Factors Influencing EPA Sites Along the Hudson River

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Introduction
The Hudson River is under constant environmental threat from the cities located along its shores. In this project I looked at EPA monitored sites (including sites covered by Superfund) along the Hudson River and their relationships with dam location and urban density. By examining the number of EPA sites in relation to these two environmental factors, we can see if some sites are under substantially more risk than others. My goal in this study was to determine the importance of the relationships between dam density, urban presence, and EPA monitored toxic sites using GIS.

Methods
I used ArcGIS 9.3 to examine the data round the Hudson River. Data for the locations of sites monitored by the EPA, along with data on dams and the ecozones that include the Hudson River, were obtained from the New York Office of GIS. I then layered on ecozone data and polygons showing urban areas (designated “large” or “small”). The boundaries of the urban areas are based on the US Census Bureau’s 2000 population count, and were originally created for transportation purposes. I believe that these polygons are a good indicator of areas strongly affected by urban development. I performed point density analysis to create density layers of each feature. I classified the density layers using the Jenks (natural breaks) method, and overlaid the two density layers (see Figures 2-4). I then created two different buffers around the cities at both 5 km and 10 km to examine how many EPA sites were within a certain radius of a major city. To determine a specific count, I selected by location from the EPA site layer using the buffer layer. I also used a layer containing polygons of urban areas to compare EPA sites with the presence of urban sprawl.

Results
Both EPA sites and dams were located in specific clumps throughout the ecozones that surround the Hudson River (see Figure 1). The locations in the highest bracket of EPA site densities (2.65-4.38) were located around New York City, while the locations in the highest bracket of dam density (0.44-0.68) were locating farther up river. I also found that most EPA sites were located within the boundaries of urban areas, with the most monitored sites located near New York City. Seven hundred sixty-three EPA sites were located within 5 kilometers of an incorporated city, which comes to 52.69%. 81.62% of the EPA sites were located within ten kilometers of a city (1,182 out of 1,448). Once the sprawls of designated urban areas were taken into account, a full 96% of sites monitored by the EPA along the Hudson River are located within the influence of a city (see Figure 5). Ecozone did not seem to have any impact; one ecosystem did not seem to be at more of a risk than another. 555 (38.38%) of the EPA sites were located in the Hudson Valley, 38 (2.62%) in the Hudson Highlands, 63 (4.35%) in the Triassic Lowlands, and 792 (54.7%) in the Manhattan Hills.

Discussion
These findings can help us identify what sites may be at risk in the future. By analyzing the factors influencing currently monitored EPA sites, the EPA and other organizations can prioritize which sites they need to watch for further development. These findings also reinforce the knowledge that large cities can give rise to major environmental problems. There is a clear relationship between proximity to cities and number of EPA monitored sites. EPA sites are located away from dams, implying that dams are not as large a threat environmentally. While the raw data regarding the different ecozones would seem to indicate that some zones were under greater risk than others, it is important to remember that the zones are different sizes, and this must be taken into account. Overall cities had the greatest impact on the locations of EPA sites. In further analysis, data from this study could provide statistical evidence for the relationships examined above.

Conclusions
• 96% of EPA sites are located within urban areas
• 81.62% of EPA sites are found within 10 km of a major city
• EPA sites are located in areas with the least amount of dams
• Ecozone did not have any clear impact

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