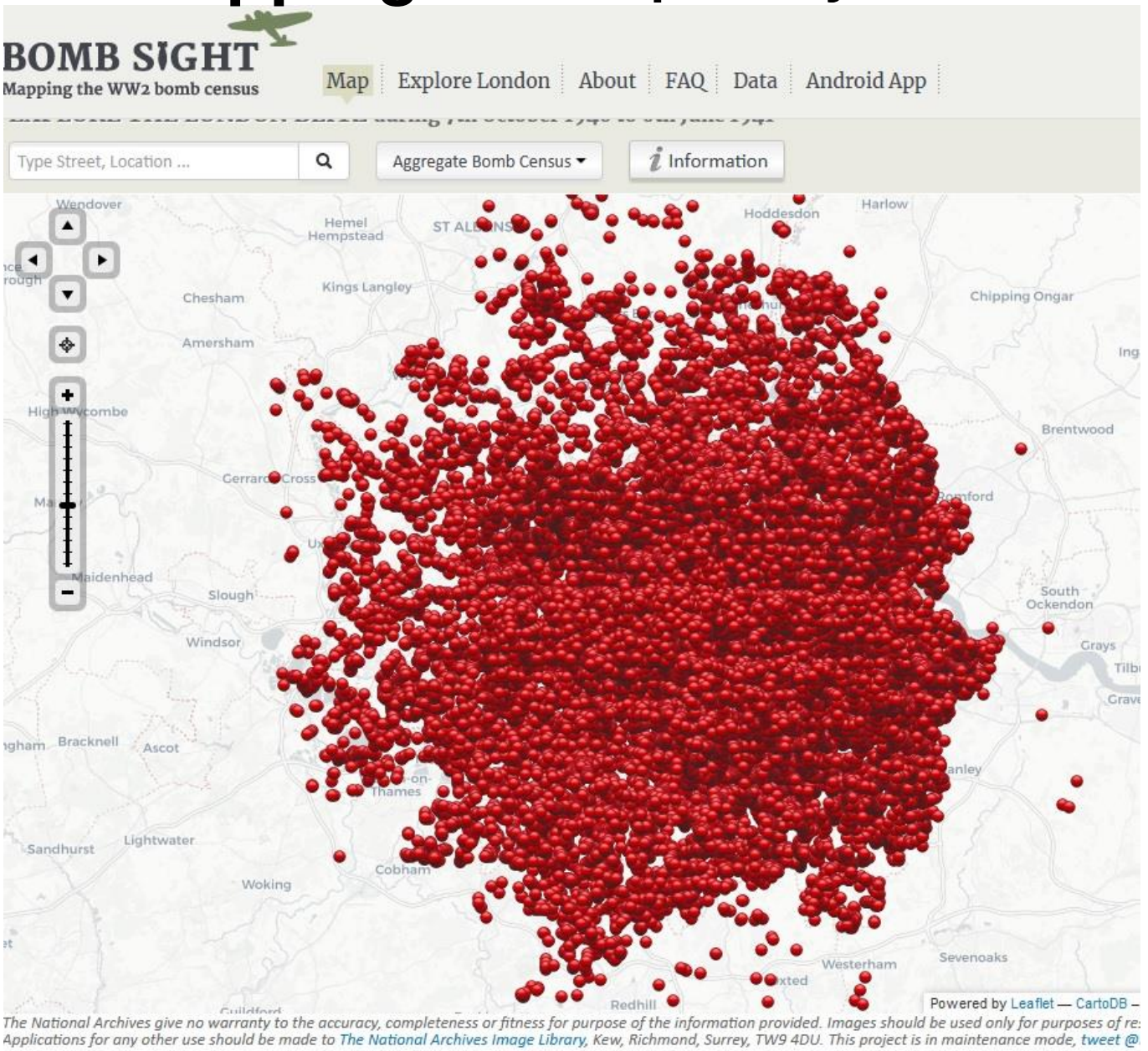
Thematic mapping:

‘Qualitative point symbols’ can be similar to topographic (general) maps- Individual point locations are important

Quantitative thematic maps Design: overall distribution is more the focus

Base layers are background for thematic maps: Map themes are ‘special purpose’

Thematic mapping: A. point symbols



Map viewer

http://bombsight.org

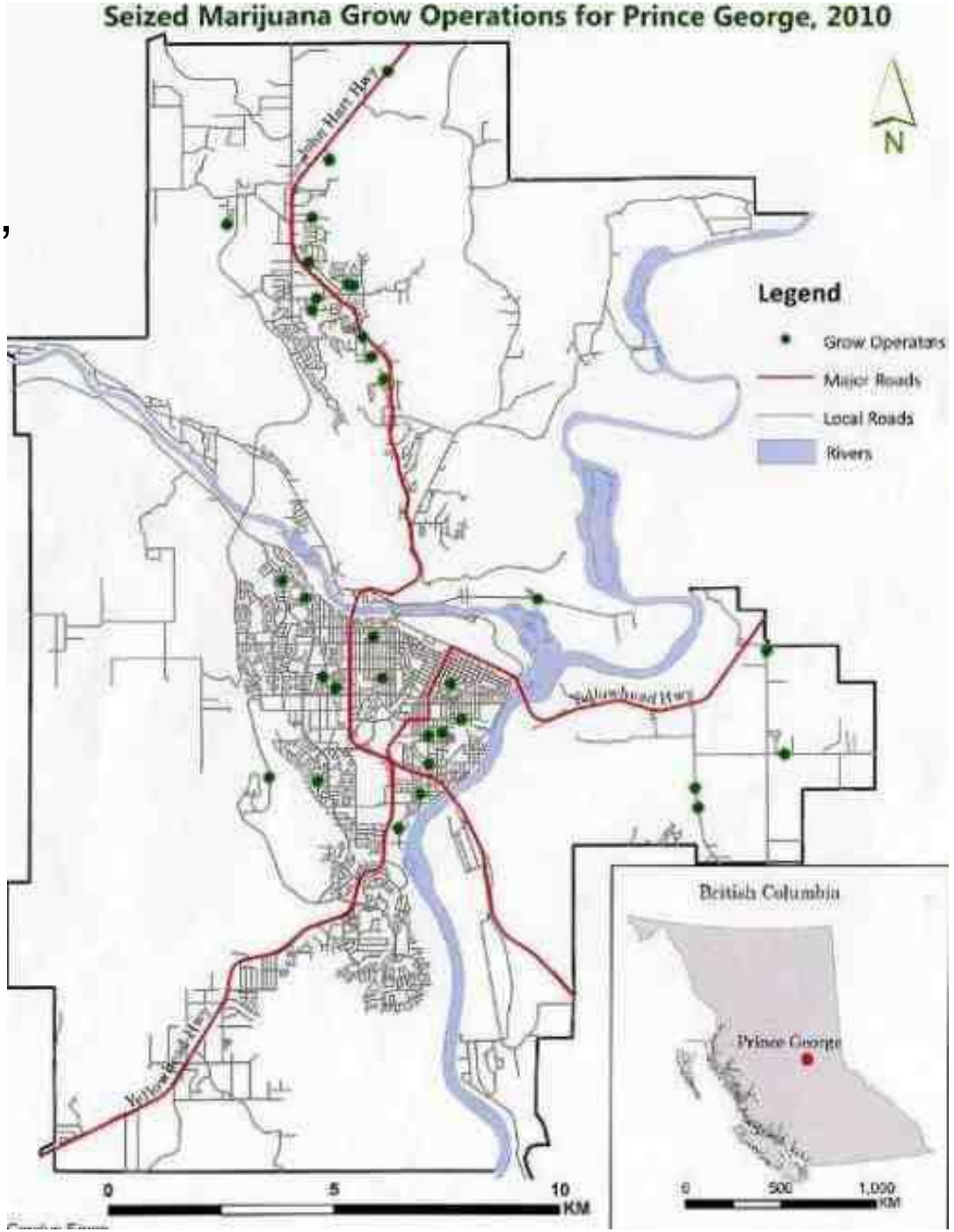
1. Dot maps

Dr. John Snow used a dot map to identify the Broad Street Pump in London responsible for the spread of cholera – previously thought to be wind-borne.

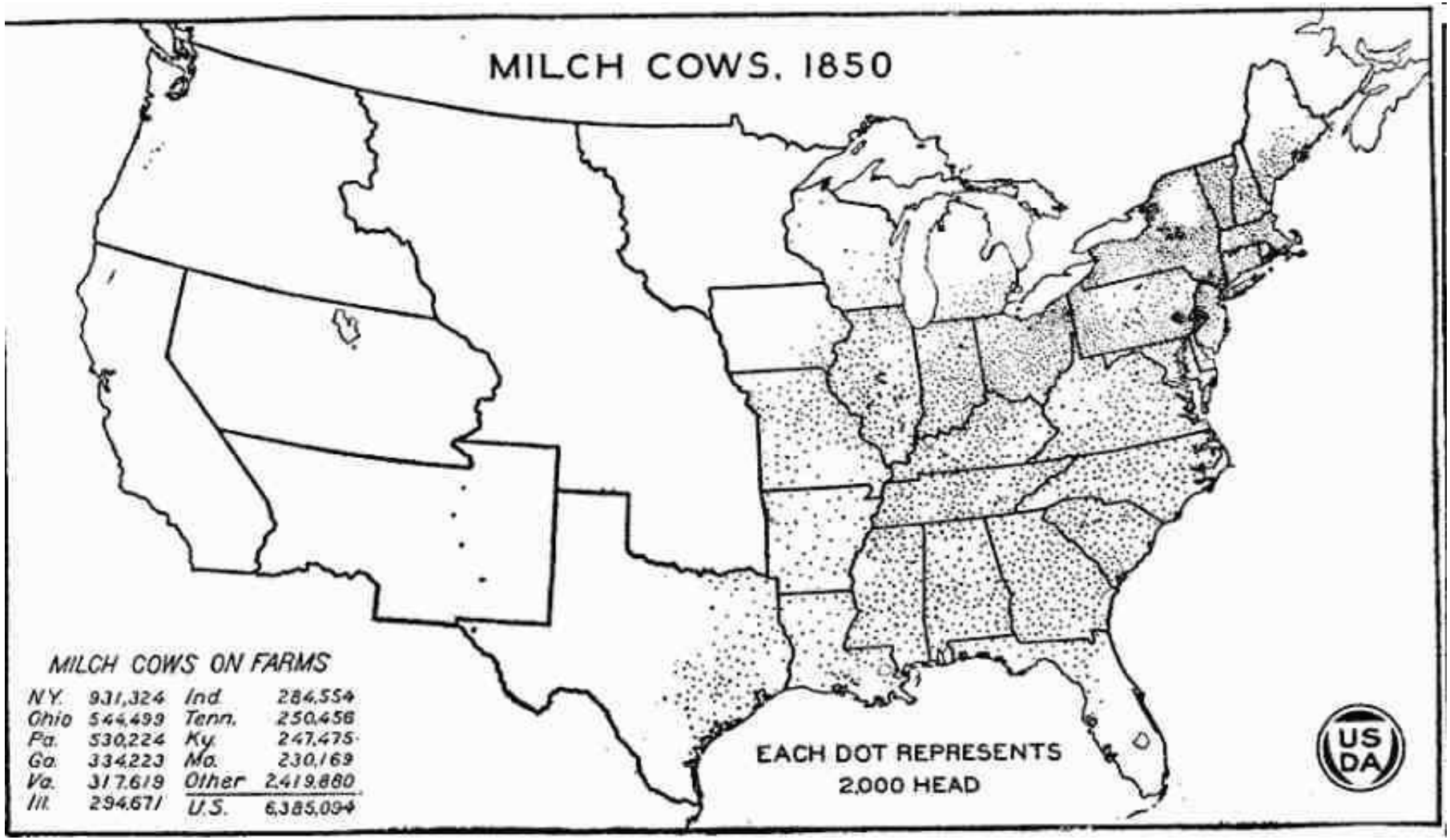
1 dot for each fatality

Example of a ‘dot map’

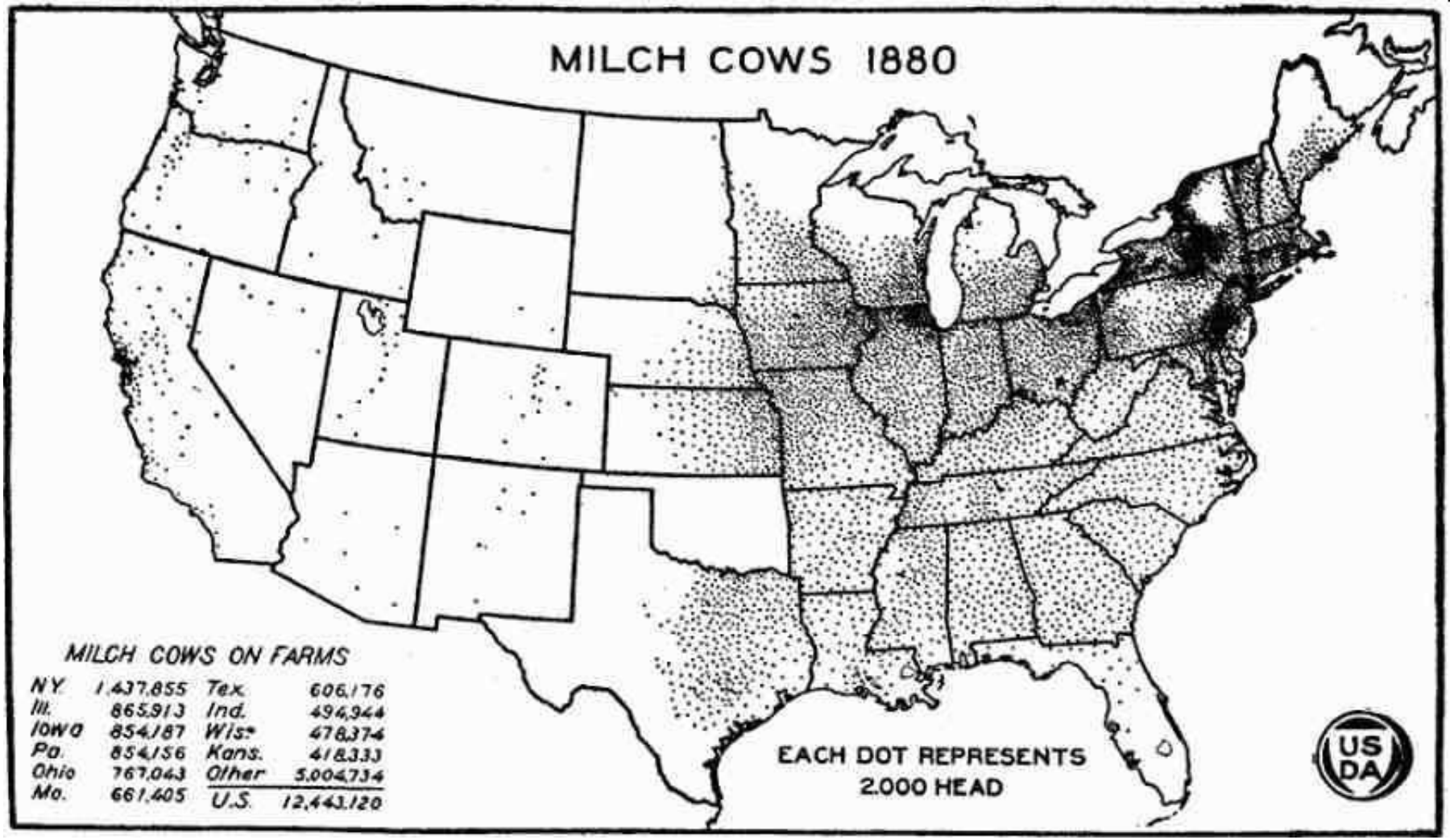
1 dot for each event



Using a ‘thematic’ scale (1 dot = 2000 cows)



