Python Map Automation: Advanced arcpy.mapping and Migration to ArcGIS Pro

Jeff Barrette

Jeff Moulds

arcpy.(m)a(p)ping samples

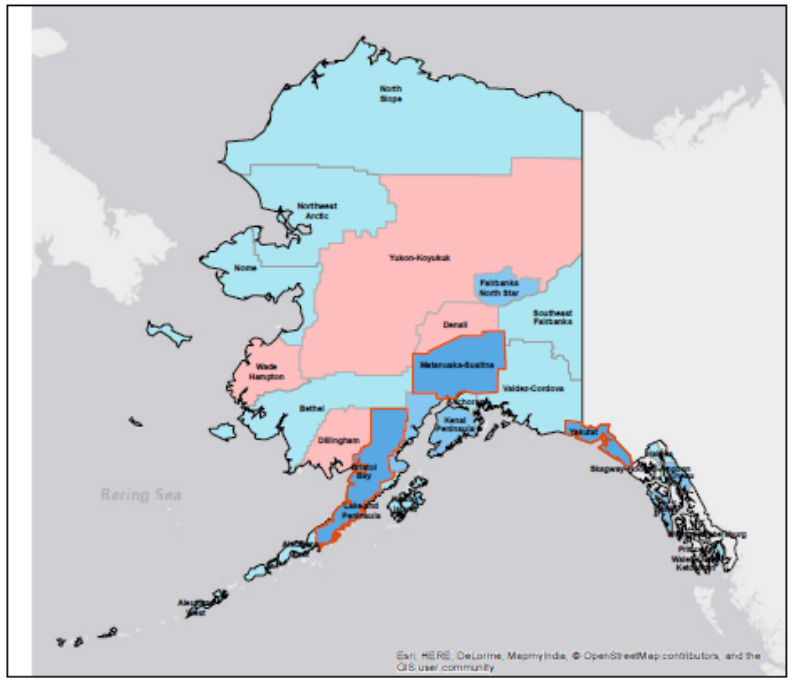
http://esriurl.com/8899

DDPwithDynamicTablesAndGraphs_10.1_v1

Header
Cell

County Name	% Growth
Chester	101.56
Warren	101.99
Washington	102.22
Mifflin	103.04
Tioga	104.21
Lehigh	105.77
Indiana	107.22
Lebanon	107.91
Clinton	113.17
York	115.98
Northumberland	116.43
Columbia	121.51
Pike	123.46

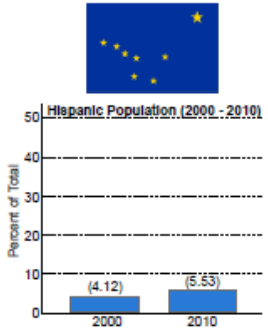
Alaska



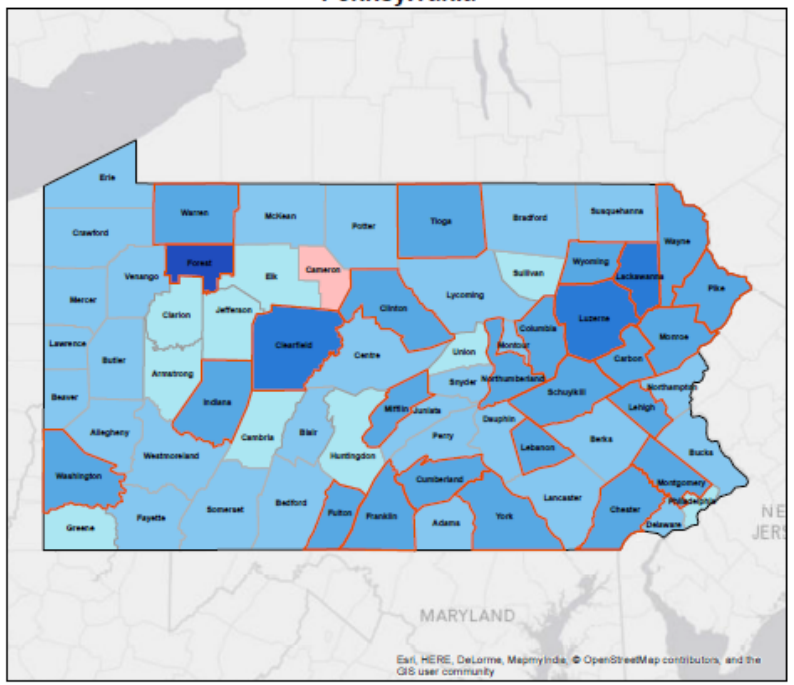
Hispanic Percent Growth from 2000 to 2010

- 100% - 250%
- 50% - 100%
- 0% - 50%
- -100% - 0%
- Greater than 100% (4)

County Name	% Growth
Lake and Peninsula	104.76
Matanuska-Susitna	122.29
Yakutat	183.33
Bristol Bay	242.86



