



UNIVERSITY OF SAN FRANCISCO
CHANGE THE WORLD FROM HERE

Map Types

Geospatial Data Visualization

MAP TYPES



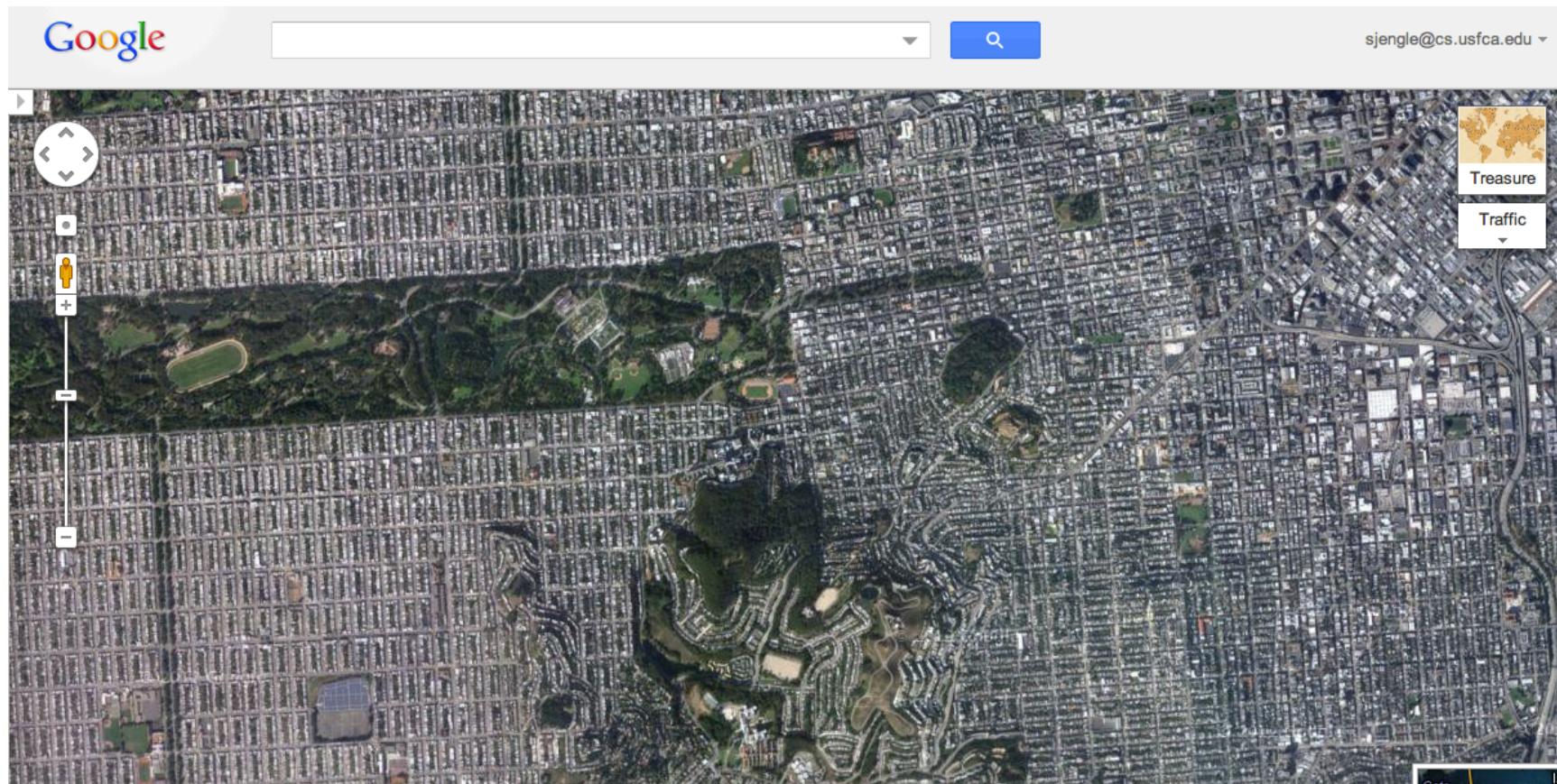
Map Types

- Physical Maps
 - Shows physical features (mountains, lakes)
- Road Maps
 - Shows road location and names, man-made features
- Topographic Maps
 - Shows 3d topography in 2d often using contour lines

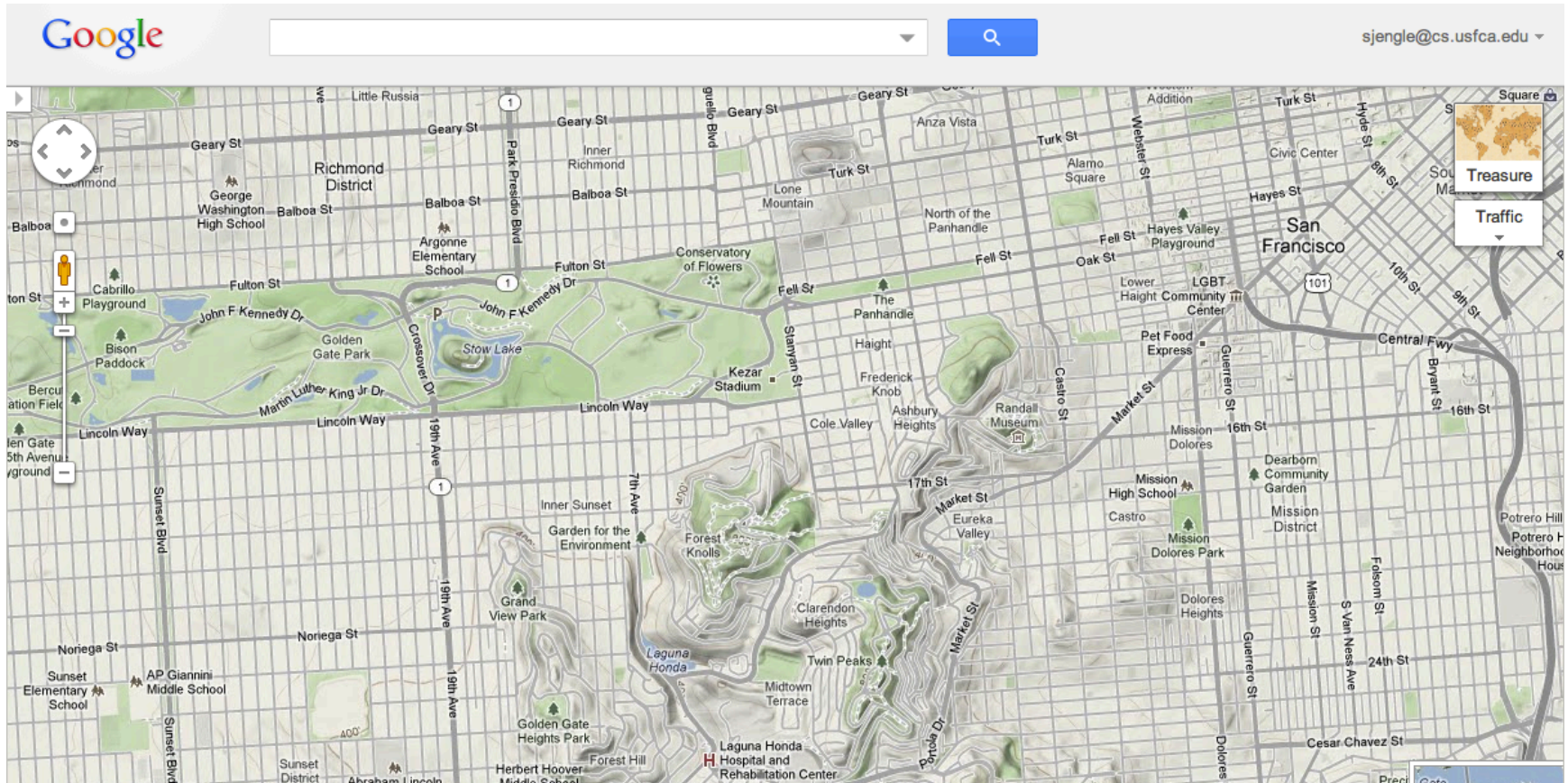
Map Types

- Thematic Maps
 - Maps for a specific purpose, usually displays a single data attribute in a geographic context
 - Includes choropleth, symbol, dot maps
- Other Maps
 - May distort geography slightly
 - Includes cartograms, transit maps, flow maps

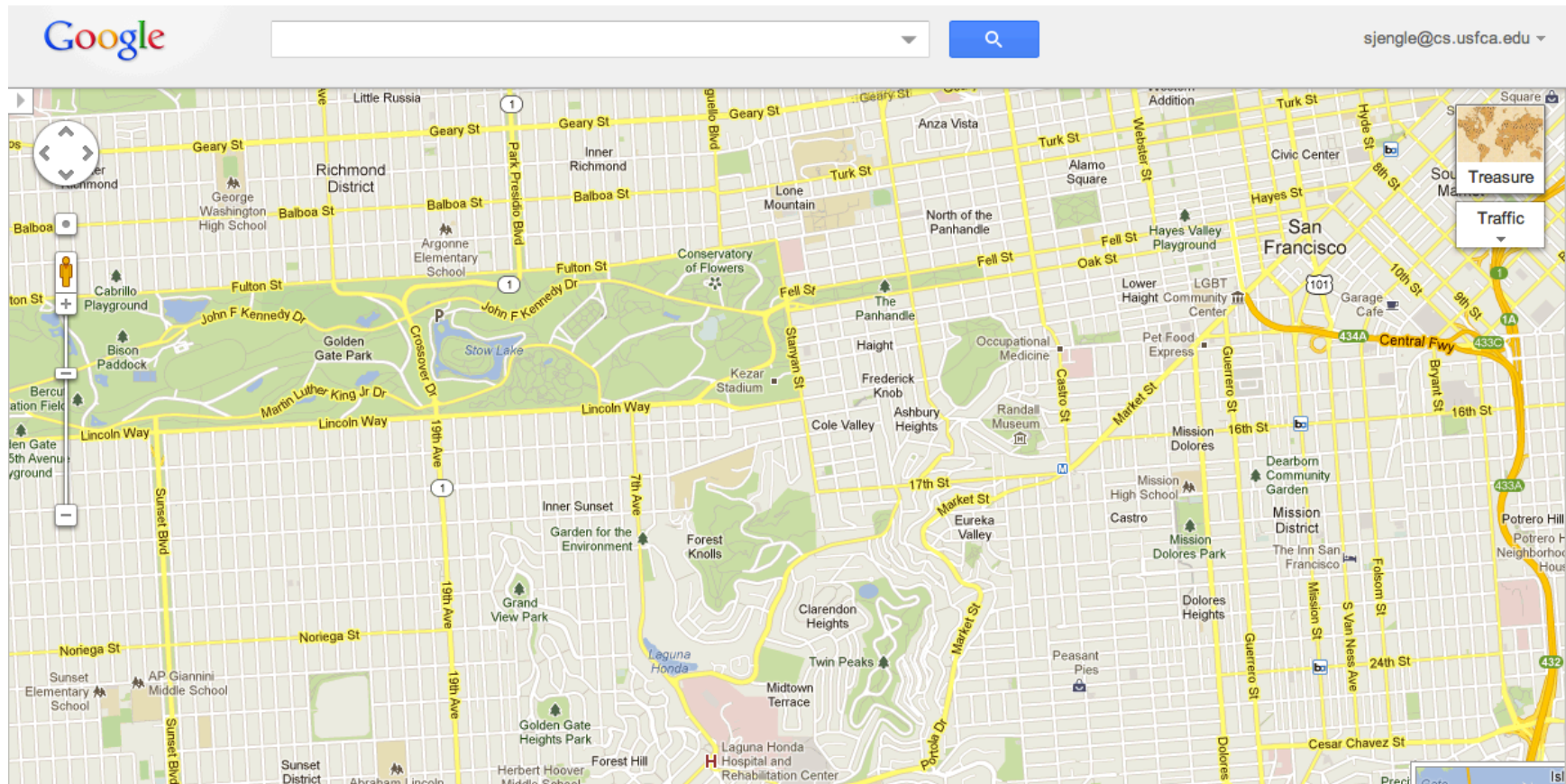




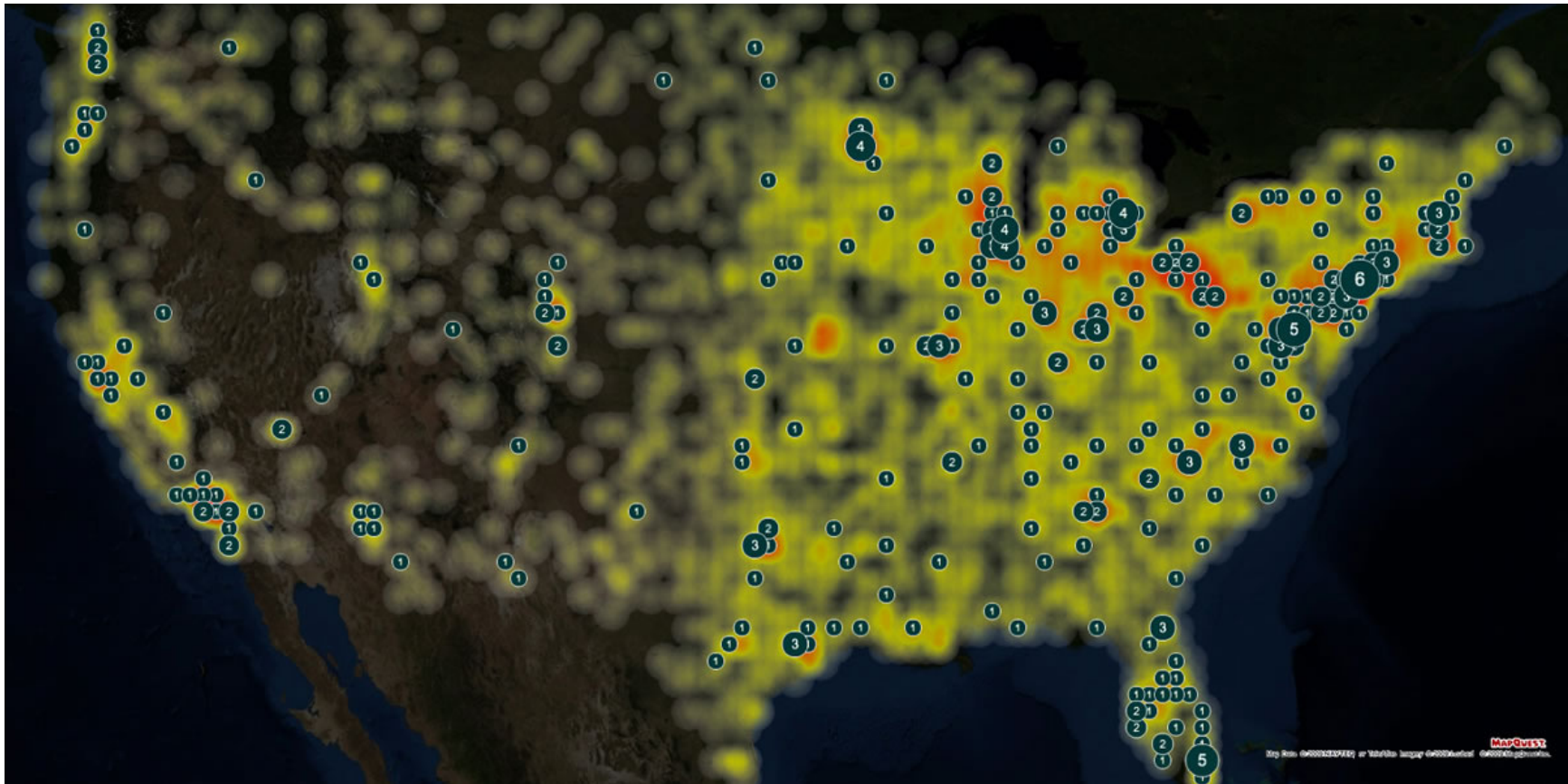
<http://maps.google.com/?ll=37.7577,-122.4376&spn=0.164489,0.283241&t=m&z=12>



<http://maps.google.com/?ll=37.7577,-122.4376&spn=0.164489,0.283241&t=m&z=12>



<http://maps.google.com/?ll=37.7577,-122.4376&spn=0.164489,0.283241&t=m&z=12>



<http://blog.spatialkey.com/2009/10/mapping-saturn-and-gm-dealerships-service-is-still-nearby/>

