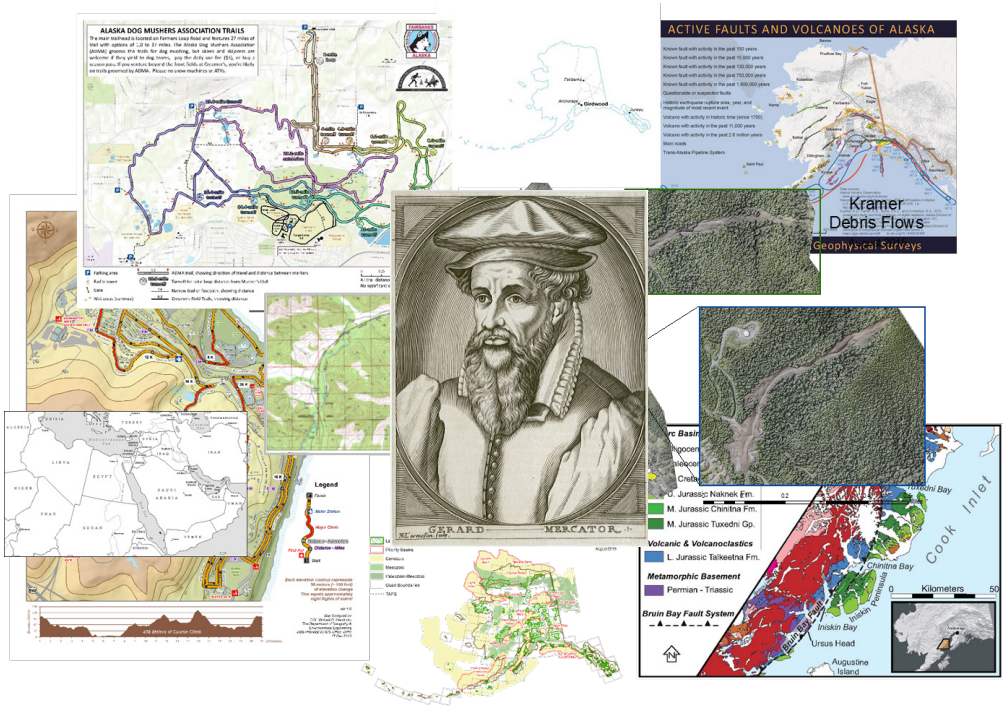
Fundamentals of Effective Visual Communications

making better <u>maps</u>, graphics, and presentations

Mike Hendricks &
Trish Gallagher
DGGS

02 Dec 2015



Agenda

PART I: Fundamentals of Map Design

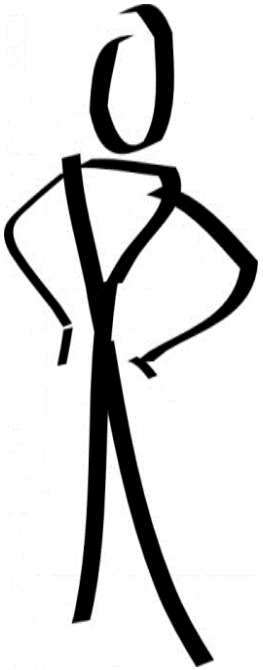
- Some Map Examples
- Fundamentals of Map Design
- Page Layout Design Considerations

PART II: Symbolizing to Make a Point

- Understanding Color
- Symbolizing Features

PART III: Generalizing and Labeling

- Generalizing Features
- Labeling and Text



What is Map?

Characteristics of a Map

- Location, Attributes, & Time: Maps show Location and attributes (qualities or magnitudes) at a given time
- Scale: All maps are reductions
- Transformations : Maps Transform. To alter markedly the appearance or form of; i.e. to transform from a spherical shape to a flat map sheet or computer screen
- Abstractions: Maps can classify, simplify, and exaggerate to communicate a message
- Symbolism: All maps use symbols to stand for elements of reality.

Cartography:

Science, art, and technology of map making and map use

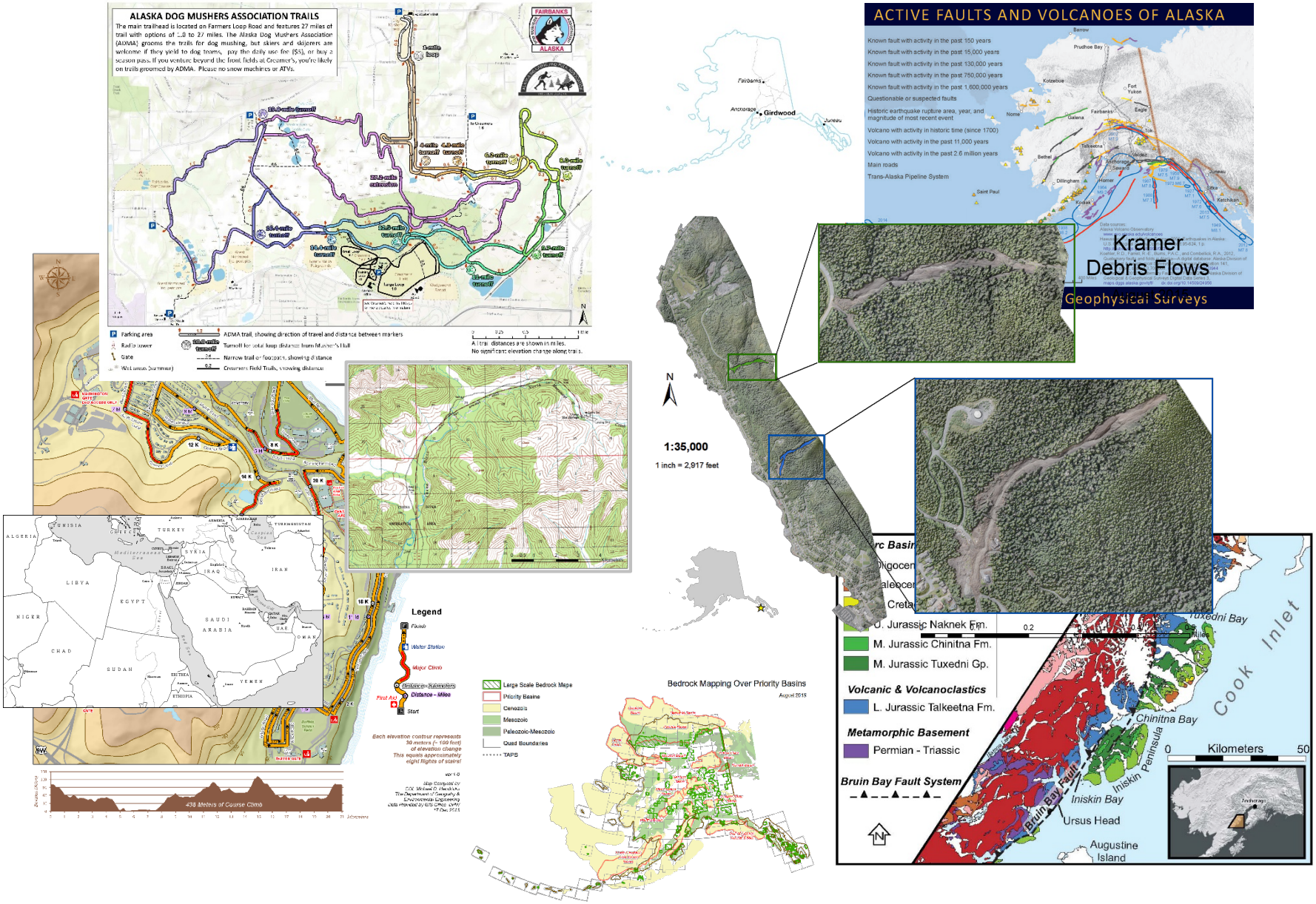
Robinson

GeoVisualization

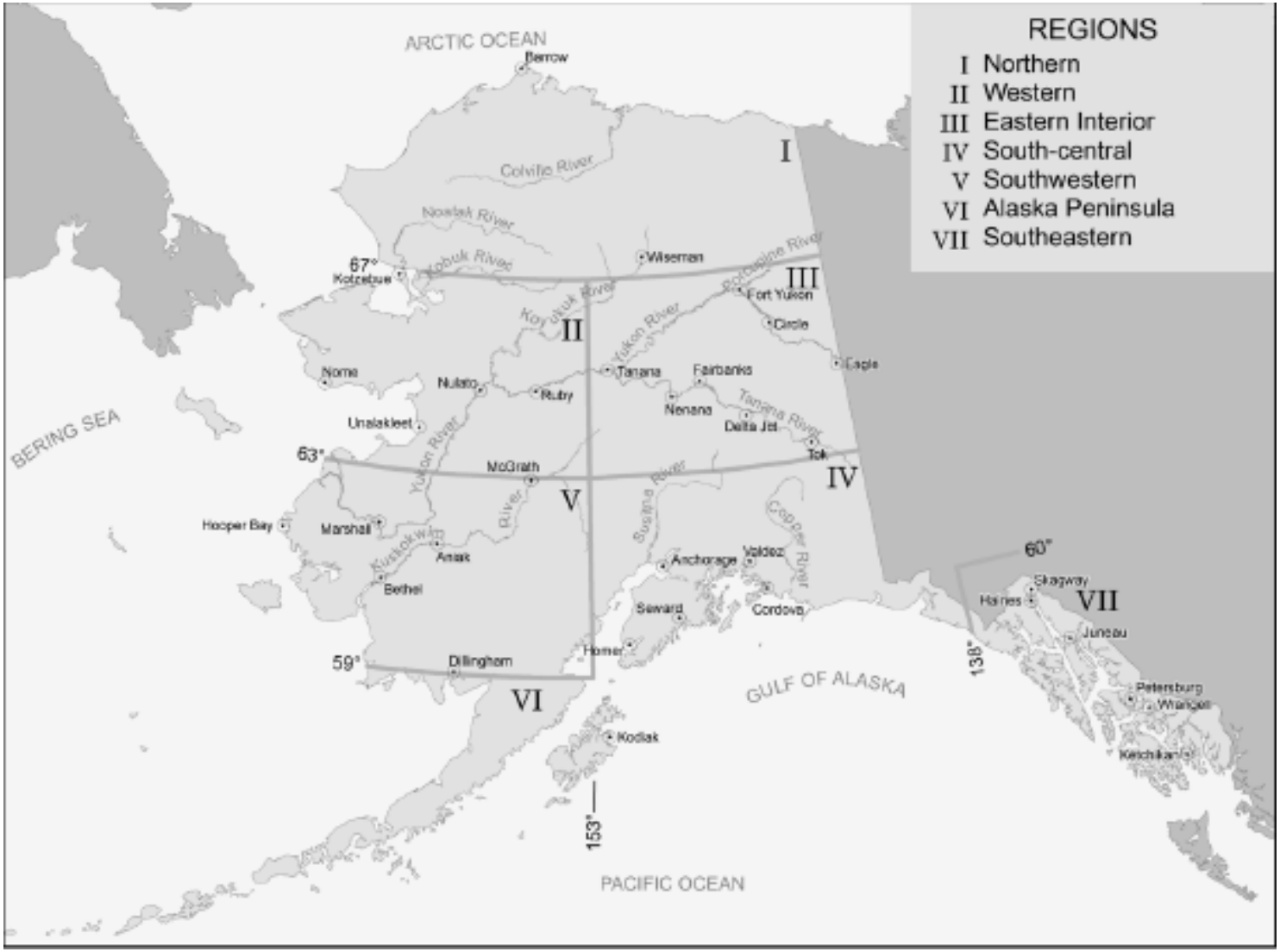
Creation and Use of Visual Representations to Facilitate Thinking, Understanding, and Knowledge Constructions about Human and physical Environments at Geographic's Scales of Measurements

