

Geocoding and GIS modeling

Geocoding

- Process of transforming a *description of a location* to coordinates on the Earth's surface

2850 S University Dr,
Fort Worth TX 76109

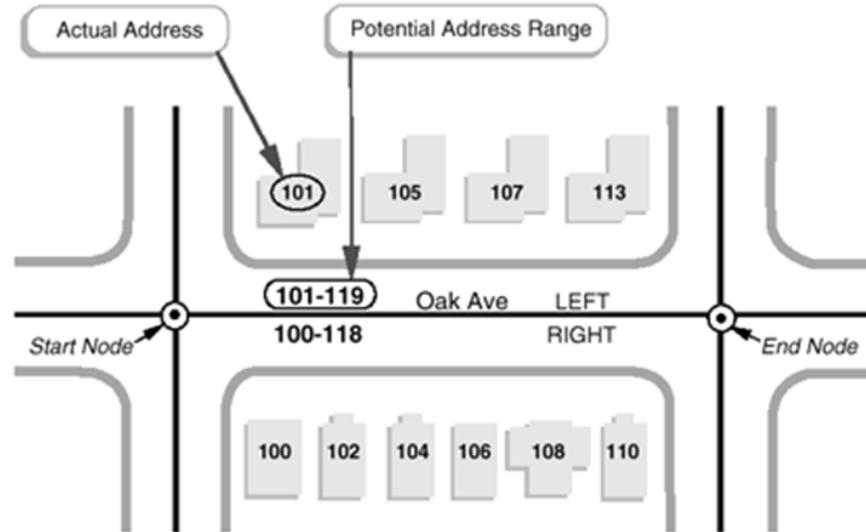


Geocoding

- **Locational description** matched to a reference dataset
- Types of geographic references:
 - Street centerlines
 - Parcel data
 - Composite locators

Street centerlines

- Reference data (e.g., TIGER/Line files) contain address information for street segments
- Geographic position of address determined by linear interpolation



Record Type 1 contains separate data fields for both the start and end of each address range.

Record Type 1				Address Range			
RT	TLID	FENAME	FETYPE	Left side		Right Side	
				Start	End	Start	End
1	0007654320	Oak	Ave	101	119	100	118

Image credit: DiBiase, D., *The Nature of Geographic Information*

Street centerlines

Table

HP_lines

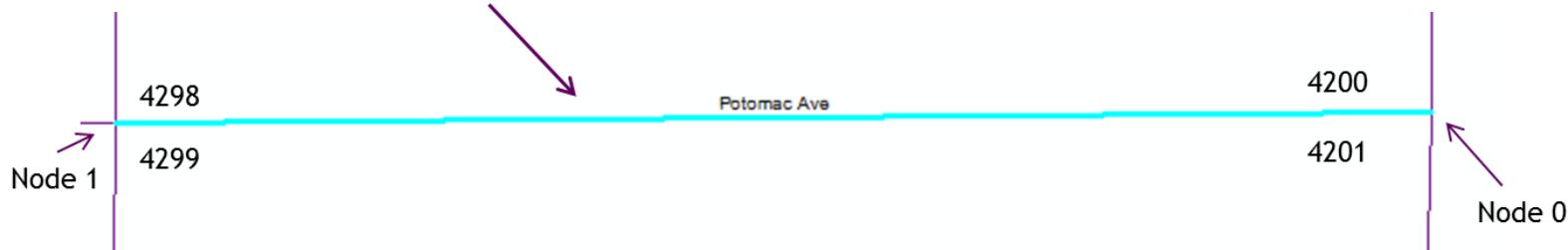
FULLNAME	SMID	LFROMADD	LTOADD	RFROMADD	RTOADD	ZIPL	ZIPR
Eastern Ave	605	5001	5099			75209	S
Roland Ave	605	4733	4797			75219	S
Lomo Alto Dr	605	5101	5199	5100	5198	75205	75205
Lomo Alto Dr	605	5051	5099	5050	5098	75205	75205
Armstrong Pkwy	605	5051	5099	5050	5098	75205	75205
S Versailles Ave	605	4501	4599	4500	4598	75205	75205
Potomac Ave	605	4201	4299	4200	4298	75205	75205
Livingston Ave	605	4301	4399	4300	4398	75205	75205
Versailles Ave	605	4201	4299	4200	4298	75205	75205
Preston Rd	605	4951	4999	4814	4998	75205	75205
Belclaire Ave	605	4301	4399	4300	4398	75205	75205
Livingston Ave	605	4201	4299	4200	4298	75205	75205

