



# WHERE ARE MY PATIENTS? GEO-CODING AND SPIDER ANALYSIS

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# AGENDA

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- INTRODUCTION
- ANALYSIS
- GEO-CODING OF ADDRESSES
- WHAT IS A SPIDER ANALYSIS?
- RESOURCES
- Q AND A



# ANALYSIS



# ANALYSIS

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- Purpose:
  - Identify where a physician's patients are located
- Uses of Analysis:
  - Office expansion
  - Network analysis
  - Fraud detection
- Limitations:
  - Rural patients expected to travel further than urban or suburban
  - Greater distances expected for some specialties



## ANALYSIS KEY STEPS

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- Use DataProbe to calculate approximate distances between providers and their patients using zip codes. Keep only those patients residing in the 95<sup>th</sup> percentile for distances
- Export provider and recipient files to MS Access for use as personal database
- Geo-code provider and patient addresses
- Generate spider diagrams

*NOTE: this demo uses de-identified data.*



# ANALYSIS SAMPLE RESULTS

## Summary of Paid PCP Claims by Percentile

This report summarizes the claims that were billed by primary care physicians (PCPs).

The following specialties were included: general or family practice, internal medicine, OB-GYN, and geria

Percentile	Estimated Distance			Patients	Servicing Physicians	Claims	Claim Lines	Total Services
	Mean	Min	Max					
Missing	N/A	N/A	N/A	10,771	2,649	33,089	41,983	44,617
45	0.00	0.00	0.00	14,615	501	58,259	76,403	78,510
50	3.99	0.00	5.49	779	258	2,444	3,076	3,123
55	7.29	5.49	8.24	2,416	281	7,541	10,509	10,688
60	9.45	8.25	10.82	1,157	365	3,633	5,403	5,559
65	12.04	10.89	13.59	1,914	414	5,832	8,348	8,559
70	15.20	13.60	16.40	1,712	440	5,460	7,553	7,741
75	18.63	16.43	19.90	1,964	441	6,205	7,854	8,131
80	21.20	19.92	22.94	2,066	466	6,057	8,095	8,474
85	24.87	22.99	27.44	1,675	516	5,207	7,822	8,409
90	30.00	27.49	32.93	1,693	443	5,029	7,765	8,245
95	39.06	33.00	45.75	1,643	583	5,214	8,284	8,780
100	95.22	45.80	2,596.91	1,633	580	5,214	7,912	8,771
<b>Totals</b>	<b>13.69</b>	<b>0.00</b>	<b>2,596.91</b>				<b>201,007</b>	<b>209,607</b>

04/13/10@15:28:26

OS\_NB\_09889.distance.pcp\_clm\_lines (201,007 Rows)

*NOTE: this demo uses de-identified data.*



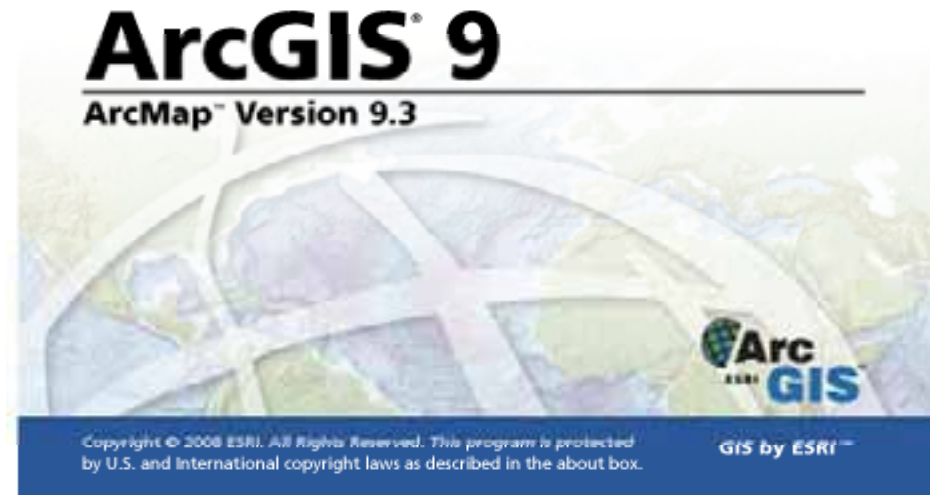
# GEO-CODING OF ADDRESSES



# GEO-CODING

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- Defined:
  - GIS operation for converting street addresses into spatial data for display as a map feature
    - Source: A to Z GIS, Edited by Tasha Wade and Shelly Sommer, ESRI Press
- Tools
  - ArcMap
  - ArcCatalog





