

GEOG 2017 EL
Applied Cartography and
Introduction to GIS

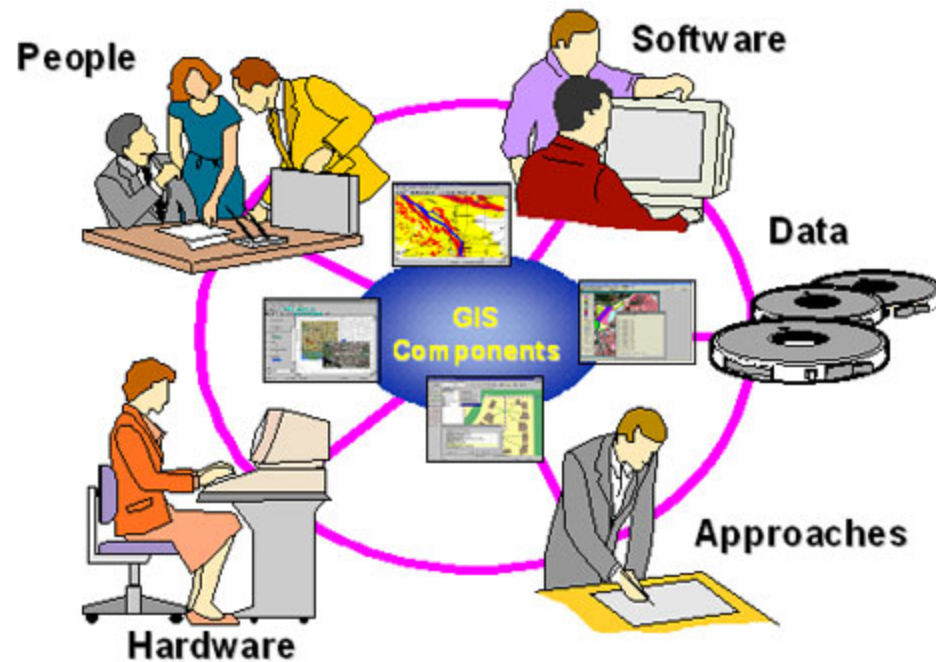
Laurentian University

Winter 2010

By Marc Lefebvre

What is GIS

“Set of tools for collecting, storing, retrieving at will, transforming, and displaying spatial data from the real world fro a particular set of purposes” pg. 6. Burrough. P.A., 1994.



Types of Maps

1. General Purpose (reference) maps

- Emphasis is on location

2. Thematic (special purpose, single topic, statistical map)

- Particular features or concepts
- Structural Characteristics of distance and directional relationships, patterns of location, spatial attributes of magnitude change
(Dent pg 6)
- Excludes topographic Maps