CHOROPLETH MAPS

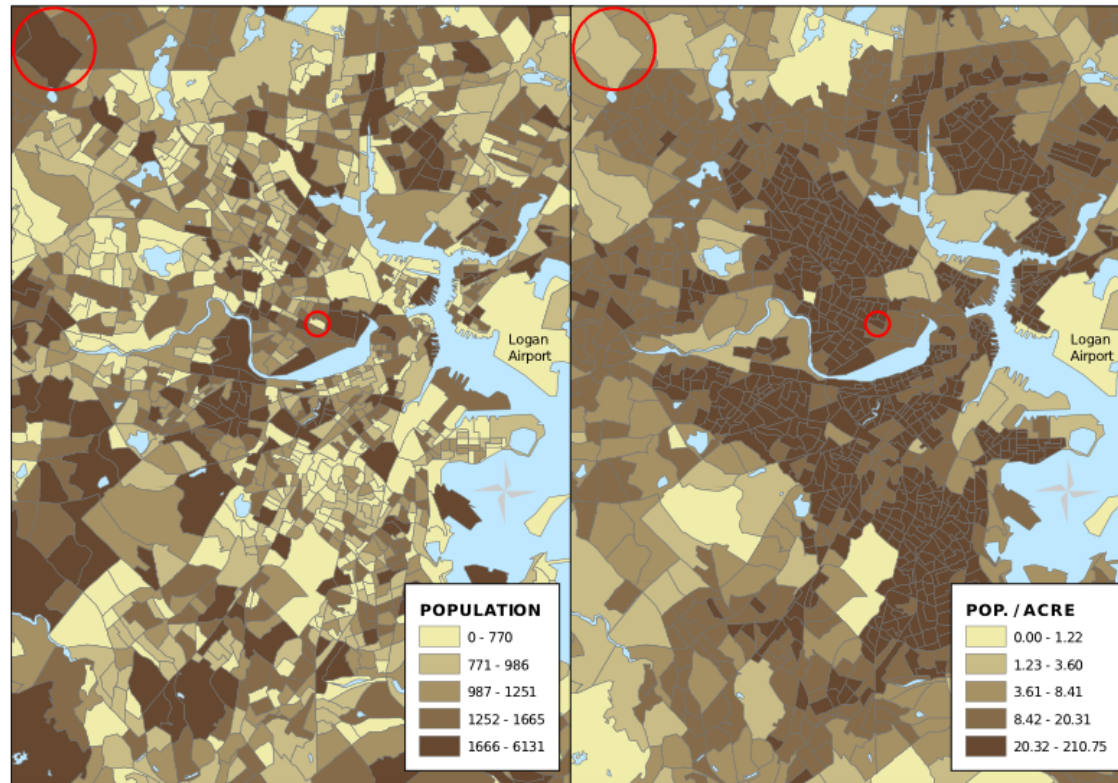


Choropleth Maps

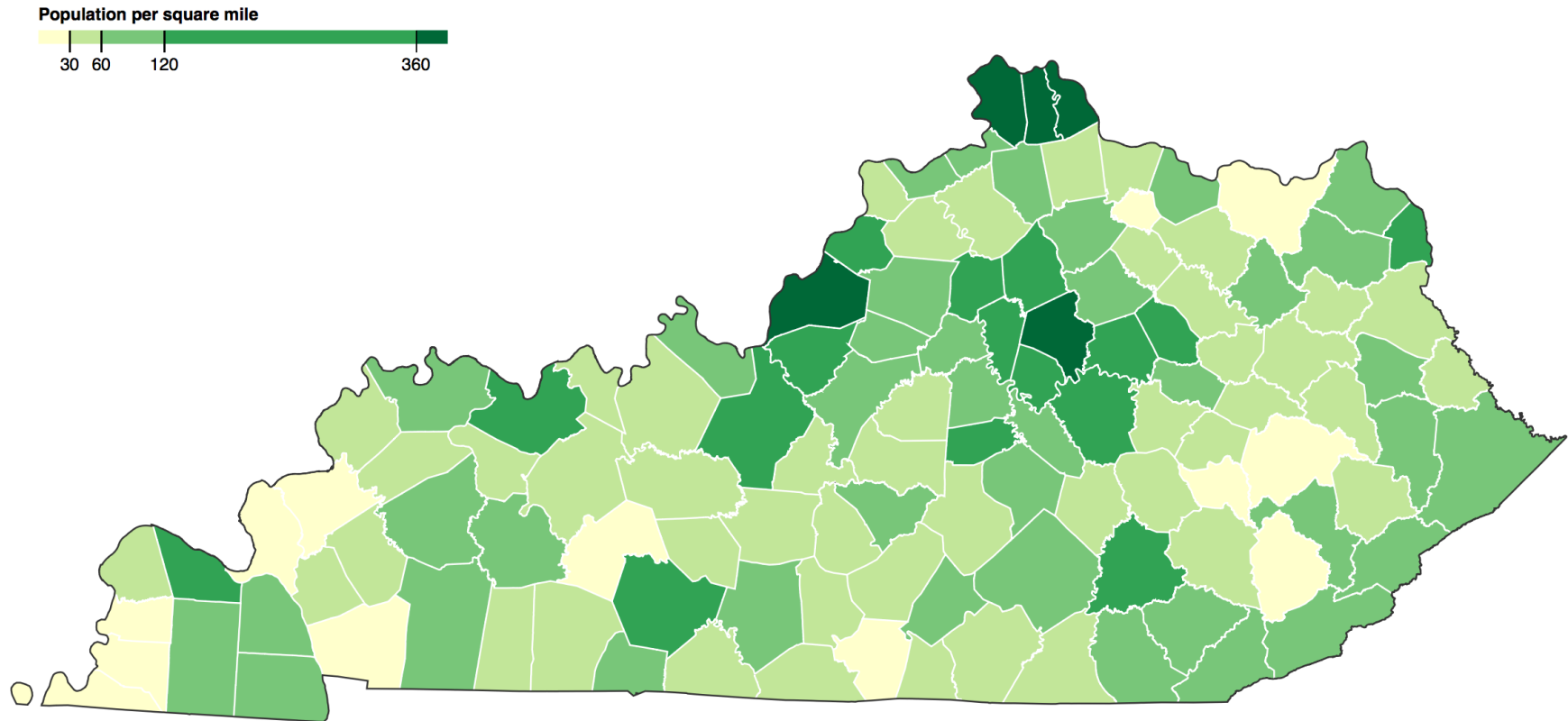
- Uses color and intensity to indicate data values
- Data should be normalized
 - Good: Percentages, ratios
 - Bad: Counts, totals
- Must use color wisely
 - Multiple colors, not using intensity
 - Multiple colors, using intensity
 - Monotone, only using intensity



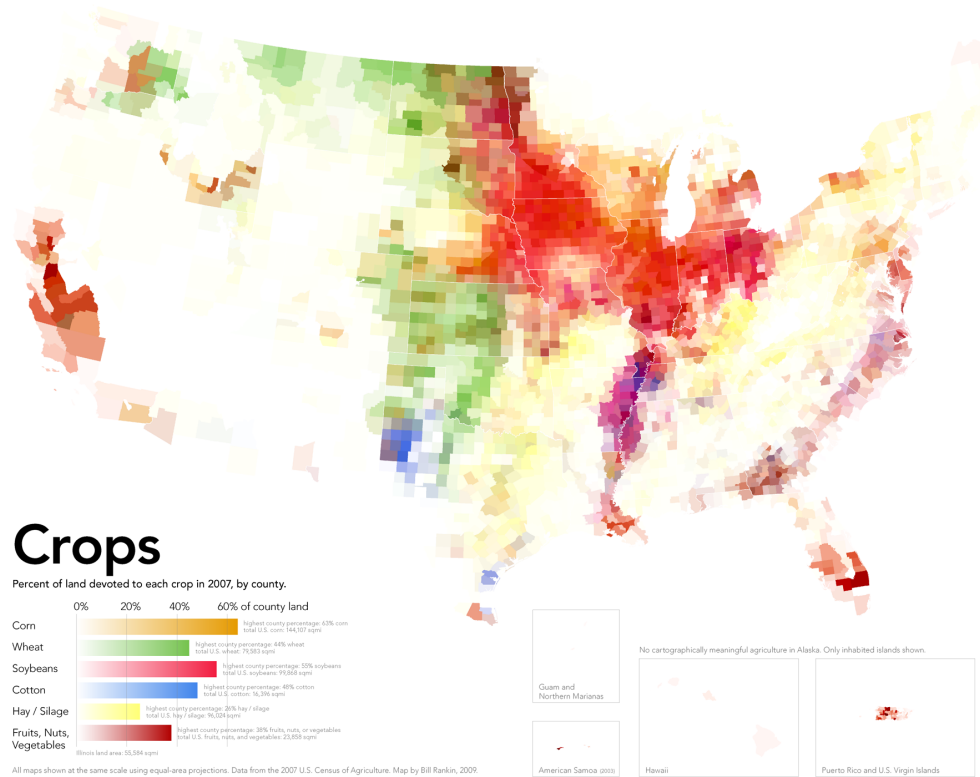
Total Population of 2000 Census Block Groups Population Density of 2000 Census Block Groups



<http://en.wikipedia.org/wiki/File:Choropleth-density.png>



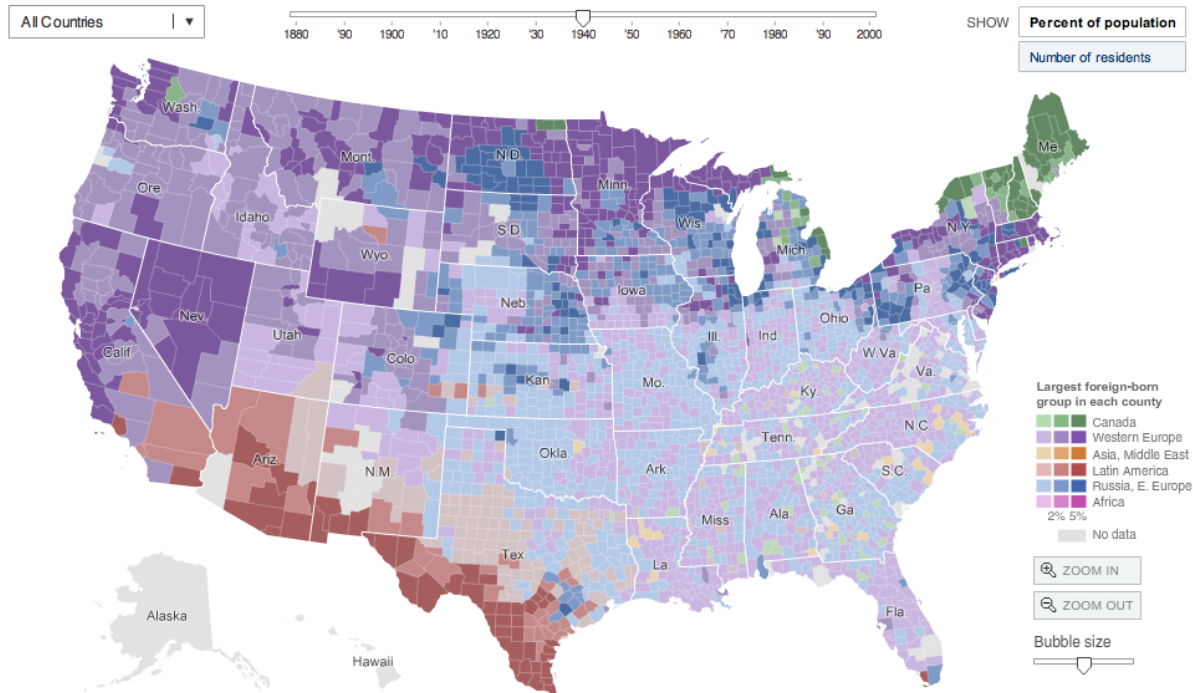
<http://bl.ocks.org/mbostock/5144735>



<http://www.radicalcartography.net/index.html?crops>

Immigration Explorer

Select a foreign-born group to see how they settled across the United States.

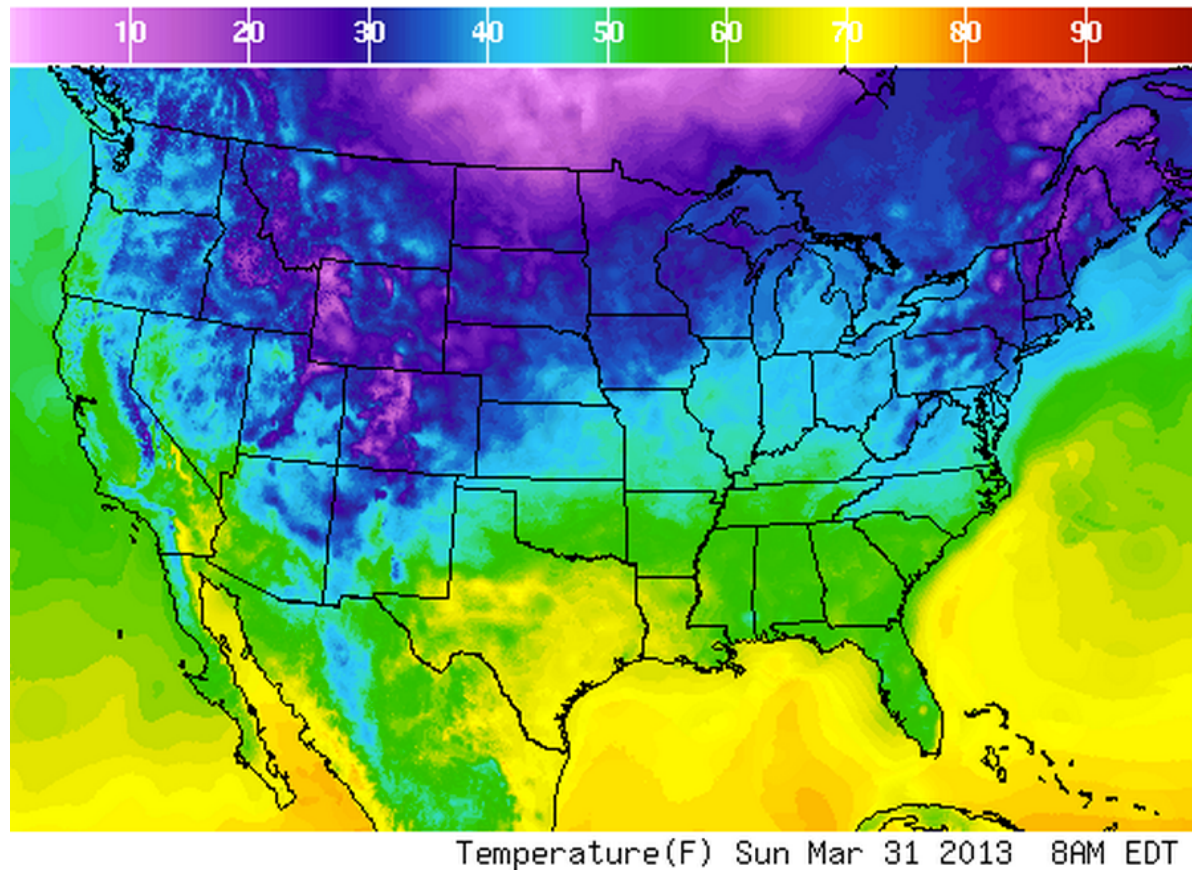


Note: Due to limitations in the Census data, foreign-born populations are not available in all areas for all years.

Sources: Social Explorer, www.socialexplorer.com; Minnesota Population Center; U.S. Census Bureau

Matthew Bloch and Robert Gebeloff/The New York Times

<http://www.nytimes.com/interactive/2009/03/10/us/20090310-immigration-explorer.html>



<http://graphical.weather.gov/sectors/conus.php?element=T>

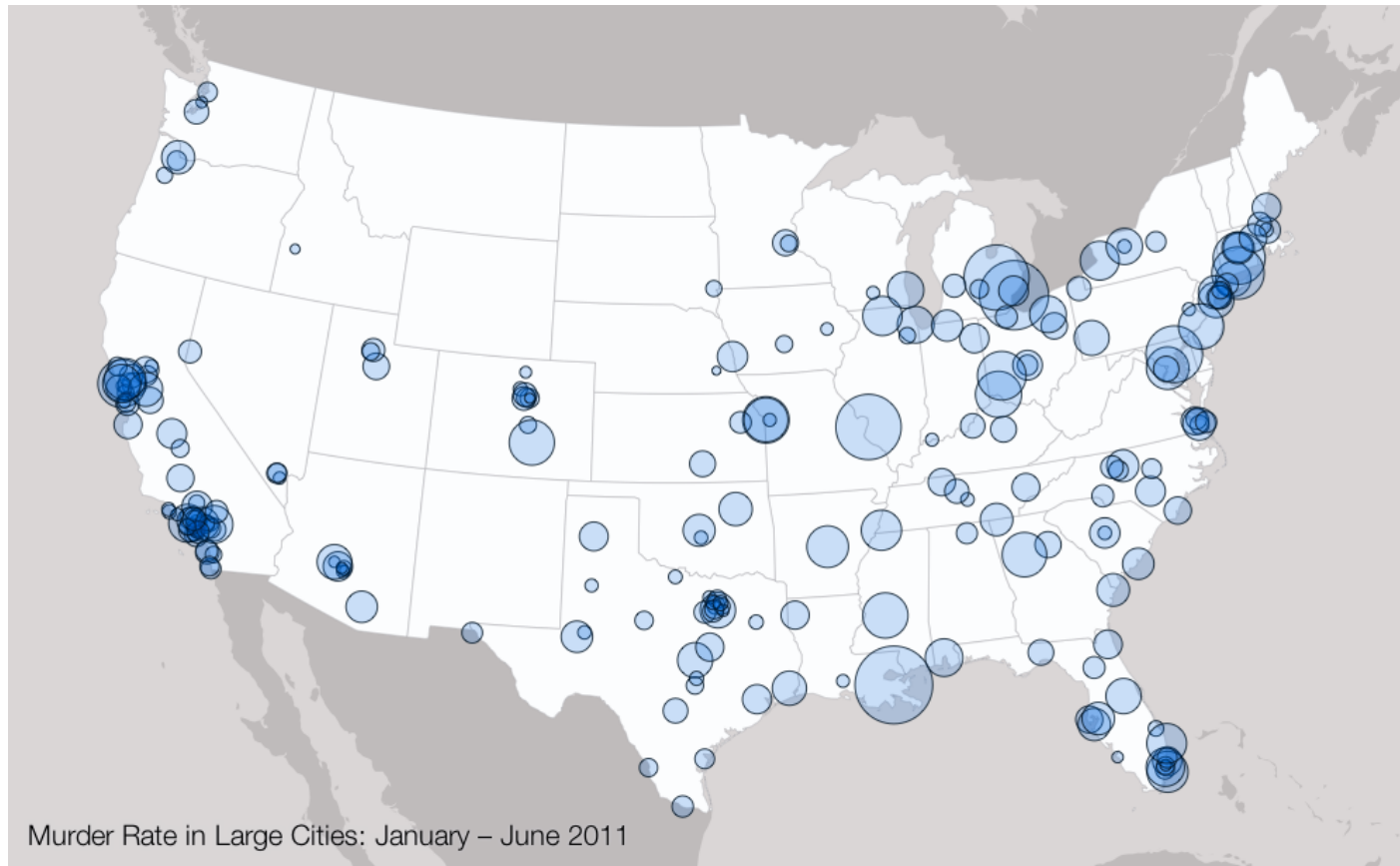
SYMBOL MAPS



Symbol Maps

- Encoding
 - Location, color, size, and type of symbol
- Location
 - Specific latitude and longitude
 - Regional (randomly placed within the region)
- Types
 - Proportional symbol maps
 - Dot maps (approximately one dot per pixel)