HP_lines

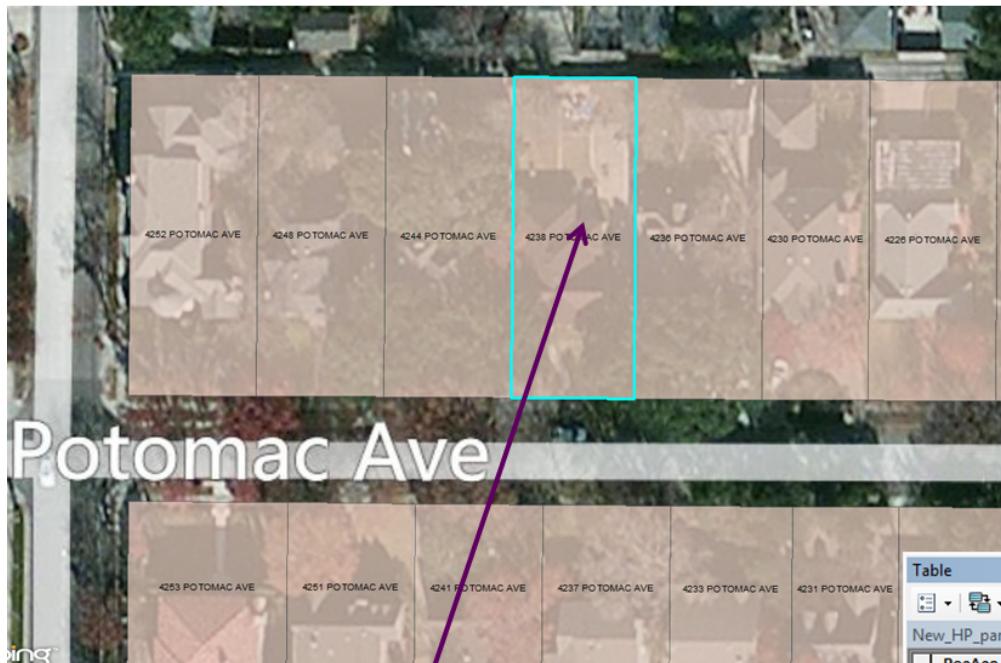
Highland Park, TX



Point will be placed on one side of line segment



Parcel data

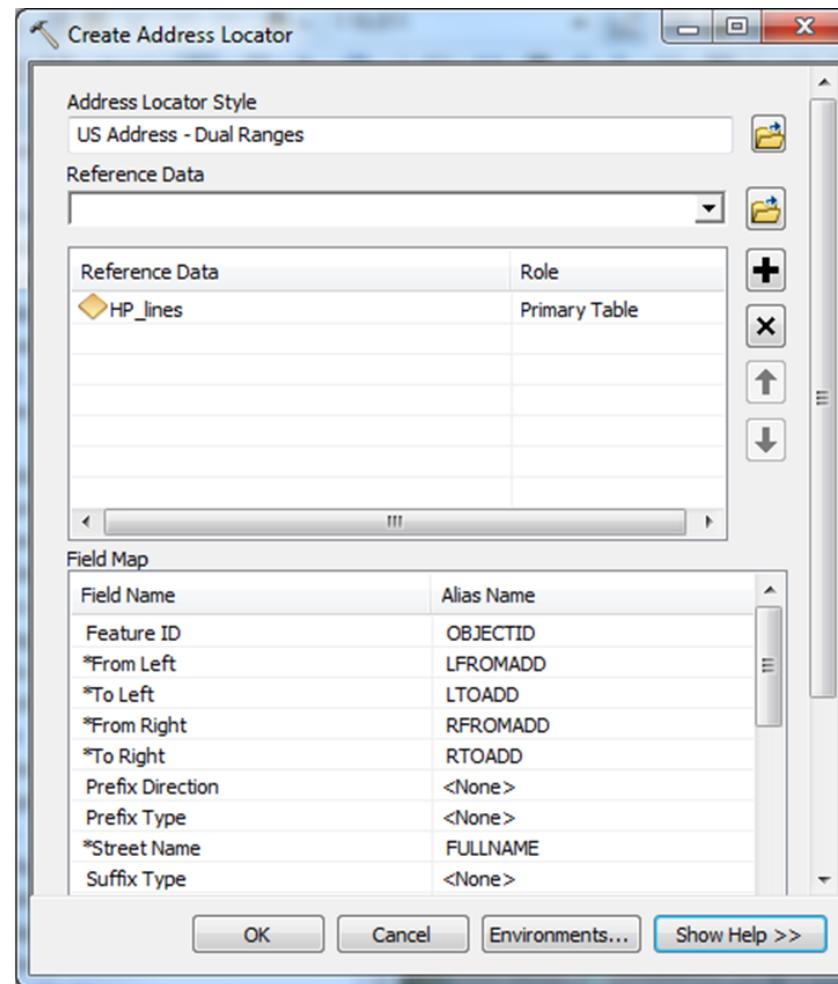
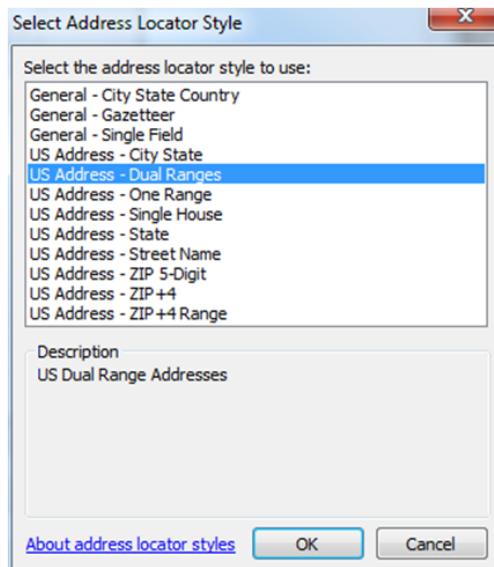
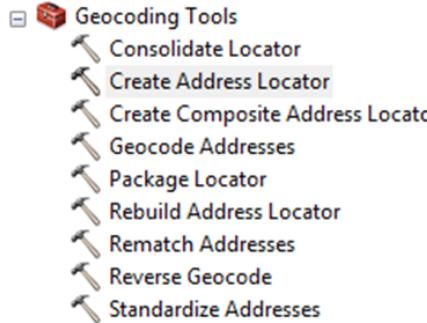