Thematic Maps

- Qualitative

- spatial distribution or location of Nominal data

- Quantitative

- spatial aspect of numerical data: Ordinal or Interval/Ratio scale

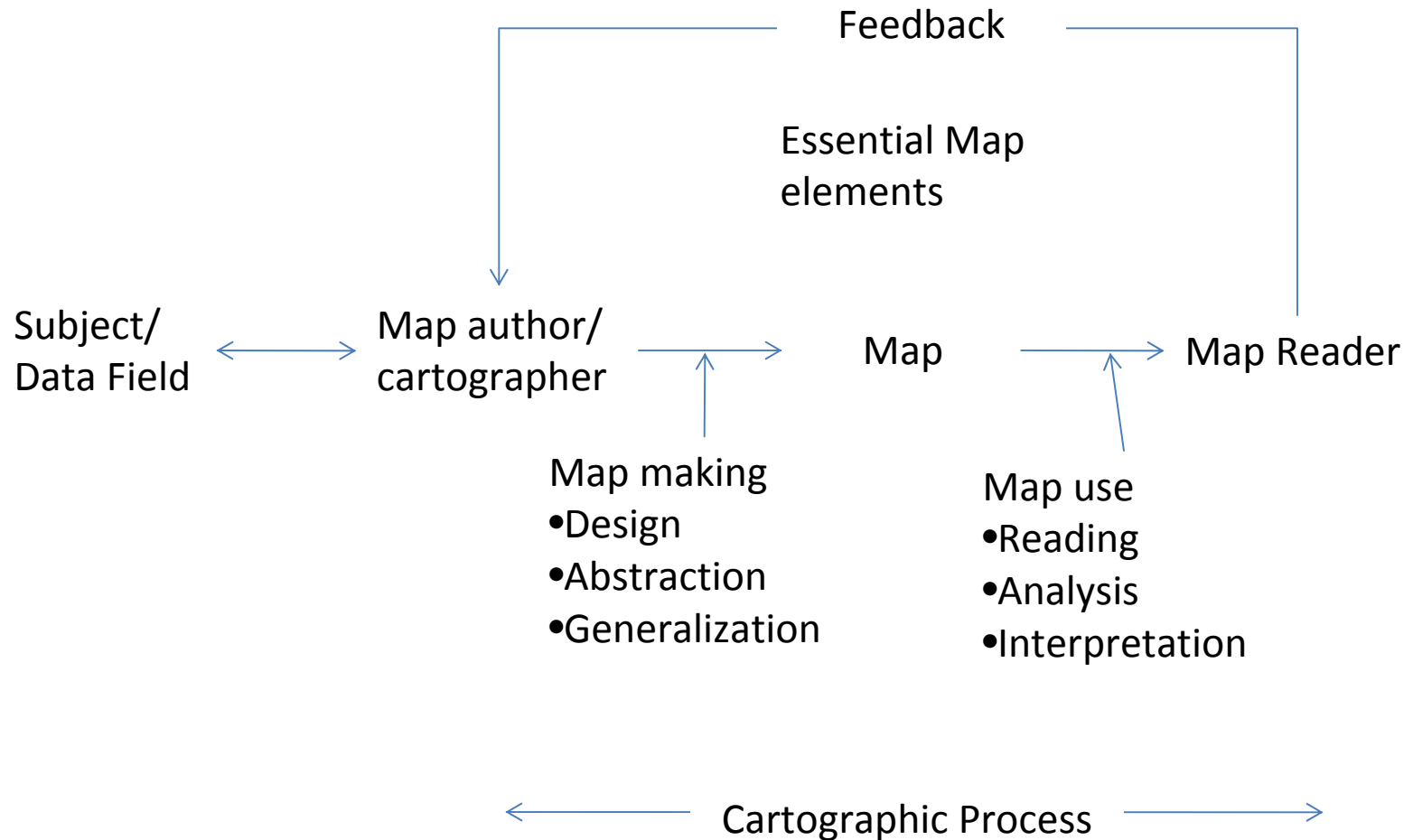
Components of Thematic

1. Geographic or Base map (locational info for context)
Include only amt of info necessary to convey the map message
2. Thematic Overlay
 - User must integrate these two visually and intellectually
 - Simplicity and Clarity

Cartographic Design Principles

- What is the purpose of the map?
- Who is the audience?
- What is the topic?
- What are the format and scale?

Thematic Map Communication



Map Generalization

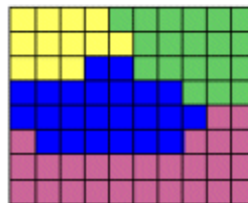
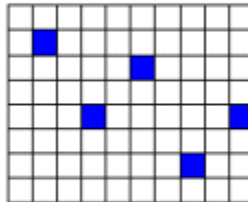
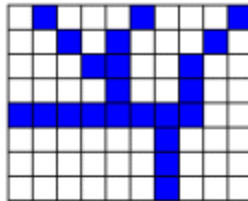
- Simplification
- Selection
- Combination
- Locational Shift and Size Exaggeration

GIS data models

Vector



Raster



Image



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 longueurs des zones colorées à raison d'un millimètre pour dix mille hommes; ils sont de plus écrits en lettres des zones. Le rouge désigne les hommes qui ont été en Russie, le noir ceux qui en sont restés. — Les renseignements qui ont servi à dresser la carte ont été puisés dans les ouvrages de M. M. Cbiers, de Féguir, de Texoniac, de Chambray et le journal inédit de Jacob, 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 de la Grande Armée en du Maréchal Davout qui avaient été détachés sur Minsk et Mielow et qui rejoindront Otscha et Witebsk, avaient toujours marché avec l'armée.

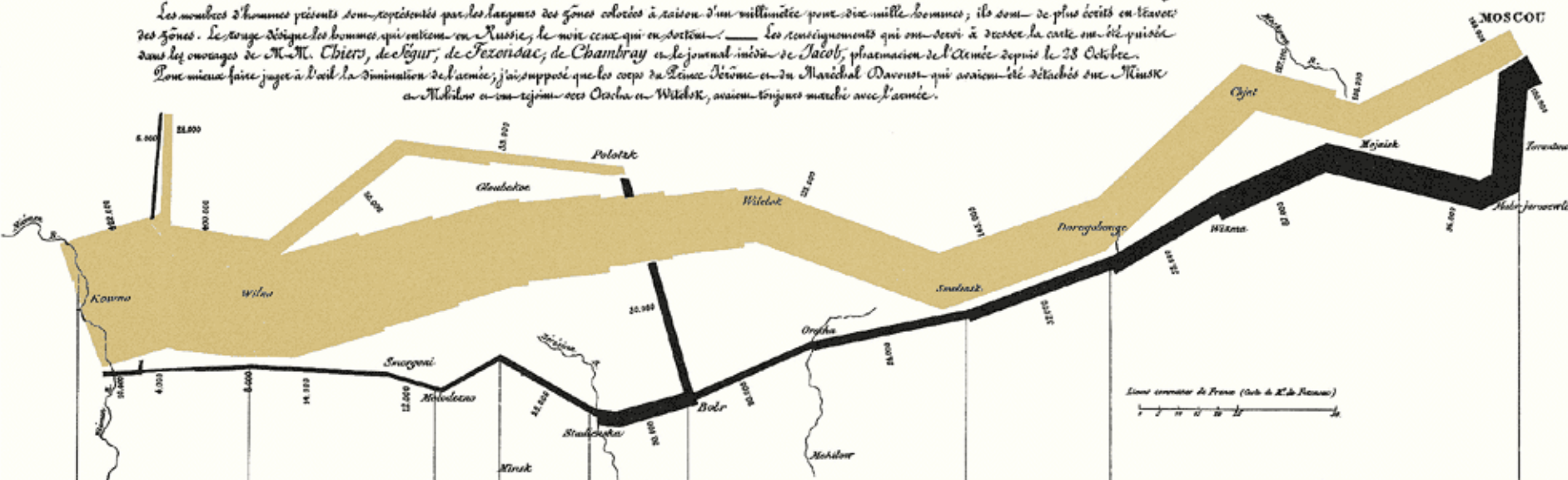
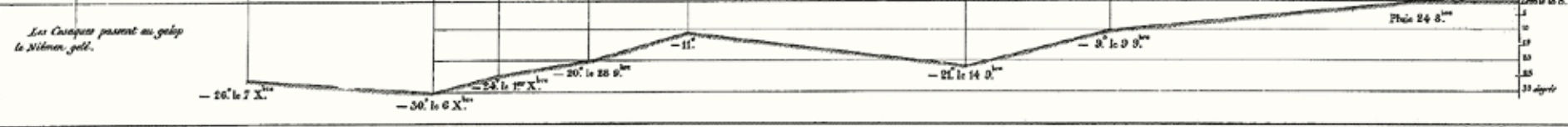