# GEO-CODING – PREPARING THE DATA

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- Import data into Access database
  - Include a separate field for each address column (street, city, state, zip code)
- Prepare the data
  - Make sure secondary parts of the address follow main address or are contained in second field
    - **Use:** 1601 Main Street, 12<sup>th</sup> floor
    - **Avoid:** 12<sup>th</sup> floor 1601 Main Street
  - Try to avoid Post Office (PO) boxes
  - No # sign in the address
    - **Use:** 1801 Main Street, Suite 1201
    - **Avoid:** 1801 Main Street, #1201



# GEO-CODING – PREPARING THE DATA

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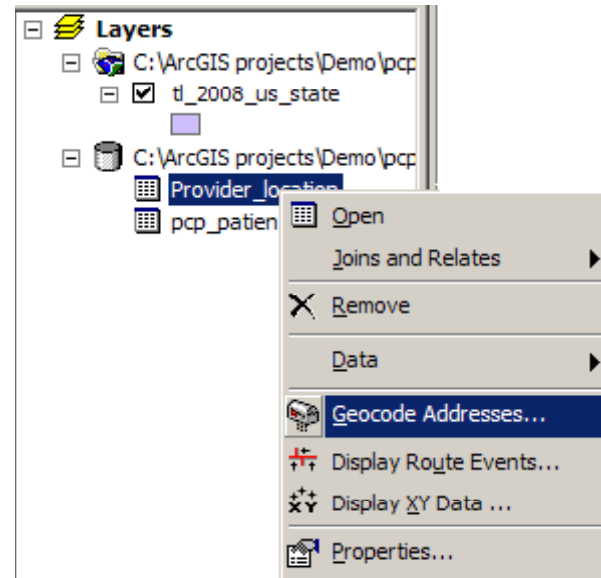
- Prepare the data, cont.
  - Include directional prefixes
    - **For example:** 2000 **N** Main Street
  - Avoid abbreviations in street names
    - **Use:** James **Cool Papa** Bell
    - **Avoid:** James **CP** Bell
  - Use numeric format with street numbers
    - **Use:** **1** Central Street
    - **Avoid:** **One** Central Street
- Refer to the references at the end of the presentation for additional tips



# GEO-CODING

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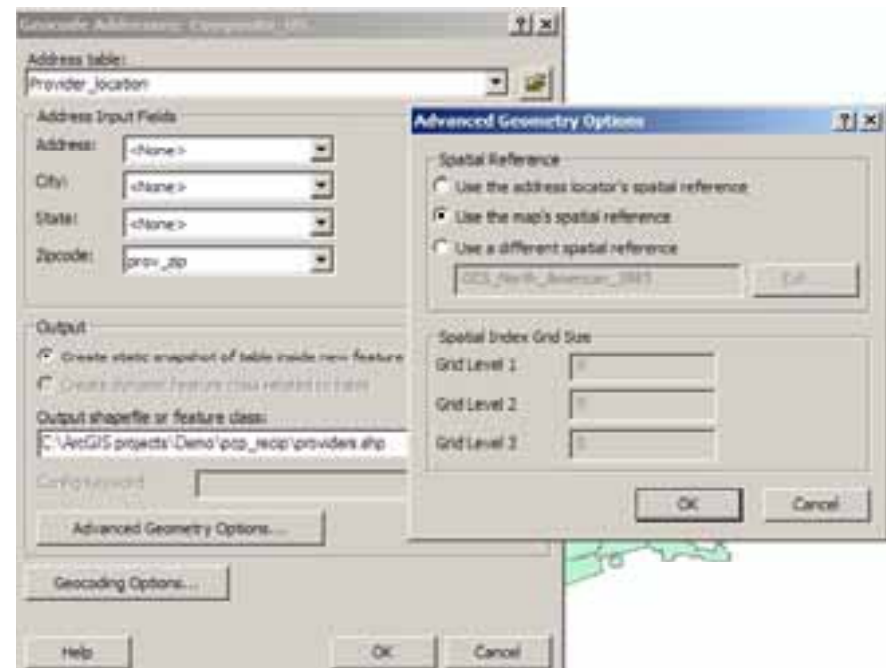
- Steps
  - Select geo-coding from menu