Point will be placed at center
of corresponding parcel



RecAcs	address	street_num	full_street_name	Shape_Length	Shape_Area
0.1722 a	4218 POTOMAC AVE	4218	POTOMAC AVE	400.000234	7499.99
0.1894 a	4222 POTOMAC AVE	4222	POTOMAC AVE	410.000613	8250.012
0.2066 a	4226 POTOMAC AVE	4226	POTOMAC AVE	419.999991	8999.980
0.1722 a	4230 POTOMAC AVE	4230	POTOMAC AVE	400.000225	7500.029
0.2066 a	4236 POTOMAC AVE	4236	POTOMAC AVE	419.999991	8999.994
0.1980 a	4238 POTOMAC AVE	4238	POTOMAC AVE	415.000302	8625.032
0.2066 a	4244 POTOMAC AVE	4244	POTOMAC AVE	419.998991	8999.965
0.2066 a	4248 POTOMAC AVE	4248	POTOMAC AVE	419.999495	8999.963
0.2066 a	4252 POTOMAC AVE	4252	POTOMAC AVE	420.000991	9000.055
0.2066 a	4300 POTOMAC AVE	4300	POTOMAC AVE	420.000495	9000.040
0.1894 a	4304 POTOMAC AVE	4304	POTOMAC AVE	410.000108	8250.011
0.1894 a	4308 POTOMAC AVE	4308	POTOMAC AVE	400.000613	8240.050

Building an address locator



Geocoding services

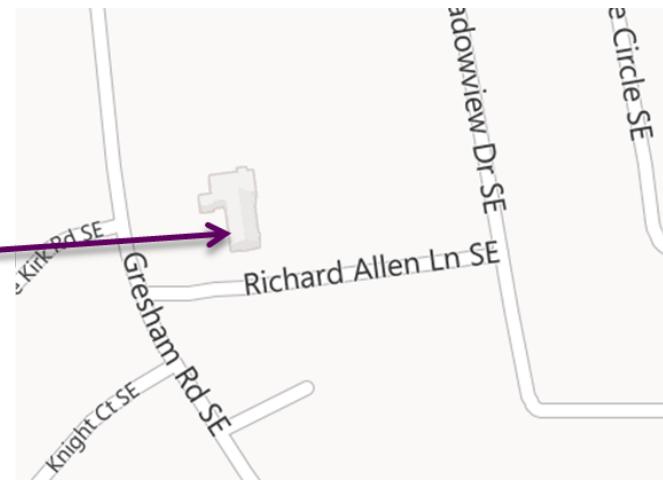
- ArcGIS Online: composite locator available through ArcGIS for Desktop w/organizational subscription
- Google: Limit of 2500 addresses/day without subscription
- Others: Bing, Yahoo, many more.

Which geocoder to use?



Geocoding error

A	B	C
1 Church	Address	City
14 Custer Avenue	1049 Custer Ave SE	Atlanta
15 Daleview	37 Daleview Dr SE	Atlanta
16 Empire Boulevard	800 Hutchens Rd SE	Atlanta
17 Grant Park	255 Georgia Avenue SE	Atlanta
18 Gresham Park	2046 Sage St SE	Atlanta
19 Lakeview	1539 Cecilia Dr SE	Atlanta
20 Lakewood Heights	1800 Jonesboro Rd SE	Atlanta



