

Arsenic Rising: How Landfills put Arsenic in the Groundwater

Introduction and Background:

Arsenic is a public health hazard when its concentration crosses a certain threshold. Naturally occurring Arsenic is common in certain bedrock. This source represents a source of pollution. If a landfill sits above certain geological formations, Arsenic can be stripped from the rock and enter the groundwater matrix.

Methodology:

In order to establish a reasonable system of transport for the Arsenic, the D.R.A.S.T.I.C model was used. The D.R.A.S.T.I.C method is widely used to create models tracking the modes of transport for soluble contaminants. It evaluates the Intrinsic Vulnerability of groundwater by weighting relevant factors to contaminant mobility in groundwater. Once the Intrinsic Vulnerability index had been created, it was combined with the landfill locations and the bedrock containing Arsenic to create an overall Vulnerability Index.

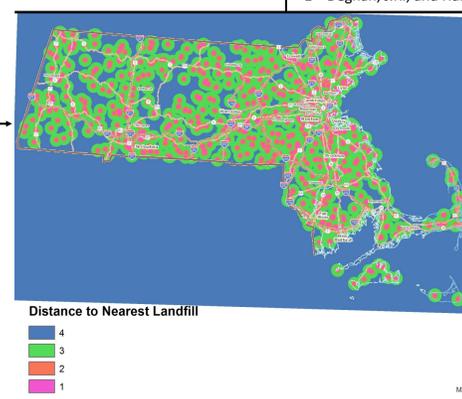
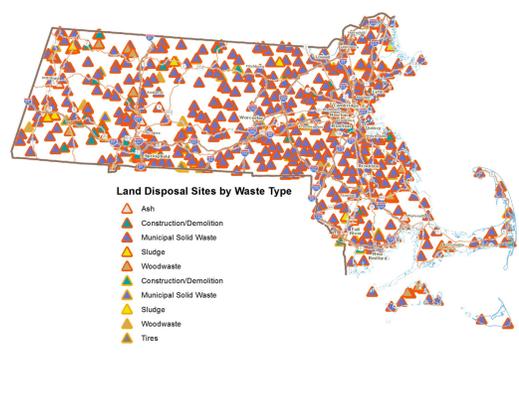
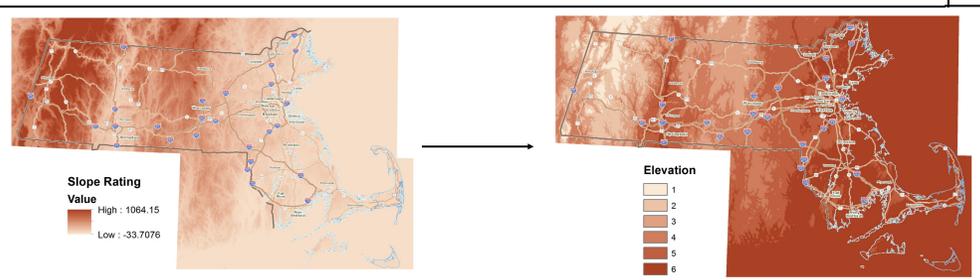
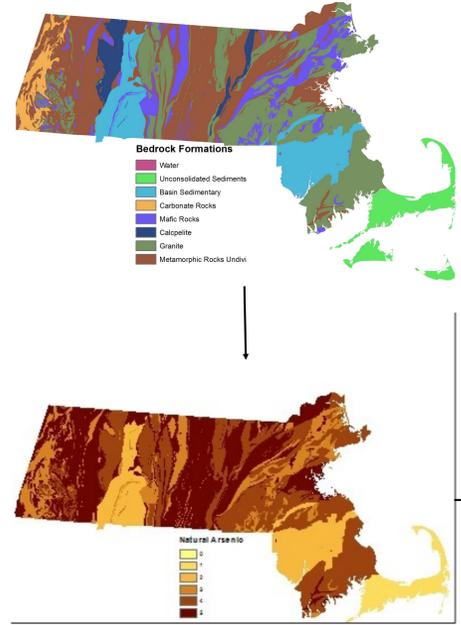
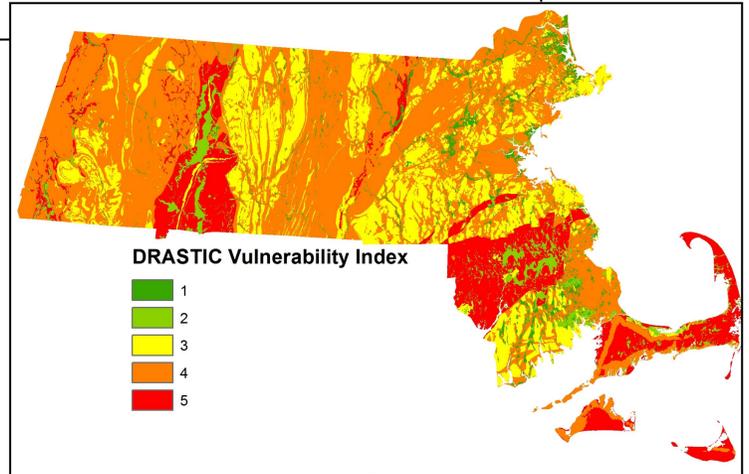
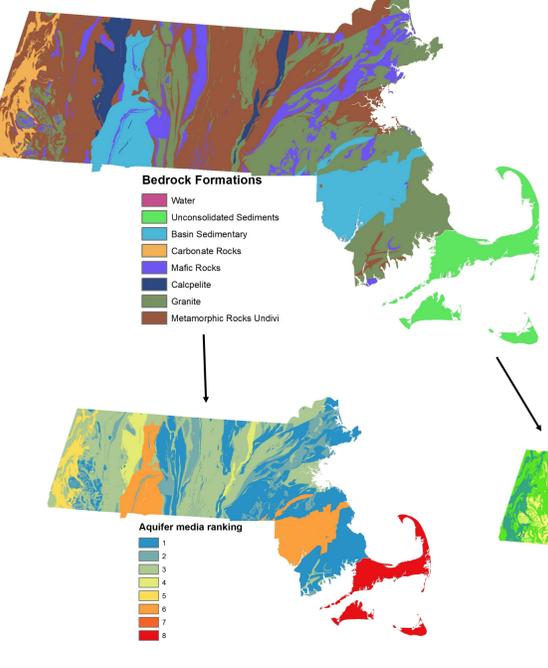
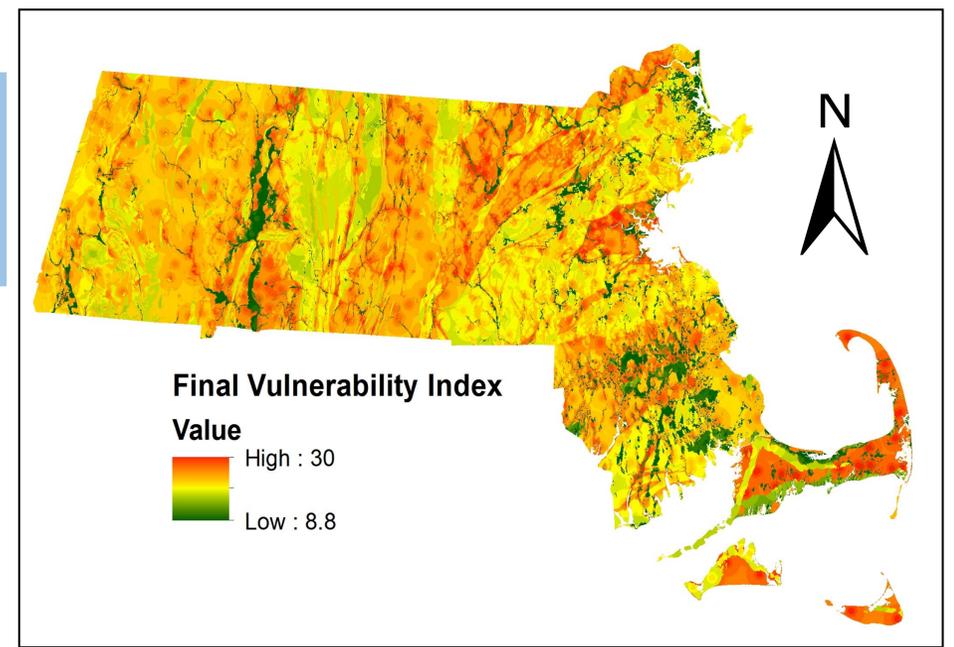
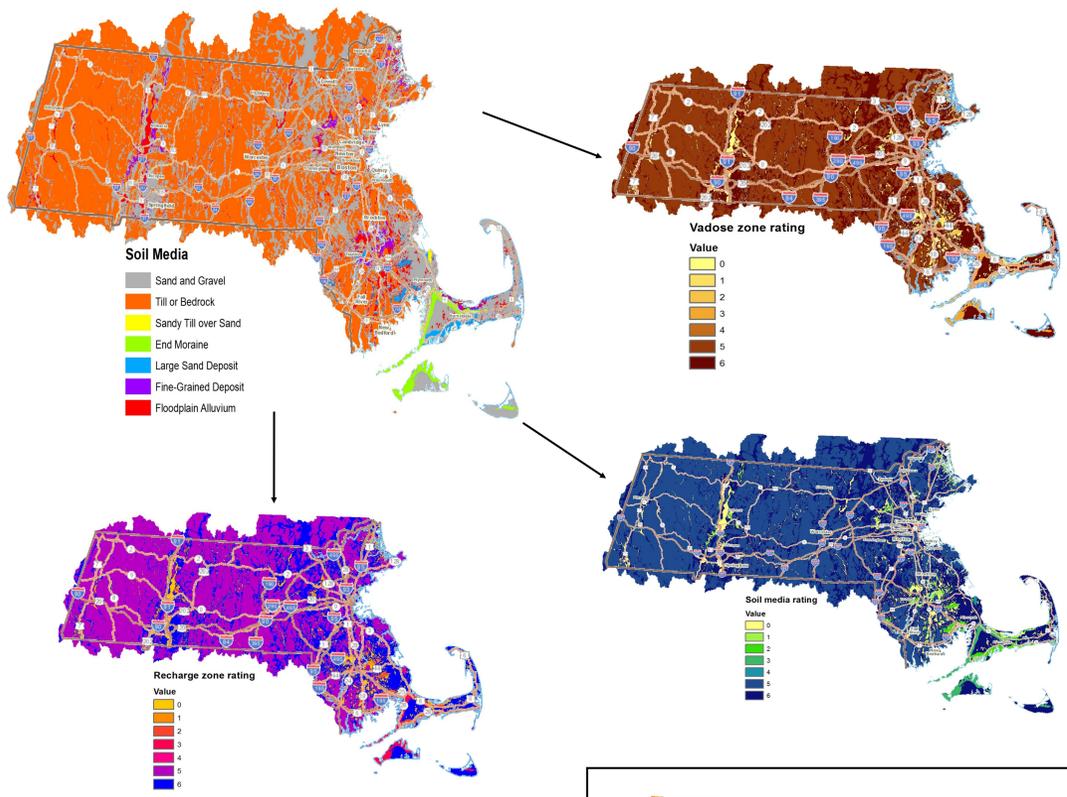
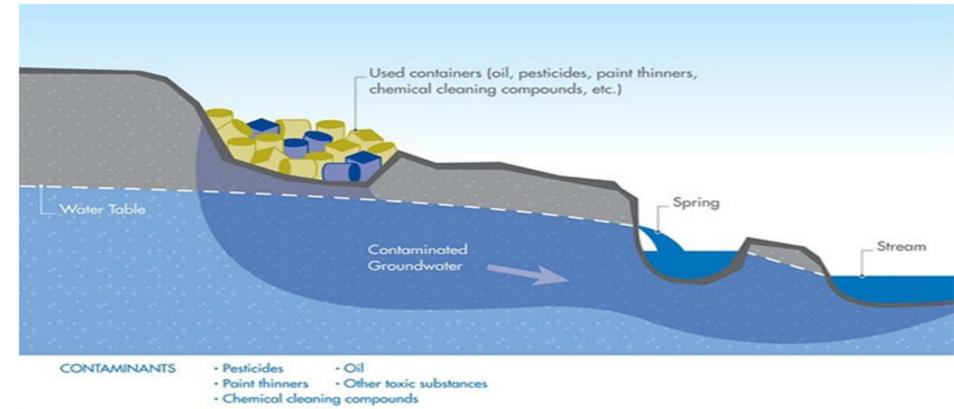
All Variables and their Weights within Formula—

