UNBC GEOGRAPHY, EARTH & ENVIRONMENTAL SCIENCES

MEET & GREET
WEDNESDAY, FEBRUARY 5TH @ 5:30PM
UNBC LIBRARY EVENT SPACE - ROOM 5-140E
MAIN FLOOR OF LIBRARY

*WDCAG 2025 CONFERENCE PLANNING
*MEET FACULTY & OTHER STUDENTS
*HEAR FROM GEES CLUB EXEC

JOIN US FOR PIZZA & CONVERSATION - EVERYONE WELCOME!

@unbcgeography_ensc

Places in the World whose Climates match with places in RUSSIA

RED ZONE:
CENTRAL-EAST ILLINOIS, USA
CENTRAL INDIANA, USA
CENTRAL & SOUTH OHIO, USA

LEGEND	
Good Match	The Average Monthly Temperatures & Koppen Classifications match best.
Special Mention	Koppen Classifications match very well, however the temperatures falling below -12.5°C (9.5°F) are ignored for the comparison.

Red zone labels:
Stewart, BC, Canada
Prince George, BC, Canada
Sudbury, ON, Canada
Ottawa, Canada
Minneapolis, MN, USA
Quebec City, QC, Canada
Flin Flon, MB, Canada
Dauphin, MB, Canada
Prince Albert, SK, Canada
Fort McMurray, SK, Canada
Regina, SK, Canada
Saskatoon, SK, Canada
Winnipeg, MB, Canada
Dryden, ON, Canada
Gaspe, QC, Canada
Duluth, MN, USA

Special mention labels:
Kuujjuaq, QC, Canada
Resolute, NU, Canada
Whale Cove, NU, Canada
Hopedale, NL, Canada
Baker Lake, NU, Canada
Inuvik, NU, Canada
Churchill, MB, Canada
Dawson, YT, Canada
Whitehorse, YT, Canada
Norman Wells, NT, Canada
Swan River, MB, Canada
Fort Nelson, BC, Canada

Russian cities:
St. Petersburg, MOSCOW, Penza, Voronezh, Volgograd, Krasnodar, Stavropol, Astrakhan, Naryanmar, Skytyvkar, Kazan, Nizhny Tagil, Ufa, Magnitogorsk, Kurgan, Omsk, Novosibirsk, Tyumen, Salekhard, Dudinka, Tura, Krasnoyarsk, Irkutsk, Chita, Zhigansk, Yakutsk, Mys Celyuskin, Anadyr, Palana, Yuzhno Sakhalinsk, Vladivostok

Thematic mapping: A. point symbols

https://pluginbc.ca/charging/finding-stations   Map viewers   http://bombsight.org
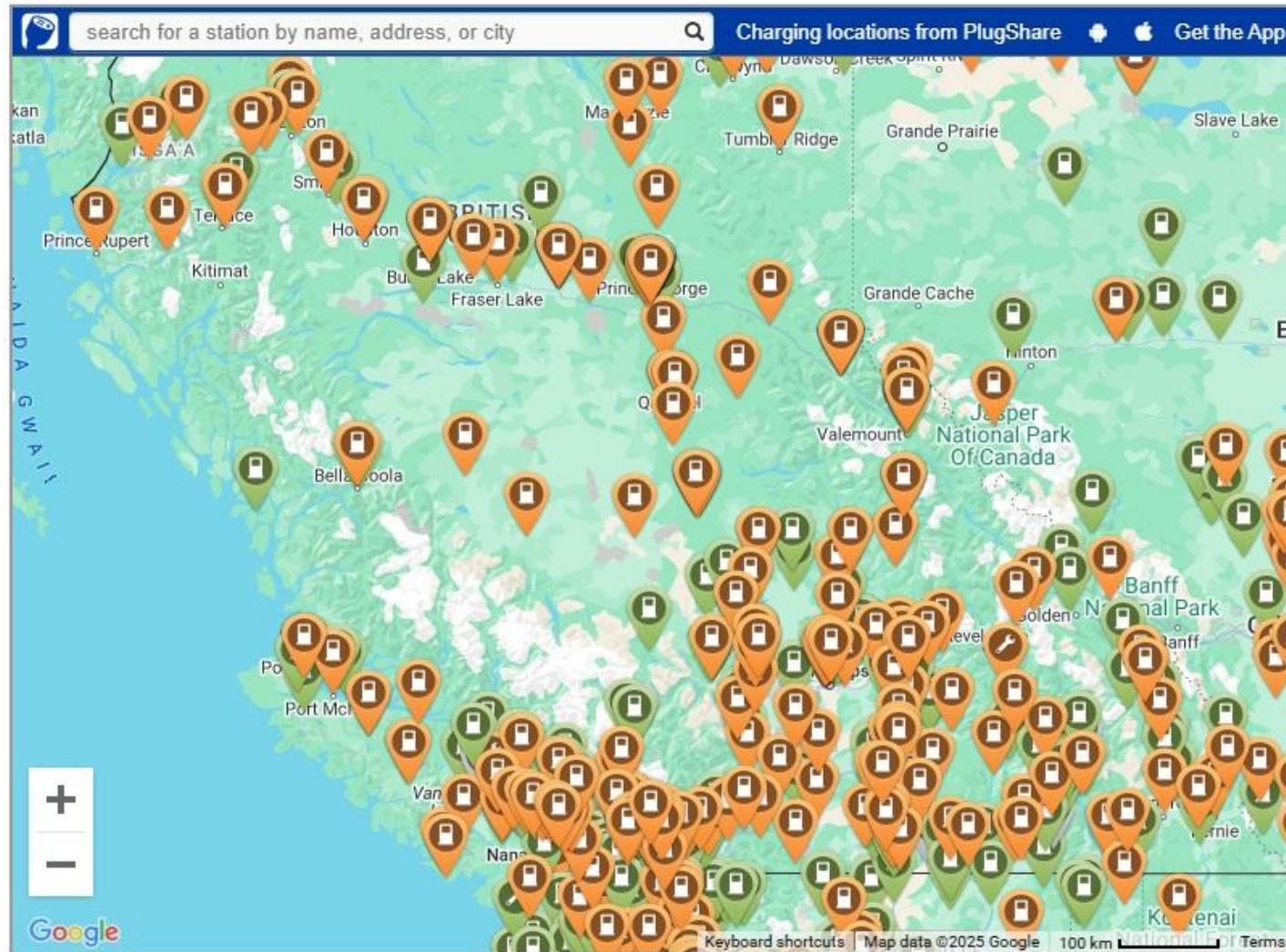
1. Dot maps

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
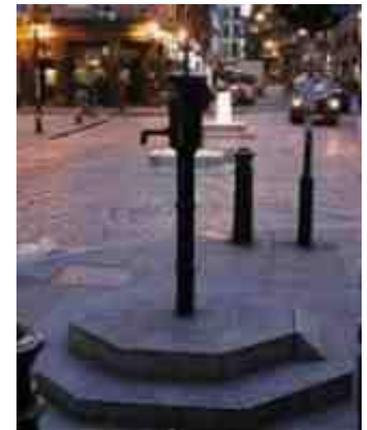
Black bear sightings, 2010

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

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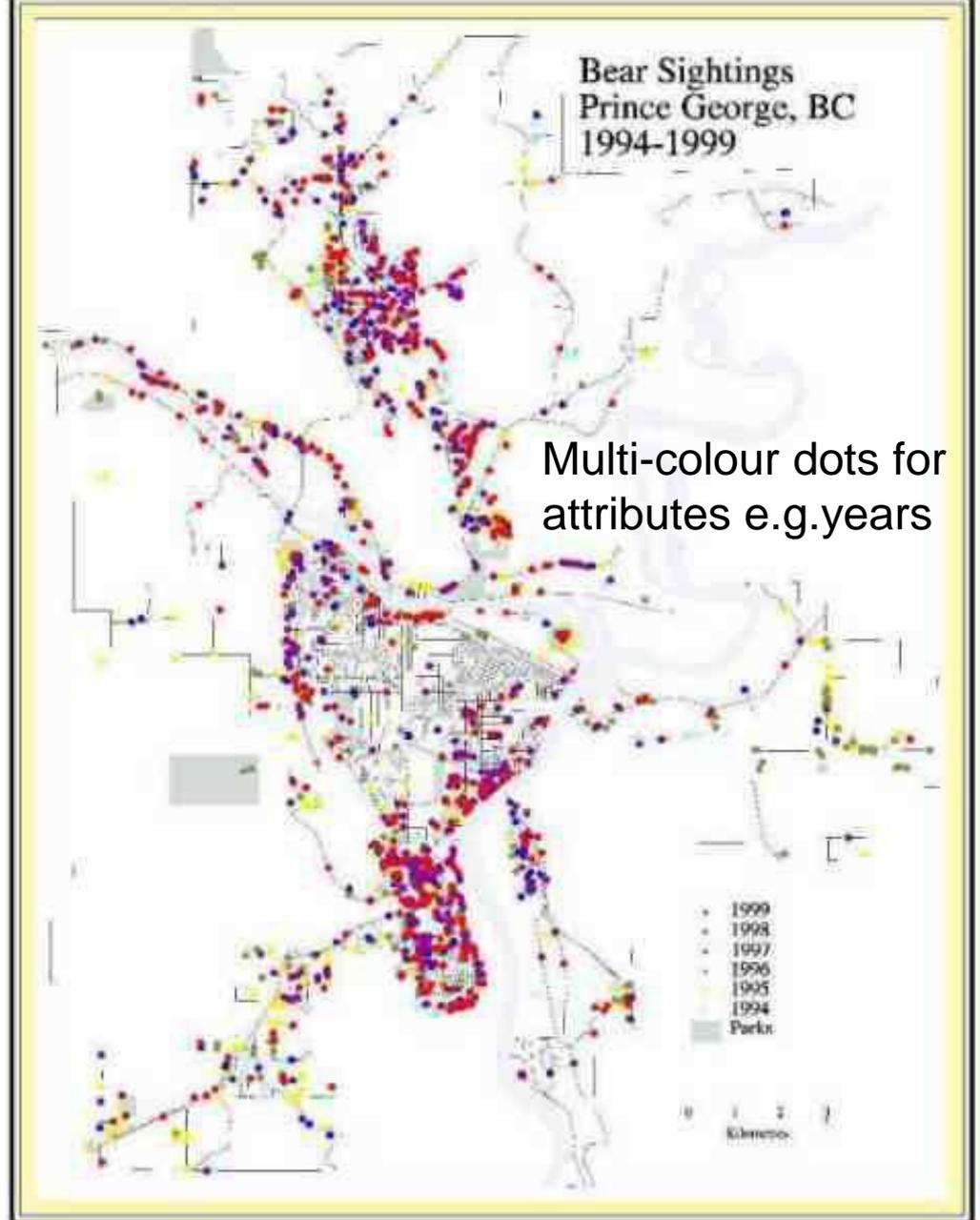
It breaks down when: exact locations are not feasible OR there are too many locations
Then instead we use a variable size symbol, where size = number of occurrences

Using a 'thematic' scale (1 dot = 2000 cows)

MILCH COWS, 1850

MILCH COWS ON FARMS

N.Y.	931,324	Ind.	284,554
Ohio	544,499	Tenn.	250,456
Pa.	530,224	Ky.	247,475
Ga.	334,223	Mo.	230,169
Va.	317,619	Other	2,419,880
Ill.	294,671	U.S.	6,385,094

