

Population Change Analysis and Nuclear Power Plants in Illinois

Dan Uhrhan

GEOG 596a

Capstone Project Proposal

Advisor: Dr. Todd Bacastow

Agenda

- Original Idea
- Background
- Proposed Methodology
- Goals and Objectives
- Project Timeline
- Anticipated Results
- Questions



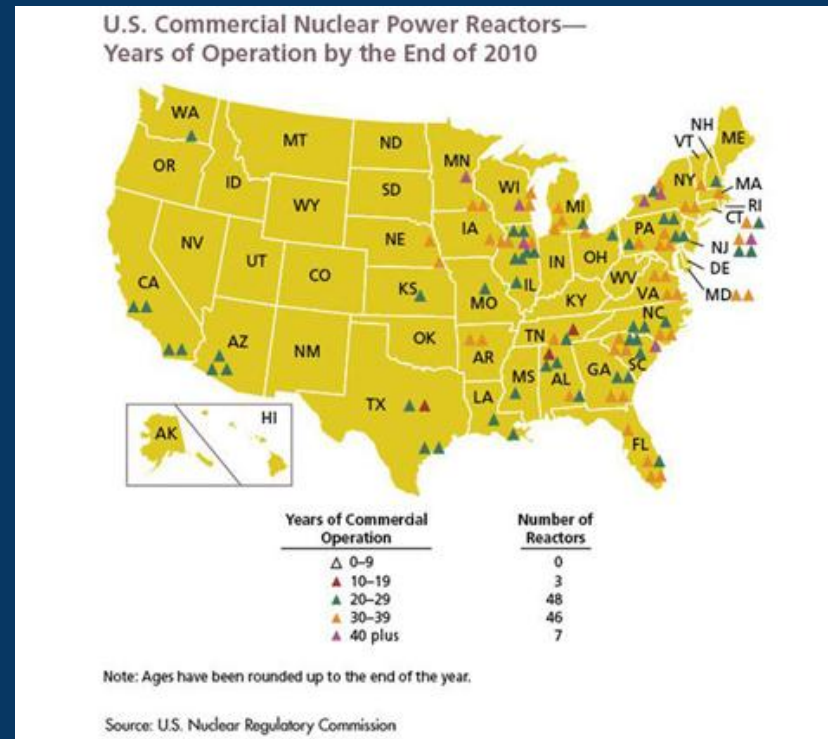
Original Idea

- Beginnings
 - State of Illinois
 - Knew I lived in the state with most reactors
- Looked at past projects
 - Wanted to model project after Mike Team's *Demographic and Spatial Analysis of North Carolina's Nuclear Plants*
- Time to choose



Background

- Short history of nuclear power in the US and Illinois
- Pros/Cons of nuclear power
- Notable problems and disasters



Short History

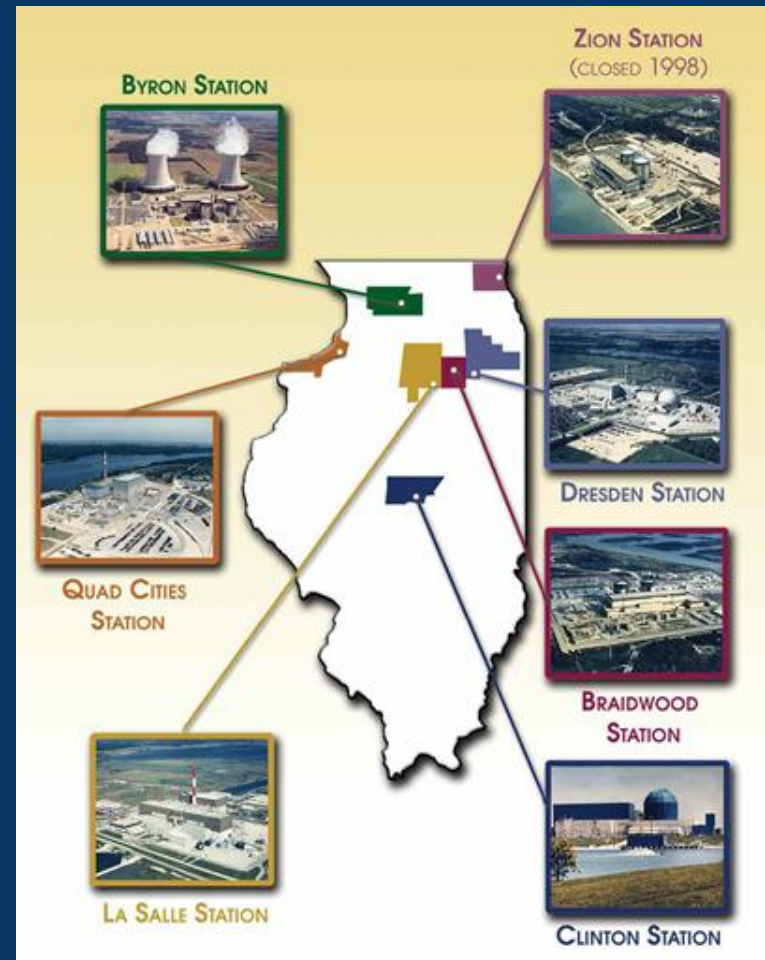
- Manhattan Project
 - 1942: Chicago Pile
- 1957: Shippingport, Pennsylvania
- 1960: Dresden 1 on-line
- 1960-1973: 6 new reactors
- 1978: Dresden 1 off-line
- 1984-1988: 7 new reactors
- 1998: Zion Nuclear Power Station decommissioned



