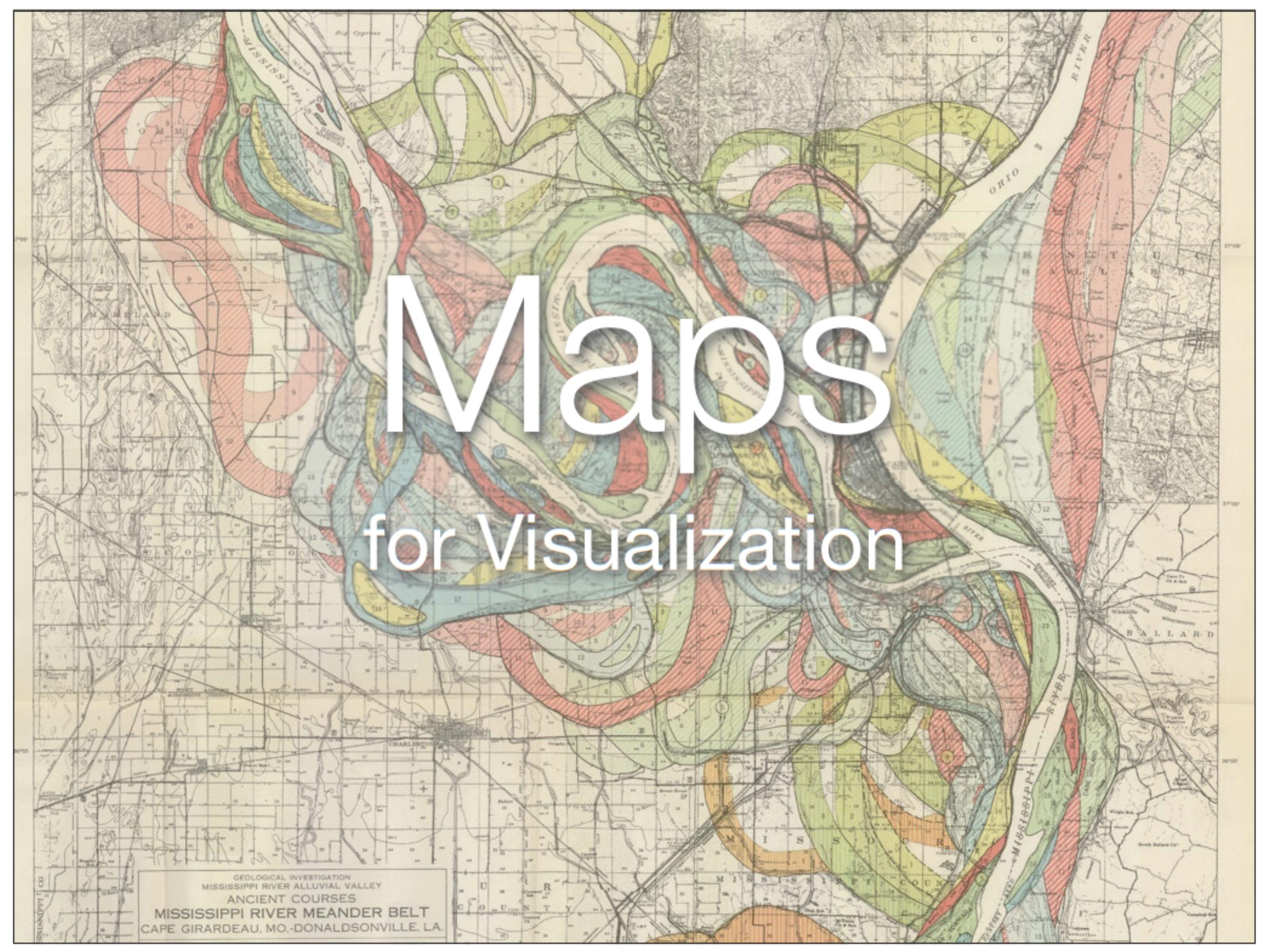


LECTURE 06

Cartographic Visualization



Maps for Visualization

GEOLOGICAL INVESTIGATION
MISSISSIPPI RIVER ALLUVIAL VALLEY
ANCIENT COURSES
MISSISSIPPI RIVER MEANDER BELT
CAPE GIRARDEAU, MO.-DONALDSONVILLE, LA.

CARTE Spéciale et approximative de la **Houille Anglaise** exportée en 1864 dessinée par M. MINARD. Ingénieur Civil de l'Etat et Chemin de fer.
Les bâtimens représentent dans le globe sont extraits du Mineral Statistics et M. Robert Scott, en 1864 (page 18 à 20) les temps d'arr. indiqués sur
Observations. ... Les temps de route indiqués sur cette carte représentent à peu près le temps de houille exportée à moins d'un mois pour chaque voyage.
Le temps de route de plus représente le temps nécessaire au transport des voies et dans l'ordre soit moins de deux.
Les grande bâtimens pour chaque continent, sont indiqués plus considérable par le temps de voyage détaillé, pour peu que plus de une centaine d'expéditions dirigées par M. Robert Scott, je le pense, furent effectuées par le principal exportateur.
Dès lors il faut considérer que le temps pour l'exportation de 17 000 000 tonnes, soit à peu près en 1864.
et 20 000 000 tonnes.
Paris, le 27 Septembre 1864.