EACH DOT REPRESENTS 2,000 HEAD

US DA
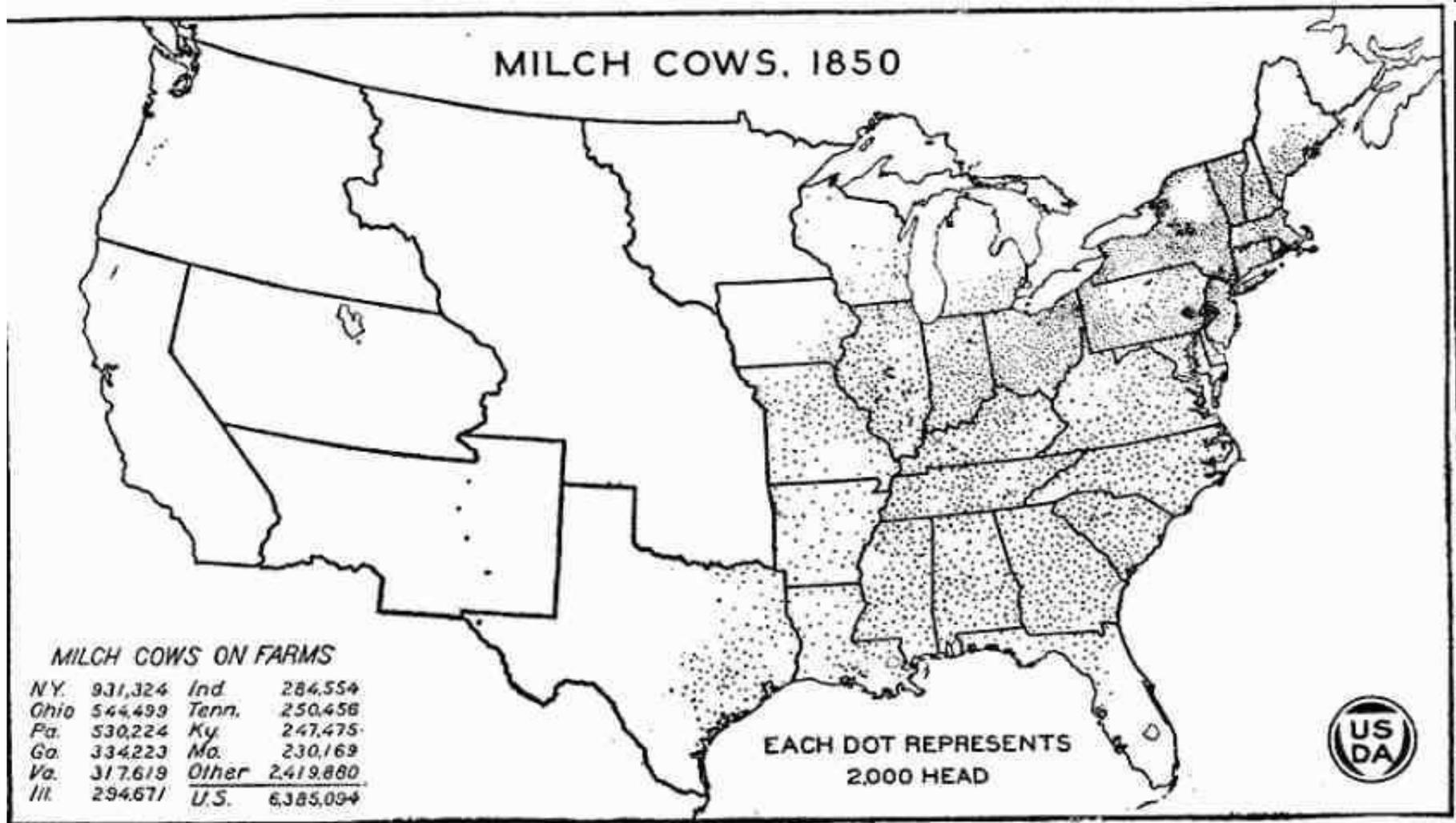
Dot maps – easy to draw, simple to understand

MILCH COWS 1880

MILCH COWS ON FARMS

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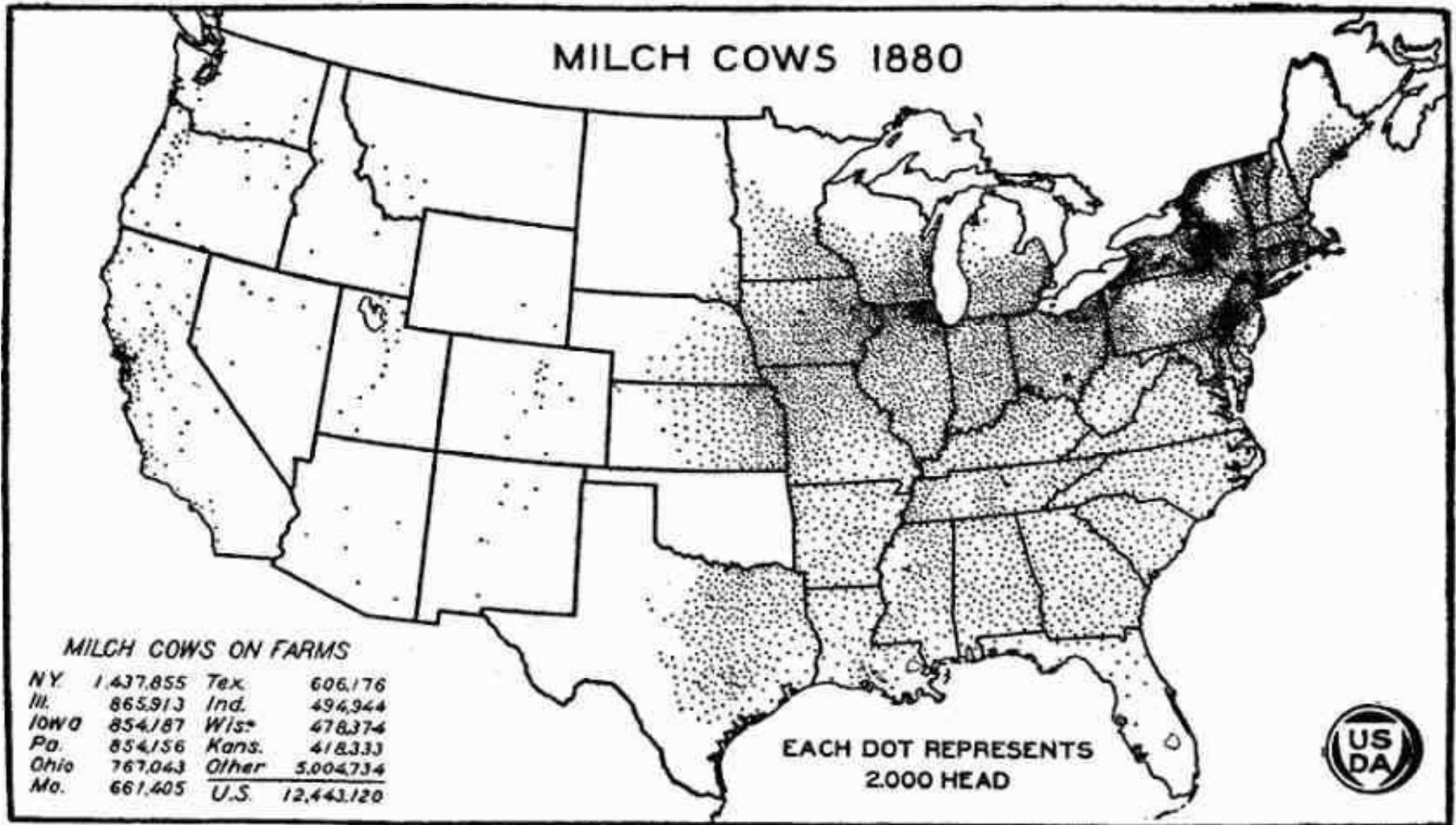
It gives a quick visual impression, but a poor estimate of actual numbers.

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
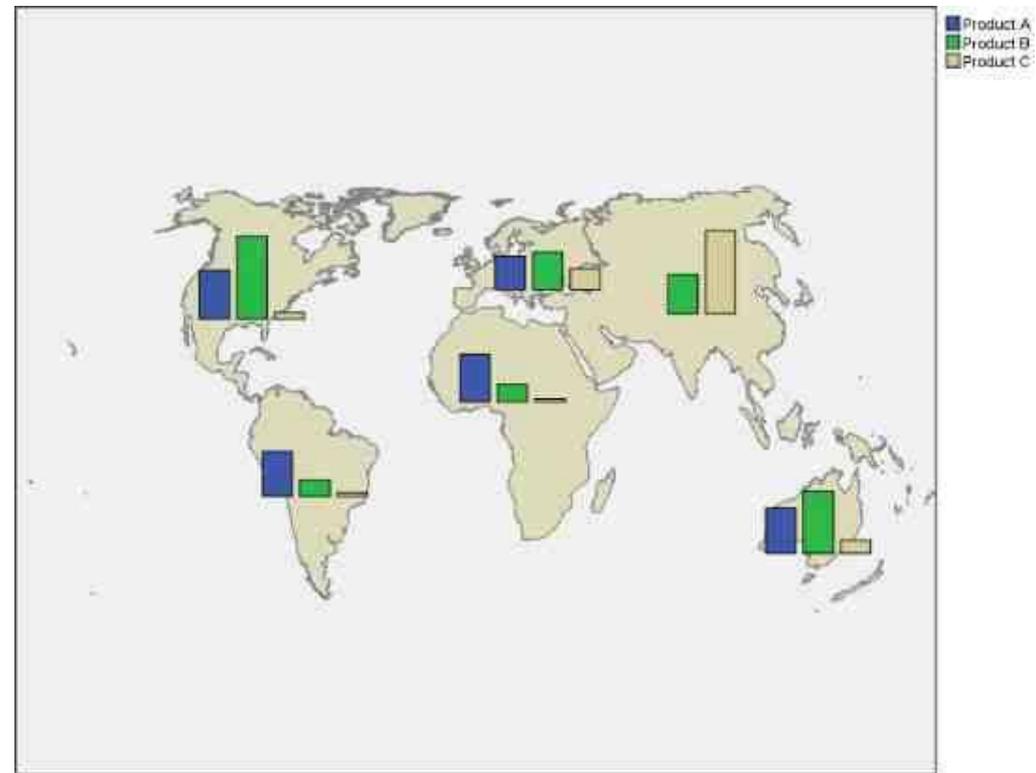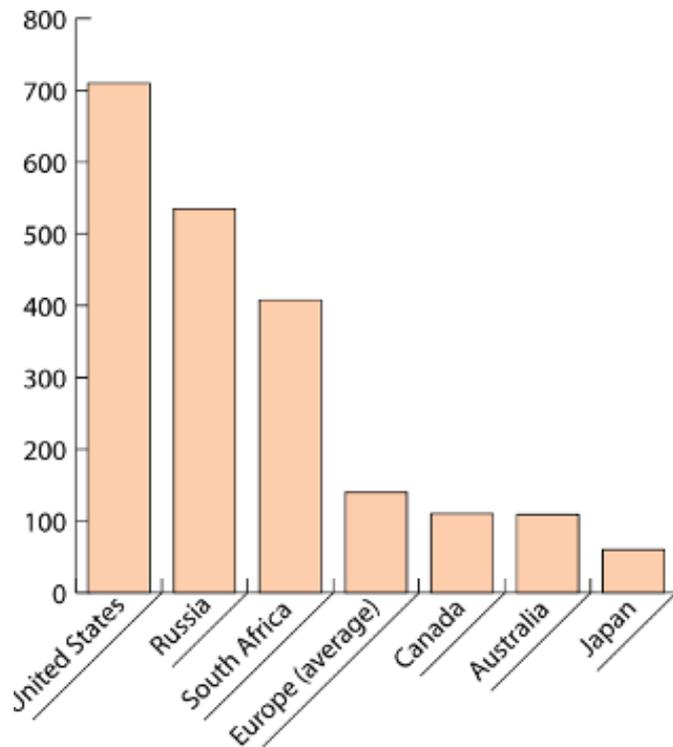
NHL PLAYERS BY PROVINCE

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.