TABLEAU GRAPHIQUE de la température en degrés du thermomètre de Réaumur au dessous de zéro.

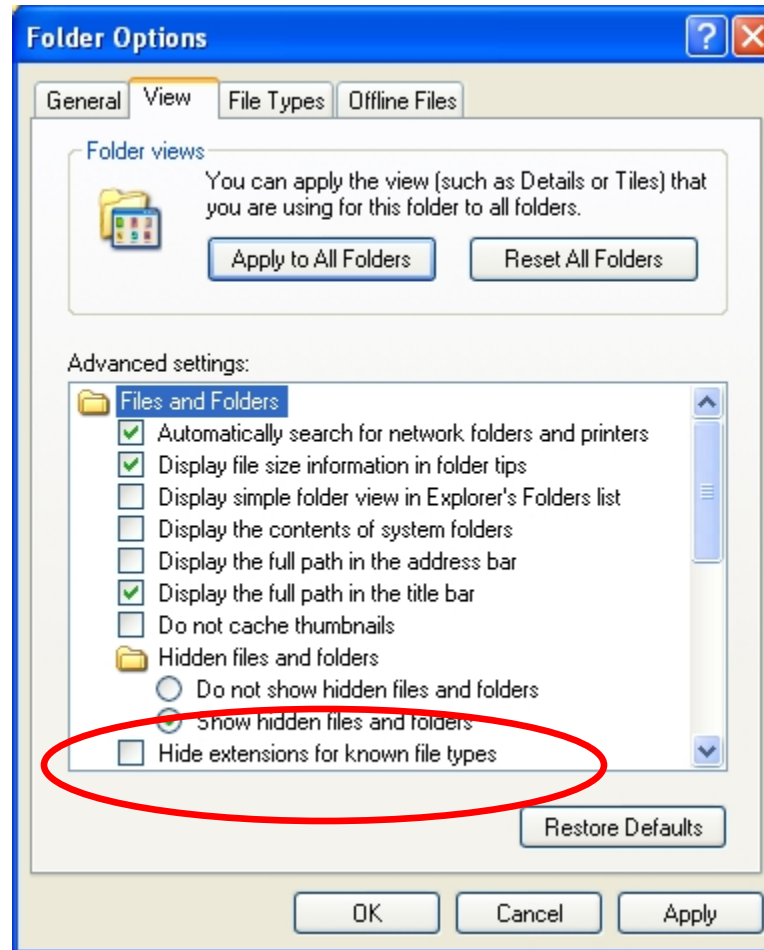


Les Cosaques passent au galop le Niémen gelé.

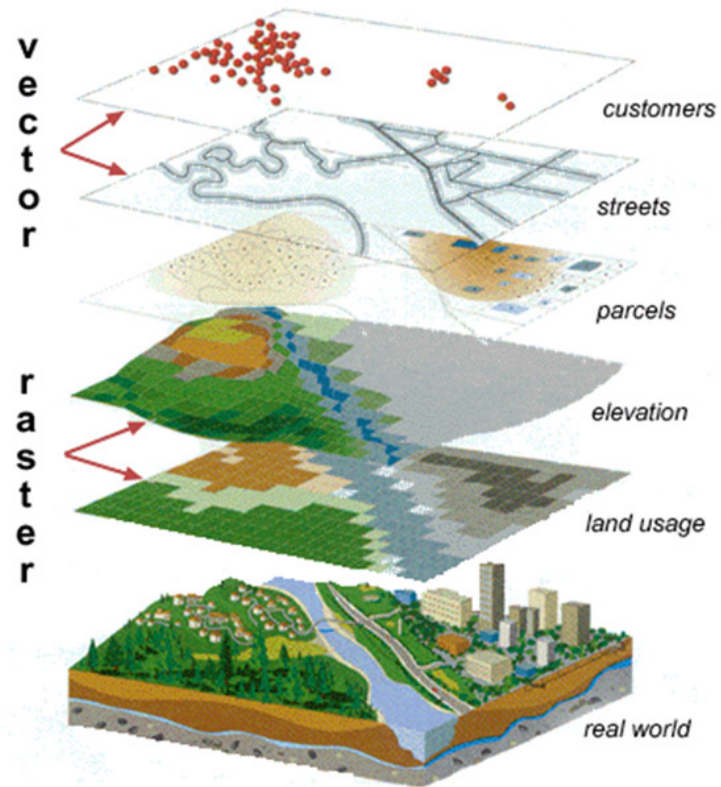
Dep. Nat. Rep. et. et. et. et.

