,000.00 on 2015-07-13.

View Comparable Sales Report



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*Represents the avg. earnings of top 10% of customers in an April 2013 survey.

Notification List

View the list of properties within 200 feet of 1087 SPRINGDALE RD. Useful for determining certified mailing lists when applying for a variance or permit.

Notification List

Adjacent Properties

Comparable sales for 1087 SPRINGDALE RD

1087 SPRINGDALE RD is Block 524.17, Lot 3 in Cherry Hill Township, Camden County. The building description is encoded as "2SB, 1SF".

The property last sold on 1986-03-31 for \$342,500.00.

View previous sales records for 1087 SPRINGDALE RD. See the complete property record.

Map of Comparables

Leaflet | State of New Jersey, Map tiles by Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL.

Map colors based on Price Per Square Foot, with red and green denoting below or above one standard deviation from the mean.
Mean: 131.01 StdDev: 27.83

List of Comparable Sales

The table below contains the comps for 1087 SPRINGDALE RD. Click on the table headers to resort the list. You can download the list to Excel using the button at the bottom of the page.

Recently Sold	Date	Price	FT ²	\$/FT ²	Building Description	Constructed
1133 WINDING DR	2015-07-29	\$994,999	5455	\$182.40	2SB,3AG	1998

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NJ Division of Taxation - G X John

www.state.nj.us/treasury/taxation/lpt/grantors_listing.shtml

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State of New Jersey
Department of the Treasury

Division of Taxation

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Grantor's Listing

The 2015 Grantors List is based on sales recorded in the sampling period beginning July 1, 2014 through June 30, 2015.

Note: All usability / non-usability classifications are prior to appeals filed with the Tax Court of New Jersey.

- [2015 Usable Listings](#)
- [2015 Non-Usable Listings](#)

Raw Data for Download

Note: The Year-to-Date SRIA file does not reflect ongoing usability investigations. This is a working file that has not yet been finalized.

- [2016 YTD SR1A file \(WinZip File: 5.91 MB\)](#)
- [2015 SR1A file \(WinZip File: 16.44 MB\)](#)
- [2014 SR1A file \(WinZip File: 16.3 MB\)](#)
- [2013 SR1A file \(WinZip File: 16 MB\)](#)
- [2012 SRIA file \(WinZip File: 15 MB\)](#)
- [2011 SRIA file \(WinZip File: 15 MB\)](#)
- [2010 SRIA file \(WinZip File: 16 MB\)](#)
- [2009 SRIA file \(WinZip File: 15 MB\)](#)
- [SR1A Layout and Field Descriptions !\[\]\(c707729f7c81796ff4b6a13762816491_img.jpg\) \(33 kb\)](#)
- [SR1A Layout 2013+ and Field Descriptions !\[\]\(4e91a26b2a6e1eaf93ff016f77c1dd9c_img.jpg\) \(32 kb\)](#)

*****ESSEX COUNTY ONLY - SR-1A reporting changes*****
Effective October 1, 2015 Essex County deeds will be identified by a 10 digit instrument number.
This instrument number will be reported on an SR-1A by entry in the existing 5 digit deed book and 5 digit page fields.

Last Updated: Thursday, 12/03/15

 OPRA | Open Public Records Act

RULES & AUTHORITY

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[Code](#) Issues 0 Pull requests 0 Pulse Graphs

Tools to work with New Jersey's cadastral spatial data. (Python and PostgreSQL)

15 commits 1 branch 0 releases 2 contributors

Branch: [master](#) [New pull request](#) [New file](#) [Find file](#) [HTTPS](#) <https://github.com/johnjreiser>   [Download ZIP](#)

 [johnjreiser](#) Added SR1A tools. Updated README. Latest commit [f86704a](#) 23 hours ago

File	Description	Time Ago
DownloadExtractParcels.py	Added Essex County	7 days ago
DownloadMODIV.sh	added shell script to download 2014 data	2 years ago
LICENSE.txt	initial commit	2 years ago
README.md	Added SR1A tools. Updated README.	23 hours ago
SR1AParser.py	Added SR1A tools. Updated README.	23 hours ago
TaxListParser.py	revised TaxListParser	5 months ago
convertMODIVtoCSV.py	added CSV tool, included updates to Parser	2 years ago
dbfSchemaCompare.py	initial commit	2 years ago
parseAdditionalLots.py	added parseAdditionalLots.py	a year ago
processCertifiedTaxLists.py	revised for 2015 data	6 months ago
sr1a_csv.py	Added SR1A tools. Updated README.	23 hours ago

 [README.md](#)

NJParcelTools

Tools to help work with cadastral data in New Jersey.