Height of pucks = 'Thematic scale'

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.

Cody Franson, Sicamous, B.C.

219 PLAYERS 119.9 Pts.

3 PLAYERS 4.7 Pts.

10 PLAYERS 132.4 Pts.

Source: QuantHockey.com; Maclean's 2014

MACLEAN'S

Making thematic maps with google earth *« Internet users per 100 population »*
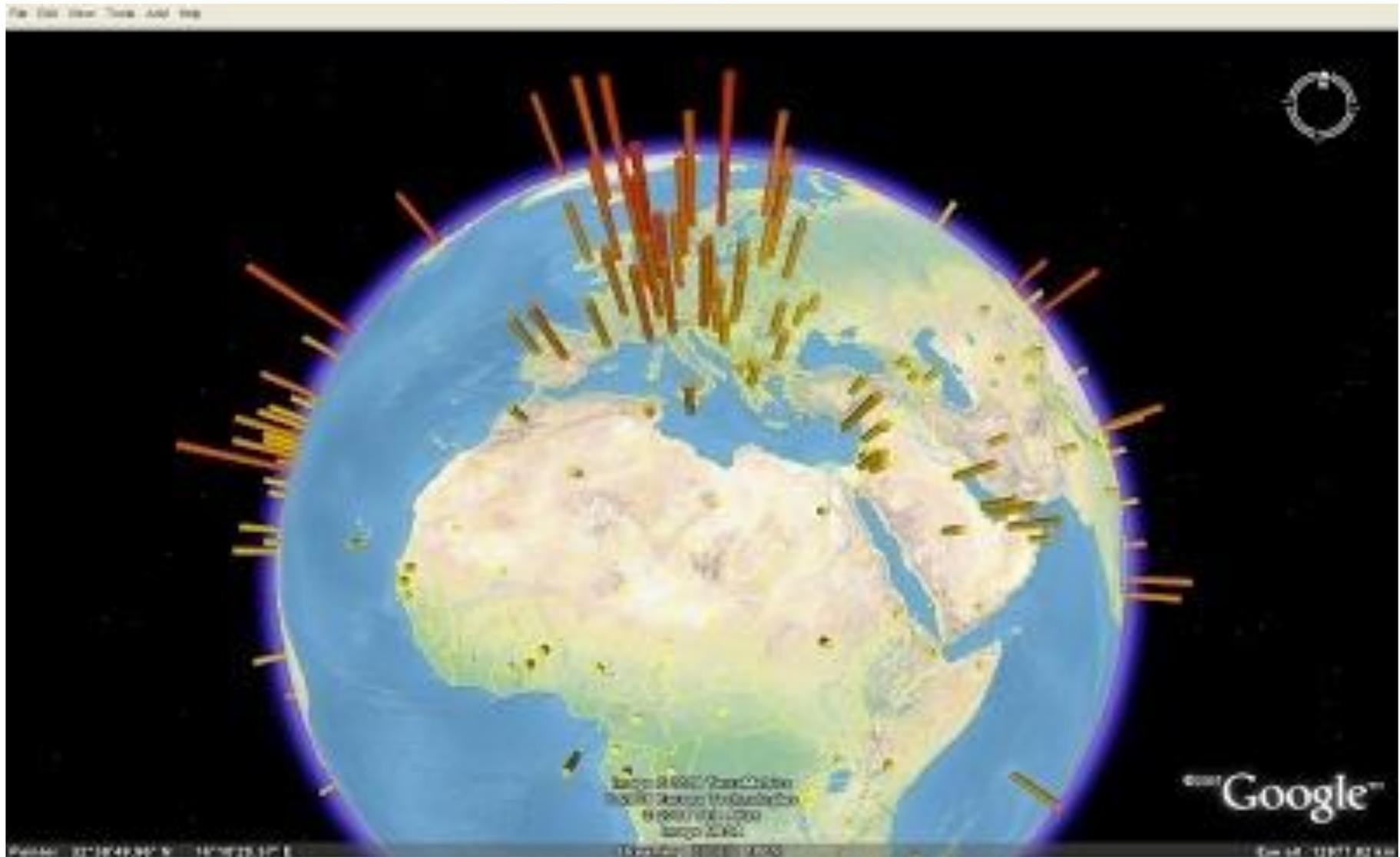
3. Proportional (formerly 'Graduated') circles
…. Area of circle symbol is proportional to the value represented

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

£0.72m
Asia

13.64m
United States

£0.72m
New
Zealand

£0.49m
South Africa

£0.22m
Rest of the
World

£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

'Thematic scale'

Area = πr^2

1   4   1   4
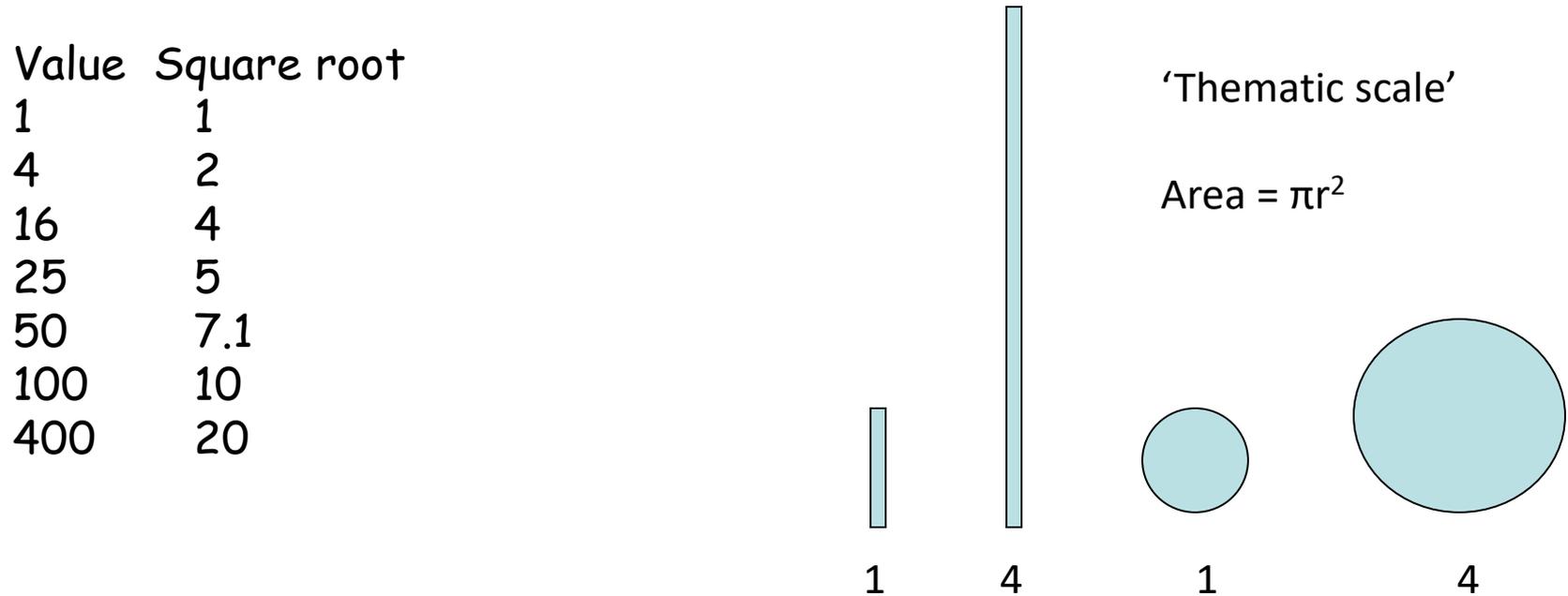
Bars are **proportional in height to the value**

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!

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
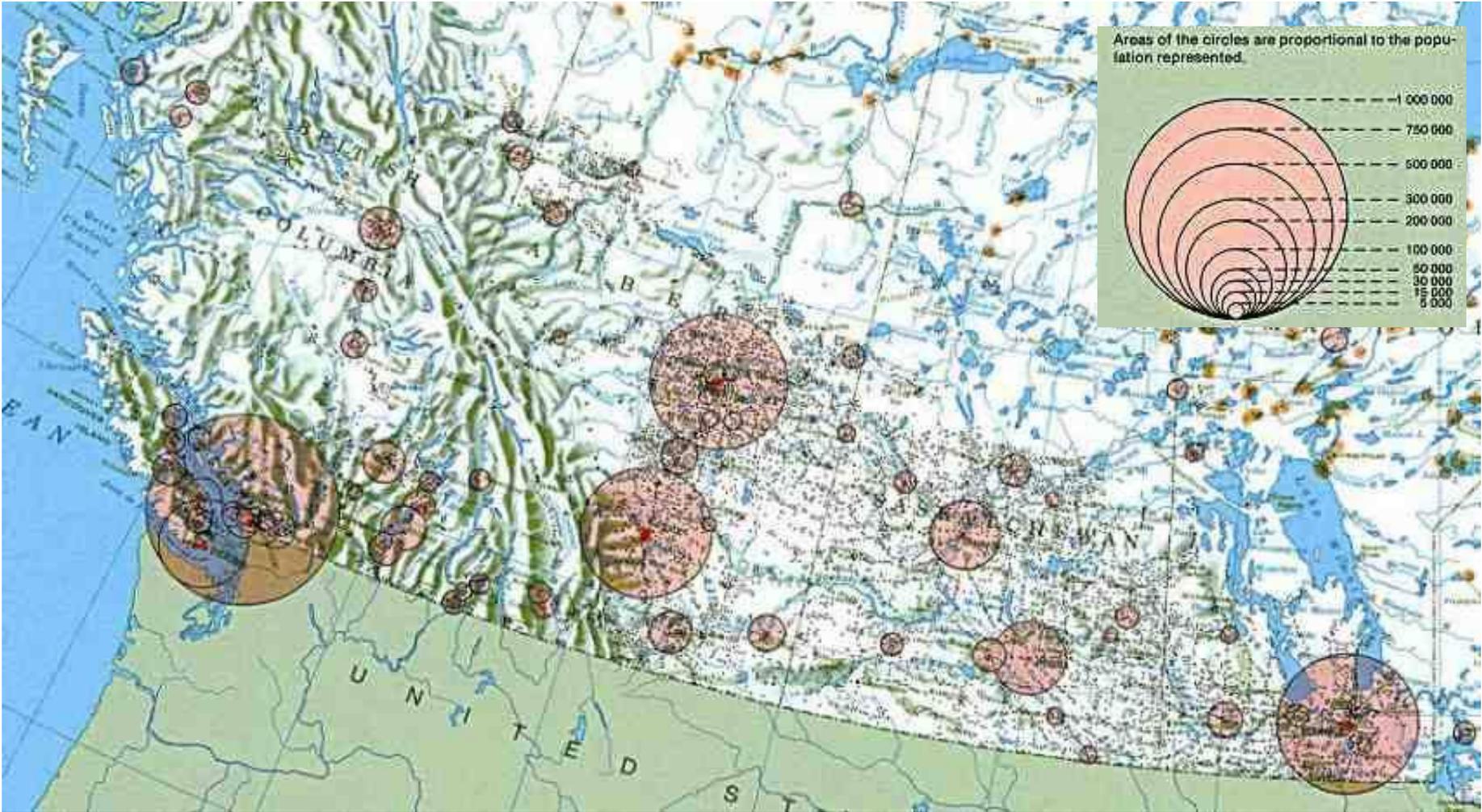
Syrians in neighbouring countries and Europe
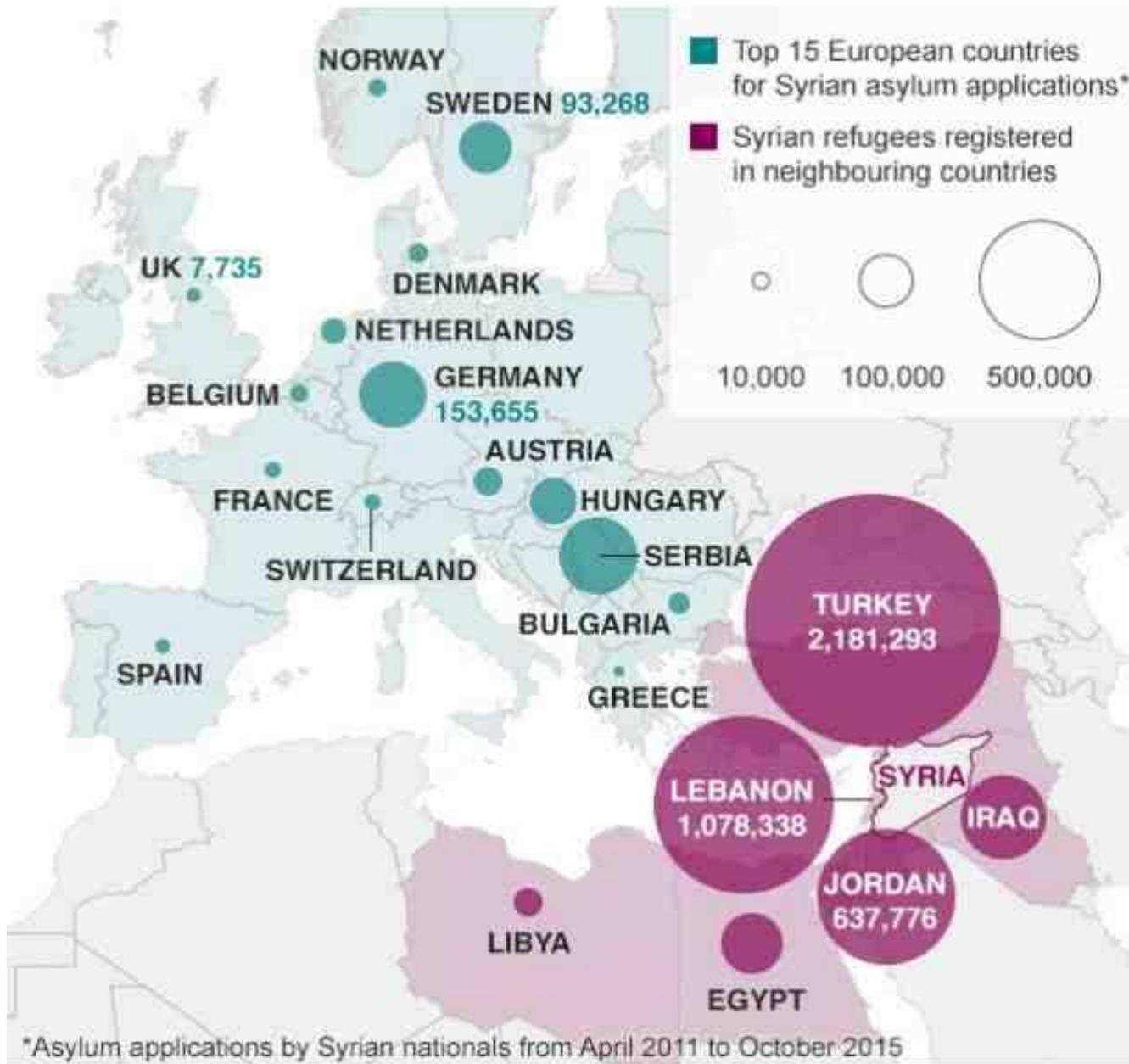
Legend