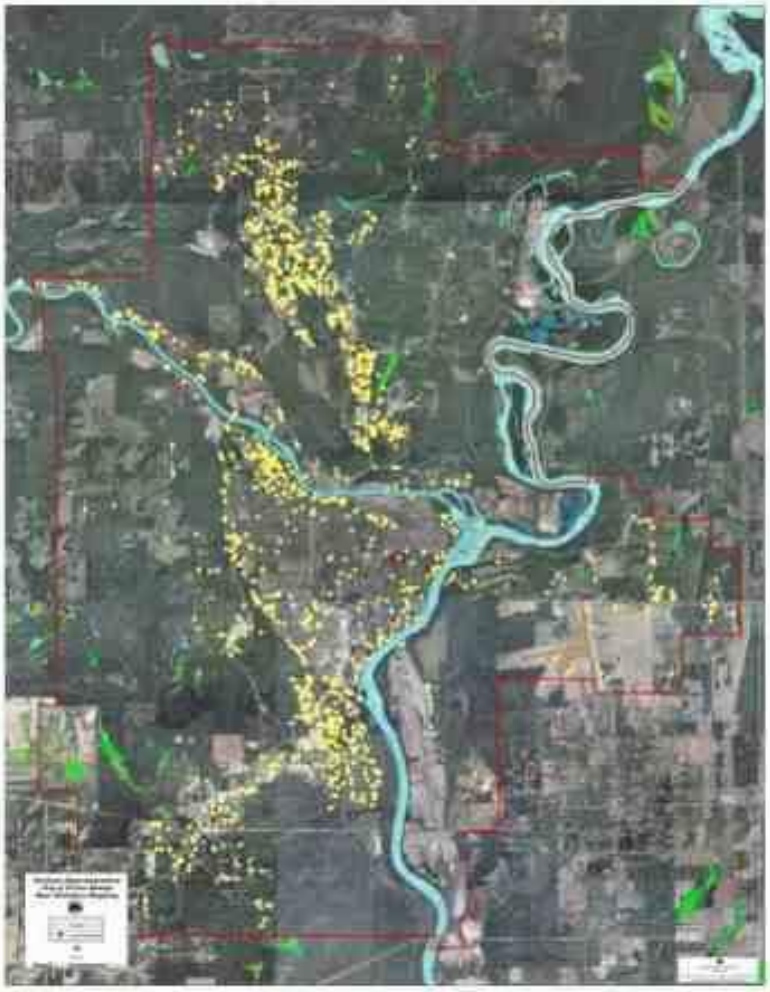
Dot maps – easy to draw, simple to understand

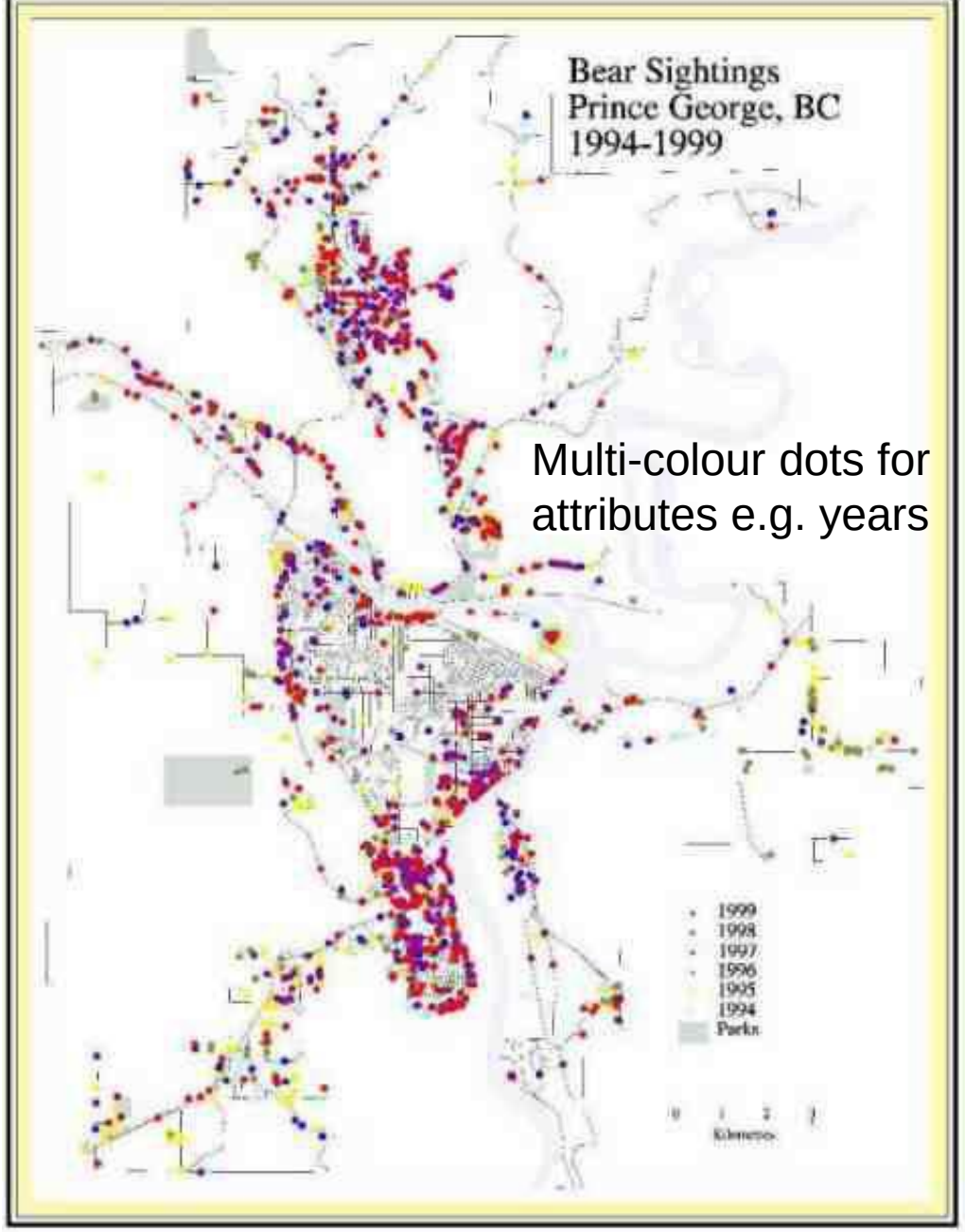


It gives a quick visual impression, but a poor estimate of actual numbers.

Black bear sightings, 2010

Yellow = sighting; Red = destroyed



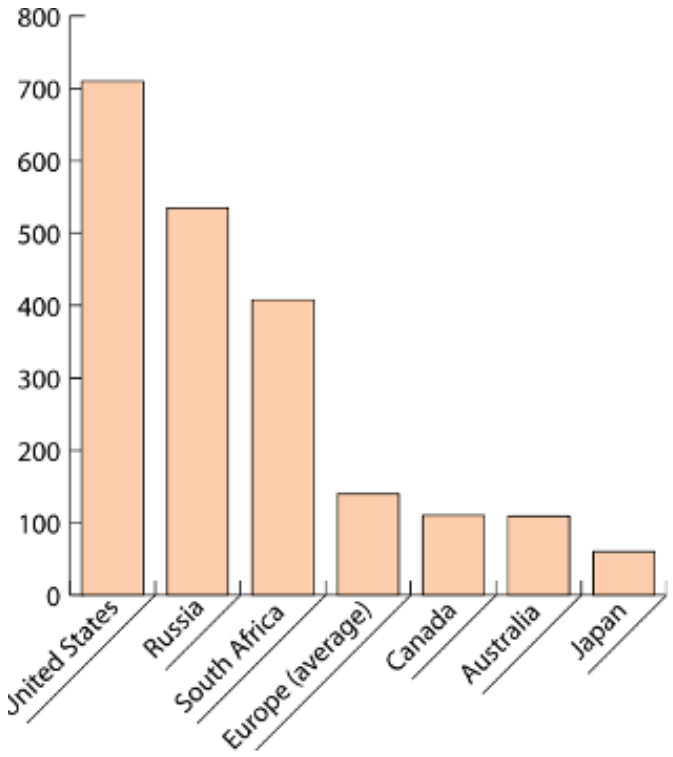


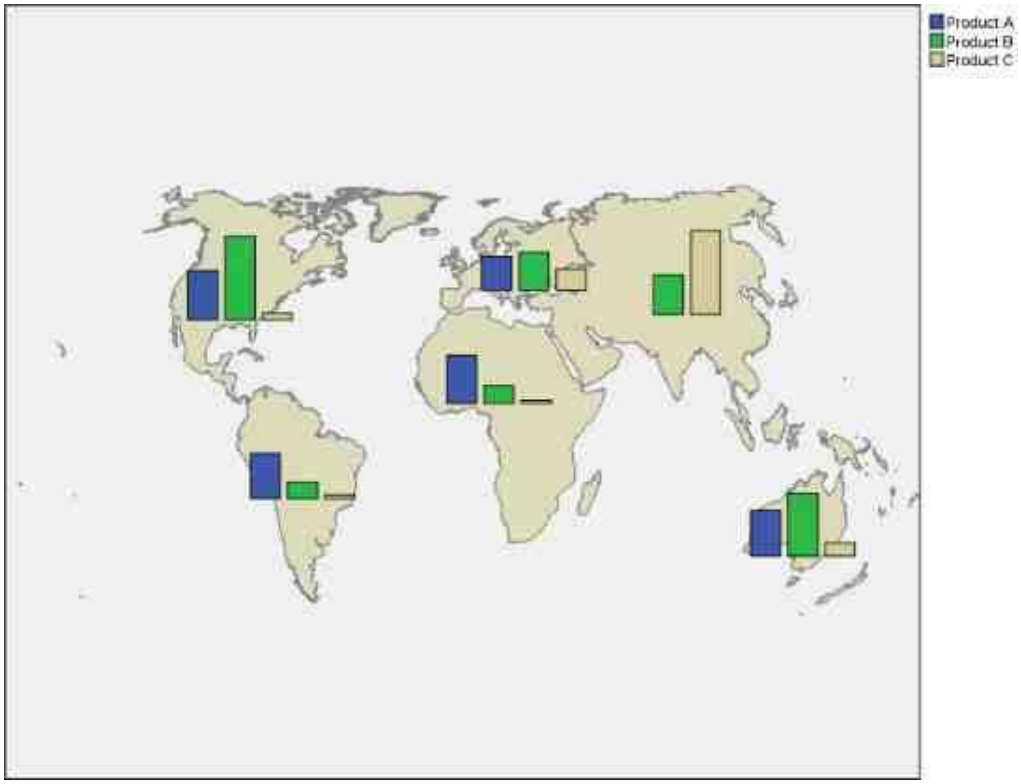
It breaks down when: exact locations are not feasible OR there are too many locations
Then instead we use a variable size symbol, where size = number of occurrences

2. Proportional Symbols - bars

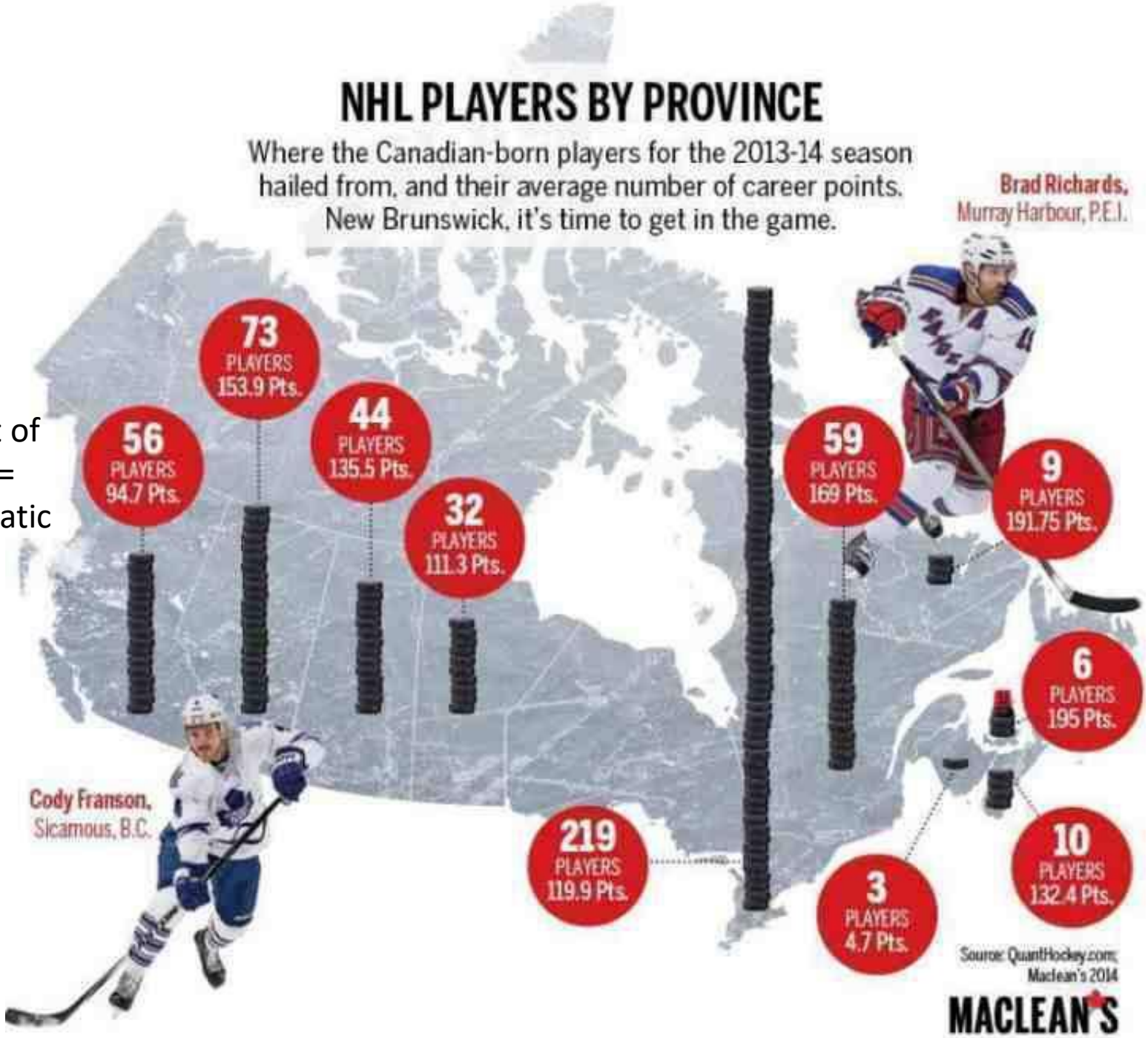
These indicate values at a point, or in an area. The simplest is a bar.