MacEachren

Some Maps


ALASKA DOG MUSHERS ASSOCIATION TRAILS
The main trailhead is located on Farmers Loop Road and features 27 miles of trail with options of 1.0 to 27 miles. The Alaska Dog MuSHers Association (ADMA) grooms the trails for dog mushing, but skiers and dejorers are welcome if they yield to dog teams, pay the daily use fee ($5), or buy a season pass. If you venture beyond the front fields at Creamer's, you're likely on trails groomed by ADMA. Please no snow machines or ATVs.
FAIRBANKS
ALASKA
Parking area
Radio tower
Gate
Wetlands (Summer)
ADMA trail, showing direction of travel and distance between markers
Turnoff for total loop distance from Musher's Hull
Narrow trail or footpath, showing distance
Creamers Field Trails, showing distance
All trail distances are shown in miles.
No significant elevation change along trails.
Legend
Finish
Water Station
Major Climb
Distance - Kilometers
Distance - Miles
Start
Each elevation contour represents 30 meters (~ 100 feet) of elevation change
This equals approximately eight flights of stairs!
Large Scale Bedrock Maps
Priority Basins
Cenozoic
Mesozoic
Paleozoic-Mesozoic
Quad Boundaries
TAPS
Bedrock Mapping Over Priority Basins
August 2015
ACTIVE FAULTS AND VOLCANOES OF ALASKA
Known fault with activity in the past 150 years
Known fault with activity in the past 15,000 years
Known fault with activity in the past 130,000 years
Known fault with activity in the past 750,000 years
Known fault with activity in the past 1,600,000 years
Questionable or suspected faults
Historic earthquake rupture area, year, and magnitude of most recent event
Volcano with activity in historic time (since 1700)
Volcano with activity in the past 11,000 years
Volcano with activity in the past 2.6 million years
Main roads
Trans-Alaska Pipeline System
Kramer
Debris Flows
Geophysical Surveys
1:35,000
1 inch = 2,917 feet
M. Jurassic Naknek Fm.
M. Jurassic Chinitna Fm.
M. Jurassic Tuxedni Gp.
Volcanic & Volcanoclastics
L. Jurassic Talkeetna Fm.
Metamorphic Basement
Permian - Triassic
Bruin Bay Fault System
Cook Inlet
Tuxedni Bay
Chinitna Bay
Iniskin Peninsula
Iniskin Bay
Ursus Head
Augustine Island
Kilometers
0
50

Fairbanks
Anchorage
Girdwood
Juneau

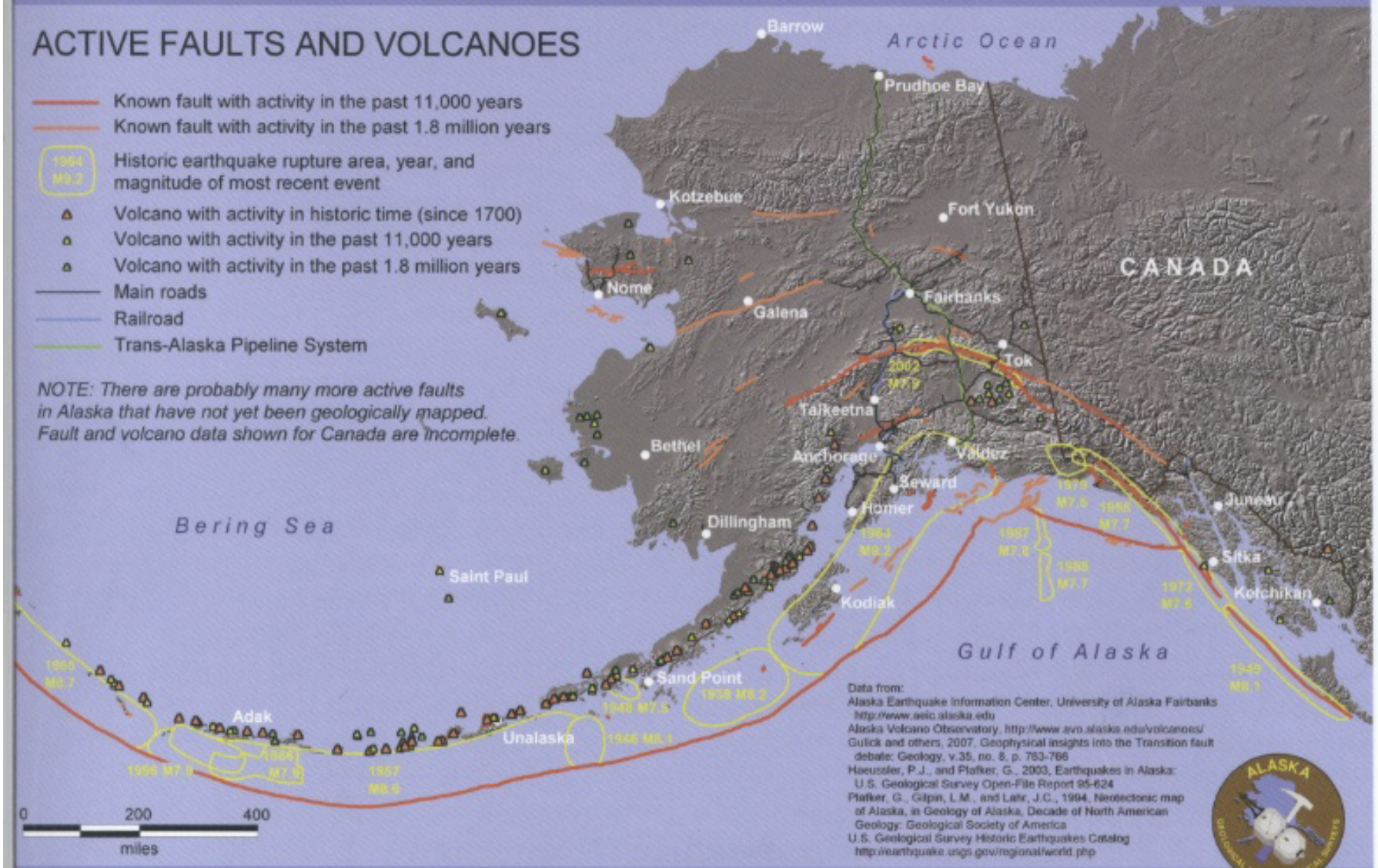

REGIONS
I Northern
II Western
III Eastern Interior
IV South-central
V Southwestern
VI Alaska Peninsula
VII Southeastern
ARCTIC OCEAN
Barrow
Colville River
Noatak River
Kobuk River
Koyukuk River
Wiseman
Porcupine River
Fort Yukon
Circle
Eagle
Yukon River
Tanana
Fairbanks
Nenana
Tanana River
Delta Jct
Tok
Kotzebue
67°
Nome
Nulato
Ruby
Unalakleet
BERING SEA
63°
McGrath
Susitna River
Copper River
Hooper Bay
Marshall
Kuskokwim River
Aniak
Bethel
Anchorage
Valdez
Seward
Cordova
Homer
59°
Dillingham
GULF OF ALASKA
Kodiak
153°
PACIFIC OCEAN
60°
Skagway
Haines
Juneau
138°
Petersburg
Wrangell
Ketchikan
I
II
III
IV
V
VI
VII

ALASKA

ACTIVE FAULTS AND VOLCANOES

- Known fault with activity in the past 11,000 years
- Known fault with activity in the past 1.8 million years
- 1964 M9.2 — Historic earthquake rupture area, year, and magnitude of most recent event
- Volcano with activity in historic time (since 1700)
- Volcano with activity in the past 11,000 years
- Volcano with activity in the past 1.8 million years
- Main roads
- Railroad
- Trans-Alaska Pipeline System

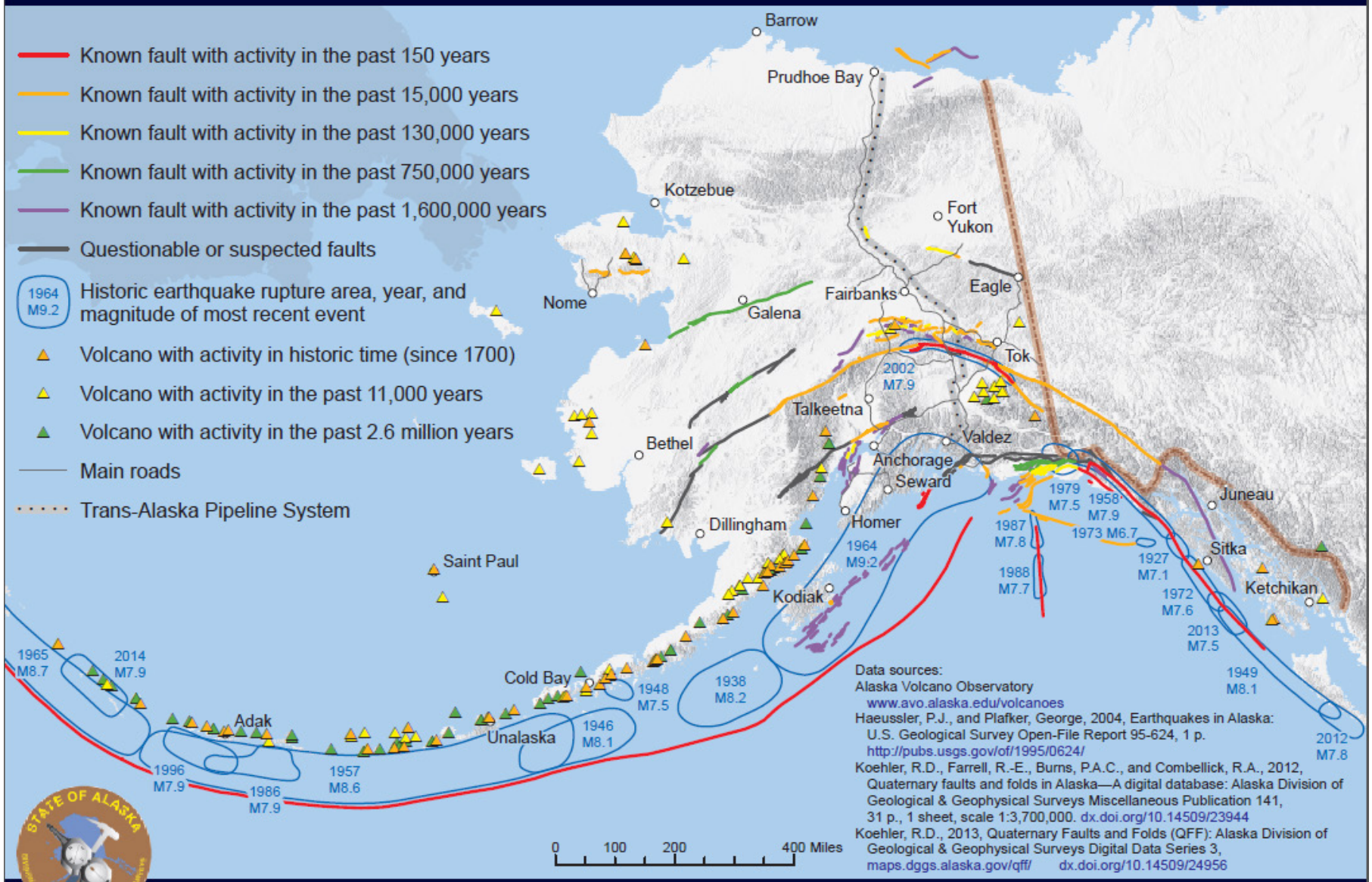
NOTE: There are probably many more active faults in Alaska that have not yet been geologically mapped. Fault and volcano data shown for Canada are incomplete.