# GEO-CODING

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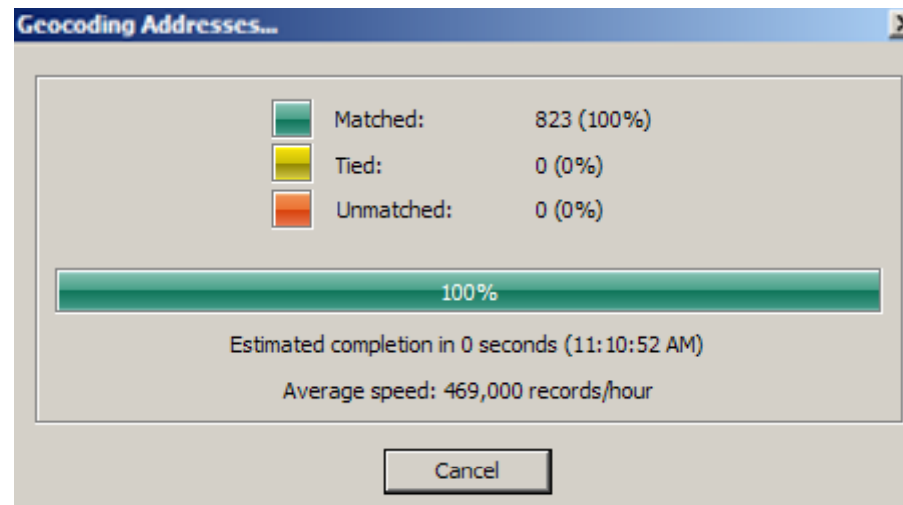
- Steps, cont.
  - Select composite map
  - Select field(s) for use with geo-coding
  - Select spatial reference



# GEO-CODING

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- Steps, cont.
  - Progress tracked records are processed.
  - Users can manually match the unmatched records.
    - Common when going to street address level.



# GEO-CODING

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- Demonstration of the match to recipients.



# WHAT IS A SPIDER DIAGRAM?



Source: <http://www.esri.com/news/arcnews/spring07/articles/spring07gifs/p9p1-1g.jpg>

# WHAT IS A SPIDER DIAGRAM?

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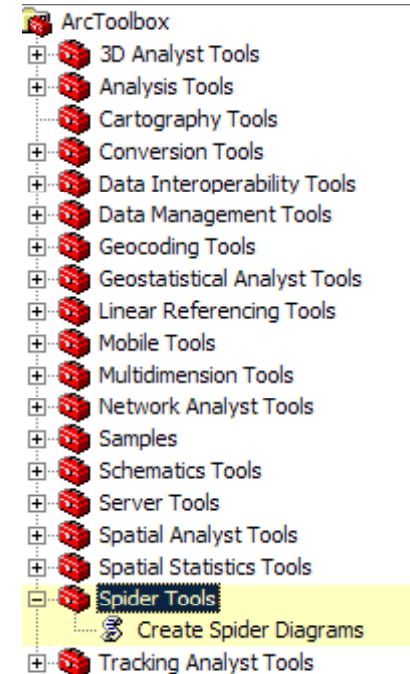
- Defined:
  - Line drawn between a location and its nearest source
  - For example: a physician practice location and the residences of patients treated by physician
- Benefits:
  - Easy to compare varying distances
  - Very visual presentation of algorithm results
- Tips:
  - Limit the number of spider diagrams within a map for ease of use; for example, one provider per map