Table

Parishes_NAD83

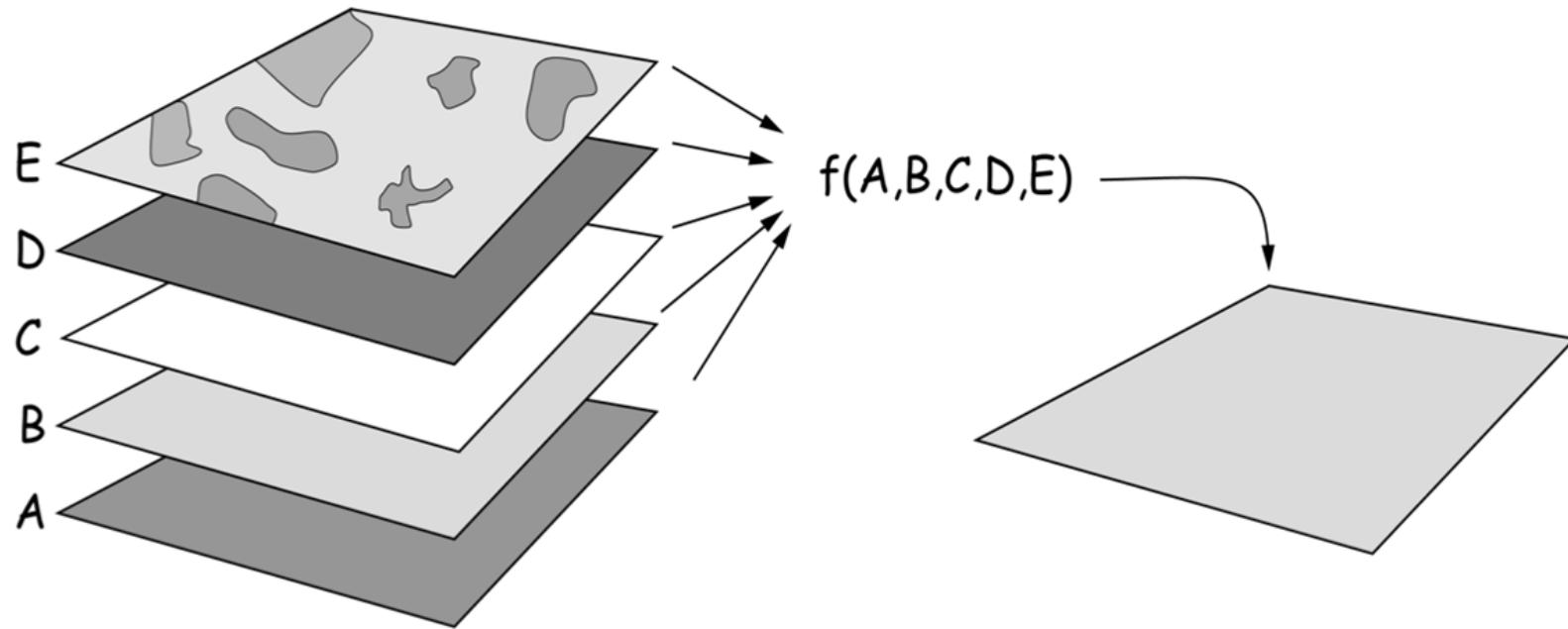
Address	City	State	Zip
Audubon & Early Sts	Paradis	LA	70070
Bacon Rd	Littleton	NC	27850
Bad Address	Forestport	NY	13338
Bad Address	Wilmington	DE	19809
Bad Address	Augusta	GA	30909
Bad Address	Fort Leonard Woods	MO	65473
Bad Address	Bayard	NE	69334
Bad Address	Selma	CA	93662
Bad Address	Smithville	TN	37166
Gatesland	Batesland	SD	57716
Beach Rd	Winter Harbor	ME	04693
Bear Creek	Landry	SD	57636
Bering	Kivalina	AK	99750
Birch Creek Village 26 miles SW of Fort Yukon	Fort Yukon	AK	99740
Bishop Hare Rd	Mission	SD	57555
Blackfoot	Blackfoot	SD	57601

Examples of geocoding error can include historical address discrepancies (above) or poor source information (left)

