Thematic mapping: 1. point symbols

'Qualitative point symbols' are similar to topographic (general) maps- Individual point locations are important

Quantitative thematic point maps
Design focus: overall distribution

Purden Lake
245

Nuclear Weapons "Accidents" and "Incidents"

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

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.
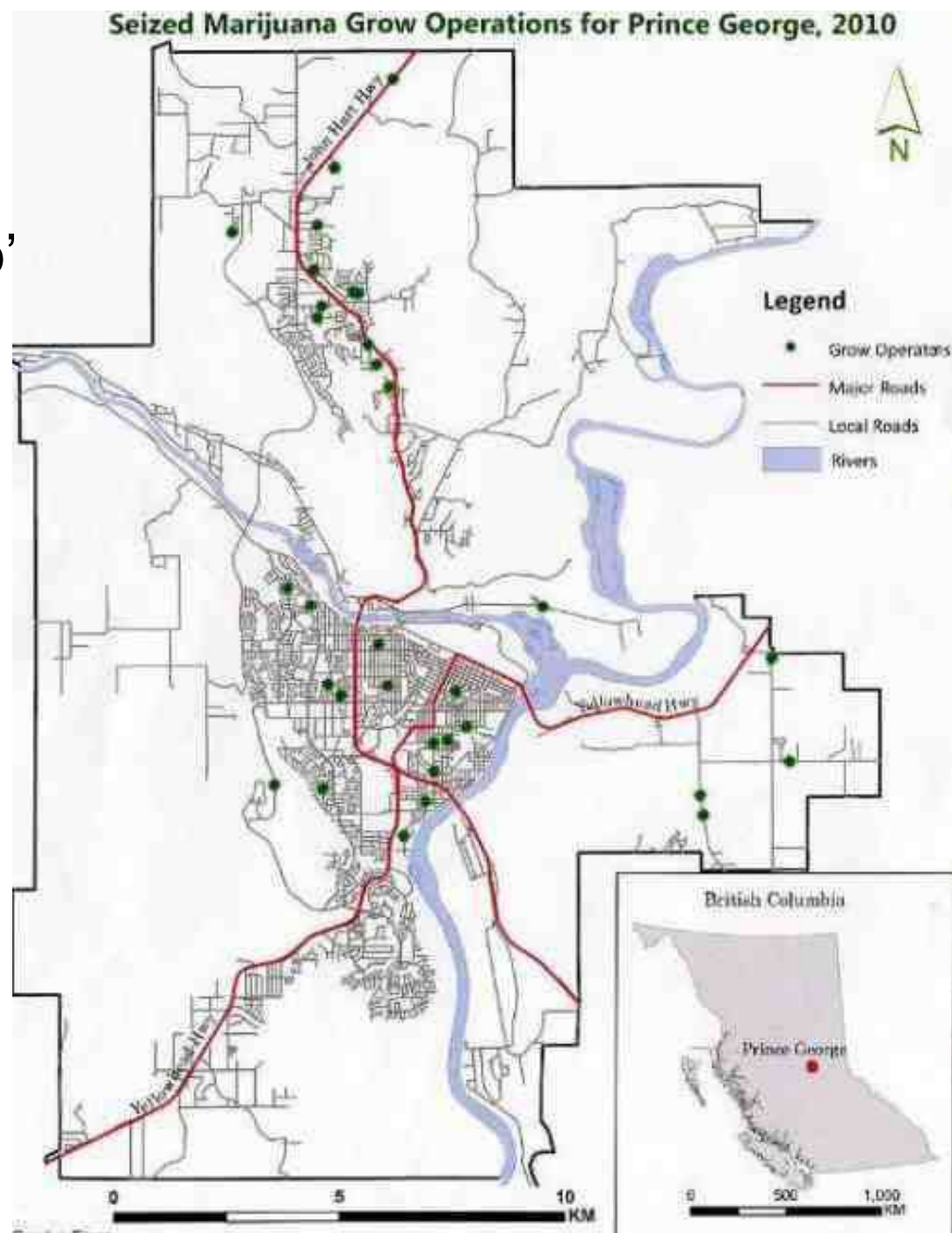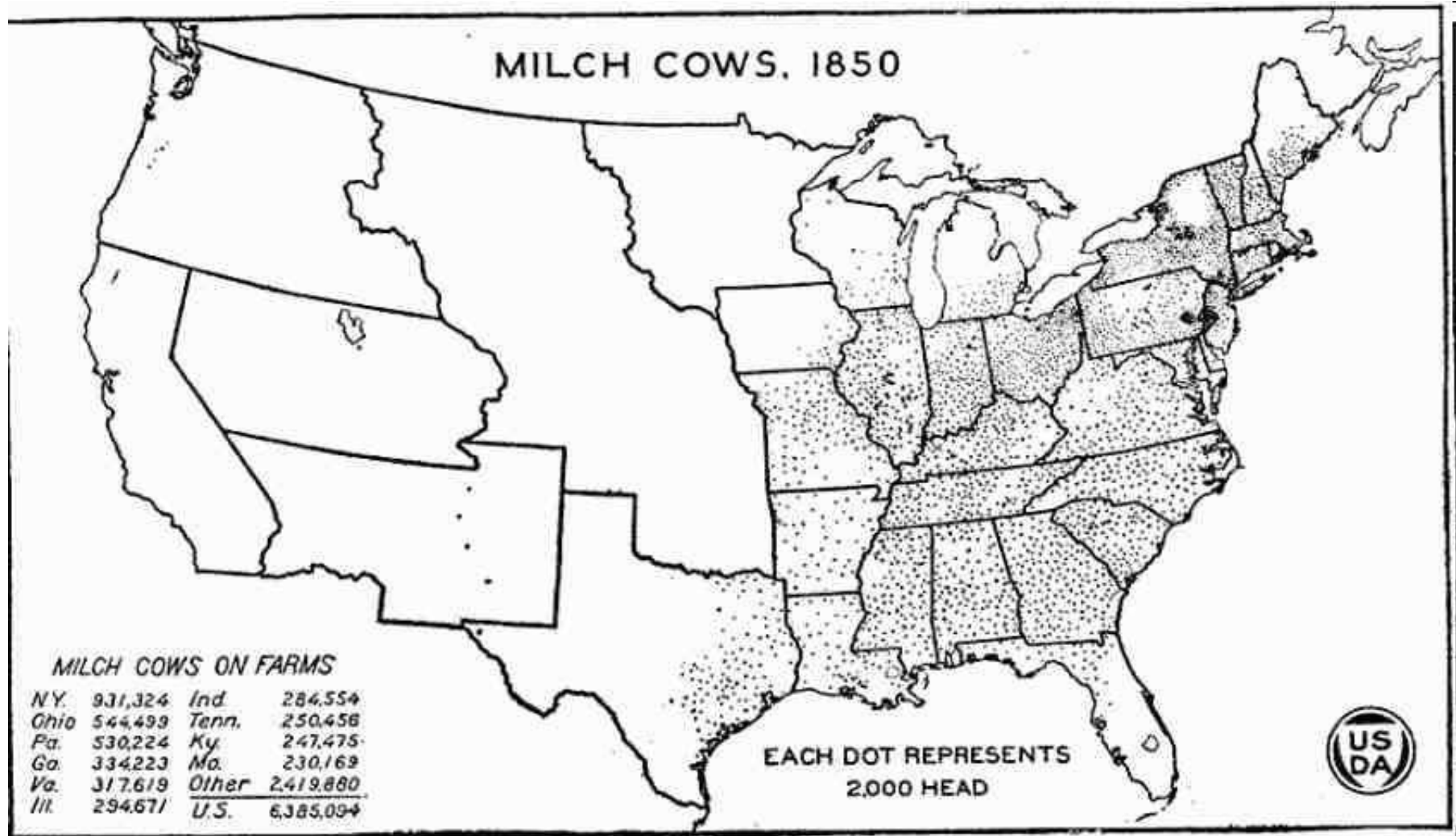