Data from:
Alaska Earthquake Information Center, University of Alaska Fairbanks http://www.aeic.alaska.edu
Alaska Volcano Observatory, http://www.avo.alaska.edu/volcanoes/
Gulick and others, 2007, Geophysical insights into the Transition fault debate: Geology, v.35, no. 8, p. 763-766
Haeussler, P.J., and Plafker, G., 2003, Earthquakes in Alaska: U.S. Geological Survey Open-File Report 95-624
Plafker, G., Gilpin, L.M., and Lahr, J.C., 1994, Neotectonic map of Alaska, in Geology of Alaska, Decade of North American Geology: Geological Society of America
U.S. Geological Survey Historic Earthquakes Catalog http://earthquake.usgs.gov/regional/world.php

Division of Geological & Geophysical Surveys

ACTIVE FAULTS AND VOLCANOES OF ALASKA

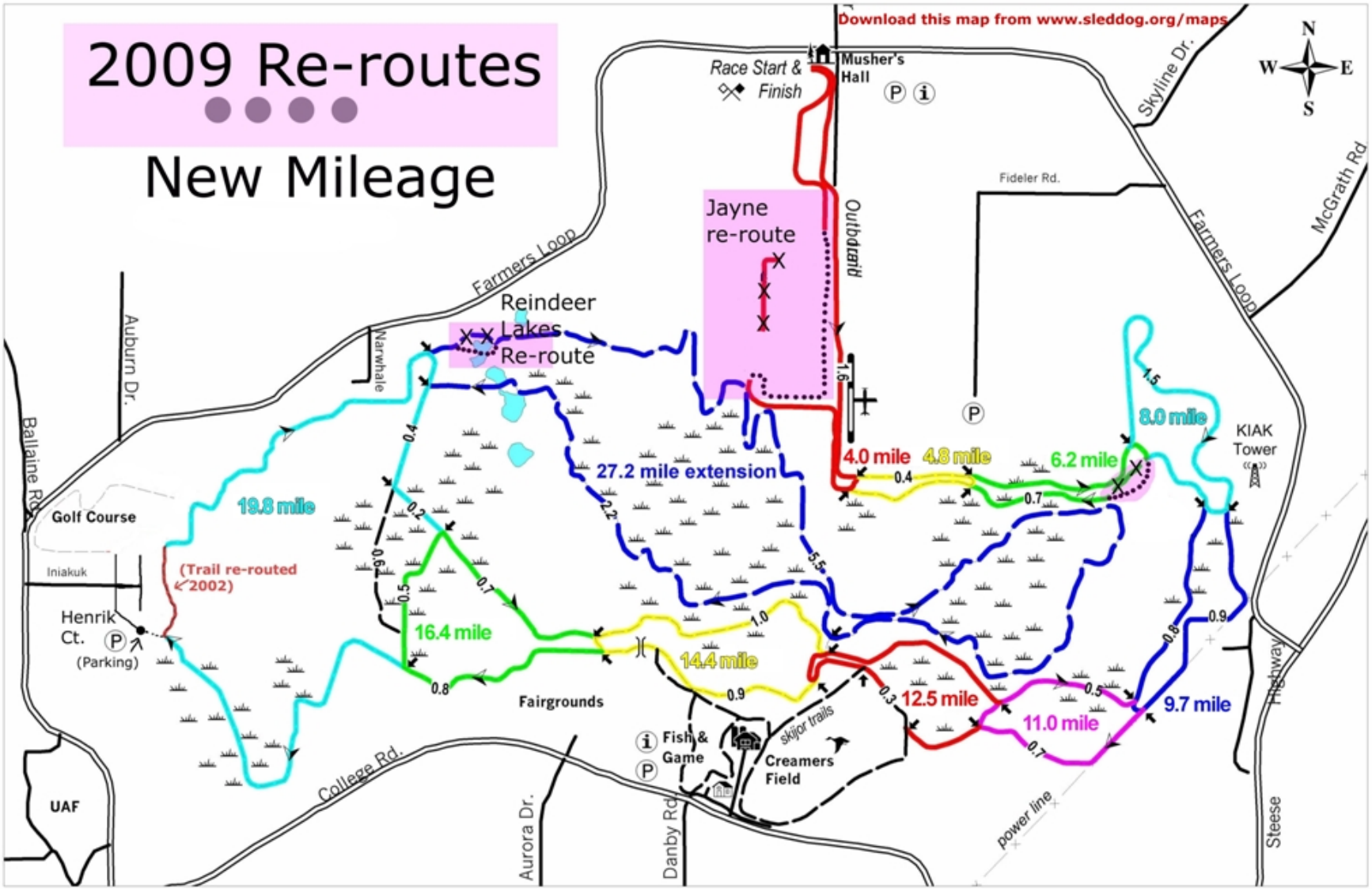


Division of Geological & Geophysical Surveys

8.00 x 6.00 in

2009 Re-routes

New Mileage



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Trails mapped using differentially corrected GPS in March of 1999.

0 0.5 1 MILES

12 mile Total loop distance from Mushers Hall

0.7 Mileage between trail junctions

Direction of travel

Trail Information

Trail Parking

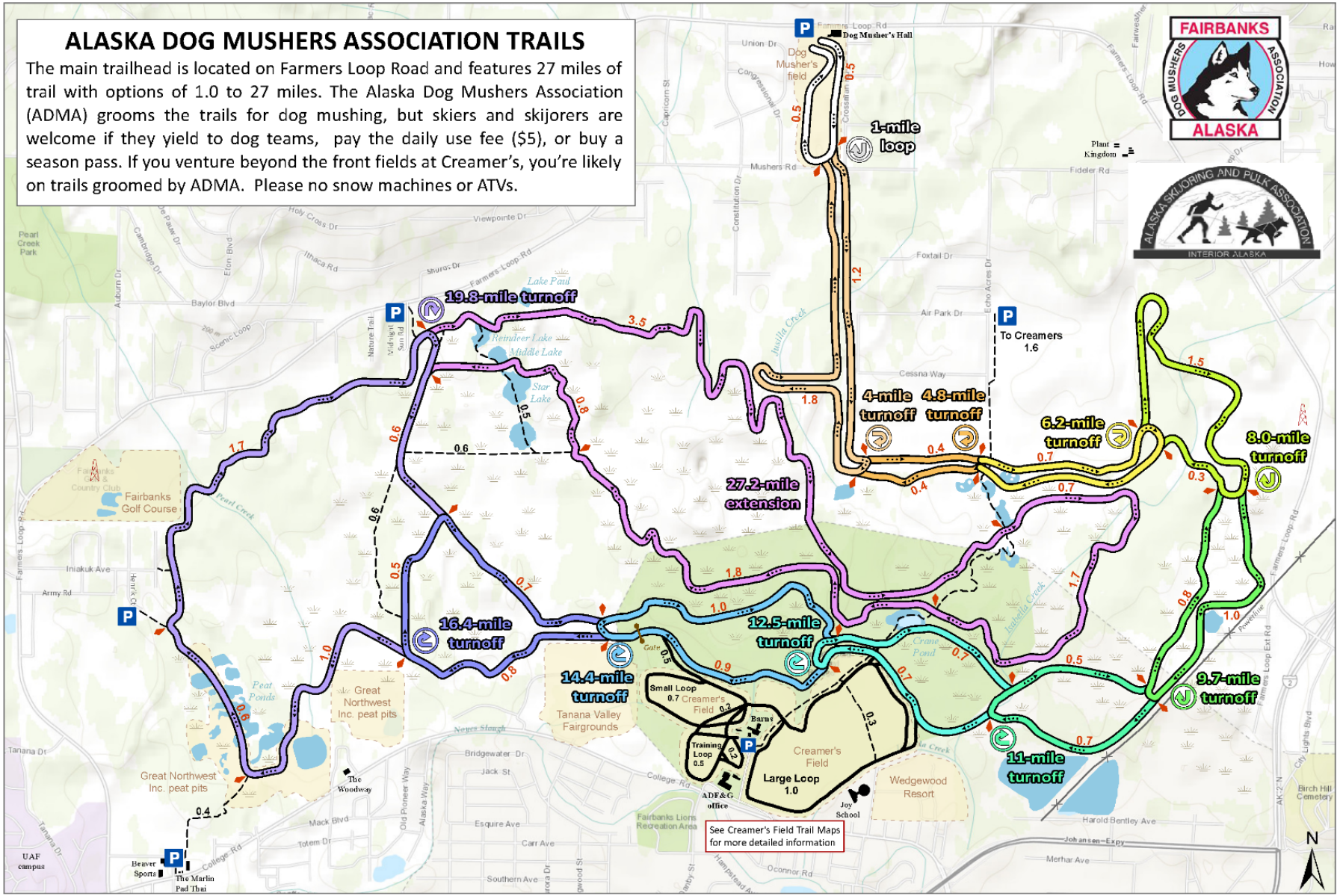
Gate

GPS surveying and map production by:

NAI ALASKA
Northern Associates, Inc
1831 Musk Ox Trail
Fairbanks, AK 99708
(907) 479-4312
carls@gci.net

ALASKA DOG MUSHERS ASSOCIATION TRAILS

The main trailhead is located on Farmers Loop Road and features 27 miles of trail with options of 1.0 to 27 miles. The Alaska Dog Mushers Association (ADMA) grooms the trails for dog mushing, but skiers and skijorers are welcome if they yield to dog teams, pay the daily use fee ($5), or buy a season pass. If you venture beyond the front fields at Creamer's, you're likely on trails groomed by ADMA. Please no snow machines or ATVs.