<http://vis4.net/blog/posts/clean-your-symbol-maps/>

All occupations

Business and technical professions

Health, education and service professions

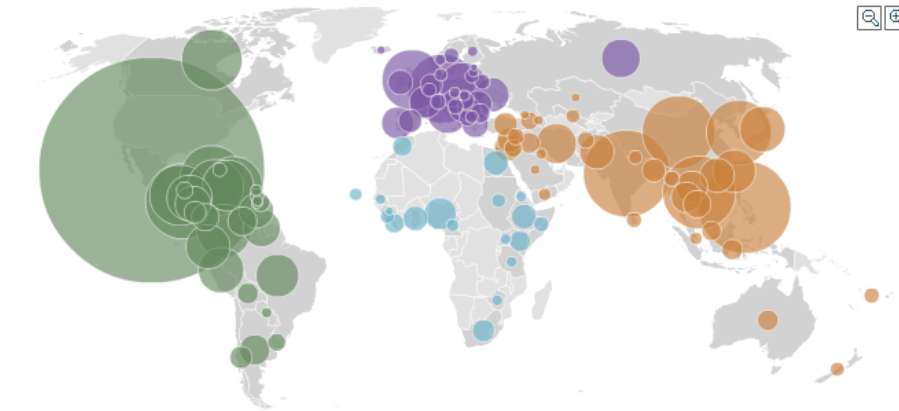
Hospitality, maintenance and personal services

Construction, manufacturing and other labor

All foreign-born workers

Number of workers: 17,553,000

As a percentage of all U.S. workers in this category: 17%



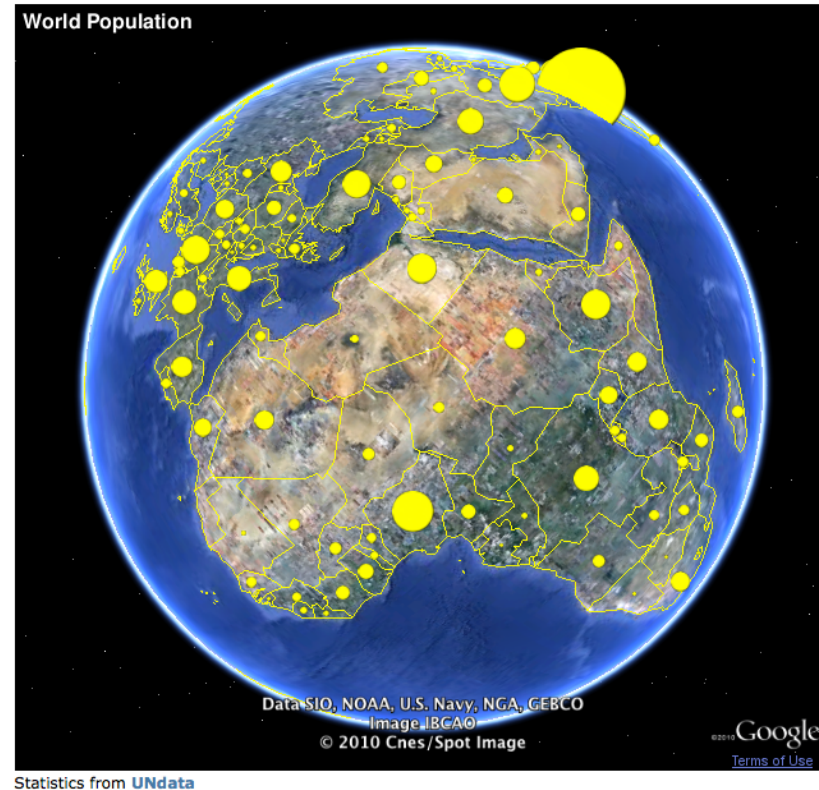
Map shows countries with more than 500 workers for the selected occupation.

Top ten	Number of workers (+/- Margin of error)		
1. Mexico	5,286,400	+/- 1%	
2. Philippines	848,800	+/- 2%	
3. India	746,200	+/- 2%	
4. China	653,000	+/- 2%	
5. El Salvador	580,100	+/- 2%	
6. Vietnam	526,000	+/- 2%	
7. Germany	476,100	+/- 2%	
8. South Korea	408,400	+/- 2%	
9. Cuba	399,300	+/- 2%	
10. Canada	364,900	+/- 2%	

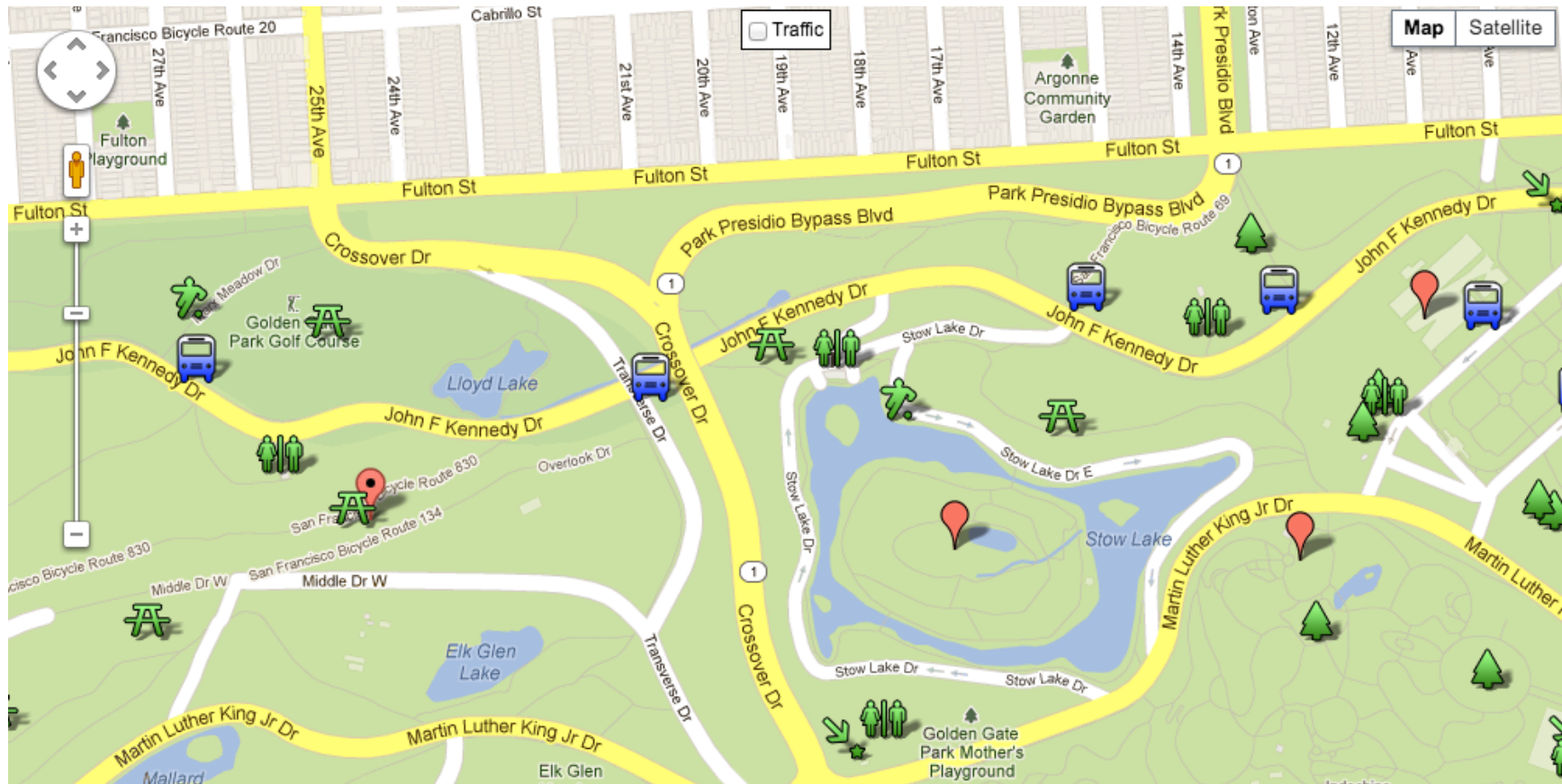
<http://www.nytimes.com/interactive/2009/04/07/us/20090407-immigration-occupation.html>

Proportional symbol map (images)

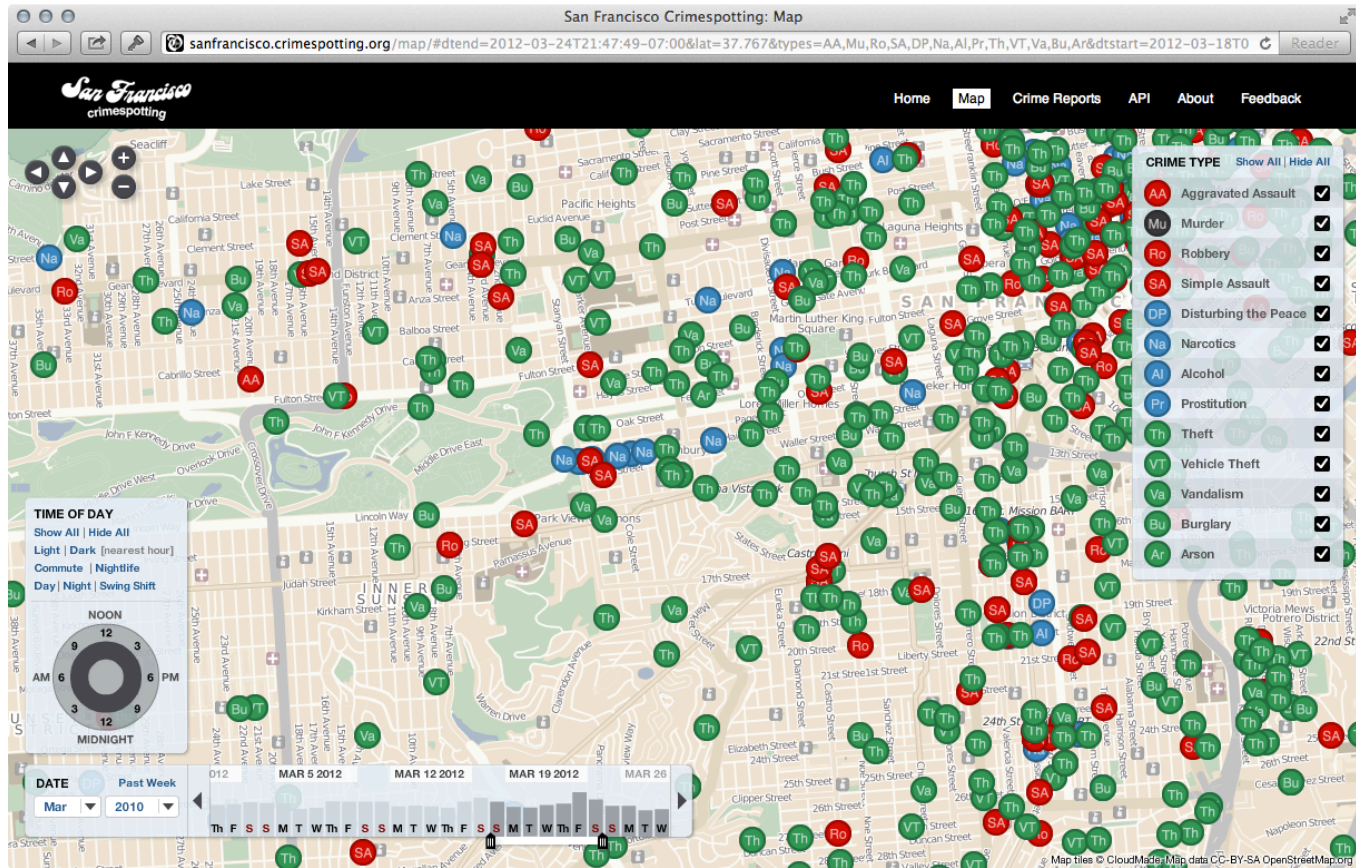
Using Google Visualization API, Google Spreadsheets ([view data](#)) and Google Earth API.



<http://thematicmapping.org/api/symbolimage.php>



<http://www.golden-gate-park.com/interactive-golden-gate-park-map.html>



<http://sanfrancisco.crimespotting.org>

A TAXONOMY OF TRANSITIONS

racial / ethnic
self-identification
in chicago
in the year 2000

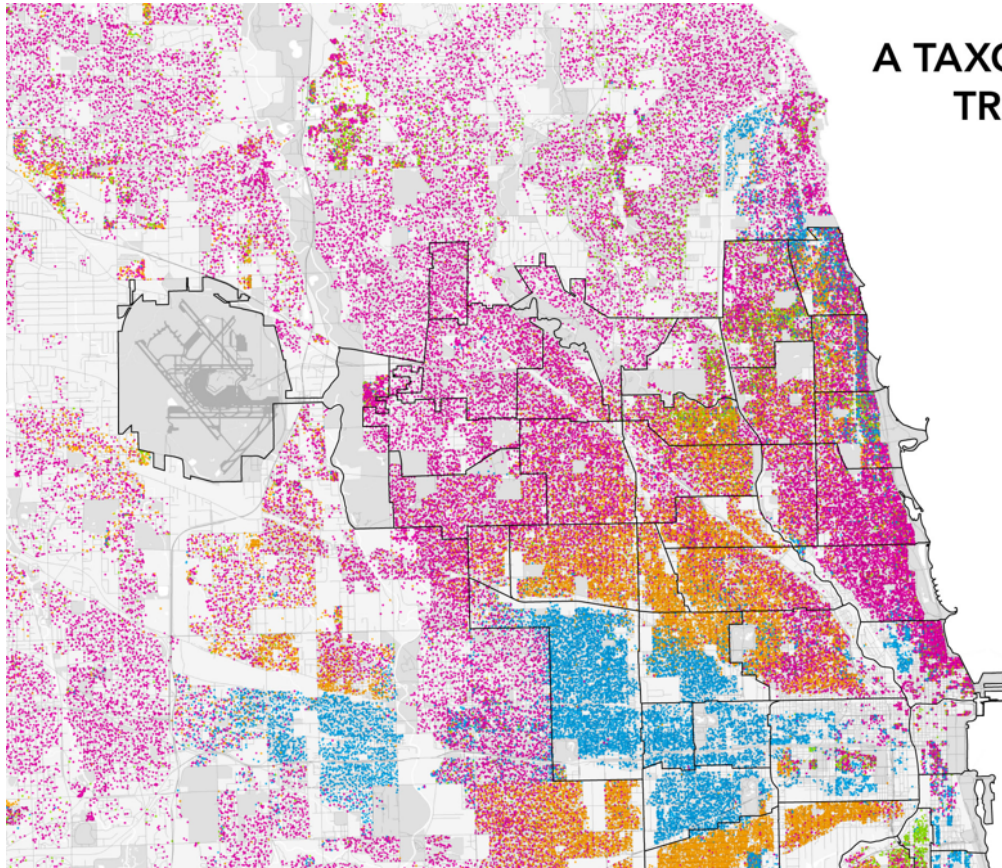
white ■
black ■
asian ■
hispanic ■
other ■

the black lines show
chicago's official
community areas.

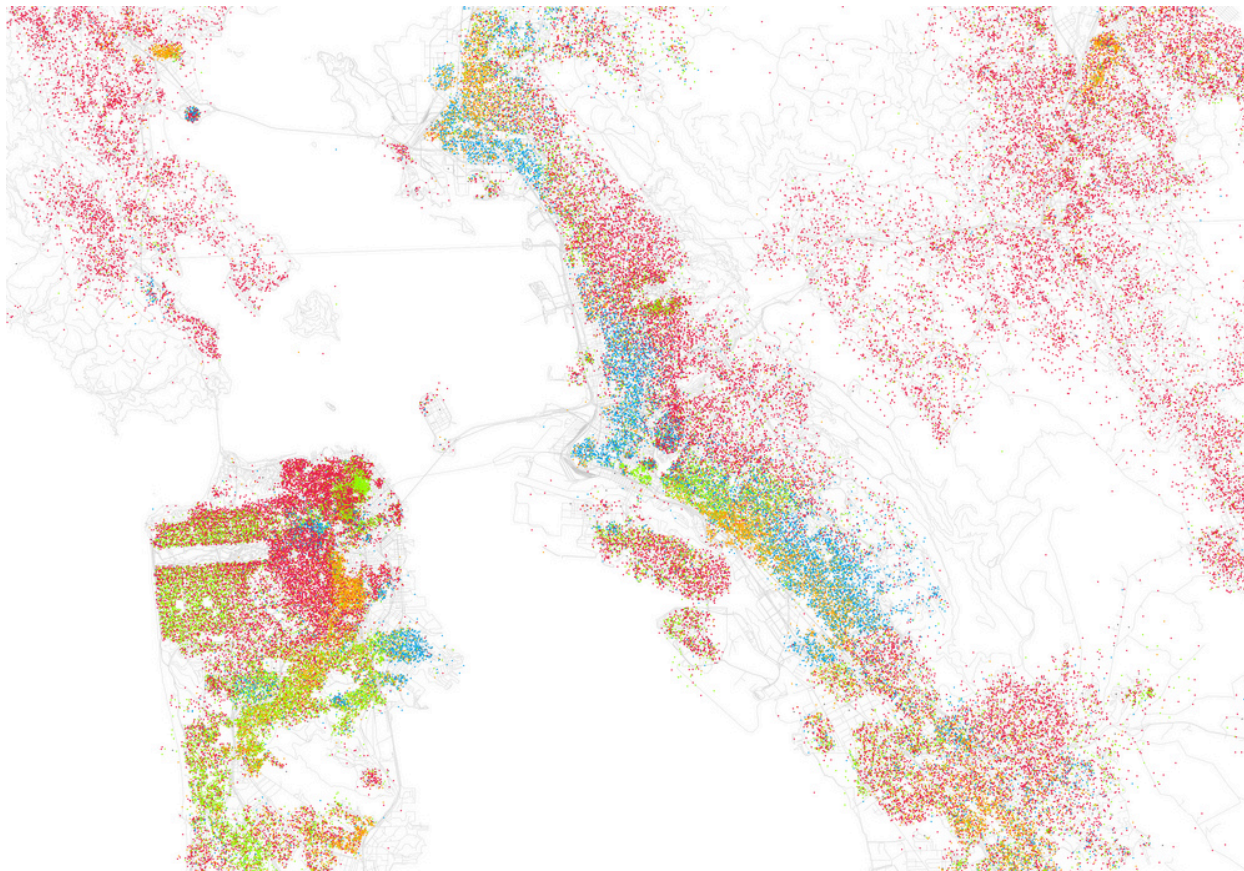
each dot represents
twenty-five people.
here, hispanic is
exclusive of other
categories.

block-level data
from the U.S. census.