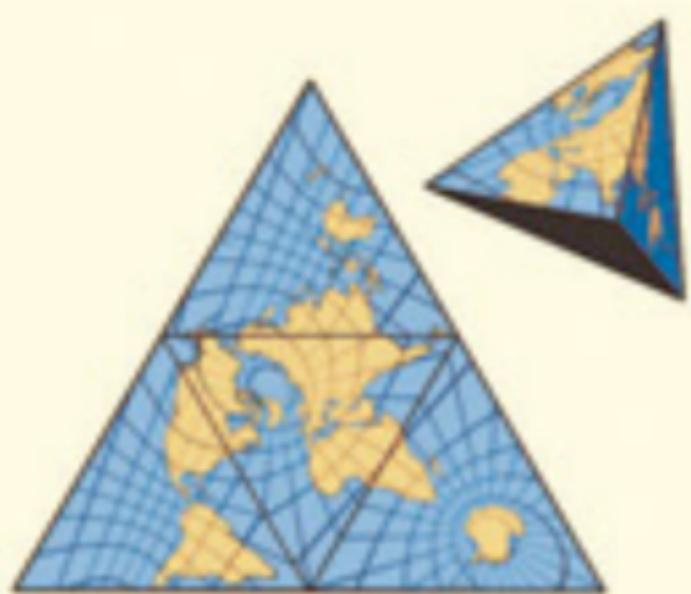


1864 British Coal Exports, Charles Minard

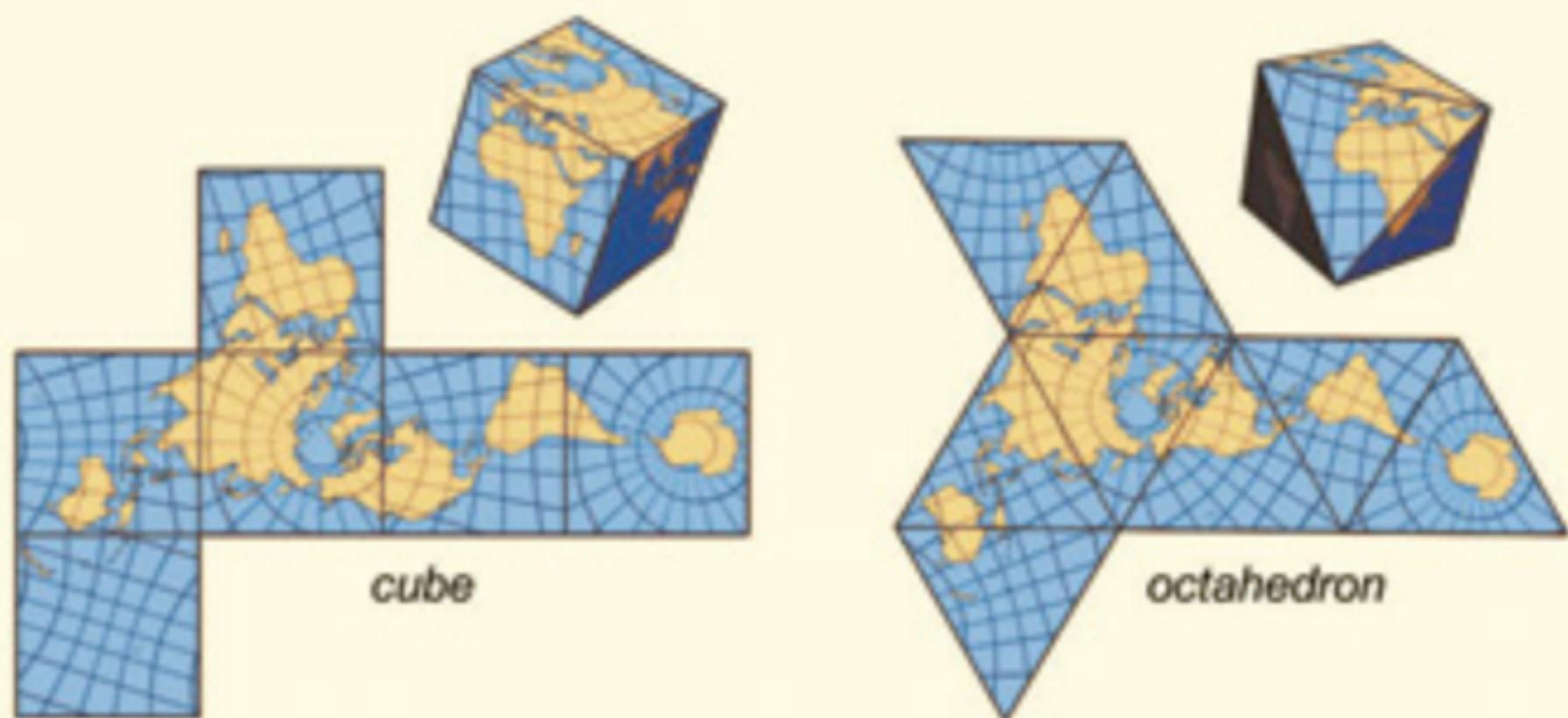
Projection



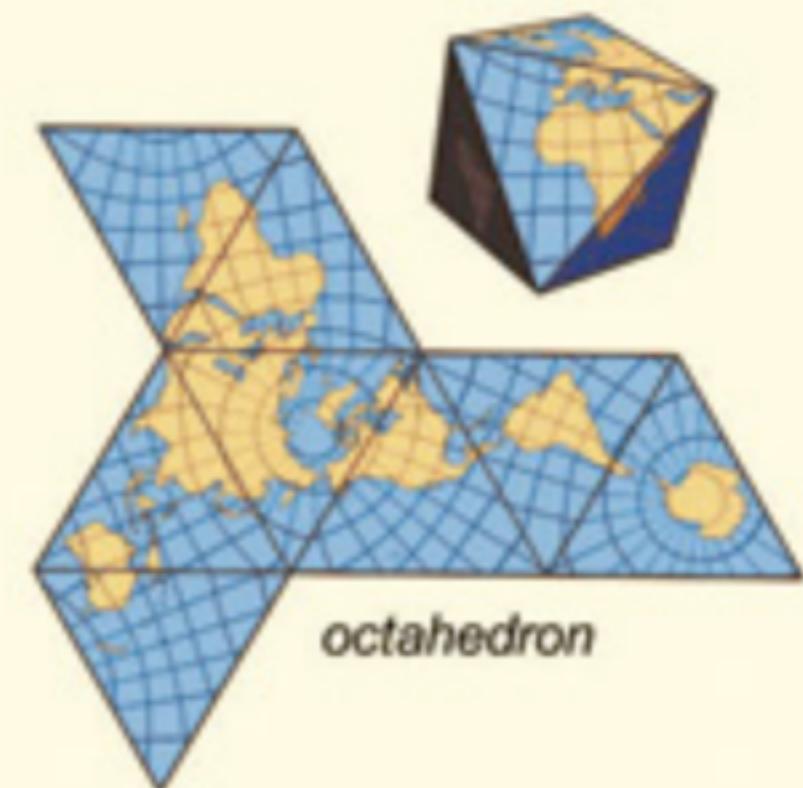
A sphere tears
when you flatten it



tetrahedron



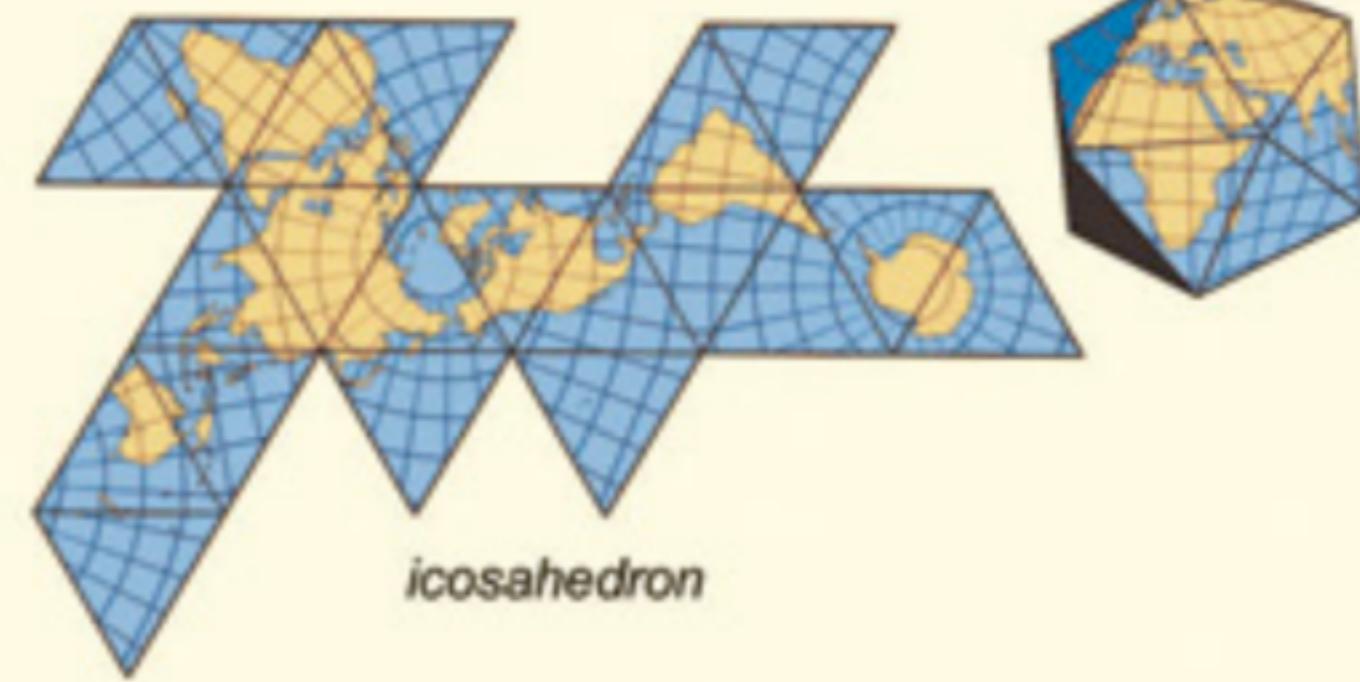
cube



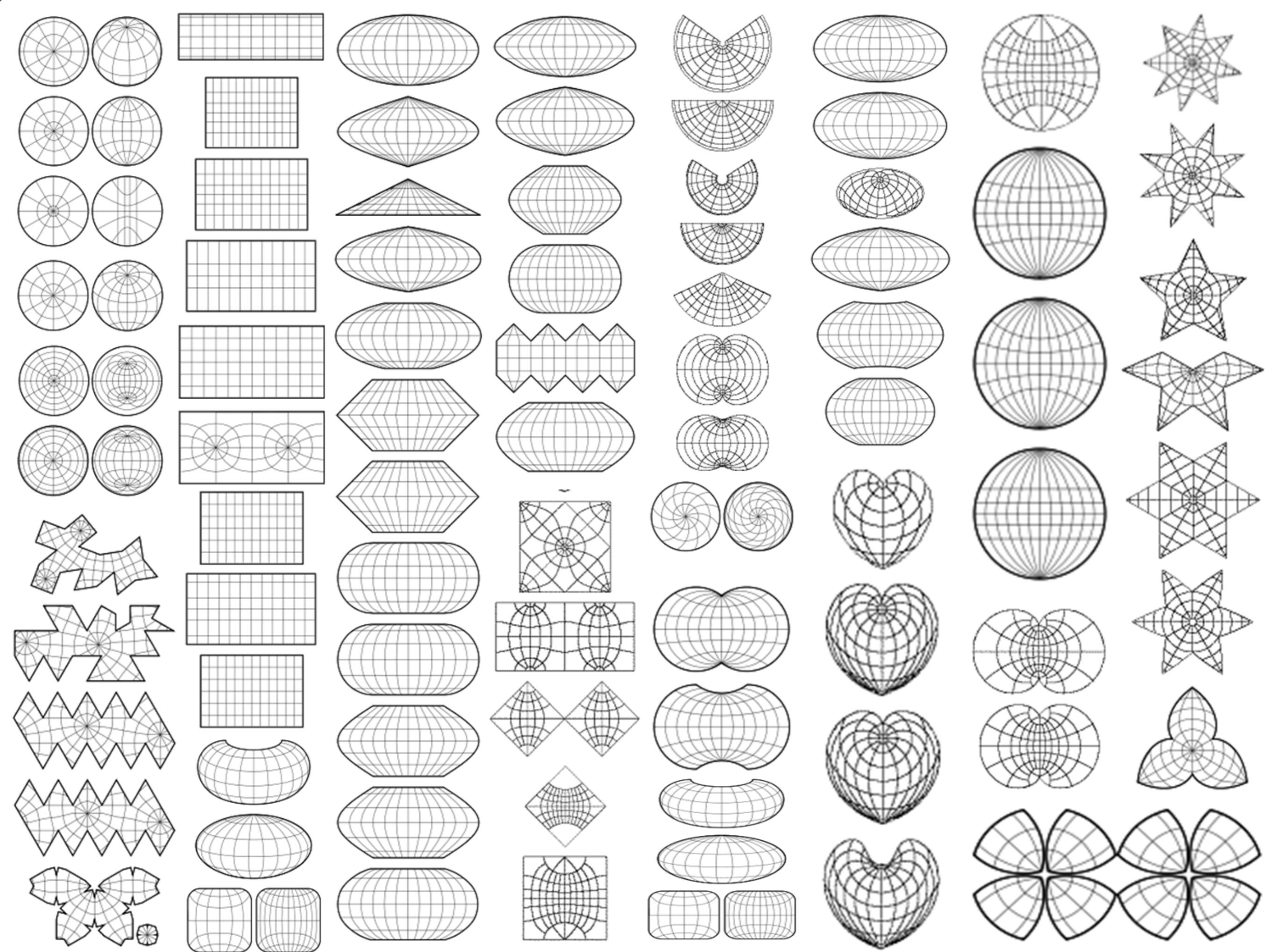
octahedron