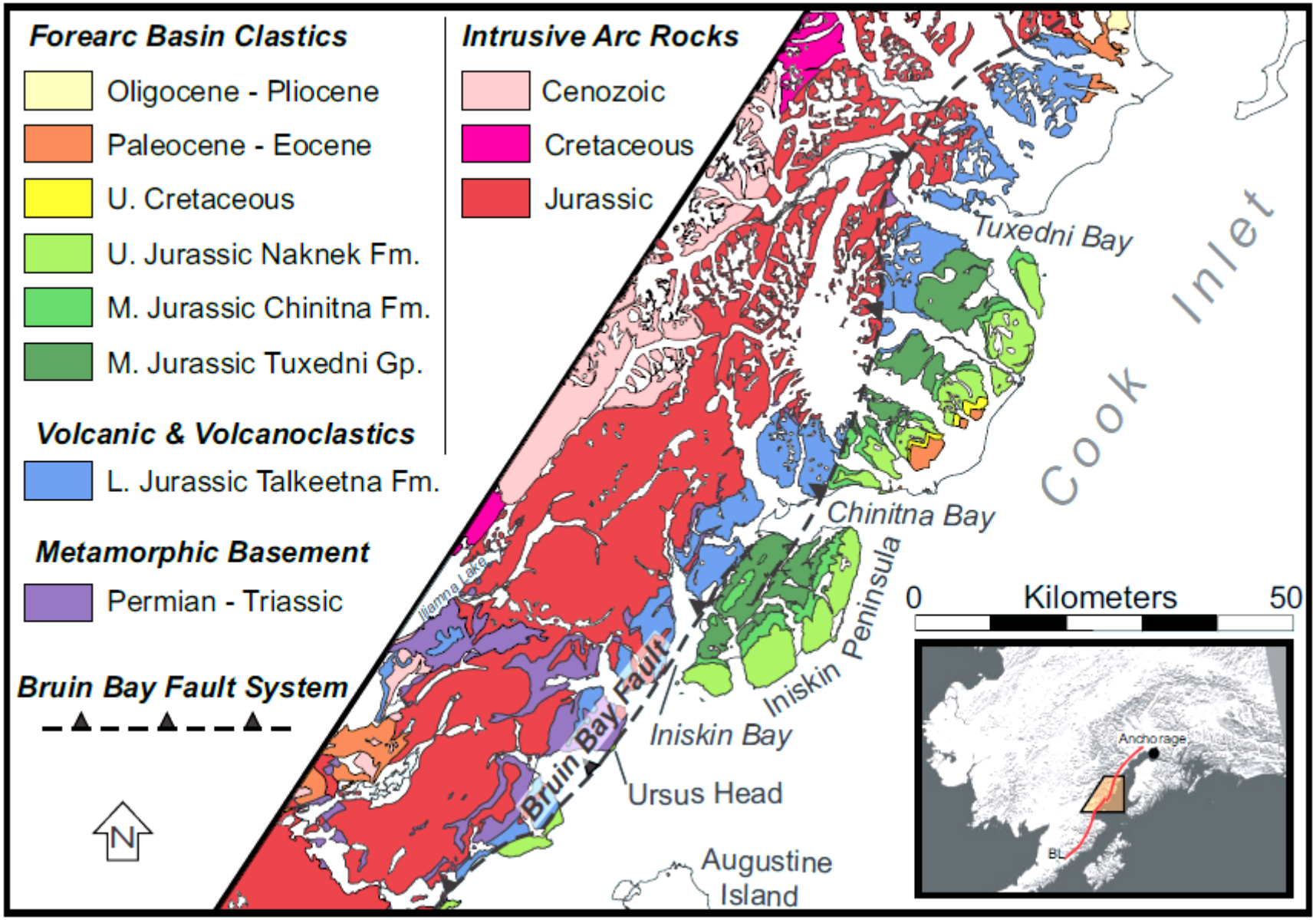


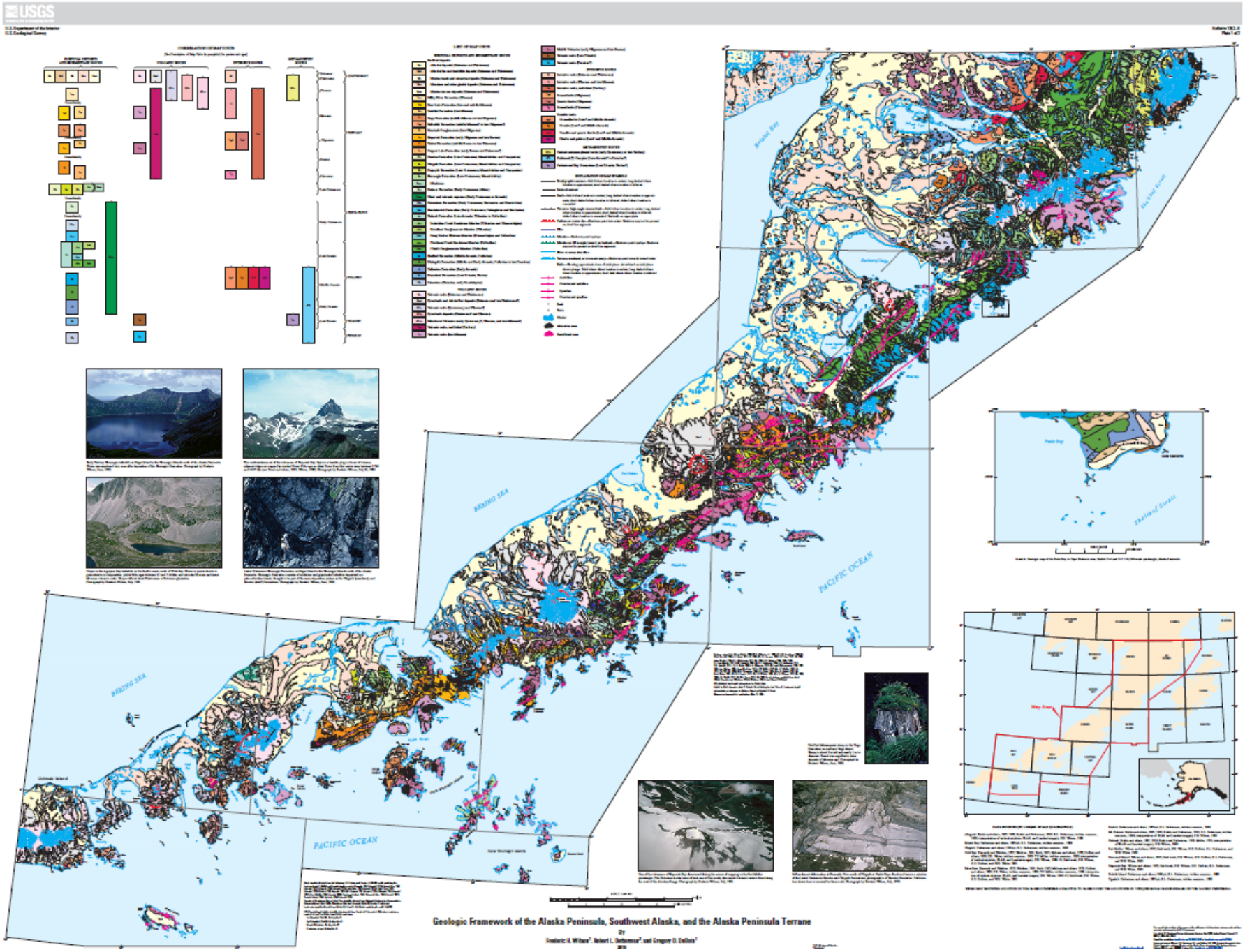
P	Parking area
	Radio tower
	Gate
	Wet areas (summer)
1.2	ADMA trail, showing direction of travel and distance between markers
10.0-mile turnoff	Turnoff for total loop distance from Musher's Hall
0.4	Narrow trail or footpath, showing distance
0.2	Creamers Field Trails, showing distance