Proportional bars:
The height of the bar is proportional to the value represented
e.g. same as in a bar chart



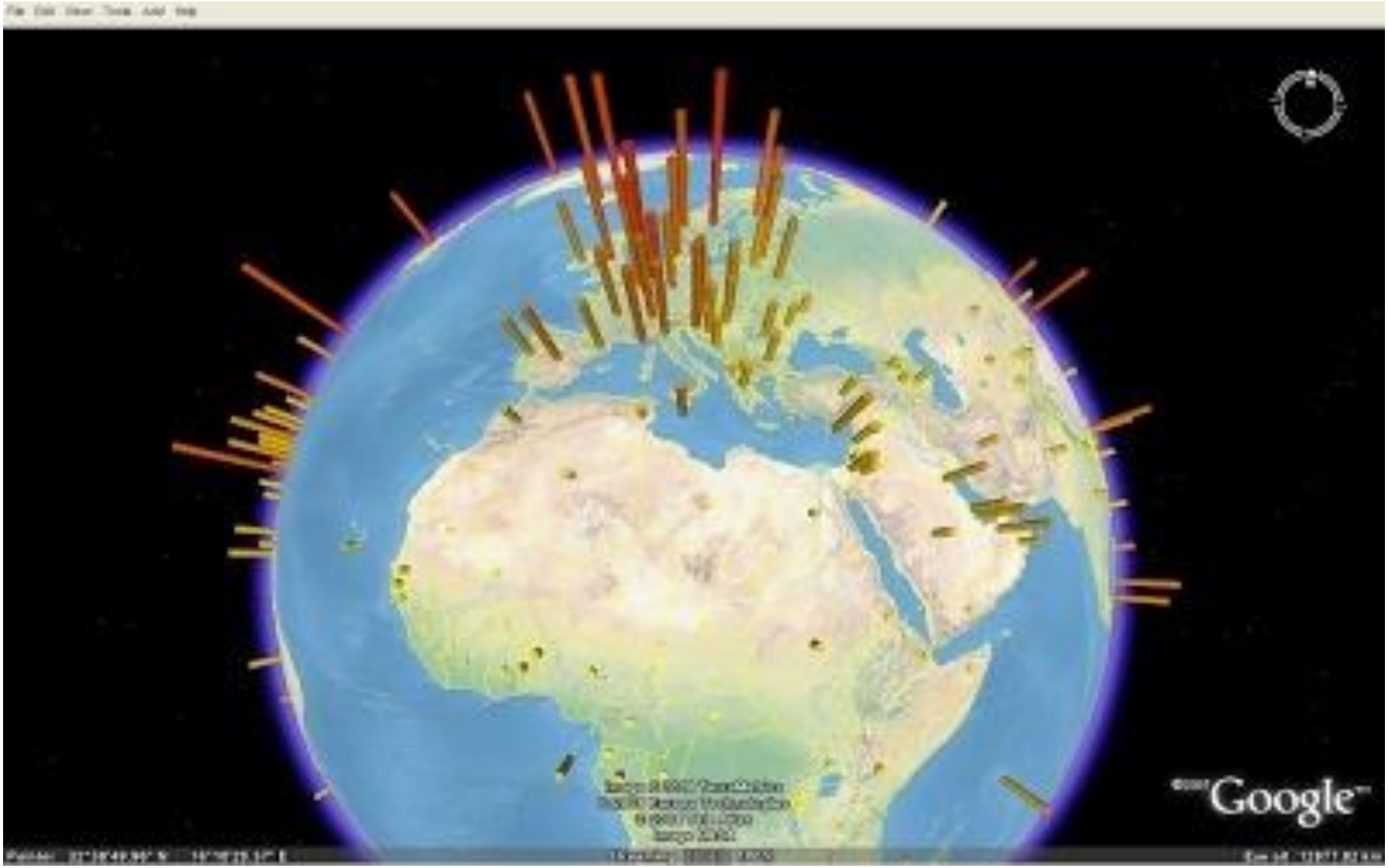


Height of pucks = 'Thematic scale'



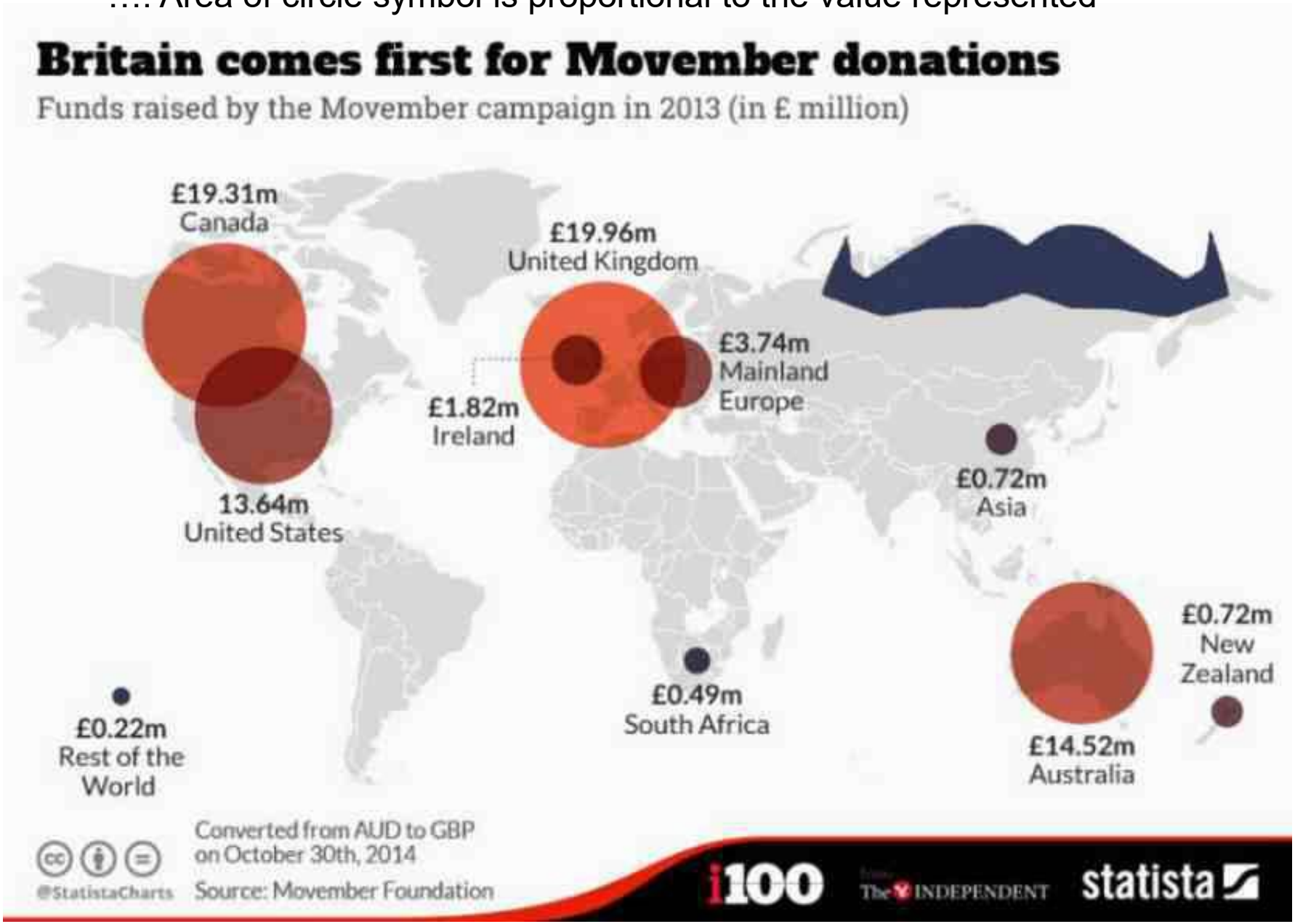
https://freegeographytools.com/2008/thematic-mapping-in-google-earth

Making thematic maps with google earth *« Internet users per 100 population »*



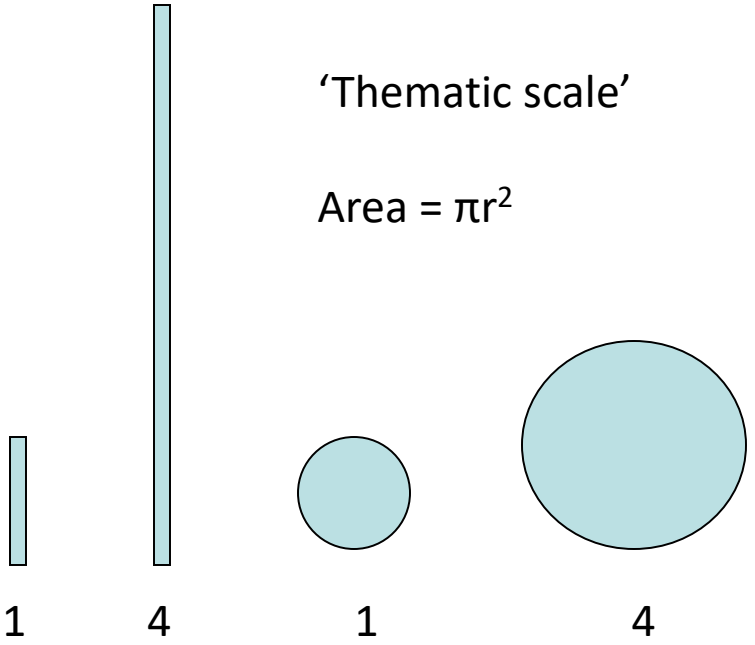
3. Proportional (formerly 'Graduated') circles

…. Area of circle symbol is proportional to the value represented



The advantage of circles over bars: (2D v 1D)

Value	Square root
1	1
4	2
16	4
25	5
50	7.1
100	10
400	20



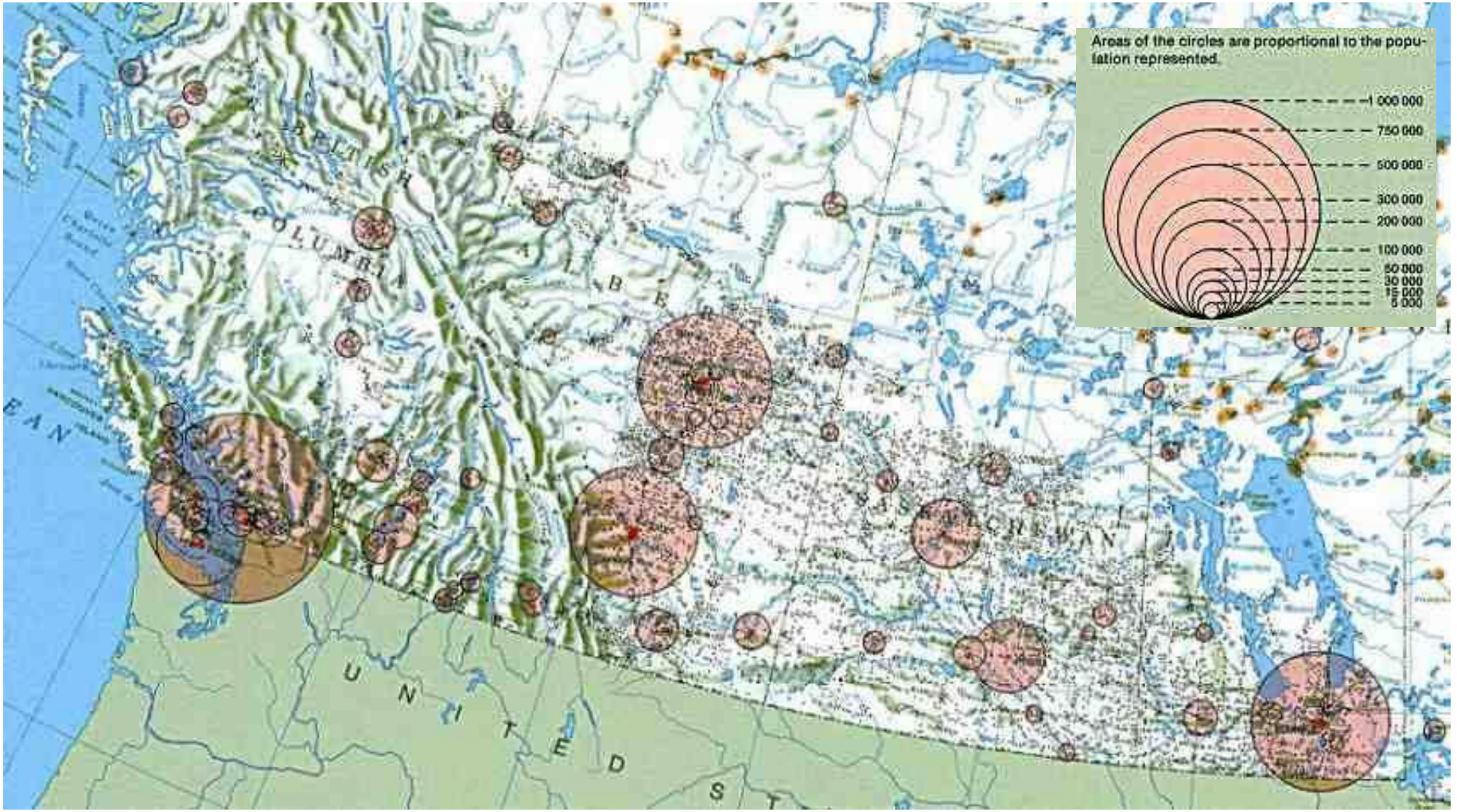
Bars are **proportional in height to the value**