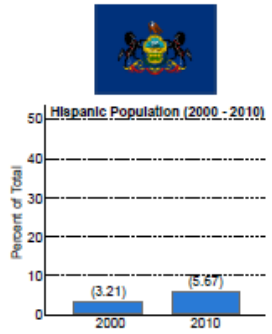
Pennsylvania



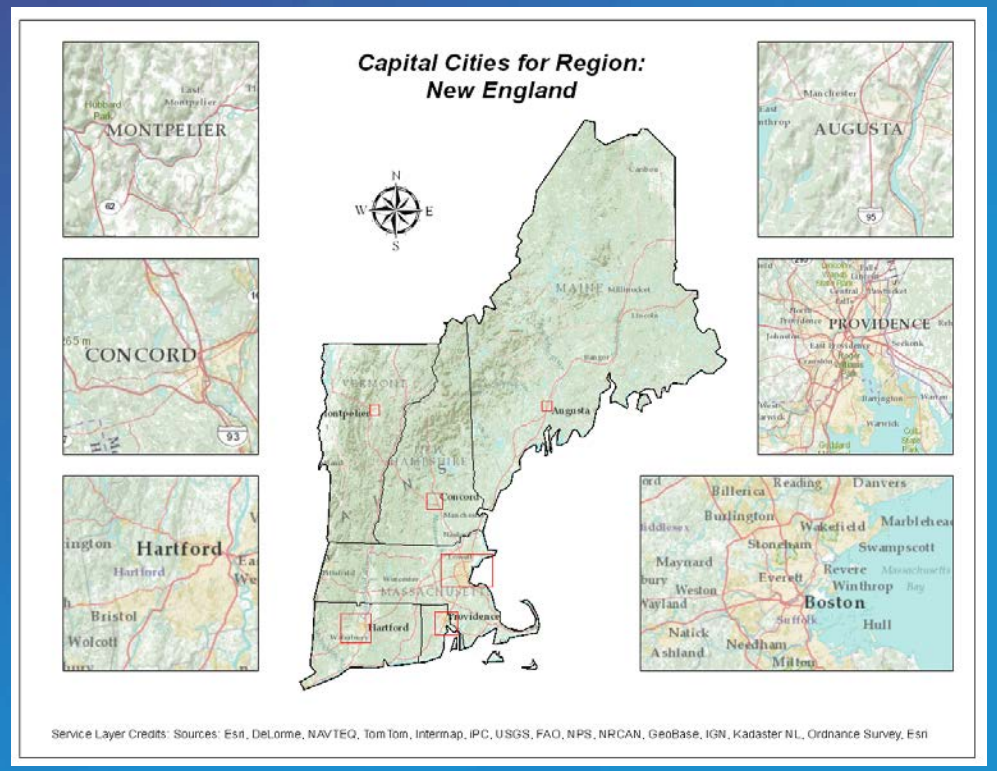
Hispanic Percent Growth from 2000 to 2010

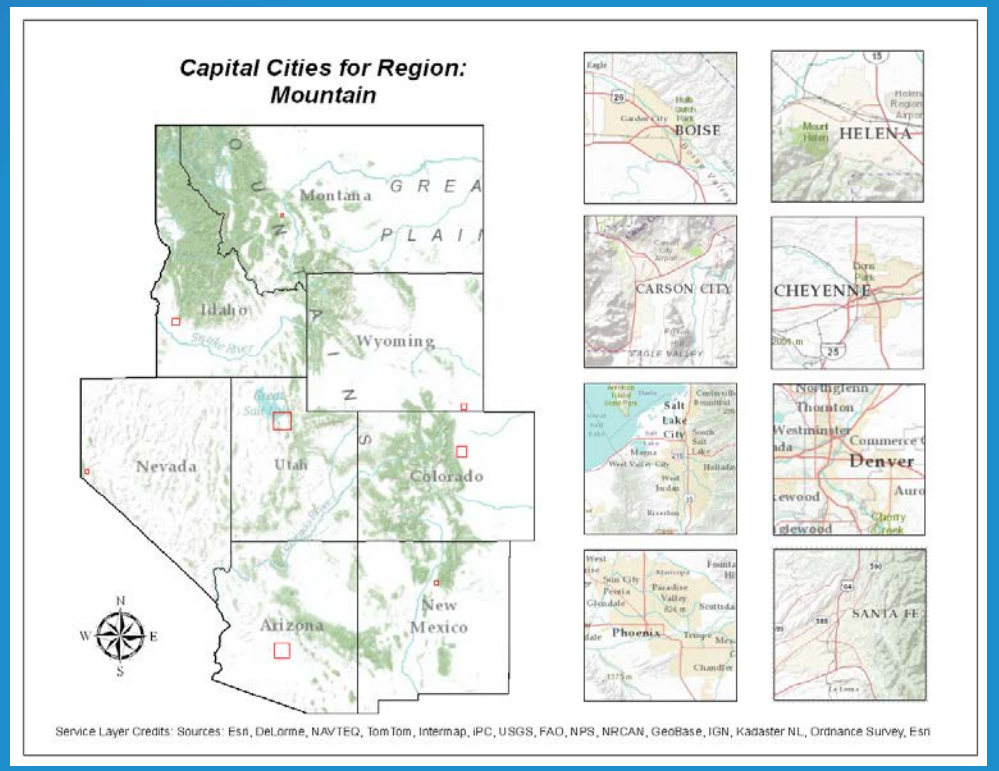
- 500% - 1000%
- 250% - 500%
- 100% - 250%
- 50% - 100%
- 0% - 50%
- -100% - 0%
- Greater than 100% (26)

County Name	% Growth
Chester	101.56
Warren	101.99
Washington	102.22
Mifflin	103.04
Tioga	104.21
Lehigh	105.77
Indiana	107.22
Lebanon	107.91
Clinton	113.17
York	115.98
Northumberland	116.43
Columbia	121.51
Pike	123.46
Cumberland	123.88
Montgomery	123.75
Wayne	143.36
Wyoming	133.69
Fulton	136.54
Monroe	142.39
Schuylkill	144.17
Carbon	150.0
Franklin	183.86
Lackawanna	261.12
Clearfield	304.86
Luzerne	478.8
Forest	596.67