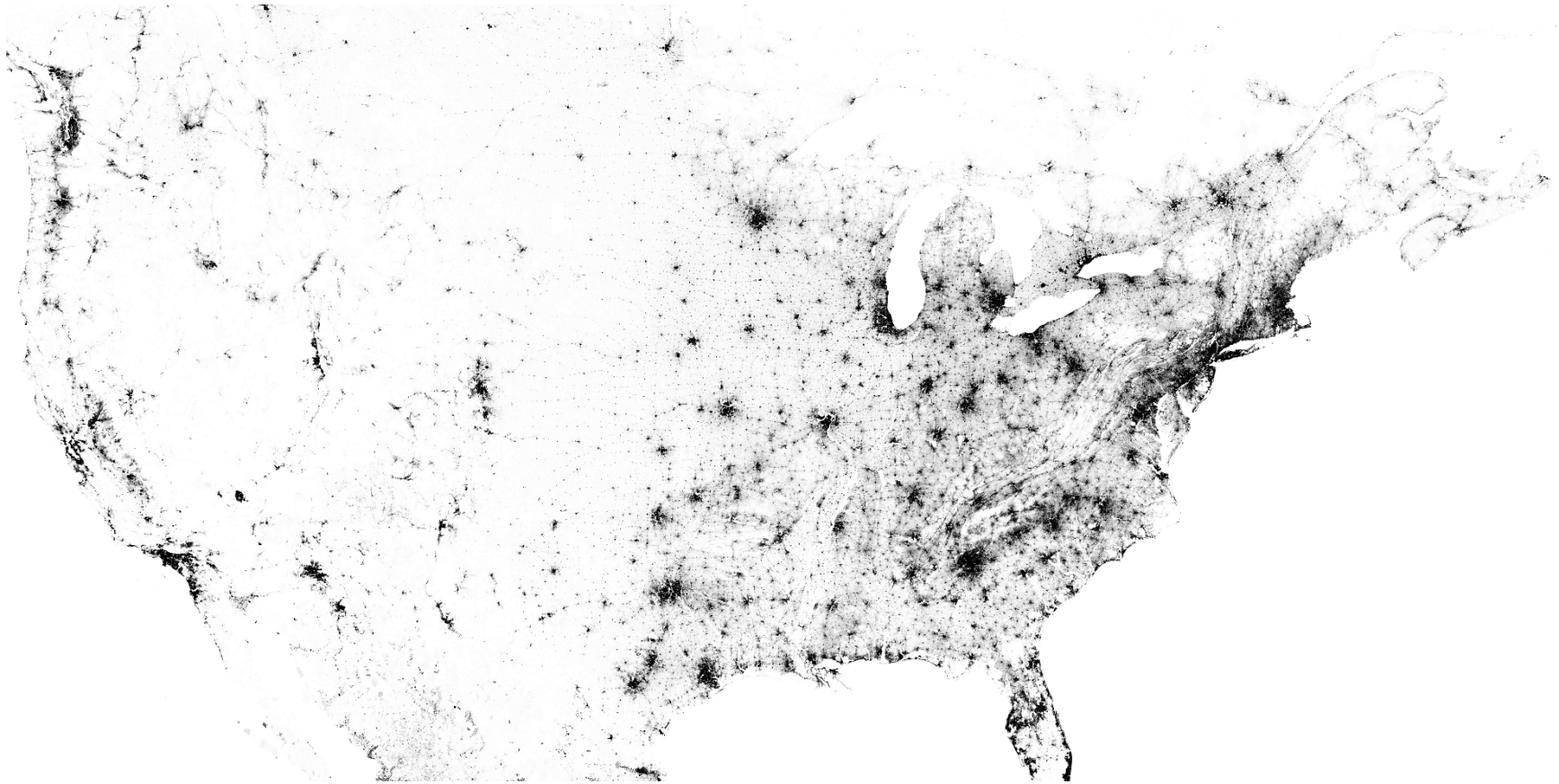
scale 1:200,000



<http://www.radicalcartography.net/index.html?chicagodots>

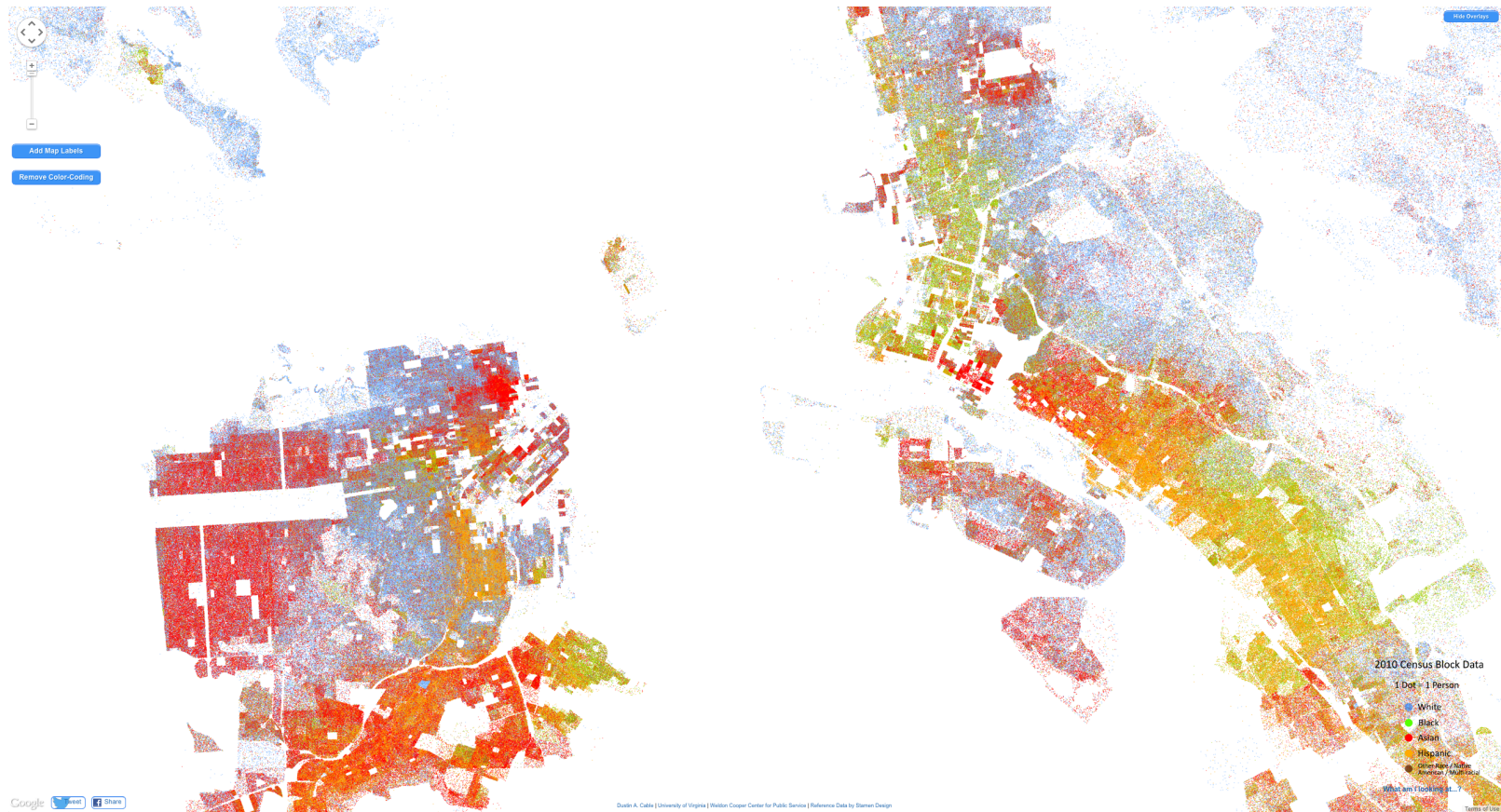


<http://www.flickr.com/photos/walkingsf/sets/72157624812674967/with/4981417821/> (SF)



<http://bmander.com/dotmap/index.html>

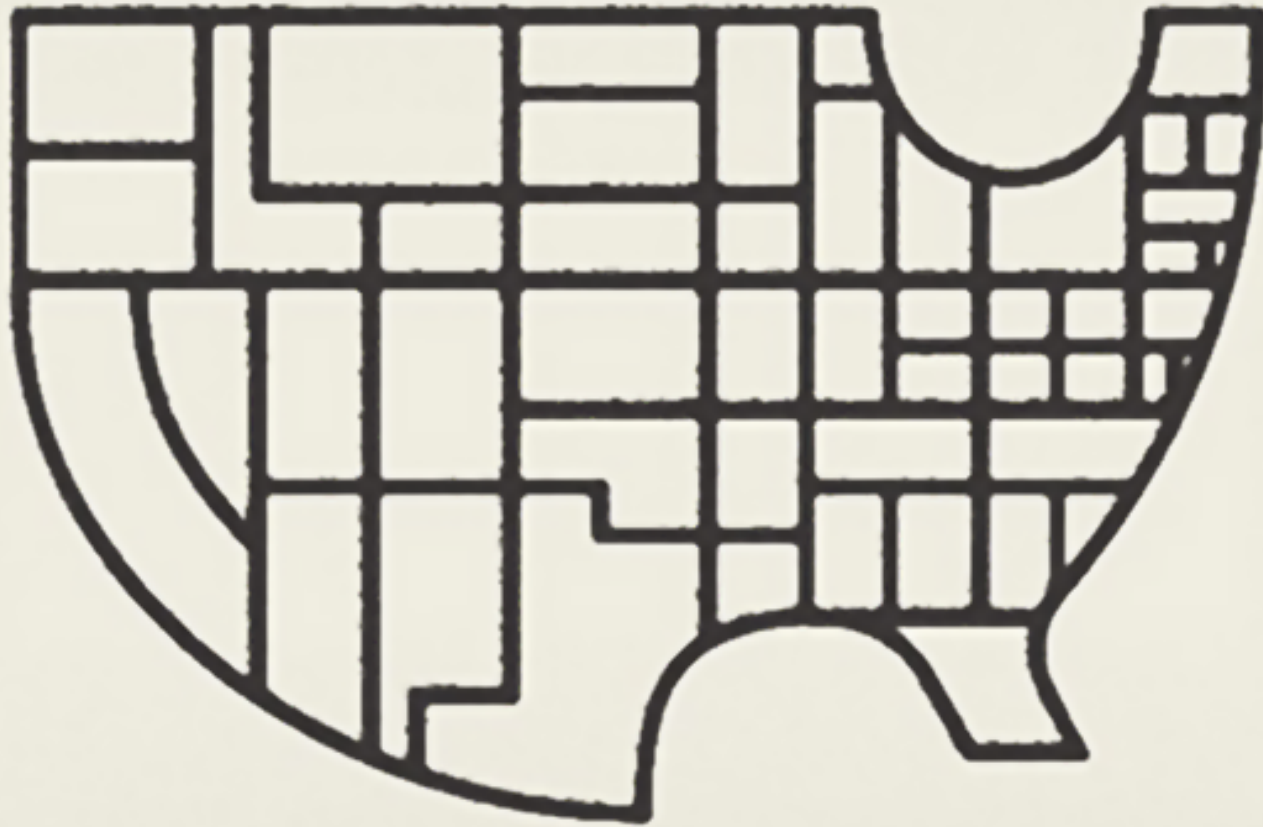




<http://demographics.coopercenter.org/DotMap/>

CARTOGRAMS





<http://drbl.in/xxR>



Cartograms

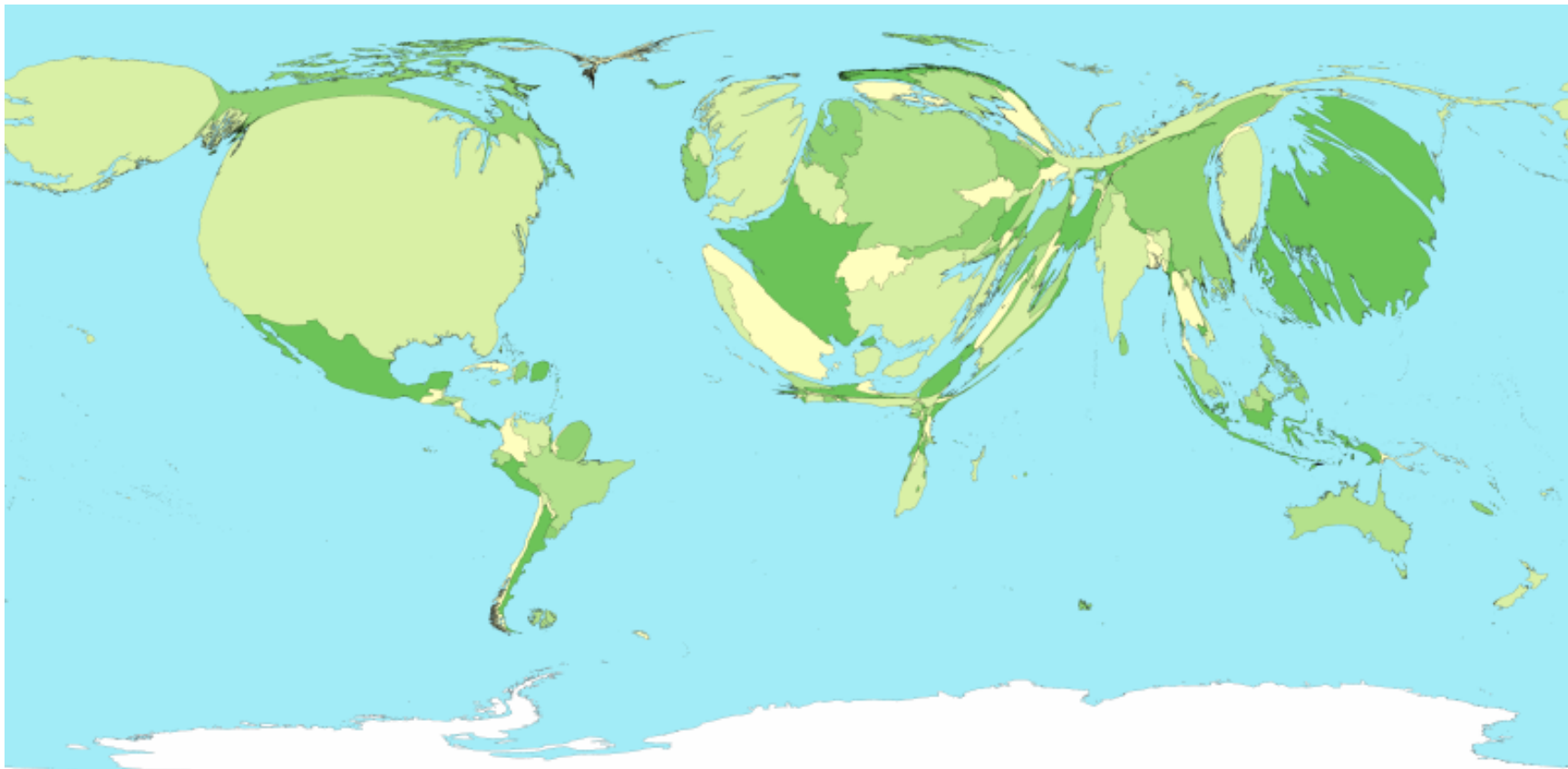
- Area Cartograms
 - Scale area proportional to data value
 - Regions remain contiguous
- Non-Contiguous Cartograms
 - Scale area proportional to data value
 - Regions become non-contiguous
- Dorling Cartograms
 - Replace region with scaled shape
 - Does not maintain region shape or topology





<http://www-personal.umich.edu/~mejn/cartograms/>





<http://www-personal.umich.edu/~mejn/cartograms/>



A New Way To Look At The World



THIS MAP SHOWS

Countries resized relative to:
People Aged 60 or Older
(number of persons)