1 dot for each fatality
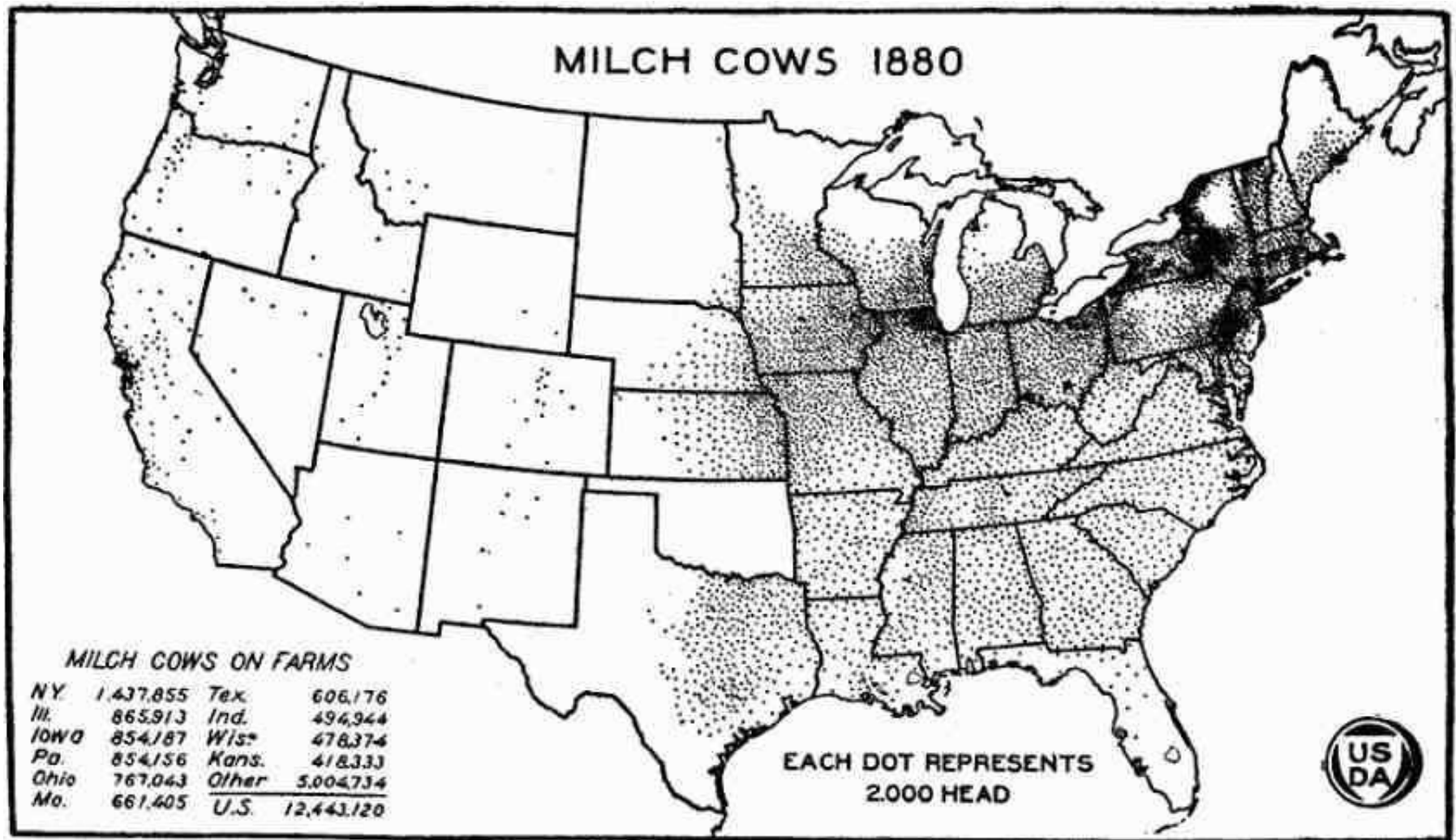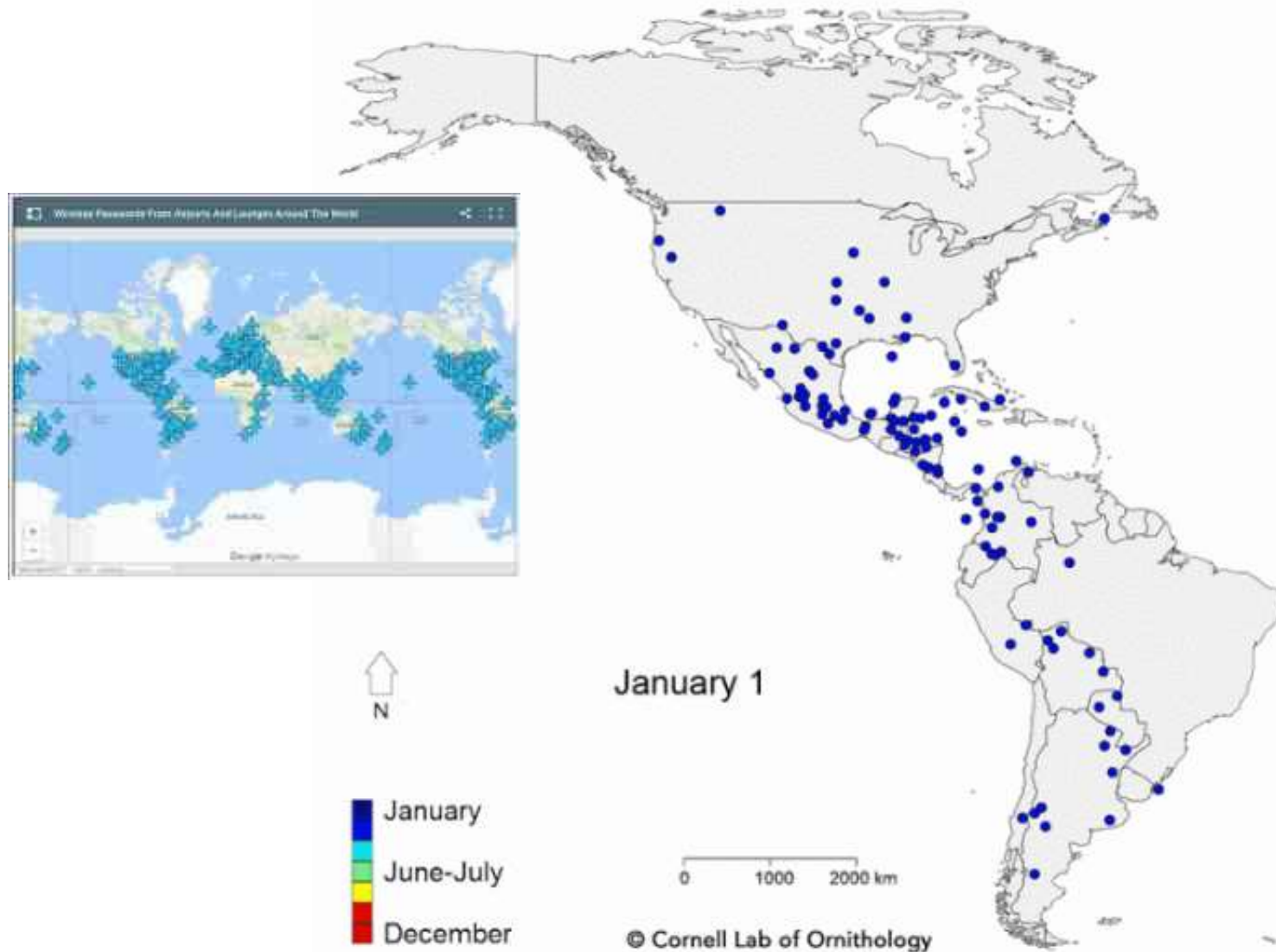
Example of a 'dot map'

1 dot for each event

Seized Marijuana Grow Operations for Prince George, 2010

Legend

- Grow Operators
- Major Roads
- Local Roads
- Rivers

British Columbia

Prince George

Using a dot scale (1 dot = 2000 cows)

Dot maps – easy to draw, simple to understand

MILCH COWS 1880

MILCH COWS ON FARMS

N.Y.	1,437,855	Tex.	606,176
Ill.	865,913	Ind.	494,944
Iowa	854,187	Wis.	478,374
Pa.	854,156	Kans.	418,333
Ohio	767,043	Other	5,004,734
Mo.	661,405	U.S.	12,443,120

EACH DOT REPRESENTS
2,000 HEAD

US
DA

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

January 1

January
June-July
December
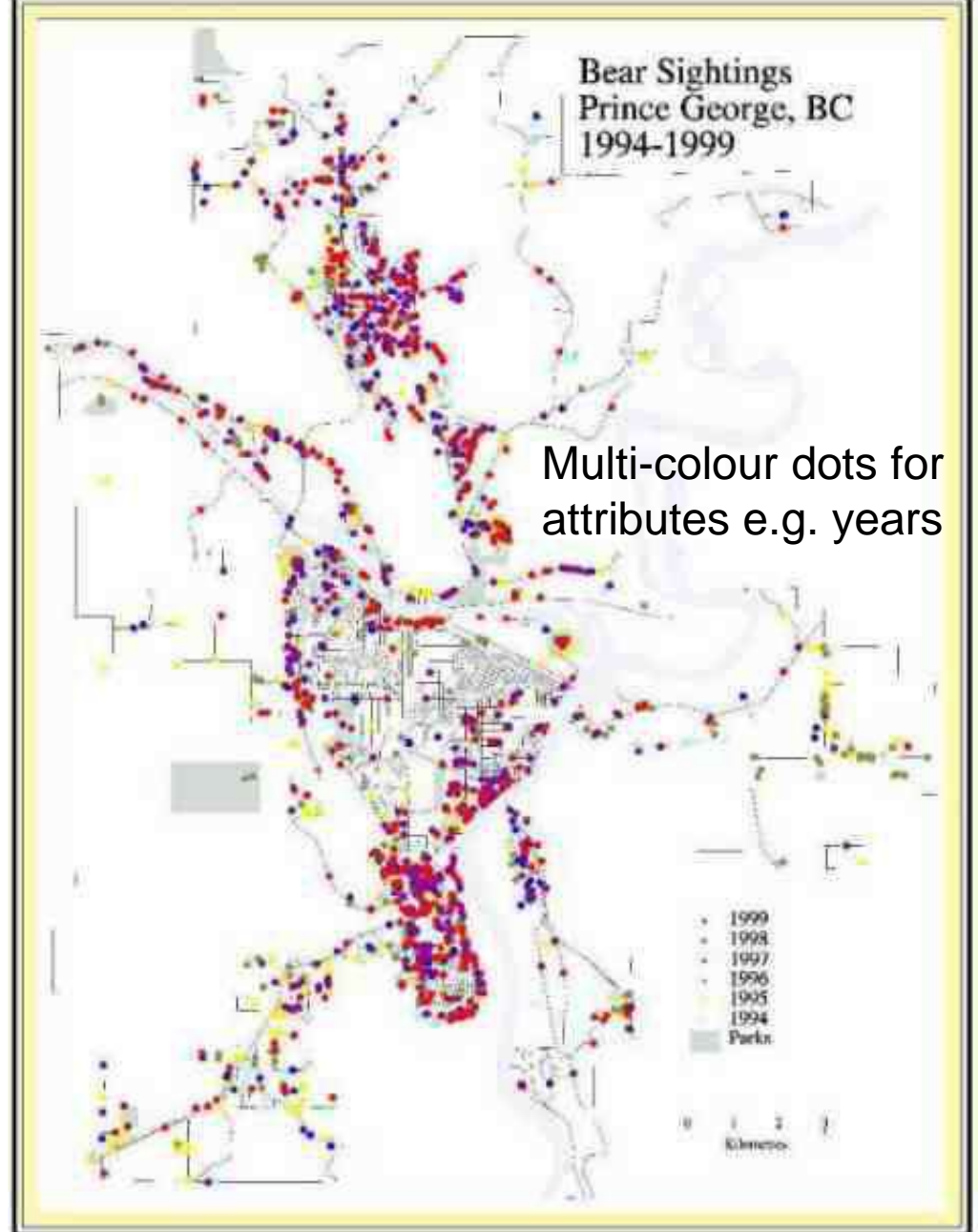
© Cornell Lab of Ornithology

https://www.allaboutbirds.org/mesmerizing-migration-watch-118-bird-species-migrate-across-a-map-of-the-western-hemisphere/

