

Mapping of:

**Unequal Exposure to Ecological Hazards 2005:
Environmental Injustices in the Commonwealth of
Massachusetts –**

**A report by the Philanthropy and Environmental
Justice Research Project, Northeastern University –**

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by: Colin Clark

Background of Study:

- Study is an update to a 2001 study by Philanthropy and E.J. Research Project (N.U.)
- Demographic data was collected from year 2000 Census and the Environmental data was obtained from the Massachusetts Department of Environmental Protection.
- Downtown Boston was broken into 12 neighborhoods for a closer look.
- The study defines income into lower and higher income communities (35 of them in this study) – Lower = up to \$52,700 med income per home,
Higher = \$52701 or greater.
- The authors note that Boston is the most expensive metro area in the U.S.
- Environmental Hazard Points (EHP's – which these maps are based), are a calculation made by the **AUTHORS assessment** “of the relative risk [polluting facilities] typically represent.” *slide will show table to determine points*
- The authors also suggest that “this report is [perhaps] the most comprehensive [E.J.] of any state in the country.
- Minority communities are defined as having greater than 15% “colored” populations.

Study Facts Noted:

- **Low income communities face a cumulative exposure rate to environmentally hazardous facilities and sites 4 times greater than high income communities.**
- **High minority communities face a cumulative exposure rate to environmentally hazardous facilities and sites over 20 times greater than low minority communities.**
- **Communities that have less money, have less resources, can not defend themselves.**
- **There are 30,570 DEP (Department of Environmental Protection) hazardous waste sites – 3,741 pose SERIOUS environmental and human health threats – 31 are on the EPA's Superfund List (National Priorities List – NPL).**
- **Hazardous waste sites are broken into 3 tiers (Tier I, Tier II, and Non-Tier).**

Building of EHP's

Points are established and facilities / sites are giving point ratings. Locations are the assigned to demographic and political units (towns, race, income). Reminder, this is the authors interpretation of which sites should be given a certain number of points. The more toxic a chemical, the higher the concentrations, the higher the points.

Type of Hazardous Site or Facility	Points Rating Severity of Each Site or Facility
Sites and Releases	
EPA National Priority List Site	25
Mass DEP TEIR 1A Site	10
Mass DEP TEIR 1B	8
Mass DEP TEIR 1D	8
Mass DEP TEIR 1C	6
Mass DEP TEIR 2	4
Other Mass DEP Sites	1
Landfill Types (O = Operational) (NO = Not Operating)	
Ash Landfill (O)	6
Ash Landfill (NO)	3
Demolition Landfill (O)	6
Demolition Landfill (NO)	3
Illegal Site (O)	6
Illegal Site (NO)	3
Municiple Incinerator (O)	10
Municiple Incinerator (NO)	3
Recycling Facility (O)	4
Recycling Facility (NO)	2
Resource Recovery Facility (O)	10
Resource Recovery Facility (NO)	3
Municiple Solid Waste Landfill (O)	6
Municiple Solid Waste Landfill (NO)	3
Sludge Landfill (O)	6
Sludge Landfill (NO)	3
Transfer Station (O)	6
Transfer Station (NO)	3
Tire Piles	6
Industrial Facilities	
TURA (MA Toxics Use Reduction Act) Facilities	5



Map-making Methodology and Metadata:

Most of the maps have been designed as graduated color – 5 class maps. Some graduated symbol and combination maps have been created. A density map created by generating center-poly points from the town (plus Boston neighborhood) polys was interpolated using IDW (Inverse Distance Weighted) function in ESRI's ArcMAP 9.0. The "EHP Mountain 3-D" display was generated using ArcScene 9.0 by taking the IDW results and creating a TIN. The TIN was then exaggerated to enhance the appearance of the "mountains."

All map points, lines, and poly's were either created for this study or gathered from the Massachusetts GIS website - <http://www.mass.gov/mgis/massgis.htm>

All maps conform to the same standard projection:

Projected Coordinate System:

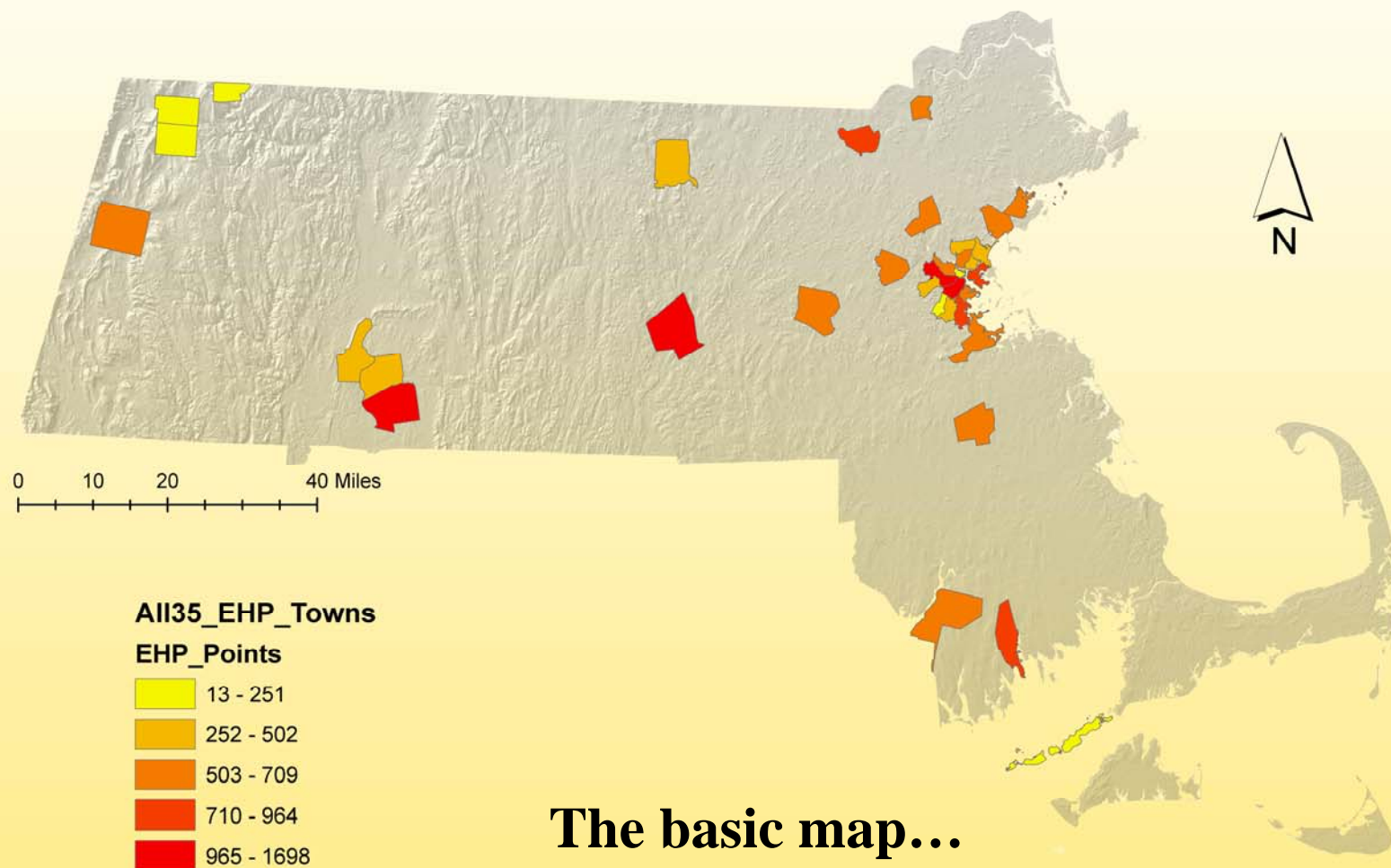
NAD_1983_StatePlane_Massachusetts_Mainland_FIPS_2001