File Names

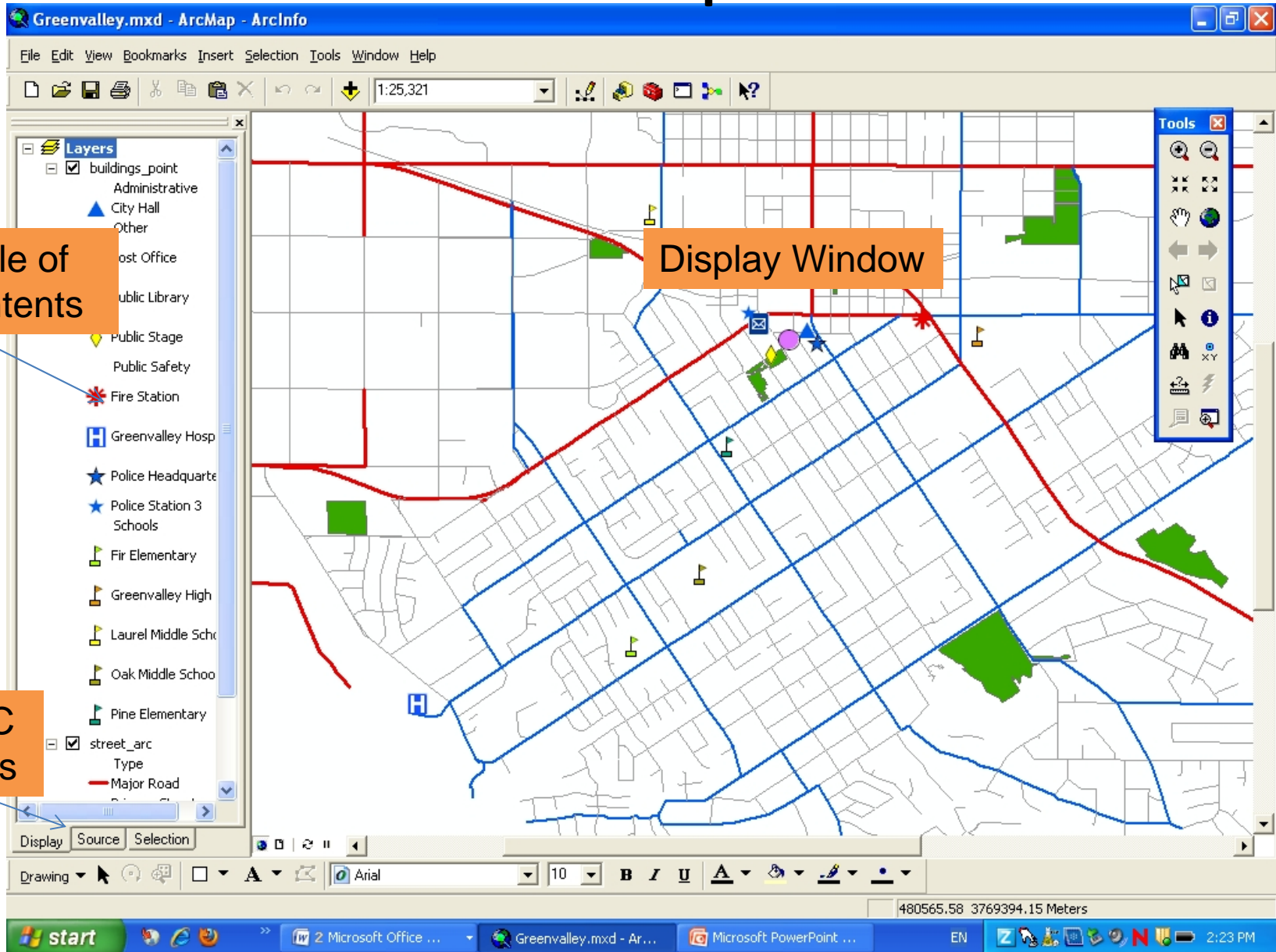
Windows Explorer > Tools > Folder Options > View tab