Black bear sightings, 2010

Yellow = sighting
Red = destroyed

Bear Sightings
Prince George, BC
1994-1999

Multi-colour dots for attributes e.g. years

1999
1998
1997
1996
1995
1994
Parks

Kilometres

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. as in a bar chart
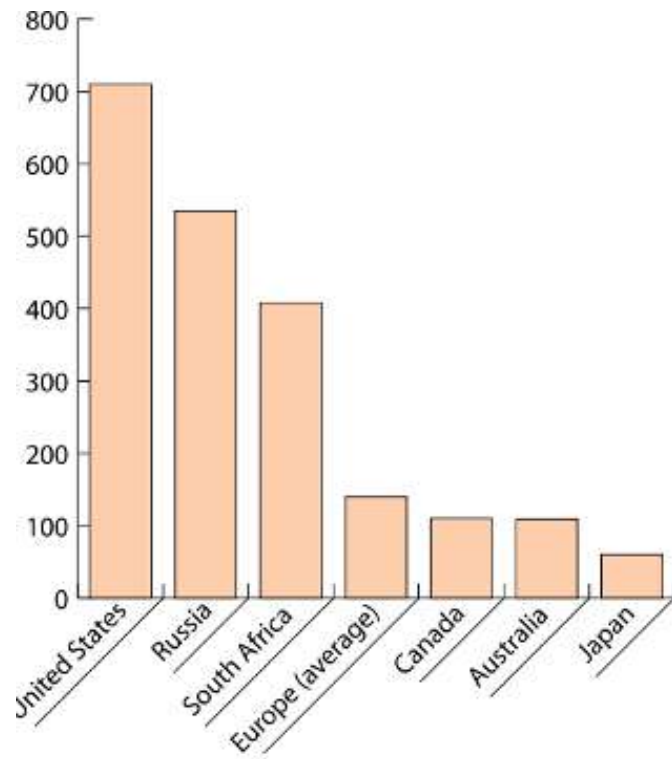
NHL PLAYERS BY PROVINCE

Where the Canadian-born players for the 2013-14 season hailed from, and their average number of career points. New Brunswick, it's time to get in the game.

Brad Richards,
Murray Harbour, P.E.I.

73 PLAYERS 153.9 Pts.

56 PLAYERS 94.7 Pts.

44 PLAYERS 135.5 Pts.

32 PLAYERS 111.3 Pts.

59 PLAYERS 169 Pts.

9 PLAYERS 191.75 Pts.

6 PLAYERS 195 Pts.

219 PLAYERS 119.9 Pts.

3 PLAYERS 4.7 Pts.

10 PLAYERS 132.4 Pts.

Cody Franson,
Sicamous, B.C.

Source: QuantHockey.com;
Maclean's 2014

MACLEAN'S

Height scale is designed to show the data range best

Smallest – visible;   largest – not too big

the base should be inside the area or centred at the base at the point
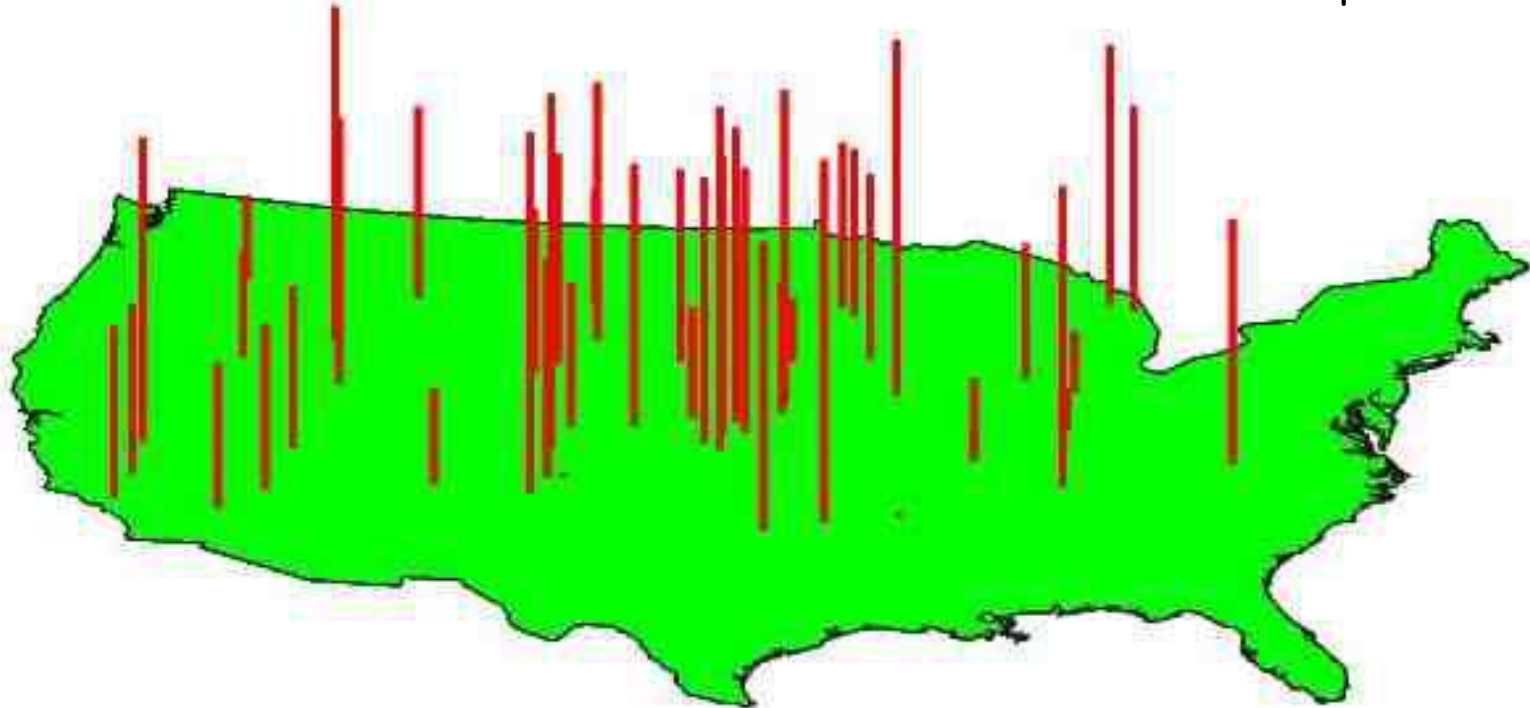
Bars break down with extreme data range: then we need to use a 2D symbol whose area is proportional to value, instead of height (only 1D). The most common is the <u>circle</u>….

# 3. Proportional (formerly 'Graduated') circles ....

Britain comes first for Movember donations

Funds raised by the Movember campaign in 2013 (in £ million)

£19.31m
Canada

£19.96m
United Kingdom

£3.74m
Mainland
Europe

£1.82m
Ireland

13.64m
United States

£0.72m
Asia

£0.22m
Rest of the
World

£0.49m
South Africa

£0.72m
New
Zealand

£14.52m
Australia

Converted from AUD to GBP
on October 30th, 2014

@StatistaCharts   Source: Movember Foundation

i100   The ♥ INDEPENDENT   statista

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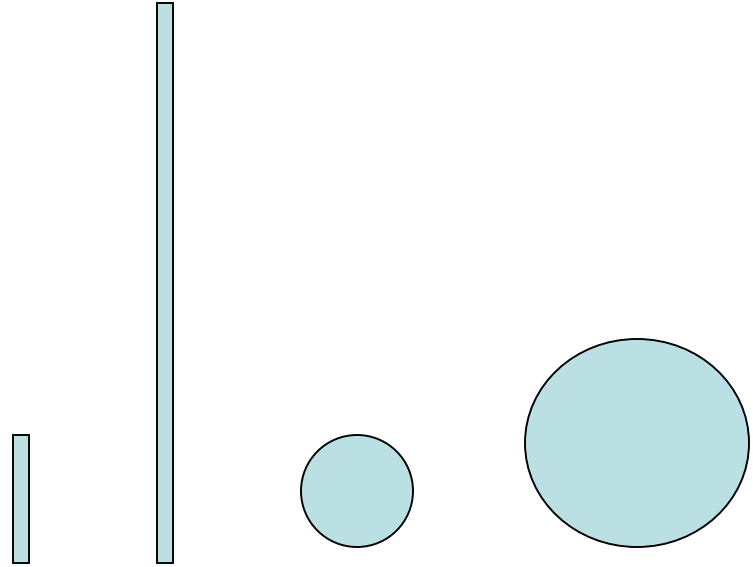
Bars are **proportional in height to the value**

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,

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

Areas of the circles are proportional to the population represented.