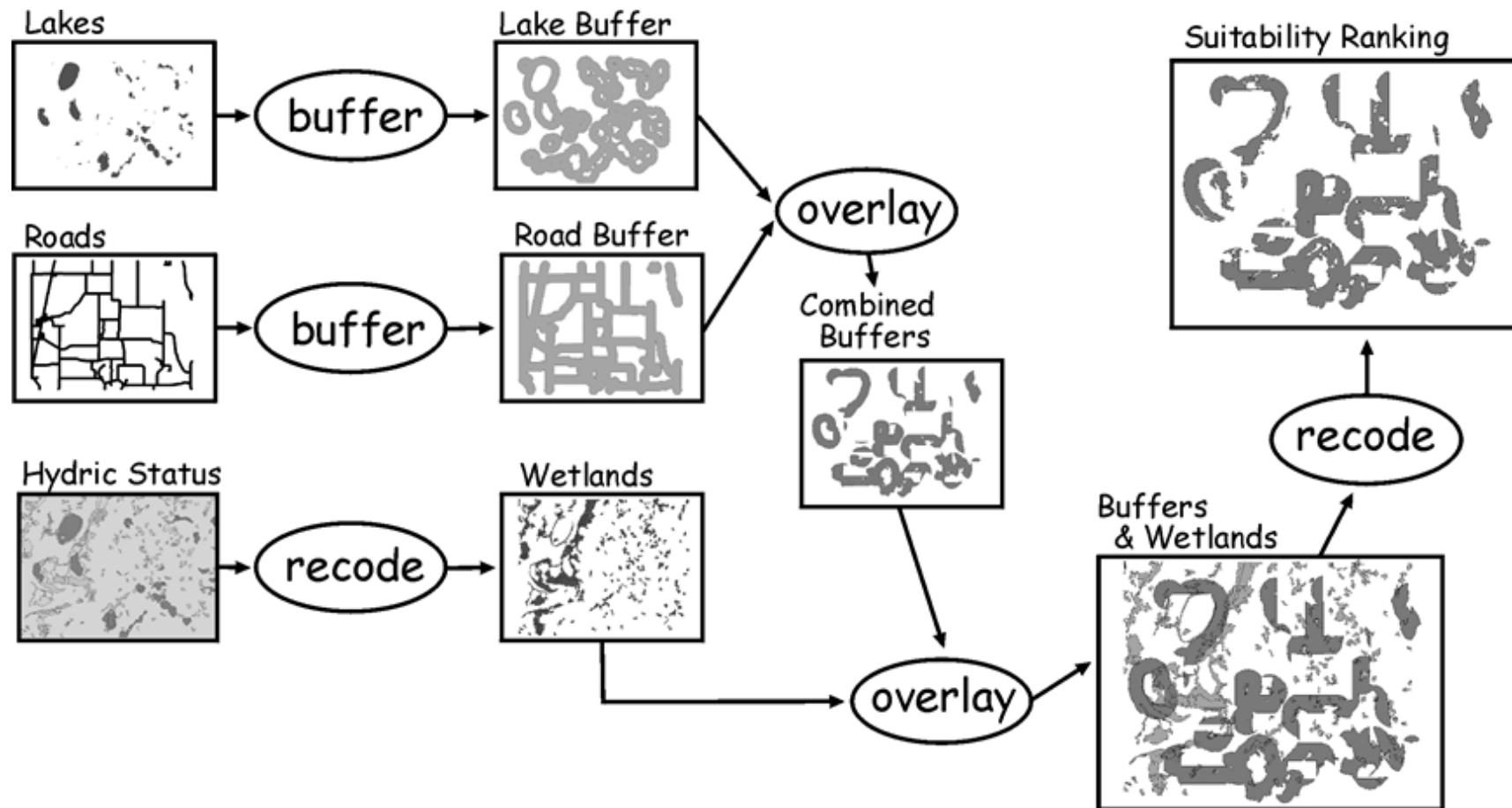
GIS modeling

- Some sort of description or process of spatial phenomena
- Types:
 - Simple spatial models
 - Cartographic models

Simple spatial models



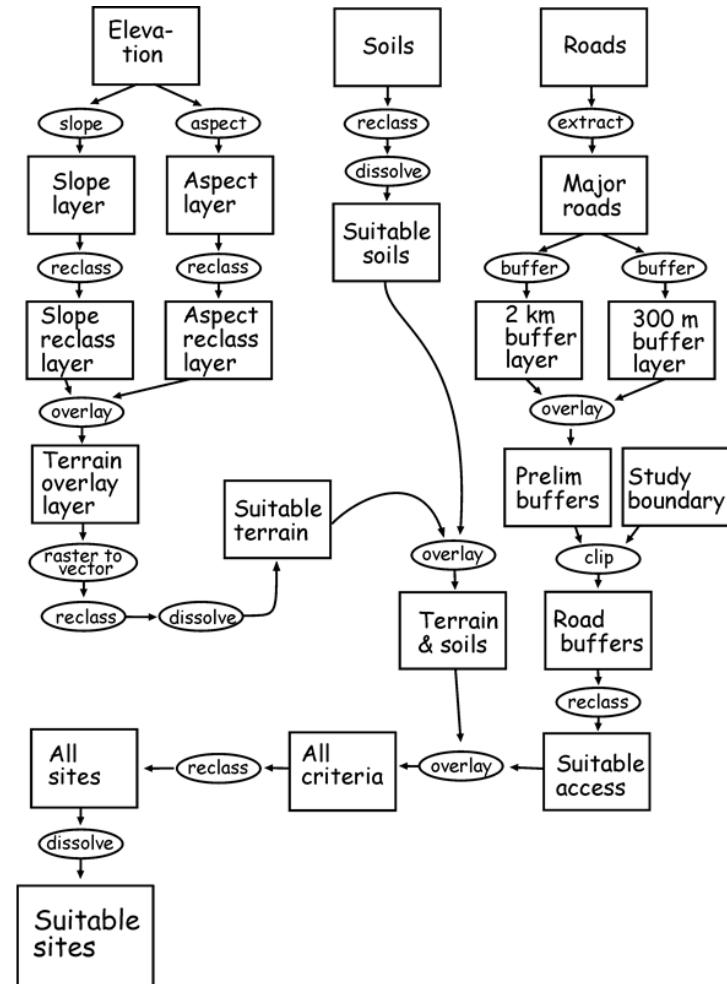
Cartographic modeling



Suitability analysis

Table 13-1 Original and refined criteria for cartographic model example.

General Criteria	Refined Criteria
Slopes not too steep	Slopes < 30 degrees
Southern aspect preferred	90 < Aspect < 270
Soils suitable for septic system	Specified list of septic-suitable soil units
Far enough from road to provide privacy, but not isolated	300 meter < distance to road < 2000 meters



Weighted overlay

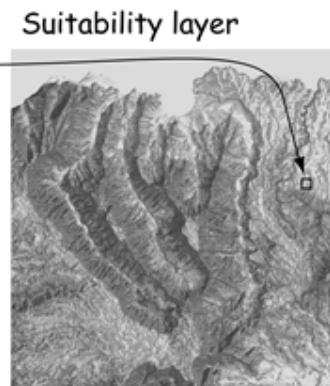
- Assignment of ranks, or weights, to inputs based on their relative importance to the model