Vector + Raster GIS



ArcGIS ArcMap Interface



Main Menu

- Layers
- buildings_point
 - Administrative
 - City Hall
 - Other
- Post Office
- Public Library
- Public Stage
- Public Safety
- Fire Station
- Greenvalley Hosp
- Police Headquarte
- Police Station 3
- Schools
 - Fir Elementary
 - Greenvalley High
 - Laurel Middle Sch
 - Oak Middle School
 - Pine Eleme
- street_arc

Data Frame Name

Layer

Tools

- Navigation tools: pan, zoom in, zoom out, home, previous view, next view
- Map interaction tools: identify, info, measure, clear
- Display tools: print, print layout, export data, export image
- Other tools: help, search, undo, redo

Layout View Button

Data View Button

Refresh Button

Pause Button

LECTURE 4
MEASUREMENT AND
REPRESENTATION OF GEOGRAPHIC
VARIABLES

Monday January 25, 2010

REVIEW OF CARTOGRAPHIC ELEMENTS & DESIGN

Basic Cartographic Elements (Design Units)

- Body or subject area (5% up from centre)
 - Symbols
 - Labels
- Title
- Legend (a.k.a Key)
- Scale (bar representative fraction)
- Orientation/Direction (North arrow, Graticule)
- Insets (Locator/Extent maps, and detail maps)

cont'd...

...cont'd

Basic Cartographic Elements (Design Units)

- Notes
 - Explanatory Text
 - Sources
 - Date
 - Author
 - Projection
- Neatline/Borders

Goals of Design

- Clarity
- Order
- Balance
 - Elements have visual weight
 - Location
 - Size
 - Tone
 - Shape
 - Direction

• cont'd

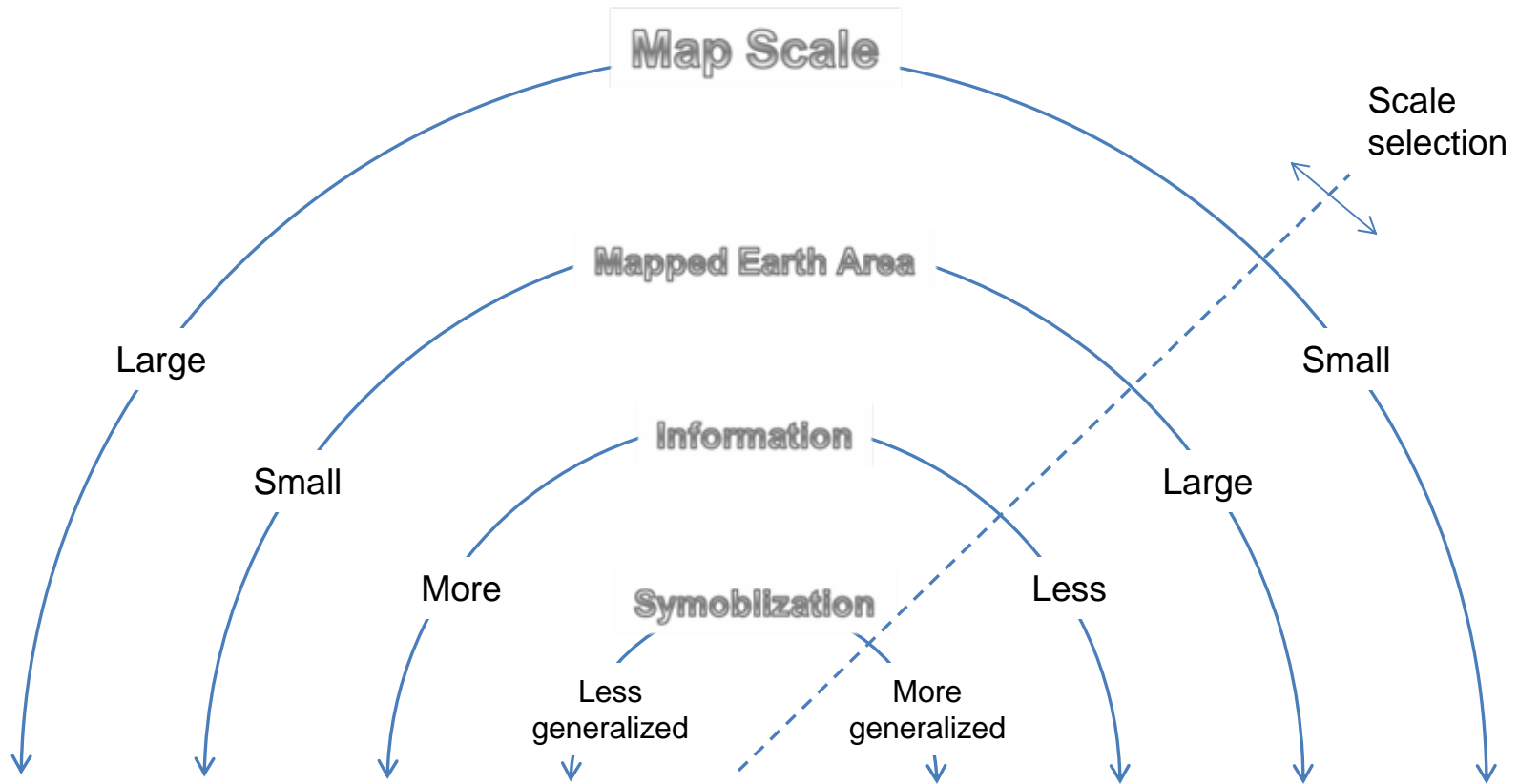
...cont'd

Goals of Design

- Contrast
- Unity
- Harmony








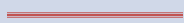

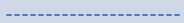






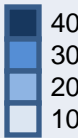
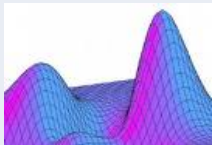
K.I.S.S.

