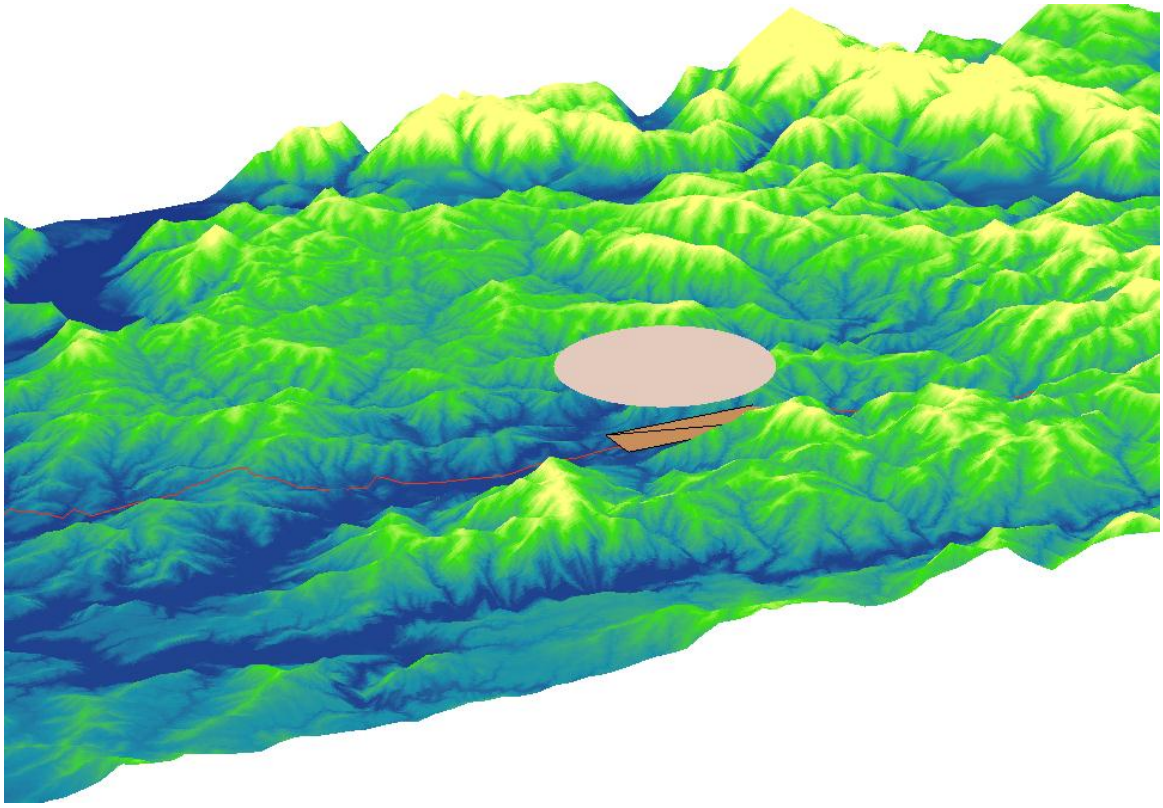
Investigating the Bunker Hill Superfund Site in the Silver Valley of Northern Idaho with GIS



Written by

Thomas Shiparski

CE 547 Introduction to GIS Hydrology

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Introduction

Located in Northern Idaho, the silver valley contains one of the biggest superfund sites in US history. The Bunker Hill Superfund site, created in 1983, originally covered 21 square miles and encompassed the towns of Pinehurst, Smelterville and Kellogg. The area was deemed a superfund site due to the large concentrations of lead in the upper soil levels. These high lead levels were a result of the local smelter built in 1917.

The EPA believes the effects from the local smelter have stretched far beyond the original 21 square mile site. The boundary line for the site has already been increased twice despite local opposition. These increases in the boundary line are due to two reasons. The First reason for the expansions was concern that more contaminated material would be brought down the canyon from other reaches in the basin. It was thought that this other material would redeposit in populated areas already cleanup. The second reason for the expansion was due to the increase in recreation along the river down stream of the Valley.