# CREATING A SPIDER DIAGRAM

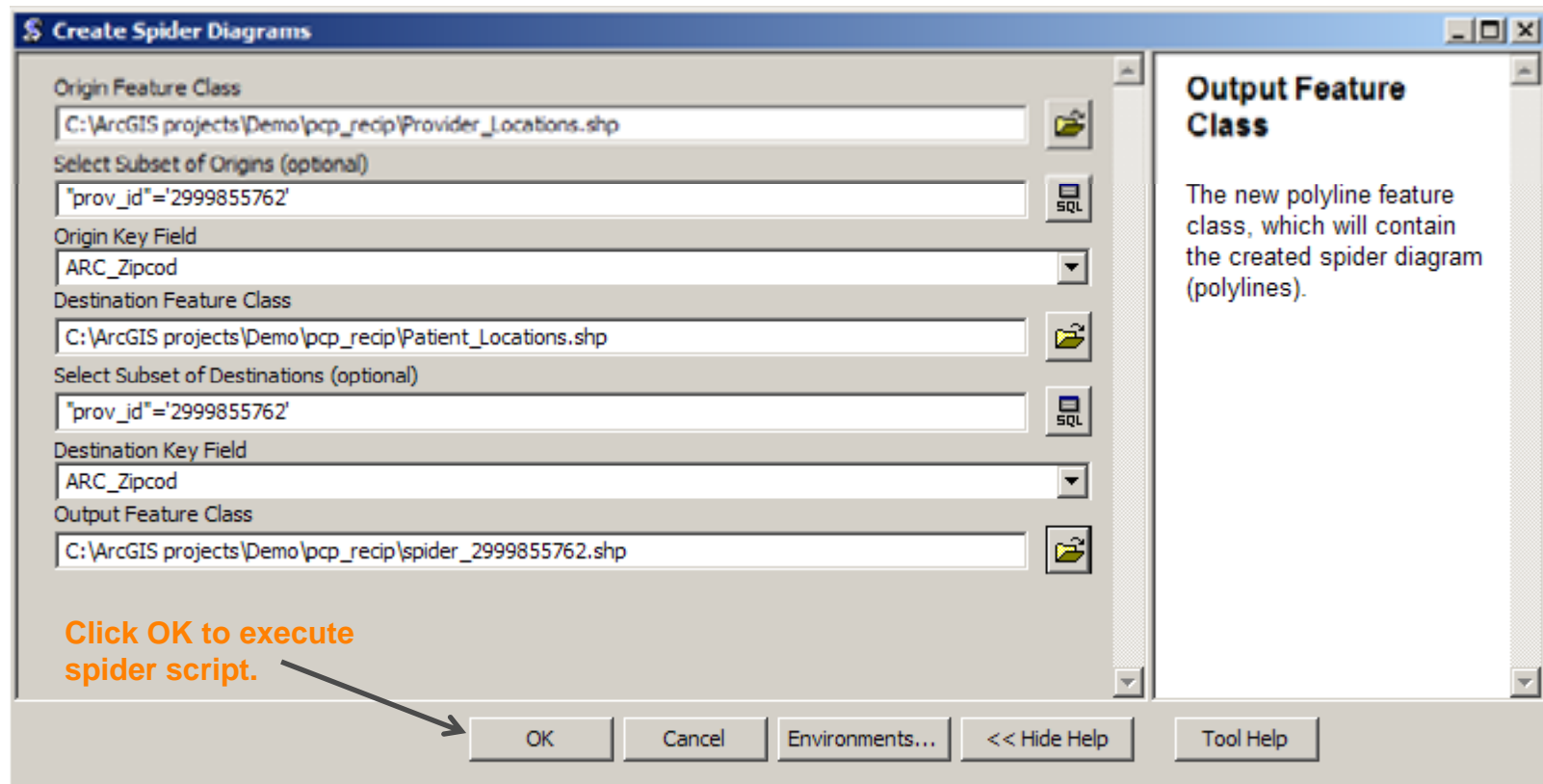
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- Steps:
  - Identify individual provider to use for spider diagram and create layers with that provider's address and patients
  - Make sure spider analysis script installed in toolbox
    - Download from ESRI if necessary
  - Generate Spider Diagram for individual provider