MultipleElementLayoutManager_10.0_v1





PageLayoutElements

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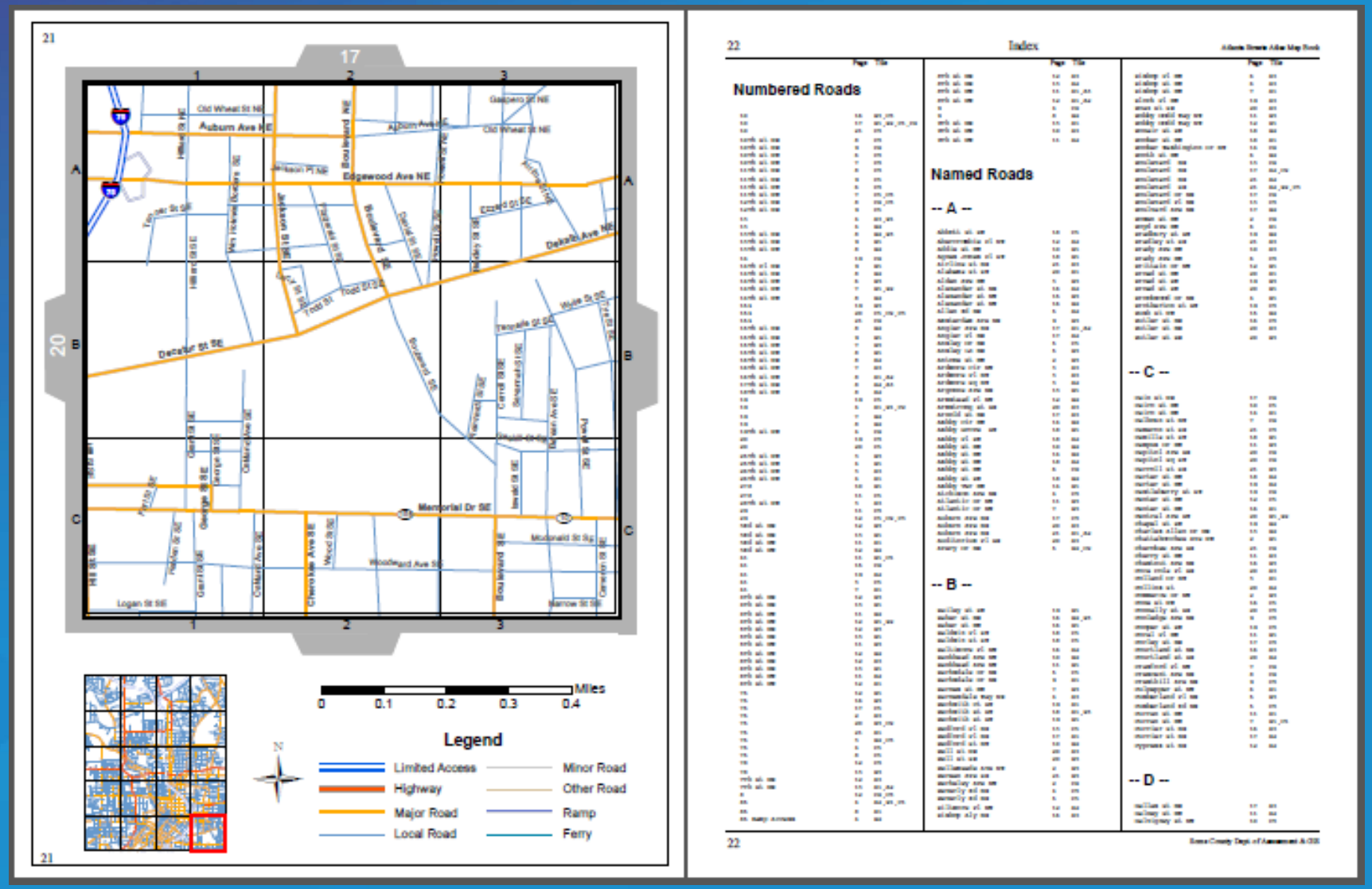
1	Default Template	[0.25,0.25,10.5,8.0,-4872376,15442576,-3658297,16367588,5000000]	[-2.0,6.5,1.7	[-2.0,4.5,1	[-2.0,2.5,1.	[-2.0,0.5,1.	[11.25,6.5,	[11.25,4.5,1.	[11.25,2.5,1.	[11.25,0.5,	[5.5, 7.75, 10, 1]
2	East North Central	[0.25,0.25,10.5,8.0,-10999471,4322861,-8332466,6354865,10000000]	[7.81,5.19,3.	[0.3,5.77,	[0.3,0.77,2.	[0.3,3.25,2.	[8.51,0.71,	<Null>	<Null>	<Null>	[5.29,7.85,9.61,4.18]
3	East South Central	[0.25,0.25,10.5,8.0,-10704277,3398170,-8704023,4922173,7500000]	[7.39,0.79,3.	[0.3,5.77,	[0.3,0.77,2.	[0.3,3.25,2.	<Null>	<Null>	<Null>	<Null>	[6.72,7.84,9.72,6.78]
4	Middle Atlantic	[0.25,0.25,10.5,8.0,-9355063,4655409,-8021560,5671411,5000000]	[0.5,5.87,2.2	[0.53,3.26	[0.53,0.64,	<Null>	<Null>	<Null>	<Null>	<Null>	[5.49,7.78,9.75,1.49]
5	Mountain	[0.25,0.25,10.5,8.0,-13512281,3592054,-9511773,6640060,15000000]	[6.47,6.38,1.	[6.47,4.49	[6.47,2.55,	[6.47,0.62,	[8.63,6.4,1.	[8.63,4.47,1.	[8.65,2.54,1.	[8.66,0.63,	[3.46,7.79,1.09,1.37]
6	New England	[0.25,0.25,10.5,8.0,-8659058,4932580,-7058854,6151782,6000000]	[0.5,6.0,2.25	[0.5,3.5,2.	[0.5,1.0,2.2	[8.5,6.0,2.2	[8.5,3.5,2.2	[7.15,1.0,3.6	<Null>	<Null>	[5.55,7.85,4.31,6.3]
7	Pacific	[0.25,0.25,10.5,8.0,-19482949,1675259,-6147923,11835279,50000000]	[8.5,6.0,2.25	[8.5,3.5,2.	[8.5,1.0,2.2	[4.87,4.8,2.	[1.13,1.39,	<Null>	<Null>	<Null>	[5.81,7.79,7.01,2.94]
8	South Atlantic	[0.25,0.25,10.5,8.0,-10362617,2812844,-7502229,4992187,10725927]	[0.5,6.5,3.25	[0.5,4.5,2.	[0.5,2.5,1.7	[0.5,0.5,3.2	[8.75,6.5,1.	[8.75,4.5,1.7	[8.75,2.5,1.7	[8.75,0.5,1.	[6.93,3.15,7.15,1.88]