Circle **areas** are proportional to the value –
…the radius is proportional to **square root of the value**

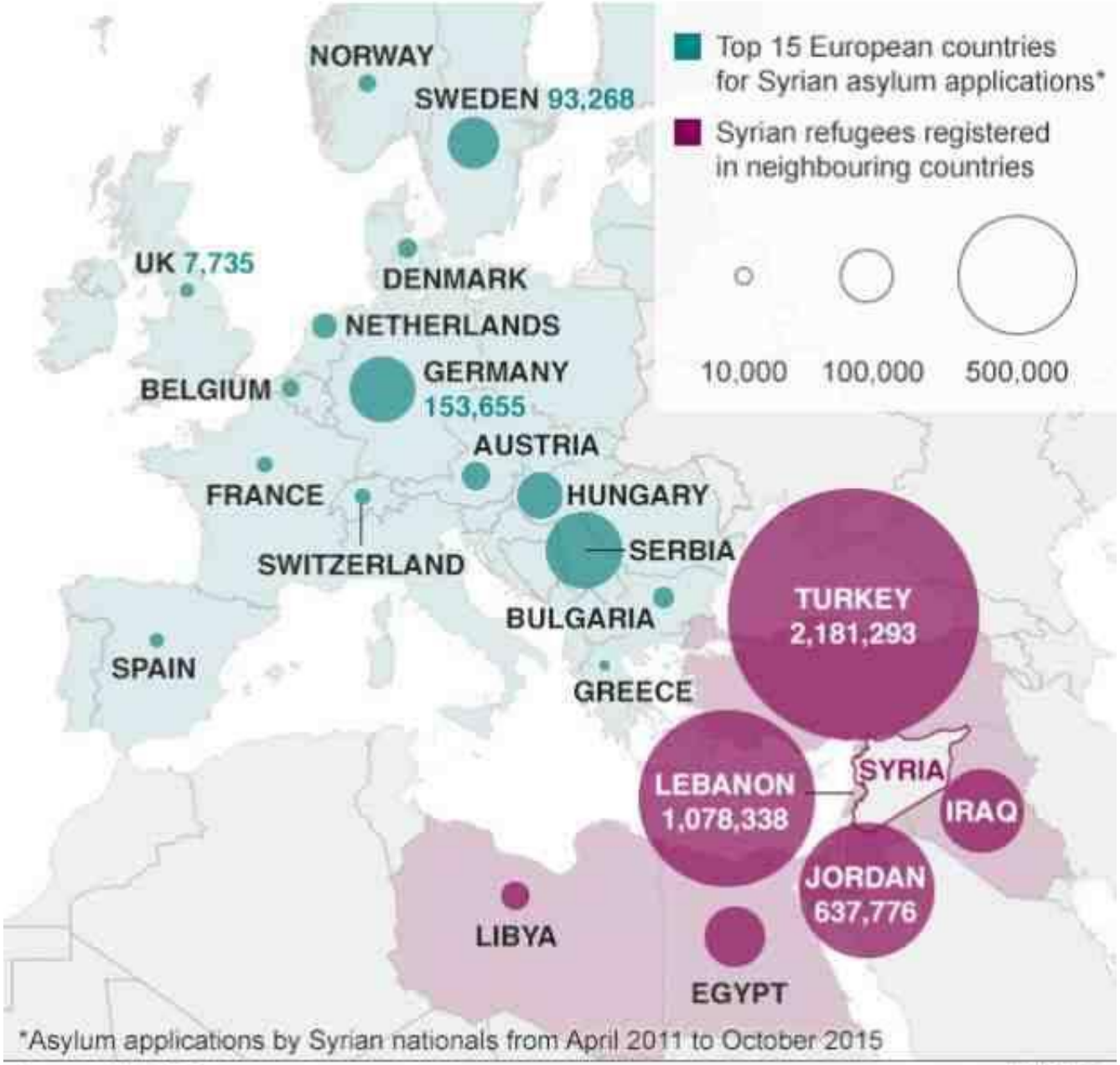
Thus it can handle greater data ranges than the bar, and has been used more than any other point symbol in thematic mapping

Legend: sample circles, nested or strung out, use round numbers

Too many sample circles!



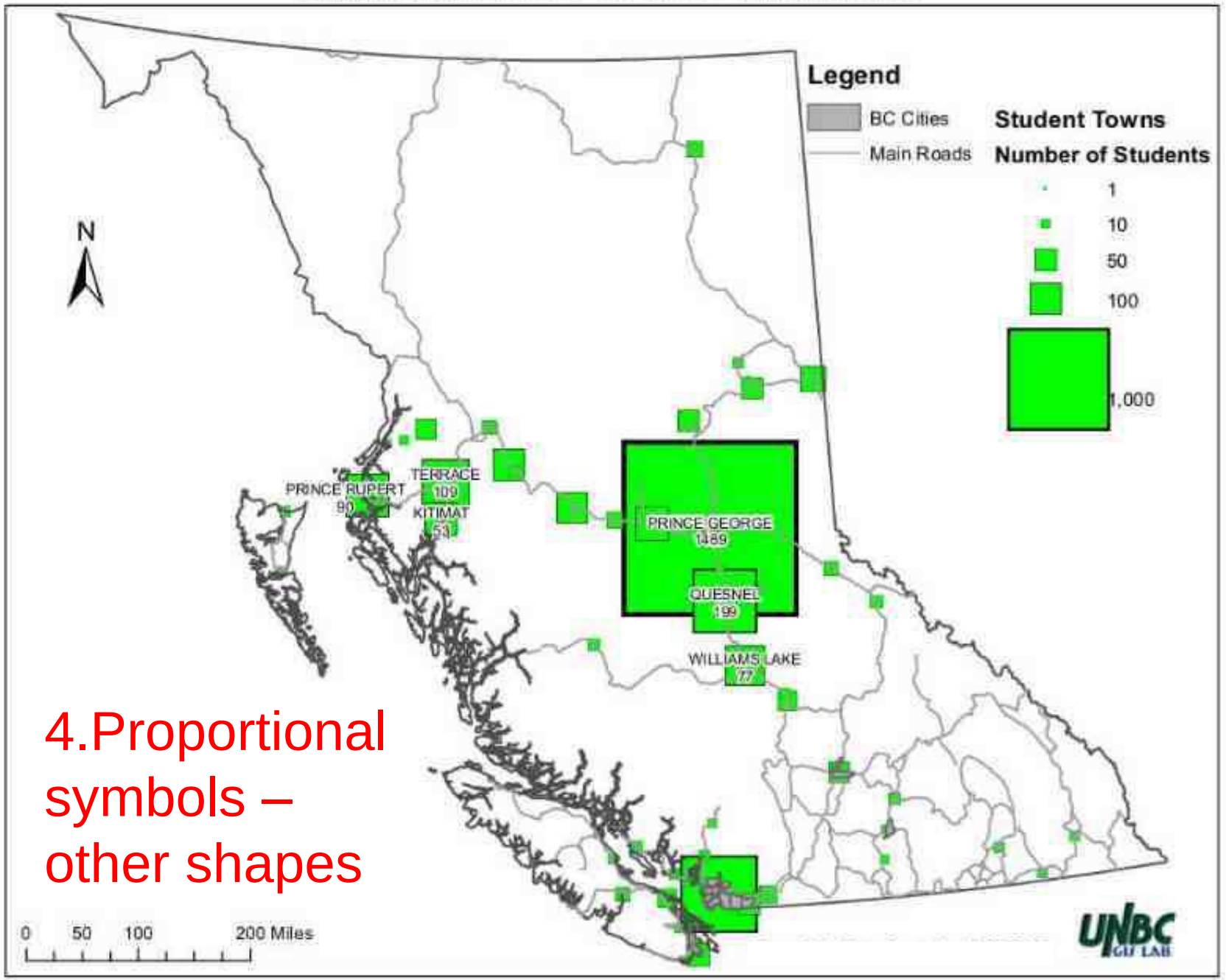
Syrians in neighbouring countries and Europe



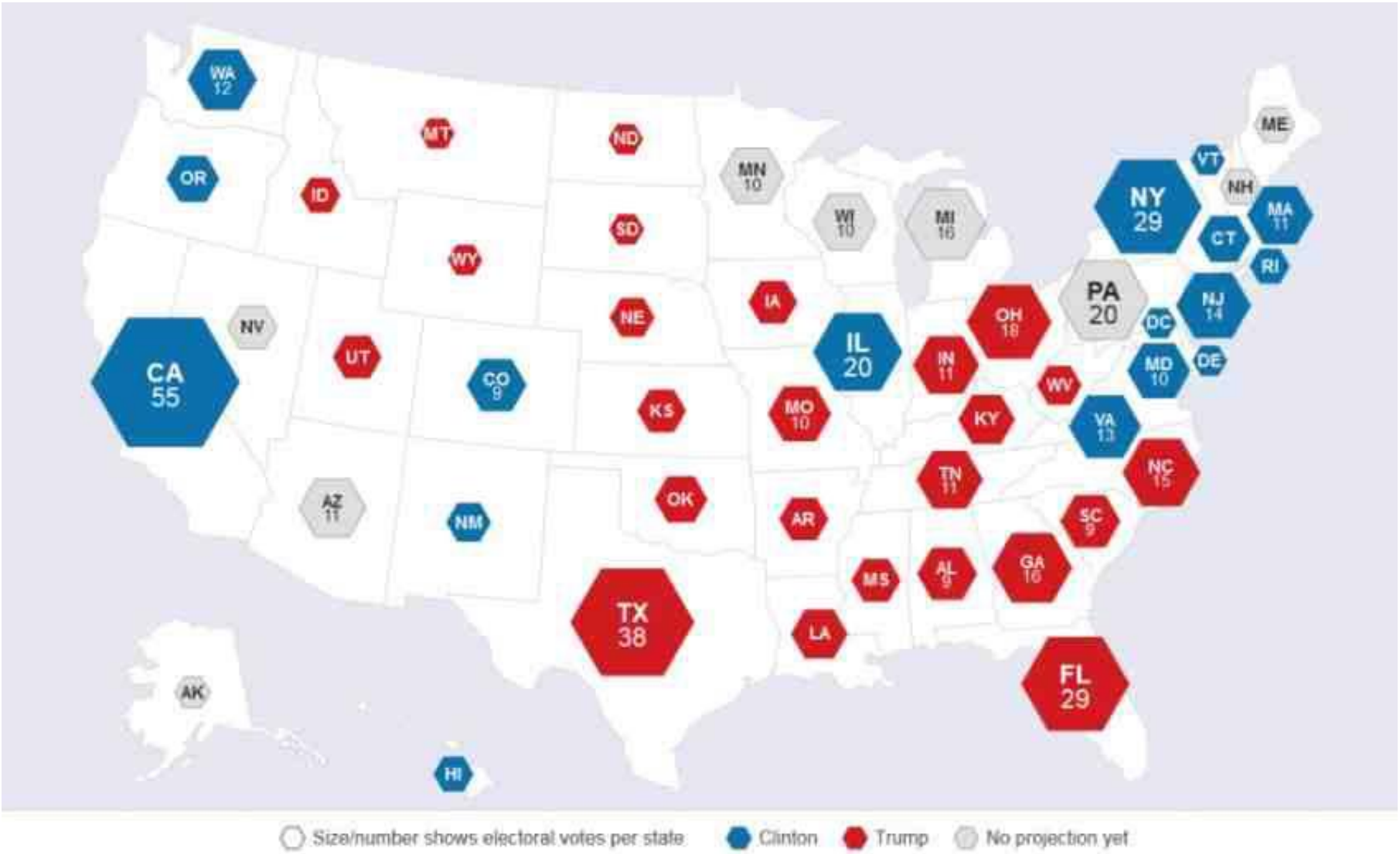
*Asylum applications by Syrian nationals from April 2011 to October 2015

Source: UNHCR

BBC


Distribution of UNBC Students
Legend
BC Cities
Main Roads
Student Towns
Number of Students
1
10
50
100
1,000
N
PRINCE RUPERT
90
TERRACE
109
KITIMAT
53
PRINCE GEORGE
1489
QUESNEL
199
WILLIAMS LAKE
77
4.Proportional symbols – other shapes
0
50
100
200 Miles
UNBC
GIS LAB

USA election results 2016 (hexagons)