DRASTIC Index (IV) =

$$DrDw + RrRw + ArAw + SrSw + TrTw + Irlw + CrCw$$

r = rating value; w = weight

- (5) -Depth to water table,
- (4) - Natural Recharge Rates,
- (3)- Aquifer media,
- (2) - Soil media,
- (1) - Topographic Aspect, Rates,
- (5) - Impact of Vadose Zone,
- (4) - Hydraulic Conductivity,



Conclusion:

This Final Vulnerability can assess correlation between landfill location, arsenic containing bedrock and the intrinsic vulnerability. This Index shows that there are many landfills located in areas where the landfill leachate could easily penetrate down to the bedrock based on the bedrock substrate and mobilize naturally occurring Arsenic. This model can be used to justify a more aggressive, and targeted sampling program which could verify if Arsenic is present in hazardous levels.

Works Cited :

1—Degnan, J.R., and Harte, P.T., 2013, Hydrogeologic framework, arsenic distribution, and groundwater geochemistry of the glacial-sediment aquifer at the Auburn Road landfill superfund site, Londonderry, New Hampshire: U.S. Geological Survey Scientific Investigations Report 2013-5123, 58 p., <http://pubs.usgs.gov/sir/2013/5123/>.

2— Aller, Linda, Bennett, Truman, Lehr, J.H., and Petty, R.J., 1985, DRASTIC—a standardized system for evaluating ground water pollution potential using hydrogeologic settings: U.S. Environmental Protection Agency, Robert S. Kerr Environmental Research Laboratory, Office of Research and Development, EPA/600/2-85/018, 163 p.

Data Sources Used:

Mass.Gov—Map database
 USDA – NRCS - Map data base
 ARC Gis—Base Maps
 Projection: Massachusetts State Plane
 Coordinate System: NAD_1983
 UEP -232 - James Goodman—12/21/2017