GenerateMapBookWithIndexPages_10_v2



arcpy.(m)a(p)ping samples

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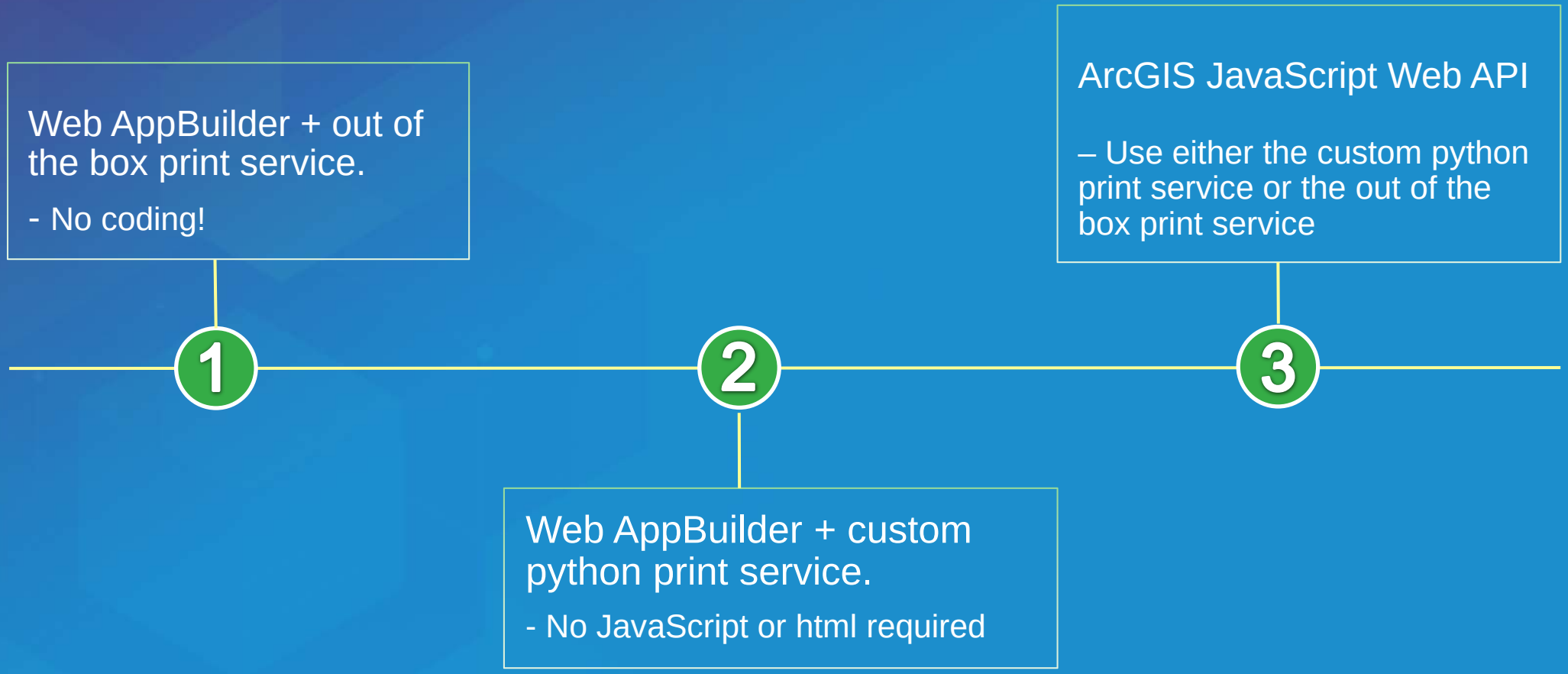
Advanced Web Map Printing with Python

Web API /
Web AppBuilder

arcpy.mapping

High quality vector
output (e.g. PDF)

Three Web Map printing development paths



Related Session: Enabling High-Quality Printing in Web Applications (Wednesday @ 10:30 Demo Theater 6)
Also search your agenda for “Web AppBuilder” – many sessions!

Advanced server printing with arcpy.mapping

- **Full capabilities of arcpy.mapping:**
  - Swap out service layers for local vector data for ***vector PDF output***
  - Export using advanced options
  - Export data driven pages
  - Export to PDF and insert additional pages (title page, reports, etc.)
  - Controlling the appearance of the legend
  - Etc.
- **Return a printer-friendly output file (PDF, PNG, etc.)**

Advanced server printing with arcpy.mapping

- **Build web apps with customized versions of the out-of-the-box print service**

- **Arcpy.mapping method for converting Web Maps to Map Documents:**
  - `ConvertWebMapToMapDocument (webmap_json, {template_mxd}, {notes_gdb}, {extra_conversion_options})`
  - **Supports client side graphics in your web app.**

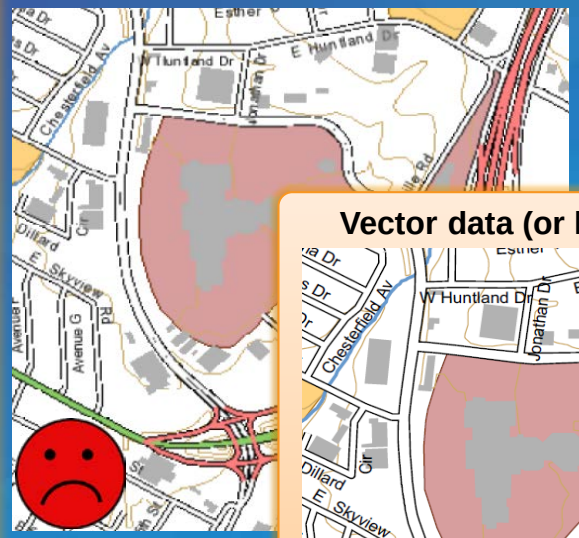
Online help and examples http://esriurl.com/4600