Byron Nuclear Generating Station

U.S. and Illinois Reactor Stats

- 104 reactors nationwide
- 2 new permits issued
- 11 power generation reactors in Illinois
 - 6 facilities in northern half of state



Why Nuclear Power?

Pros

- High power output with zero greenhouse gas emissions
- Petroleum independent
- Advanced Technology
 - Possible future technologies

Cons

- Possibility of incidents
- Wastes and contamination
- Very expensive to build
- Electricity needed to maintain

Notable Problems and Disasters

- 1979: Three Mile Island
 - Partial core meltdown
 - Coolant release
- 1986: Chernobyl
 - Full core meltdown
 - Containment failure
- 2011: Fukushima Daiichi
 - Multiple partial core meltdowns



Chernobyl Nuclear Power Plant, post-disaster

Why does any of this matter?

- Time
 - Things have changed in the last 50 years
- Attitudes
 - How the public perceives nuclear power
- People
 - There are just more people around

Goals and Objectives

- Develop a Risk Terrain Model, or RTM, for the nuclear power plants in Illinois

Proposed Methodology

- Utilize Risk Terrain Modeling, or RTM
- RTM can help us visualize various risk factors in a given location
- Multiple risk layers can be combined into a risk terrain map
- This map can give users an idea of all risk factors, or lack of risk, at every location of an area of interest

U.S. Census Data

- Download Illinois census data from 1960 to 2010
 - Convert to usable tables and then shapefiles
- Format differences
 - 1960 – 1990
 - 2000 – 2010

Part II. Population of the United States and Each State

UNITED STATES -- POPULATION OF STATES: 1930-1990

	1990	1980	1970	1960
UNITED STATES	248,709,873	226,545,805	203,211,926	179,323,175
Alabama	4,040,587	3,893,888	3,444,165	3,266,740
Alaska	550,043	401,851	300,382	226,167
Arizona	3,665,228	2,718,215	1,770,900	1,302,161
Arkansas	2,350,725	2,286,435	1,923,295	1,786,272
California	29,760,021	23,667,902	19,953,134	15,717,204
Colorado	3,294,394	2,889,964	2,207,259	1,753,947
Connecticut	3,287,116	3,107,576	3,031,709	2,535,234
Delaware	666,168	594,338	548,104	446,292
District of Columbia	606,900	638,333	756,510	763,956
Florida	12,937,926	9,746,324	6,789,443	4,951,560
Georgia	6,478,216	5,463,105	4,589,575	3,943,116
Hawaii	1,108,229	964,691	768,561	632,772
Idaho	1,006,749	943,935	712,567	667,191
Illinois	11,430,602	11,426,518	11,113,976	10,081,158
Indiana	5,344,159	5,450,224	5,193,609	4,662,496
Iowa	2,776,755	2,913,808	2,824,376	2,757,537