'thematic scale'

Distribution of UNBC Students
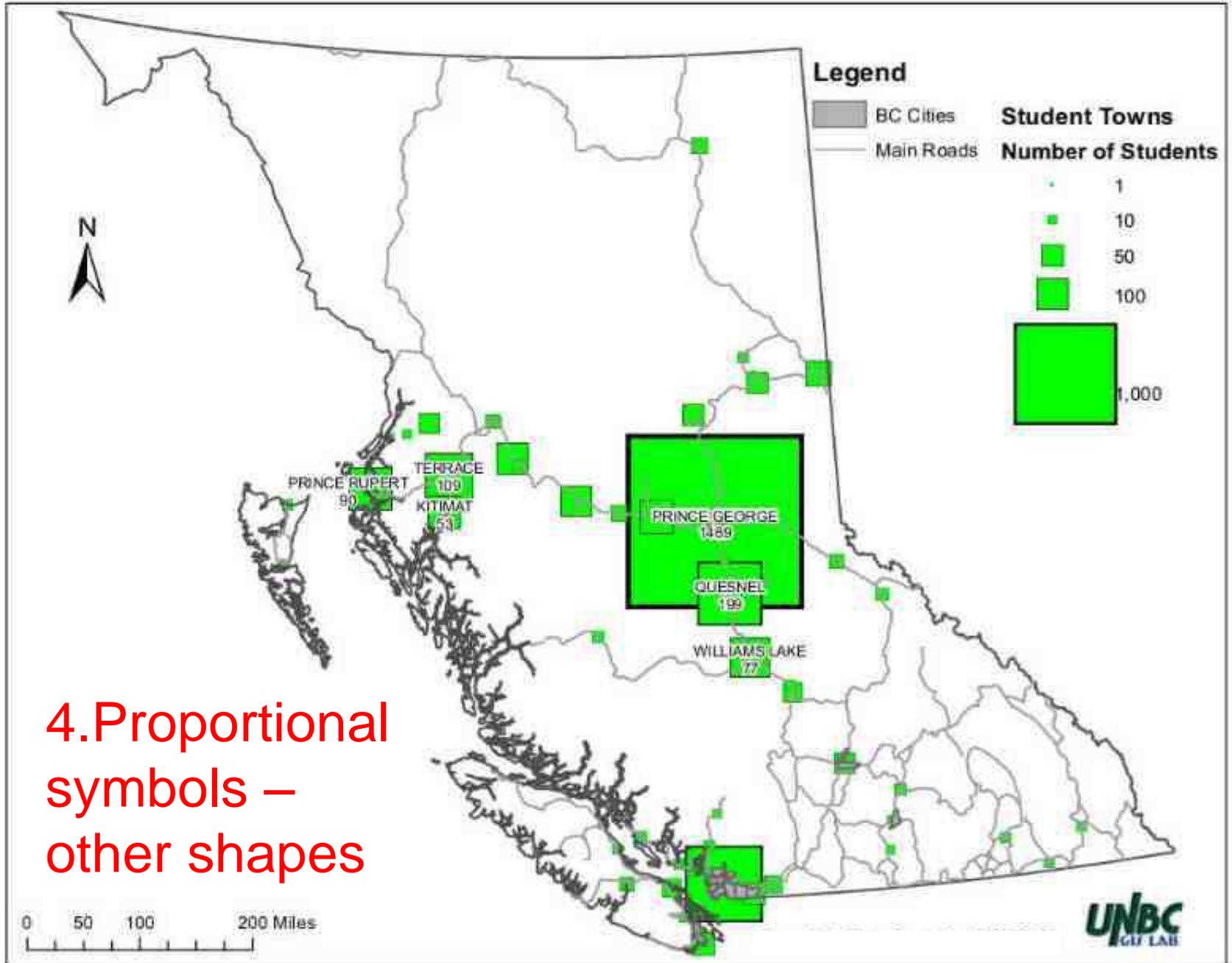
4.Proportional symbols – other shapes

USA election results 2016   (hexagons)

WA 12 · OR · CA 55 · NV · AZ 11 · AK · HI · ID · UT · NM · MT · WY · CO 9 · ND · SD · NE · KS · OK · TX 38 · MN 10 · IA · MO 10 · AR · LA · WI 10 · IL 20 · MS · MI 16 · IN 11 · KY · TN 11 · AL 9 · OH 18 · WV · GA 16 · SC 9 · NC 15 · VA 13 · FL 29 · PA 20 · NY 29 · VT · NH · ME · MA 11 · CT · RI · NJ 14 · DC · MD 10 · DE

Size/number shows electoral votes per state   ● Clinton   ● Trump   ○ No projection yet

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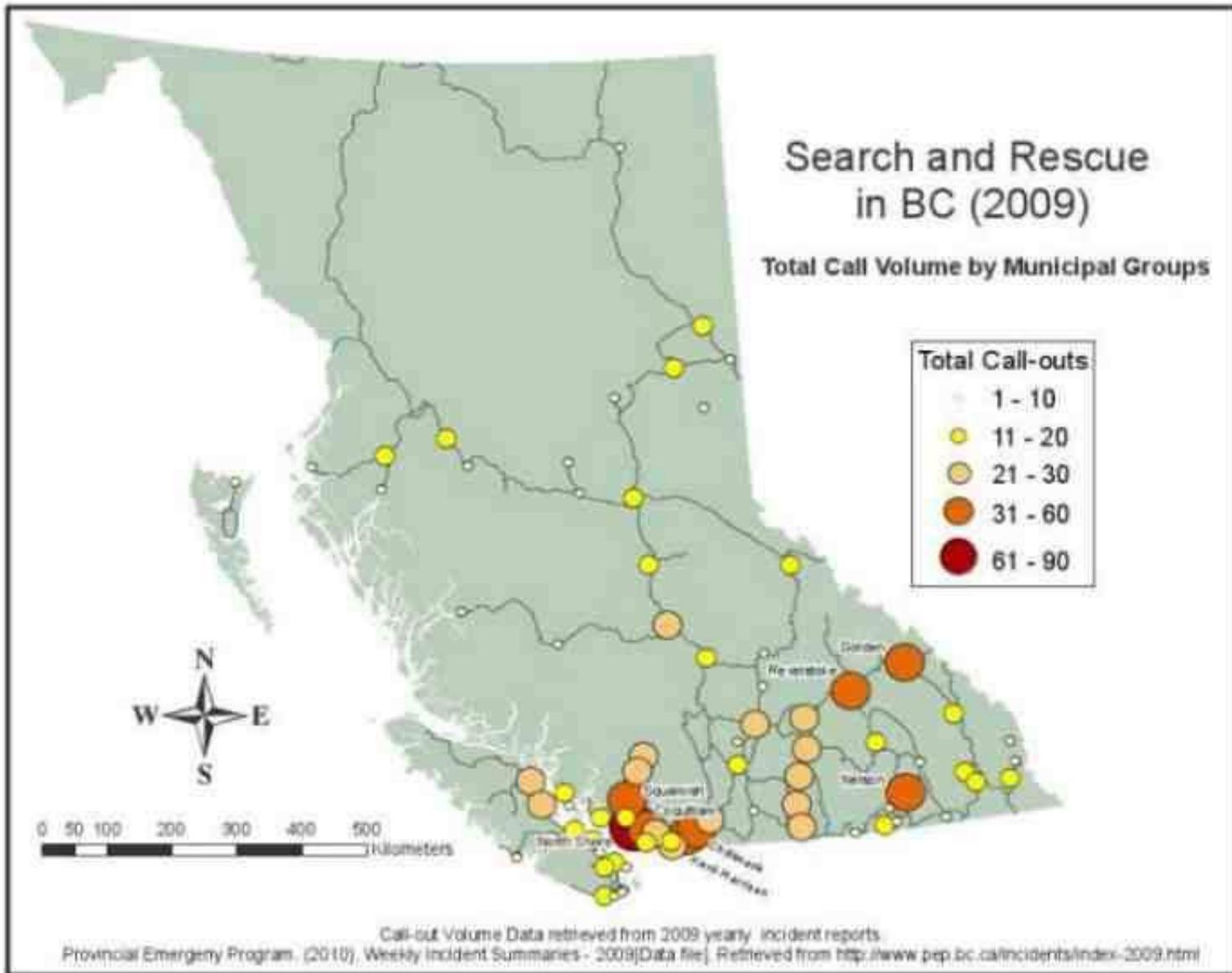
Where it is not feasible to keep all symbols individually proportional to their values, they can be grouped into classes and shown by a symbol size ~proportional to the class range central value. The design of these classes should be based on grouping similar values.