WORLD TOTAL

759.1 million

Data © UN Population Division

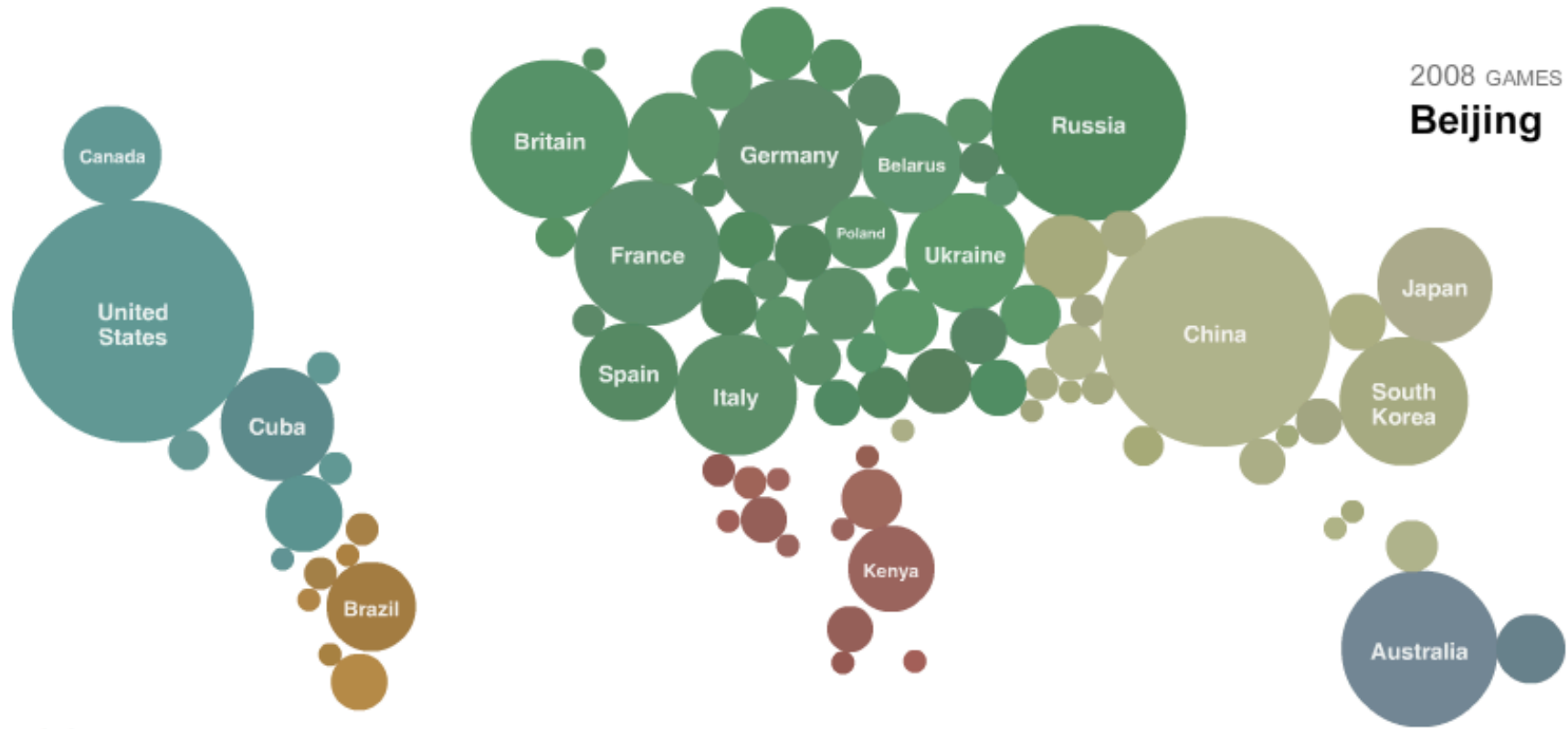
RANKING

China	166.5 million
India	91.7 million
United States	52.8 million
Japan	38.7 million
Russian Federation	25.4 million
Germany	21.3 million
Indonesia	20.8 million
Brazil	19.8 million

Aging Population

show.mappingworlds.com

<http://show.mappingworlds.com/world/?subject=POPULATIONAGING>



http://www.nytimes.com/interactive/2008/08/04/sports/olympics/20080804_MEDALCOUNT_MAP.html

Country Codes of the World

At the end of every TLD, we'll read
where it is a top-level domain (TLD).

Although, some of the world's most
popular TLDs are for three states
There are even more than 100 TLDs in use
and the world, each of which are
country code top-level domains
(ccTLDs).

ccTLDs are two-digit codes assigned to
countries and territories.

Of the 100 million TLDs that have
been registered, more than 50
million are ccTLDs.

Some ccTLDs are easy to decipher,
such as .us for Australia.
But many codes are not so obvious,
such as .lk for Sri Lanka or .ar for
Argentina.

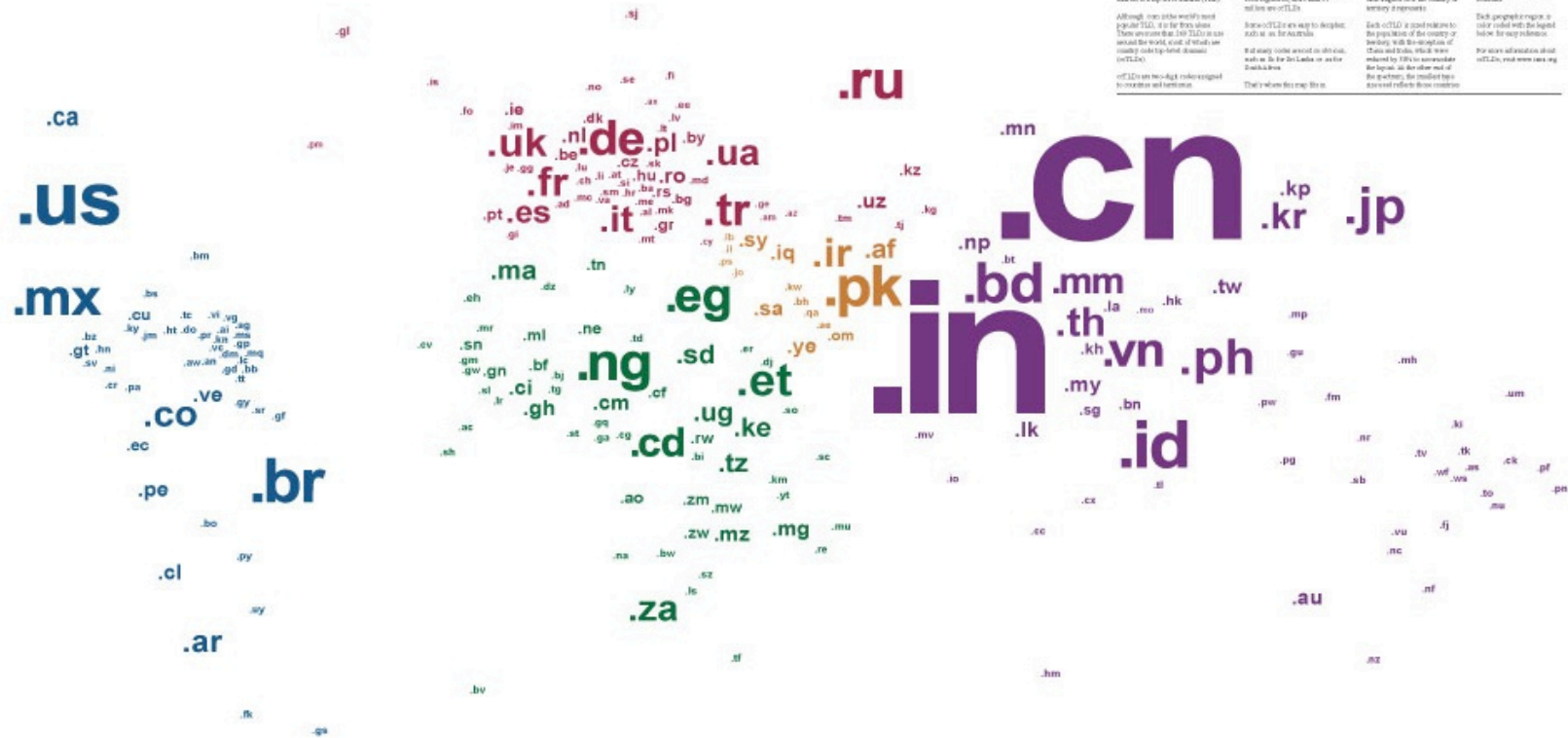
That's where this map fits in.

This map includes 241 ccTLDs,
each aligned with the country or
territory it represents.

Each ccTLD is good evidence to
the population of the country or
territory, with the population of
China and India, which were
reduced by 10% to accommodate
the layout, as the other end of
the spectrum, the smallest figure
accounted reflects those countries.

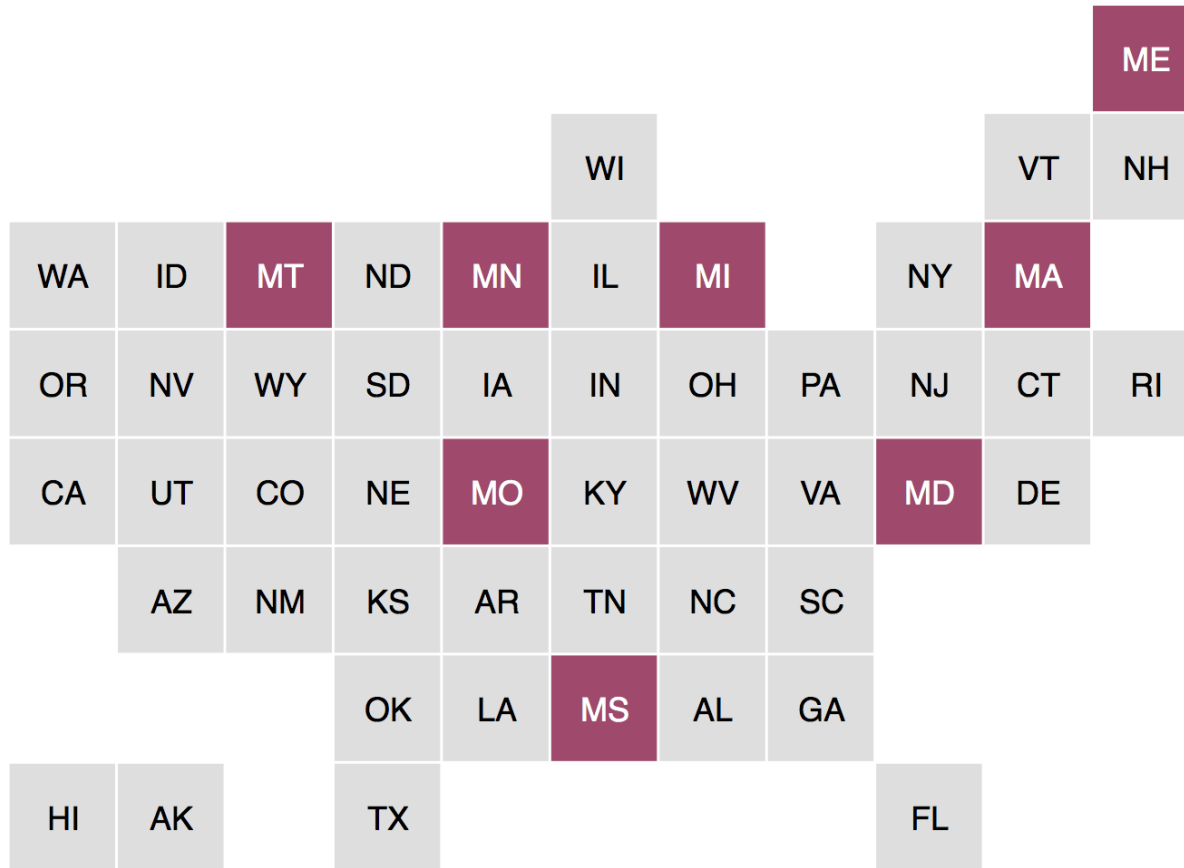
Each geographic region is
color-coded with the legend
below for easy reference.

For more information about
ccTLDs, visit www.icann.org.



<http://www.bytelevel.com/map/ccTLD.html>





<http://bl.ocks.org/mbostock/29cc3cc4078091fd2115>

ELECTION RESULTS 2008

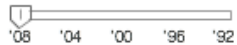
<http://elections.nytimes.com/2008/results/president/map.html>



State winners
County bubbles
County leaders
Voting shifts

 ZOOM IN

Year



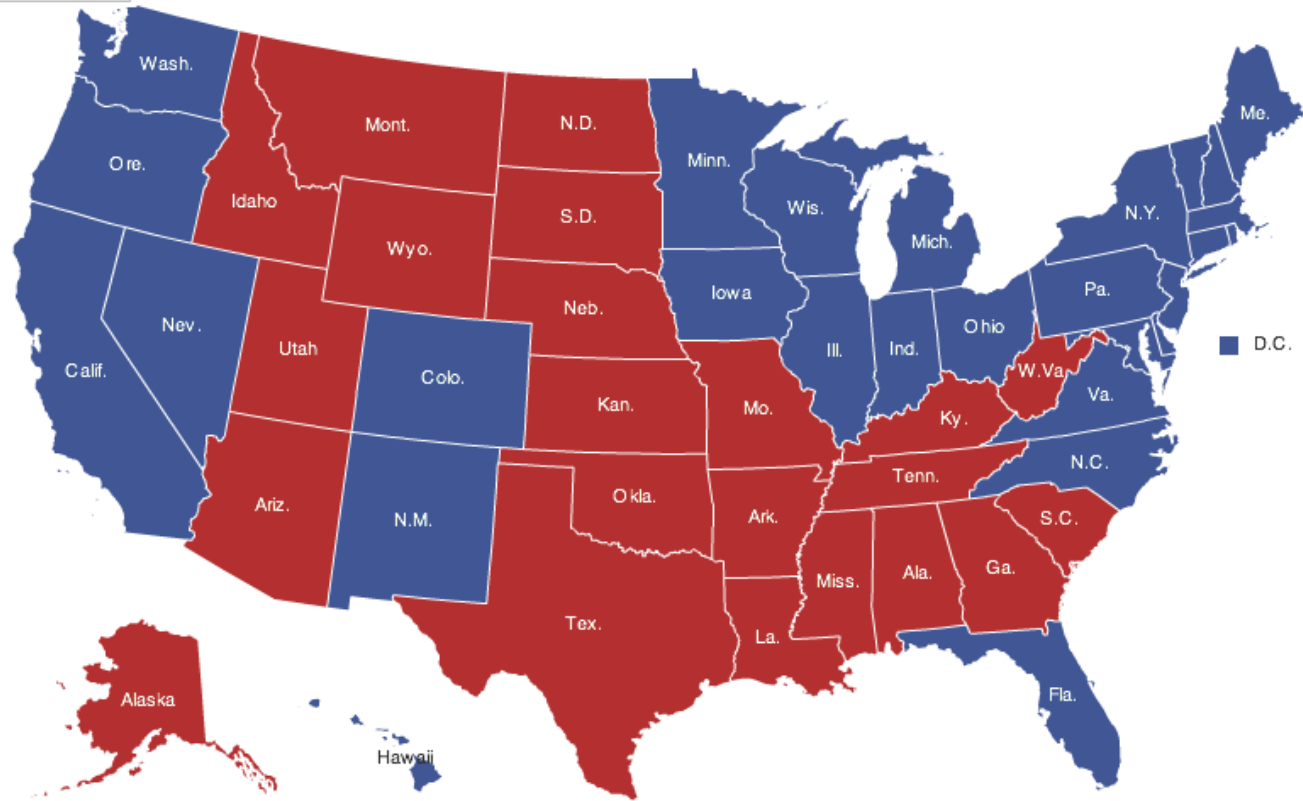
Map key

DEMOCRATS

 Lead  Win

REPUBLICANS

 Lead  Win

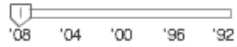


Choropleth Map

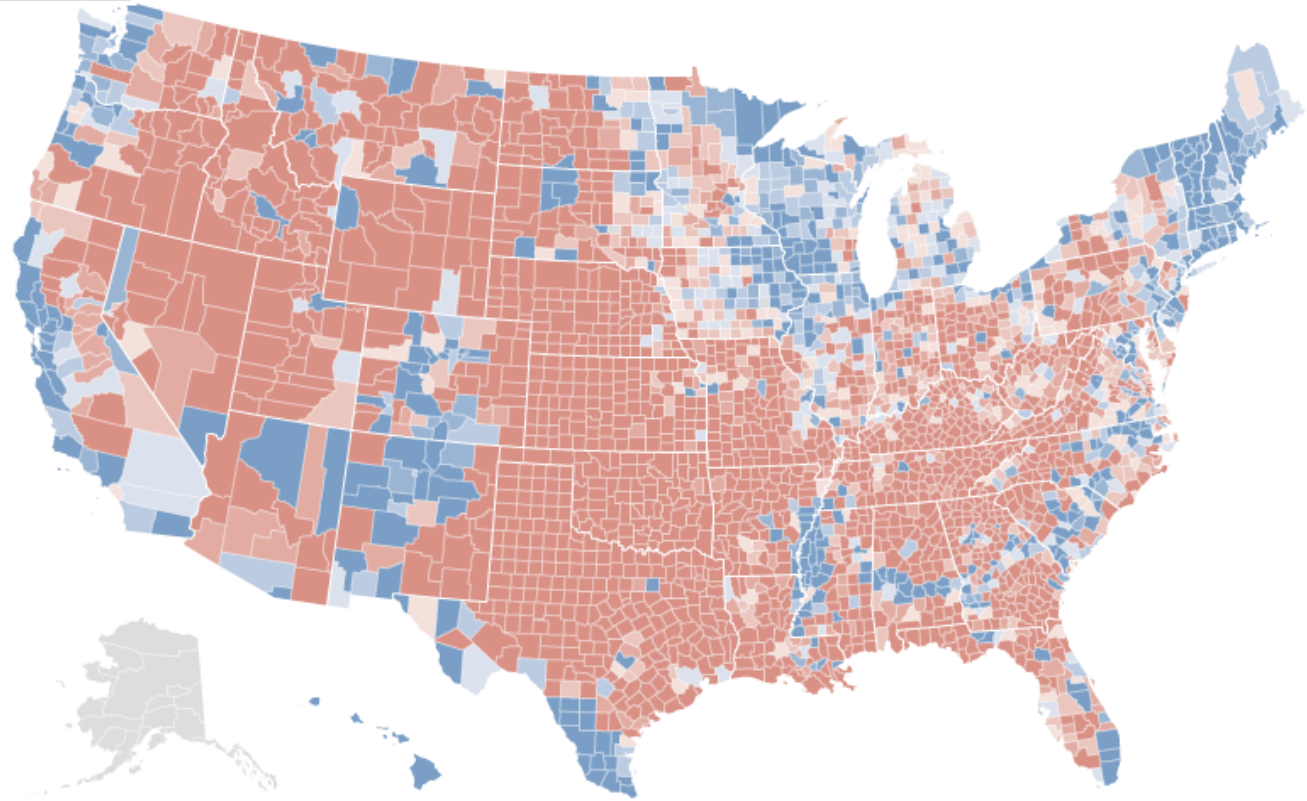
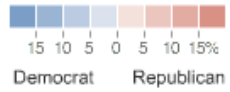
- State winners
- County bubbles
- County leaders**
- Voting shifts