1 000 000
750 000
500 000
300 000
200 000
100 000
50 000
30 000
15 000
5 000
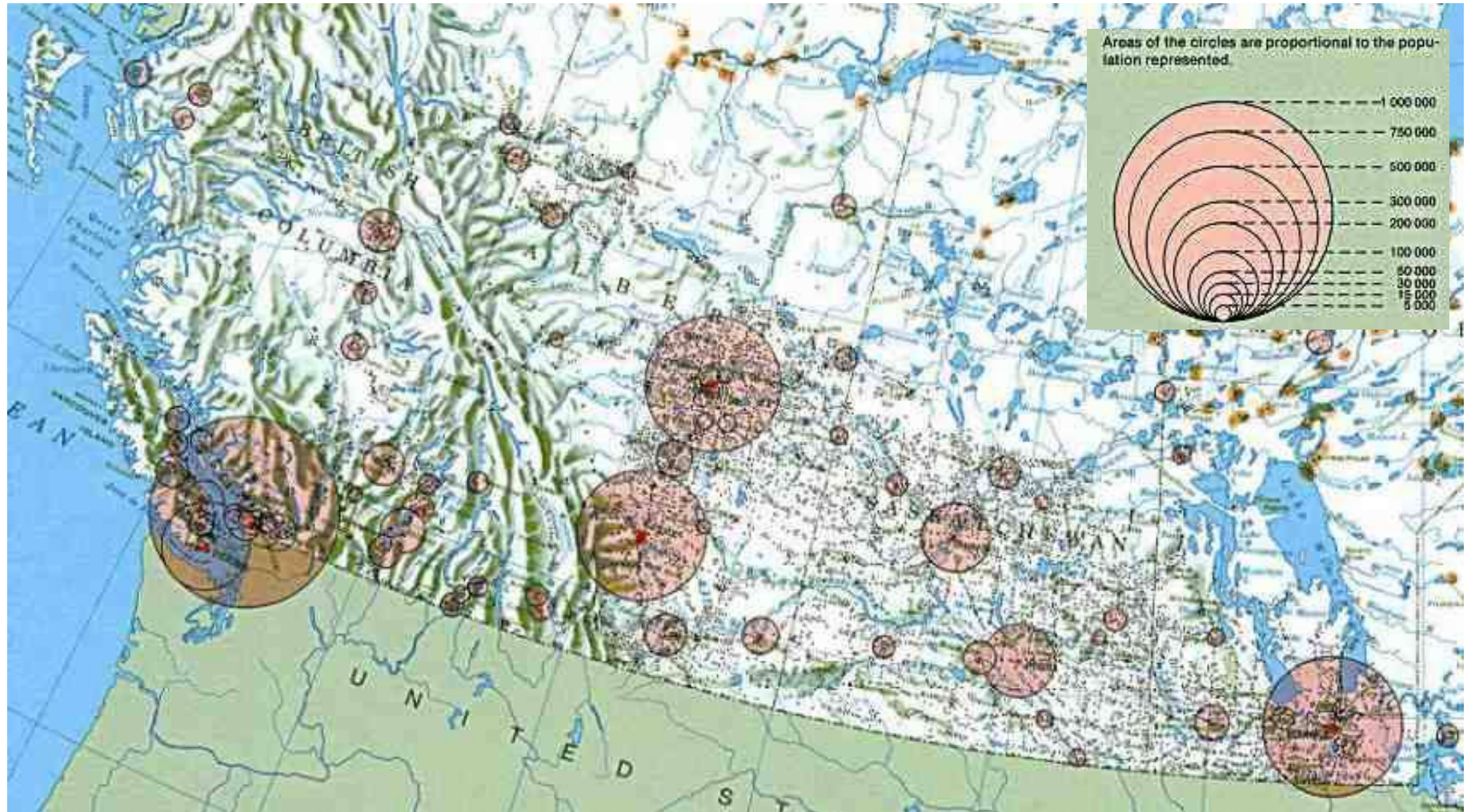
Syrians in neighbouring countries and Europe

Top 15 European countries for Syrian asylum applications*

Syrian refugees registered in neighbouring countries

NORWAY

SWEDEN 93,268

UK 7,735

DENMARK

NETHERLANDS

GERMANY 153,655

BELGIUM

AUSTRIA

FRANCE

HUNGARY

SWITZERLAND

SERBIA

BULGARIA

SPAIN

GREECE

TURKEY 2,181,293

LEBANON 1,078,338

SYRIA

IRAQ

JORDAN 637,776

LIBYA

EGYPT

10,000   100,000   500,000

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

Source: UNHCR

BBC

Coronavirus websites

https://news.google.com/covid19/map

Distribution of UNBC Students
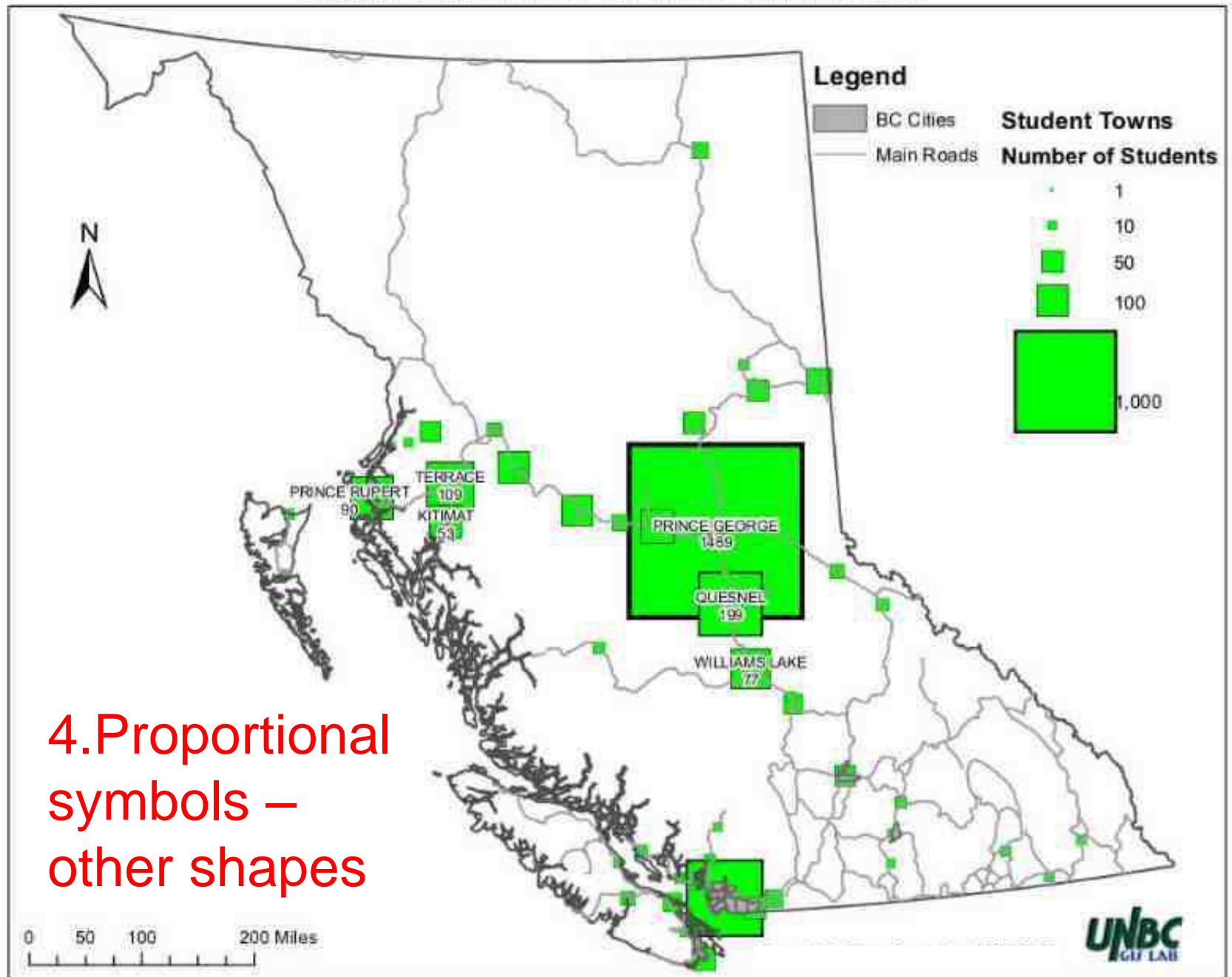
4.Proportional symbols – other shapes

USA election results 2016   (hexagons)