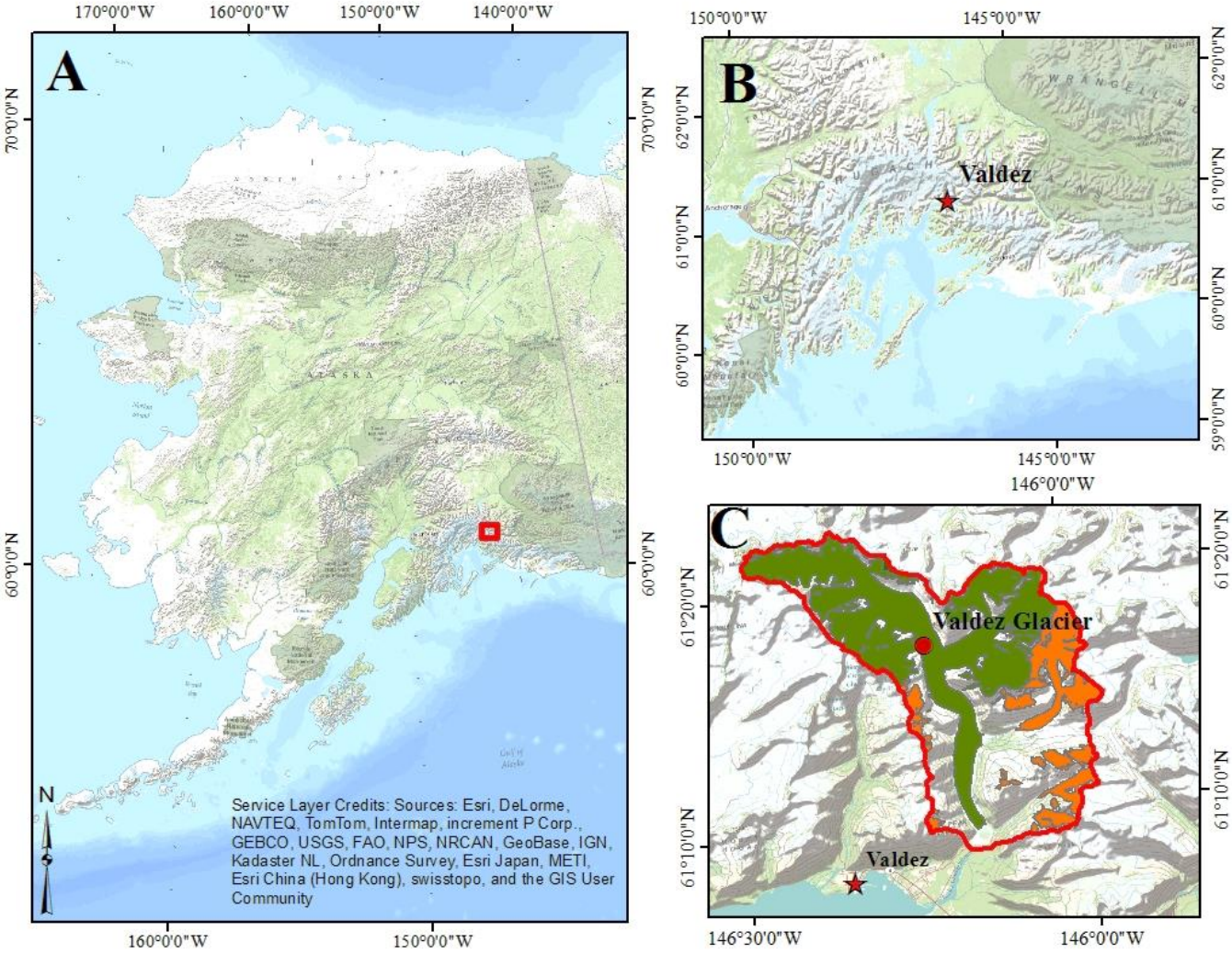
0 0.25 0.5 1 Mile

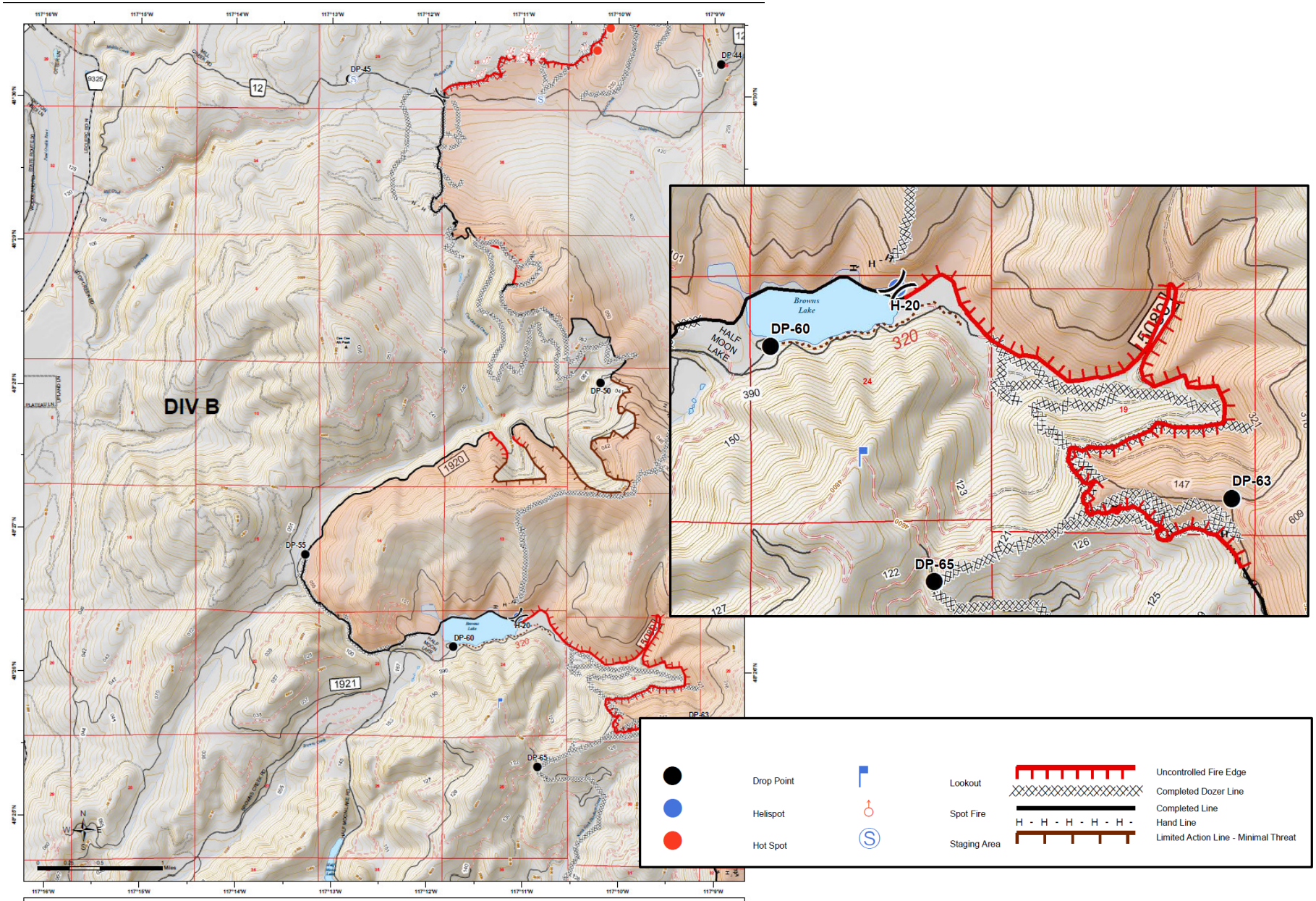
All trail distances are shown in miles.
No significant elevation change along trails.

Trails mapped using differentially corrected GPS in March of 1999 by Northern Associates, Inc. Cartography by Patricia Gallagher. Basemap from ESRI World Topo Map service.

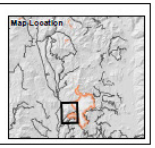

Forearc Basin Clastics
Oligocene - Pliocene
Paleocene - Eocene
U. Cretaceous
U. Jurassic Naknek Fm.
M. Jurassic Chinitna Fm.
M. Jurassic Tuxedni Gp.
Volcanic & Volcanoclastics
L. Jurassic Talkeetna Fm.
Metamorphic Basement
Permian - Triassic
Bruin Bay Fault System
N
Intrusive Arc Rocks
Cenozoic
Cretaceous
Jurassic
Tuxedni Bay
Cook Inlet
Chinitna Bay
Iniskin Peninsula
Iliamna Lake
Bruin Bay Fault
Iniskin Bay
Ursus Head
Augustine Island
0
Kilometers
50
Anchorage
BL


USGS
BERING SEA
PACIFIC OCEAN
Bristol Bay
Shelikof Strait
Geologic Framework of the Alaska Peninsula, Southwest Alaska, and the Alaska Peninsula Terrane


A
170°0'0"W
160°0'0"W
150°0'0"W
140°0'0"W
70°0'0"N
60°0'0"N
N
Service Layer Credits: Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community
B
150°0'0"W
145°0'0"W
62°0'0"N
61°0'0"N
60°0'0"N
Valdez
C
146°0'0"W
61°20'0"N
61°10'0"N
Valdez Glacier
Valdez
146°30'0"W