🔍 ZOOM IN

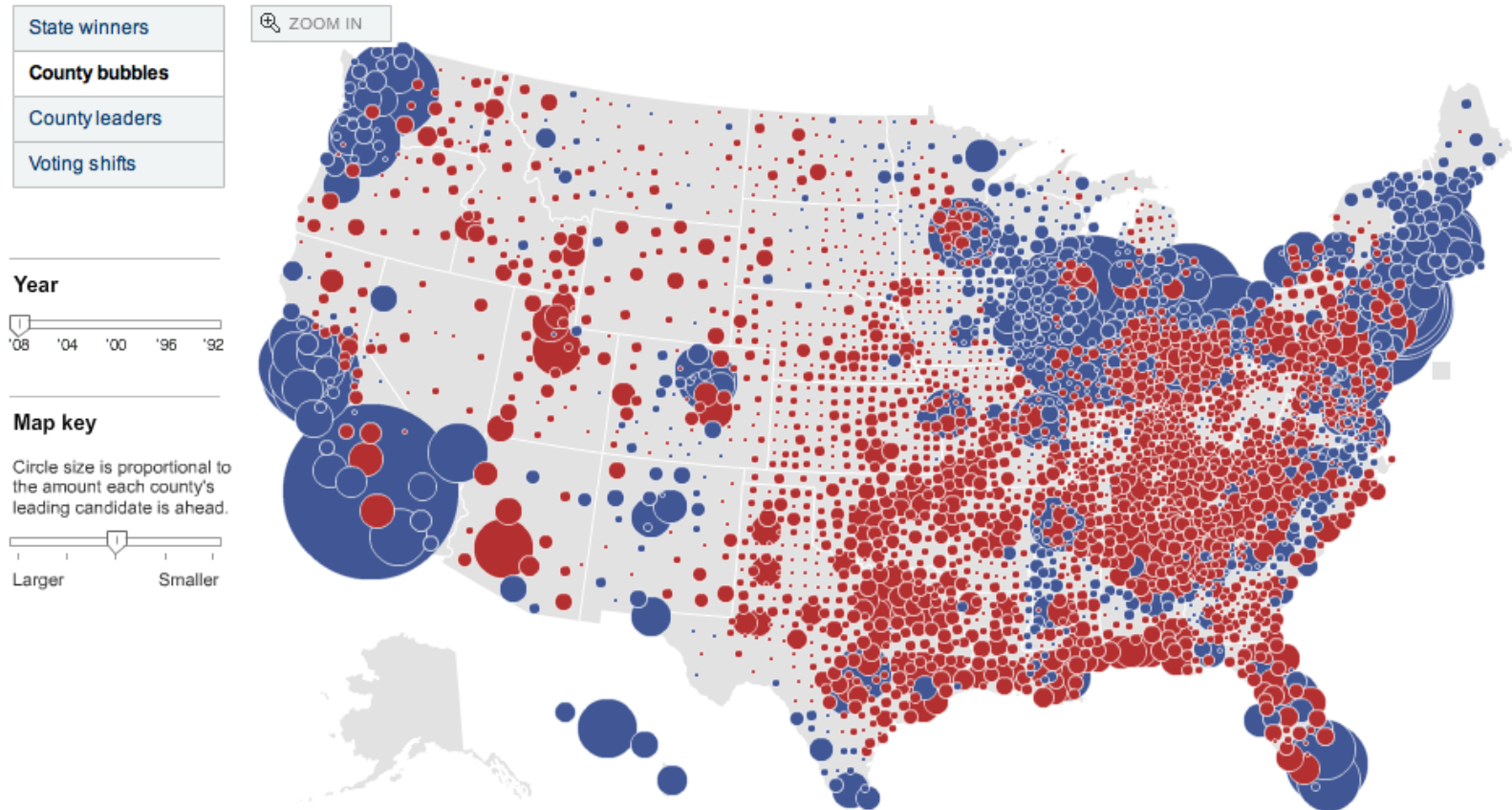
Year



Map key



Choropleth Map



Proportional Symbol Map

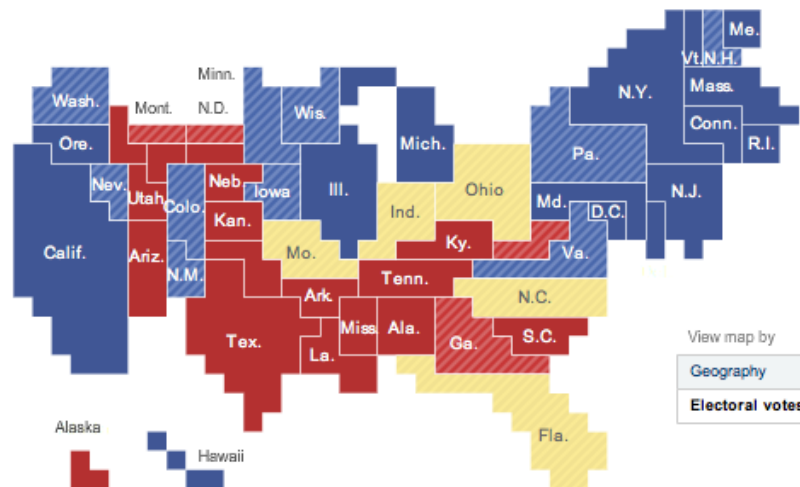
The Electoral Map: Key States

By ADAM NAGOURNEY, JEFF ZELENY AND SHAN CARTER
November 4, 2008

-  E-MAIL
-  SHARE
-  FEEDBACK



The colors show the latest breakdown by The New York Times of which states are considered to be in play in the presidential election. This is a snap-shot in time; it is not a prediction of how the race is going to turn out Nov. 4. Ratings are based on a variety of factors, including polling, previous elections results and the political landscape in the state. **Click on a state for more information.**



Dorling Cartogram

TRANSIT MAPS

Schematic/Diagrammatic Map, Tube Map



Schematic Diagrams

- Diagram
 - Graphic design that **explains** rather than represents*
- Schematic Diagram
 - Elements are abstracted and simplified
 - Realistic elements not necessary included
 - Unrealistic elements sometimes introduced
- Examples
 - Circuit diagrams, transit maps

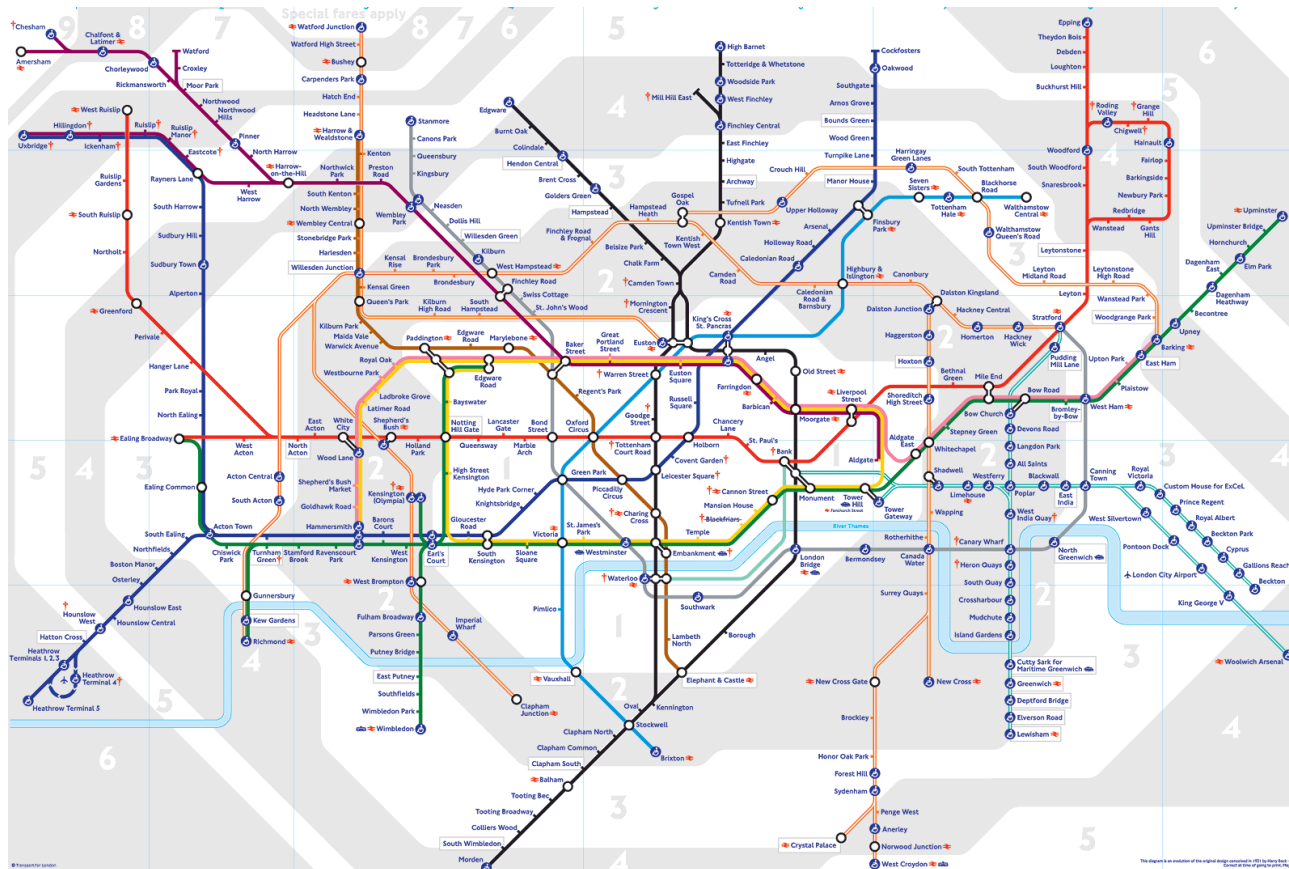
* <http://www.merriam-webster.com/dictionary/diagram>



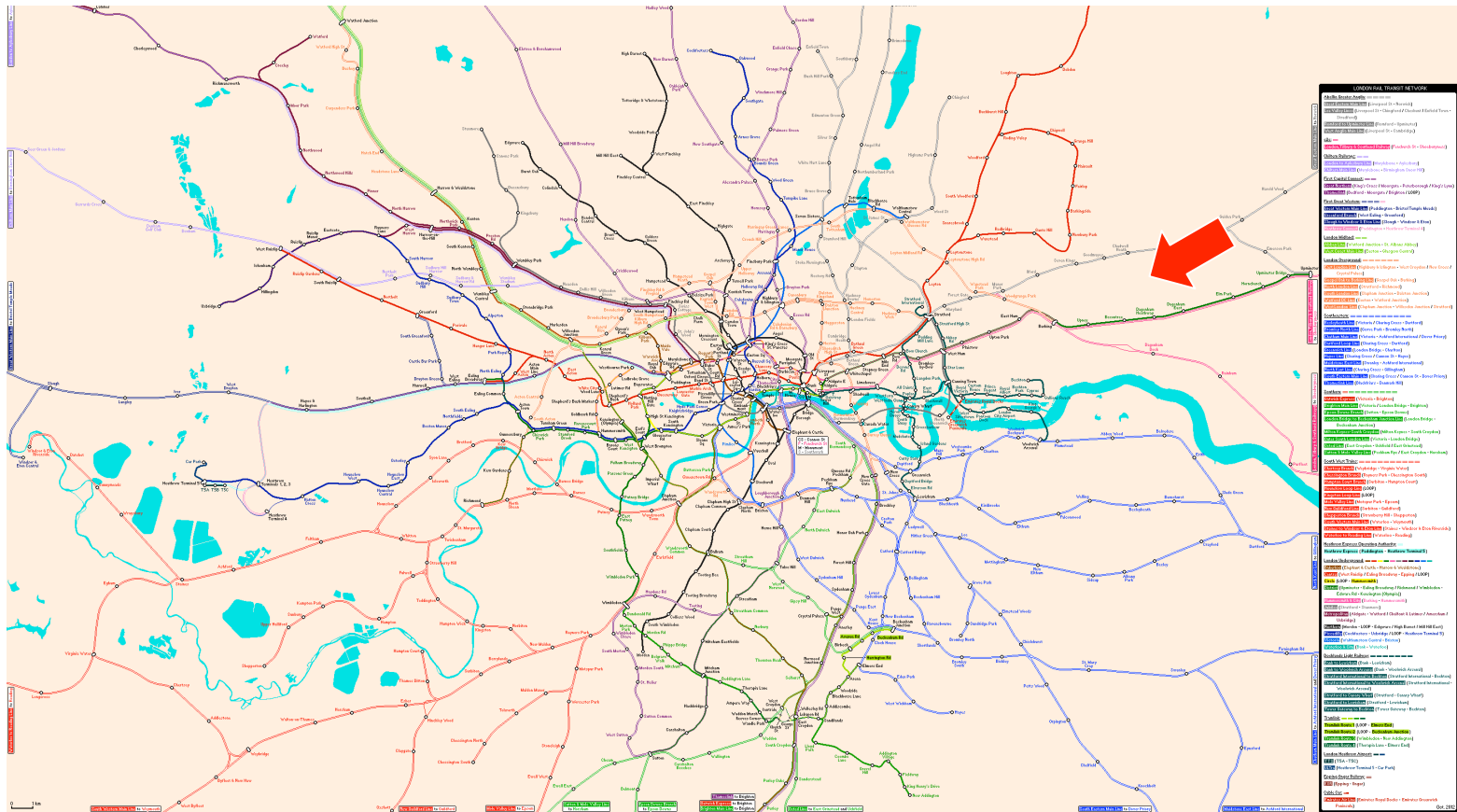
Transit Map

- Try to preserve direction and order of stops
 - Distance less important, stops usually equally spaced for readability
- Simply as much as possible actual routes
 - Do not trace actual route taken by subway
- Use straight lines, and 45° angles
- Use color to indicate different transit lines





http://www.bbc.co.uk/london/travel/downloads/tube_map.html



http://cityrailtransit.com/maps/london_map.htm



<http://www.sfmta.com/cms/mmaps/official.htm>



<http://www.sfmta.com/cms/mmmaps/official.htm>



<http://www.bart.gov/schedules/bystation.aspx>

FLOW MAPS



Flow Maps

- Encoding
 - Edge between two locations indicates flow between those locations
 - Width of edge proportional to flow
 - Usually wider end of edge is source of flow
- Limitations
 - Can get difficult to compare flows
 - Best flow maps are done by hand



Carte Figurative des pertes successives en hommes de l'Armée Française dans la campagne de Russie 1812-1813.

Dressée par M. Minard, Inspecteur Général des Ponts et Chaussées en retraite Paris, le 20 Novembre 1869.

Les nombres d'hommes présents sont représentés par les largeurs des zones colorées à raison d'un millimètre pour dix mille hommes; ils sont de plus écrits en travers des zones. Le rouge désigne les hommes qui entrent en Russie, le noir ceux qui en sortent. Les renseignements qui ont servi à dresser la carte ont été puisés dans les ouvrages de M.M. Thiers, de Ségur, de Fezensac, de Chambray et le journal inédit de Jacoby, pharmacien de l'Armée depuis le 28 Octobre. Pour mieux faire juger à l'œil la diminution de l'armée, j'ai supposé que les corps du Prince Nèssmé et du Maréchal Davoust qui avaient été détachés sur Minsk et Mohilow et qui rejoignent vers Orscha et Witebsk, avaient toujours marché avec l'armée.

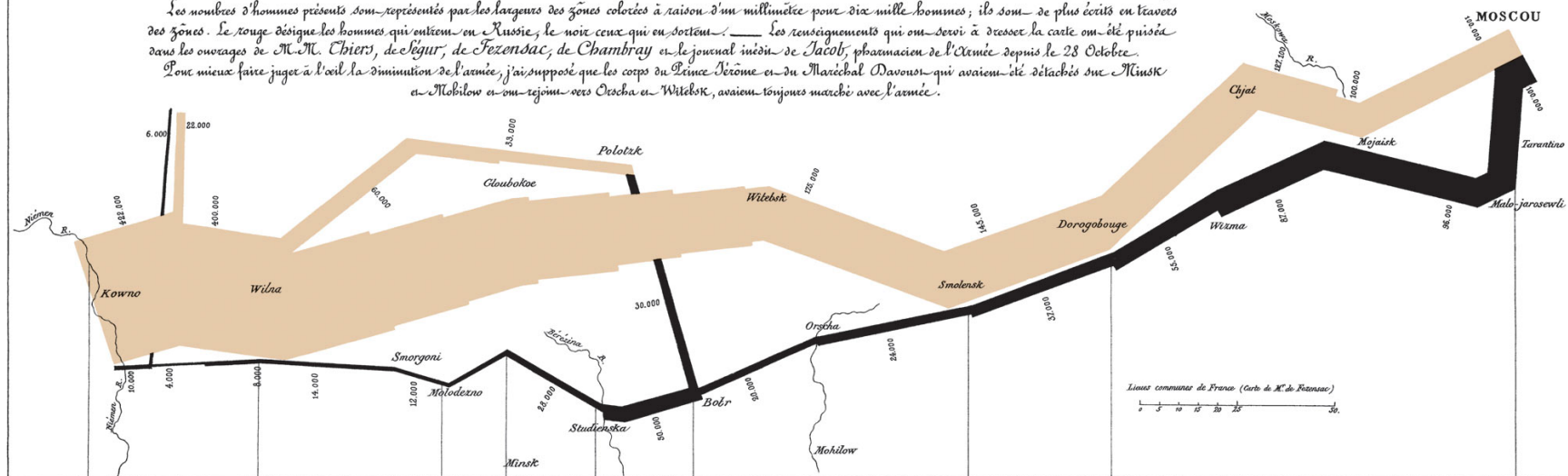
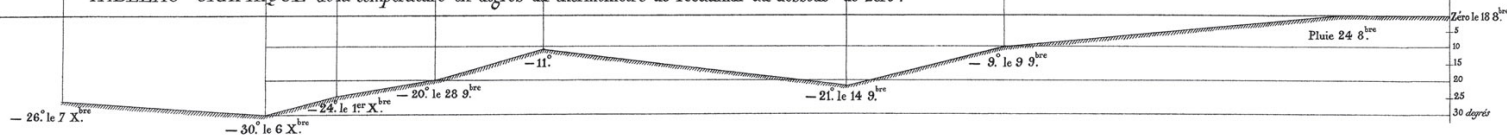


TABLEAU GRAPHIQUE de la température en degrés du thermomètre de Réaumur au dessous de zéro.