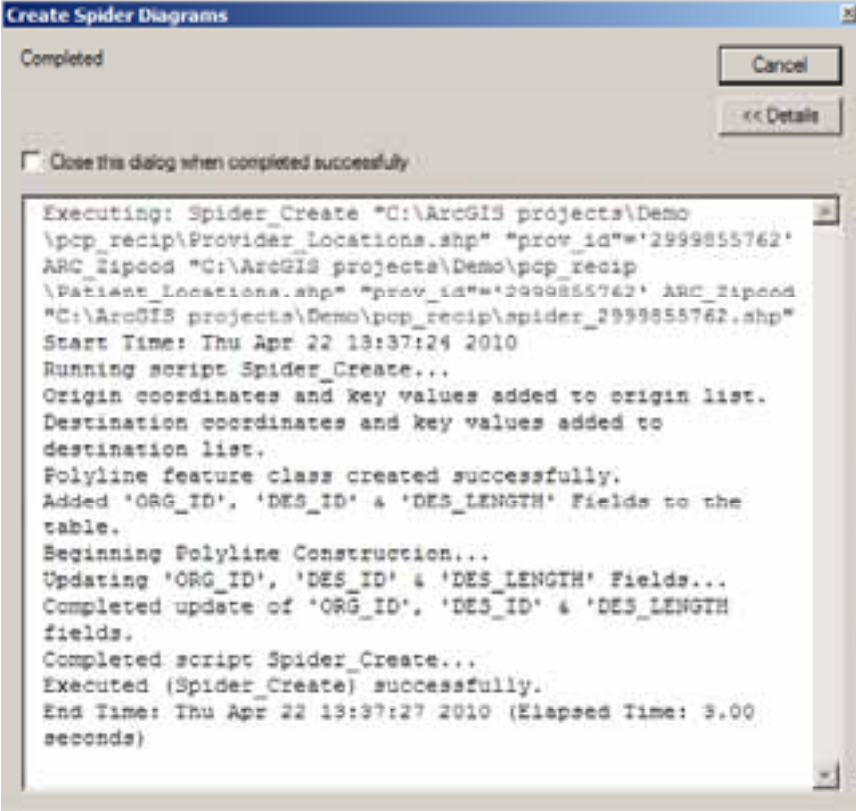
# CREATING A SPIDER DIAGRAM

- Demonstration



# CREATING A SPIDER DIAGRAM

- Demonstration
  - Log will be generated with results



```
Completed
Cancel
<< Details
 Close this dialog when completed successfully

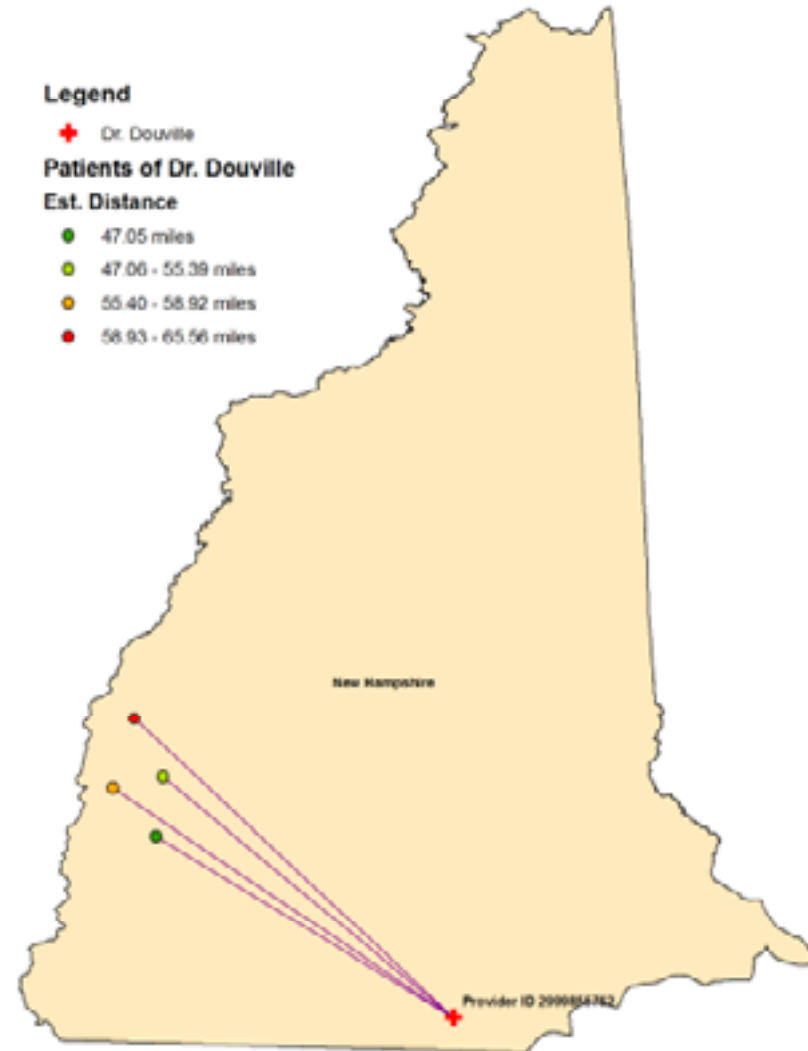
Executing: Spider_Create "C:\ArcGIS projects\Demo
\pcp_recip\Provider_Locations.shp" *prov_id*='2999855762'
ARC_Spced "C:\ArcGIS projects\Demo\pcp_recip
\Patient_Locations.shp" *prov_id*='2999855762' ARC_Spced
"C:\ArcGIS projects\Demo\pcp_recip\spider_2999855762.shp"
Start Time: Thu Apr 22 13:37:24 2010
Running script Spider_Create...
Origin coordinates and key values added to origin list.
Destination coordinates and key values added to
destination list.
Polyline feature class created successfully.
Added 'ORG_ID', 'DES_ID' & 'DES_LENGTH' Fields to the
table.
Beginning Polyline Construction...
Updating 'ORG_ID', 'DES_ID' & 'DES_LENGTH' Fields...
Completed update of 'ORG_ID', 'DES_ID' & 'DES_LENGTH
fields.
Completed script Spider_Create...
Executed (Spider_Create) successfully.
End Time: Thu Apr 22 13:37:27 2010 (Elapsed Time: 3.00
seconds)
```