SR1A Upload Status — Inbox

info@areaplot.com December 4, 2015 at 3:02 AM

To: info@areaplot.com

SR1A Upload Status

```
Downloading and extracting SR1A data...
Archive: 2016YTDSR1A.zip
inflating: 2016 YTD SR1A.txt
Processing the YTD file...
Loading CSV and rebuilding indexes...
Null display is "(null)".
Timing is on.
DROP INDEX
Time: 509.103 ms
DROP INDEX
Time: 252.494 ms
DROP INDEX
Time: 897.041 ms
BEGIN
Time: 1.787 ms
TRUNCATE TABLE
Time: 45993.302 ms
ALTER SEQUENCE
Time: 2.337 ms
COPY 64113
Time: 3894.609 ms
COMMIT
Time: 45.829 ms
CREATE INDEX
Time: 26088.725 ms
CREATE INDEX
Time: 26694.389 ms
CREATE INDEX
Time: 13303.677 ms
Refreshing materialized view and rebuilding indexes...
Null display is "(null)".
Timing is on.
Time: 0.777 ms
DROP INDEX
Time: 635046.079 ms
DROP INDEX
Time: 4289.339 ms
REFRESH MATERIALIZED VIEW
Time: 119625.436 ms
CREATE INDEX
Time: 490474.240 ms
CREATE INDEX
Time: 350282.094 ms
CREATE INDEX
Time: 175758.513 ms
SR1A YTD load complete.
```

Q & A

Books

- Lutz, Mark. Learning Python, 5th Edition. O'Reilly Media. ISBN: 978-1-4493-5573-9
- Lubanovic, Bill. Introducing Python, 1st Edition. O'Reilly Media. ISBN: 978-1-4493-5936-2
- Shaw, Zed. Learn Python the Hard Way. Addison-Wesley. ISBN: 978-0321884916



Online Tutorials

- Learning Python:
 - Code.org
 - Codecademy
- ESRI Training offerings:
 - Python for Everyone -
[http://training.esri.com/gateway/index.cfm?
fa=catalog.webcoursedetail&courseid=2520](http://training.esri.com/gateway/index.cfm?fa=catalog.webcoursedetail&courseid=2520)
 - Using Python in ArcGIS Desktop 10 -
[http://training.esri.com/gateway/index.cfm?
fa=catalog.webCourseDetail&courseID=1868](http://training.esri.com/gateway/index.cfm?fa=catalog.webCourseDetail&courseID=1868)

Python Syntax | Codecademy

www.codecademy.com/courses/introduction-to-python-6WeG3/3/2?curriculum_id=4f89dab3d788890003000...

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Python Syntax 11/13 <

Exponentiation

All that math can be done on a calculator, so why use Python? Because you can combine math with other data types (e.g. **booleans**) and commands to create useful programs. Calculators just stick to numbers!

Now let's work with exponents.

```
eight = 2 ** 3
```

In the above example, we create a new variable called `eight` and set it to `8`, or the result of 2 to the power to 3 (2^3).

Notice that we use `**` instead of `*` or the multiplication operator.

Instructions

Save & Submit Code Reset Code

None

Python for Everyone

training.esri.com/Courses/PythEveryone10_1/player.cfm

Python for Everyone by Esri

Virtual Campus esri

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Introduction

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Creating scripts

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References

Step 7: Create a list

The script's next task (indicated in the pseudocode) is to create a list of shapefile variables.

In the script window, move your cursor to line 7, under `#Create a list of shapefile variables.`

```
1 #Assign variables to the shapefiles
2 park = "nd_park520.shp"
3 school = "ND_schools454.shp"
4 sewer = "nd_sew454.shp"
5
6 #Create a list of shapefile variables
7 |
```

Type the following line of code:

```
shapeList = [park, school, sewer]
```

Press Enter.

[View result](#)

In this line of code, `shapeList` is a variable assigned to a list of values. The list is indicated with the bracket closures `[]`, and each item in the list is separated by a comma.

Why would you use a list instead of a tuple?

[Answer](#)

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Online Communities

- Blogs
 - geospatialpython.com
 - sgillies.net
 - many more...
- Stack Exchange
 - gis.stackexchange.com
 - stackoverflow.com
- GeoNet - Python & Geoprocessing forums
 - <http://forums.arcgis.com/forums/117-Python>

The screenshot shows a question on the Geographic Information Systems Stack Exchange site. The question title is "Multivalue parameter as text in Python toolbox - reading in to imported module function". The question text describes building a Python toolbox with a tool that calls specific functions from a custom module. It mentions using `parameter[2].valueAsText` to read a multivalue list of raster layers. The code provided shows how to handle this:

```
output = parameters[0].valueAsText
input = parameters[2].valueAsText
function = parameters[1].valueAsText
functionname = "Local" + function
option = parameters[3].valueAsText
expression = parameters[4].valueAsText

newGrid = getattr(localfuncs,functionname)(input,option,expression)
newGrid.save(output)
```

The trouble is that the 'input' (multivalue read in as text) ends up being a semicolon-delimited string of file names, and the function in the custom module can't seem to convert it back to a list of raster layers for processing.

The screenshot shows a discussion thread on the Esri GeoNet community. The topic is "arcpy.da.InsertCursor breaks after 1000 records". The post by HOKis asks about a Python script that transforms input featureclass and tables into several output tables and one featureclass, and how to avoid nested loops. The code provided is:

```
01. def insertRows(workspace, fields, data):
02.     edit.startOperation()
03.     with arcpy.da.InsertCursor(workspace, fields) as cursor:
04.         for row in data:
05.             try:
06.                 cursor.insertRow(row)
07.             except:
08.                 err = ""
09.                 for elm in row:
10.                     err = err + str(elm) + "|"
```

On the right side, there are sidebar links for "Community Bulletin", "Love this site?", "Get the weekly newsletter!", and "Sign up for the newsletter".

Thanks for listening!

- Feel free to follow up with questions:

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@johnjreiser on Twitter

github.com/johnjreiser