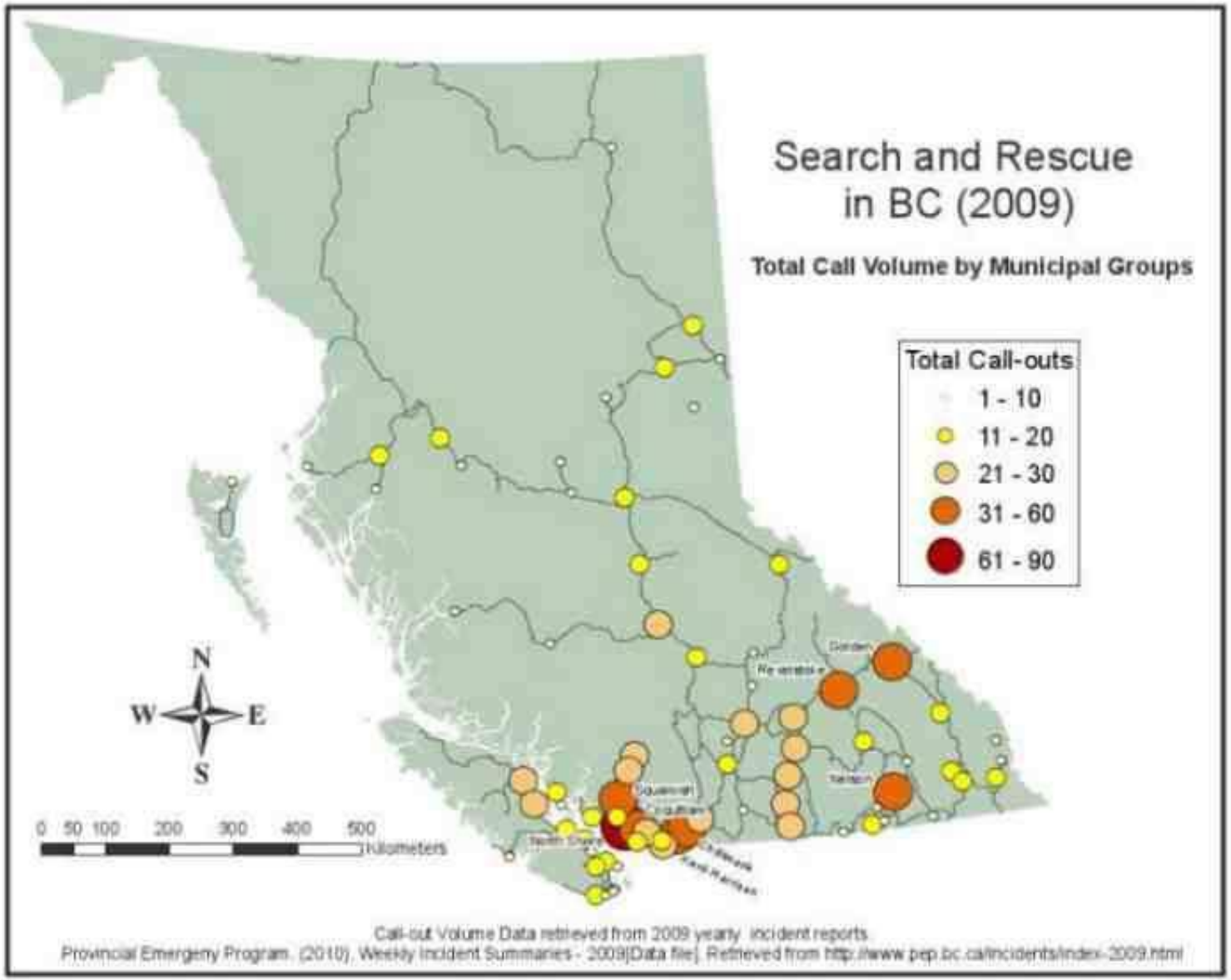
Facing the Presidential Election 2004

http://www.geog.ucsb.edu/~sara/html/mapping/electionelection04/electionchtml

data source: ESRI, New York Times

* resemblance with a Hollywood actor is pure conspiracy theory

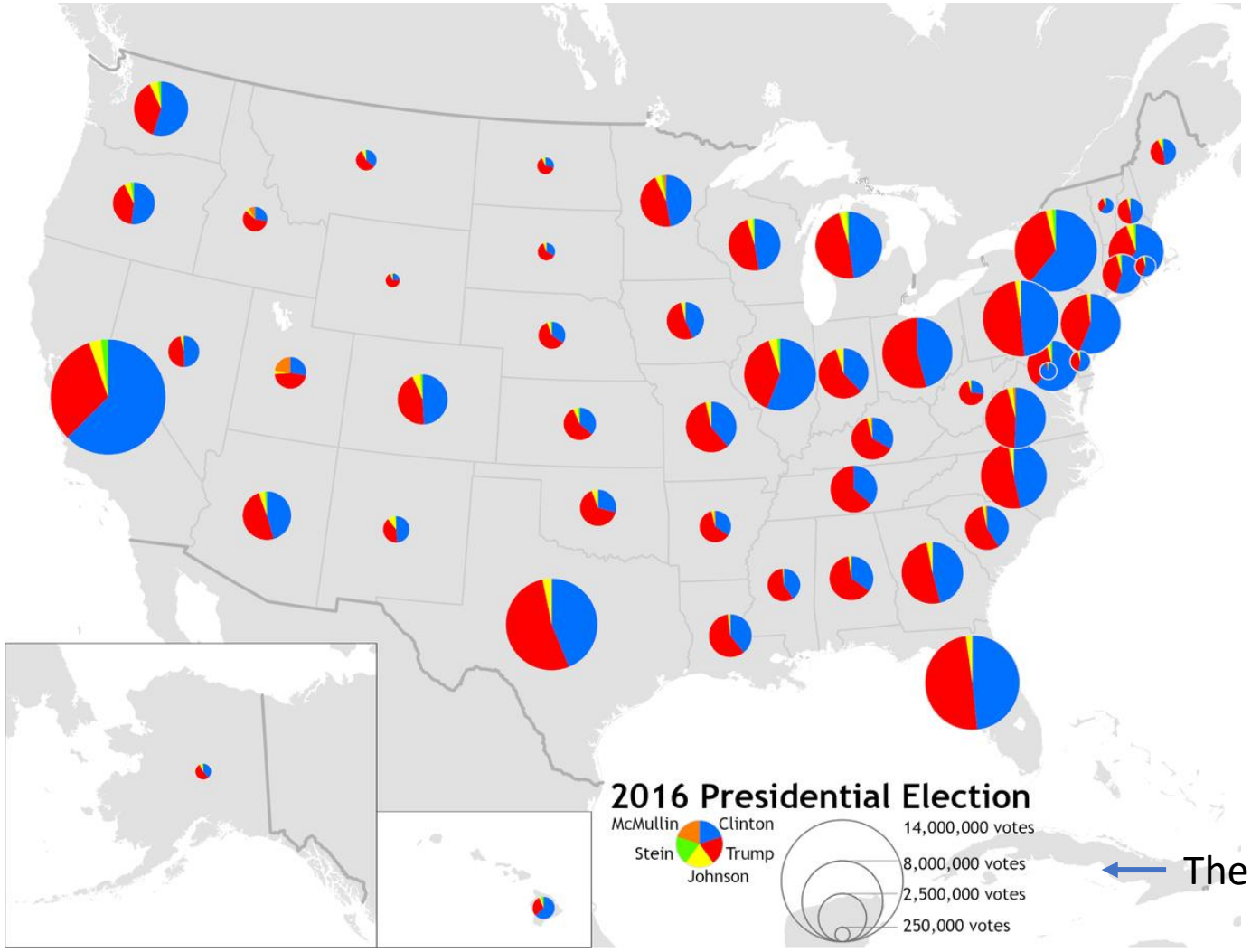
5. Graduated ('Range Graded') Symbols: grouped in classes



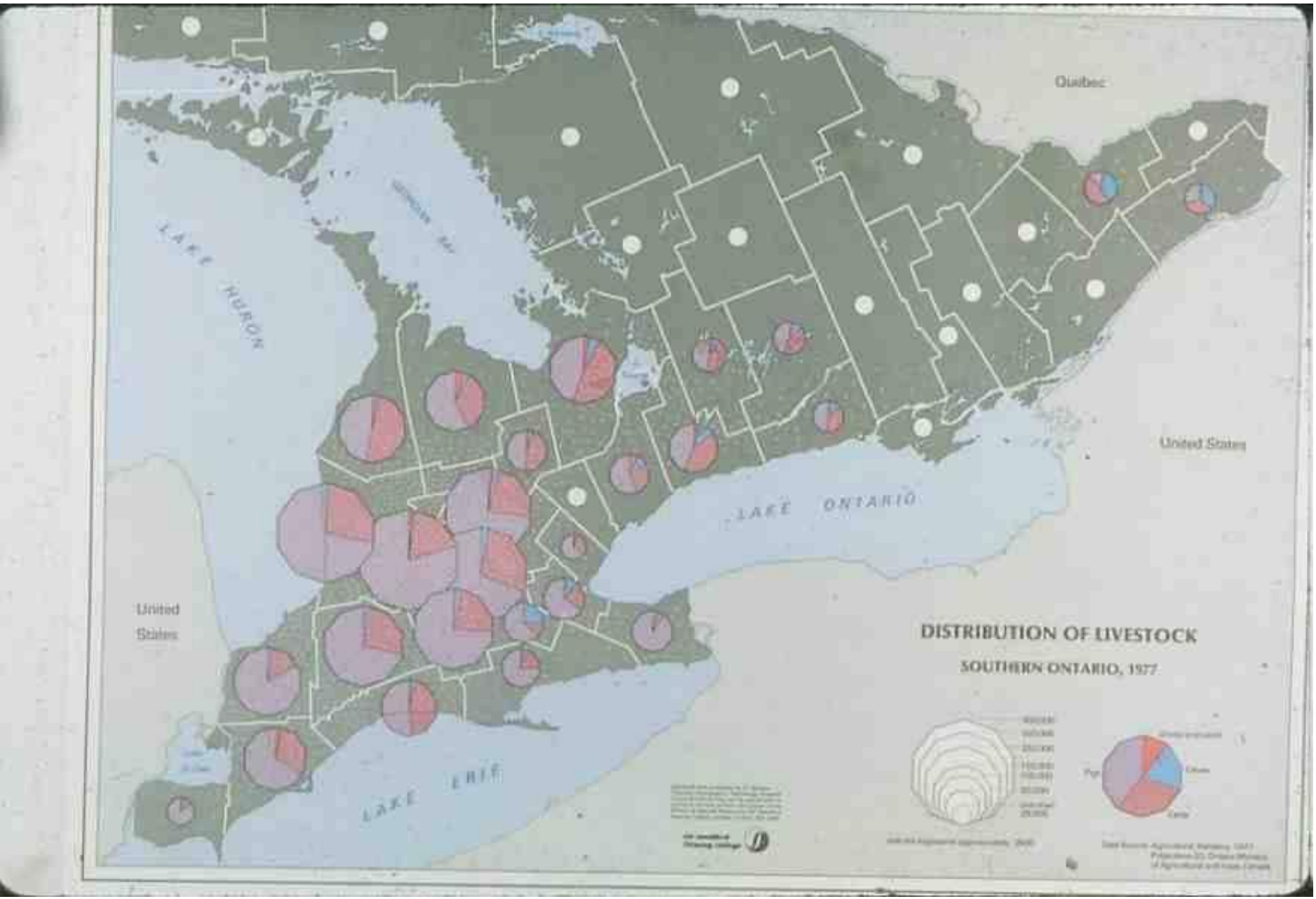
Where it is not feasible to keep all symbols individually proportional to their values, they can be grouped into classes and shown by a symbol size ~proportional to the class range central value. The design of these classes should be based on grouping similar values.

6. Segmented Proportional Symbols

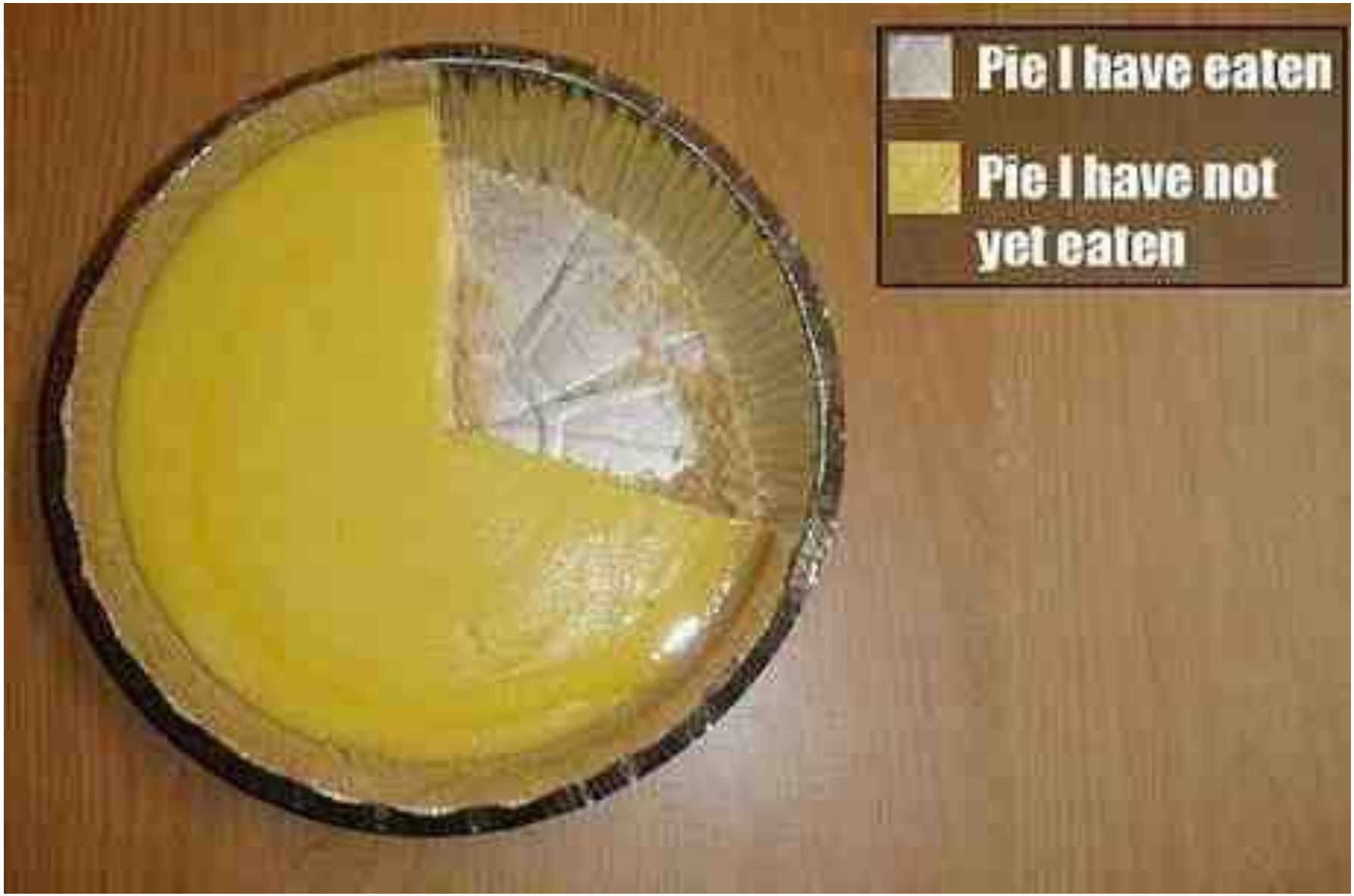
Circles are divided into 'pie' sections, starting at the '12 o'clock' position and progressing clockwise round, always in the same sequence for the subdivisions.



