Cartographer: *Eugen Taso* **Course:** UEP 232 – Introduction to GIS **Date:** *May*, 2009 **Coordinate System:** GCS North American 1983 HARN, Miles **Sources:** *Florida Geographic Data Library* US Environmental Protection Agency EGrid

US Census, 2000 ESRI United States Data Maps 906 (M:Drive) GDAE Climate Change Project (S: Drive)

Introduction

There are many objections to nuclear power, but one of the major complaints is that it is a dangerous source of energy, with potential disastrous consequences in case of an accident (i.e. Chernobyl). Despite only one minor incident in U.S.' 50+ year-old commercial nuclear power history (i.e. Three Mile Island), and despite safer, reliable technologies currently available to replace older reactors, critics contend there is still a high safety risk associated with nuclear power.

The Florida nuclear reactors vulnerability assessment examines the vulnerability of different variables (population, infrastructure, natural habitats) within a set distance of a nuclear reactor in the event of a hypothetical nuclear disaster.

There are five nuclear reactors in Florida, according to the Nuclear Regulatory Commission, in three distinct power plants across the State:

Crystal River (1 reactor), located in Citrus County St Lucie (2 reactors), located in St. Lucie County

Turkey Point (2 reactors), located in Miami-Dade County

Although not an exhaustive analysis, the project examines the potential impact on four distinct categories of variables within three "buffer" areas (1-mile buffer, 5-mile buffer and 10-mile buffer):

Population – total population in potential danger, as well as the specific impact on several vulnerable categories (population over 65 years old, population under 18 years old, and Hispanic population)

Travel Infrastructure – total miles of road and railroad in potential danger Built Public Infrastructure – potential vulnerability of hospitals, schools, colleges & universities and nursing/assisted care homes within the buffer zones Wildlife/Nature Impact – potential damage to natural habitats and conservation areas in the state, around the power plants

The goal is to observe the extent of the potential impact of a hypothetical nuclear accident and, if possible, draw some conclusions about nuclear safety.

Methodology and Examples

Information for the project was obtained from the Florida Geographic Data Library, the US EPA and other sources, on roads, railroads, power plants, census blocks, cities, colleges, schools, hospitals, nursing homes, and the Integrated Wildlife Habitat System (a measure of the vulnerability of natural habitat in all areas of Florida). Although there are more variables that could be impacted in the event of a nuclear accident, the selected variables are representative of several different types of disaster management targets found in the literature.

The project was executed entirely using GIS ArcMap. Three "buffer zones" were created around the three power plant locations to allow for specific impact areas. Though in the case of a nuclear explosion, or a reactor meltdown, impact would be much larger than a 10-mile radius, the analysis was limited to this predefined areas in order to obtain some concrete, palpable results.

Spatial joins, spatial analysis, overlays, intersections, clips, and other GIS tools were used to create maps and summary tables containing the selected variables for each of the three individual power plants in Florida. The variables falling within the buffer zones are deemed vulnerable to a potential disaster.

Seven distinct maps, in addition to data tables, were created for each individual power plant, representing the different variables for the analysis. There are four maps for each power plant based on the census variables, one map for the roads and railroads, one map for schools, colleges, nursing homes, hospitals and finally one map for the wildlife impact of a potential disaster.

The maps to the right represent examples of the total work that was performed. They show selected vulnerable variables for the three power plants, and allow for an overall picture of the impact of a potential nuclear disaster.

Nuclear Reactors Vulnerability Assessment Florida Three-Buffer Analysis



The results of the analysis are presented in the tables below, f individual nuclear power plant. After conducting the analysis, conclusion is that there is significant vulnerability in case of disaster in Florida on infrastructure, wildlife, and, most impor human population (young, old, minorities). Nonetheless, it is

parent that nuclear power plants in Florida were built relatively far from heavily populated centers, allowing for at least a 5-mile buffer from the location of the nuclear reactor. Based on these findings, for future nuclear projects, if the same standards are maintained, impact can be minimized by correctly identifying a remote site for the location of the power plant, as well as by limiting human settlements to least 10 miles distance from the reactor.

	1 Mile	5 Mile	10 Mile
Interstate Miles*	0	0	12
State Highway Miles**	0	0	18
Local Road Miles***	7	101	856
Population Over 65****	0	19	8410
Population Under 18****	0	139	38004
Population Hispanic****	0	184	51634
Total Population****	0	426	111611
Schools	0	0	69
Nursing Homes	0	1	396
Colleges and Universities	0	0	1
Hospitals	0	0	2
Wildlife Vulnershility Median	4	Α	4

intes). Nonetheles	5, It	12
Crystal River Buffer	Statis	sti
	1 Mile	5
Interstate Miles*	0	
State Highway Miles**	0	
Local Road Miles***	13	1
Population Over 65****	1	6
Population Under 18****	0	Ę
Population Hispanic****	0	
Total Population****	4	2
Schools	0	
Nursing Homes	0	
Colleges and Universities	0	
Hospitals	0	
Wildl ife Vulnerability Median	6	

****Includes Census Block data from Lew/C

St. Lucie Buffer Statistics							
	1 Mile	5					
Interstate Miles*	0						
State Highway Miles**	0						
Local Road Miles***	11	2					
	47						
Population Over 65****	17	(
Population Under 18****	59	7					
Population Hispanic****	61						
Total Population****	233	3					
Schools	0						
Nursing Homes	0						
Colleges and Universities	0						
Hospitals	0						

WildLife Vulnerability Median 2

*Includes roads with >65mph speed limit Includes roads with speed limits >35mph ***Includes roads with speed limits <35mph ***Includes Census Block data from St. Lu

Crystal River Roads and Rail Vulnerability



Turkey Point Roads and Rail Vulnerabilitv



•	1	
or t1	each	
, u a n	uclear	
rta	ntly,	
al	so ap-	
	10 Mile	
onne 0	10 Mile 0	
7 54	18 666	
69	4773	
39 57	4200 439	
761 0	20648 10	
1 0	23 0	
1	1	
5	5	
out <	65mph	
itrus	Counties	
Mile	10 Mile	
7	54	
53	1272	
41 759	15814 21928	
03 524	9253 87140	
1	61	
2 0	214 1	
0	2	
2	2	
nut –	65mph	
	ounty	
Iro	ads	
SM		
₽ ₽	A	
S	ESS.	
R		
118392 40		
Iroa	ads	
	REDINA	
O.C.		
	S	
	Nuclear Power Plants	
	Pionda Mairoads	
	N	
0 0.5 1	2 3 4 5 Miles	