Map Scale Effects



MEASUREMENT OF GEOGRAPHICAL VARIABLES

Geographic Variables and Representation

Scale of Measurement	Representation			
	Point	Line	Area	Surface Volume
Nominal	<ul style="list-style-type: none"> • Town 7 Mine 	<ul style="list-style-type: none">  River  Road 	<ul style="list-style-type: none">  Swamp  Census Area 	
Ordinal	<ul style="list-style-type: none">  Large  Medium  Small 	<ul style="list-style-type: none">  Major  Minor  Trail 	<ul style="list-style-type: none">  Industrial Region  Major  Minor 	
Interval-Ratio	<ul style="list-style-type: none"> Repetition Graduated 	<ul style="list-style-type: none">  Contour (Isarithms)  Flowlines 	<ul style="list-style-type: none">  40, 30, 20, 10 	

Symbol Dimensions and Map Type

Symbol Dimension	Map Type	
	Qualitative	Quantitative
Shape	X	
Size		X
Colour <ul style="list-style-type: none">•Hue•Value (light/dark)•Saturation (Intensity/purity)	X	X X
Pattern <ul style="list-style-type: none">•Orientation•Arrangement•Texture	X X	X

Census Geography

For your term project

Standard Geographical Classification (SGC) Geographic Code

PR-CD-CSD code

12 06 008

Description

- Province 12:Nova Scotia
- CD 06:Lunenburg
- CSD 008: Mahone Bay

35 06 008

- Province 35:Ontario
- CD 06: Ottawa
- CSD 008:Ottawa

LECTURE 5

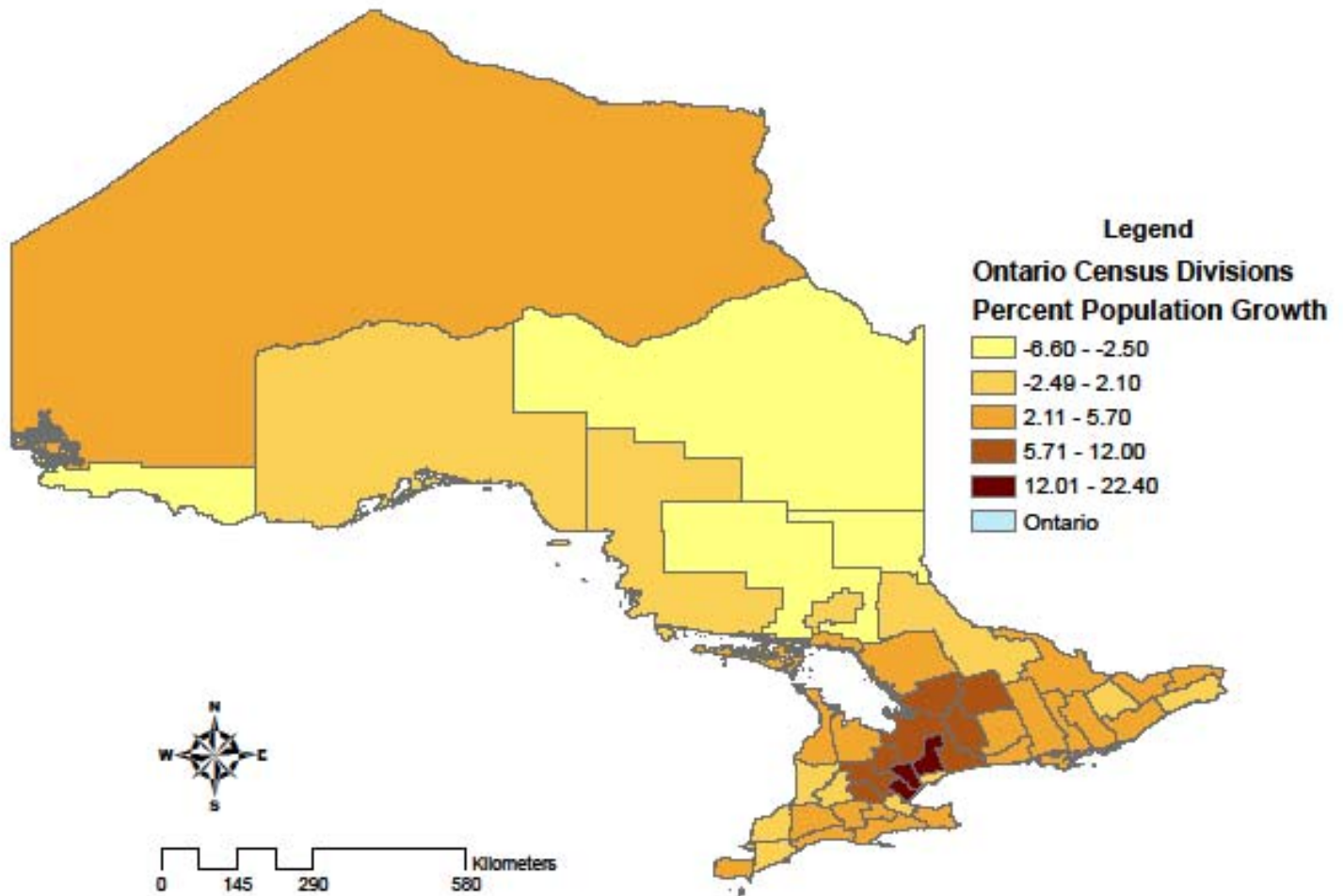
STATISTICAL MAP CLASSIFICATION

VARIABLES

Monday February 8, 2010

LAB 5 REVIEW

Percent Growth in Ontario Census Divisions



by

Check your data and calculations!

Census Division	2006 Population	Land Area (sq km)	Population Density (per sq km)	Population Change	Data check	Data Check %
Greater Sudbury	155268	157909	1.7	3211.19	2641	1.7%
Parry Sound	39665	40918	3.2	9222.04	1253	3.2%
Simcoe	377050	422204	12	4840.56	45154	12.0%
York	729254	892712	22.4	1761.84	163458	22.4%
Toronto	2481494	2503281	0.9	630.18	21787	0.9%

Shape	CDUID	CDNAME	CDTYPE	PRUID	PRNAME	Ontario_CD PopDen	OID	GEOCODE	Pop2001	Pop2006	PopChg	LandArea
Polygon						2.410215	0	3557000	118567	117461	-0.9	48734.0
Polygon						114.459948	1	3529000	118485	125099	5.6	1092.0
Polygon						16.020171	2	3541000	63892	65349	2.3	4079.0
Polygon						43.951414	3	3536000	107709	108589	0.8	2470.0
Polygon						0.584103	4	3556000	85247	82503	-3.2	141247.0