dodecahedron

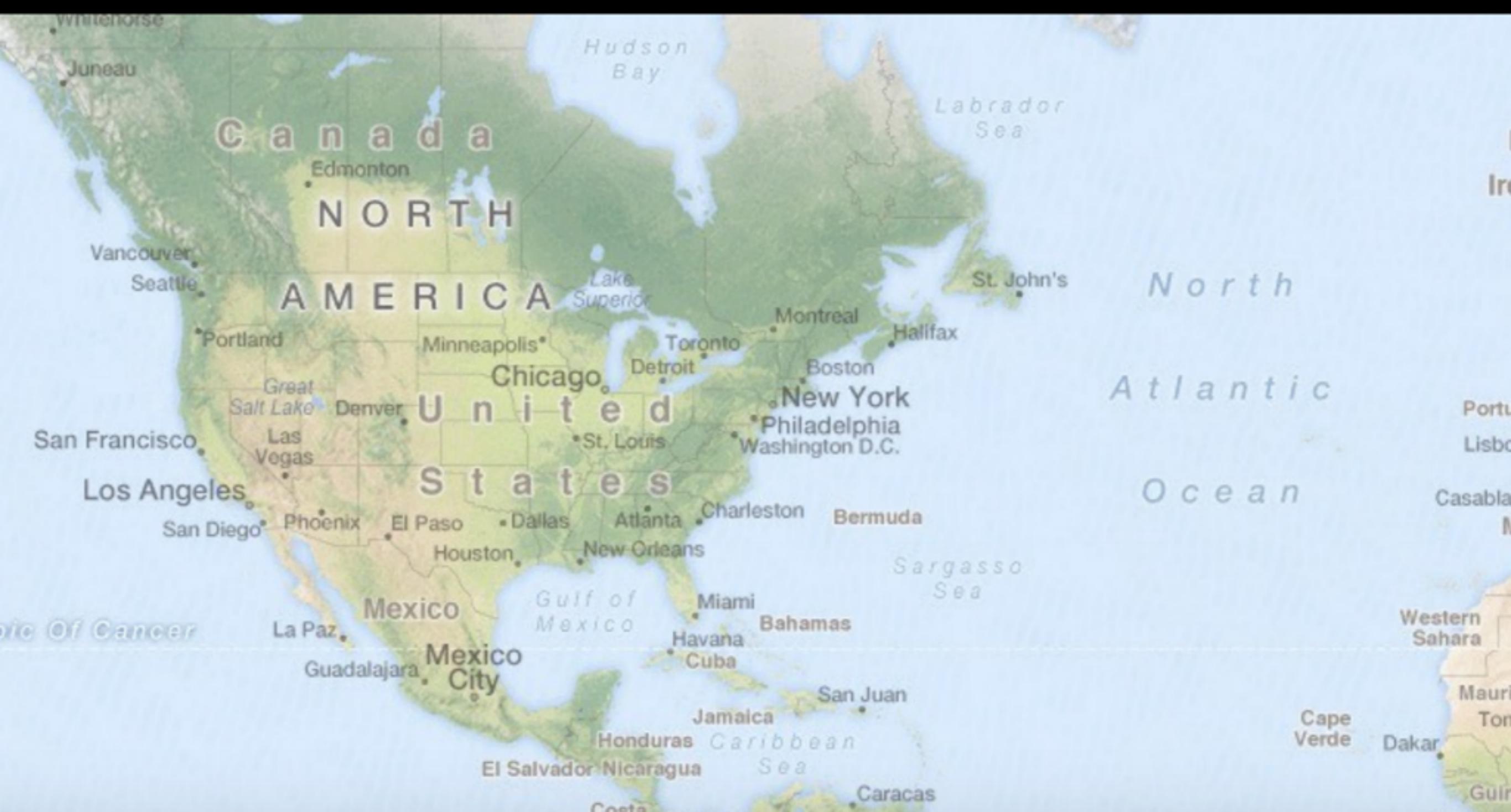


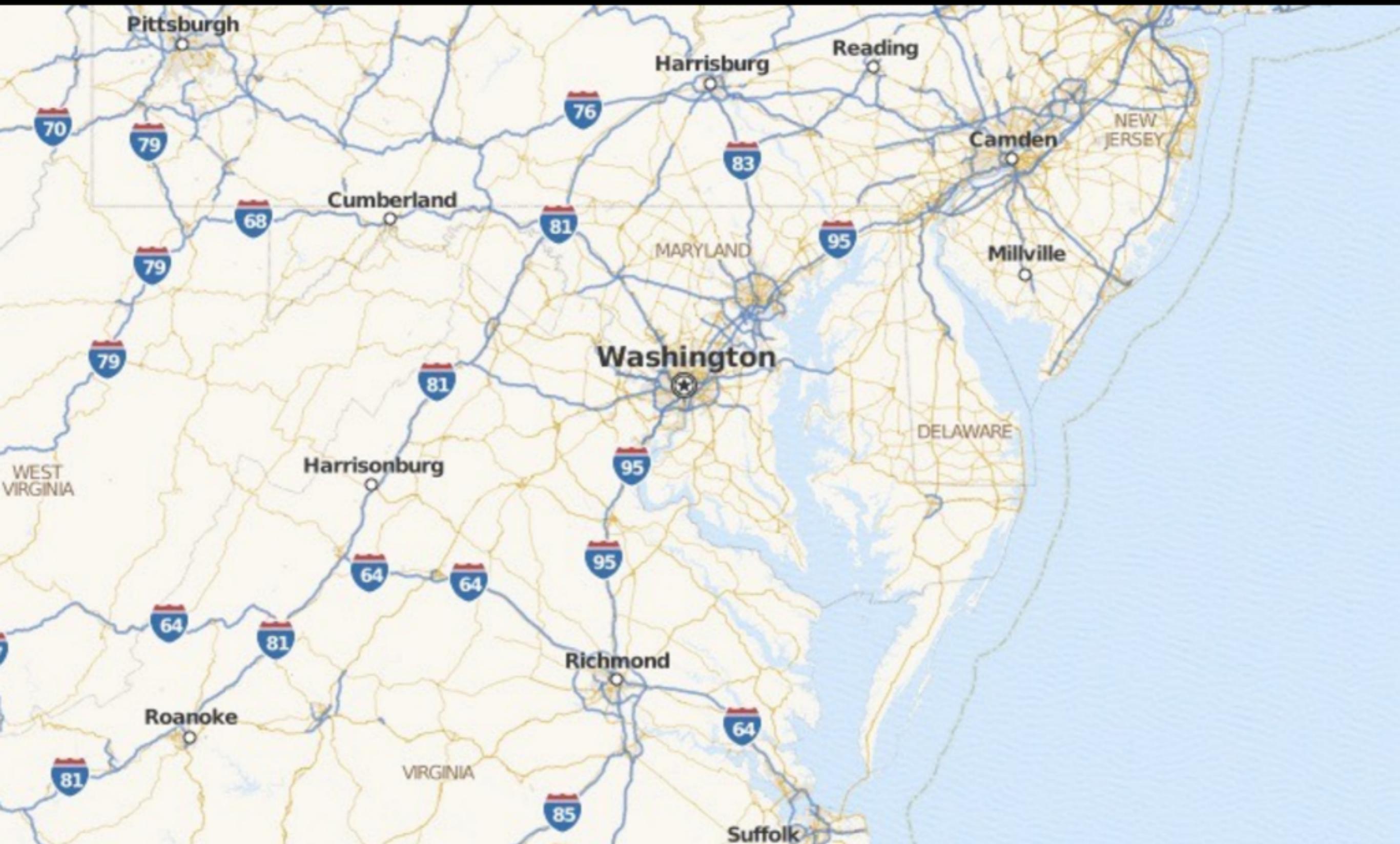
icosahedron

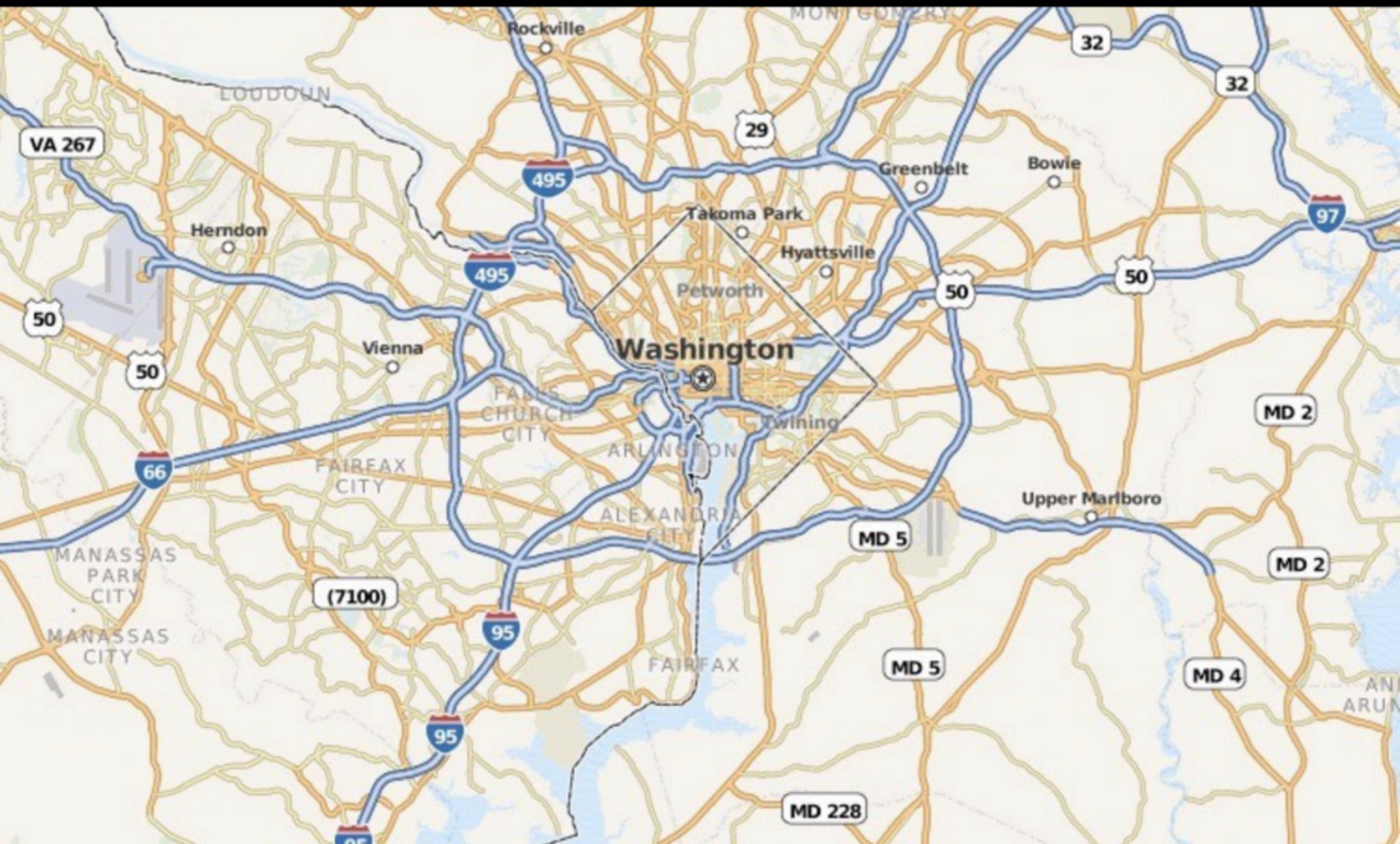


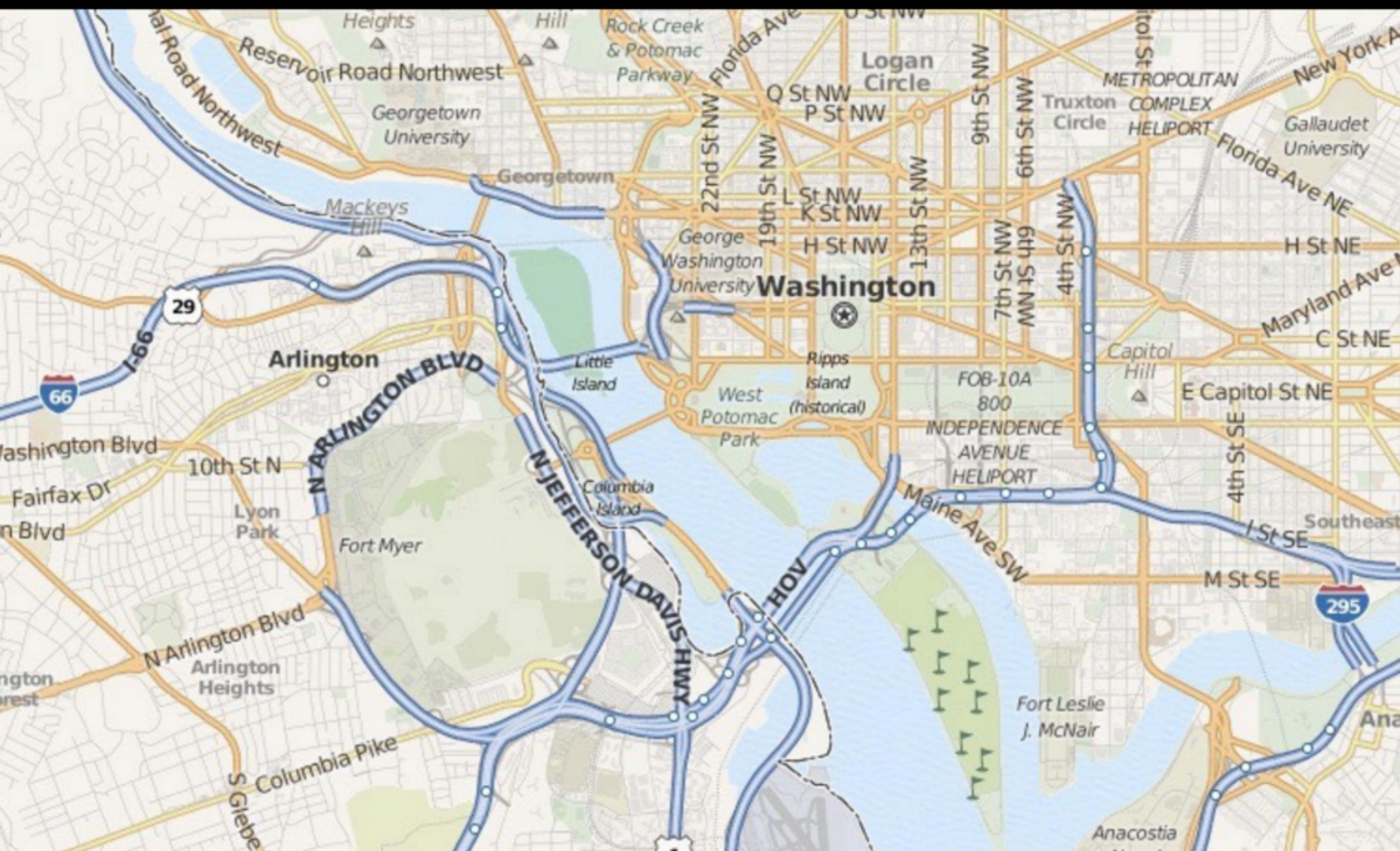
Scale

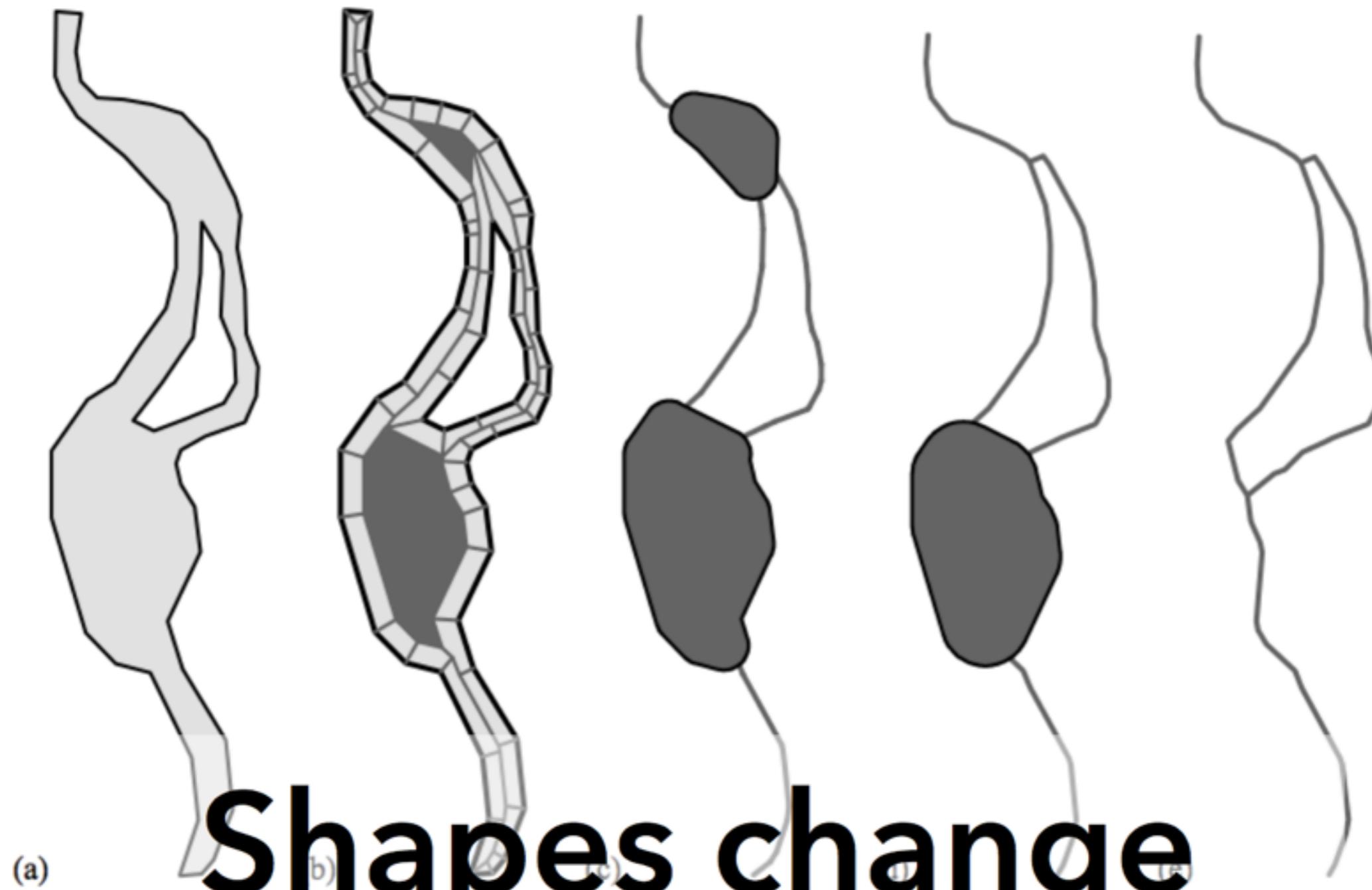
What shows at different scales?











Shapes change at different scales

