Top Nuclear Targets in the United States of America

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Abstract

The Russian Federation (RF) is preparing to launch 25-megaton Nuclear Warheads at the United States of America (USA). A spatial analysis of the top 5 potential targets is needed based on city population, and distance from nuclear power plants and military installments. Only the direct damage from the extent of the blast will be considered, all effects from nuclear and thermal radiation will not be taken into account. This situation and its analysis is all hypothetical and limited to the described criterion.

Introduction

In this hypothetical situation, there is a potential threat to the prosperity of the people in the RF. A nuclear war is becoming more of a threat and the RF needs to be prepared to conduct a nuclear strike USA soil. The RF is equipped with 25-megaton nuclear warheads and the extent of their explosive blast damage is categorized by the shock wave it emits. The shock wave is the wall of pressure that expands radially from the explosion and is measured in pounds per square inch (PSI). PSI will be constricted to three separate categories based on the anticipated effected area in miles (Homeland Security News 2014). Table 1 defines each PSI category with a damage radius and brief description of each.

PSI	Damage Radius (miles)	Description
5 to 12	10.7	All infrastructure has been destroyed. Only structural remains or foundations can be seen. 50% of the population is dead, 40% injured on impact.
2	20	Most infrastructure has been destroyed or heavily damaged. Debris from blast is littered everywhere. 5% of the population is dead, 45% injured on impact.
1	30.4	Infrastructure is moderately damaged. Debris from blast causes most injuries. 25% of the population is injured, the rest unharmed.

Table 1: 25-megaton nuclear warhead PSI blast damage distance and description.

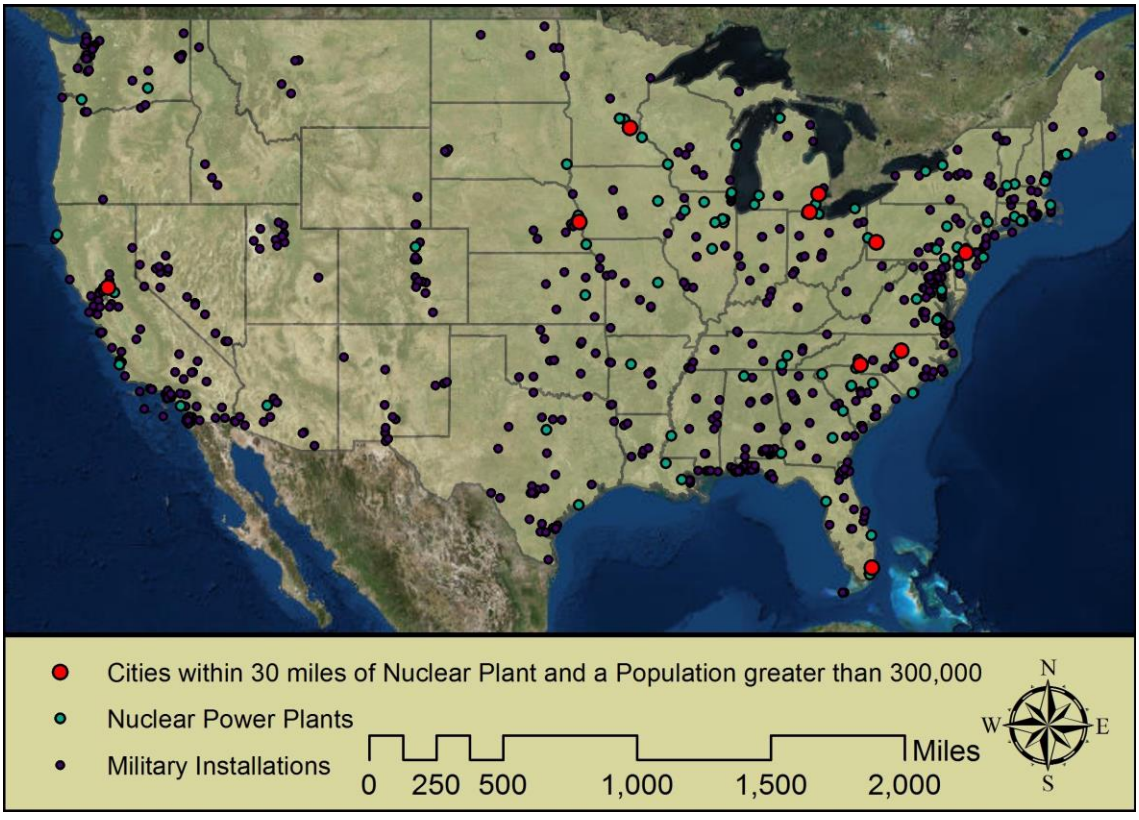
In theory, RF wants to have the strongest impact when attacking the USA. Targets must be cities with a large population, and within the blast radius of nuclear power plants and military installments. The RF is committed to making the strongest impact on common USA society by civilian casualties, limiting viable power supplies,