# CREATING A SPIDER DIAGRAM

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- Results:

- Dr. Douville had 121 patients who traveled 13.4 to 65.56 miles to see him. Of those, 117 traveled 47 miles or more. The map focuses on those who traveled 47 or more miles.



# RESOURCES



# RESOURCES

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- Spider Diagram Tools for ArcGIS 9.2 (New and Improved)
  - ArcGIS script for creating spider diagram created by Tony Palmer, U.S. Army Corps of Engineers
  - <http://arcscripts.esri.com/details.asp?dbid=14908>
- ArcGIS Locator Service
  - [http://resources.esri.com/arcgisonlineservices/index.cfm?a=content\\_detail&contentID=F2865AEC-1422-2418-34AF85DA552B4009](http://resources.esri.com/arcgisonlineservices/index.cfm?a=content_detail&contentID=F2865AEC-1422-2418-34AF85DA552B4009)

## RESOURCES

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- Geocoding a table of addresses with StreetMap North America data
  - [http://webhelp.esri.com/arcgisdesktop/9.3/index.cfm?id=7058&pid=7055&topicname=Geocoding\\_a\\_table\\_of\\_addresses\\_with\\_StreetMap\\_North\\_America\\_data](http://webhelp.esri.com/arcgisdesktop/9.3/index.cfm?id=7058&pid=7055&topicname=Geocoding_a_table_of_addresses_with_StreetMap_North_America_data)
- Personal Geodatabase 101
  - <http://www.dhss.mo.gov/GIS/documents/PersonalGeodatabase101.pdf>
- “The ESRI Guide to GIS Analysis: Volume 1 Geographic Patterns & Relationships” by Andy Mitchell, ESRI Press



## RESOURCES

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- ArcGIS script for creating spider diagram created by Tony Palmer, U.S. Army Corps of Engineers
  - [http://www.dhss.mo.gov/GIS/documents/Geocode\\_Street\\_Map\\_HOWTO\\_Standard.pdf](http://www.dhss.mo.gov/GIS/documents/Geocode_Street_Map_HOWTO_Standard.pdf)
- Best Practices – Preparation of Address Data for Geo-coding
  - [http://www.dhss.mo.gov/GIS/documents/Geocode\\_PreparingInputAddressData\\_BestPractices.pdf](http://www.dhss.mo.gov/GIS/documents/Geocode_PreparingInputAddressData_BestPractices.pdf)
- “GIS for Health Organizations” by Laura Lang, ESRI Press



# Q AND A