Size/number shows electoral votes per state   ● Clinton   ● Trump   ○ No projection yet
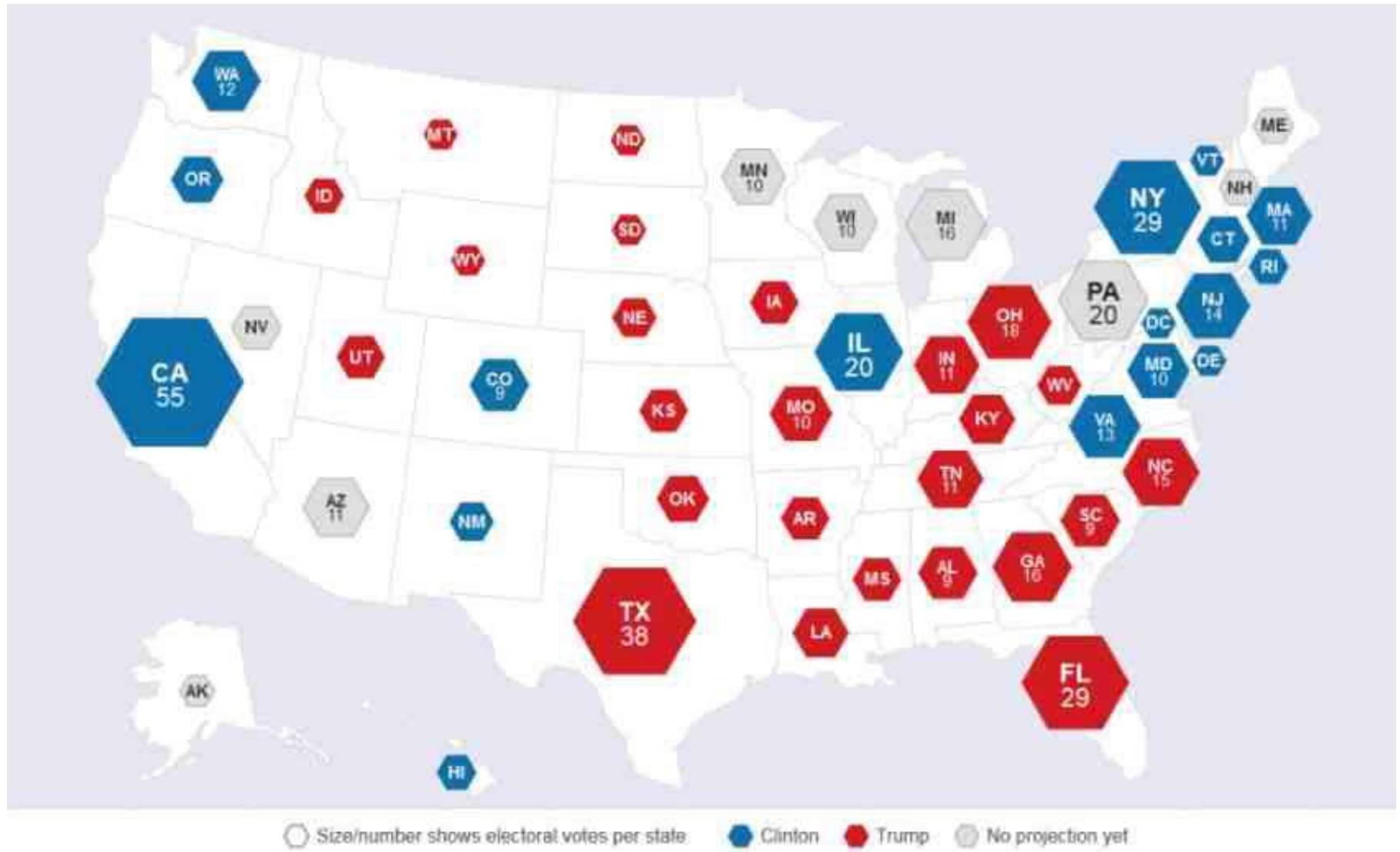
Facing the Presidential Election 2004

urban pop. (%)

- 13 - 35
- 36 - 48
- 49 - 55
- 56 - 66
- 67 - 100

electorate votes

3
15
55

popular vote for president George W. Bush (%)

9.3   50.0   71.1

data source: ESRI, New York Times
* resemblance with a Hollywood actor is pure conspiracy theory

[Infographic]   other graduated shapes are possible: Squares, Triangles …

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

Search and Rescue
in BC (2009)

Total Call Volume by Municipal Groups

Total Call-outs
- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 60
- 61 - 90

Call-out Volume Data retrieved from 2009 yearly incident reports
Provincial Emergeny Program. (2010). Weekly Incident Summaries - 2009[Data file]. Retrieved from http://www.pep.bc.ca/incidents/index-2009.html
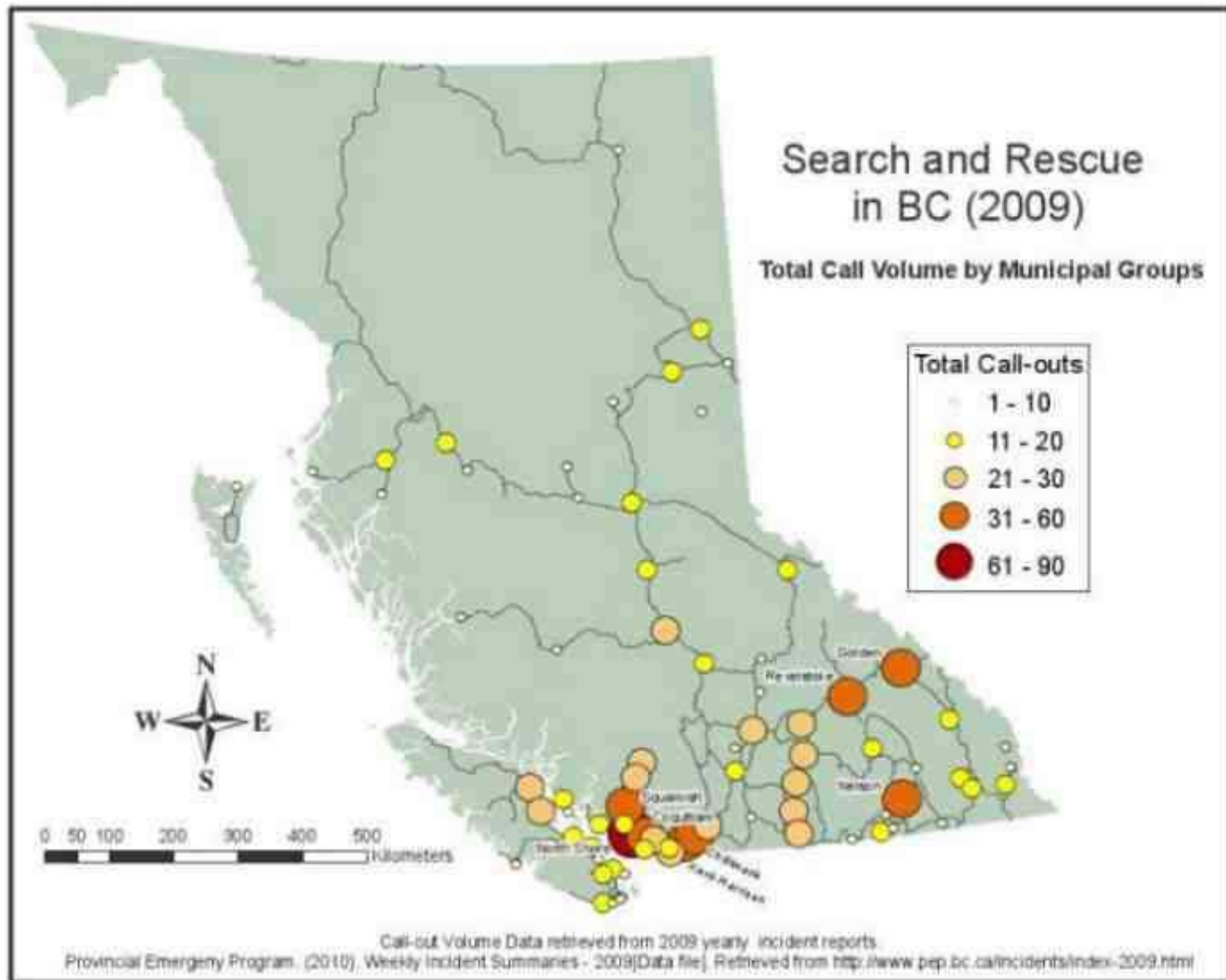
Where it is not feasible to keep all symbols individually proportional to their values, they can be grouped into classes and shown by a symbol size ~proportional to the class range central value. The design of these classes should be based on grouping similar values.