Polygon						36.642927	5	3522000	51003	54436	6.7	1485.0
Polygon						222.443374	6	3518000	506901	561258	10.7	2523.0
Polygon						45.379192	7	3534000	81553	85351	4.7	1880.0
Polygon						212.495814	8	3537000	374975	393402	4.9	1851.0
Polygon						39.173694	9	3510000	138606	143865	3.8	3672.0
Polygon						49.174605	10	3553000	155268	157909	1.7	3211.0
Polygon						20.498789	11	3542000	89073	92411	3.7	4508.0
Polygon						37.251697	12	3528000	104670	107812	3	2894.0
Polygon						4.011408	13	3546000	15085	16147	7	4025.0
Polygon						454.166279	14	3524000	375229	439256	17.1	967.0
Polygon						451.624135	15	3525000	490268	504559	0	1117.0
Polygon						21.827009	16	3512000	125915	130474	3.6	5977.0
Polygon						17.465584	17	3540000	59701	59325	-0.6	3396.0
Polygon						24.370561	18	3516000	69179	74561	7.8	3059.0
Polygon						0.158203	19	3560000	61802	64419	4.2	407192.0
Polygon						42.710464	20	3538000	126971	128204	1	3001.0
Polygon						21.410541	21	3509000	62495	63785	2.1	2979.0
Polygon						29.61214	22	3507000	96606	99206	2.7	3350.0
Polygon						14.601942	23	3511000	39461	40542	2.7	2776.0
Polygon						2.75015	24	3551000	12679	13090	3.2	4759.0
Polygon						127.318029	25	3539000	403185	422333	4.7	3317.0
Polygon						14.796773	26	3544000	53106	57563	8.4	3890.0
Polygon						230.518777	27	3526000	410574	427421	4.1	1854.0
Polygon						4.962652	28	3548000	82910	84688	2.1	17065.0
Polygon	3514	Northumberland	CTY	35	Ontario	42.5456	29	3514000	77497	80963	4.5	1902.0
Polygon	3506	Ottawa	CDR	35	Ontario	292.329373	30	3506000	774072	812129	4.9	2778.0
Polygon	3532	Oxford	CTY	35	Ontario	50.383925	31	3532000	99270	102756	3.5	2039.0
Polygon	3549	Parry Sound	DIS	35	Ontario	4.436979	32	3549000	39665	40918	3.2	9222.0
Polygon	3521	Peel	RM	35	Ontario	933.197843	33	3521000	988958	1159405	17.2	1242.0
Polygon	3531	Perth	CTY	35	Ontario	33.51229	34	3531000	73675	74344	0.9	2218.0
Polygon	3515	Peterborough	CTY	35	Ontario	34.968508	35	3515000	125856	133080	5.7	3805.0
Polygon	3502	Prescott and Russell	UC	35	Ontario	40.06836	36	3502000	76446	80184	4.9	2001.0
Polygon	3513	Prince Edward	CDR	35	Ontario	24.278668	37	3513000	24901	25496	2.4	1050.0
Polygon	3559	Rainy River	DIS	35	Ontario	1.393659	38	3559000	22109	21564	-2.5	15472.0
Polygon	3547	Renfrew	CTY	35	Ontario	13.175596	39	3547000	95138	97545	2.5	7403.0