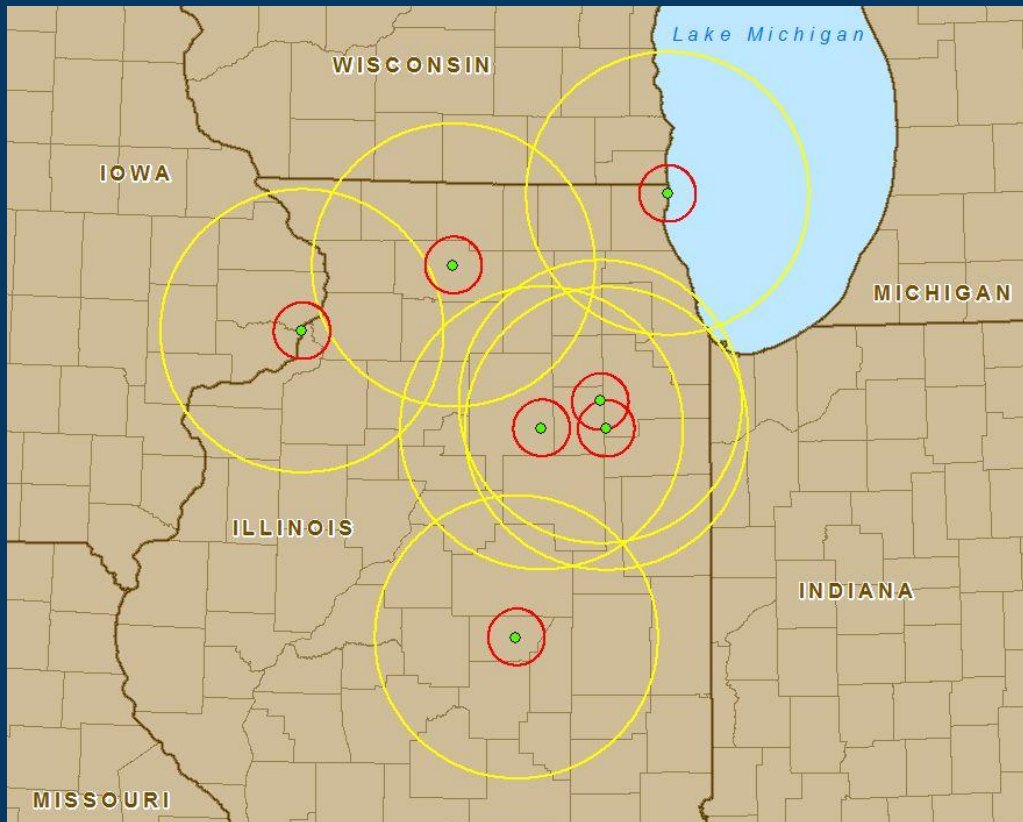
Reactor Locations

- Surprisingly easy to find
 - Exelon Corporation website – Street addresses
 - Wikipedia – Coordinates
 - The State Journal-Register – Google Maps App



Mapping Population

- Best way to figure partial county populations?



- Whole county
- NRC Emergency Planning Zones
 - 10 mile EPZ
 - 50 mile EPZ

Ancillary Data

- Data and objectives do not call for orthoimagery
- Illinois Natural Resources Geospatial Data Clearinghouse (<http://www.isgs.uiuc.edu/nsdihome/>)
- LandScan was mentioned in a presentation last night

Project Timeline

- Weeks 1 – 2: Data compilation
- Weeks 3 – 6: Data manipulation and usage
- Weeks 7 – 9: Presentation report compilation
- Week 10: Present findings for presentation approval

Anticipated Results

- First thoughts
 - Upward trend due to a general rise in the population
- More likely to be a mixed bag
 - Other factors go into considering where to live
- Major nuclear incidents effect
 - Threat of terrorism

References

Exelon Corporation. (2011). Dresden Generating Station Fact Sheet. Retrieved April 28, 2012, from Exelon Corporation Web Site: http://www.exeloncorp.com/assets/energy/powerplants/docs/Dresden/fact_dresdenplant.pdf

Exelon Corporation. (2012). Exelon Corporation: Illinois. Retrieved April 28, 2012, from Exelon Corporation Web Site: <http://www.exeloncorp.com/community/locations/illinois.aspx>

Harder, A. (2012, February 13). Is America Poised For A Nuclear Renaissance? Retrieved April 28, 2012, from National Journal Web Site: <http://energy.nationaljournal.com/2012/02/is-america-poised-for-nuclear.php>

Illinois Emergency Management Agency. (2009, May). Nuclear Generating Facilities in Illinois. Retrieved April 27, 2012, from Ready Illinois: http://www.iema.illinois.gov/iema/radiation/pdf/BNFS_PowerPlantBrochure.pdf

Landis, T. (2011, March 15). Illinois' nuclear ban not going anywhere. Retrieved April 30, 2012, from The State Journal-Register Web Site: <http://www.sj-r.com/top-stories/x13275048/Illinois-nuclear-power-industry-needs-to-learn-from-Japan-state-representative-says>

SJ-R.com. (2011, March 14). Nuclear power stations in Illinois - Google Maps. Retrieved April 30, 2012, from Google Maps: <http://goo.gl/maps/EMJg> or <https://maps.google.com/maps/ms?hl=en&gl=us&ptab=2&ie=UTF8&oe=UTF8&msa=0&msid=208109426211512772807.00049e772338fc1290bbb>

United States Census Bureau. (1996). Population of States and Counties of the United States: 1790 to 1990. Retrieved April 27, 2012, from United States Census Bureau Web Site: <http://www.census.gov/population/www/censusdata/pop1790-1990.html>

United States Department of Energy. (2010, November 22). CP-1 Goes Critical, December 2, 1942. Retrieved April 27, 2012, from The Manhattan Project: An Interactive History: http://web.archive.org/web/20101122183641/http://www.cfo.doe.gov/me70/manhattan/cp-1_critical.htm

United States Nuclear Regulatory Commission. (2012, March 29). NRC: Zion Units 1 & 2. Retrieved April 30, 2012, from United States Nuclear Regulatory Commission Web Site: <http://www.nrc.gov/info-finder/decommissioning/power-reactor/zion-nuclear-power-station-units-1-2.html>

United States Nuclear Regulatory Commission. (2012, March 29). NRC: History. Retrieved April 27, 2012, from United States Nuclear Regulatory Commission Web Site: <http://www.nrc.gov/about-nrc/emerg-preparedness/history.html>

Questions?

Contact Information:

Dan Uhrhan

dfu101@psu.edu

Work: 314-232-1718