Projection: Lambert_Conformal_Conic

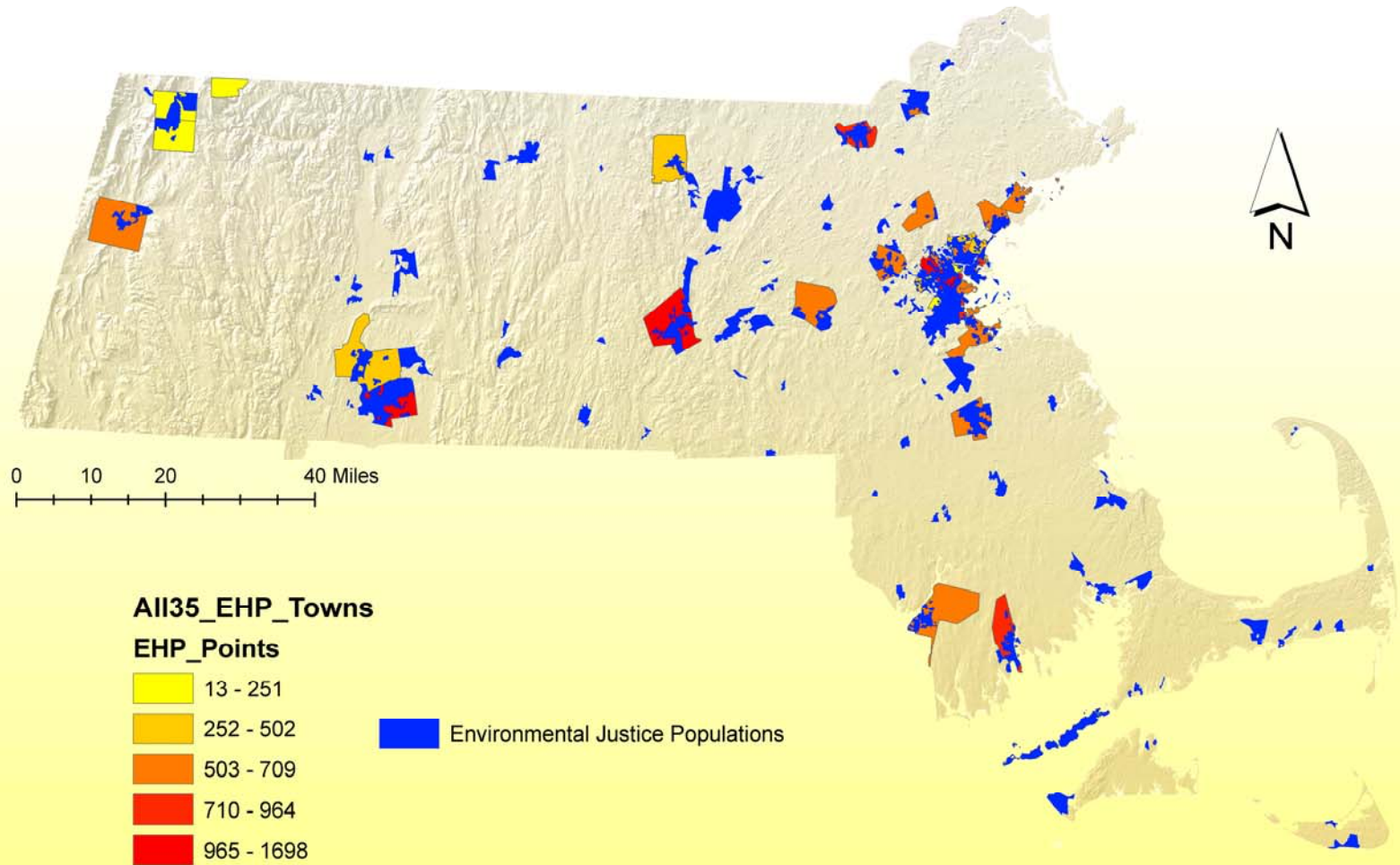
On to the MAPS!!!