and destroying military infrastructure. Esri's ArcMap 10.1 will be used as the primary tool to conduct this spatial analysis.

Methods

Spatial data for this project was collected from several sources: USA city locations and populations were gathered from the United States Census, nuclear power plant locations via International Atomic Energy Agency, and military installations from USA's Department of Defense website (see acknowledgments and bibliography). Each data source is reasonably accurate given they were all produced by a USA government branch or a nationally recognized agency. Each data set was then projected with ArcMap into the geographic coordinate system WGS 1984 for versatility.

In ArcMap, each data set was uploaded and examined for accuracy, geographic extent, and quality of the data. Once concluded, potential cities were limited using the Raster Calculator by populations over 300,000 people. This significantly decreased the number of cities, yet maintained only cities with a larger population. Next, a buffer of 30.4 miles was established around all nuclear power plants. Then, an intersection of the buffer and potential cities was performed to refine cities near nuclear power plants. A buffer of 10.7 and 20 miles was first conducted, but there were fewer than the 5 cities remaining. Alaska and Hawaii had no potential targets remaining. Figure 1 shows potential targets after the nuclear power plant buffer, and the location of nuclear power



plants and military installments in the USA.

Figure 1: Location of potential targets after initial spatial analysis.

Continuing in ArcMap, a buffer of 30.4 miles was added to each potential target, and then intersected with military installments to display and formulate each effected military installment. Once completed, a field was added in the cities attribute table to display the number of installments within the 30.4 mile radius. The top 5 targets with the highest number of installments was chosen. Each map created was done solely in ArcMap, exported as a JPEG (Joint Photographic Experts Group) and inserted into the final report. The final report was typed and completed in Microsoft Word.

Results

Each of the 5 targets meets the criterion defined by the RF and are the top choices from 8 potential cities. Target cities were narrowed down by the number of military installments and nuclear power plants within the damage radius. Figure 2 displays the top targets the RF would use if they were to use a 25-megaton nuke in the USA.

Figure 2: Top 5 target cities in the USA for a nuclear strike by the RF.

Of the top 5 targets chosen there were 3 other potential cities that could be targeted by the RF if needed. Each target city has a population of over 300,000 people, and has military installments and nuclear power plants that would be directly affected if a 25-megaton nuclear strike would occur in its epicenter. Meeting each criterion as defined by the RF, each target serves as a viable option. Table 2 provides detailed information of each of the 5 target cities with raw data on population, and number of military installments and nuclear power plants within the damage radius.

City	Population	Military Installments	Nuclear Power Plants
Omaha	394,356	5	1
Philadelphia	1,475,892	6	2
Pittsburgh	318,456	3	2
Sacramento	462,910	8	1
Toledo	306,253	6	2

Table 2: Top 5 targets with detailed information on effected entities.