Though the Cleanup has already proven to be accredited for the decrease in mortality rate and lead blood levels in the town's people, those living in and around the region severally oppose expansion of the site. The Silver valley has been struggling with economical depression since 1982 when the Gulf Resources, the primary operating company for the mines and smelter, claimed bankruptcy. The bad publicity from the negative portrayal as one of the worst cleanup sites adds to their economical issues.

Objective

In this paper I will look at the surrounding watersheds and stream systems around the smelter and analyze the need for the expansion of the superfund Site. I will also research other issues and factors facing this debate.

Methods

To accomplish this I used data provided by Idaho's Geospatial Data clearinghouse, Idaho's department of environmental quality and USGS seamless data distribution. Using arcGIS software I manipulated Digital Elevation Maps (DEM), land cover maps and base maps to perceive a better idea of the topography in the area. For the maps created, I used a 1 arc second DEM. I used the NAD83 projection to produce a better interpretation of the layout of the area.

Results

I first created a shade relief map of the area using the 3D analyst tool in arc catalog. I was able to get a landcover map to place on top of this. Using descriptions of topography and land markers, I used the editor tool to show an approximate depiction of the original 21 square mile box location seen in Figure 1.

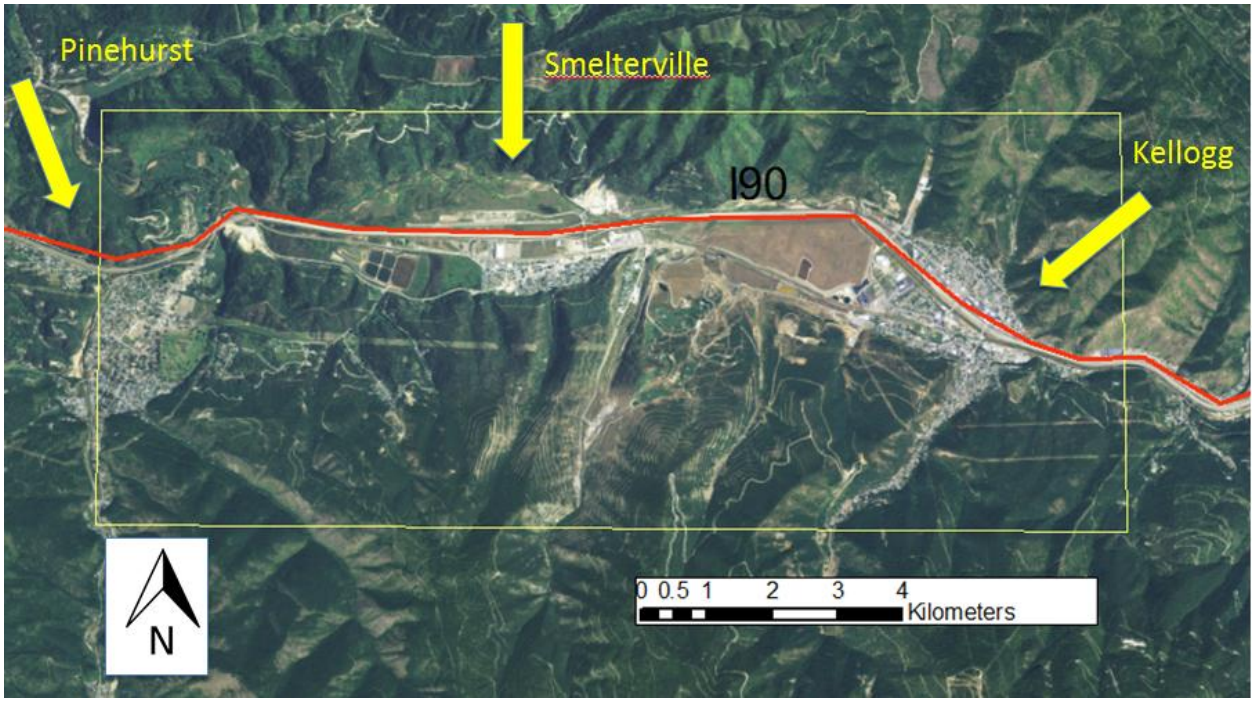


Figure 1 Shows an Arial photo of "the Box" and the three towns most affected.