Segmented proportional symbols – decagons (loonies?)



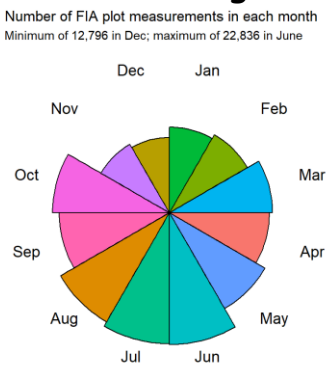
Segmented symbols / Pie chart humour



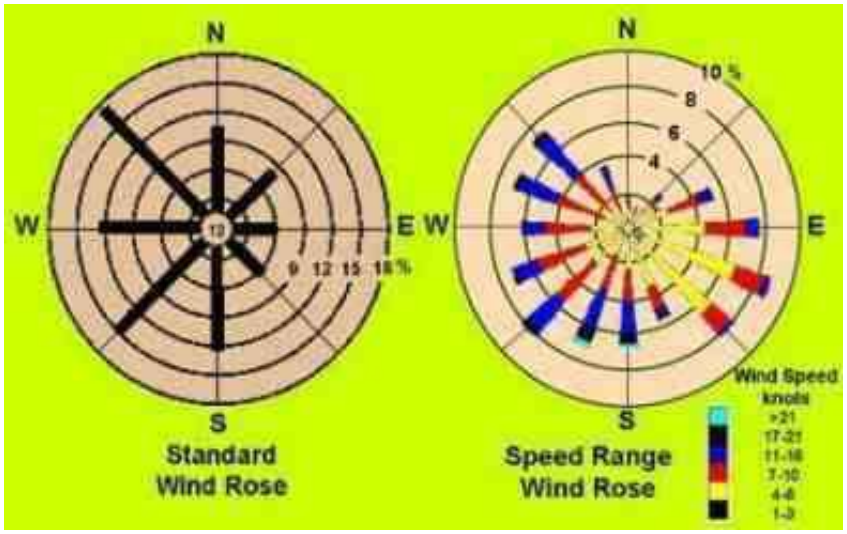
Alternative segmented circles

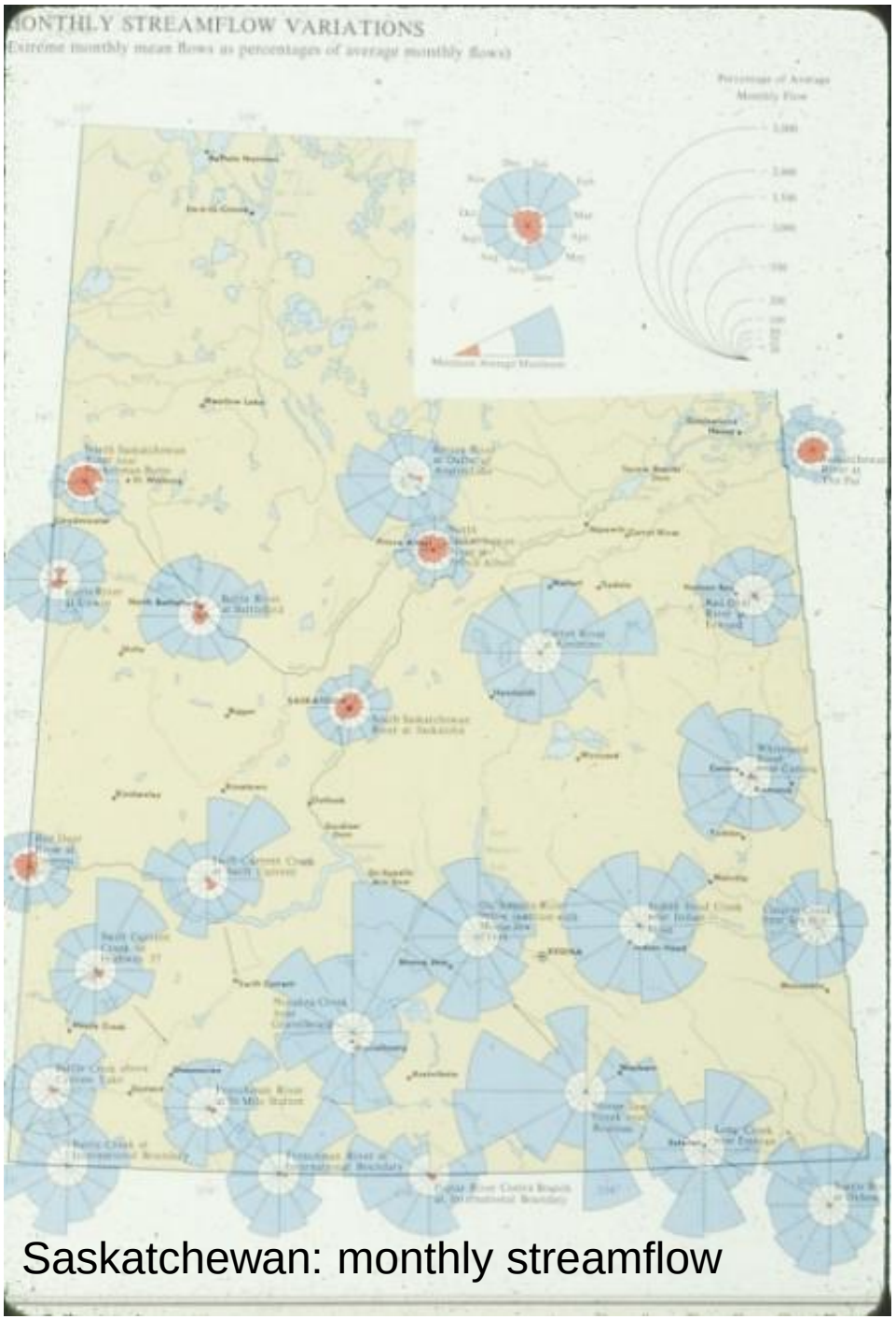
'polar diagrams'

'pie sections' are equal in number of degrees, but vary in radius, according to the value.



This is used where it is important to directly compare the constituent values, e.g. river flow over 12 months, or wind speeds from the 8 cardinal directions (a 'wind rose').