2	1	3
2	(2)	3
1	1	3



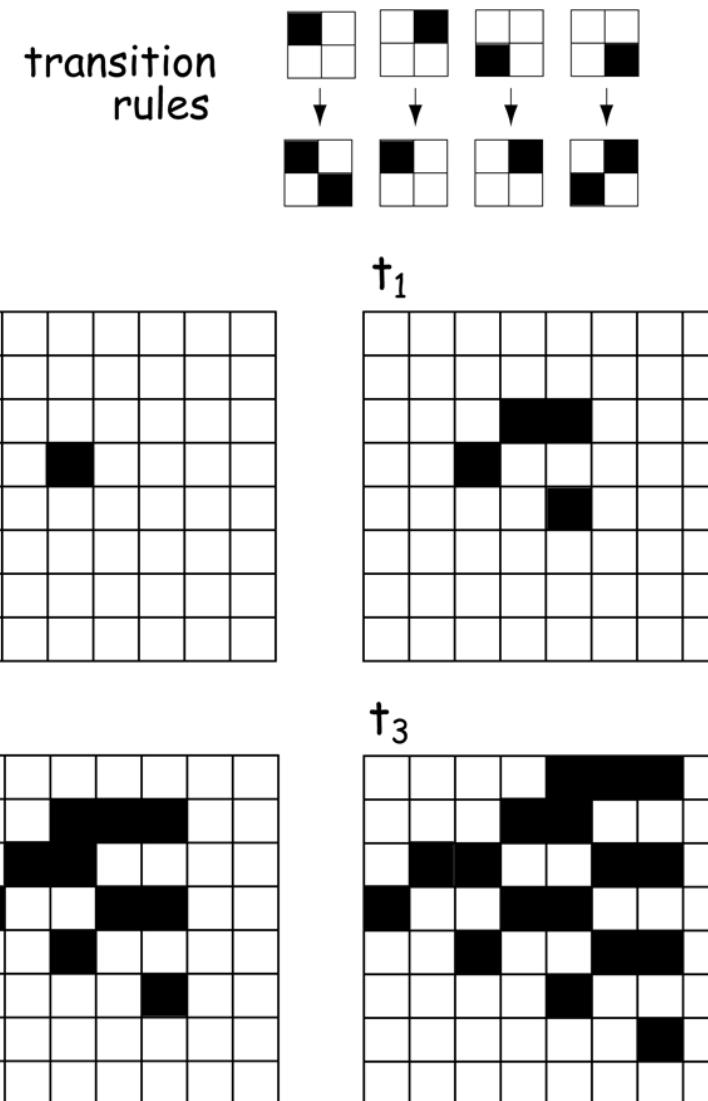
5	1	3
6	(4)	5
2	7	5



$$w_A \cdot 2 + w_B \cdot 4 = \text{suitability layer value}$$

Cellular automata models

- “Rules” applied to input cells based on their arrangement
- Can be used for urban development modeling, land use modeling, etc.



Agent-based models

- "Agents" move around a digital landscape based on a set of rules or environmental factors
- Used to simulate crowd behavior, animal behavior, transportation networks
- Example: research from Dr. Paul Torrens, University of Maryland

ArcGIS ModelBuilder

- Graphical interface for building geoprocessing models
- Can be configured as "tools" for future use, or exported as scripts

ModelBuilder elements

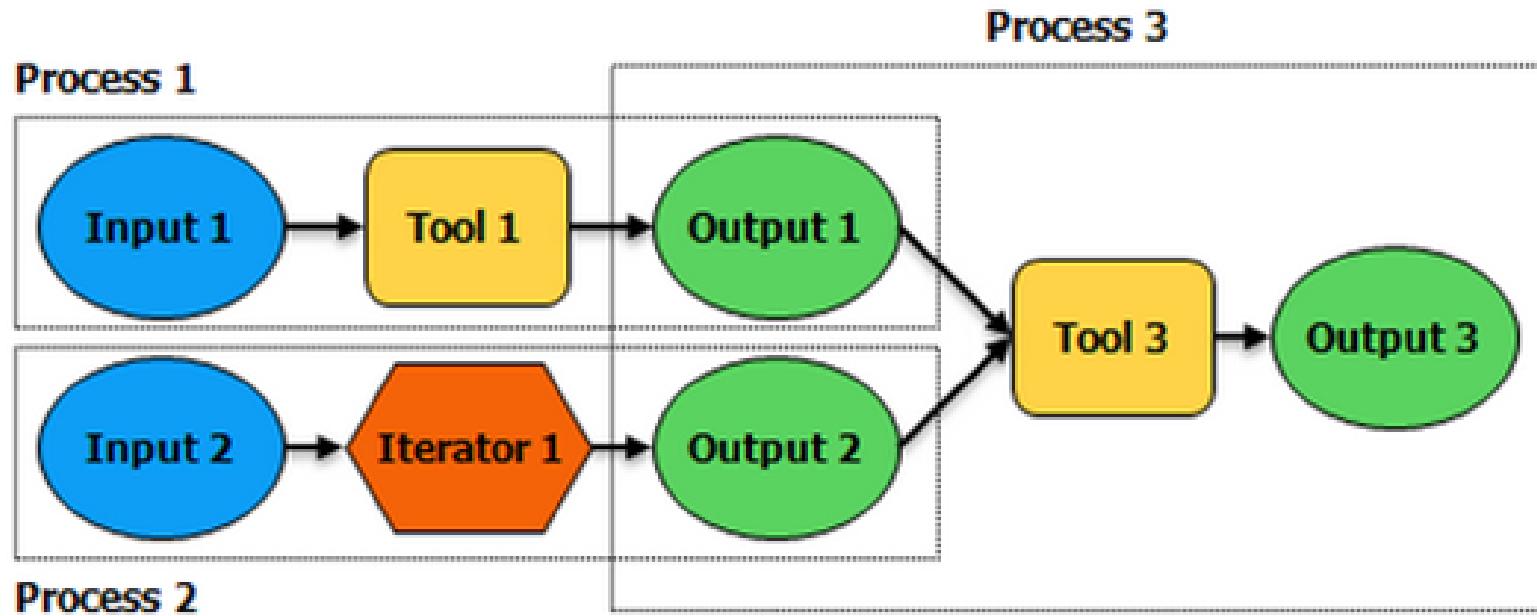


Image credit: Esri

Model iteration

- Iterators allow you to run the model for every element of a given type (feature class, workspace, table, etc.)