Using arcSCENE, I took a DEM of the box and surrounding hillside upstream of the box to create a three-dimensional model of the canyon. With this model I attempted show how the surrounding network of streams, funneled everything to the 3 towns in the box.

It was estimated by one source that 3000 tons of lead fallout from the smelter fell over 100 square miles between 1965 and 1981. Figure 2 shows a 5.6 mile radius around the smelter on the three dimensional map. This is where a majority of the fallout would have been. However fallout could have been carried in other directions and also carried on pass this radius in smaller concentrations.

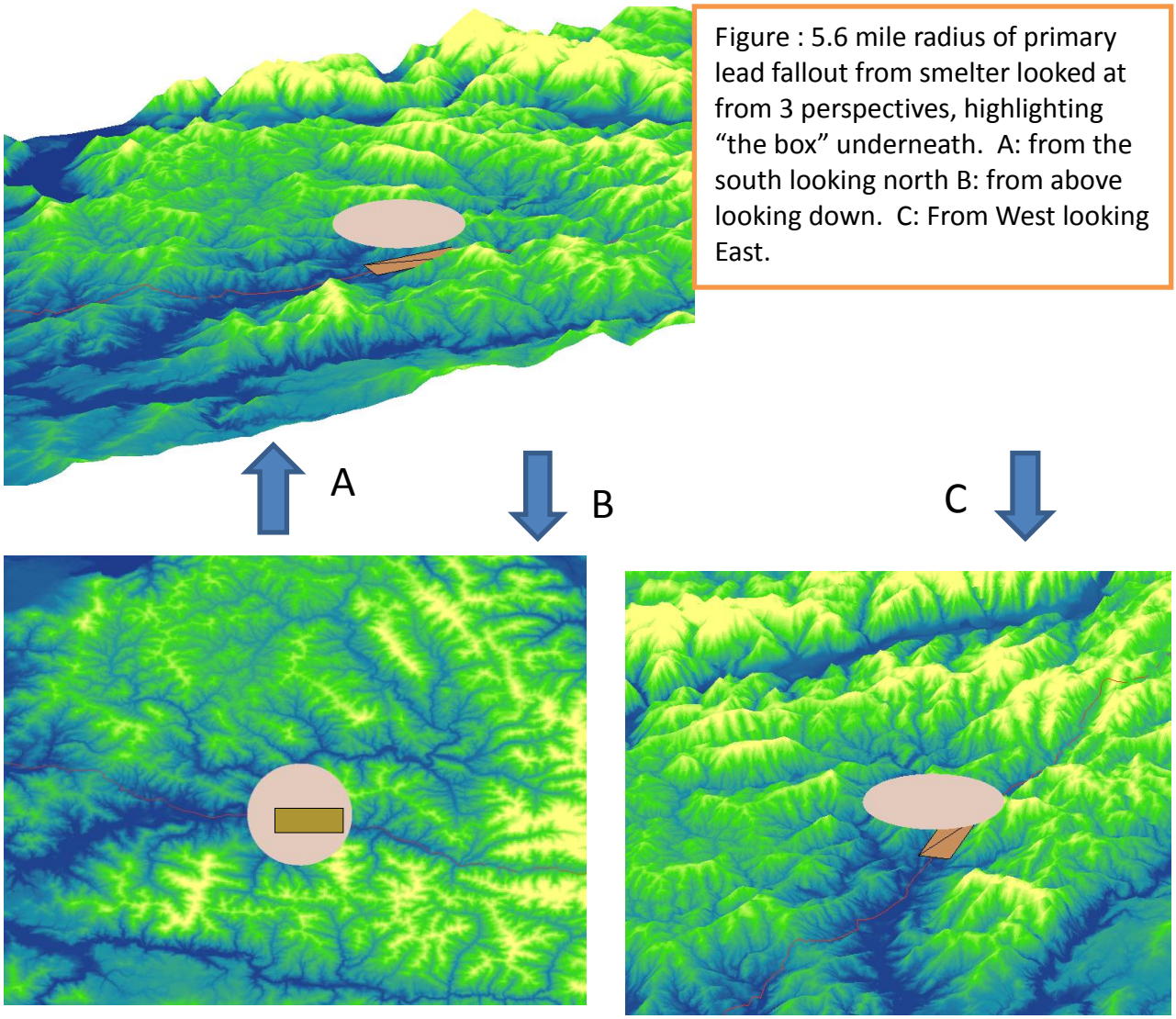


Figure : 5.6 mile radius of primary lead fallout from smelter looked at from 3 perspectives, highlighting "the box" underneath. A: from the south looking north B: from above looking down. C: From West looking East.

The first expansion in 2002 is referred to as "the Basin". The boundaries for this expansion were the outer edges of the three watersheds surrounding the smelter. I used a map showing the Hydrologic Unit Codes across the nation and exported these three watersheds. From these I created a stream flow and accumulation map for the basin seen in Figure 3.