Demo: Web app to export vector PDF using arcpy.mapping

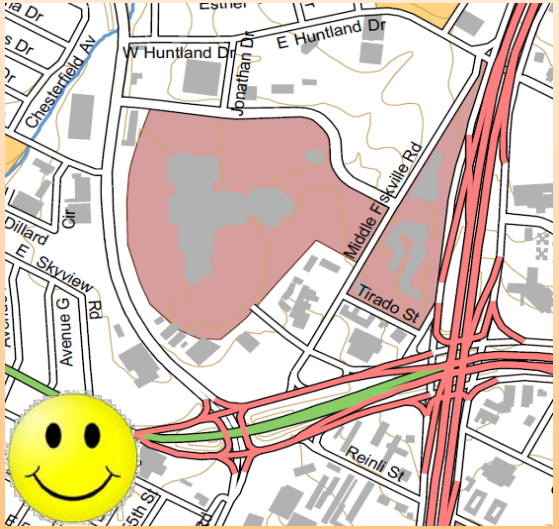
- Output or print vector layers instead of “flat” image of service layers
  - Vector layers will be staged in template map document

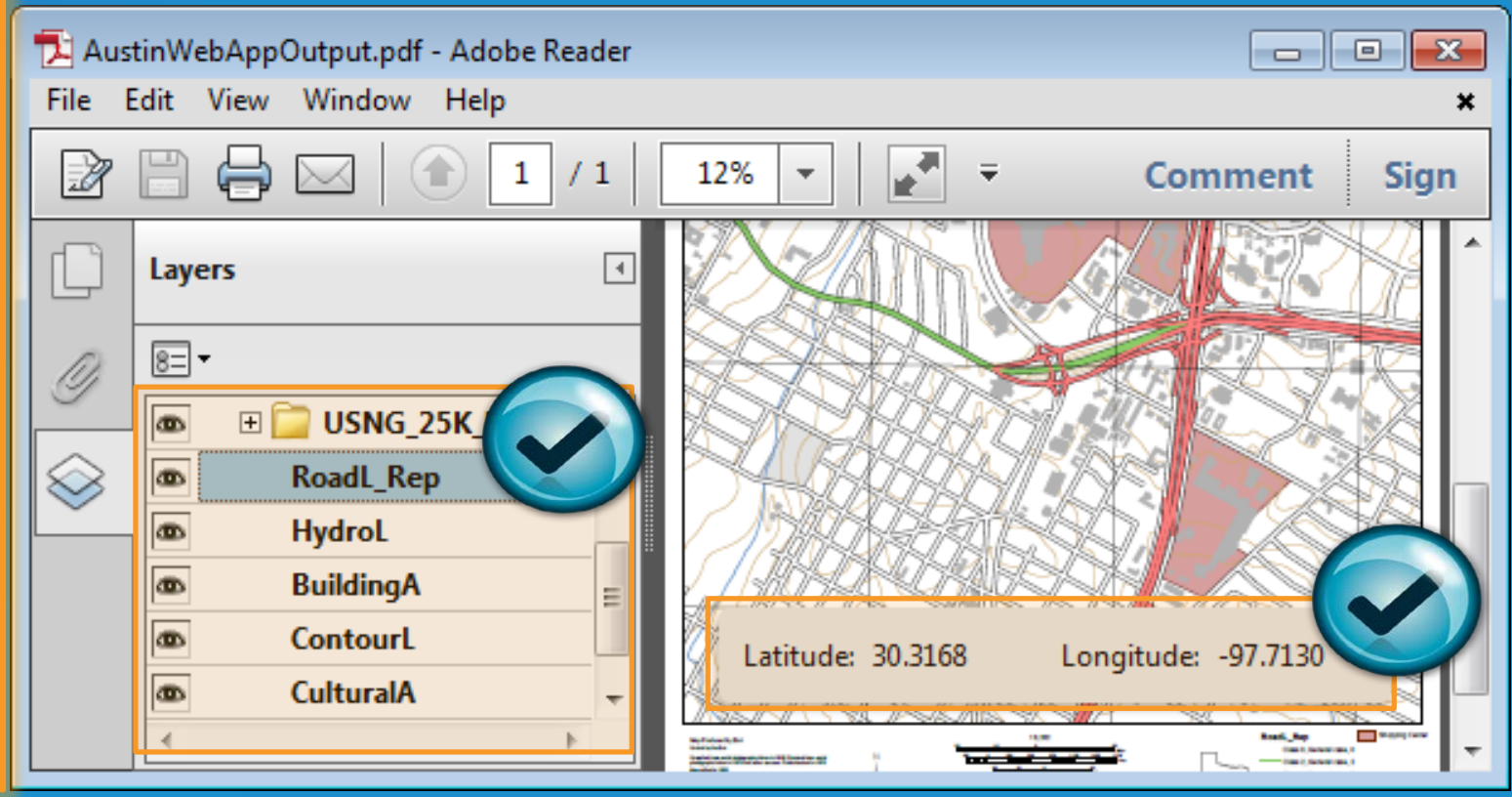
Output PDF viewed in Adobe Reader:

Map service tiled cache (low dpi)



Vector data (or high dpi image)