Les Cosaques passent au galop le Niémen gelé.

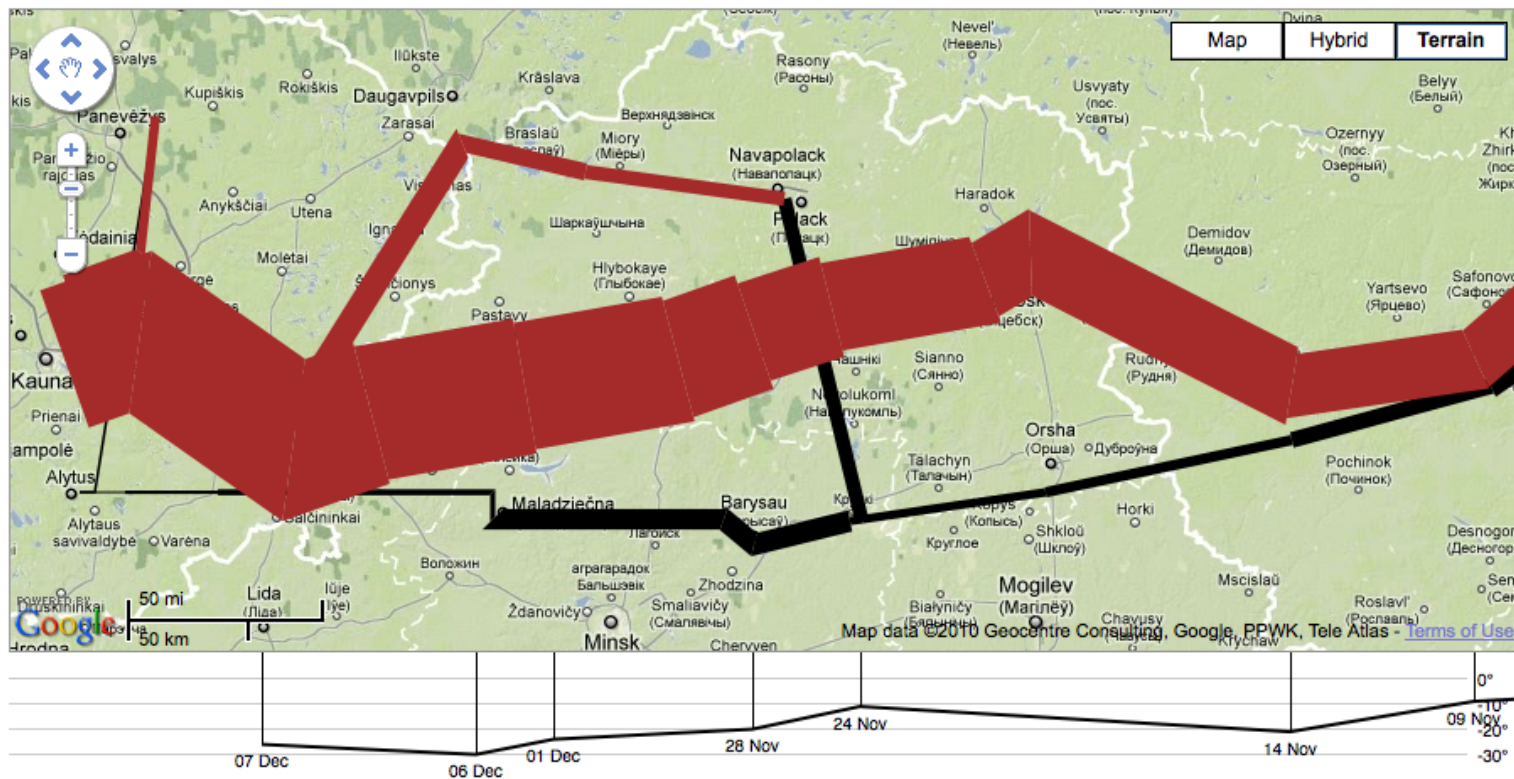


Auget, par Regnier, R. Par. 5^{me} Maria St 6^{me} à Paris.

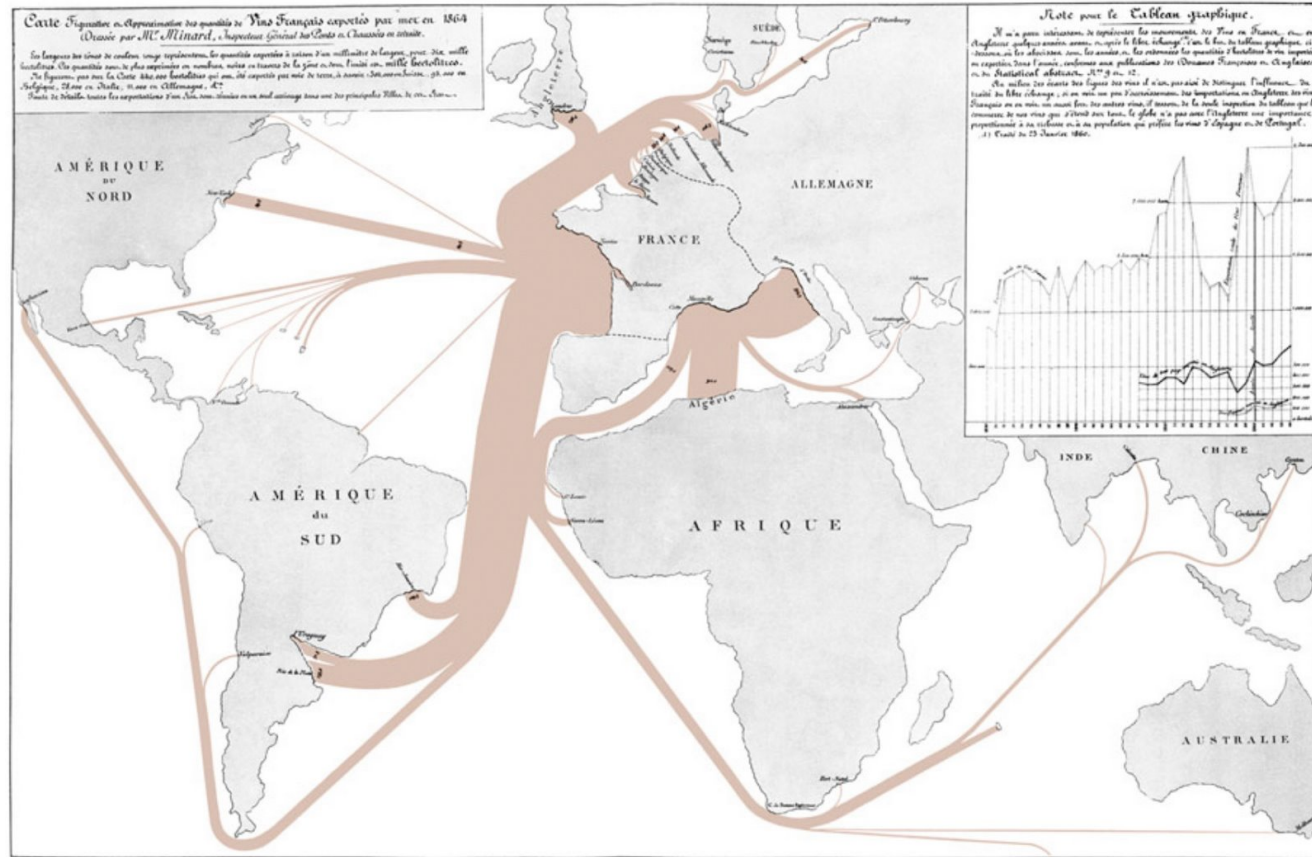
Imp. Lith. Regnier et Desvres.

<http://en.wikipedia.org/wiki/File:Minard.png>

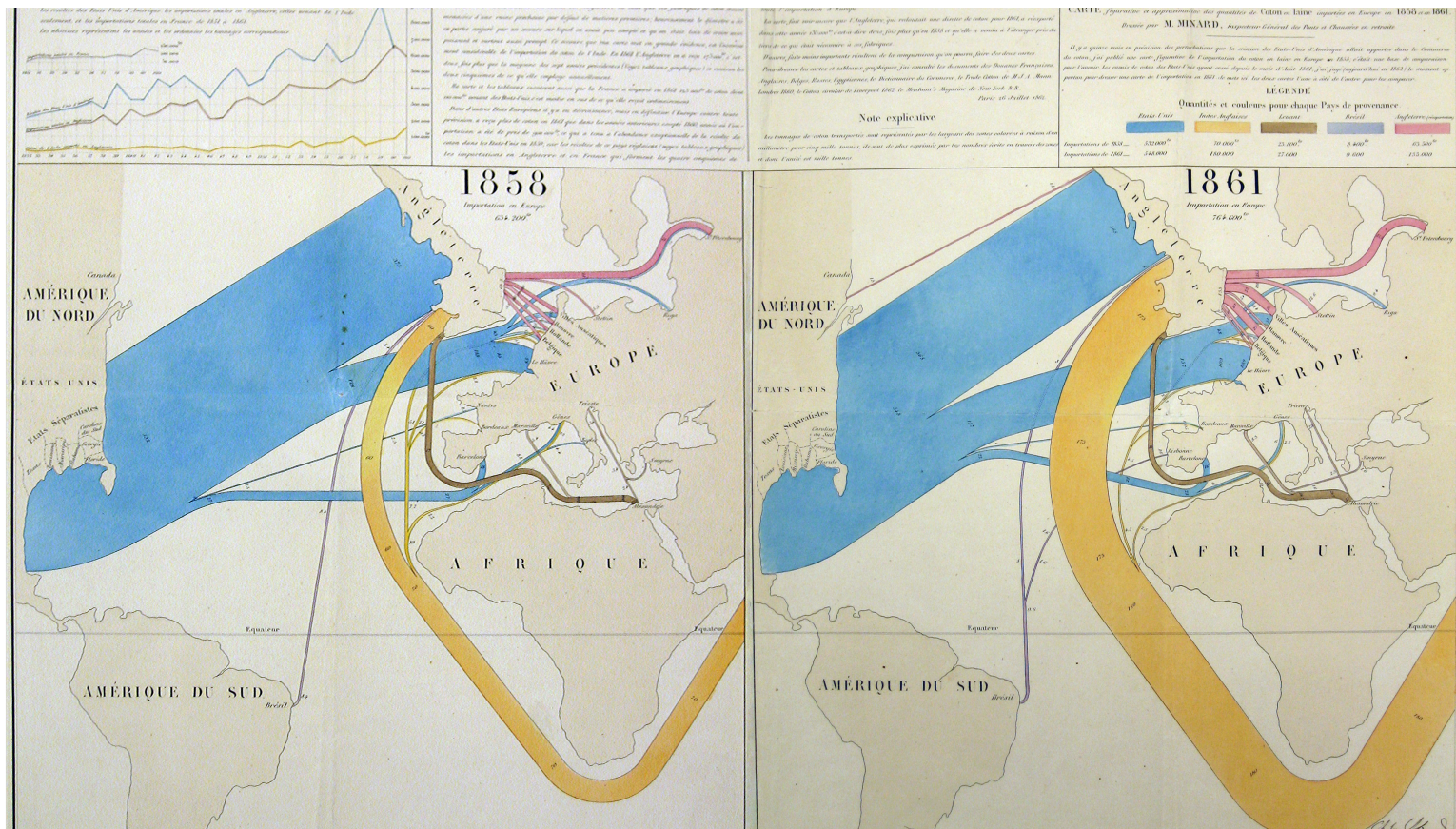
Minard's Napoleon



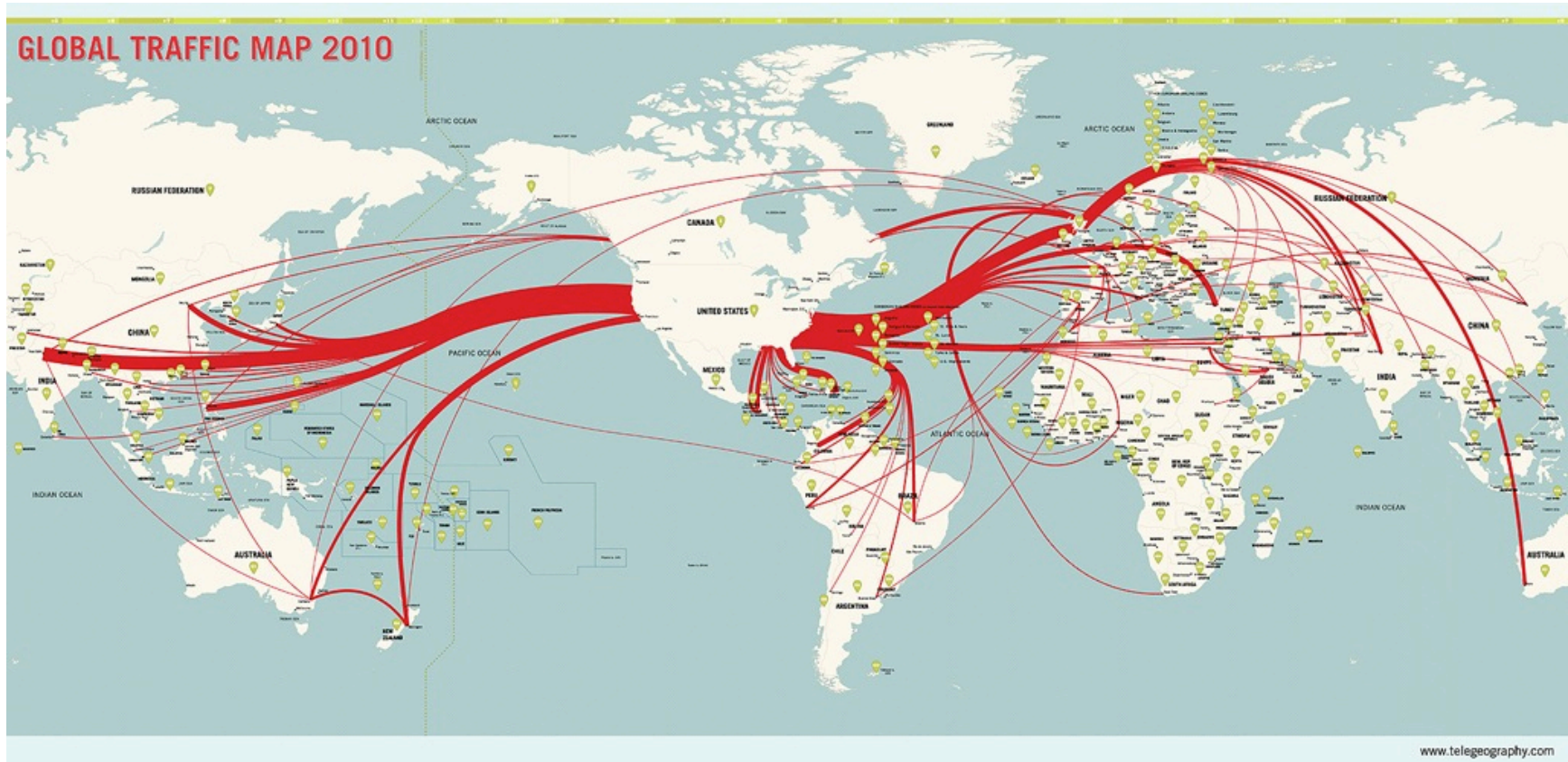
<http://vis.stanford.edu/protovis/ex/napoleon.html>