Figure 11. Fragmentation of a river into polygons and lines with different thresholds leading to different results (c, d, e).

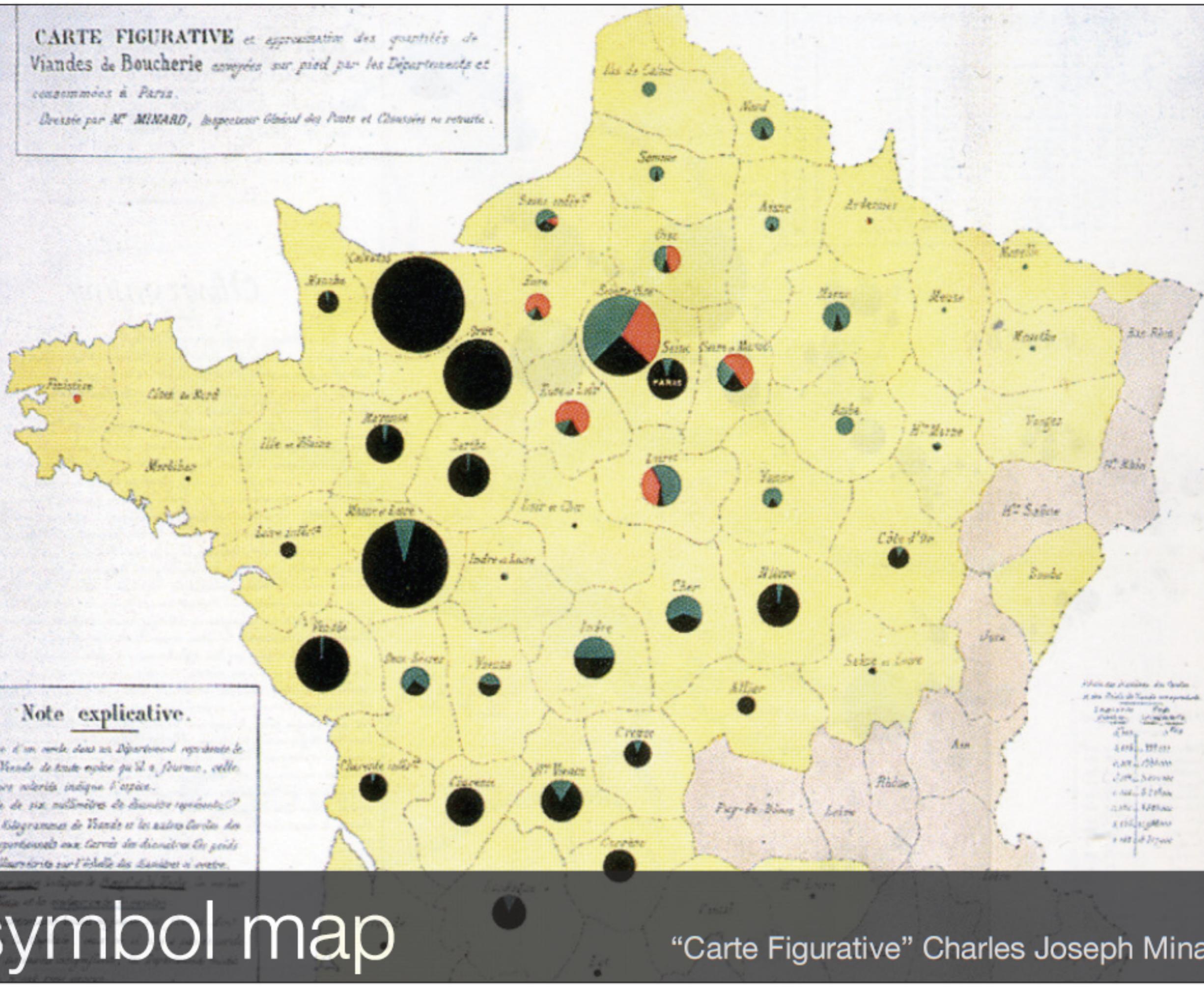
Symbols

Dots can can be good symbols



CARTE FIGURATIVE et approvisionnement des quantités de Viandes de Boucherie conçues sur pied par les Départements et consommées à Paris.