Demo: Web app to export vector PDF using arcpy.mapping

Python code used in custom GP service

Get web map JSON

Get template MXD

Create new MXD based on web map

Remove service layers

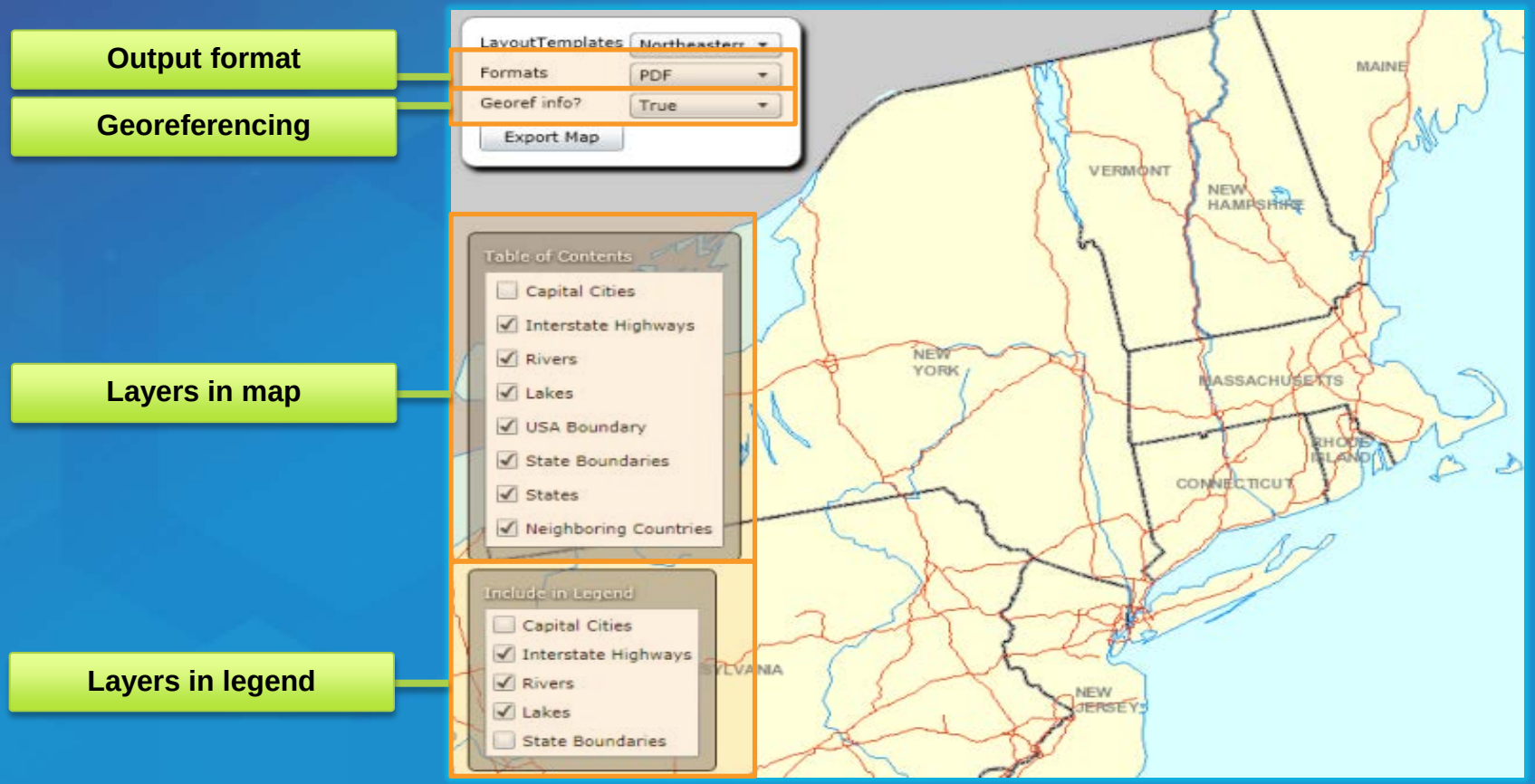
Export PDF

Output file of job

```
import arcpy, os, uuid

# Input WebMap json
Web_Map_as_JSON = arcpy.GetParameterAsText(0)

# Input Layout template
Layout_Template = arcpy.GetParameterAsText(1)

# The template location in the server registered folder
templatePath = '//gilbert/Austin/Templates'
templateMxd = os.path.join(templatePath, Layout_Template + '.mxd')

# Convert the WebMap to a map document
result = arcpy.mapping.ConvertWebMapToMapDocument(Web_Map_as_JSON, templateMxd)
mxd = result.mapDocument
df = arcpy.mapping.ListDataFrames(mxd, 'Webmap')[0]

# Remove the service layer
# This will just leave the vector layers from the template
for lyr in arcpy.mapping.ListLayers(mxd, data_frame=df):
    if lyr.isServiceLayer:
        arcpy.mapping.RemoveLayer(df, lyr)

# Export the web map to PDF
output = 'WebMap_{}.pdf'.format(str(uuid.uuid1()))
Output_File = os.path.join(arcpy.env.scratchFolder, output)
arcpy.mapping.ExportToPDF(mxd, Output_File, georef_info=True)

# Set the output parameter to be the output file of the server job
arcpy.SetParameterAsText(3, Output_File)
```

Web app to export vector PDF using arcpy.mapping

- Two tutorials in the help:
  - Basic vector web map printing: http://esriurl.com/4601
  - Advanced web map printing: http://esriurl.com/4602



Publishing map services with arcpy.mapping

- arcpy.mapping.CreateMapSDDraft(map_document, out_sddraft, service_name, {server_type}, {connection_file_path}, {copy_data_to_server}, {folder_name}, {summary}, {tags})
- Workflow to convert map document to map service.
- Use python scripts for:
  - Scheduled service updates. E.g. nightly.
  - Publishing automated analysis results.
  - Batch publishing.

Publishing map services with arcpy.mapping

Sample script: CreateMapSDDraft

Reference MXD

Server connection, service properties, etc.

Create and analyze sddraft for errors, warnings, etc.