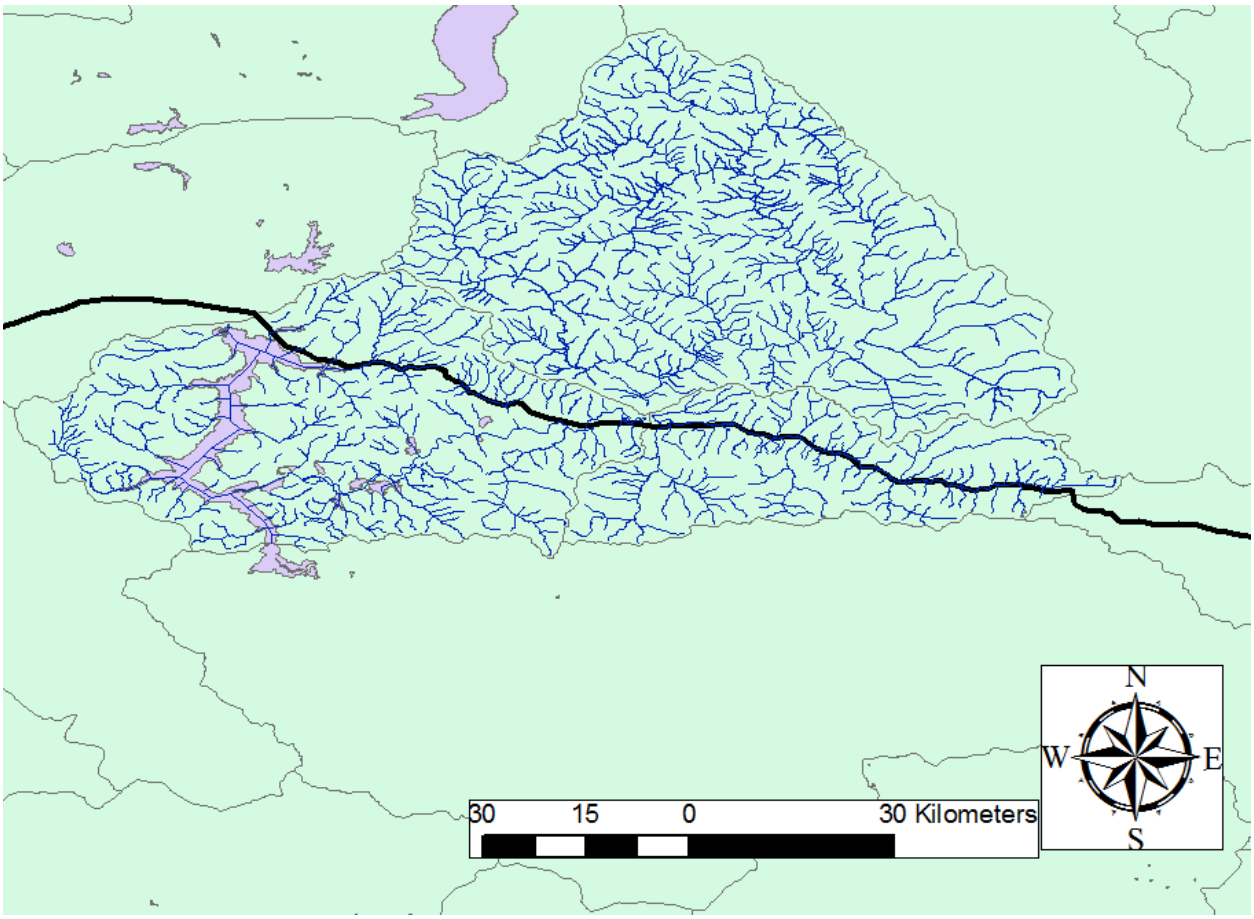