Dessiné par M^e MINARD, Inspecteur Général des Ponts et Chaussées ne retrace.



symbol map



Dots can include data

Ike

BRITISH ALBERTA
SASKATCHEWAN
Last update
Category 2 Hurricane

Sept. 11, 2008, 5 p.m. EDT

Maximum wind speed 100 mph

Ground speed 10 mph

Pressure 950

Seattle

WASH.

Oregon

Boise

MONTANA

NORTH DAKOTA

S. DAK.

WYOMING

UNITED STATES

NEVADA

UTAH

CALIFORNIA

Las Vegas

ARIZONA

Phoenix

NEW MEXICO

COLORADO

KANSAS

TEXAS

OKLA.

MISS.

ARK.

LA.

FLA.

GUATEMALA

HONDURAS

NICARAGUA

COSTA RICA

VENEZUELA

SURINAME

GUYANA

COLOMBIA

ECUADOR

PERU

Alberta

SASKATCHEWAN

MANITOBA

ONTARIO

QUEBEC

NEWFOUNDLAND AND LABRADOR

Q U E B E C

NEWFOUNDLAND AND LABRADOR

Q U E B E C

St John's

N.B.

P.E.I.

ME.

N.H.

Boston

VT.

N.Y.

Detroit

Indianapolis

PA.

New York

Philadelphia

Washington, D.C.

VA.

KY.

IND.

OHIO

PA.

NC.

S.C.

GA.

FLA.

MIAMI

Nassau

Kingston

DOM. REP.

San Juan

Bridgetown

Castries

St. George's

Port-of-Spain

Caracas

Montería

Medellín

Ibagué

Bogotá

Quito

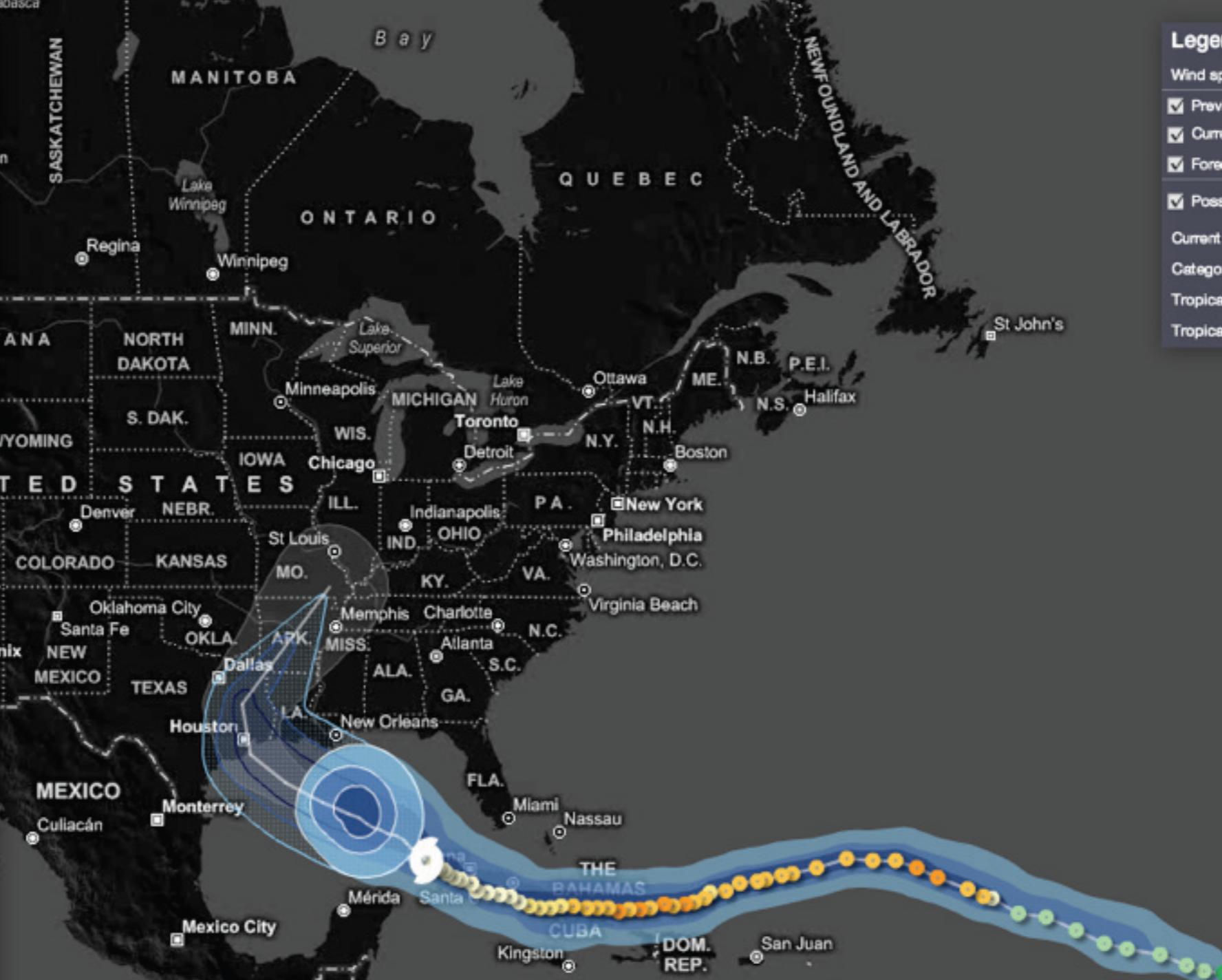
Guayaquil

Iquitos

Manaus

Belém

Fortaleza



Legend

Wind speed, mph | 39+ 58+ 74+

<input checked="" type="checkbox"/> Previous	
<input checked="" type="checkbox"/> Current	
<input checked="" type="checkbox"/> Forecast	

Possible forecast error |

Current location |

Categories 1 - 5 |

Tropical storm |

Tropical depression |

5-day storm forecast for your home

Type an address...

Search



- Flexible spatial subdivision
- Can encode many dimensions
- Easy to implement
- Many suffer from occlusion, interference

The New York Times

Mapping America: Every City, Every Block

Find something interesting? Share this view on [Twitter](#) or [Facebook](#)

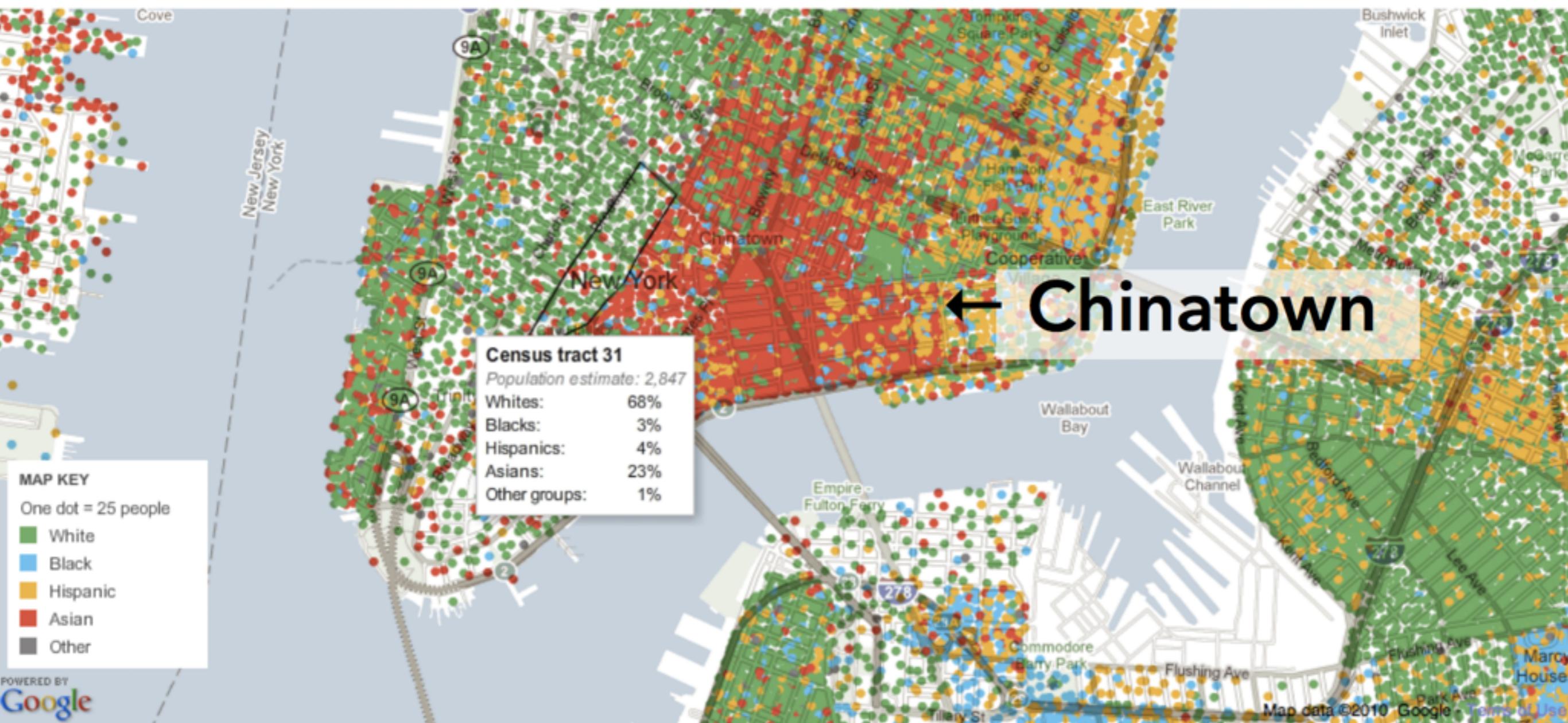
Browse local data from the Census Bureau's American Community Survey, based on samples from 2005 to 2009. Because these figures are based on samples, they are subject to a margin of error, particularly in places with a low population, and are best regarded as estimates.