Stage and publish Map Service

```
import arcpy

# define local variables
wrkspc = 'C:/Project/'
mapDoc = arcpy.mapping.MapDocument(wrkspc + 'counties.mxd')
con = 'GIS Servers/arcgis on MyServer_6080 (publisher).ags'
service = 'Counties'
sddraft = wrkspc + service + '.sddraft'
sd = wrkspc + service + '.sd'
summary = 'Population Density by County'
tags = 'county, counties, population, density, census'

# create service definition draft
arcpy.mapping.CreateMapSDDraft(mapDoc, sddraft, service, 'ARCGIS_SERVER',
                               con, True, None, summary, tags)
# analyze the service definition draft
analysis = arcpy.mapping.AnalyzeForSD(sddraft)

# stage and upload the service if the sddraft analysis did not contain errors
if analysis['errors'] == {}:
    # Execute StageService
    arcpy.StageService_server(sddraft, sd)
    # Execute UploadServiceDefinition
    arcpy.UploadServiceDefinition_server(sd, con)
else:
    # if the sddraft analysis contained errors, display them
    print analysis['errors']
```

Online help and samples: http://esriurl.com/4598

Publish and overwrite a hosted feature service on ArcGIS.com blog post: http://esriurl.com/9754

Publishing other service types with python

- Create geoprocessing services
  - `arcpy.CreateGPSDDraft()`
- Create image services
  - `arcpy.CreateImageSDDraft()`
- Create geocoding services
  - `arcpy.CreateGeocodeSDDraft()`

arcpy.mp

http://esriurl.com/9785

Function for importing 10.x documents into ArcGIS Pro Projects

- ArcGISProject.importDocument(document_path, {include_layout})

Looping through MXDs in a folder.

Reference a template APRX. Import MXD into the APRX. Save the project.

```
1  import arcpy, os
2  folder = r"C:\Project"
3  for file in [f for f in os.listdir(os.path.join(folder, 'MXDs'))
4               if os.path.splitext(f)[1].lower() == '.mxd']:
5      aprx = arcpy.mp.ArcGISProject(os.path.join(folder, 'template.aprx'))
6      aprx.importDocument(os.path.join(folder, file))
7      aprx.saveACopy(os.path.join(folder, 'APRXs', os.path.splitext(file)[0] + '.aprx'))
8      del aprx
```

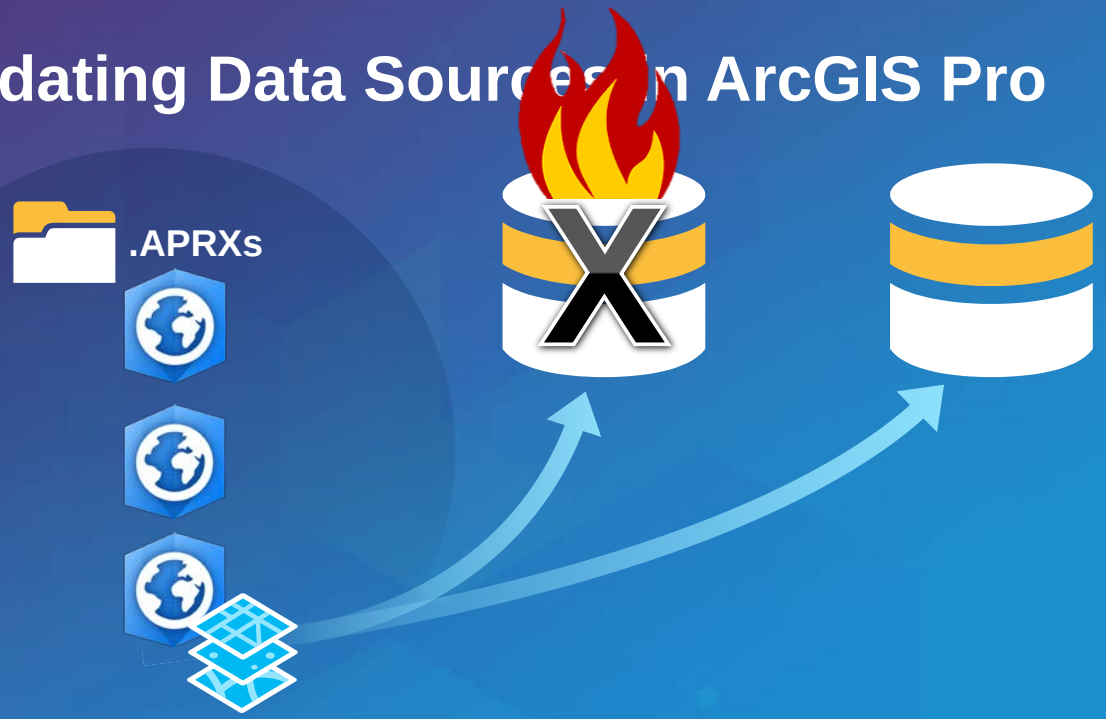
Function for importing 10.x documents into ArcGIS Pro Projects

- ArcGISProject.importDocument(document_path, {include_layout})


```
1  aprx = arcpy.mp.ArcGISProject("CURRENT")
2  aprx.importDocument(r"C:\Project\Demo\Mexico.mxd", include_layout=True)
3  aprx.importDocument(r"C:\Project\CentralColorado.mxd", include_layout=False)
4  aprx.importDocument(r"C:\Project\Yosemite.3dd")
5  aprx.importDocument(r"C:\Project\Structured.sxd")
```

DEMO

Updating Data Sources in ArcGIS Pro



Project/Map/Layer/Table/LayerFile.updateConnectionProperties (current_connection_info, new_connection_info, {auto_update_joins_and_relates}...)

Find this path:

```
aprx = arcpy.mp.ArcGISProject(r'C:\Projects\YosemiteNP\Yosemite.aprx')
aprx.updateConnectionProperties(r'C:\Projects\YosemiteNP\Vector Data\Yosemite.gdb',
                                r'C:\Projects\YosemiteNP\DBConnections\Server.sde')
```

Replace it with this path:

Updating Data Sources advanced concepts – Layer.connectionProperties

- New at Pro
- The entire layer data source object model is exposed as a Python dictionary.
- Use if you need more fine grained control that what is available in Project/Map/Layer/Table/LayerFile.updateConnectionproperties()

Access a layer in a map.