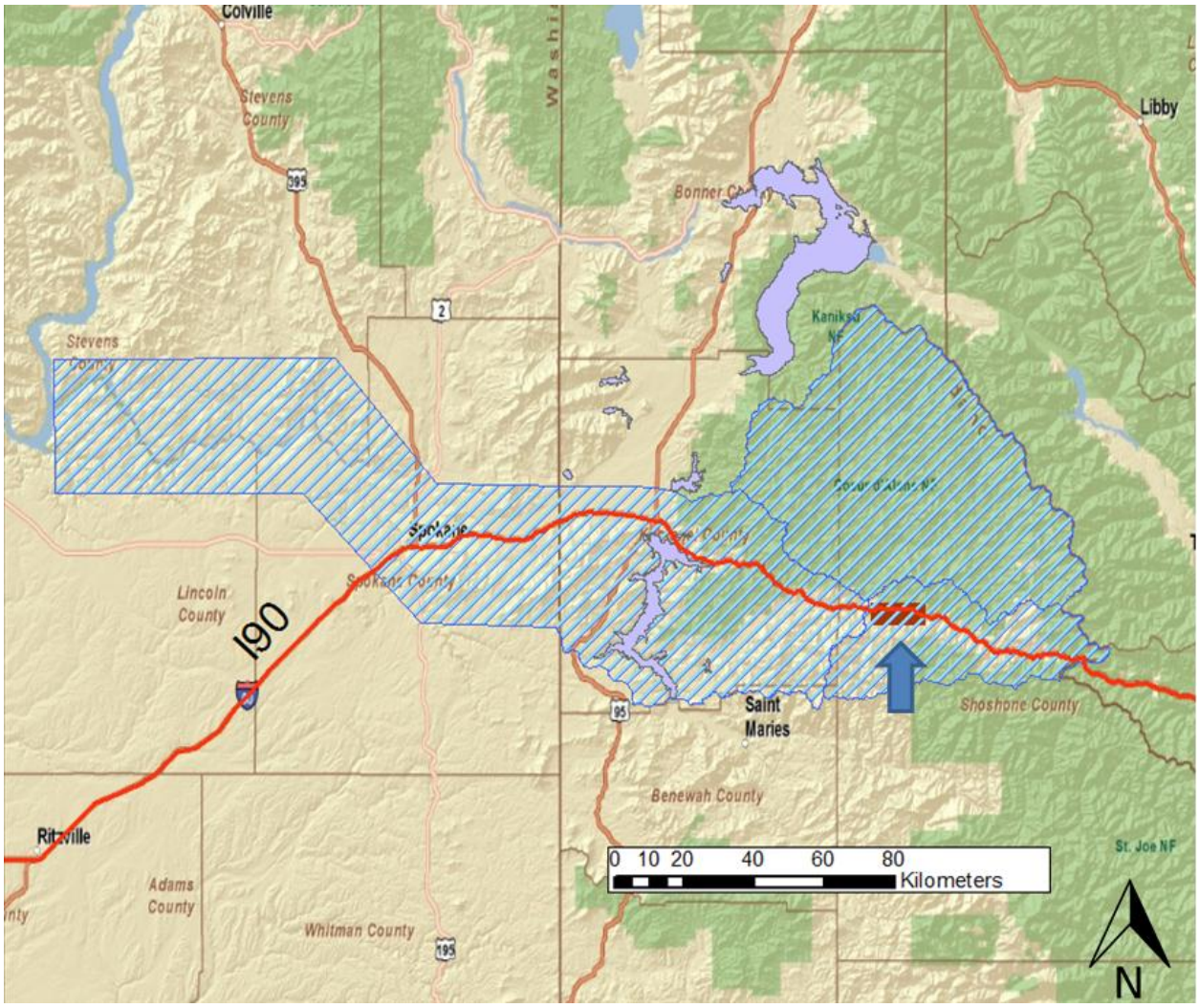