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.
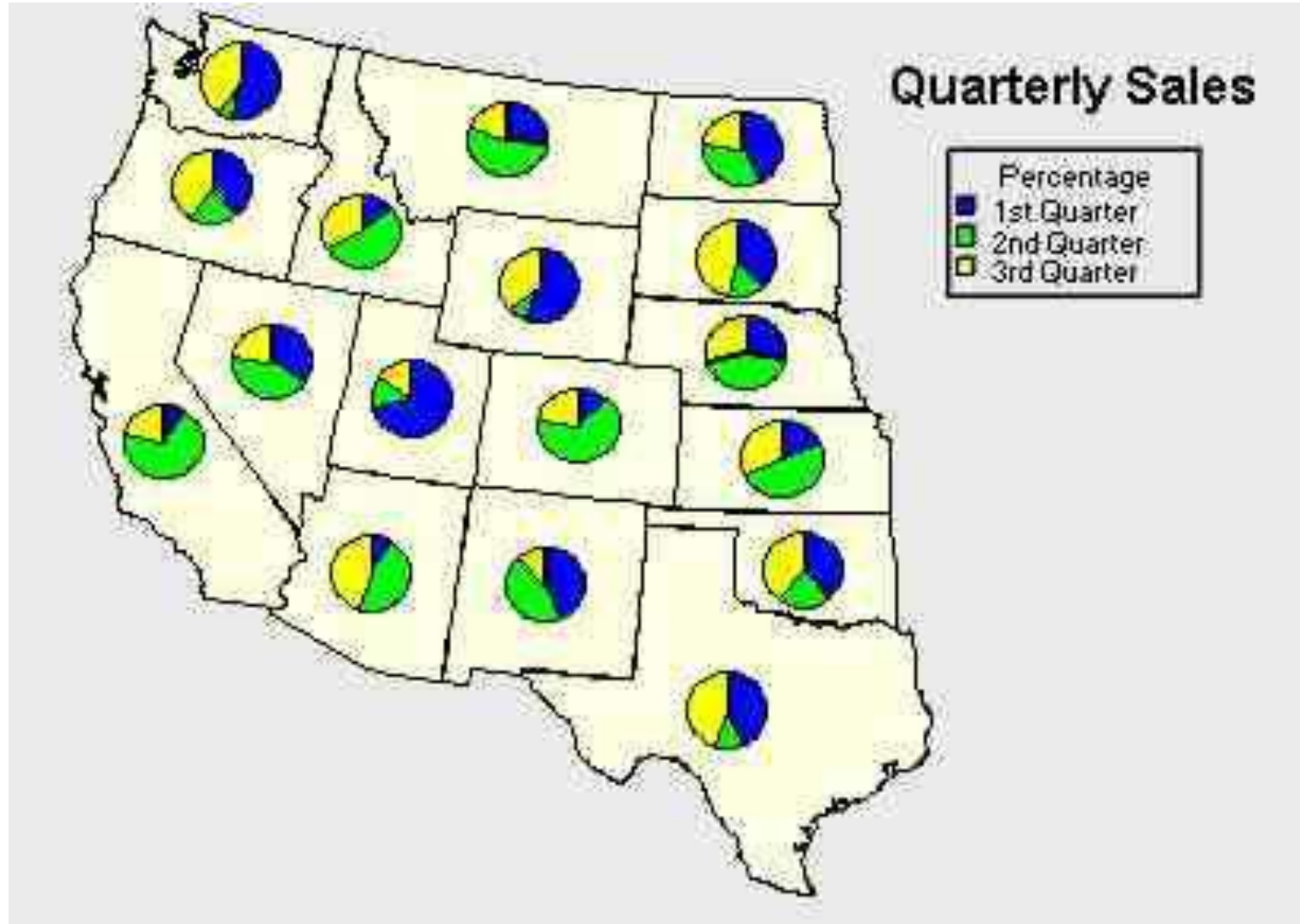
Segmented symbols / Pie chart humour

Segmented proportional symbols – decagons (loonies?)

DISTRIBUTION OF LIVESTOCK

SOUTHERN ONTARIO, 1977
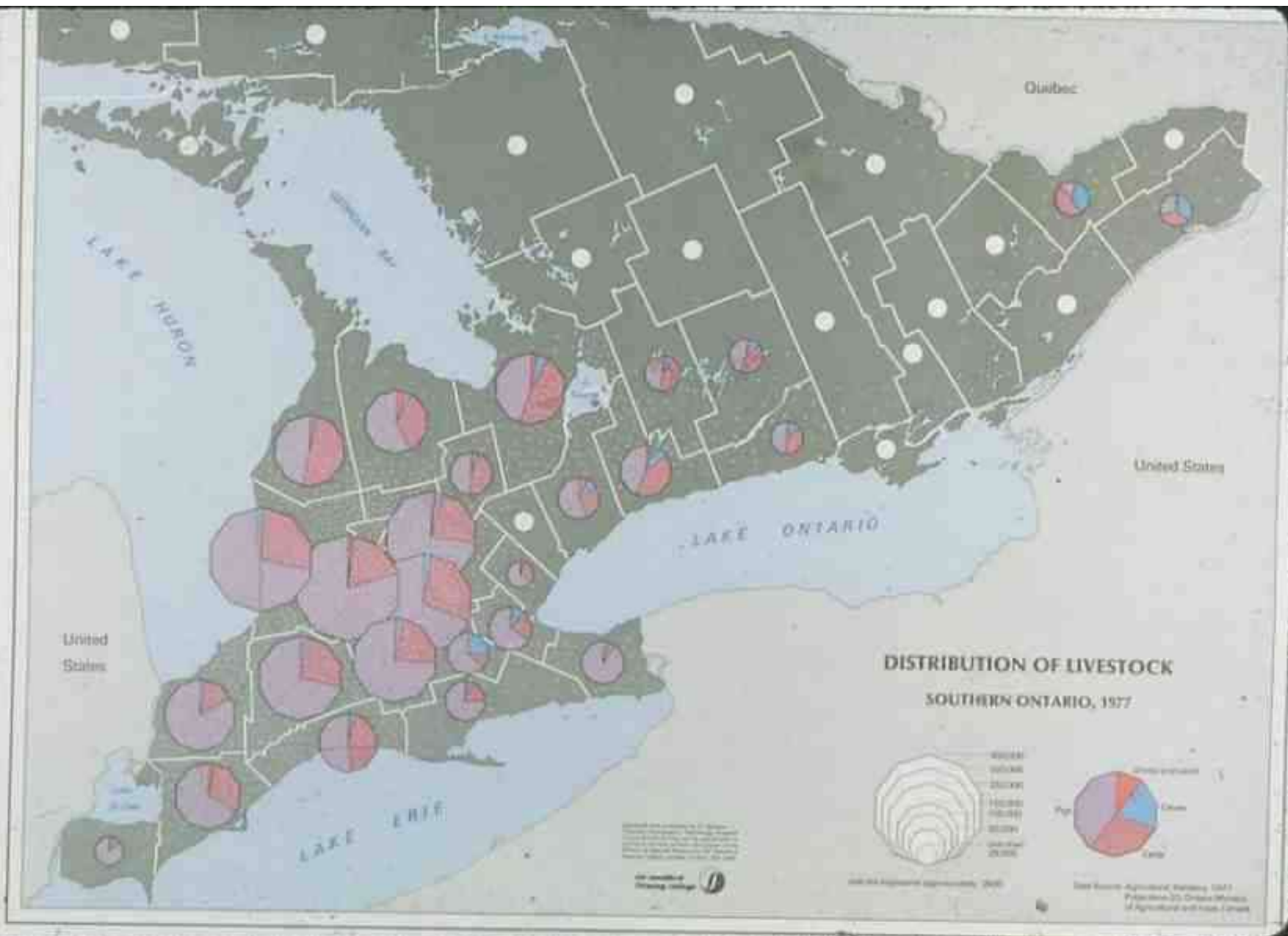
Alternative segmented circles

'polar diagrams'

'pie sections' are kept 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').
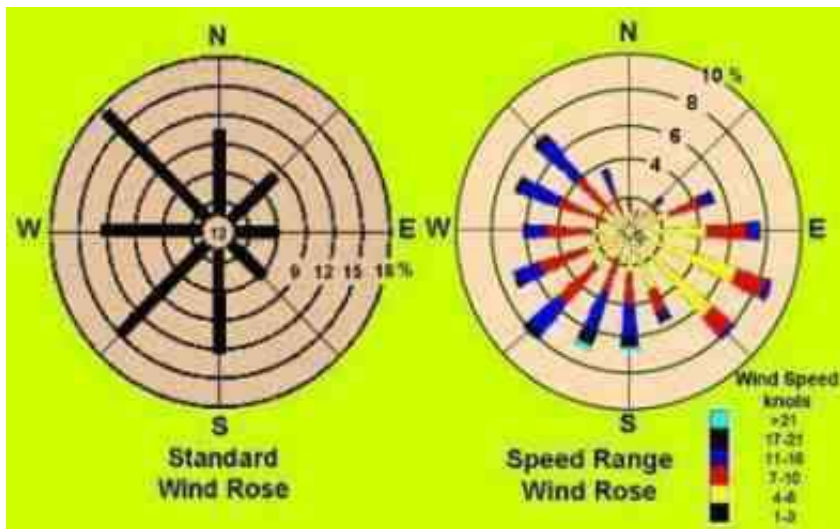
Saskatchewan: monthly streamflow

Polar diagrams

Florence Nightingale

7. Volumetric graduated symbols:

They are visually 3D, and apply a value proportional to perceived volume.

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.