Field Calculator

Fields:

- Ontario_CD.FID
- Ontario_CD.CDUID
- Ontario_CD.CDNAME
- Ontario_CD.CDTYPE
- Ontario_CD.PRUID
- Ontario_CD.PRNAME
- Ontario_CD.PopDen
- OnCDdata.OID
- OnCDdata.GEOCODE
- OnCDdata.Field_1
- OnCDdata.Field_2
- OnCDdata.Field_3

Type:

Number
 String
 Date

Functions:

- Abs ()
- Atn ()
- Cos ()
- Exp ()
- Fix ()
- Int ()
- Log ()
- Sin ()
- Sqr ()

Ontario_CD.PopDen = Advanced

[OnCDdata.Field_2] / [OnCDdata.Field_4]

Calculate selected records only

Buttons: Load..., Save..., Help, OK, Cancel

Map Classification

- Equal Interval
- Defined Interval
- Quantile
- Natural Breaks
- Geometrical Interval
- Standard Deviation
- Manual

Intervals

- Equal Interval
 - You set number of classes
 - SW calculates size of class
 - best applied to familiar data ranges: %, temp
- Defined Interval
 - You set the size of the class
 - SW calculates the number of classes

Quantiles

- Each class contains an equal number of features
- Quartiles, Quintiles
- Good for linearly distributed data
- Caution
 - Similar features can be placed in adjacent classes, or
 - features with widely different values can be put in the same class.
 - minimize this distortion by increasing the number of classes.

Natural Breaks

- natural groupings inherent in the data
 - group similar values and
 - maximize the differences between classes

Geometrical Interval

- class breaks are based on class intervals that have a geometrical series.
- “algorithm creates geometrical intervals by minimizing the square sum of element per class. This ensures that each class range has approximately the same number of values with each class and that the change between intervals is fairly consistent.” ESRI ArcMap Help file

Standard Deviation

- how much a feature's attribute value varies from the mean
- Arc calc mean and std dev
- + / -

Manual

- Use the histogram
- Necessary when there is significance to class breaks



er: Ontario_CD [Zoom: 100]

- Layers
- E:\GEOG2017\Data\GEOG2
- Ontario_CD
- E:\GEOG2017\Data\GEOG2
- OnCDdata

Classification

Classification Method: Manual

Classes: 7

Data Exclusion: Exclusion ... Sampling ...

Columns: 100 Show Std. Dev. Show Mean

Classification Statistics

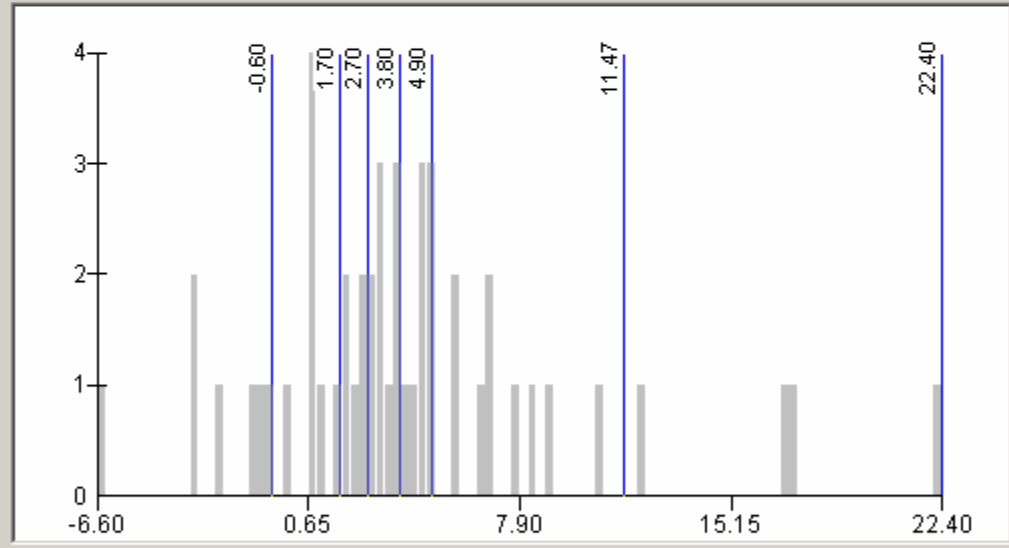
Count:	49
Minimum:	-6.60
Maximum:	22.40
Sum:	202.00
Mean:	4.12
Median:	3.50
Standard Deviation:	5.17

Break Values %

-0.60
1.70
2.70
3.80
4.90
11.47
22.40

Snap breaks to data values

OK Cancel



lay Source Selection