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.

2016 Presidential Election

McMullin   Clinton
Stein   Trump
Johnson

14,000,000 votes
8,000,000 votes
2,500,000 votes
250,000 votes

Thematic scale
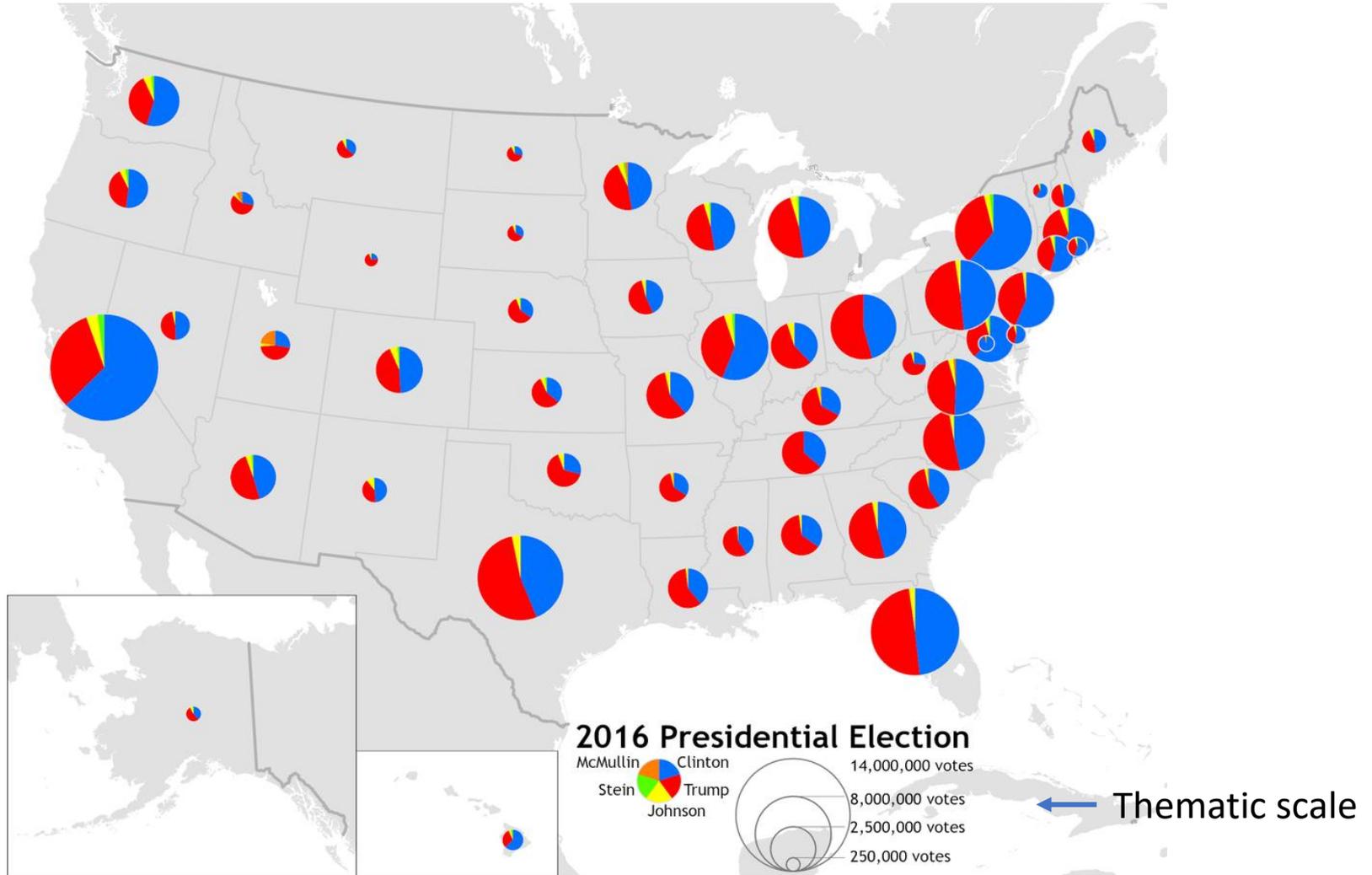
Segmented proportional symbols – decagons (loonies?)

DISTRIBUTION OF LIVESTOCK

SOUTHERN ONTARIO, 1977
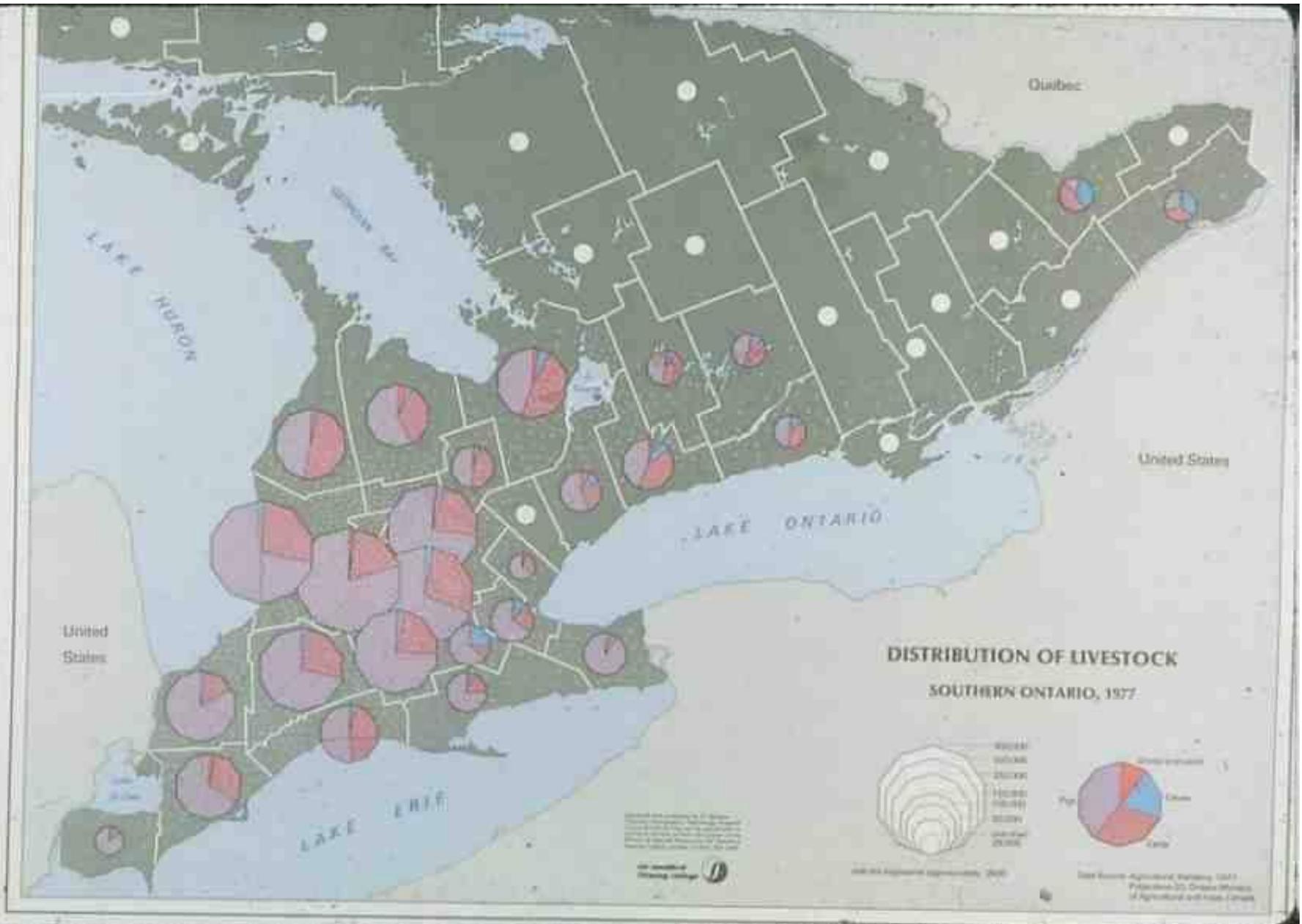
Segmented symbols / Pie chart humour
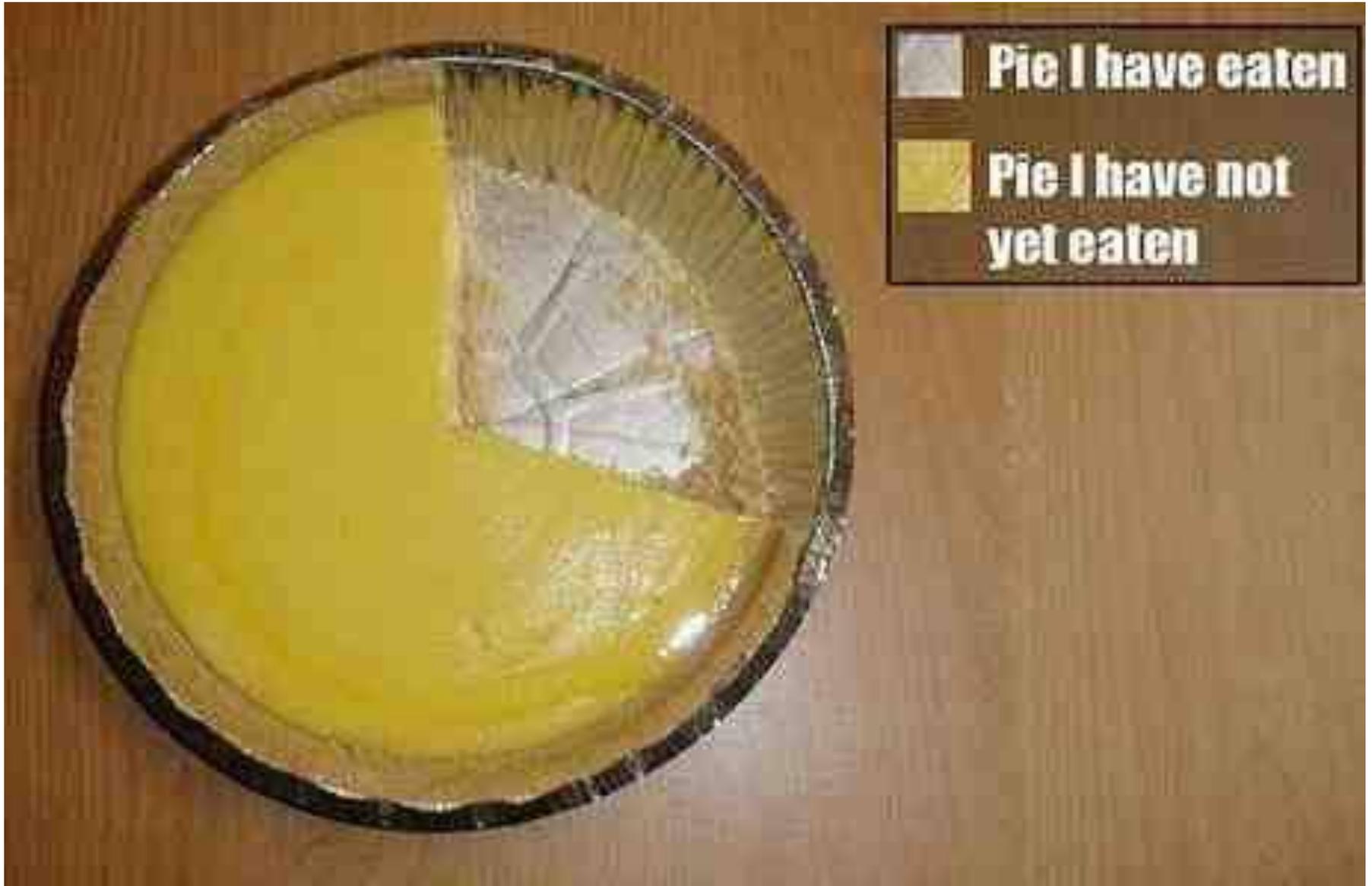
Alternative segmented circles

'polar diagrams'

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

Number of FIA plot measurements in each month
Minimum of 12,796 in Dec; maximum of 22,836 in June
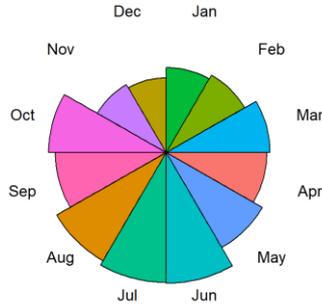
This is used where it is important to directly compare the constituent values, e.g. river flow over 12 months, or wind speeds from the 8 cardinal directions (a 'wind rose').