Get layer's connection properties.

File Geodatabase layer connection properties dictionary

```
import arcpy, pprint
p = arcpy.mp.ArcGISProject('current')
m = p.listMaps()[0]
l = p.listLayers()[0]
pprint.pprint(l.connectionProperties)
```

```
{'connection_info': {'database': 'C:\\Projects\\YosemiteNP\\Data\\Yosemite.gdb'},
 'dataset': 'RangerStations',
 'workspace_factory': 'File Geodatabase'}
```

DEMO

Two ways to use the connection properties dictionary – enterprise geodatabase examples

1. **Write directly to the dictionary**

Get layer connection properties

Update dictionary

Set layer connection properties

```
# change the sde username and password
# ====================================
oldUser = 'Robbie'
newUser = 'Sly'
password = 'Dunbar'
# get the layer's connection properties
conProps = sdeLayer.connectionProperties
conProps['connection_info']['user'] = newUser
conProps['connection_info']['password'] = password
conProps['dataset'] = sdeLayer.name.replace(oldUser, newUser)
# apply the new connection properties
sdeLayer.connectionProperties = conProps
```

2. **UpdateConnectionProperties will also do find and replace for full and partial dictionaries**

Old database info

New database info

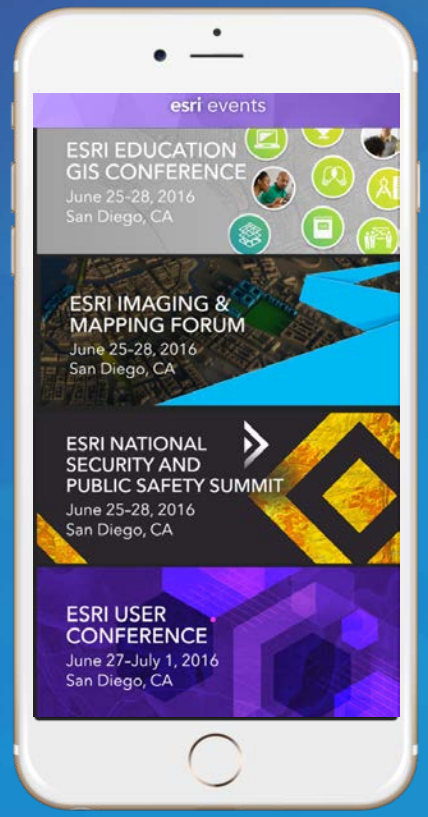
Set layer connection properties

```
# change the sde server
# =====================
newDatabase = 'Shakespeare'

# old database to search for
old_dict = {'connection_info': {'db_connection_properties': 'esri4',
                                'instance': 'sde:sqlserver:esri4',
                                'server': 'esri4',
                                'version': 'sde.DEFAULT'}}

# new database to replace with
new_dict = {'connection_info': {'db_connection_properties': newDatabase,
                                'instance': 'sde:sqlserver:' + newDatabase,
                                'server': newDatabase,
                                'version': 'dbo.DEFAULT'}}

# update the data sources by doing a find and replace on the project
aprx.updateConnectionProperties(old_dict, new_dict, True, True)
```

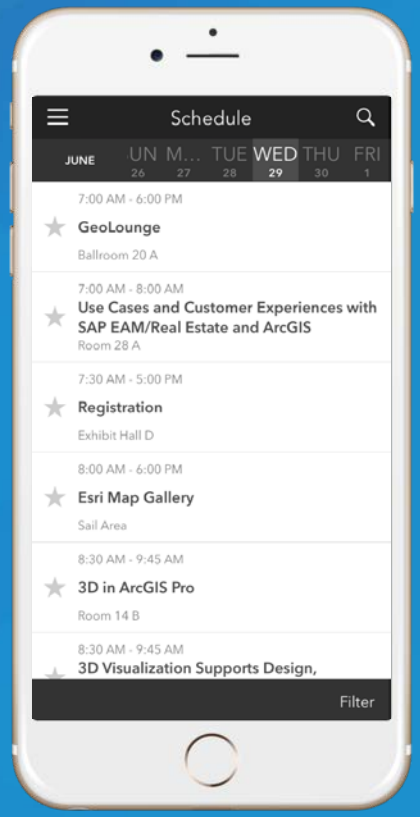
Please take our Survey

Your feedback allows us to help maintain high standards and to help presenters

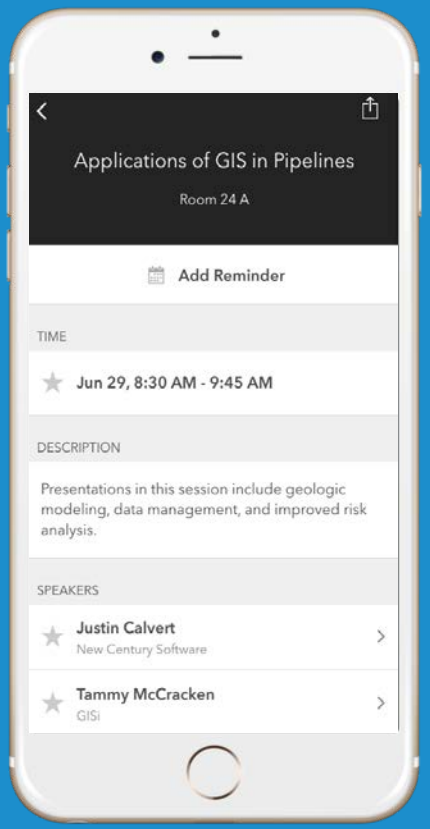
Find your event in the Esri Events App



Find the session you want to review



Scroll down to the bottom of the session



Answer survey questions and submit