Creating and Using a Brownfield Index in Vermont

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Introduction

Brownfields are abandoned or underutilized commercial or industrial properties where redevelopment is often hindered by possible environmental contamination (Kretchik, 2002). According to information compiled by the State of Vermont, there are 195 brownfield sites in the state. These may include gas stations, dry cleaners, chemical manufacturers, and other sites no longer being used. The Vermont Department of Health writes that chemicals can come from sites like these and contaminate water near open areas. Brownfields can thus be the source of negative health effects, both by proximity to people and water sources. Are lower-income towns more susceptible to the harmful effects of brownfields? This project hopes to evaluate the effect of brownfields in different areas and find correlation to income differences.

Methods

Data was compiled from the State of Vermont's Open Geodata Portal. This data includes brownfield sites, public water sources, and geographic information. Town and city data was compiled by the Vermont Department of Labor's 2015 Economic Demographic report. The data was projected using ArcMap into Universal Transverse Mercator, NAD83, Zone 18N. Public water sources were quantified based on their proximity to the nearest brownfield site using an ArcGIS near function. A spatial join function sorted the brownfield sites and public water sources by town. I prepared an index of brownfield effectiveness that could be calculated for each town. The index was based on the amount of water sources within a quarter mile of a brownfield site, the average distance of water sources from a brownfield, the geographic density of brownfields, the amount of brownfields in total, and the amount of brownfields per capita. The highest possible score in each category is 8, meaning 40 is the total possible index in a town. The town indexes were compared to median adjusted income data used from the Vermont Department of Labor with a linear regression and r^2 values.

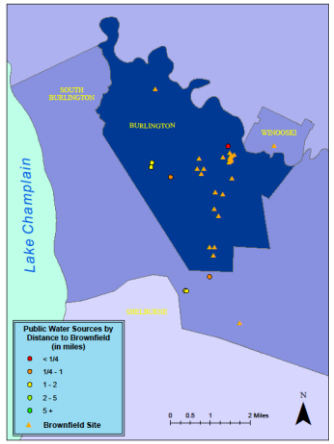
References

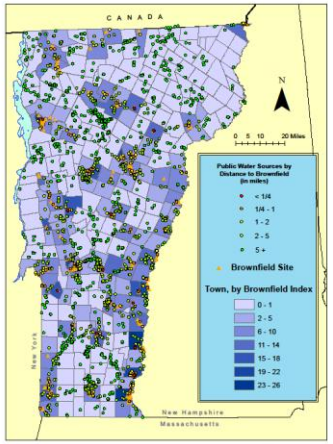
Bambra, Clare. 2014. "Healthy land? An examination of the area-level association between brownfield land and morbidity and mortality in England." *Environment and Planning*. 46(2).

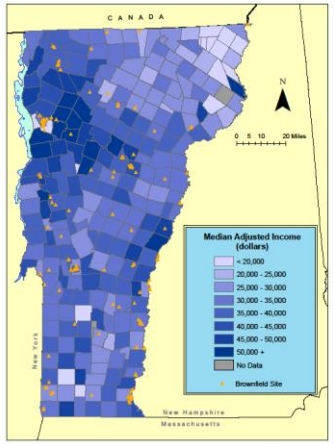
Kretchik, Joe. 2002. "Brownfields." *Chemical Health and Safety*. 9(2), p34.

Acknowledgment

I would like to thank Phillip Nyhus, Abby Pearson, and Manny Gimond for their expertise and guidance in GIS, spatial analysis, and statistical reasoning.