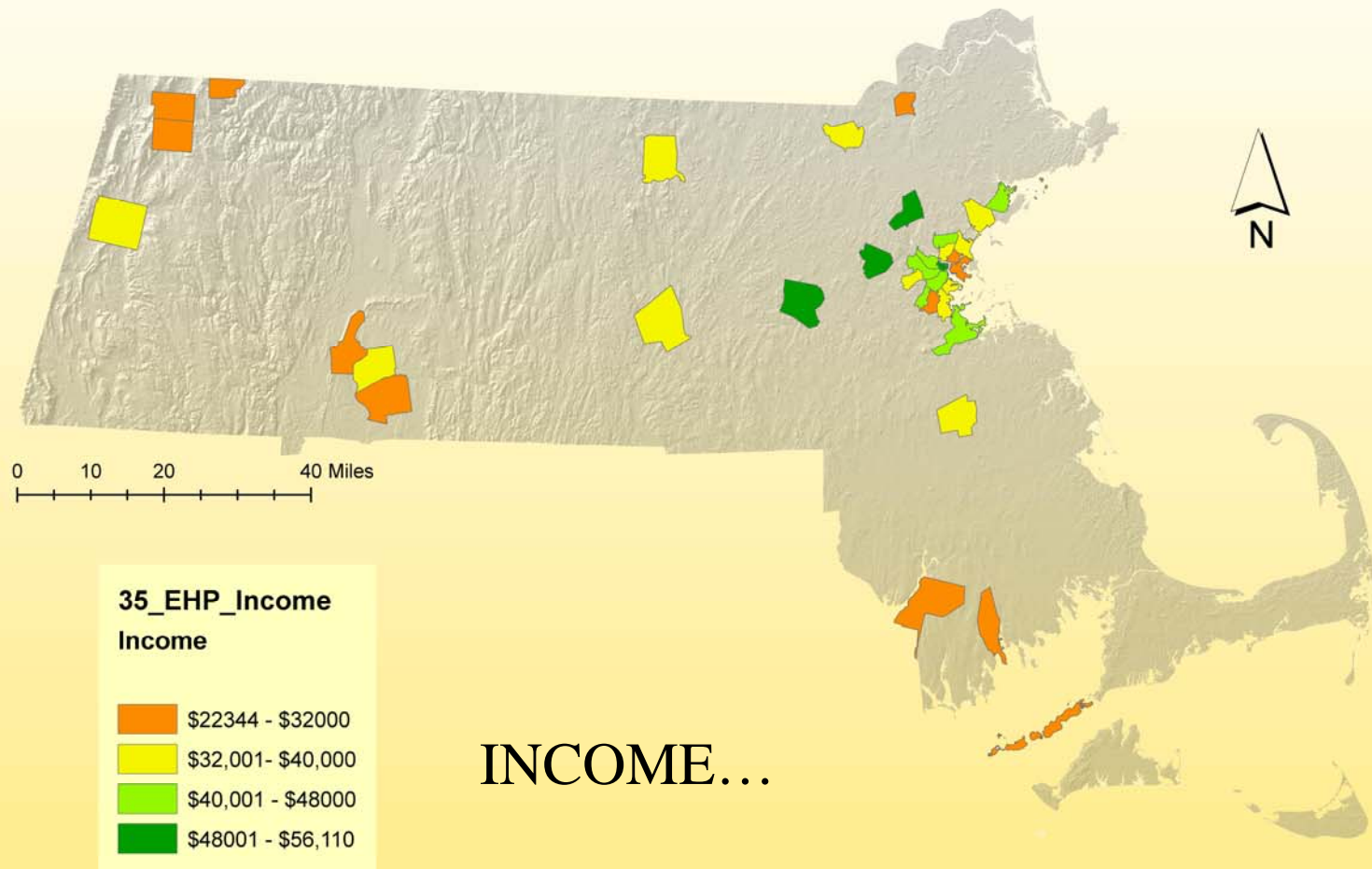
Total EHP POINTS by TOWN



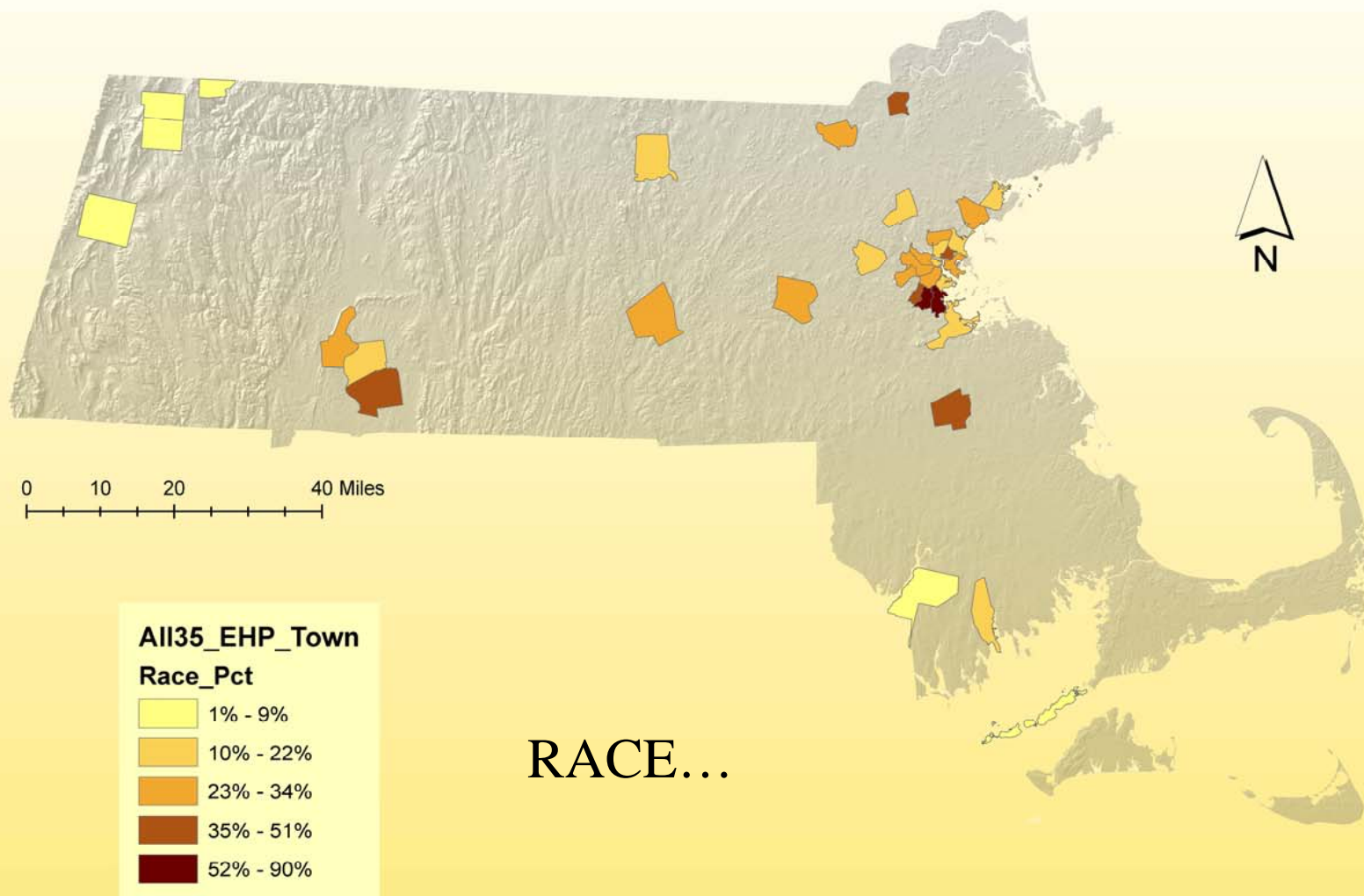
Total EHP POINTS by TOWN - Add State DATA COVER