Distribution of racial and ethnic groups

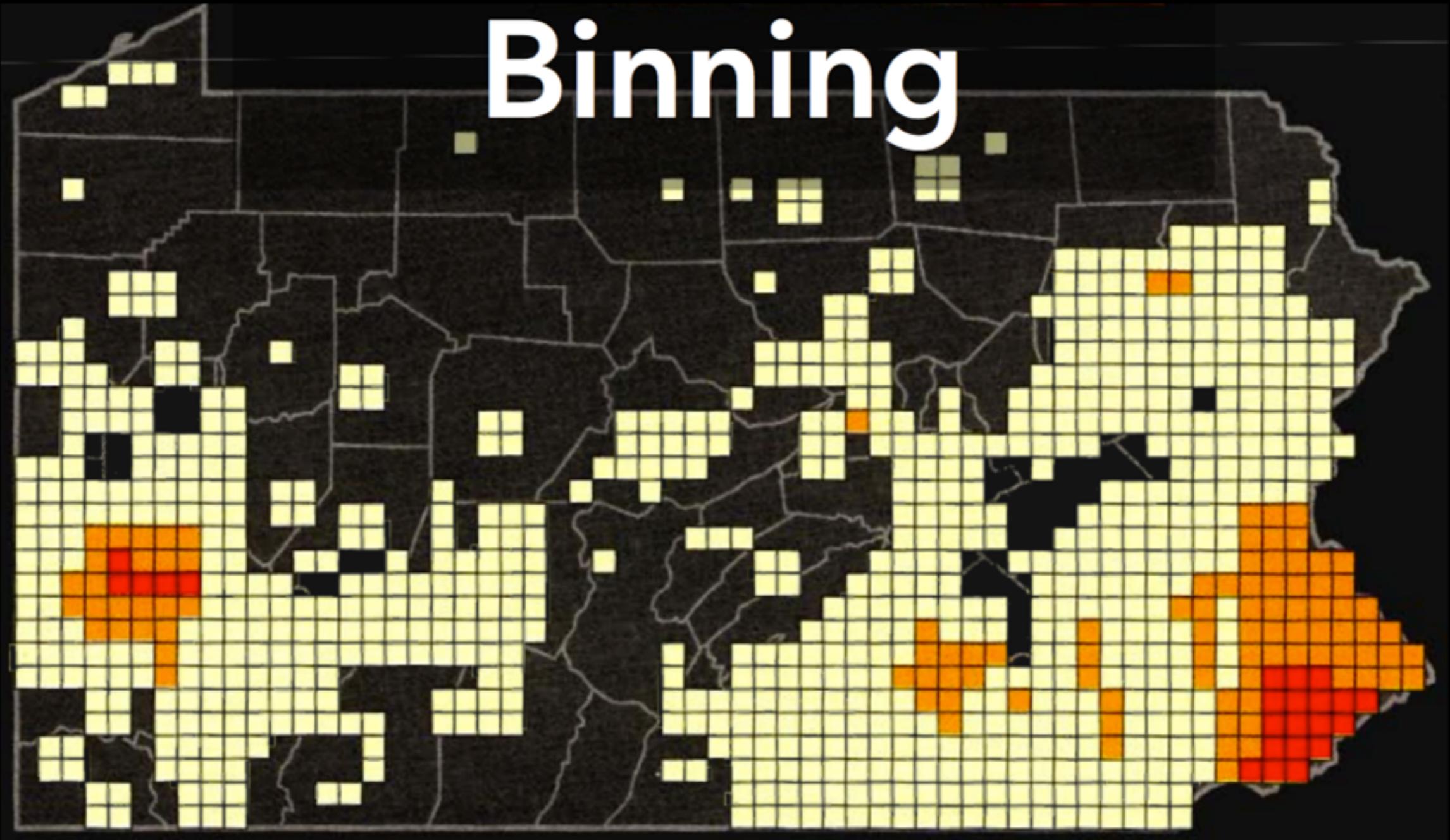
[View More Maps](#)