Towns with Highest Index

Burlington (26)
Rockingham (24)
Brattleboro (24)
Proctor (20)
Putney (20)
Montpelier (20)

Water Sources within 1/4 mile	Score
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8

Brownfields per 10 Sq Miles	Score
0	0
0 - 0.01	1
0.01 - 0.03	2
0.03 - 0.05	3
0.05 - 0.1	5
0.1 - 0.3	7
0.3 - 0.5	8

Brownfields per 100 people	Score
0	0
0 - 0.05	2
0.05 - 0.1	4
0.1 - 0.2	6
0.2 +	8

Number of Brownfields	Score
0	0
1 - 2	1
3 - 5	3
6 - 10	5
10 +	8

Avg Water Source Distance (miles)	Score
0 - 0.5	8
.5 - 1	6
1 - 2	4
2 - 5	2
5 +	0

Discussion

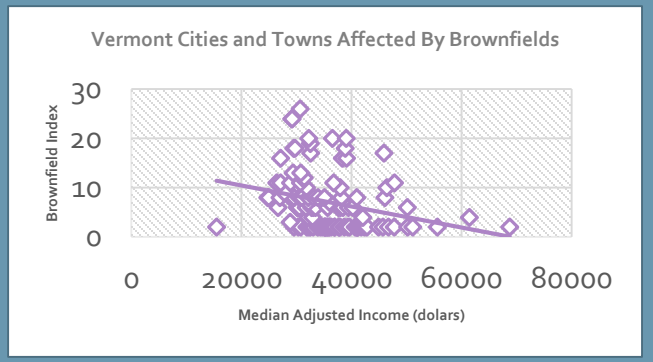
While there is a trend between income and this brownfield index, a firm correlation cannot be made. It is imaginable that this trend exists, as lower income may be associated with more abandoned sites and less incentive to develop them. It is interesting to see where high income towns and cities fall on the brownfield index. It is not until incomes fall below $50,000 that one sees a town with an index higher than 5. One conclusion to be made is that high income towns do not experience effects from brownfields, whereas middle- and low-income towns see a large range of effects. Brownfields are thus a problem facing a large number of communities of various economic backgrounds. The residential environment is a large factor in community health, and there is a level of inequality in which towns are more affected by brownfields which has been overlooked in discourse (Bambra, 2014).

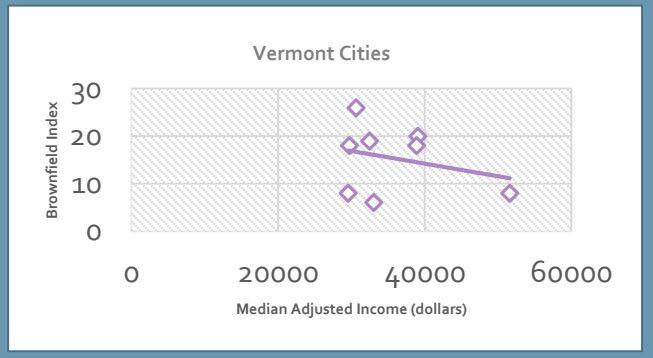
Another point to be made from this data is the overall range of brownfield effectiveness. While a large amount of towns have no brownfields nor public water sources close to brownfields, others have very many, often concentrated in small areas. The map of Burlington shows this, as 10 sites are clustered in the northeast with a public water source less than a quarter mile away from the closest brownfield. This further demonstrates the inequality in the experiences of the people of Vermont with brownfield sites.

Further research could include using a reevaluated method of indexing the effectiveness of brownfields with more and/or different variables. The data collected here could also be used to analyze how brownfield effectiveness may coincide with drinking water problems or health complications.

Results

The results have been organized in two ways. The first shows the correlation between income and brownfield indexes in all cities and towns in Vermont where the Brownfield index was not zero. As there are a significant amount of rural areas in Vermont with a range in income, the data was not completely useful to examining the effect of brownfields where they can actually make an impact. The second way shows the correlation of income and brownfield index in only the cities of Vermont.





I found this to be a useful measure as these are the most urban areas where population is also higher and brownfields can make more of an impact. Both interpretations of the data showed a correlation between income and brownfield effects. As incomes in a town or city rise, there is an overall trend such that brownfields are less prominent in effectiveness. However the r^2 values for each are quite low, such that they do not prove this correlation. In the first method the value was 0.075, whereas it was 0.078 for the second method.