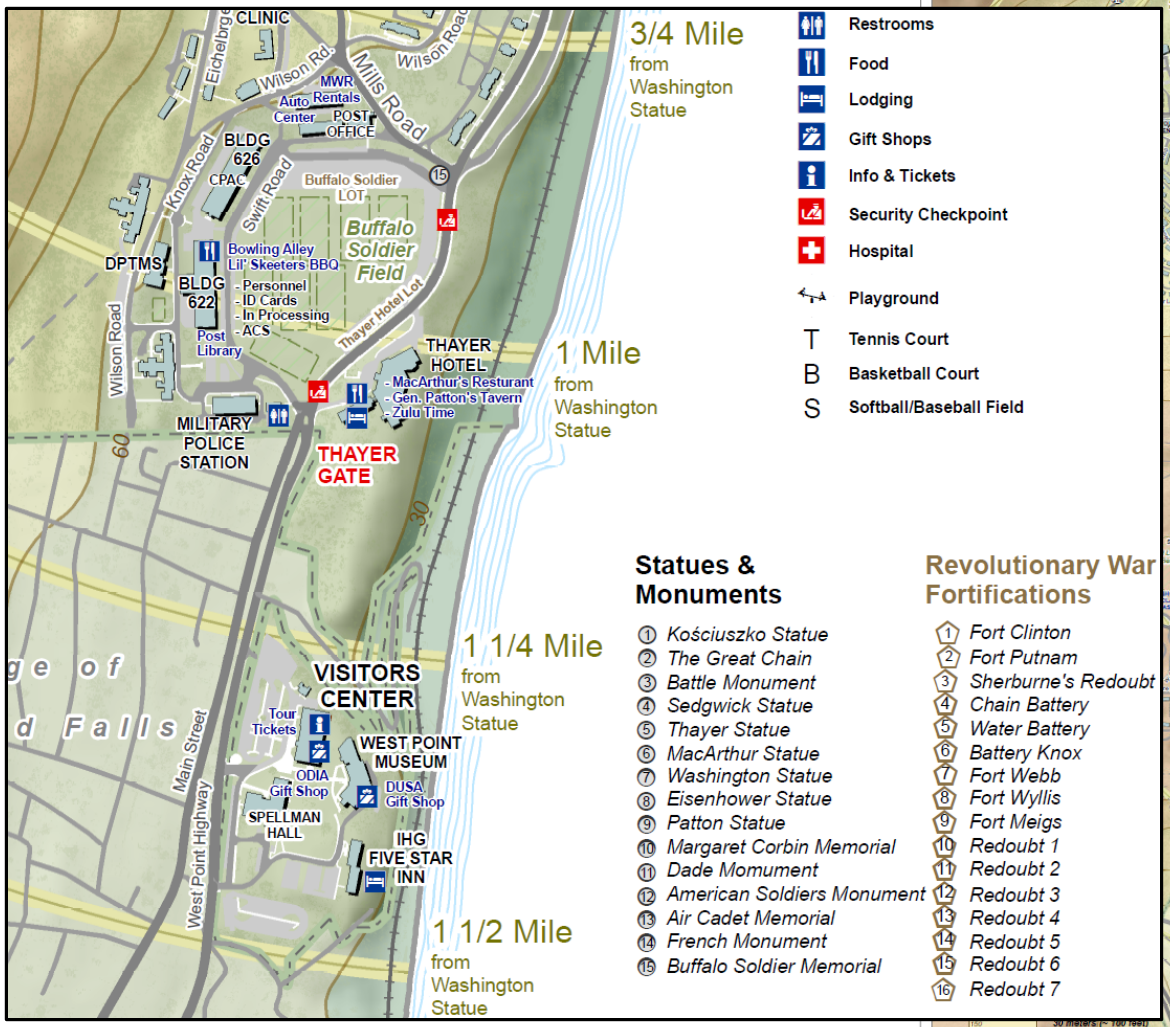


DIV B
Kaniksu Complex
WA-COF-001302
September 10, 2015



United States Military Academy
Reference Map

1:12,000



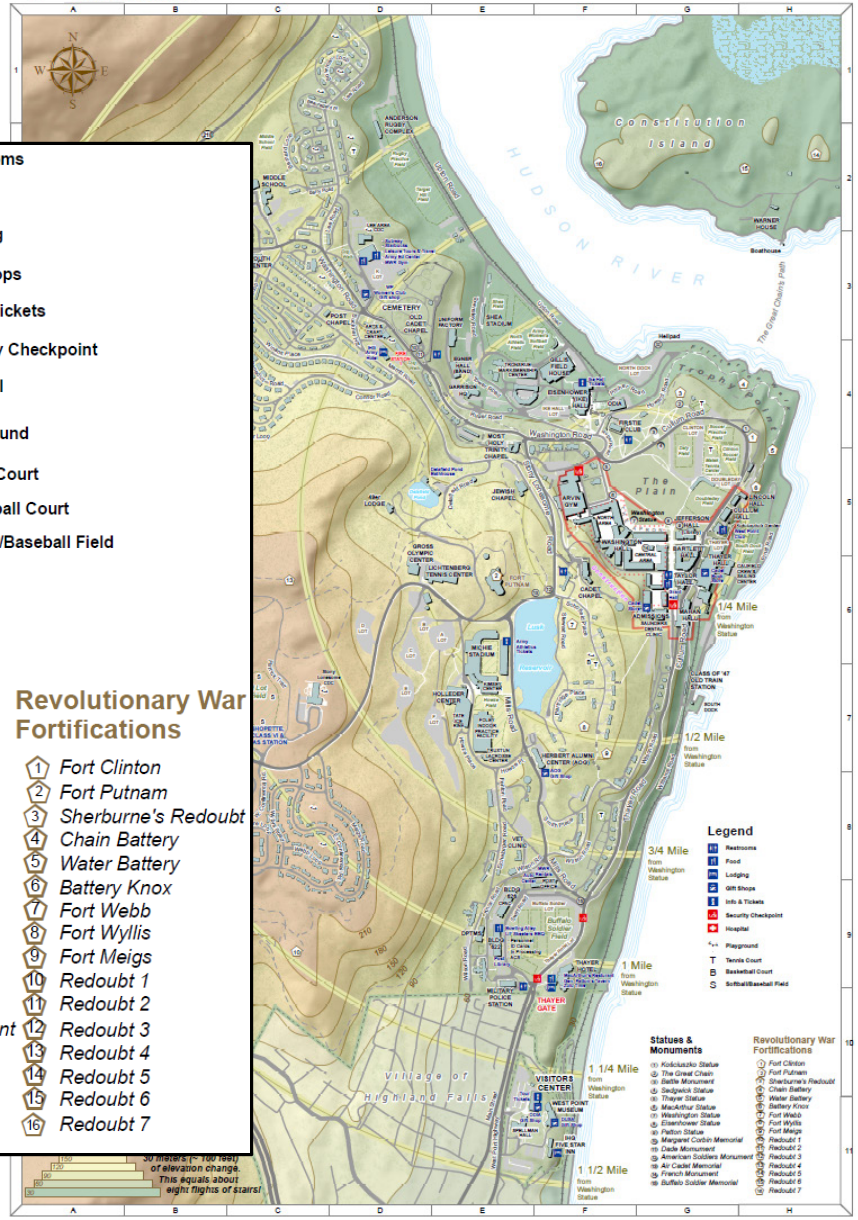
- Restrooms
- Food
- Lodging
- Gift Shops
- Info & Tickets
- Security Checkpoint
- Hospital
- Playground
- T Tennis Court
- B Basketball Court
- S Softball/Baseball Field

Statues & Monuments

1. *Kościuszko Statue*
2. *The Great Chain*
3. *Battle Monument*
4. *Sedgwick Statue*
5. *Thayer Statue*
6. *MacArthur Statue*
7. *Washington Statue*
8. *Eisenhower Statue*
9. *Patton Statue*
10. *Margaret Corbin Memorial*
11. *Dade Momument*
12. *American Soldiers Monument*
13. *Air Cadet Memorial*
14. *French Monument*
15. *Buffalo Soldier Memorial*

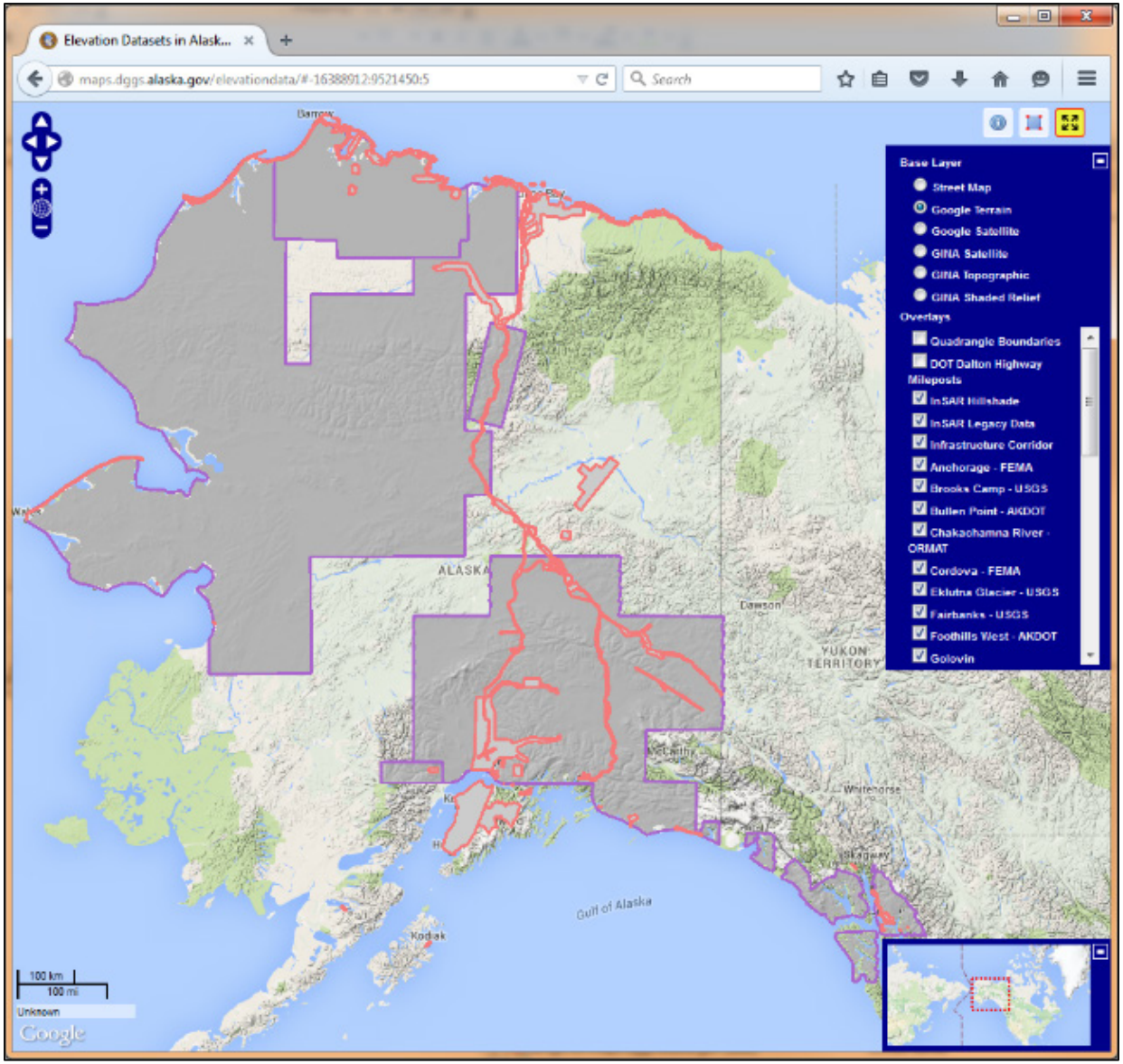
Revolutionary War Fortifications

1. *Fort Clinton*
2. *Fort Putnam*
3. *Sherburne's Redoubt*
4. *Chain Battery*
5. *Water Battery*
6. *Battery Knox*
7. *Fort Webb*
8. *Fort Wyllis*
9. *Fort Meigs*
10. *Redoubt 1*
11. *Redoubt 2*
12. *Redoubt 3*
13. *Redoubt 4*
14. *Redoubt 5*
15. *Redoubt 6*
16. *Redoubt 7*

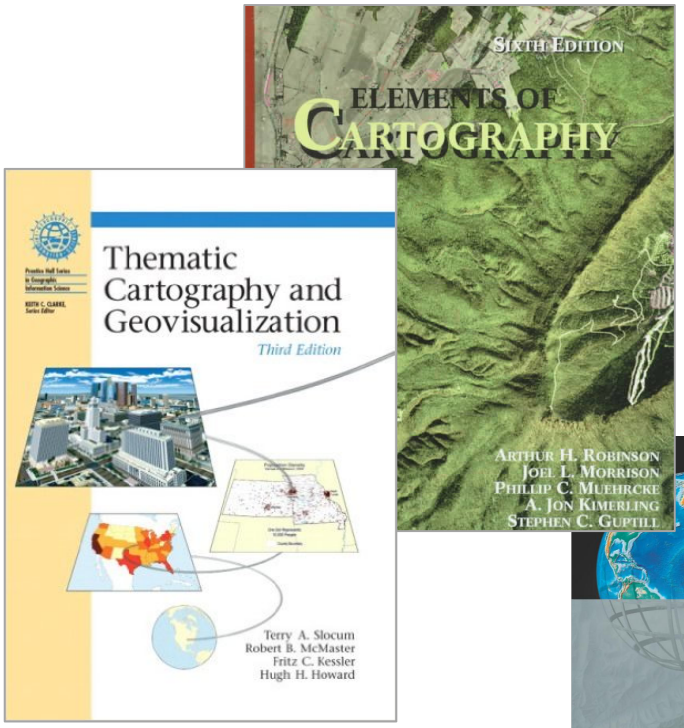


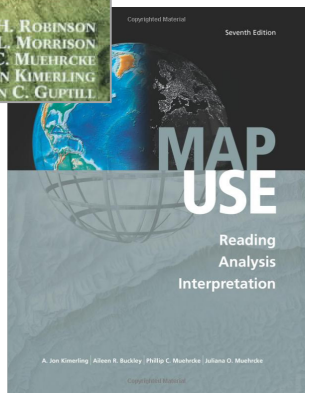
July 2014
Ver 1.0

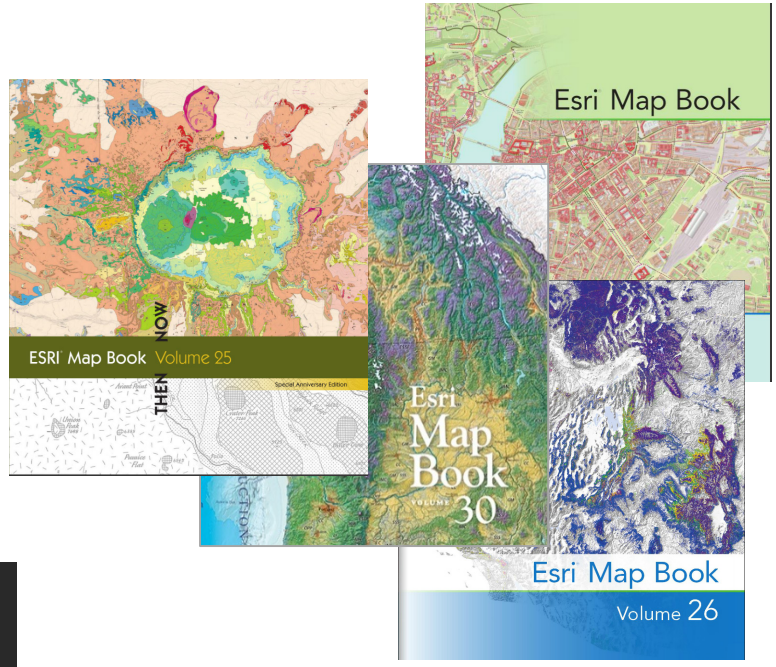
Map Designed by
COL Michael D. Hendricks
The Department of Geography & Environmental Engineering
Data Provided by GIS Office, DPW