Address, ZIP code or city

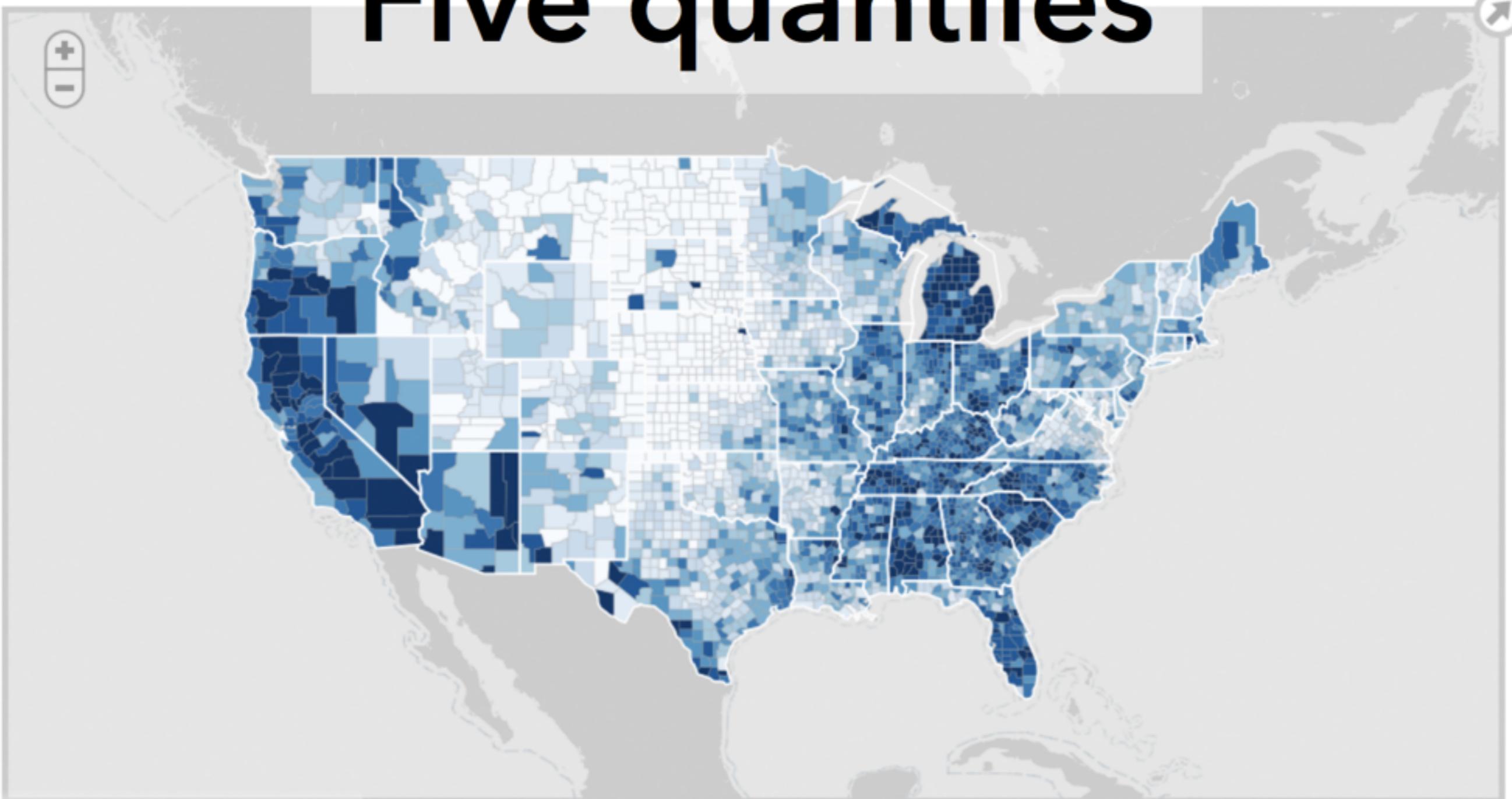
Go



Binning



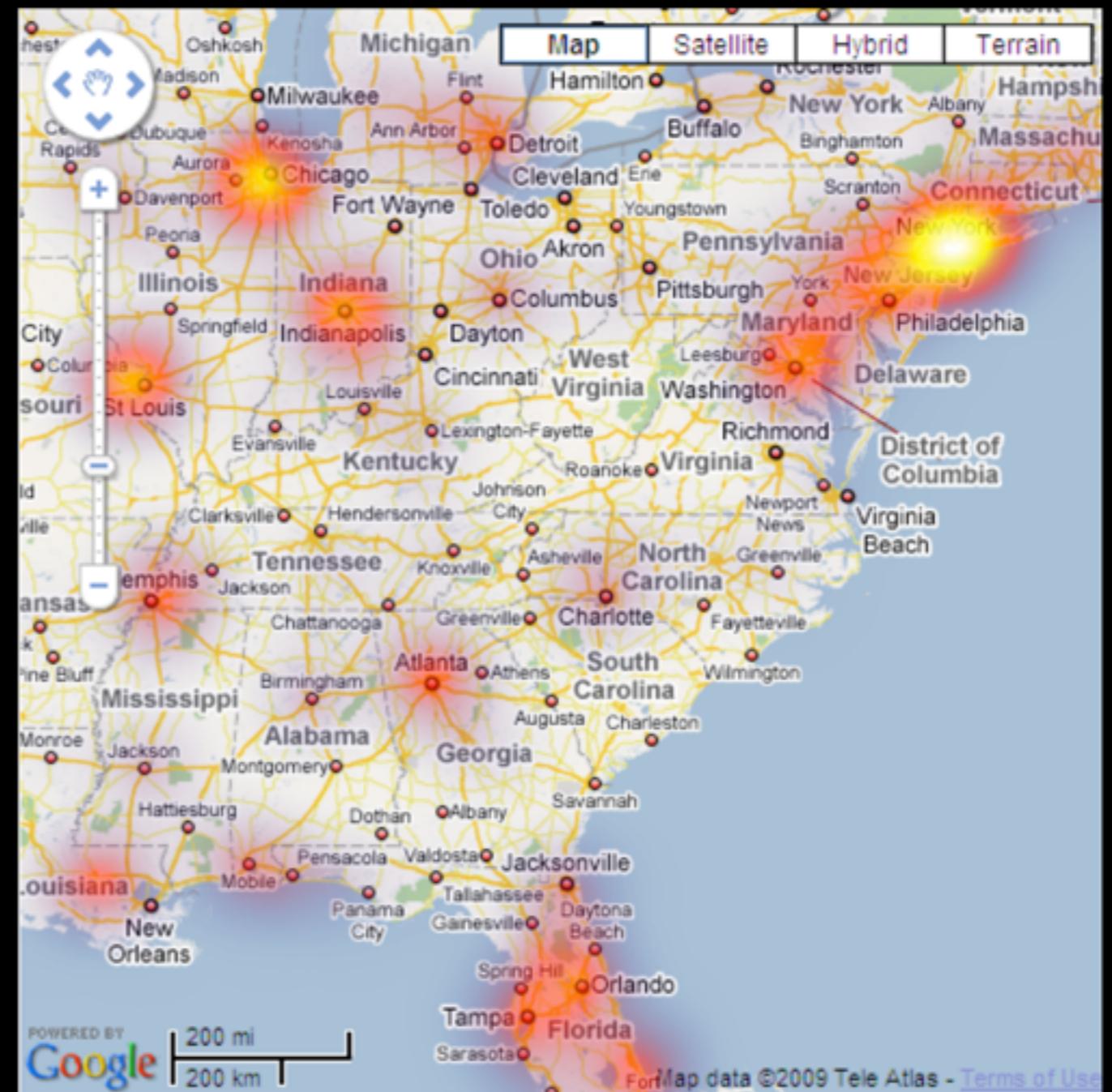
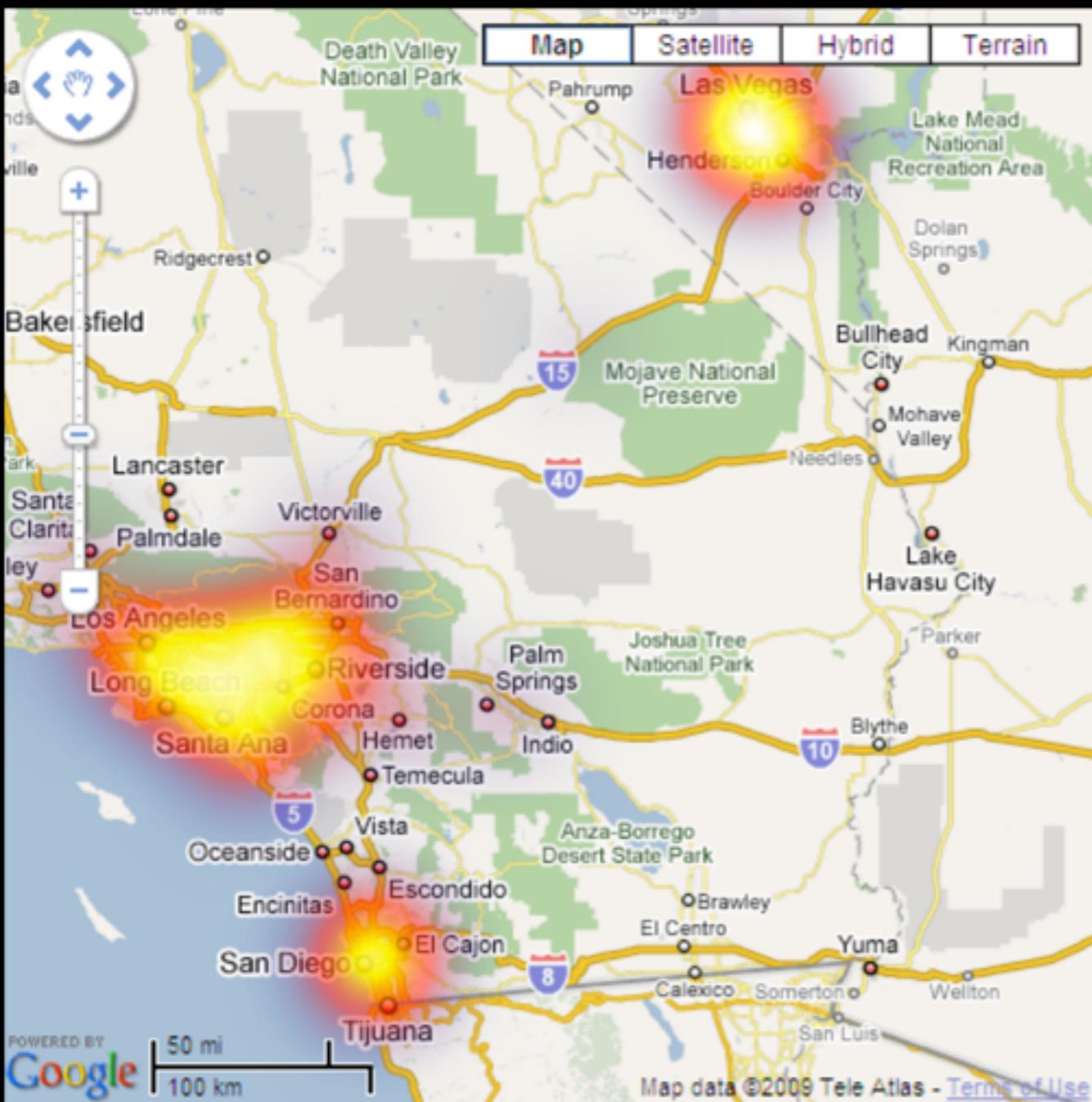
Five quantiles

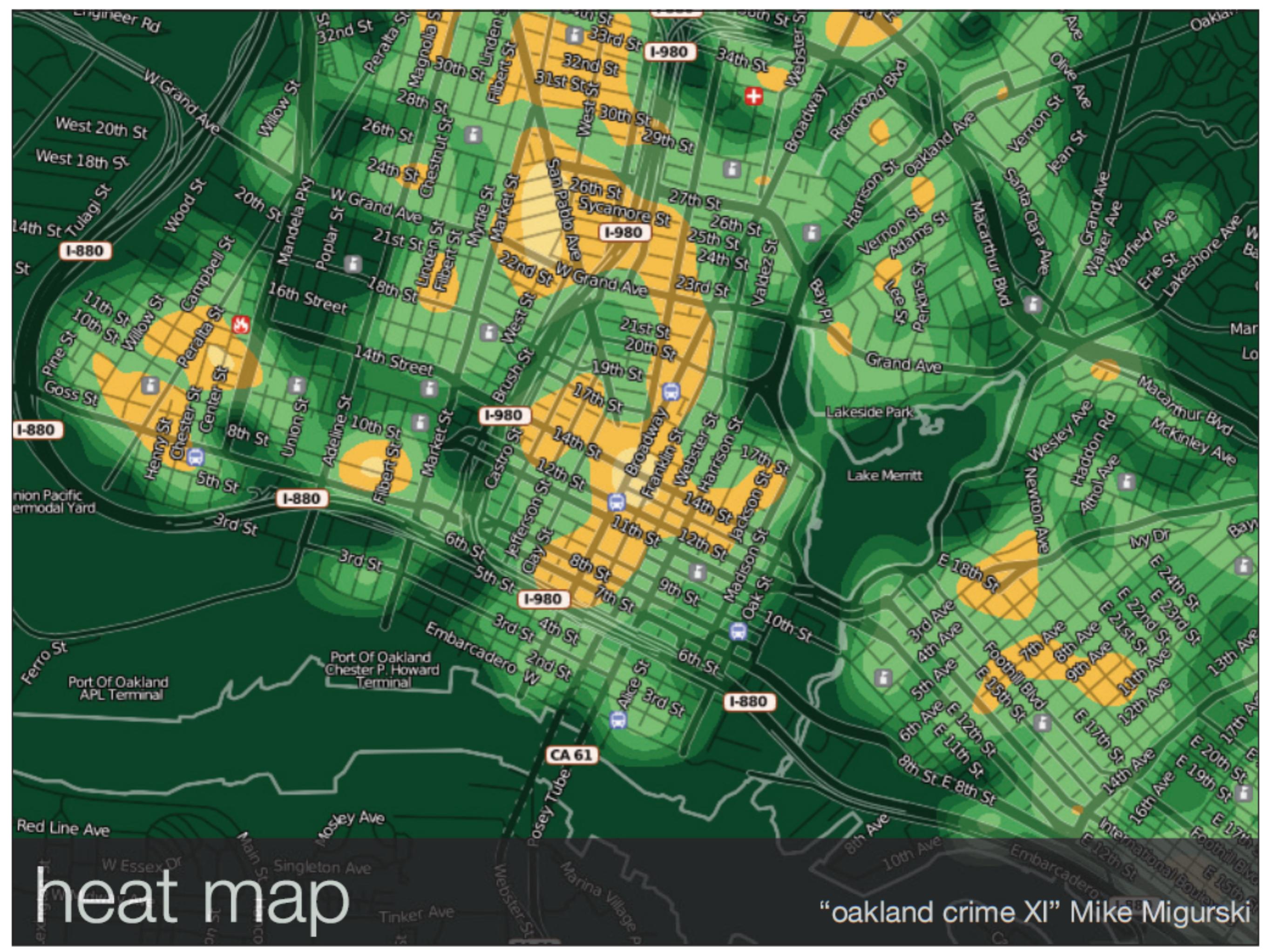


Polymaps is a project from
[SimpleGeo](#) and [Stamen](#).

Unemployment

- ~ discrete 1D distribution
- Fixed spatial subdivision
- Encode density, not raw value
- Choose color carefully
- Use equal-area projection





- Continuous 1D distribution
- Micro and macro comparison
- Scalable with data size or compute contours