Saskatchewan: monthly streamflow
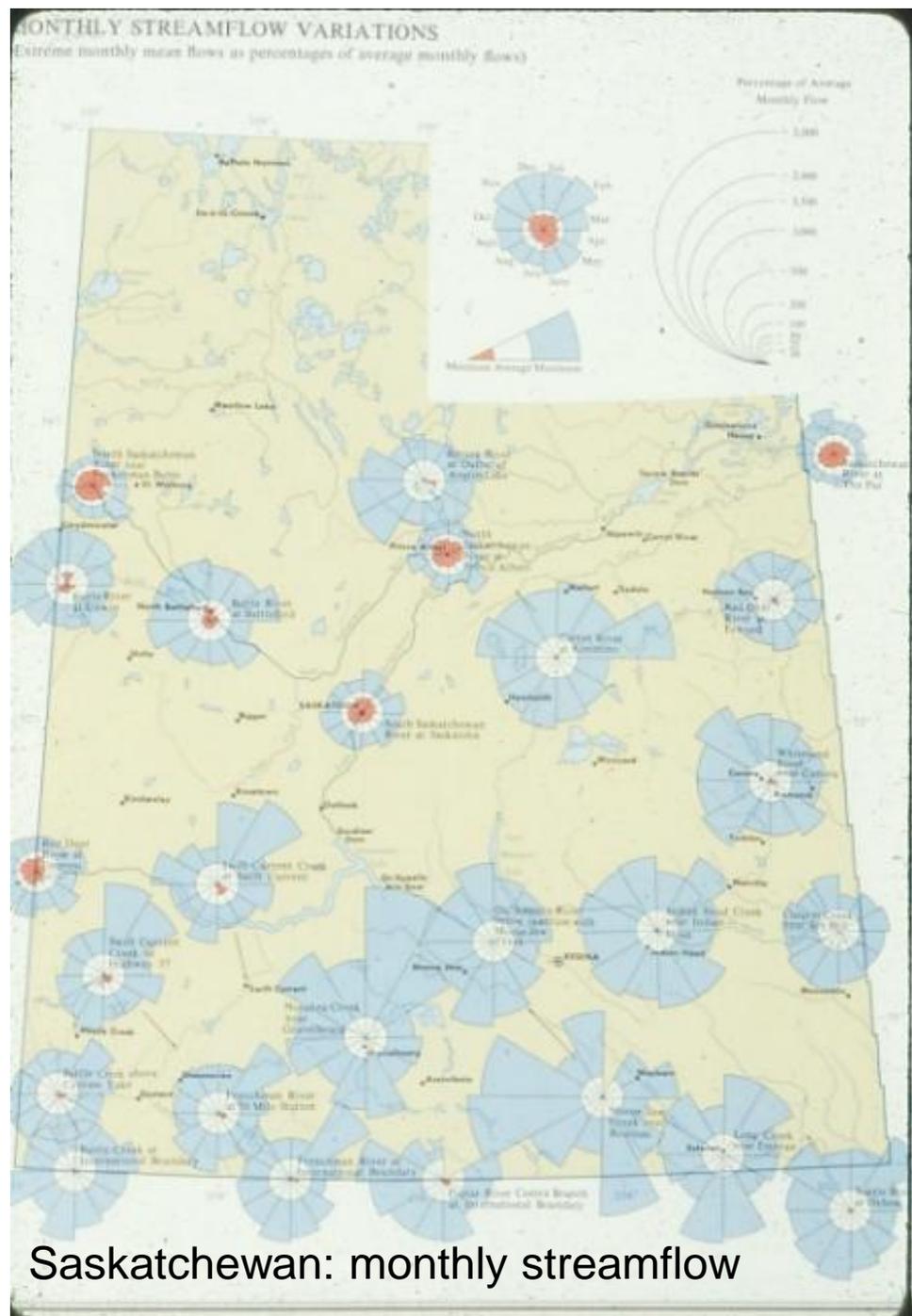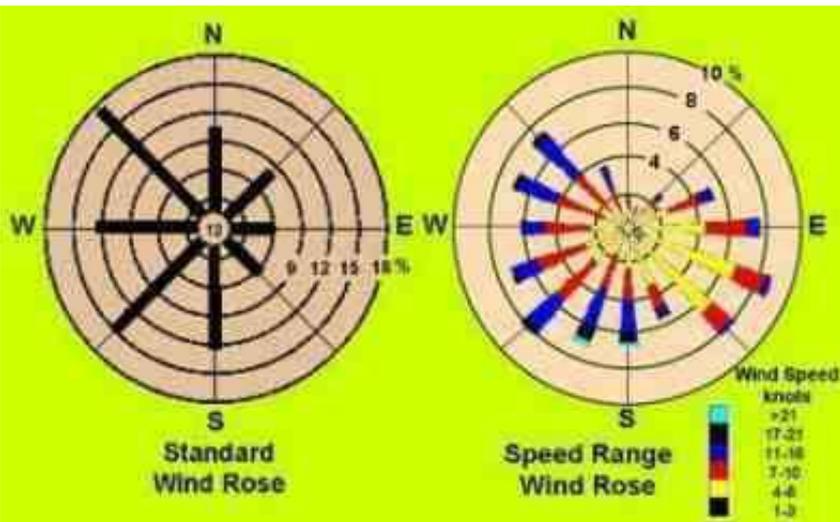
Polar diagrams

Florence Nightingale

Diagram of the Causes of Mortality in the Army in the East

Preventable or Mitigable Zymotic disease

Wounds
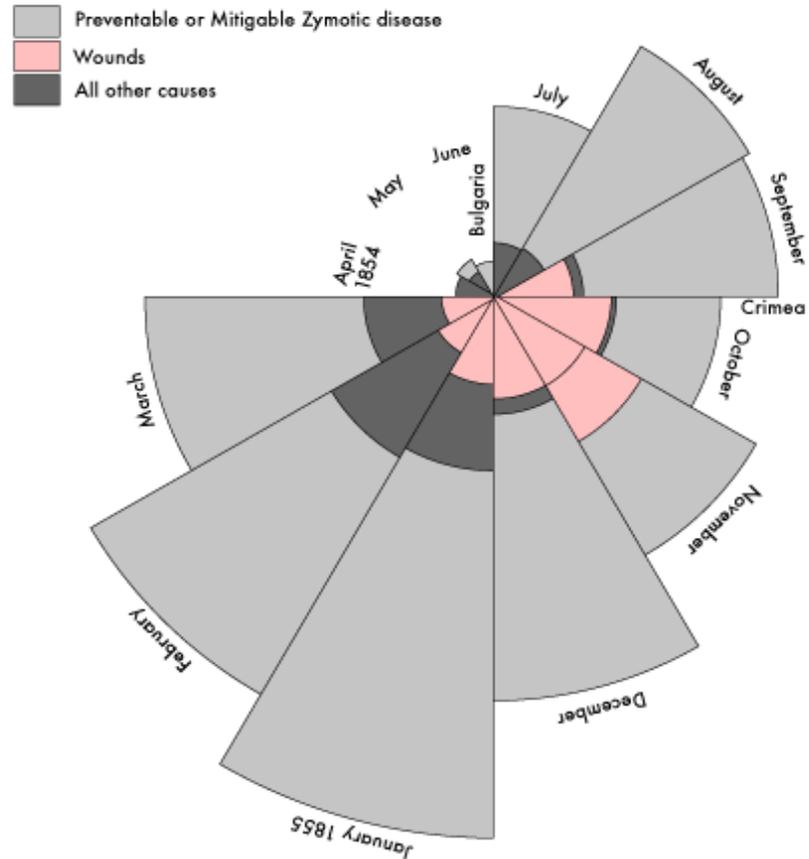
All other causes

The black line across November 1854 marks the boundry of the deaths from all other causes during that month. In October 1854, the black coincides with the red.

Florence Nightingale 1856

7. Volumetric graduated symbols:

$$Volume = 4/3\ \pi r^3$$

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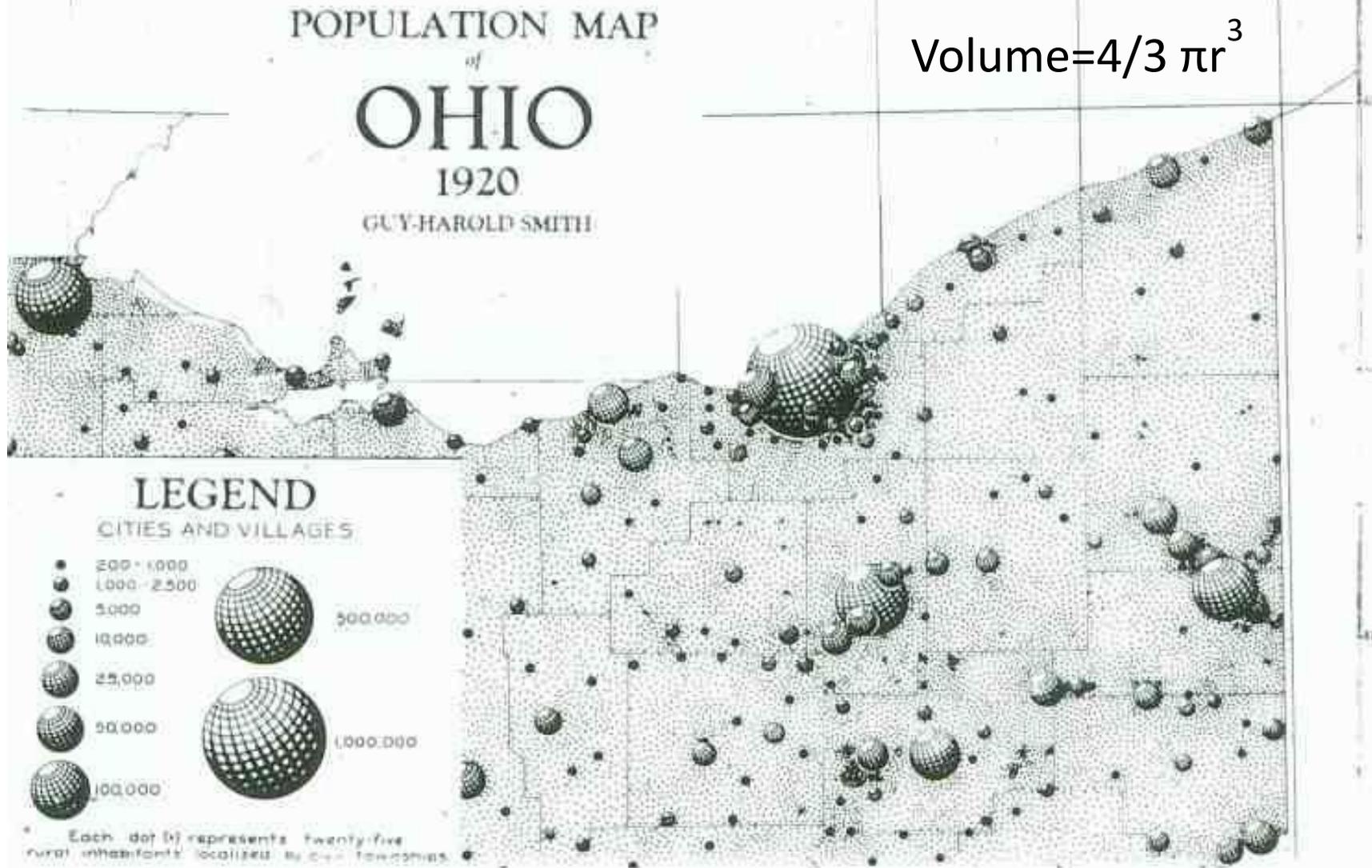
Figure 6.13   A portion of a population map of Ohio (1920) drawn by Guy-Harold Smith. Compare with Fig. 6.8. (Courtesy of the author and *The Geographical Review*, published by the American Geographical Society of New York.)