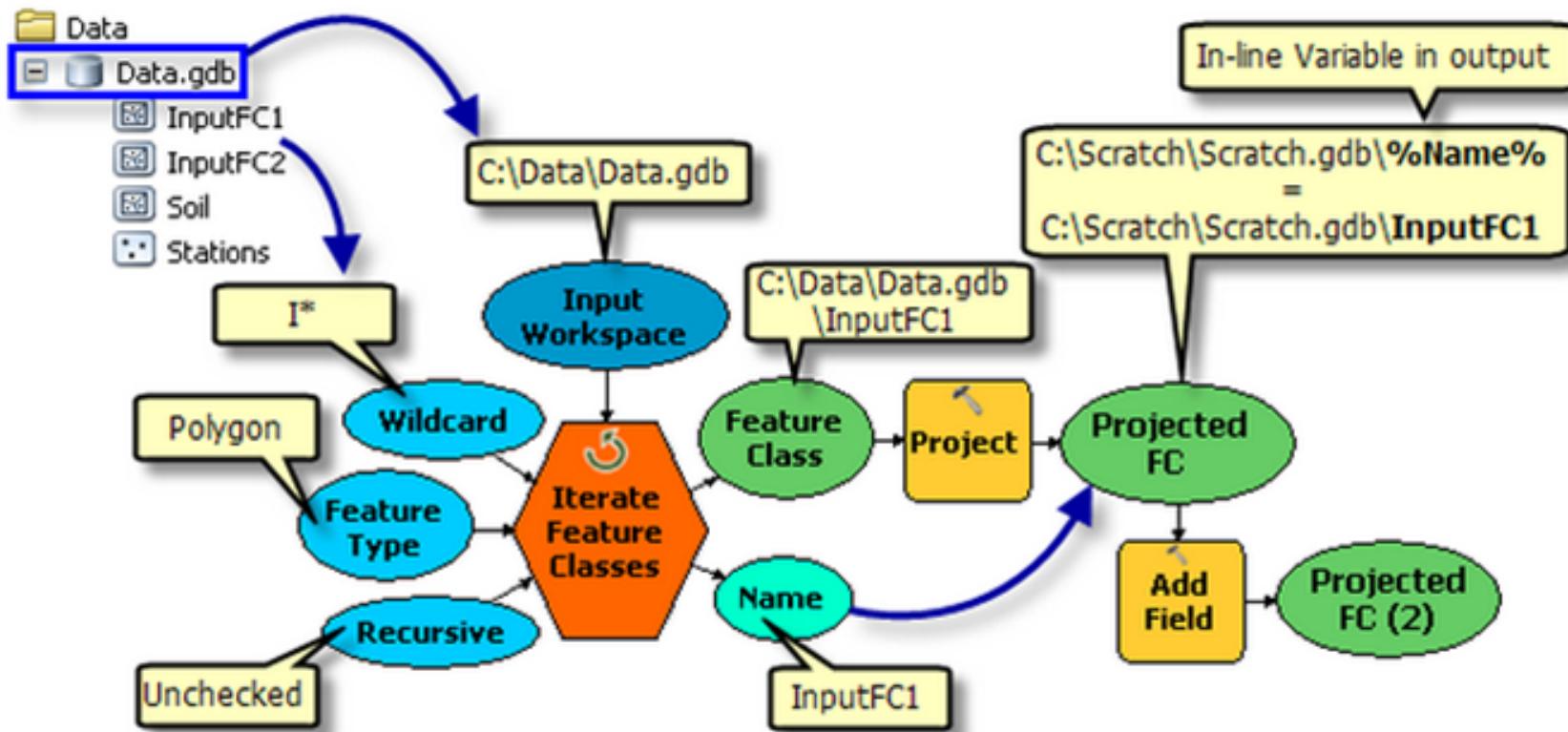


Image credit: Esri

Inline variable substitution

- Model inputs can be used as variables by enclosing them in percentage signs (%)