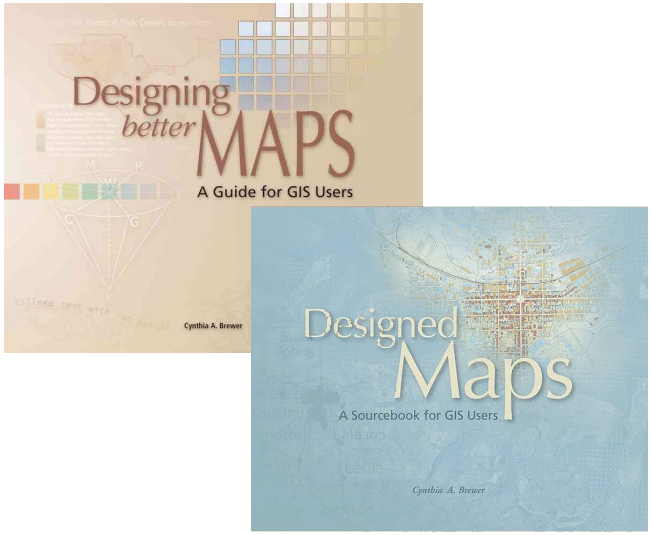

Elevation Datasets in Alask...
maps.dggs.alaska.gov/elevationdata/#-16388912:9521450:5
Search
Base Layer
Street Map
Google Terrain
Google Satellite
GINA Satellite
GINA Topographic
GINA Shaded Relief
Overlays
Quadrangle Boundaries
DOT Dalton Highway Mileposts
InSAR Hillshade
InSAR Legacy Data
Infrastructure Corridor
Anchorage - FEMA
Brooks Camp - USGS
Bullen Point - AKDOT
Chakachamna River - ORMAT
Cordova - FEMA
Eklutna Glacier - USGS
Fairbanks - USGS
Foothills West - AKDOT
Golovin
Barrow
ALASKA
Dawson
YUKON TERRITORY
Whitehorse
Skagway
Gulf of Alaska
Kodiak
100 km
100 mi
Unknown
Google

Some Cartographic References









Fundamentals of Map Design

Principles
of Map Design

- Ensure Legibility
- Ensure Visual Contrast
- Consider Figure – Ground
- Employ Visual Hierarchy
- Maintain Balance

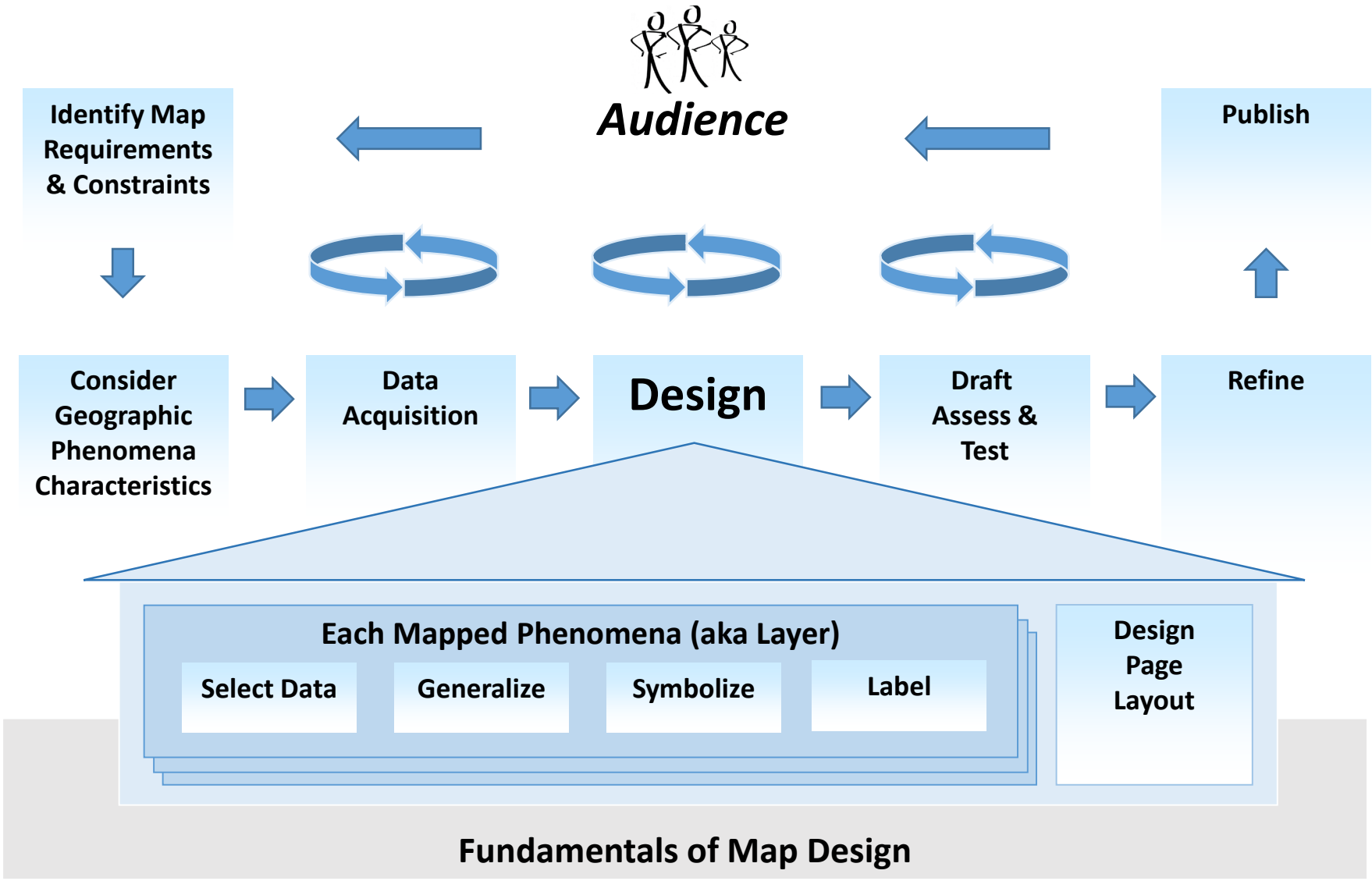
Controls
of Map Design

- Geographic Reality
- The Audience
- Purpose of Map
- Available Data
- Map Scale Options
- Conditions of Use
- Technical Limitations

Graphic Variables

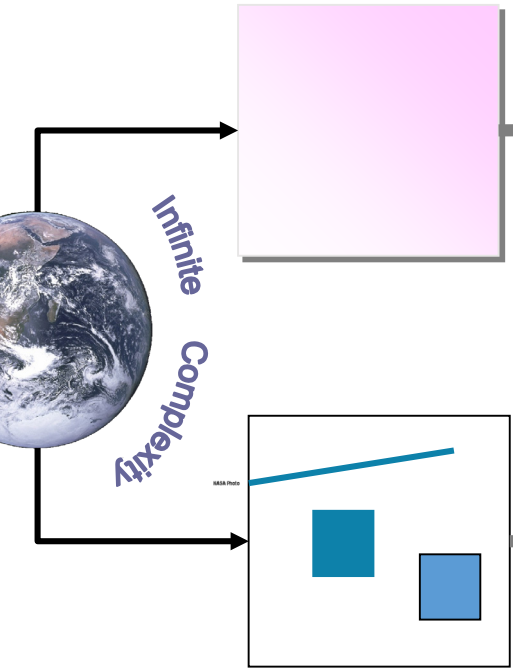
Position	Size	Shape	Color			Pattern
			Hue	Value	Saturation	

The Map Design Process



Data Models for Maps

Continuous



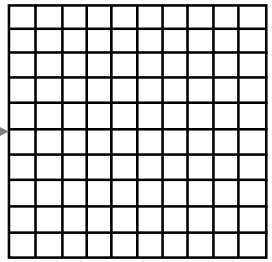
Continuous Phenomena is best represented as Raster Data

Discrete Phenomena is best represented as Vector Data

Discrete

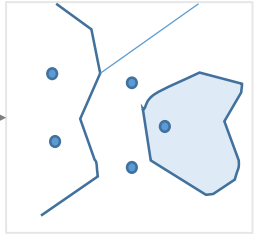
The world is empty except for the well defined objects. Discrete objects can generally be counted.

Raster



A grid of squares Rasters divide the world into arrays of cells and assign attributes to the cells

Vector



Points are connected to make Lines and Polygons to represent the location of discrete objects