POPULATION MAP
of
OHIO
1920
GUY-HAROLD SMITH

LEGEND
CITIES AND VILLAGES

200 - 1,000
1,000 - 2,500
5,000
10,000
25,000
50,000
100,000

500,000
1,000,000

Each dot (·) represents twenty-five
rural inhabitants localized by civil townships.
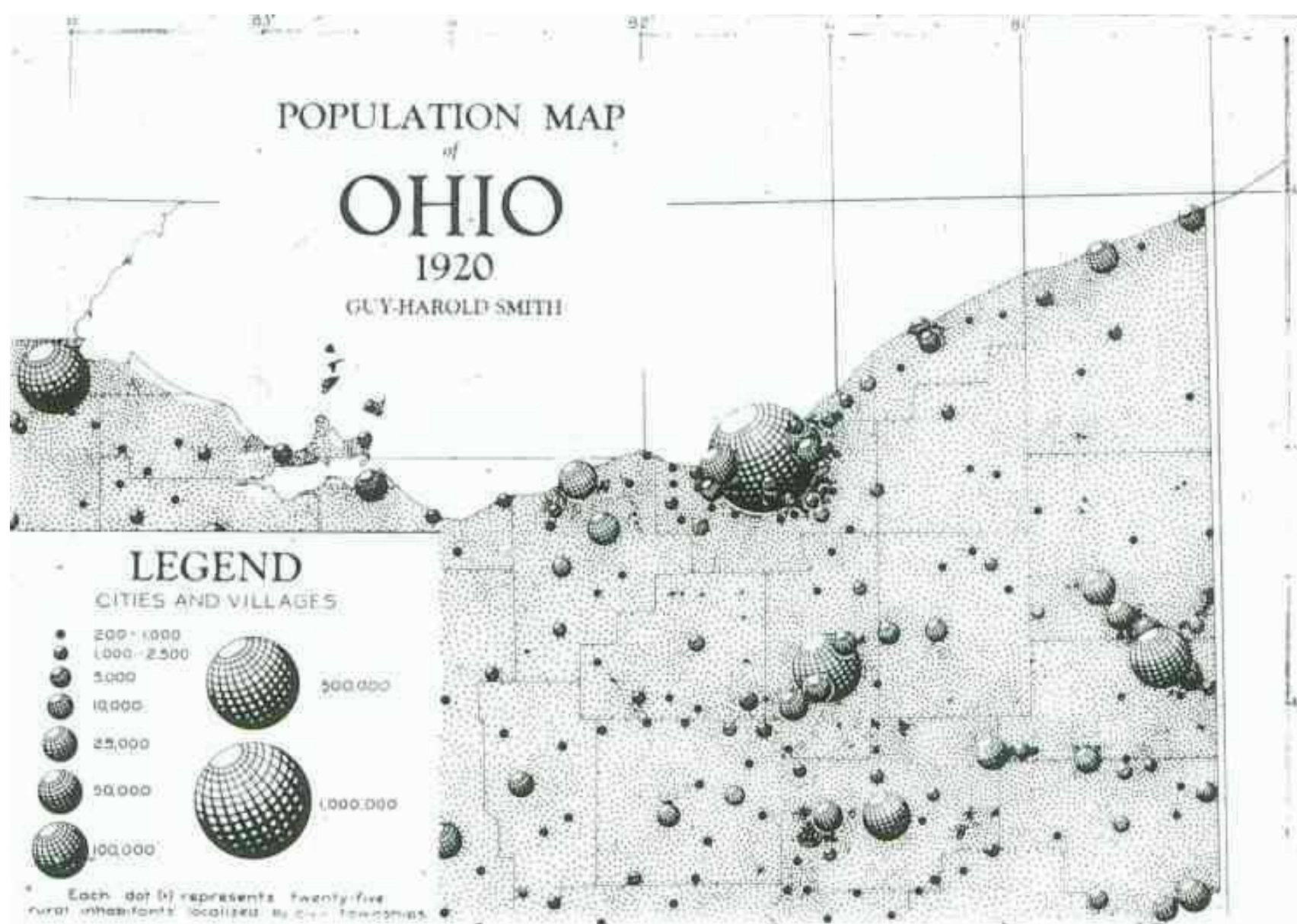
Figure 6.13   A portion of a population map of Ohio (1920) drawn by Guy-Harold
Smith. Compare with Fig. 6.8. (Courtesy of the author and *The Geographical
Review*, published by the American Geographical Society of New York.)

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

Not easily segmented

English Wine Cask Units

Butt	Puncheon	Hogshead	Tierce	Barrel	Rundlet	Kilderkin	Firkin	Pin
126 Gallons	84 Gallons	63 Gallons	42 Gallons	32 Gallons	18 Gallons	16 Gallons	8 Gallons	4 Gallons
477 Litres	318 Litres	238 Litres	159 Litres	118 Litres	68 Litres	59 Litres	30 Litres	15 Litres
1/2 Tun	1/3 Tun	1/4 Tun	1/6 Tun	1/8 Tun	1/14 Tun	1/16 Tun	1/32 Tun	1/64 Tun

Final Infographic:

euuw…

What is this …

A proportional segmented volumetric doodoo ?
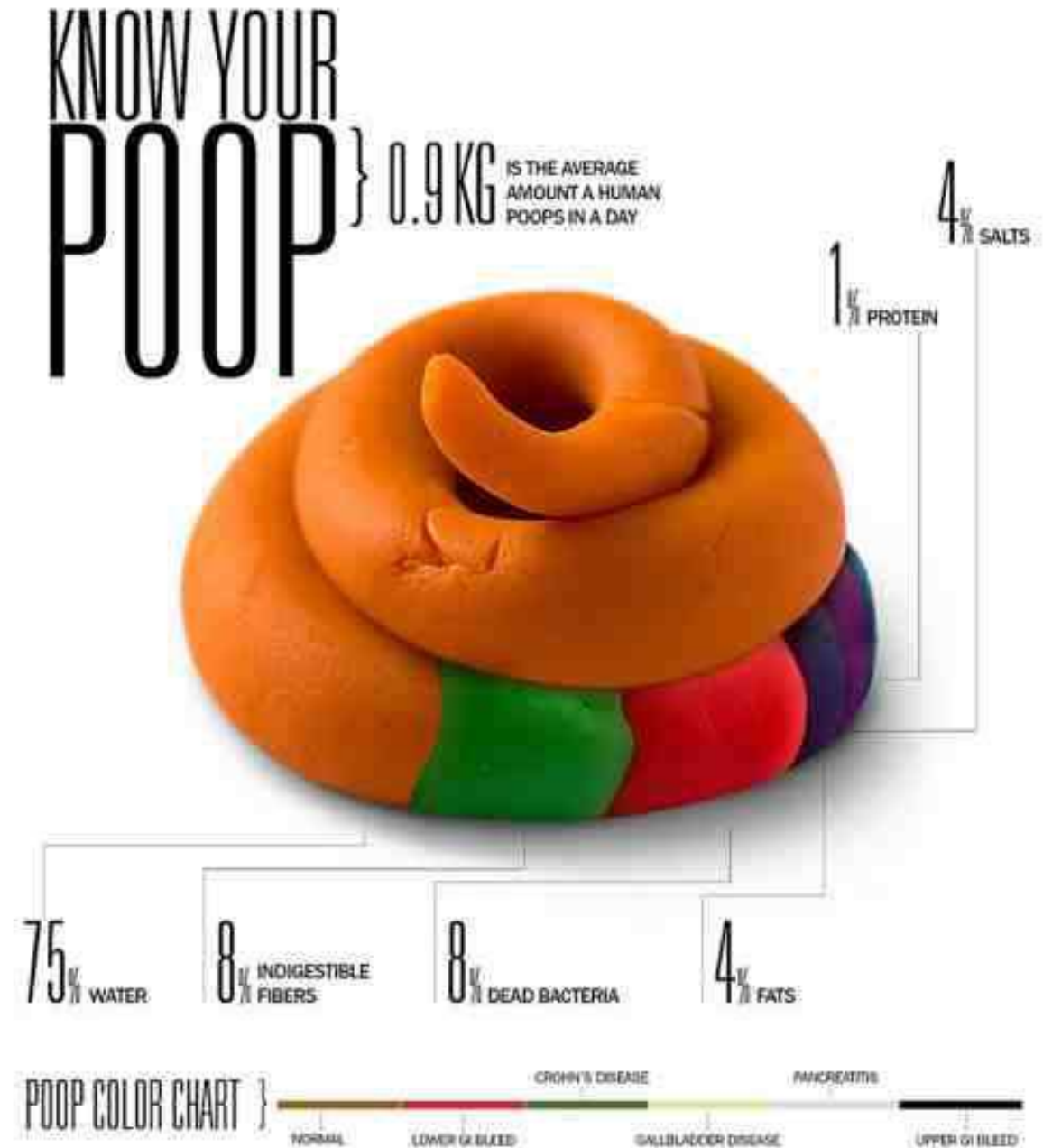
Summary – thematic point techniques

- Dot maps (and other same-size shapes)

Graduated symbols

Bar – linear (1D) proportional symbol

Circle – 2D proportional symbol (and other shapes)

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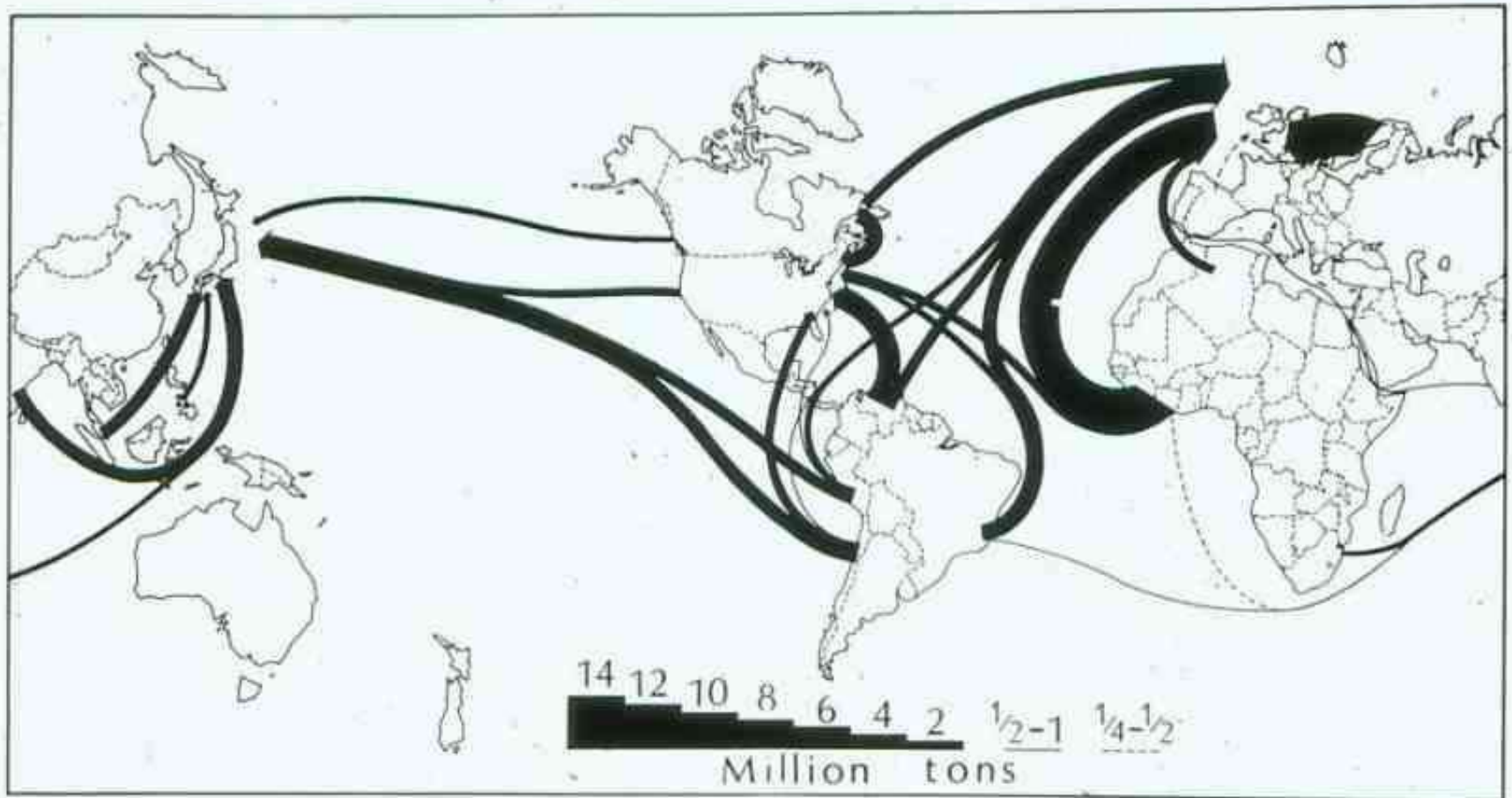
Figure 6.21   A portion of a flow-line map showing the movement of iron ore. Map by G. B. Lewis. (From G. Manners, "Transport Costs, Freight Rates, and the Changing Economic Geography of Iron Ore", *Geography*, 52 (1967), 260-279.)