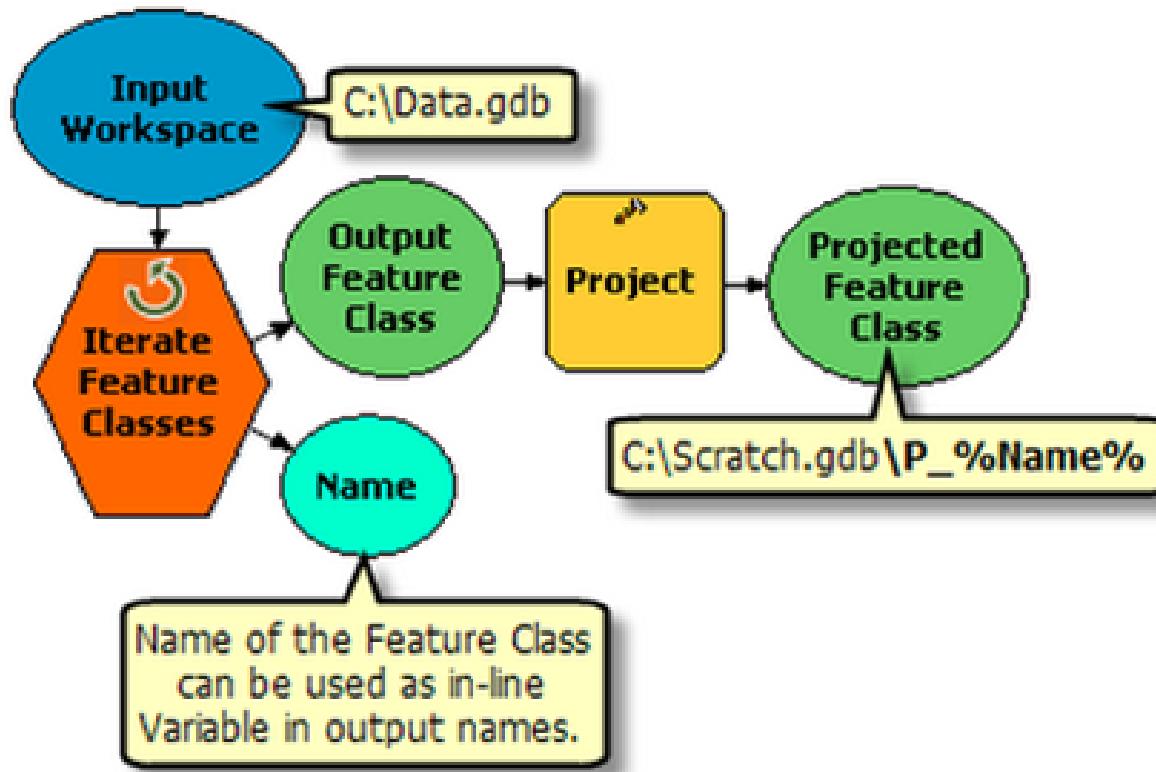


Image credit: Esri

Model parameters and tool development

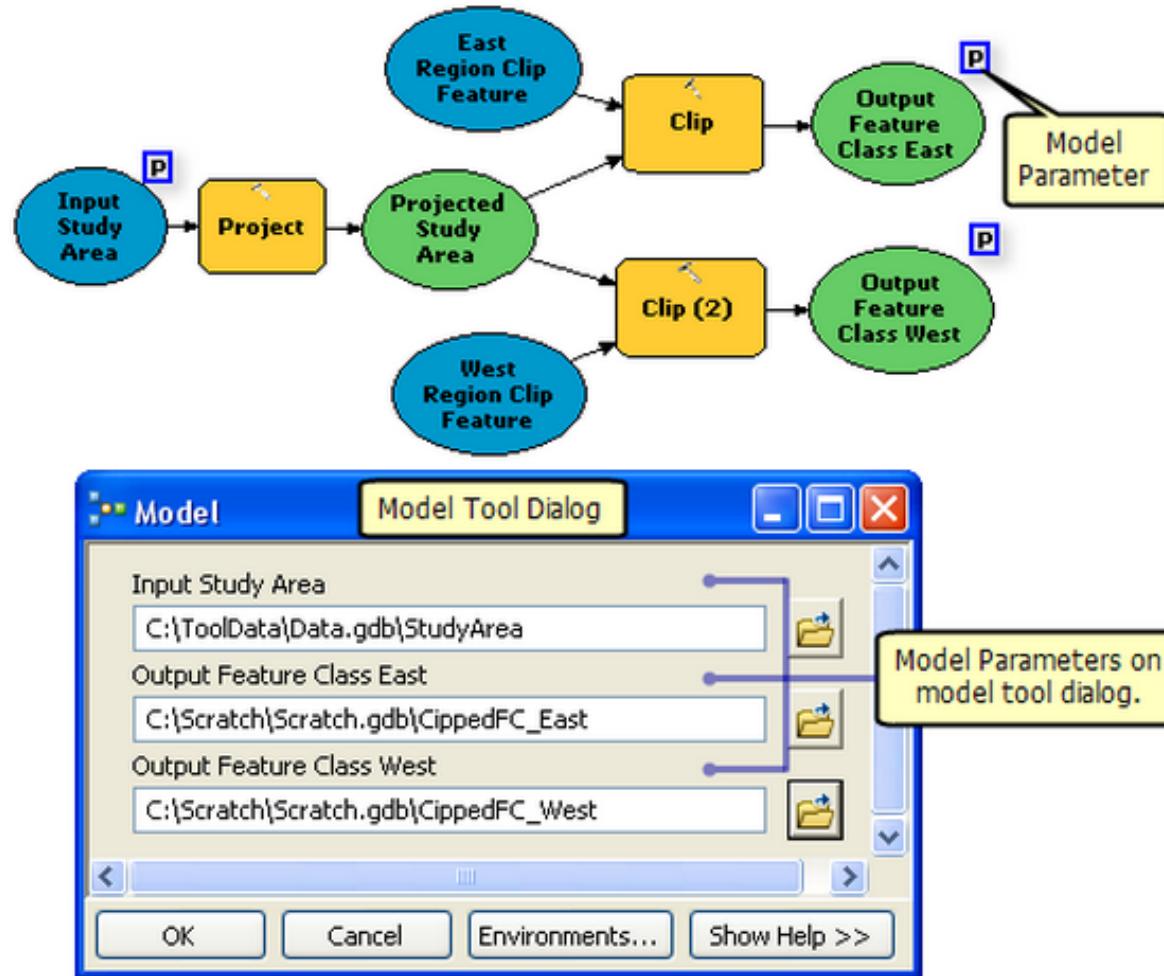


Image credit: Esri