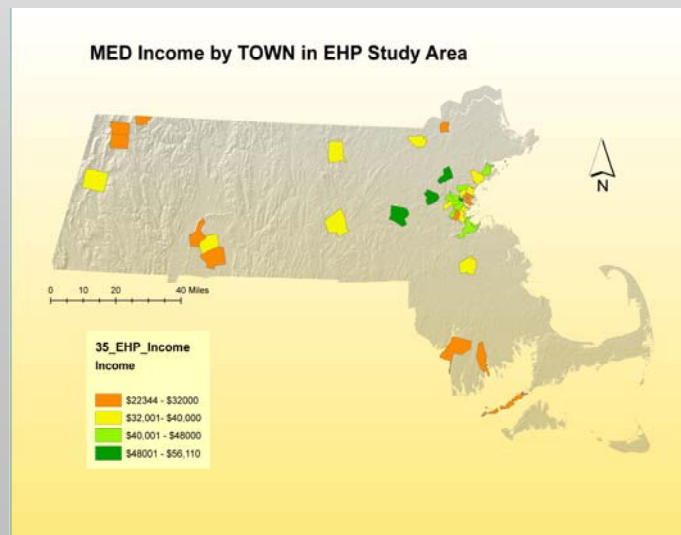
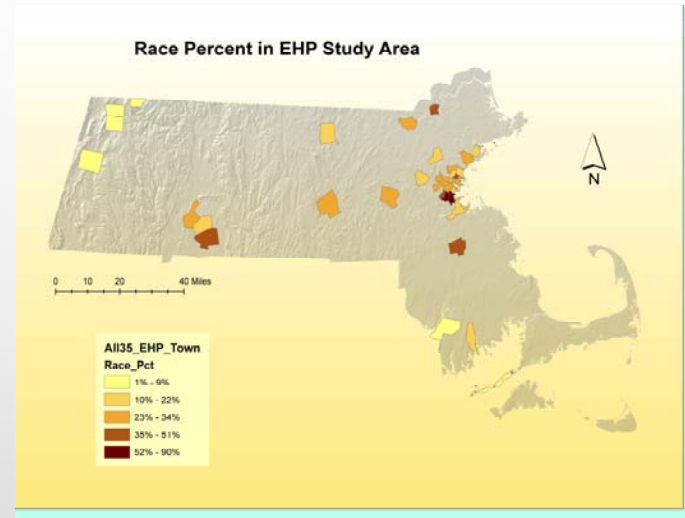
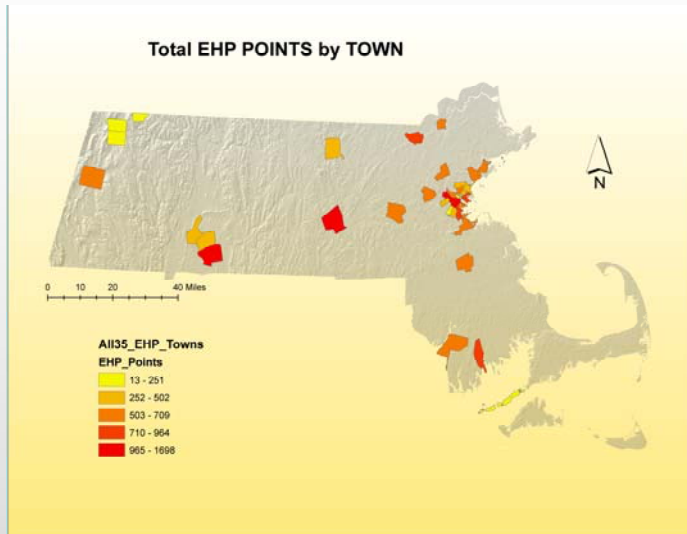
MED Income by TOWN in EHP Study Area



Race Percent in EHP Study Area



Comparison: side by side



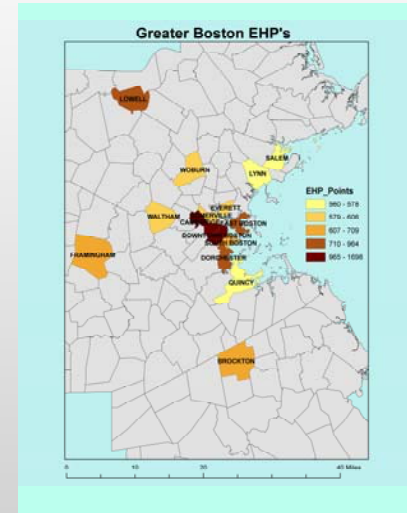
Building Boston's Neighborhoods:



**Boston Town Poly
Selected and layer
created.**

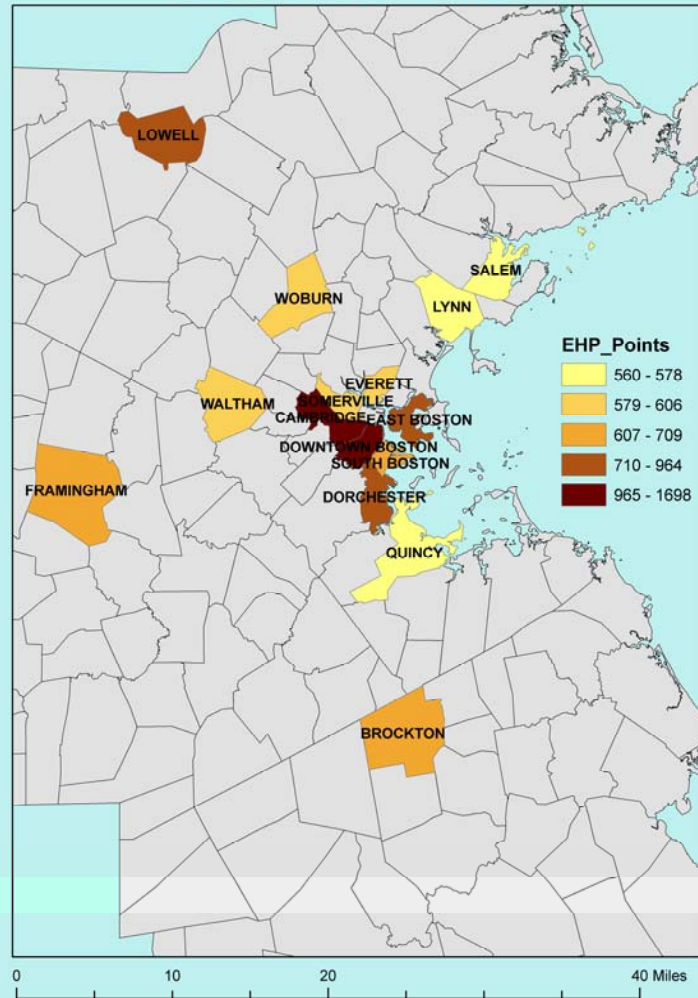


**“Neighborhoods”
created from Census
“block group” polys.**

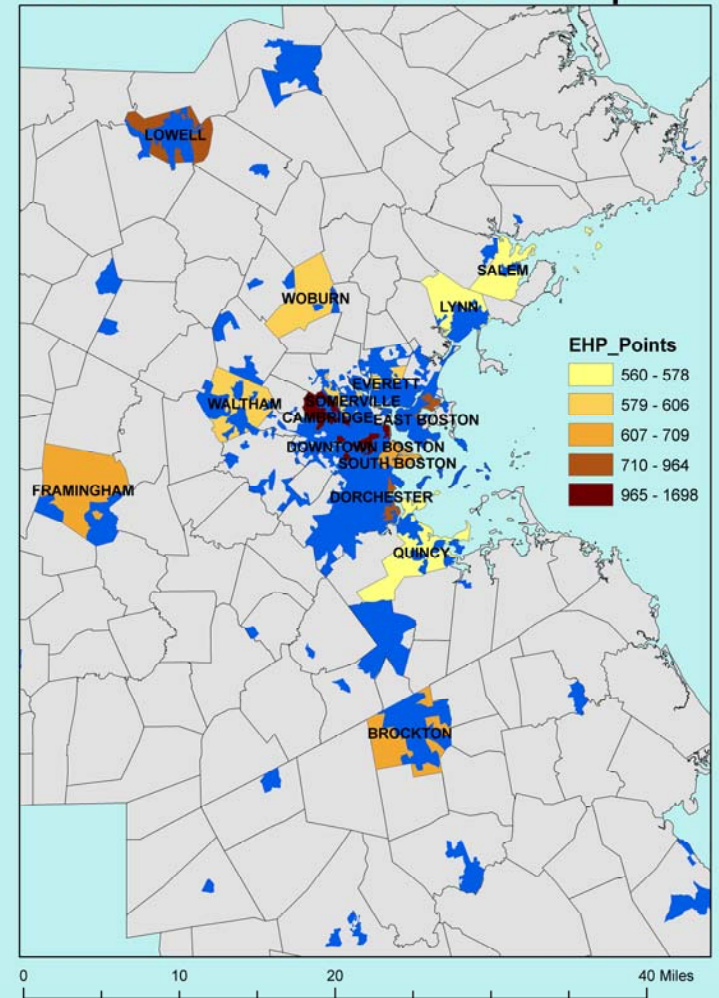


**Neighborhoods
then merged into
“Towns’ layer
and attributes
selected and
classed for
mapping.**

Greater Boston EHP's

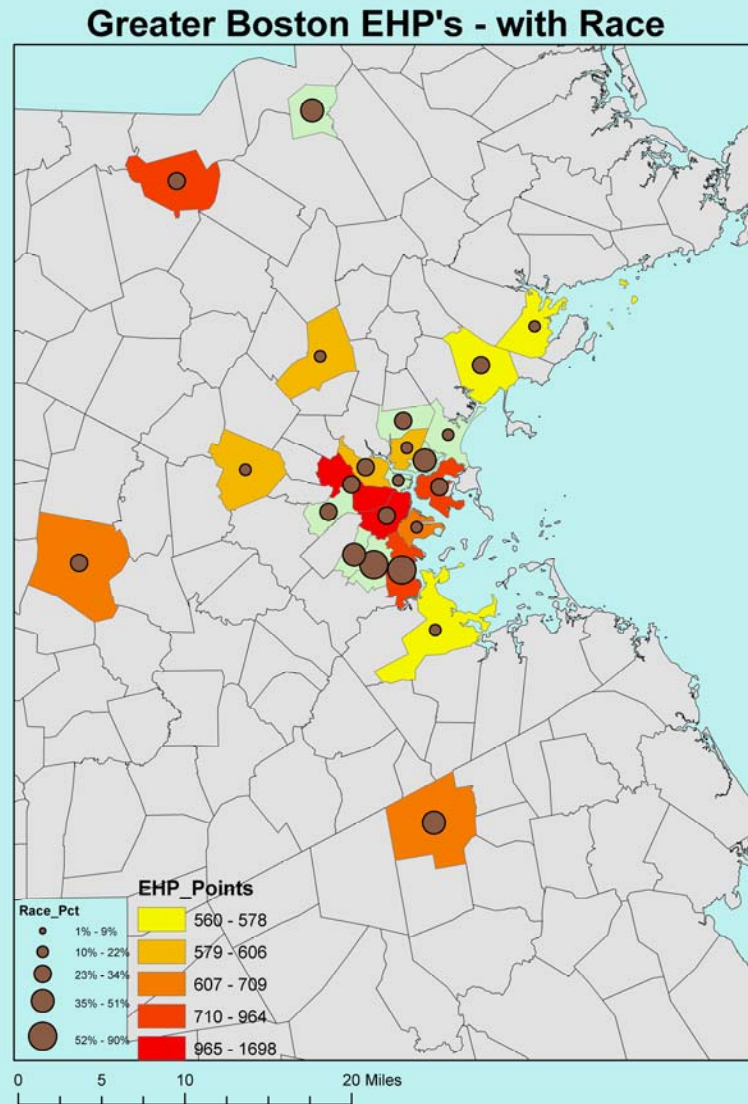


Greater Boston EHP's - with STATE splash



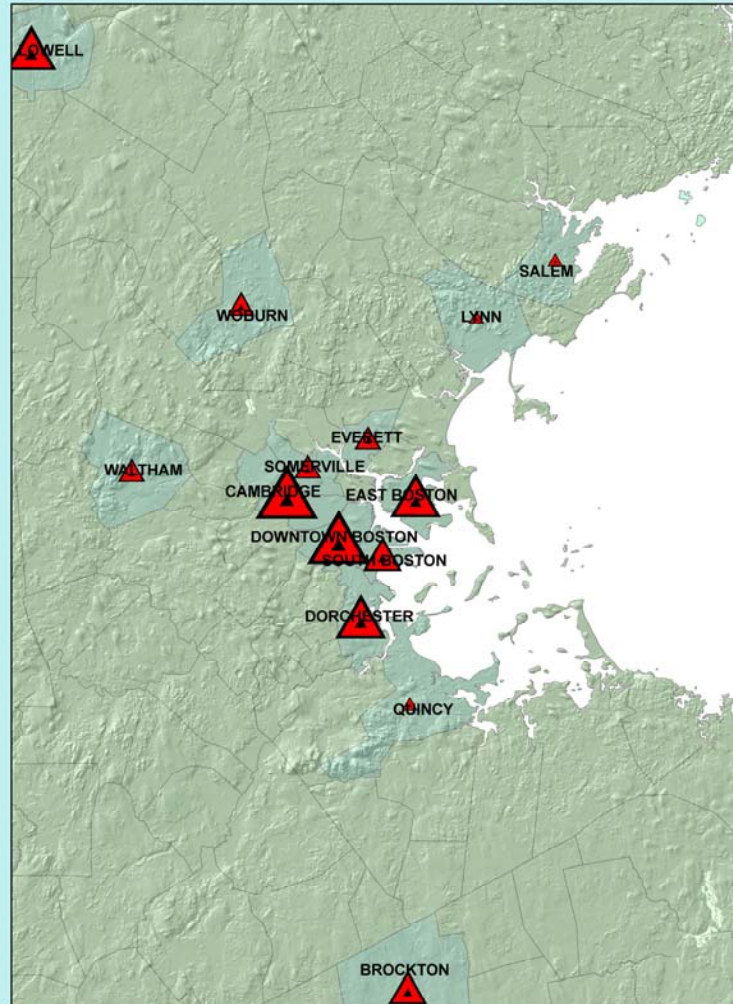
An Attempt at multi-symbol mapping to include two of the three main attributes of the study:

- EHP's
- Race

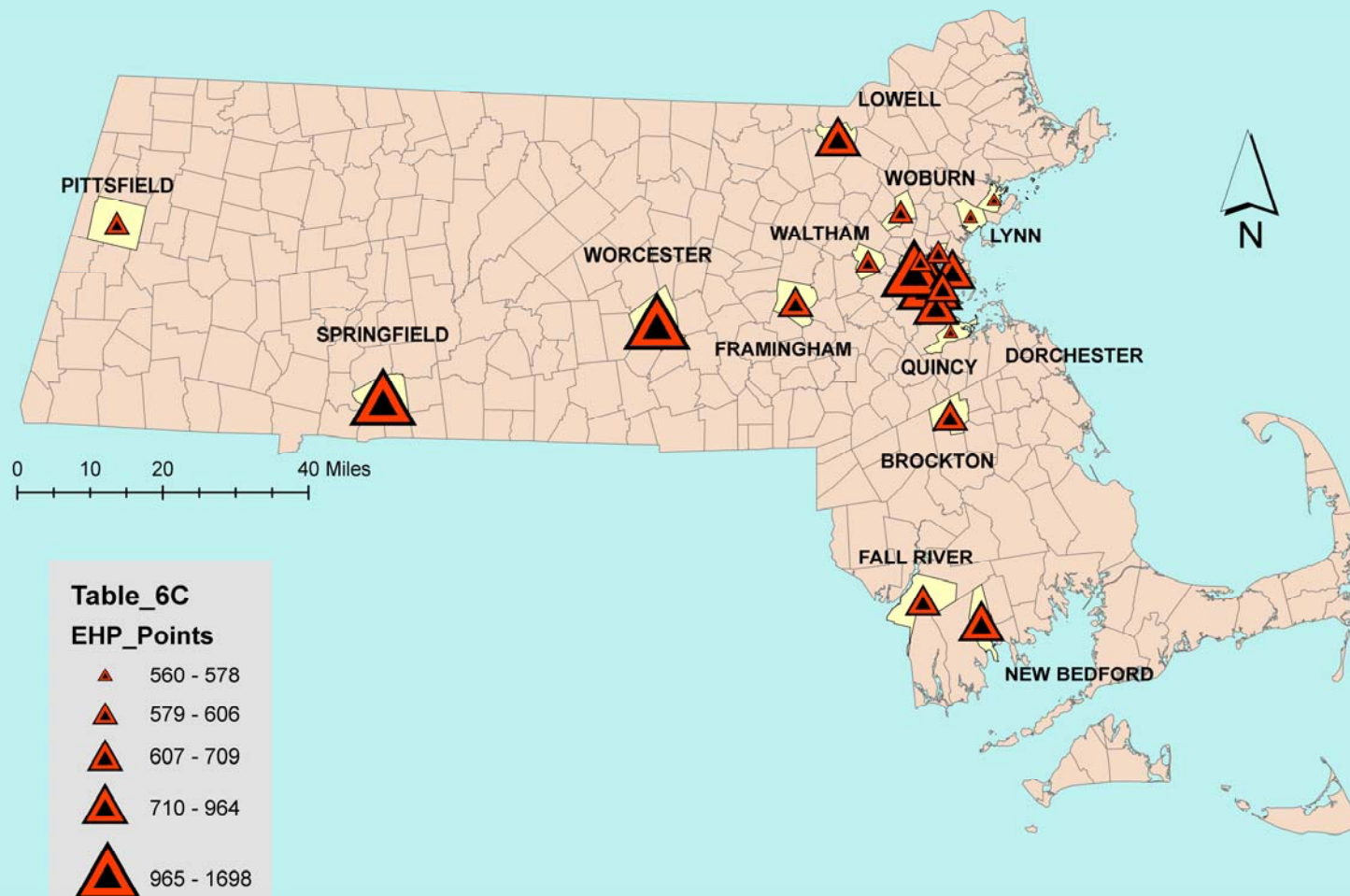


**Graduated symbol
map for contrast
with choropleth
mapping schemes.**

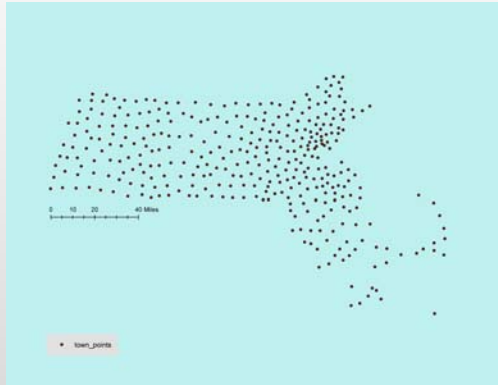
Boston Area Graduated Symbols EHP's



TOP 20 EHP POINTS



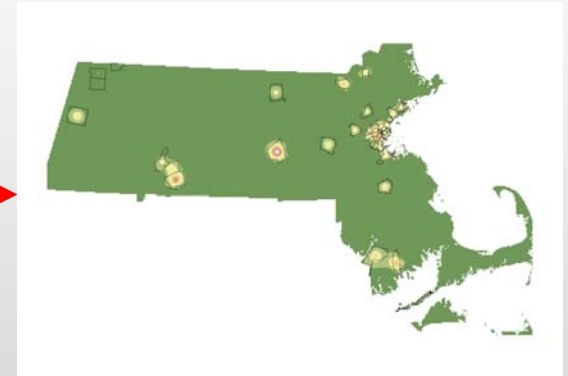
Mountain Building:



**Town points
created at poly
centers**



**Town points
merged with
attribute table
of working EHP
town layer**

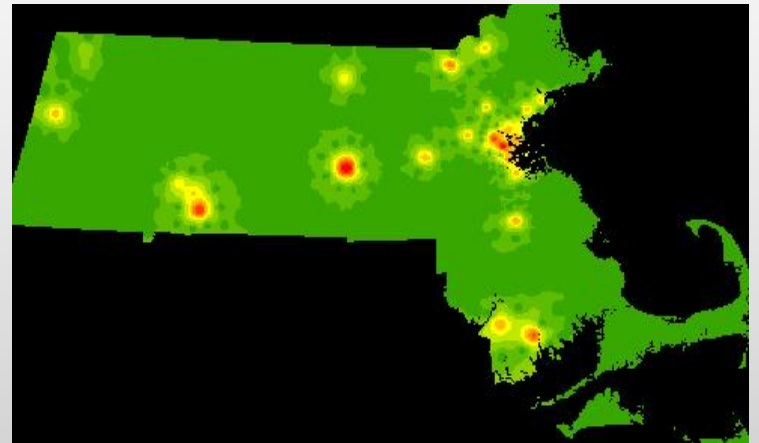


**EHP point field used
for IDW density
interpolation**

Mountain Building 2:



**IDW TIN
output**



**IDW into
ArcScene**

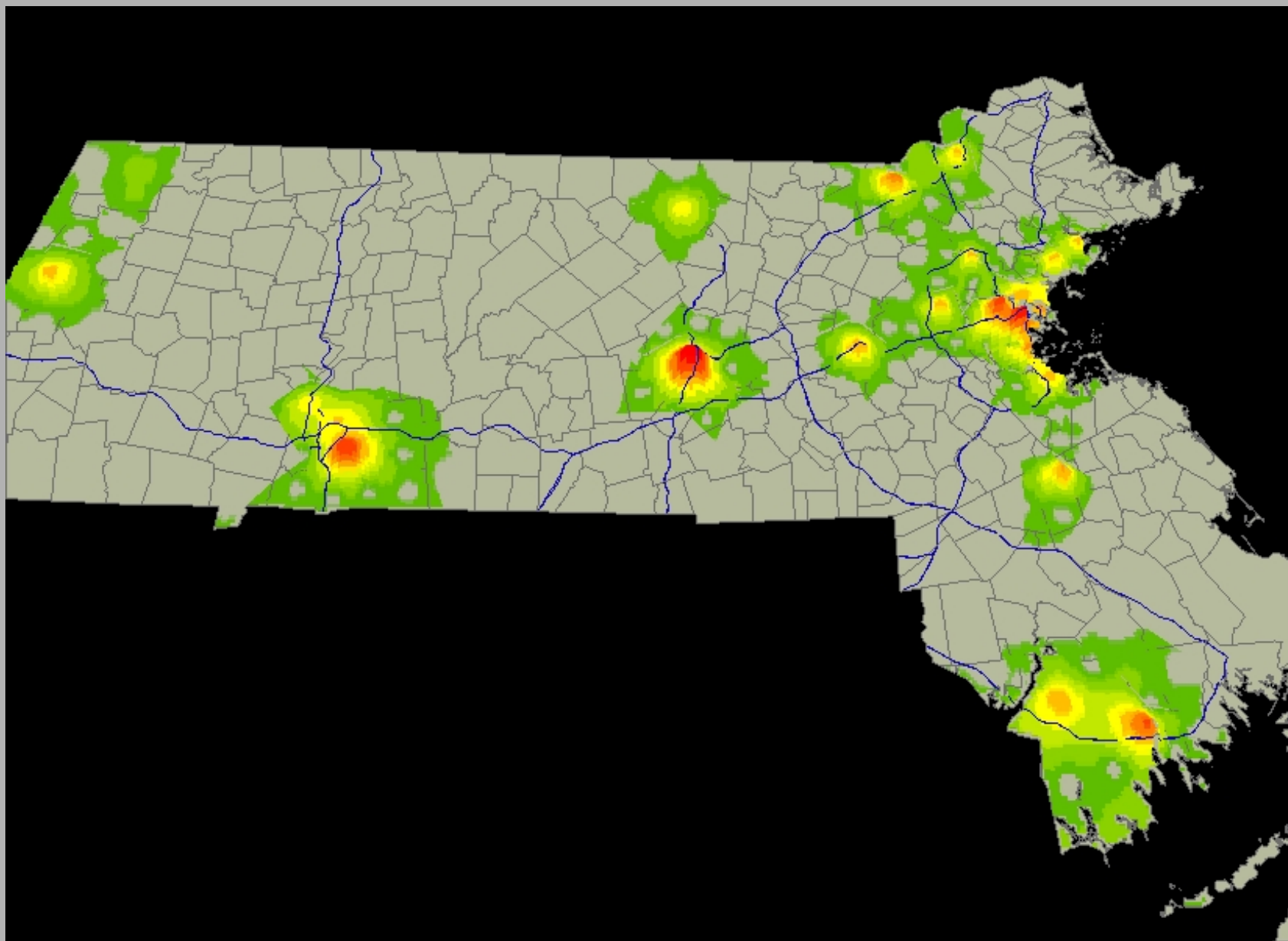
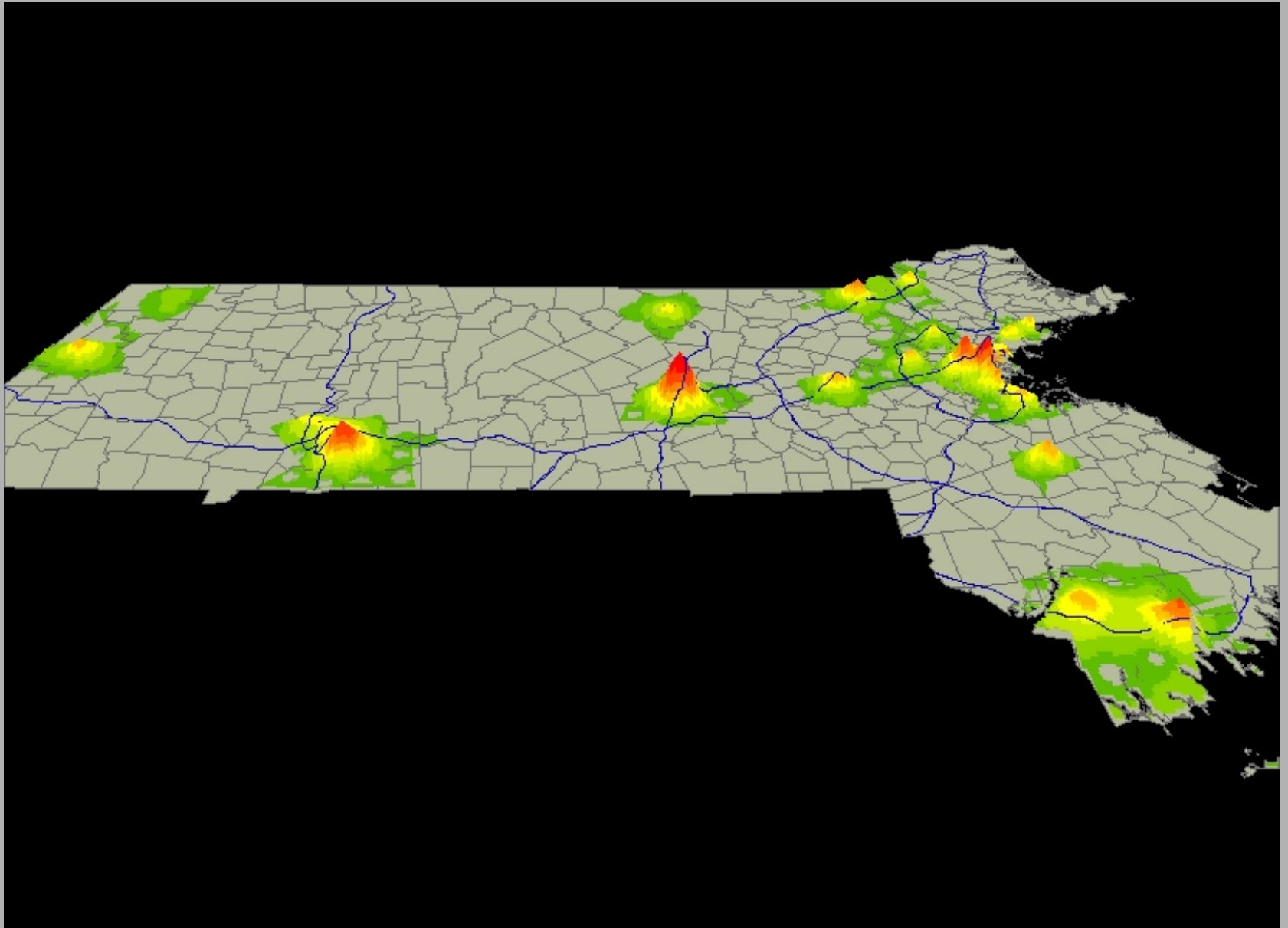
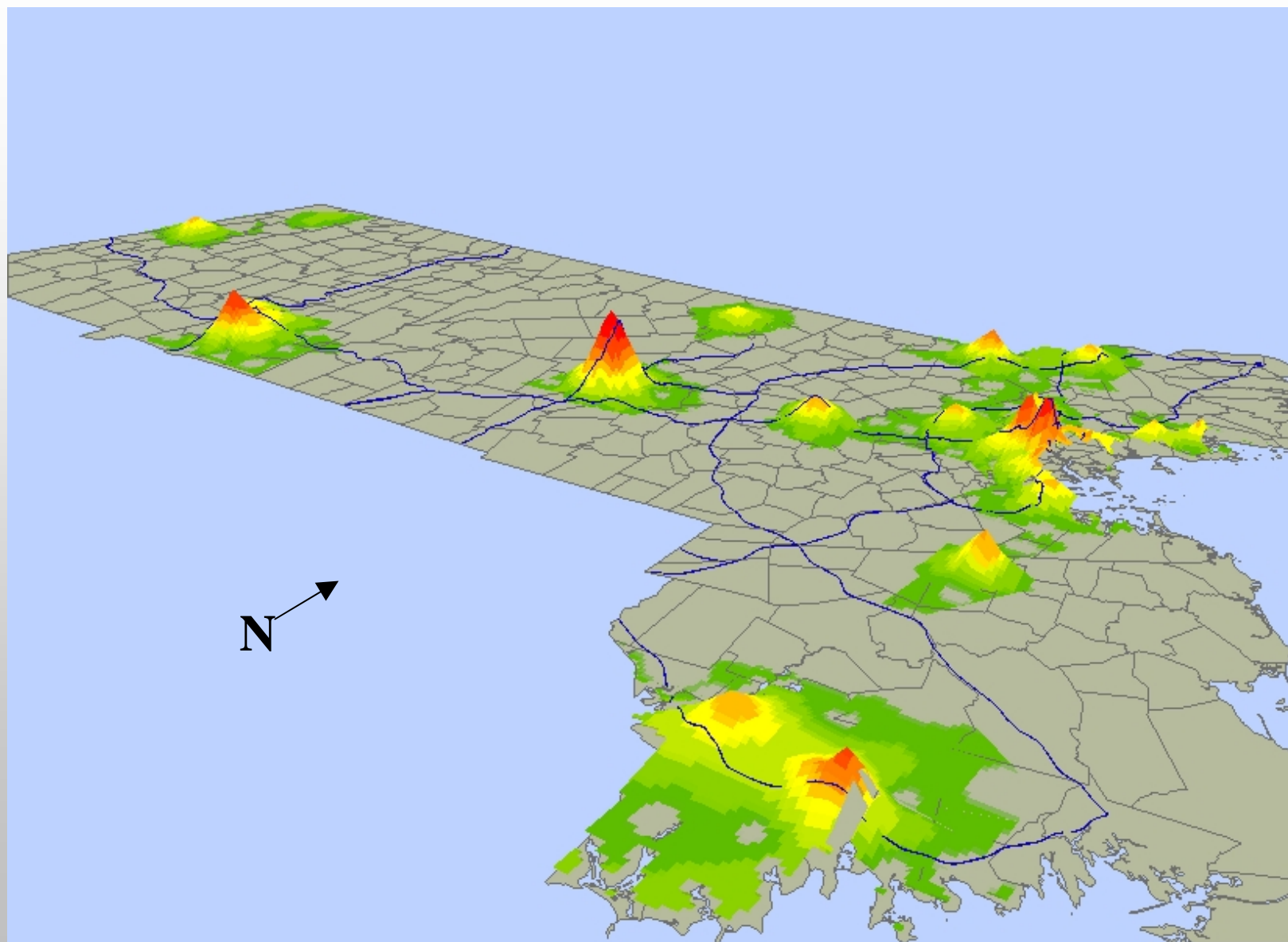
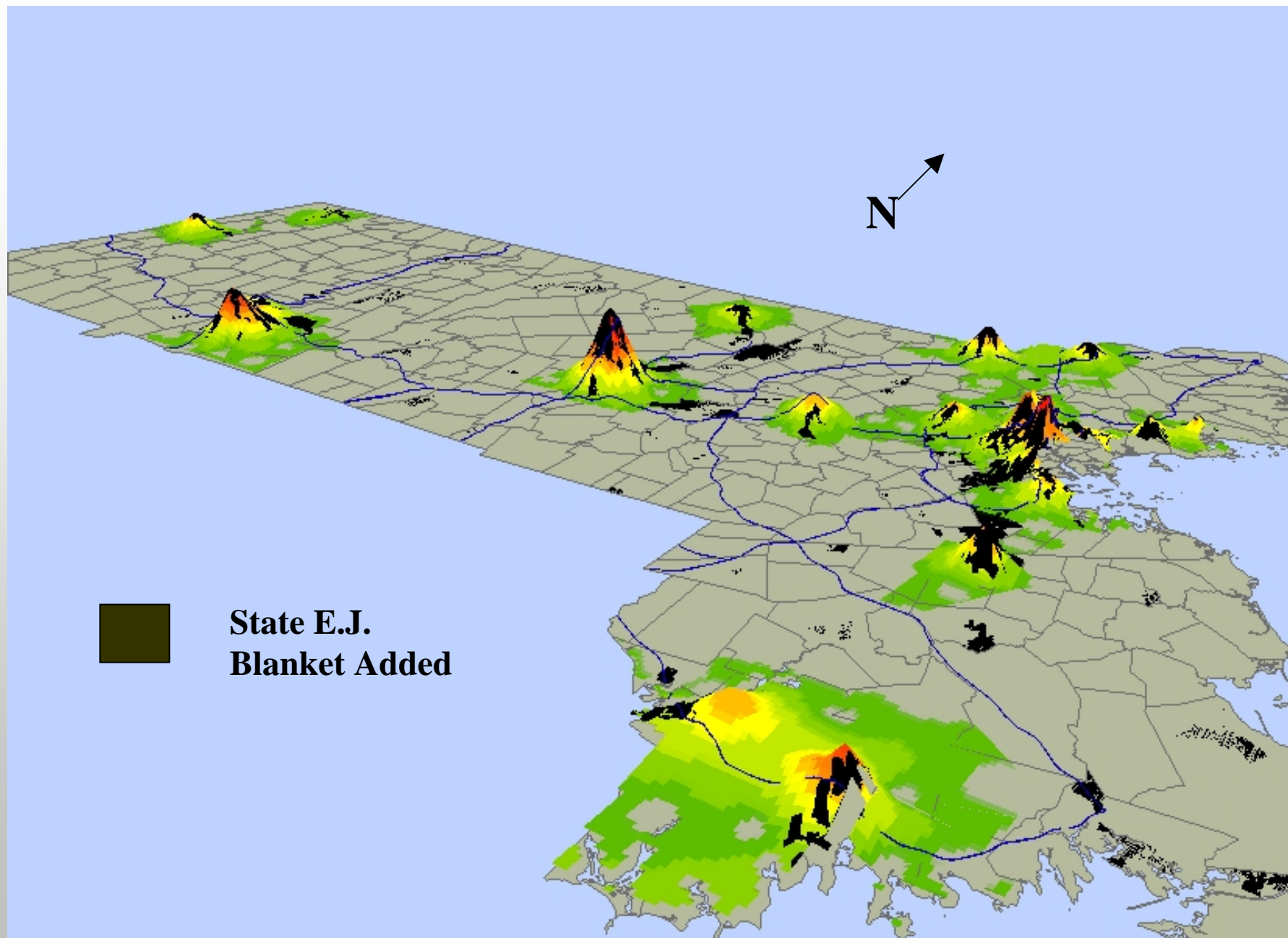


Image “tilt” for better perspective:







Conclusions / Questions:

- **Did populations move into areas that were already considered higher Environmental threats (affordability of land) – or did it change (areas built) after they moved there?**
- **Are the facilities and sites considered higher hazards located in areas where both distribution is easier (ports, highways, rail) and populations are both minority and poor? Cities...**
- **Money will protect the rich from polluting facilities and sites – judicial, political clout see to it...**