River volume - Canada
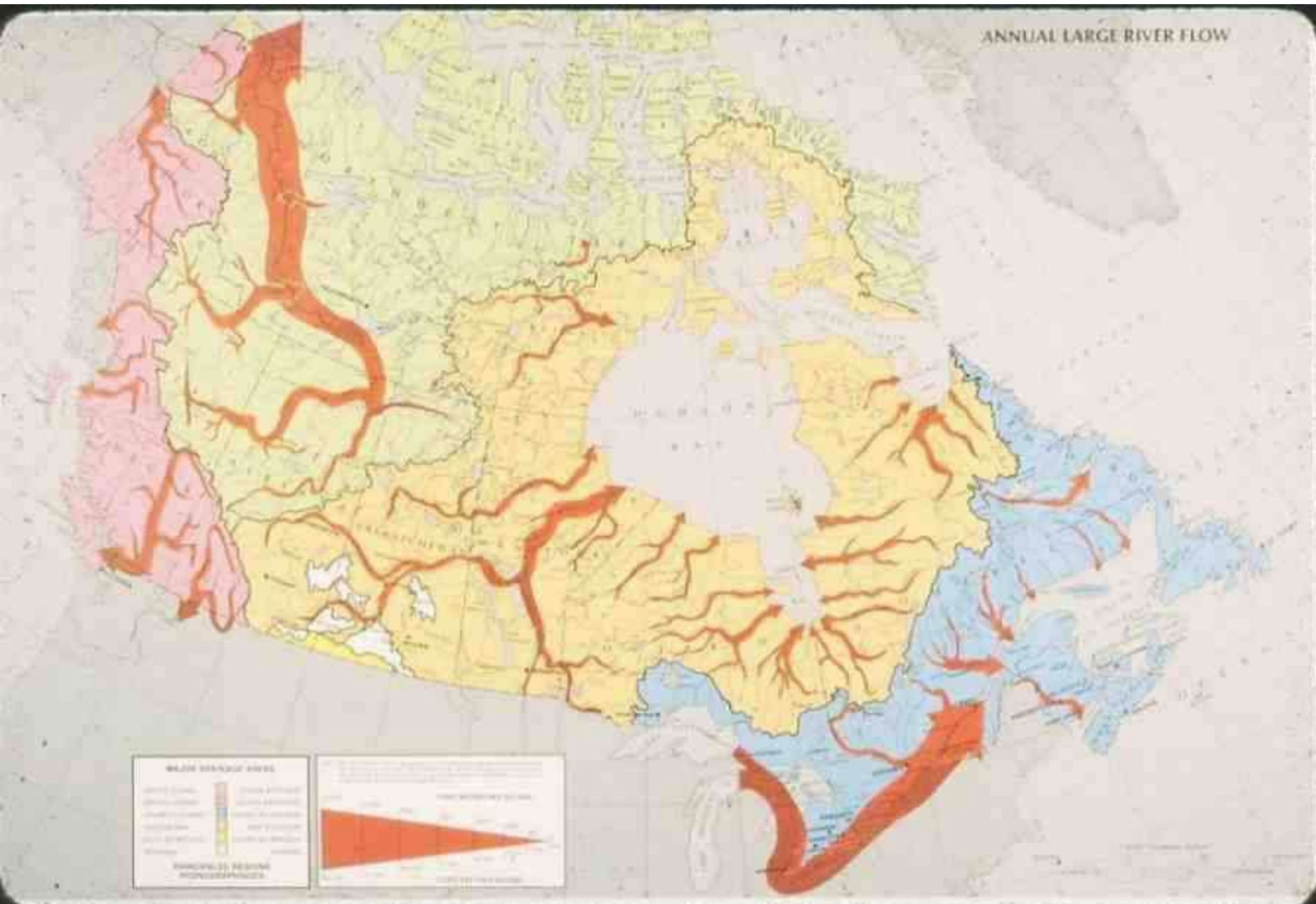
Thematic line techniques: graduated lines
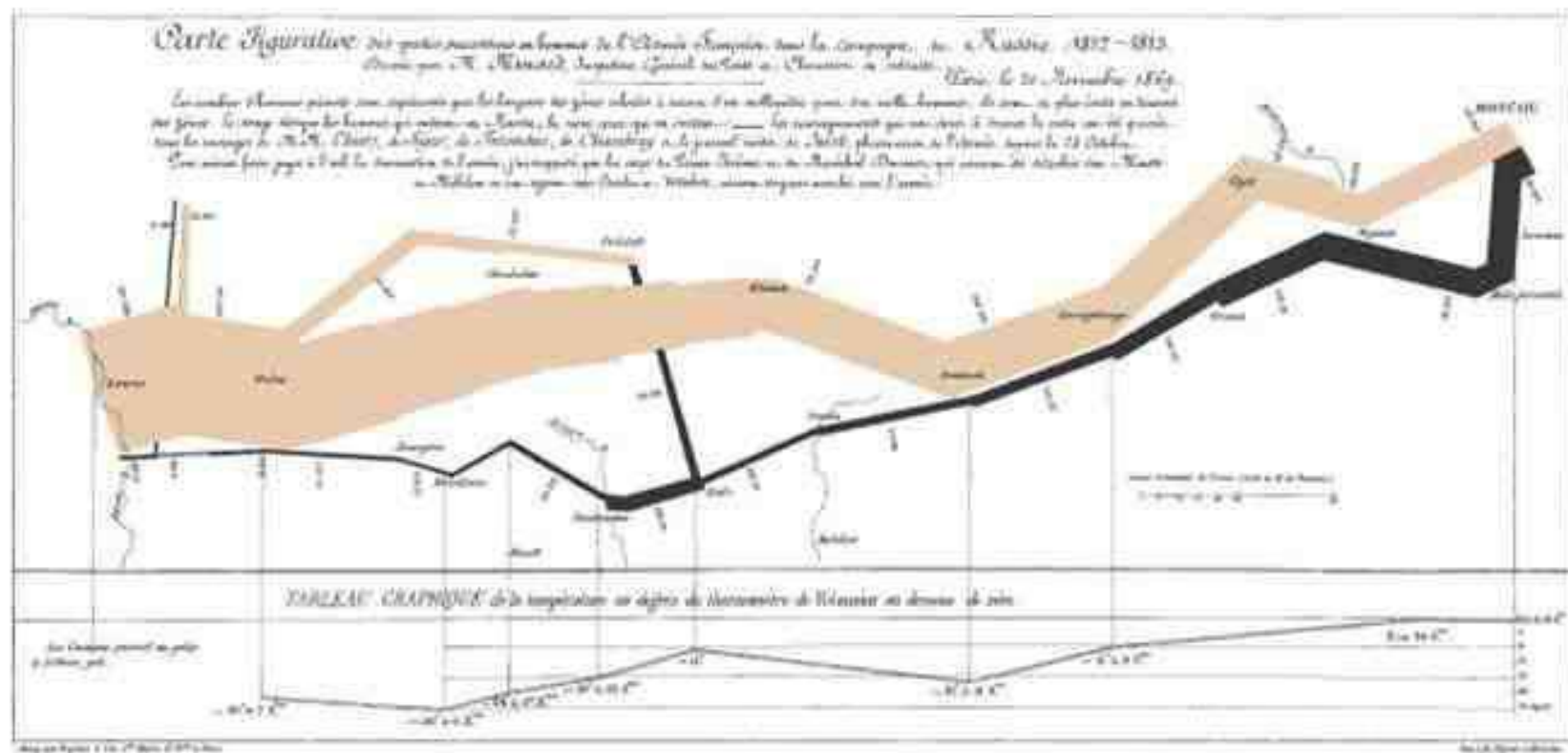
Napoleon's March to Moscow   The War of 1812