They are visually 3D and apply a value proportional to perceived volume.
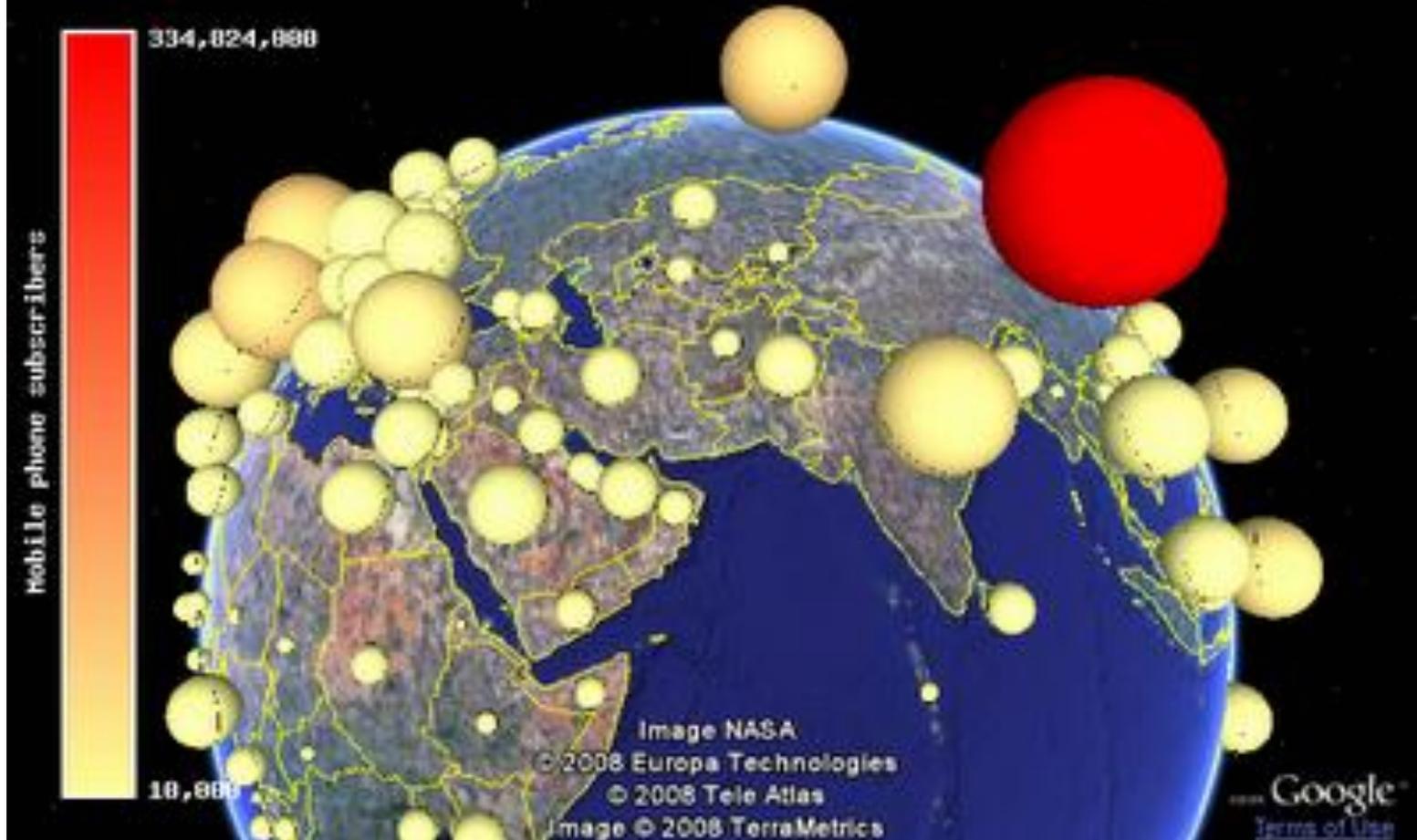
These can handle even greater data range than circles, -> a sphere radius is proportional to the cubed root of values e.g. 1:1000 becomes 1:10.

World's deadliest pandemics

200M
Black Death (Bubonic Plague)
1347-1351
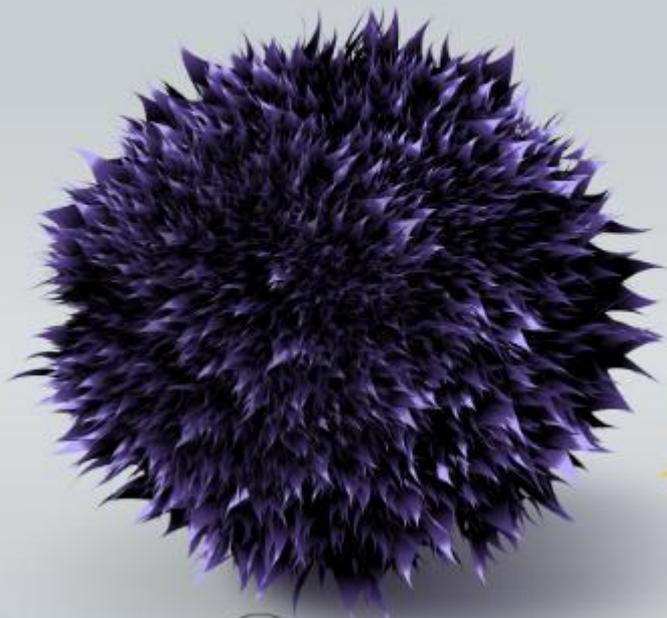
56M
Smallpox
1520

40-50M
Spanish Flu
1918-1919

30-50M
Plague of Justinian
541-542

'Thematic
← Scale'

The plague originated in rats and spread to humans via infected fleas.

The outbreak wiped out 30-50% of Europe's population. It took more than 200 years for the continent's population to recover.

Smallpox killed an estimated 90% of Native Americans. In Europe during the 1800s, an estimated 400,000 people were being killed by smallpox annually. The first ever vaccine was created to ward off smallpox.

The death toll of this plague is still under debate as new evidence is uncovered, but many think it may have helped hasten the fall of the Roman Empire.

7m: 2023

25-35M
HIV/AIDS
1981-PRESENT

12M
The Third Plague
1855

5M
Antonine Plague
165-180

3M
17th Century Great Plagues
1600

2.2M*
COVID-19
2019-9:22AM PT,
FEB 01, 2021
[ONGOING]

1.1M
Asian Flu
1957-1958

1M
Russian Flu
1889-1890

1M
Hong Kong Flu
1968-1970

Johns Hopkins University estimates

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)

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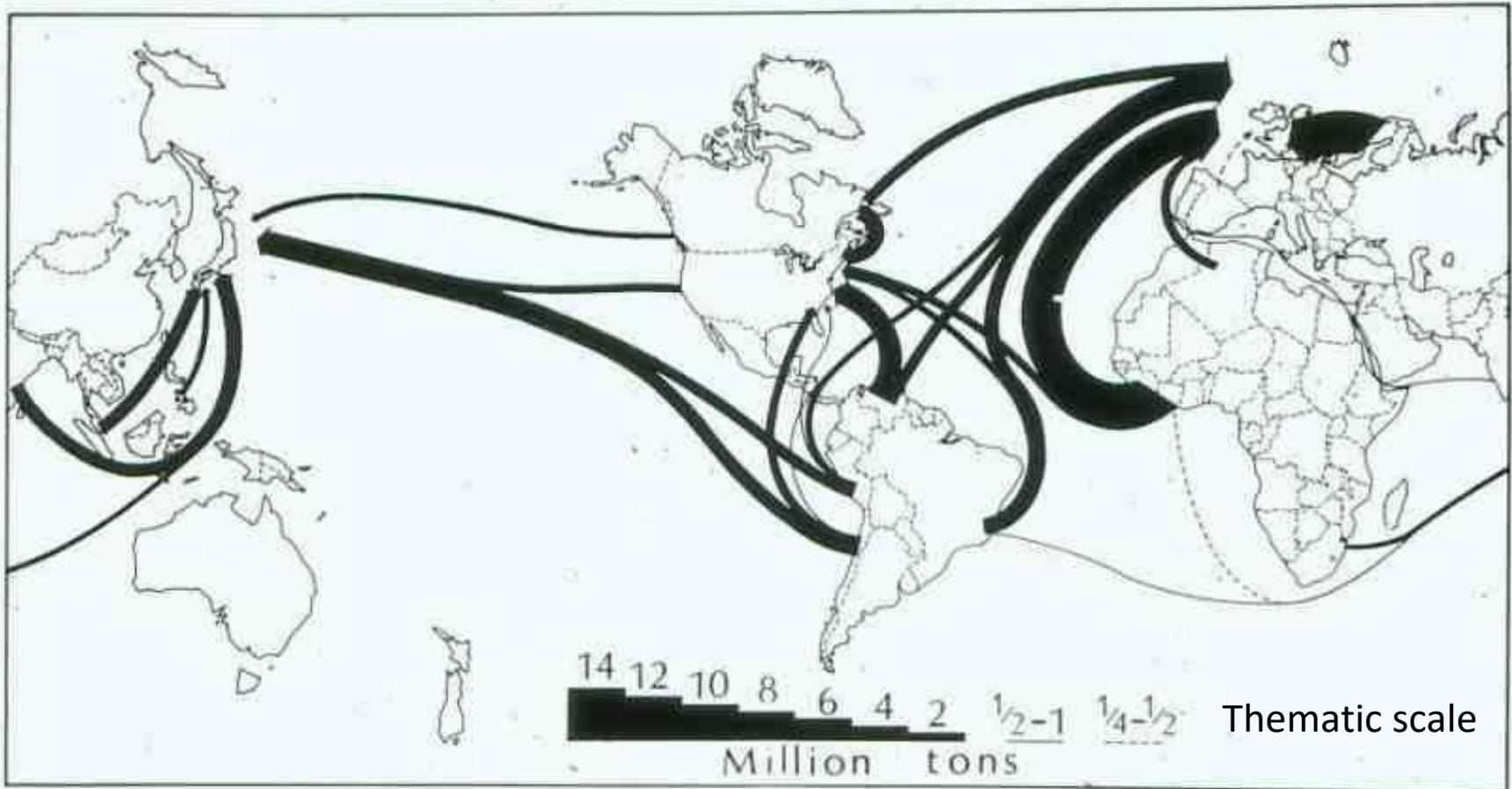
Figure 6.21   A portion of a flow-line map showing the movement of iron ore. Map by G. B. Lewis. (From G. Manners, "Transport Costs, Freight Rates, and the Changing Economic Geography of Iron Ore", *Geography*, 52 (1967), 260-279.)