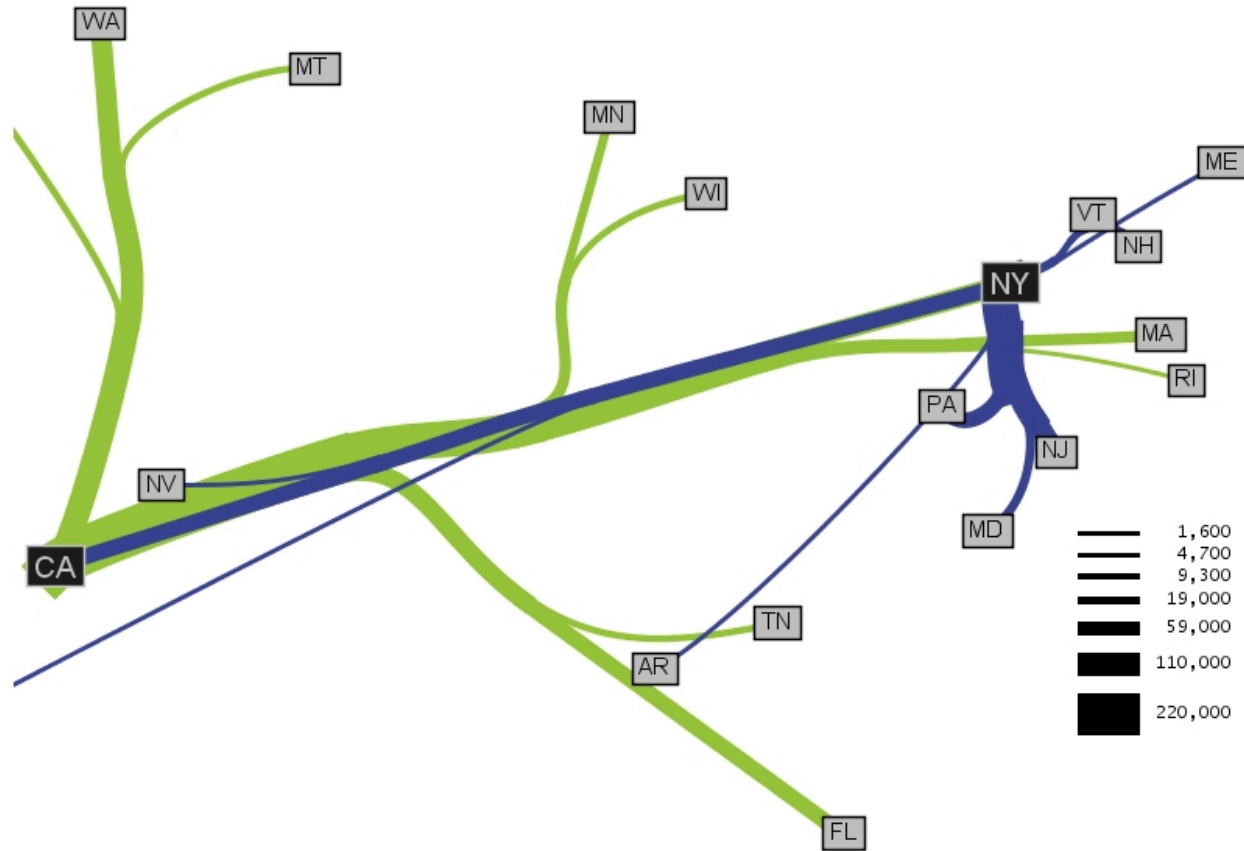
<http://lifeingreytones.blogspot.com/2009/04/literature-review-post-1.html>



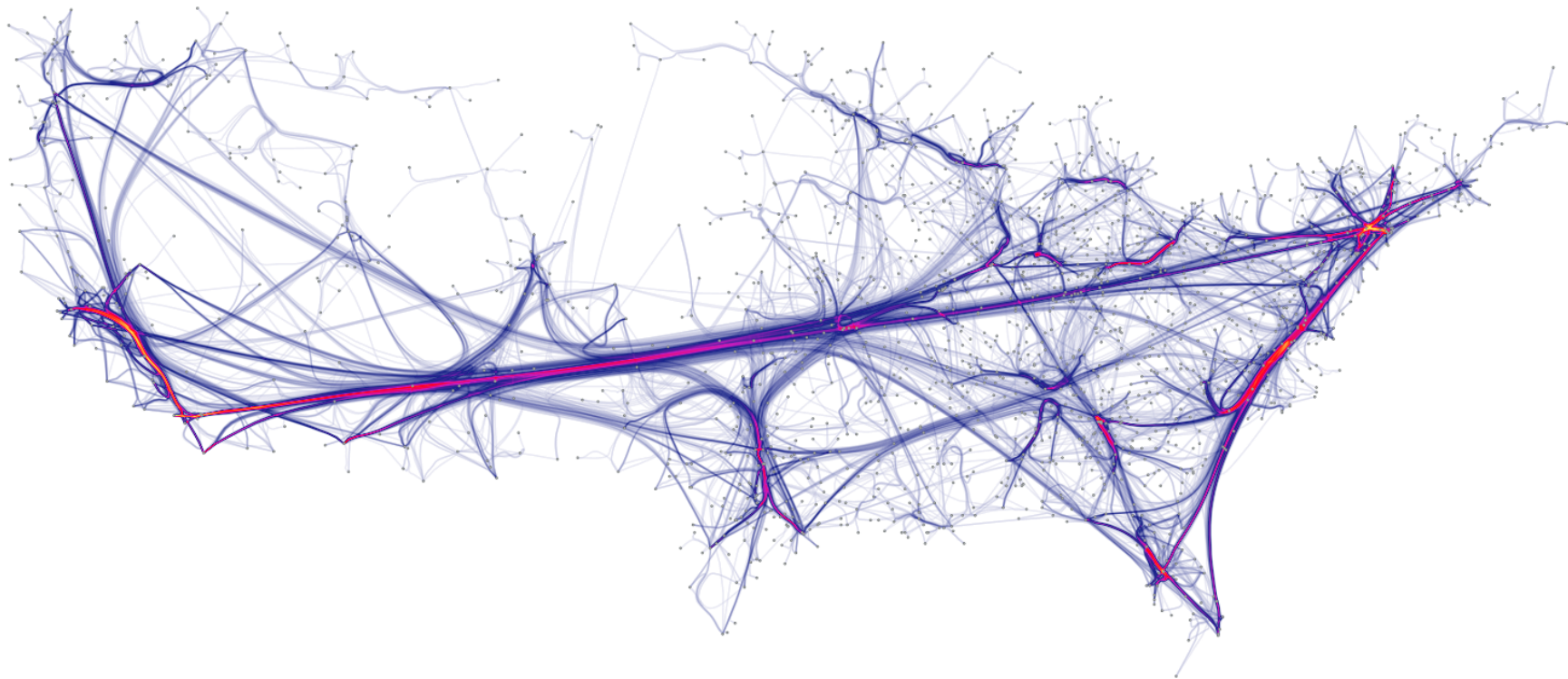
<http://cartographia.wordpress.com/2008/06/30/mondays-with-minard-cotton-and-wool-comparisons/>



http://www.telegeography.com/product-info/map_traffic/index.php



http://graphics.stanford.edu/papers/flow_map_layout/



<http://www.win.tue.nl/~dholten/>

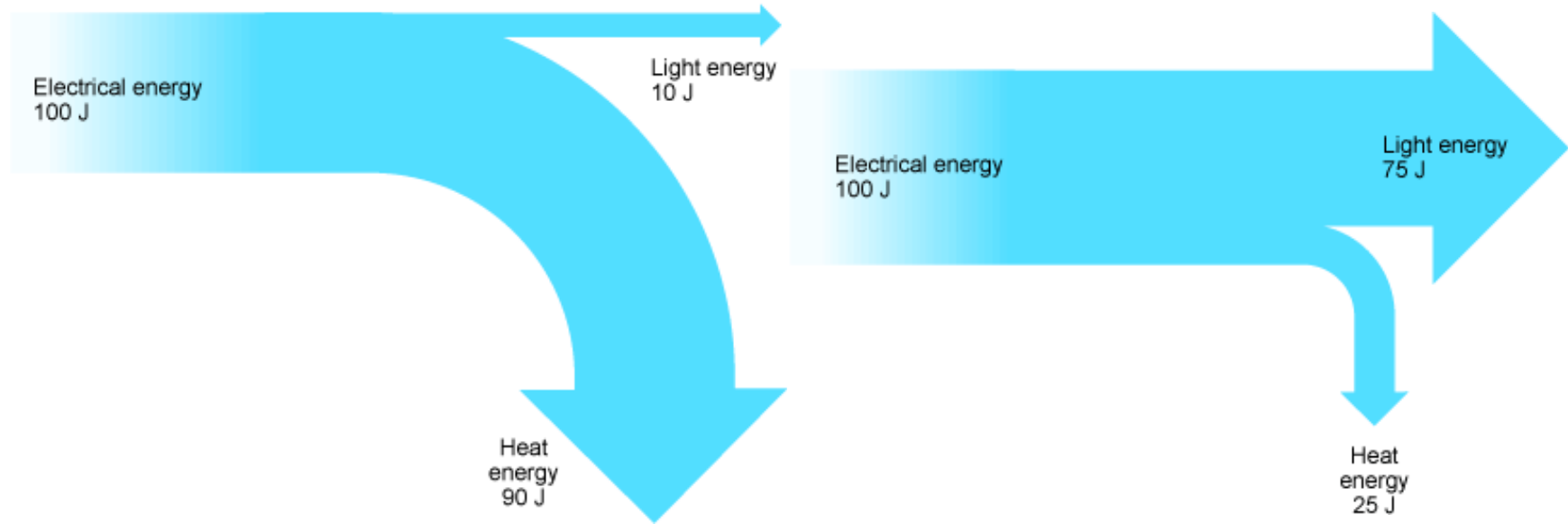
SANKEY DIAGRAMS



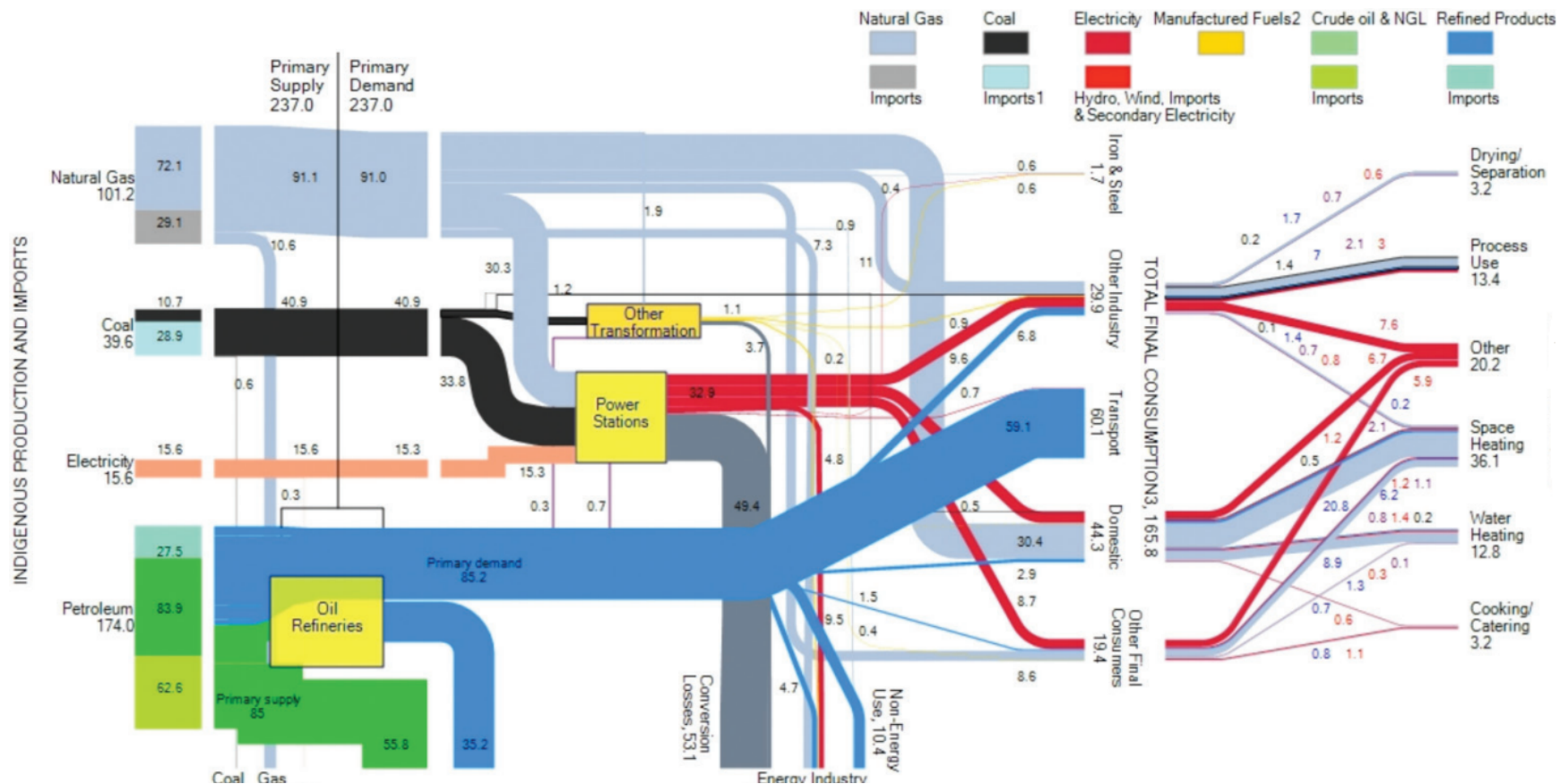
Sankey Diagrams

- A type of flow map, applied to non-geospatial data
- Width of line indicates amount of flow
- Arrows (optional) indicate direction of flow
- Must apply a simple node layout
 - Usually nodes on left or right
 - Flow travels from left nodes to right nodes
 - No flow between nodes on same side

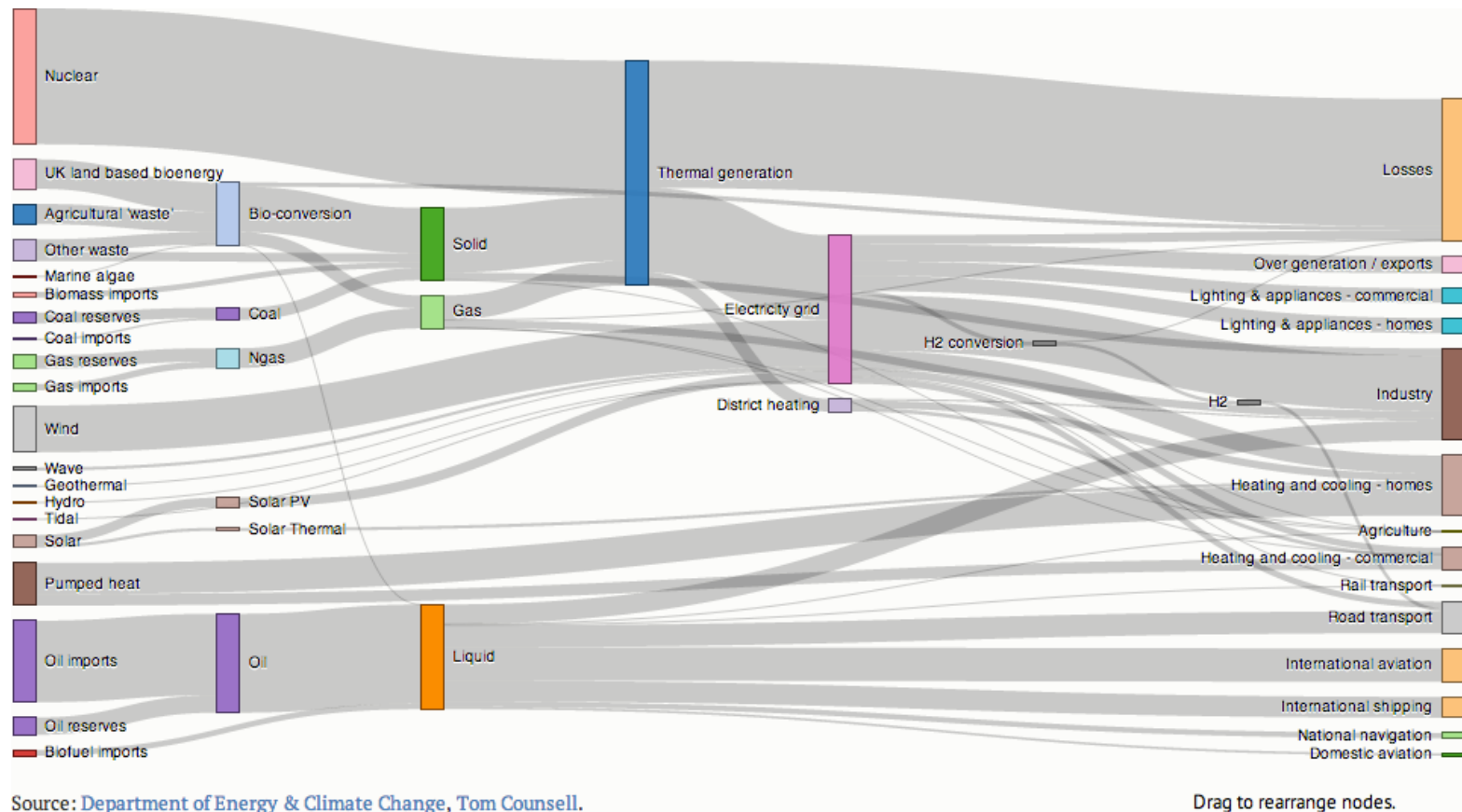




http://www.bbc.co.uk/schools/gcsebitesize/science/aqa_pre_2011/energy/heatrev6.shtml



<http://www.sankey-diagrams.com/uk-2050-energy-flow-sankey-diagram/>



<http://bost.ocks.org/mike/sankey/>

RESOURCES



D3 Examples

- Proportional Symbol Map (no legend): <http://bl.ocks.org/mbostock/4342045>
- County Bubbles (with circle legend): <http://bl.ocks.org/mbostock/9943478>
- Unemployment Choropleth (no legend): <http://bl.ocks.org/mbostock/5925375>
- Kentucky Choropleth (with color legend): <http://bl.ocks.org/mbostock/5144735>
- Non-Contiguous Cartogram: <http://bl.ocks.org/mbostock/4055908>
- Hexbin Map: <http://bl.ocks.org/mbostock/4330486>
- Heatmap: <http://bl.ocks.org/mbostock/6264239>



D3 Examples (Other)

- Zoom to Bounding Box II
<http://bl.ocks.org/mbostock/9656675>
- TopoJSON Files
<http://bl.ocks.org/mbostock/4090846>
- U.S. States TopoJSON Demo
<http://bl.ocks.org/mbostock/4090848>



QUESTIONS?