Other Interesting Maps

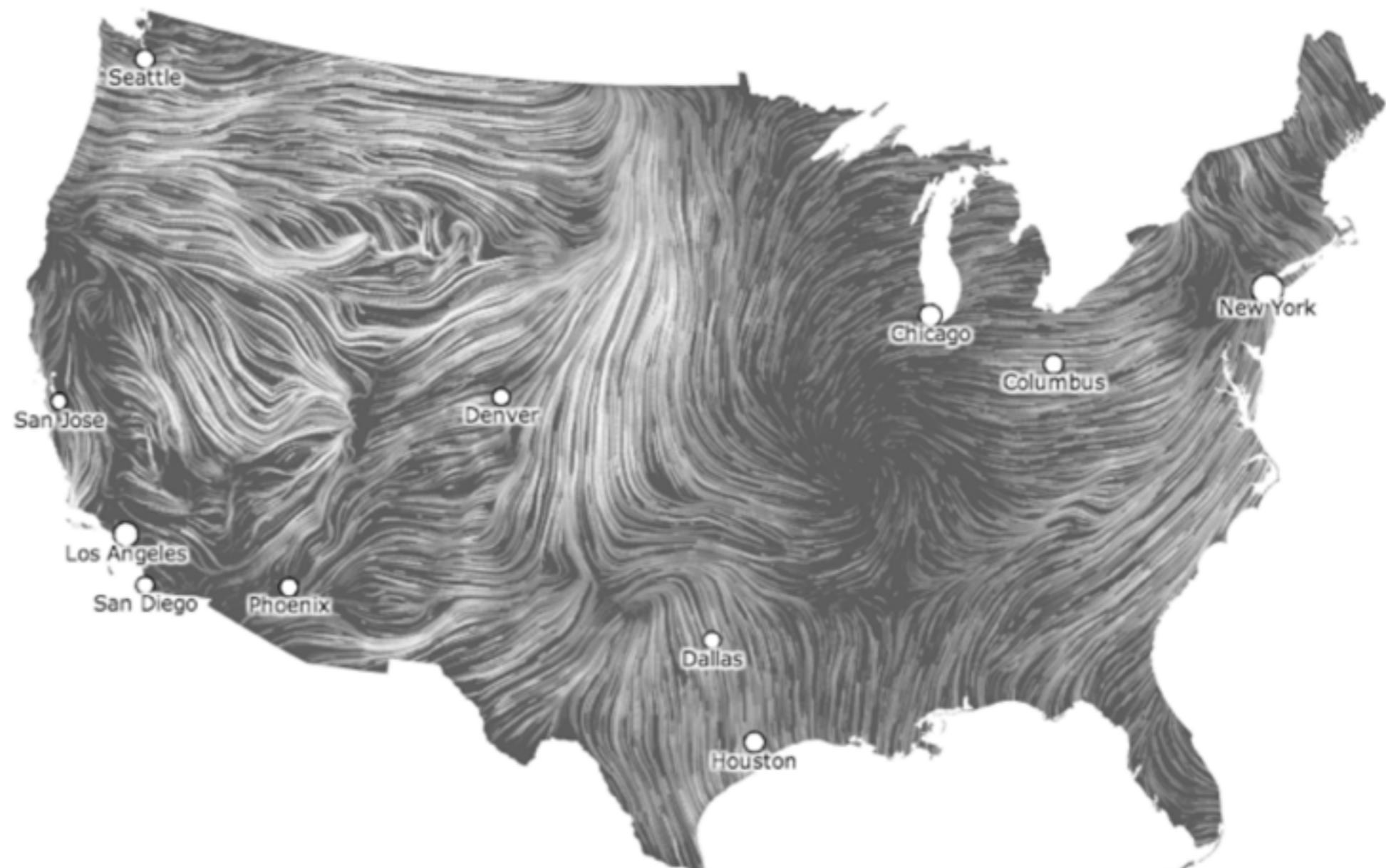
wind map

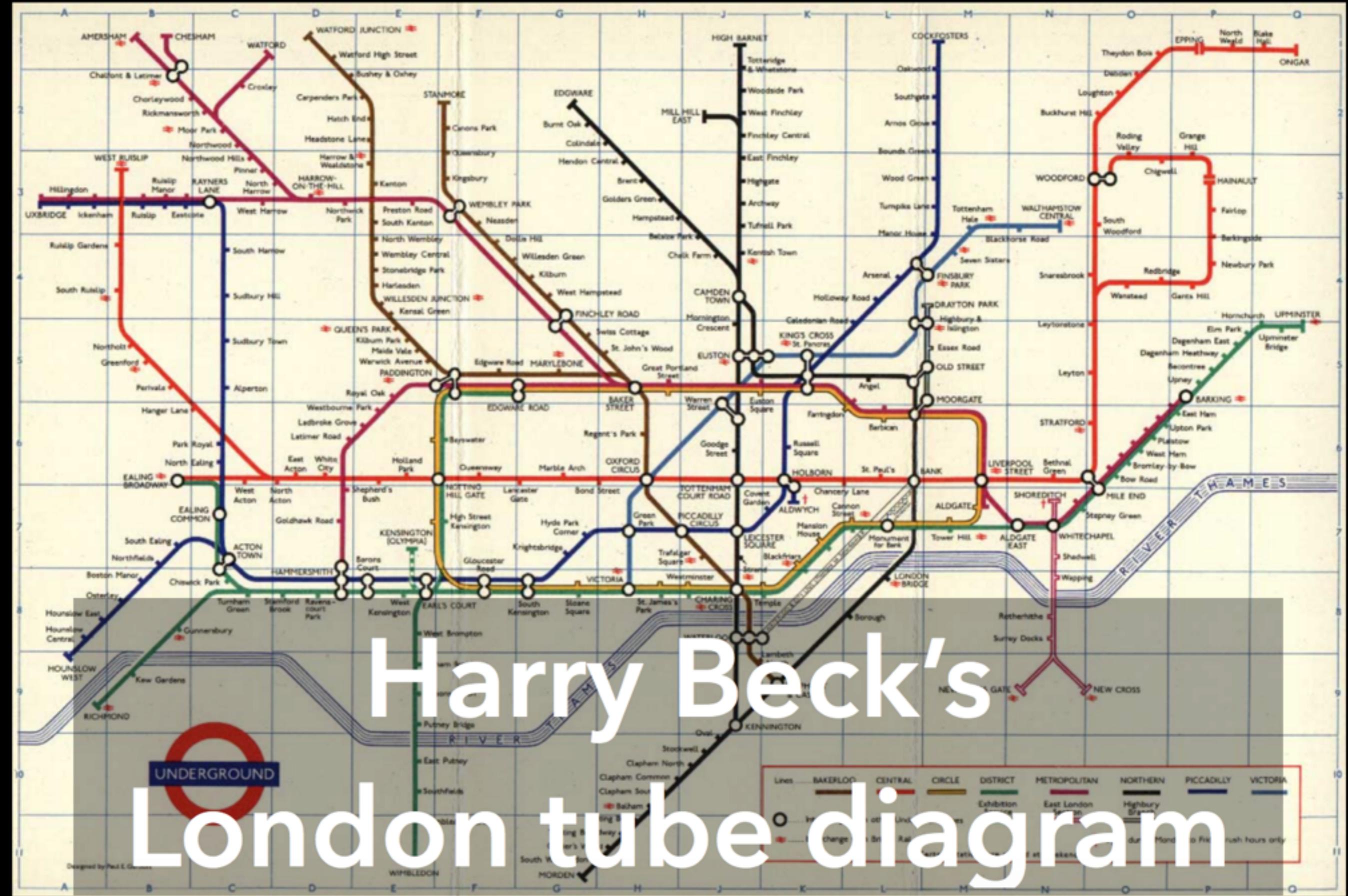
February 19, 2014

11:55 am EST

(time of forecast download)

top speed: 35.3 mph
average: 11.6 mph





Map Design via Optimization [Agrawala '01]

Set of graphic elements

Roads, labels, cross-streets, ...

Choose visual attributes

Position, orientation, size, ...

Distortions increase flexibility

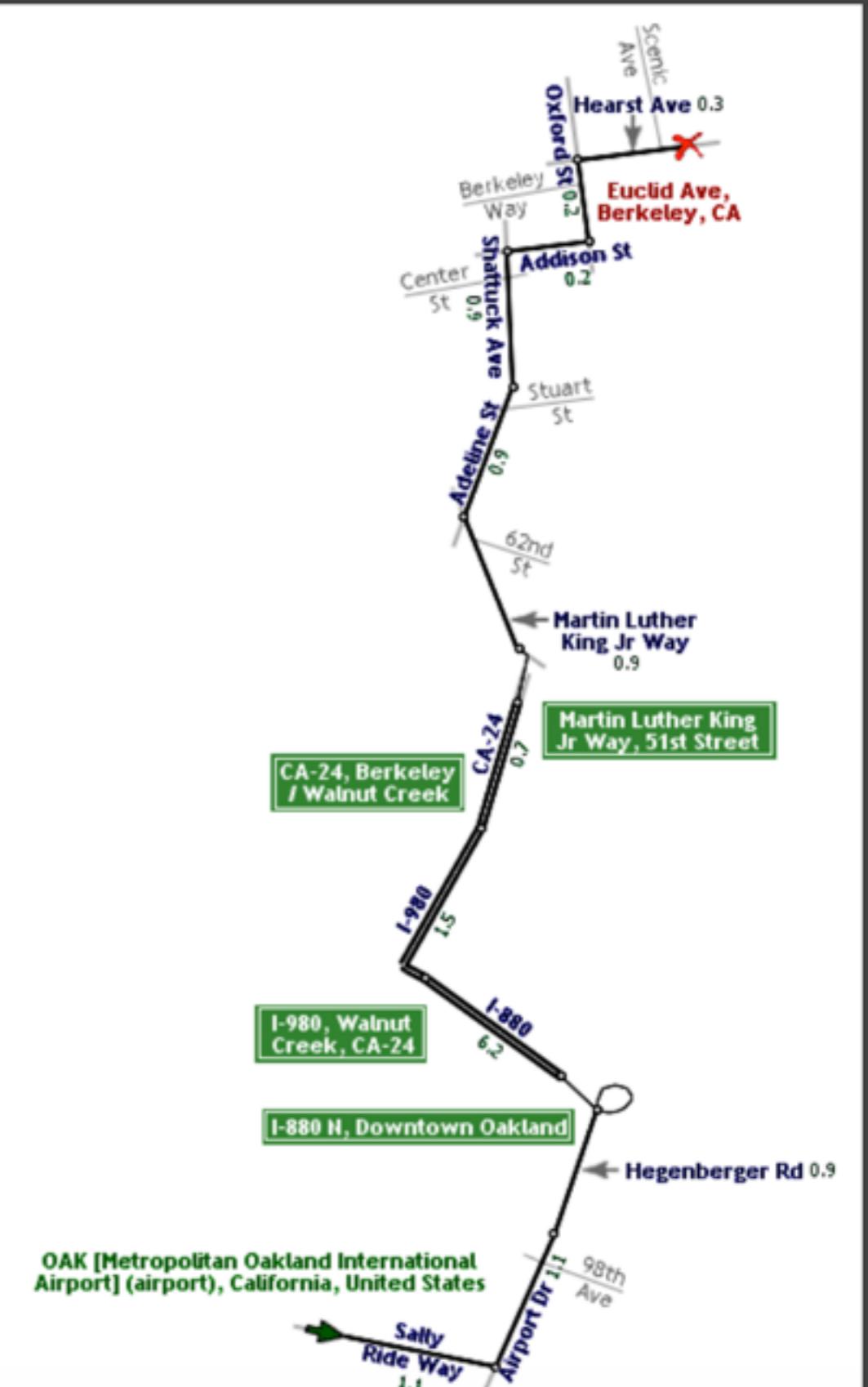
Develop constraints based on design principles

Simulated annealing

Perturb: Form a layout

Score: Evaluate quality

Minimize score



Route Maps: Bellevue to Seattle