Figure 3 Shows the first expansion, “the Basin” and its stream systems

The second expansion in 2007 was not given a name but added 100 square miles to the site. This expansion was created with lines of latitude and longitude rather than topography as in the first expansion. Given the lines of latitude and longitude, I was again able to use the editor tool and draw in the second expansion. Figure 4 shows the last expansion.

Figure 4 Shows the second expansion of the Basin and highlights the original 21 square miles.



Discussion

After looking at the maps I created with the arc software, the possibility of contamination and continued contamination extending miles beyond the original designated area is apparent. The steep mountainous terrain in the area outside the box creates numerous streams of which to transport contaminated soil. It is likely that we will continually find contaminated areas linked to the smelter. I am sure

that affects from the site could still be measured to a point on the polar opposite end of the earth.

There are examples of many projects and incidents of which the affects can be traced far beyond the central location. The superfund sites were designed to take money from pollutant creating companies and use it to cleanup polluted sites caused by the company. When the companies go bankrupt the funding is still there by other companies still in business and contributing to the funding. However, this plan was designed for small areas. By extending the boundaries in the Silver Valley to where they are now or even farther will likely exhaust funding resources.

I agree that as the areas in and around the silver valley become more and more populated, efforts are needed to assure safety. Perhaps it doesn't need to be considered a part of the superfund site though. I feel the original box did need to be considered a super fund site but the areas out side of this do not. The reasoning in labeling these areas as extensions of the superfund site is to assure funding for the cleanup, but when such a large portion is taken will other sites suffer?

Future Work

I would like to look into soil testing concentrations further outside the basin. I would also want to compare this to other sites that may be enriched with lead in the area. I think weather patterns and wind directions during the peak productions should be looked at as well. These might give a better idea of where higher concentrations would be found. From there we can look at the likelihood of flow accumulation off the higher contaminated areas.

References

Karen Dorn Steele. "EPA Strikes Vein of Anger." Spokesman Review Sunday July 21, 2002. April 18, 2012
http://www.spokesmanreview.com/newsstory.asp?date=072102&ID=s1186145

Silver Valley Resource Center on the web. 2011. Silver Valley Action. April 17, 2012
http://silvervalleyaction.com/index.html

CH2MHILL, Focused Feasibility Study Report: Upper Basin of the Coeur d'Alene River, Bunker Hill Mining and Metallurgical Complex Superfund Site. United States Environmental Protection Agency Region 10 July 2010
http://www.epa.gov/region10/pdf/sites/bunker_hill/upper_basin_ffs_rpt_exec_sum.pdf

S.M. Moodie, E.K. Tsui, E.K. Silbergeld, " Community and family level factors influence care giver to screen blood lead levels of children in a mining community. Environmental Research v110, Issue 5 July 2010, Pages 484-496

Idaho Department of Environmental Quality on the web. 2011. DEQ. March 20, 2012

http://www.deq.idaho.gov/assistance-resources/maps-data.aspx

U.S. Department of the Interior Bureau of Land Management on the web. 01-31-2011. BLM March 20, 2012

http://www.blm.gov/id/st/en/prog.html

United States Geological Services Seamless Data Warehouse on the web. Decemeber 28, 2010. USGS April 18, 2012

http://seamless.usgs.gov/website/seamless/viewer.htm