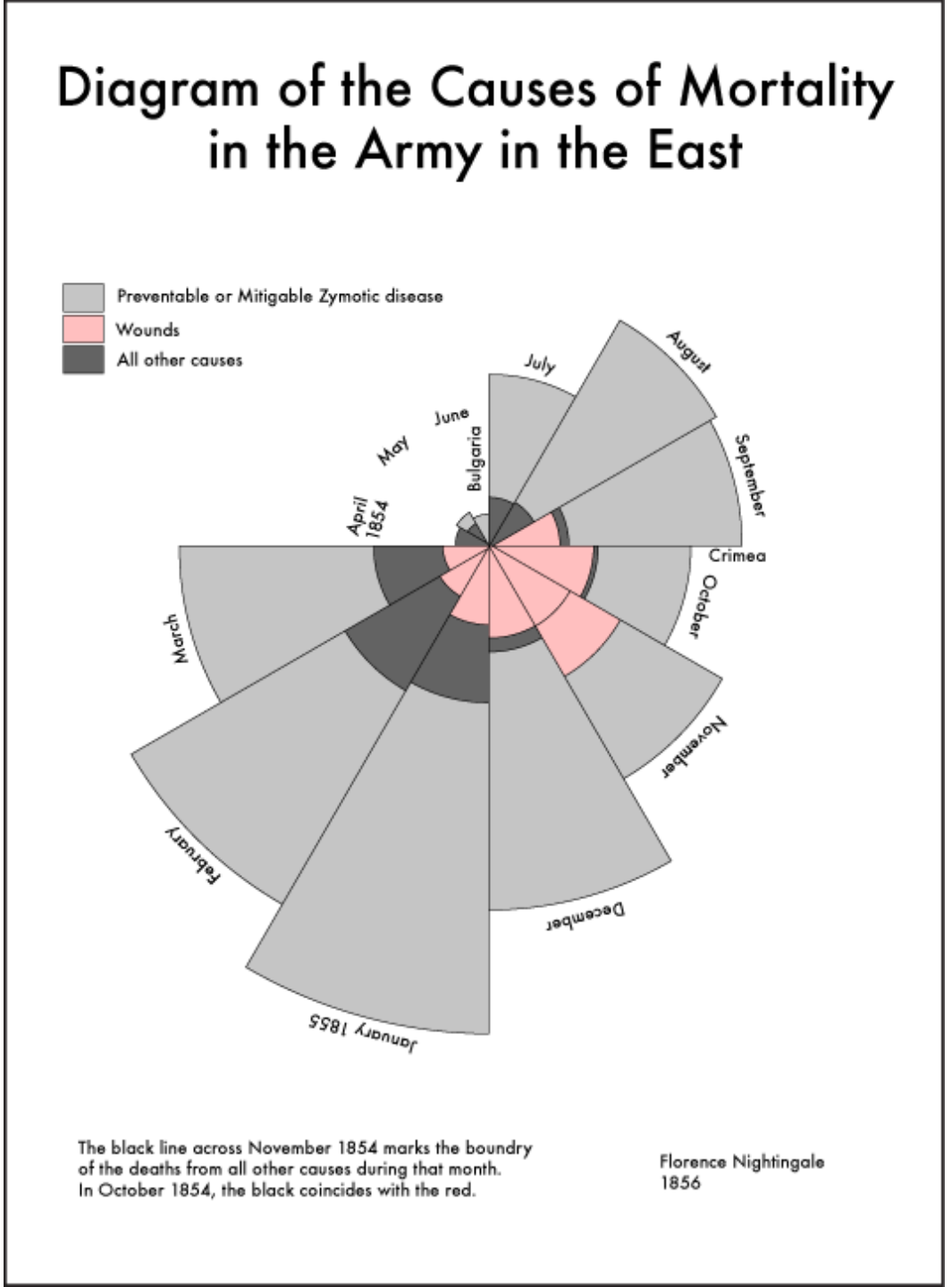




Saskatchewan: monthly streamflow

Polar diagrams

Florence Nightingale



7. Volumetric graduated symbols:

Volume=4/3 πr^3

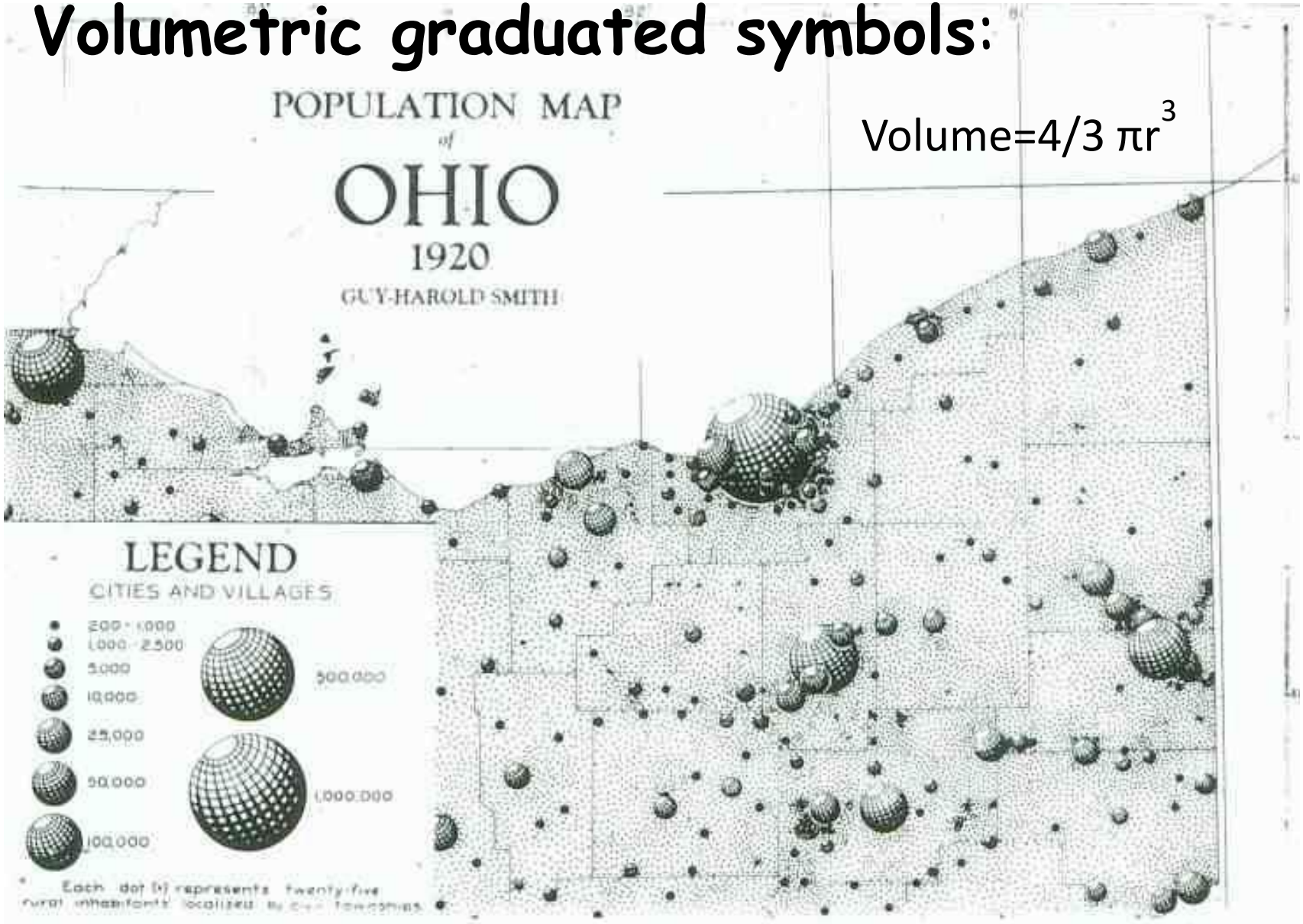
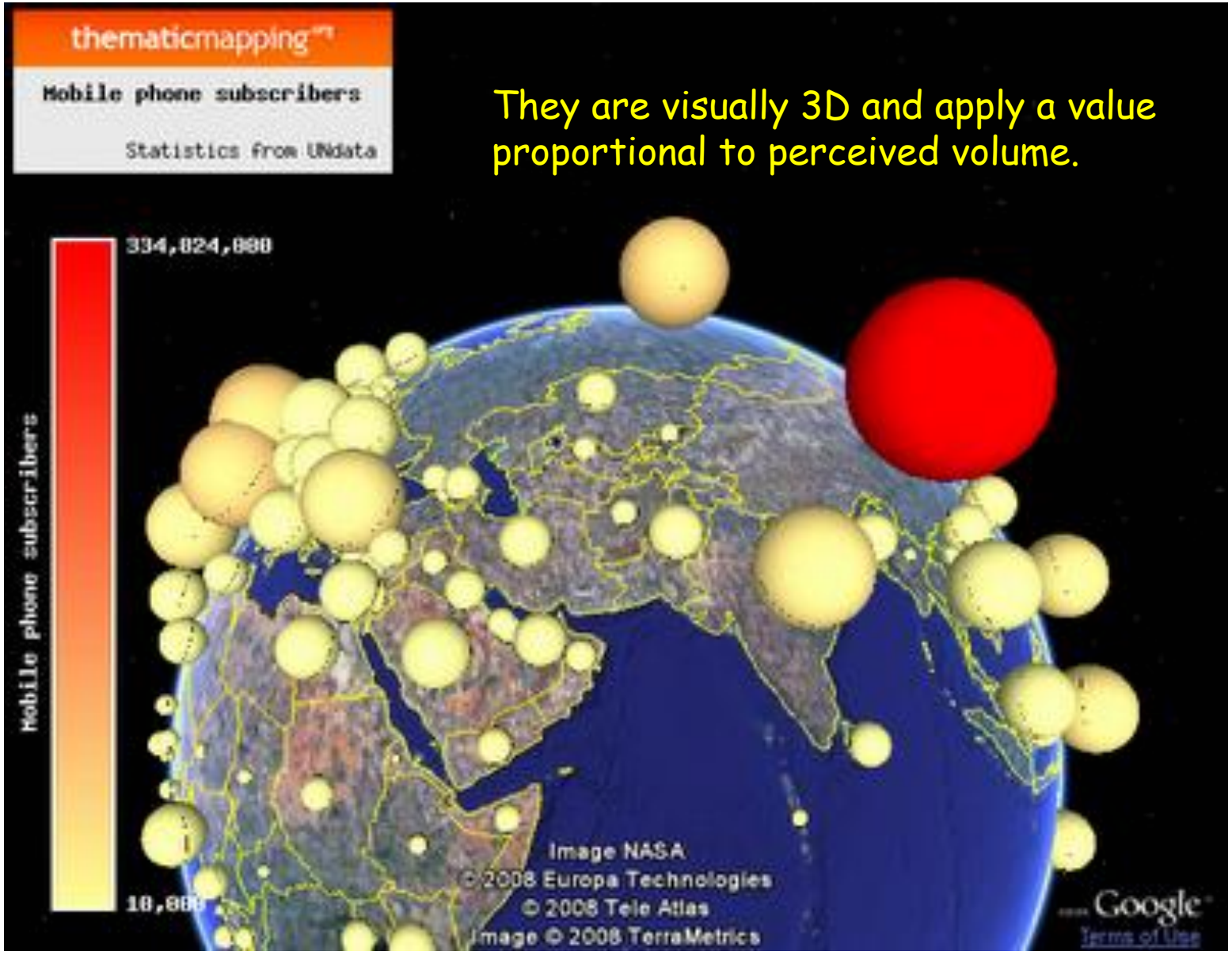


Figure 6.13 A portion of a population map of Ohio (1920) drawn by Guy-Harold Smith. Compare with Fig. 6.8. (Courtesy of the author and *The Geographical Review*, published by the American Geographical Society of New York.)



These can handle even greater data range than circles, -> a sphere radius is proportional to the cubed root of values e.g. 1:1000 becomes 1:10.

Infographic: Other shapes are possible: cubes, any 3D shape

Not easily segmented, maybe hard to compare sizes

Infographic

Tun
216 gallons

World's deadliest pandemics

'Thematic ← Scale'

Summary – thematic point techniques

- Dot maps (and other same-size shapes)

Graduated symbols

Bar – linear (1D) proportional symbol

Circle – 2D proportional symbol (and other shapes)

- Graduated (Range graded) symbols – classed by size

- Segmented symbols – subdivided by subcategories

Spheres – 3D proportional (volumetric) symbol

Line techniques: 1. Graduated line symbols:

are used to indicate movement or FLOW (line width = amount)

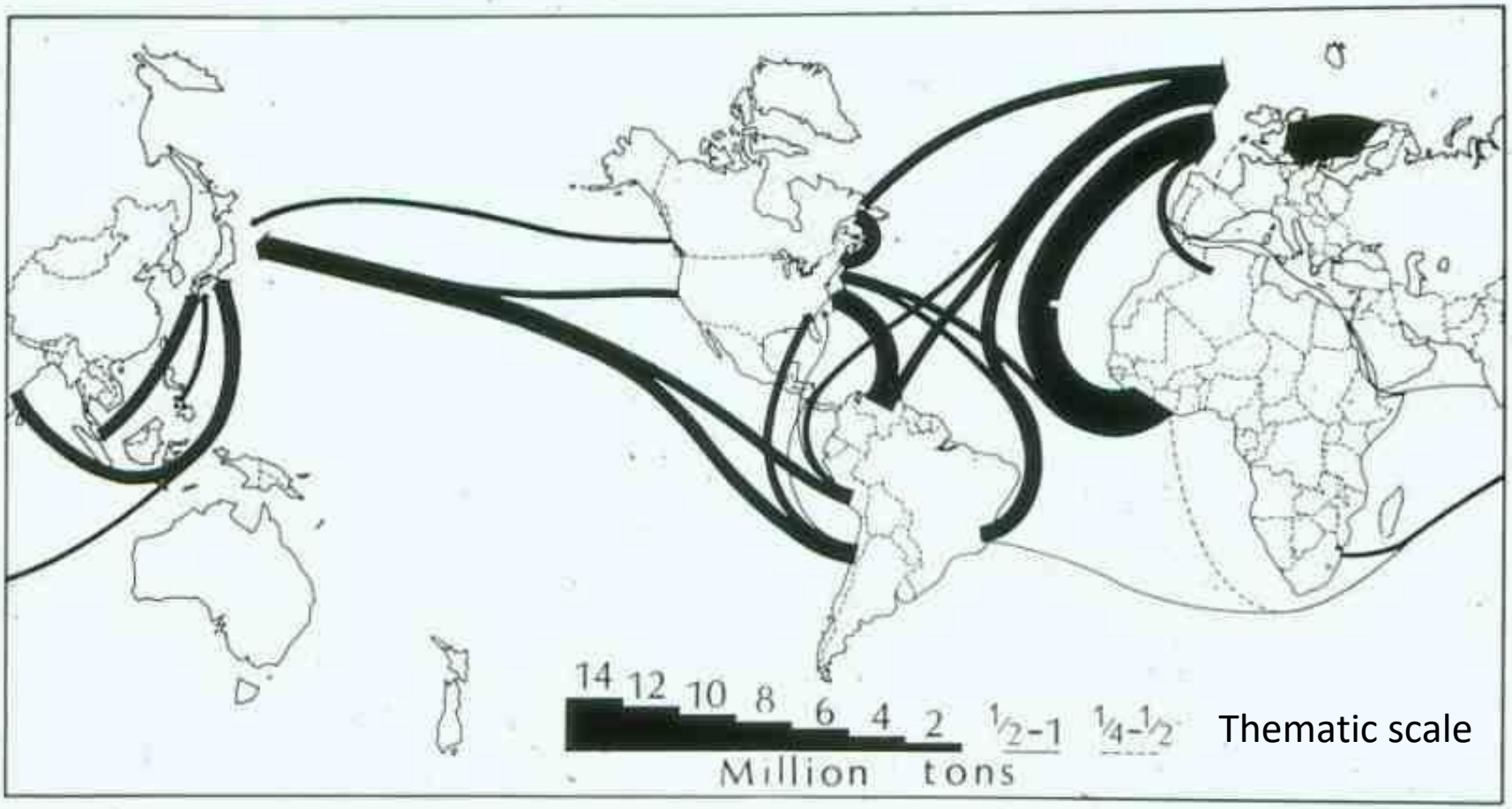
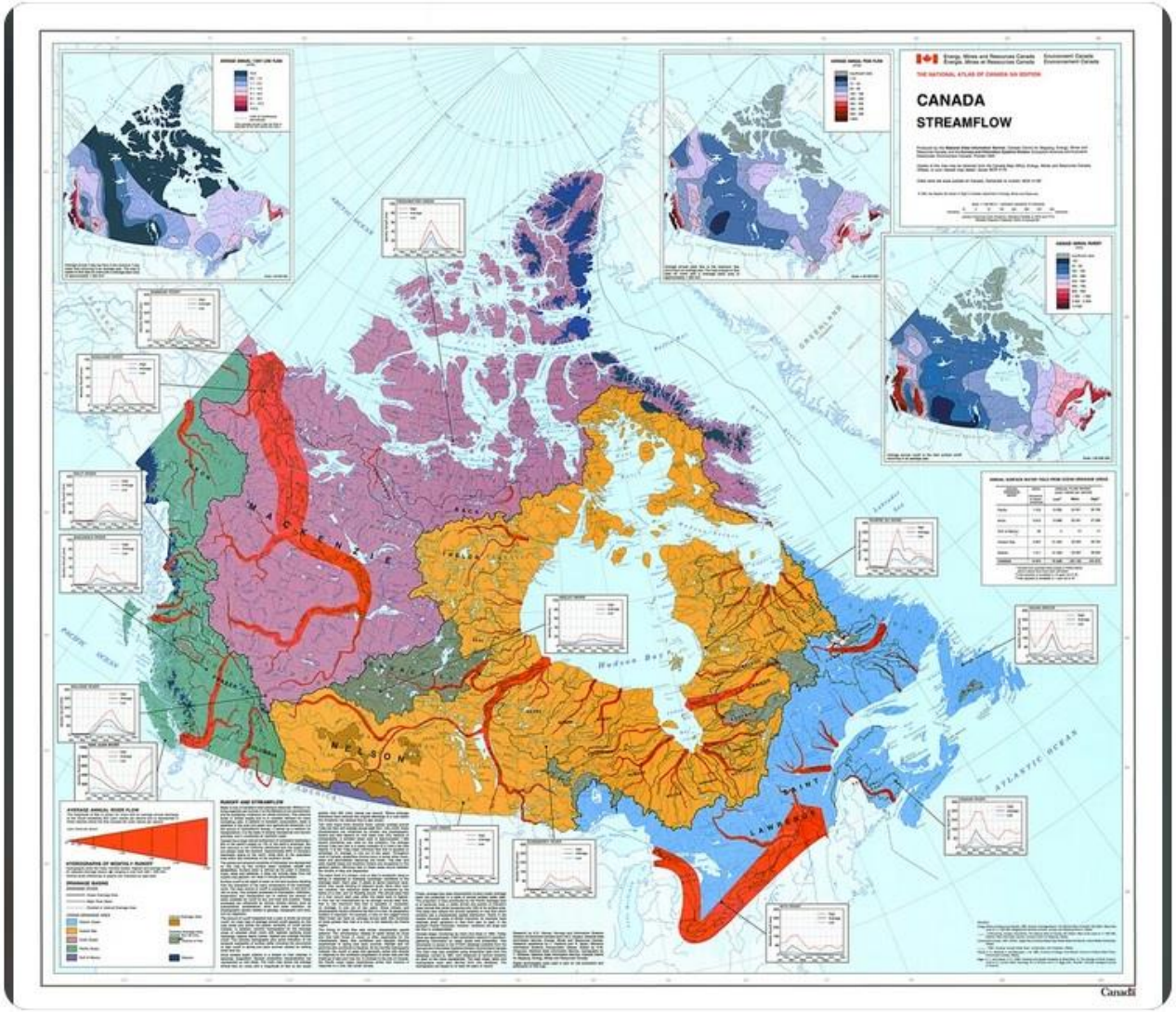
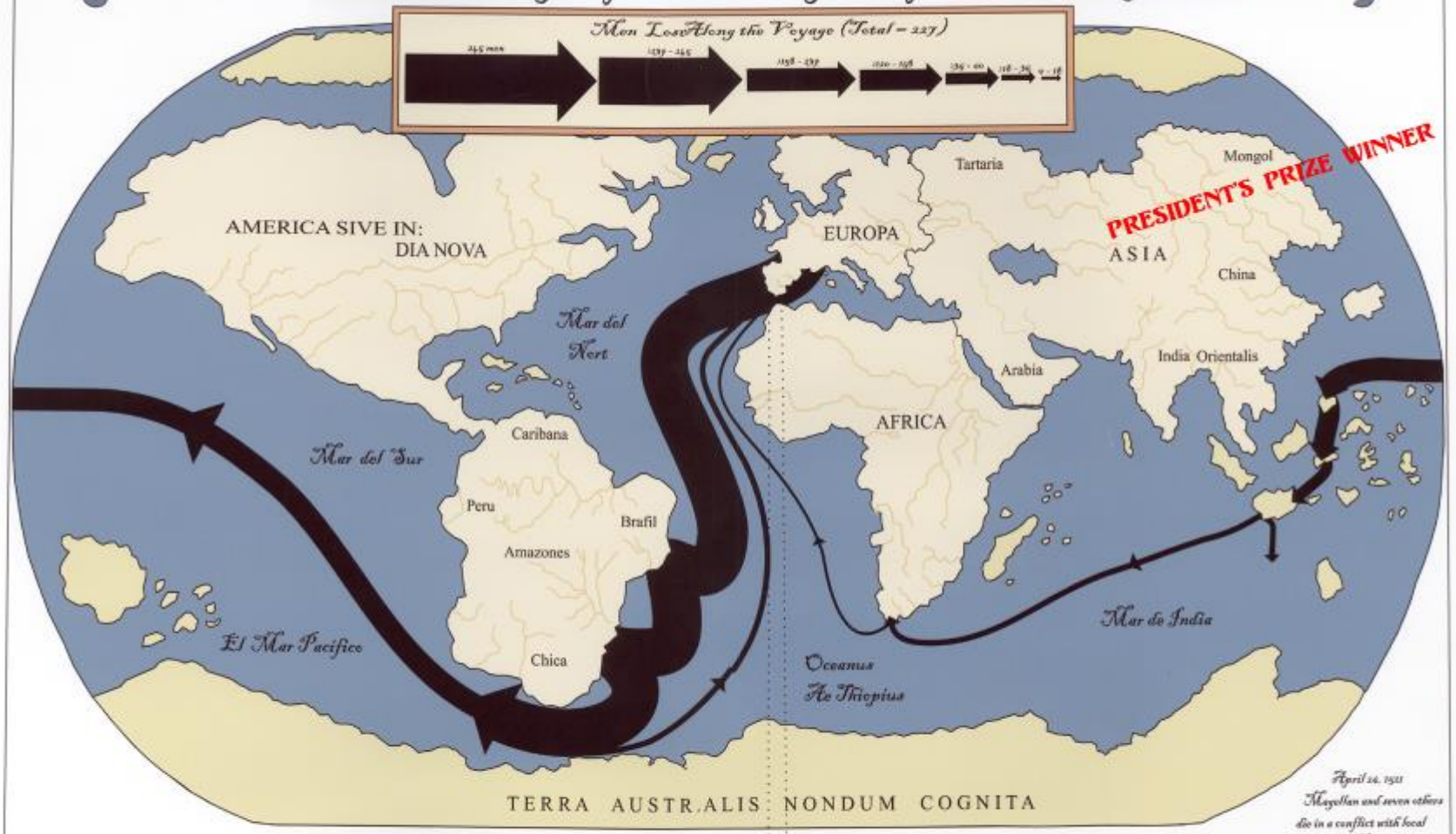