The damage radius of the nuke as defined in the introduction is categorized into three categories based on PSI. The initial shock wave of the nuke will expand the PSI radially and raw data on this distance was used to find potential targets. Figure 3 & 4 provides an in-depth look at two of the top target cities.

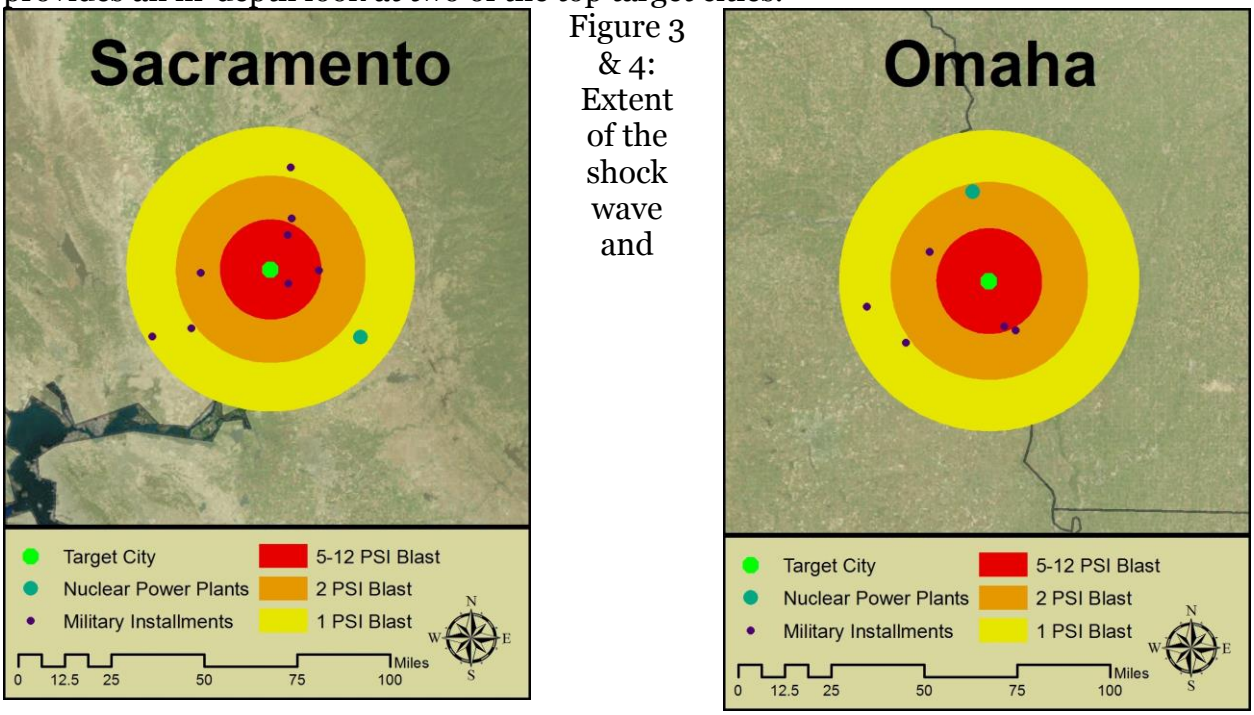


Figure 3 & 4: Extent of the shock wave and impacted surrounding features for Omaha and Sacramento

Conclusion

In this hypothetical situation, the 5 targets determined by a spatial analysis the RF now has 5 potential targets of where to drop their 25-megaton nuclear warheads. Each target city will serve the RF most adequately when launching such strike given their desired criterion. By narrowing down the targets to 5 select cities within the criterion, the RF can now conduct further spatial analysis on the epicenter of each nuke and overall effects. Overall effects could include but are not limited to direct nuclear and thermal radiation. This spatial analysis is necessary when making large impacting decisions such as the proposed nuclear strike. ArcMap is a powerful tool that can be used with public data to make such determinations. Overall, this spatial analysis provides the RF with the top 5 target cities if they were to use 25-megaton nuclear warheads against the USA.

Acknowledgments

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