Canadian watersheds and major river flow volume
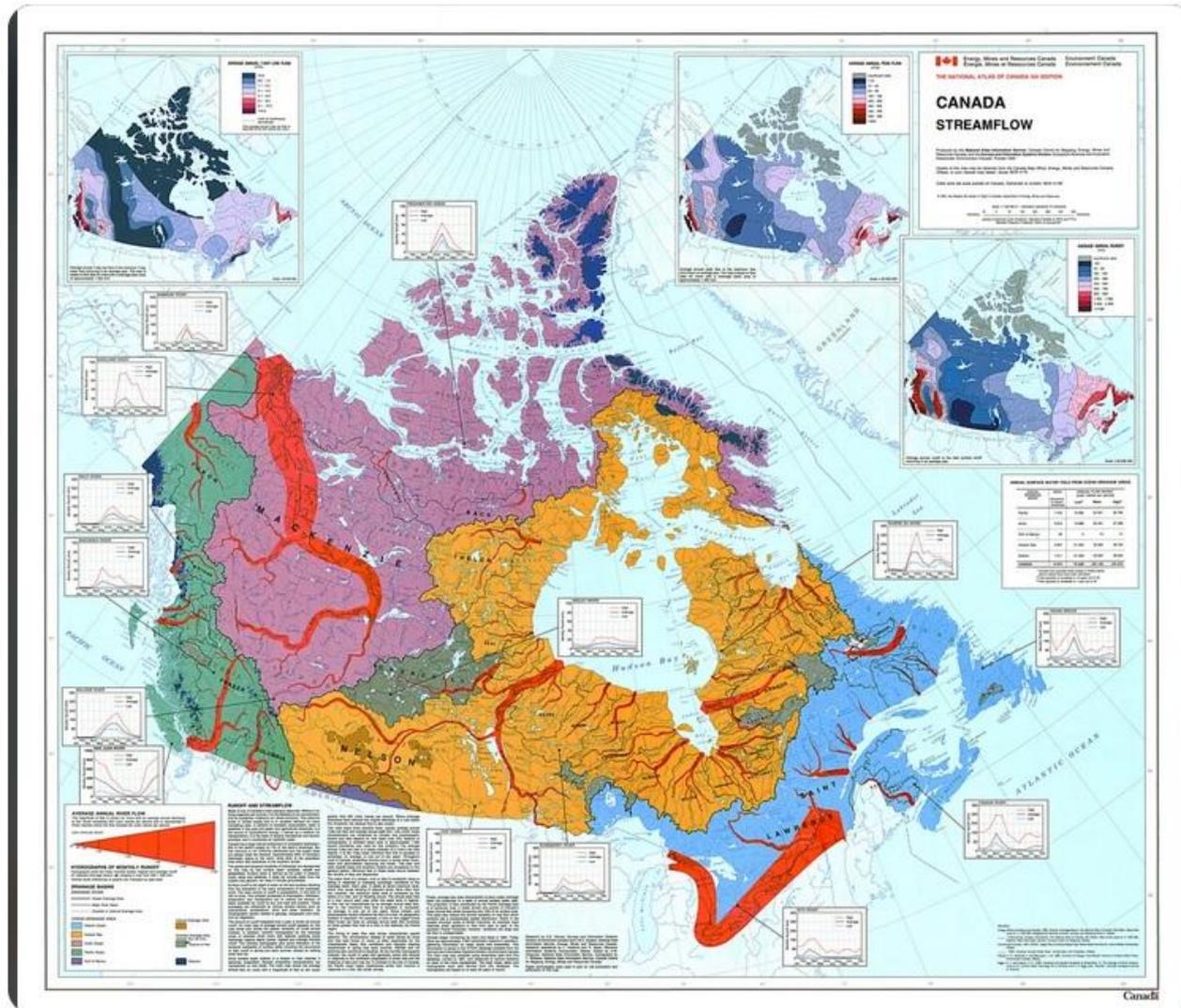
Peril at Sea: The men lost during the first circumnavigation of the world, Magellan 1519 - 1522

Men Lost Along the Voyage (Total = 227)

245 men → 137 - 145 → 118 - 137 → 100 - 118 → 35 - 40 → 18 - 35 → 4 - 18

PRESIDENT'S PRIZE WINNER

AMERICA SIVE IN:
DIA NOVA

EUROPA

Tartaria

Mongol

ASIA

China

India Orientalis

Arabia

AFRICA

Mar del Nort

Mar del Sur

Caribana

Peru

Brasil

Amazones

Chica

El Mar Pacifico

Oceanus Ae Thiopius

Mar de India

TERRA AUSTRALIS NONDUM COGNITA

Timeline of Events

April 14, 1521
Magellan and seven others die in a conflict with local natives at Mactan Island

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 fiver men who attempted to commit mutiny

September 8, 1522 one ship returns to Seville, Spain with 18 men

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

March 17, 1521
Magellan reaches the Phillippines one dies

November 10, 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 40 men

May 1, 1521 29 men killed, one ship abandoned

One ship is captured, crew killed

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

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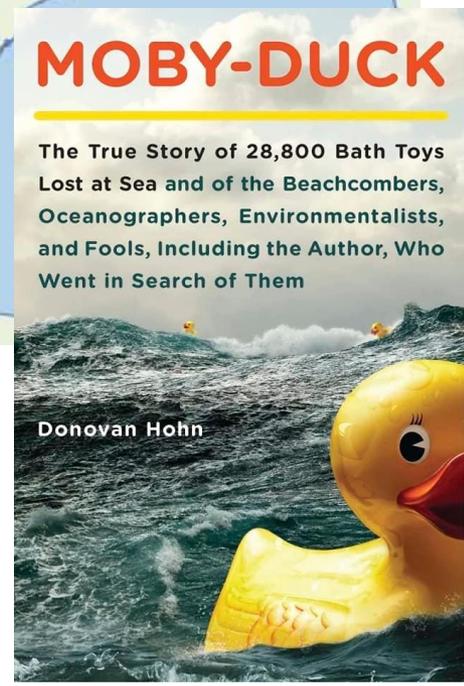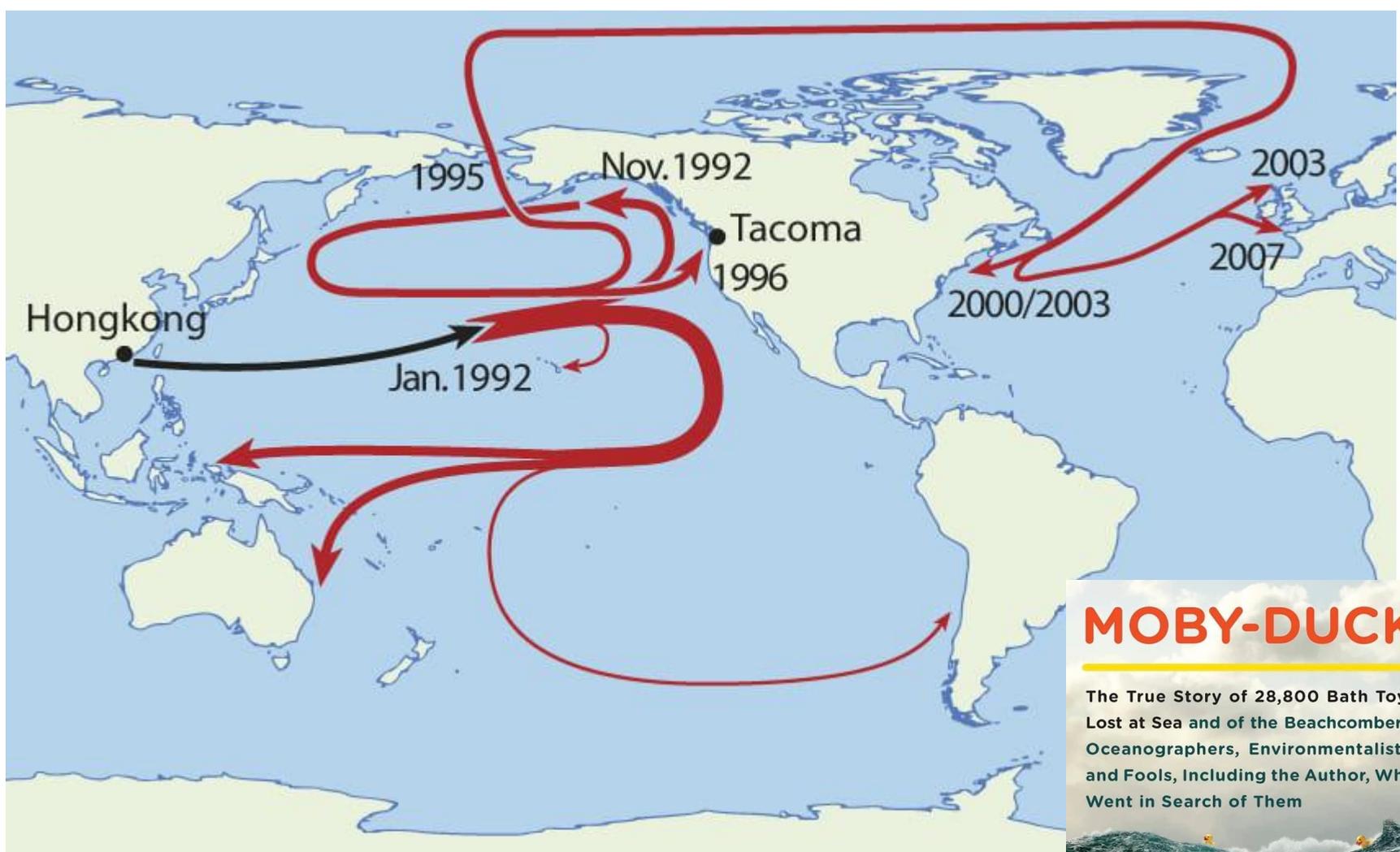
28,800 Rubber ducks were washed overboard from a container ship in the Pacific Ocean on 10 January 1992 and have subsequently been found on beaches around the world and used by oceanographers to trace ocean currents. * No thematic scale except by inference of start line

NB: 'take-home' moodle quiz sfter Thursday lecture - 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,
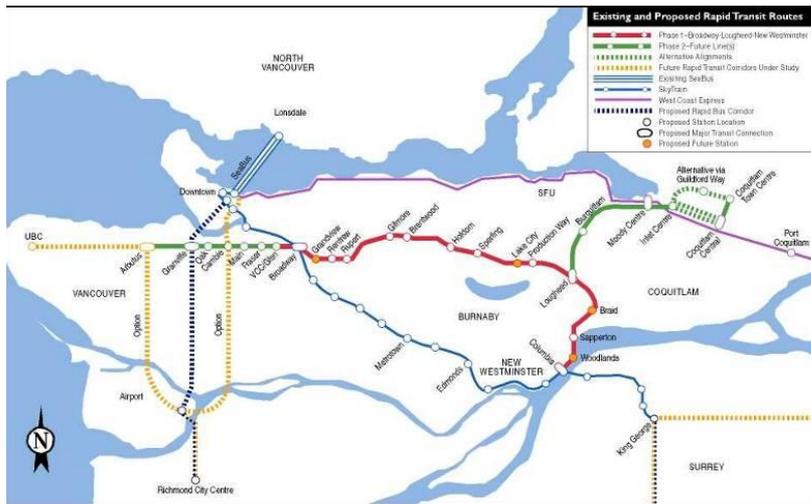
LONDON

PARIS

NEW YORK

GLASGOW

Being Scottish

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

Ski map prototype example:

Ken Field (Esri)