Figure 6.21 A portion of a flow-line map showing the movement of iron ore. Map by G. B. Lewis. (From G. Manners, "Transport Costs, Freight Rates, and the Changing Economic Geography of Iron Ore", *Geography*, 52 (1967), 260-279.)

Canadian watersheds and major river flow volume



Peril at Sea: The men lost during the first circumnavigation of the world, Magellan 1519 - 1522



PRESIDENT'S PRIZE WINNER

December 1520 - February 1521
20 men lost to sickness crossing the Pacific Ocean

November - December, 1520
Magellan navigates the straight

April 1, 1520
Magellan kills five men who attempted to commit mutiny

September 8, 1521 one ship returns to Seville, Spain with 18 men

November 8, 1521 remaining crew reaches the Spice Islands, one killed

April 24, 1521
Magellan and seven others die in a conflict with local natives at Mactan Island

March 17, 1521
Magellan reaches the Philippines one dies

November 20, 1520
crew of 60 desert back to Spain on one ship

Mid April, 1520
one ship destroyed one killed

September 20, 1519
Magellan and his crew of 245 men leave Seville, Spain on five ships

Cape Verde 25 men die of starvation or sickness 17 men captured

December 21, 1521 two remaining ships leave for Spain, one via the Atlantic, the other via the Pacific, each with 60 men

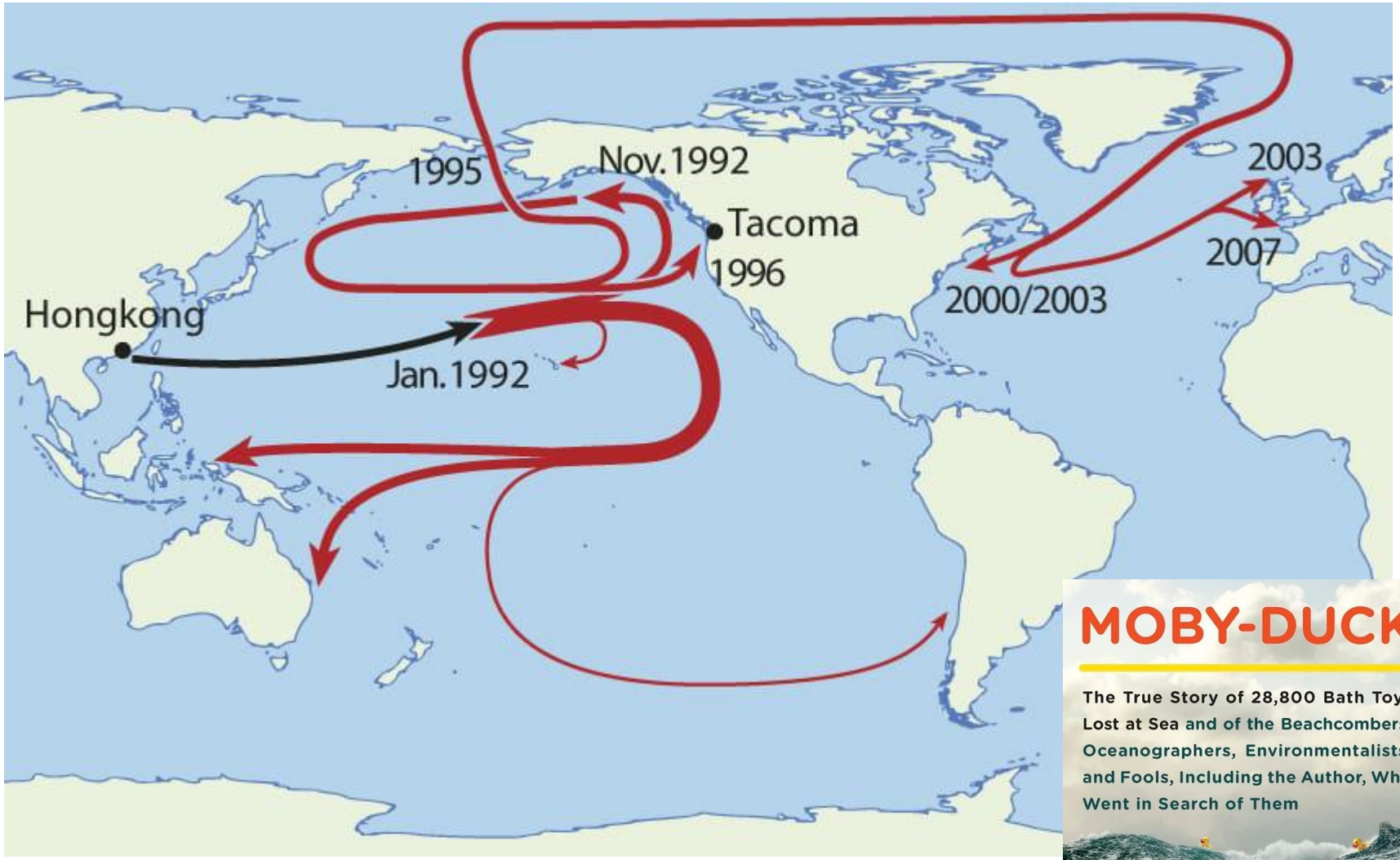
May 1, 1521 29 men killed, one ship abandoned

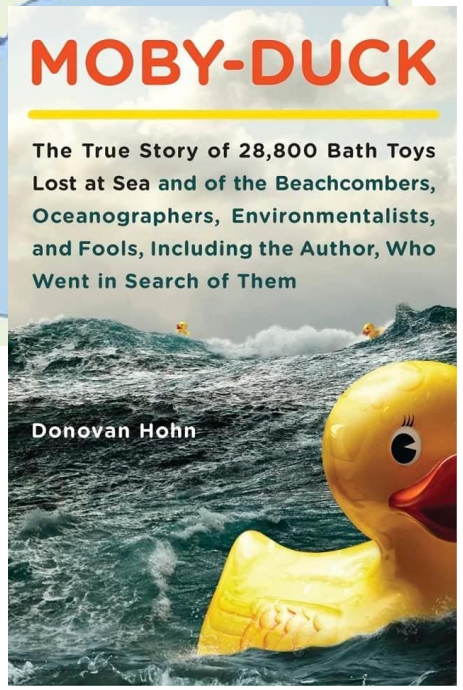
One ship is captured, crew killed

Timeline of Events

Data Source: Beaun, (1929). *Ferdinand Magellan*. London: John Lane the Bodley Head Ltd.
Map Source: Wikimedia. http://upload.wikimedia.org/wikipedia/commons/9/98/1570_Tyrus_Ortelius_mr.jpg

Map Created by: Alison Clark



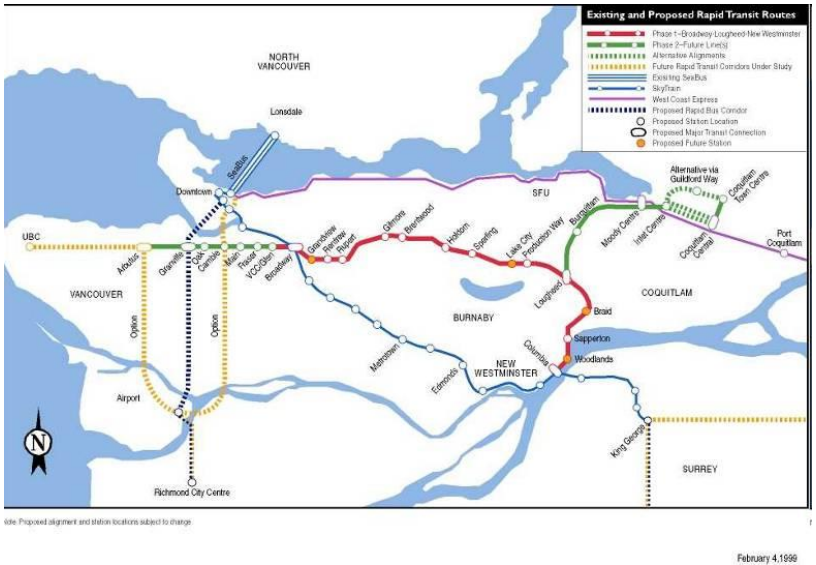


28,800 Rubber ducks were washed overboard from a container ship in the Pacific Ocean on 10 January 1992 and have subsequently been found on beaches around the world and used by oceanographers to trace ocean currents. * No thematic scale except by inference of start line

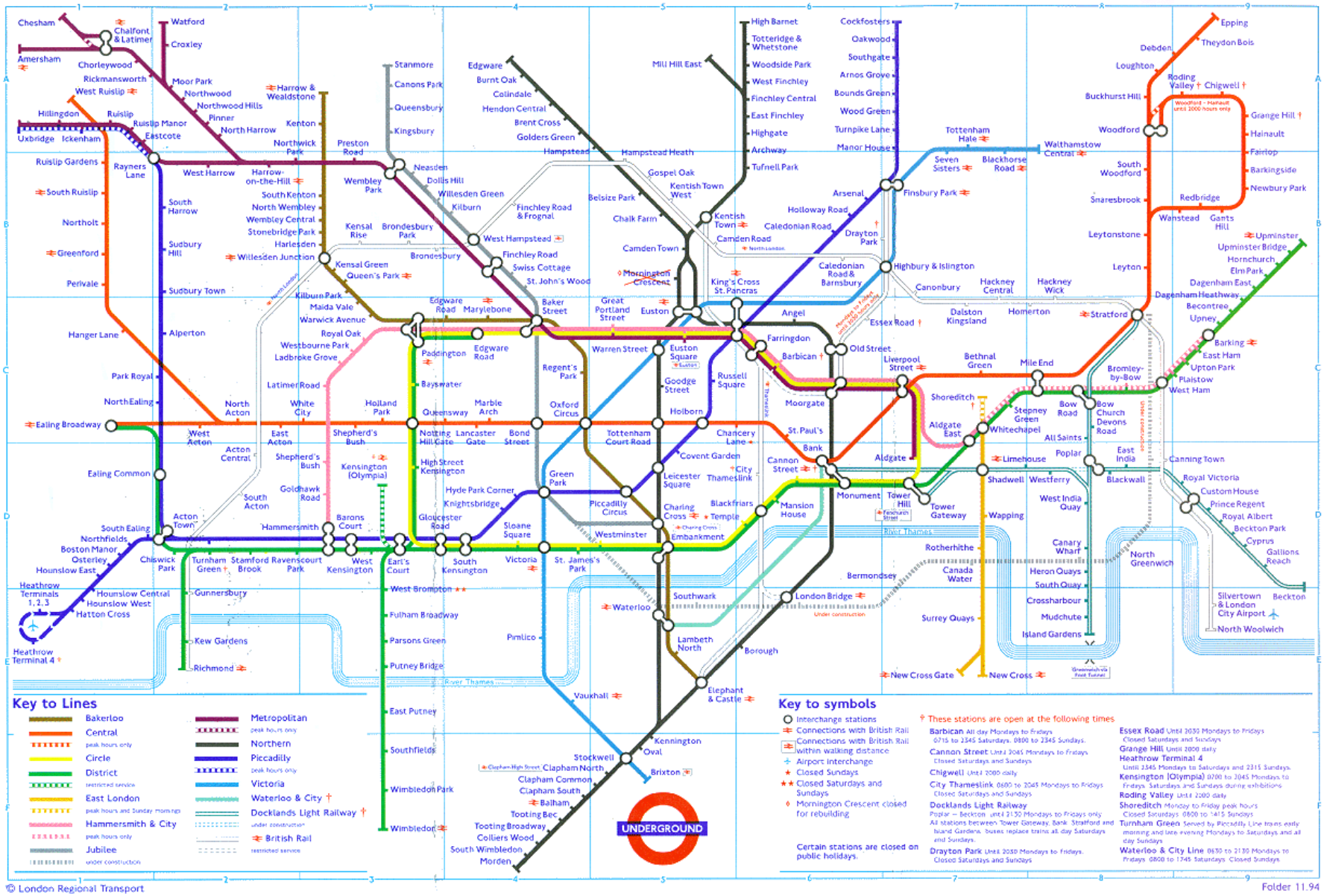
NB: 'take-home' moodle quiz next week after Monday:Thematic maps

2. **Topological** Cartograms

These are based on shape (geometry) and **connectivity** e.g. route networks; distance is relatively unimportant; the classic examples are city underground and train maps,



London: http://www.afn.org/~alplatt/tube.html



Ski map prototype example:

Ken Field (Esri)