Dimensionality

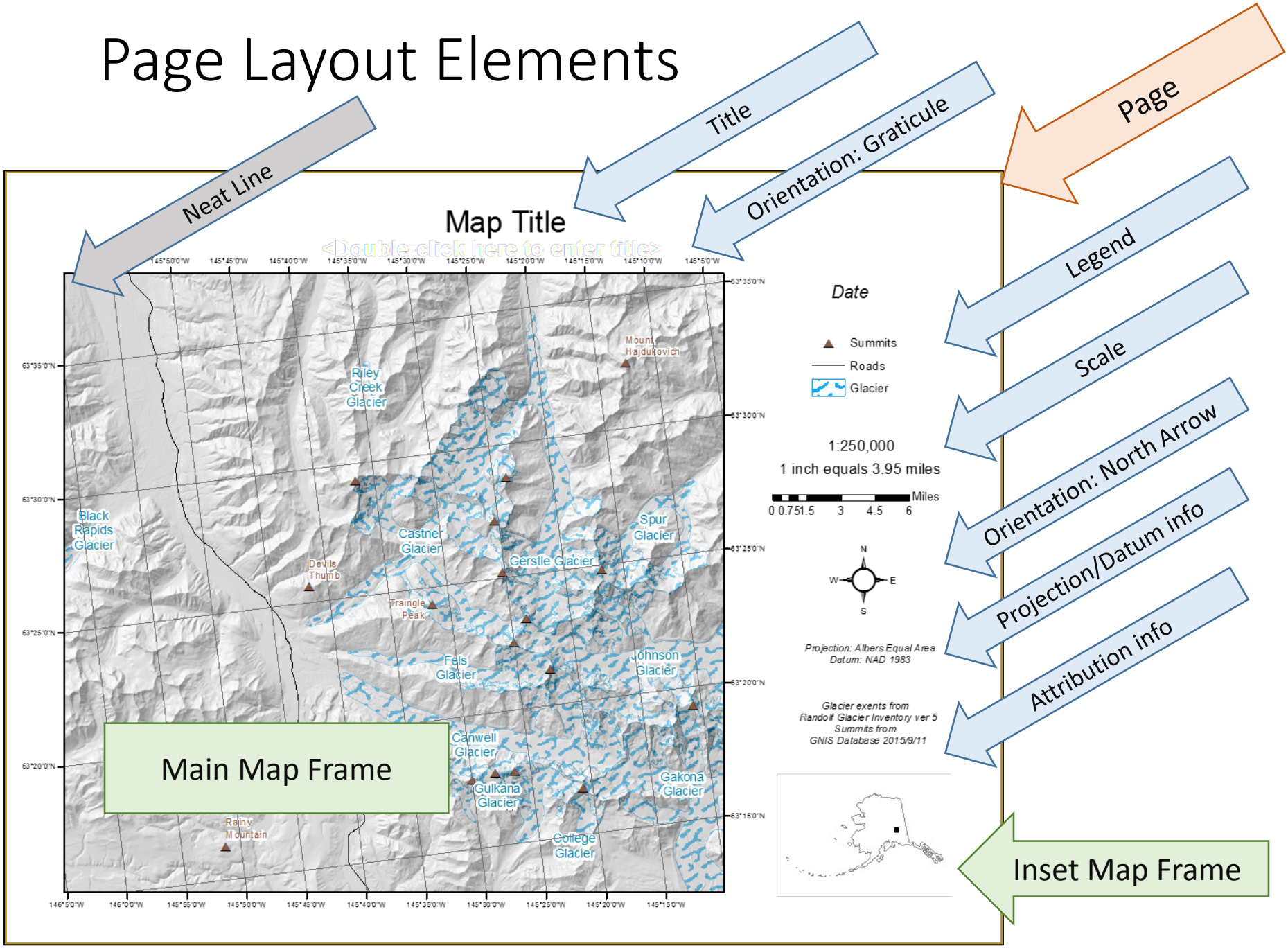
0-D → *point*

1-D → *line*

2-D → *polygon*

3-D → *volume*

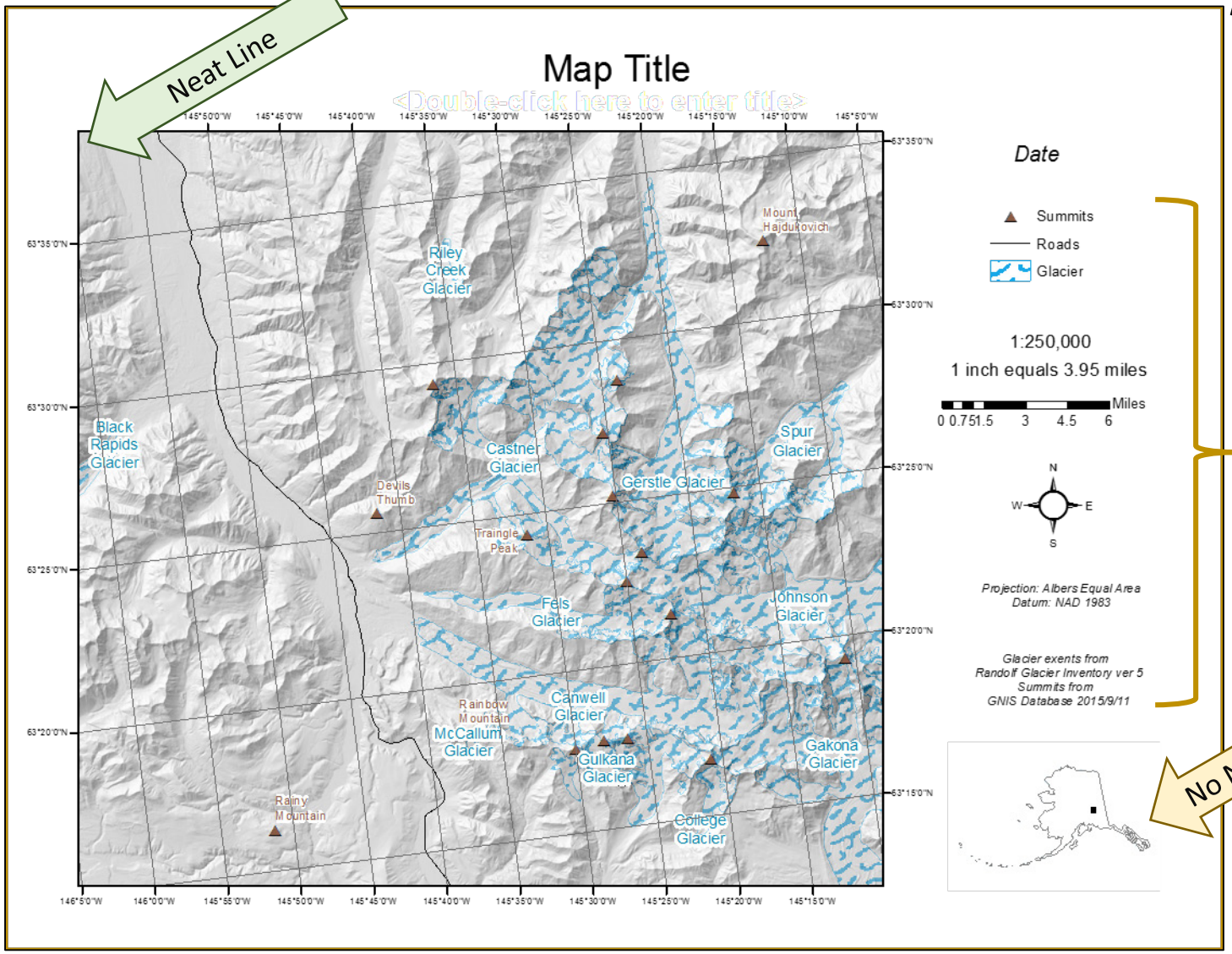
Page Layout Elements



Neat Lines & Borders – Is it a Must?

Page Neat Line?

Neat Line

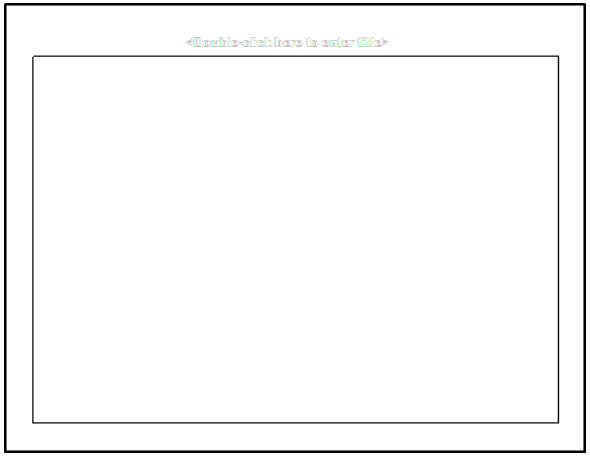


No Neat Line on this map

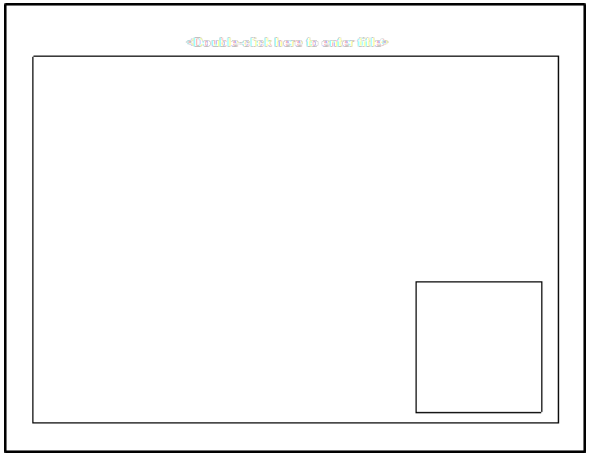
No Neat Line on this map

Common Combinations of Map Elements on the page

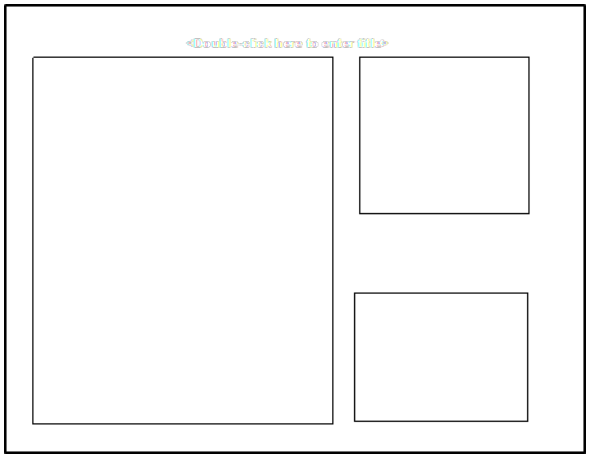
Only Primary Map Element



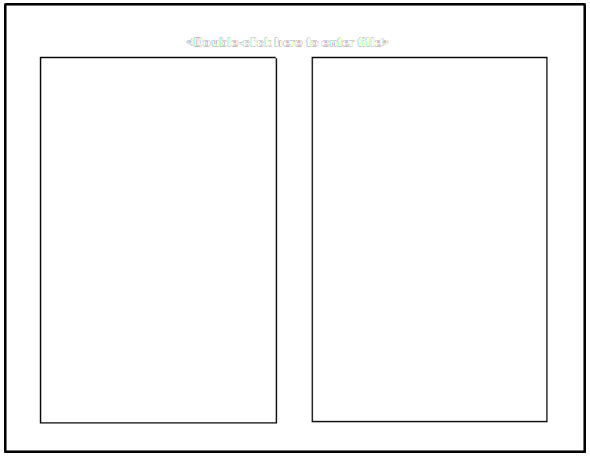
Primary Map Element with Smaller Scale Inset



Primary Map Element with Larger Scale Insets(s) to show Detail

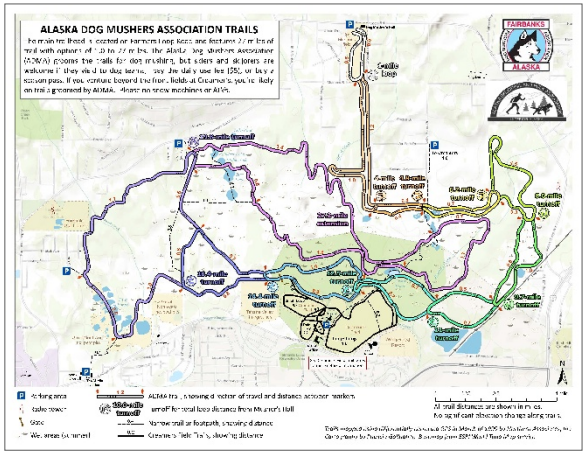


Multiple Primary Map Elements in comparison

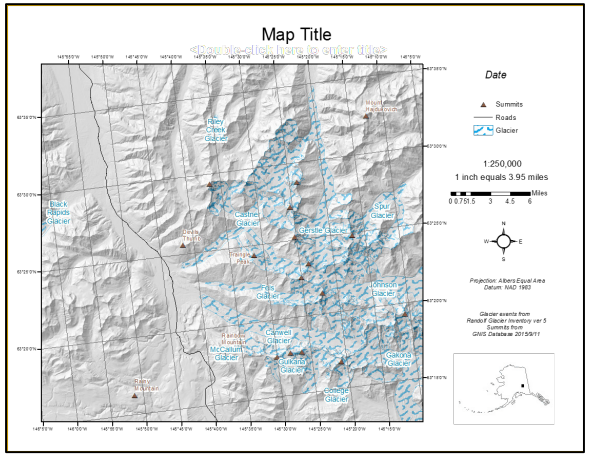


Common Combinations of Map Elements on the page

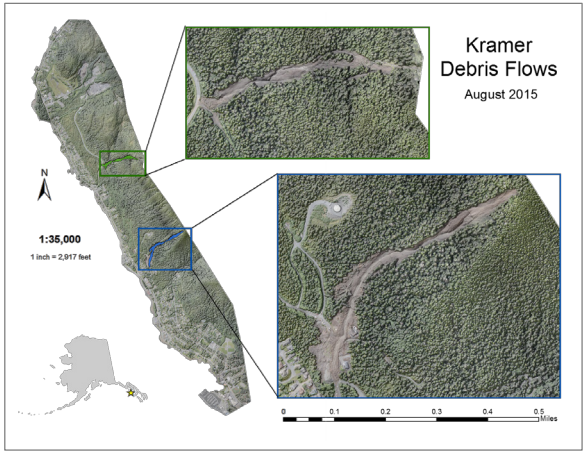
Only Primary Map Element



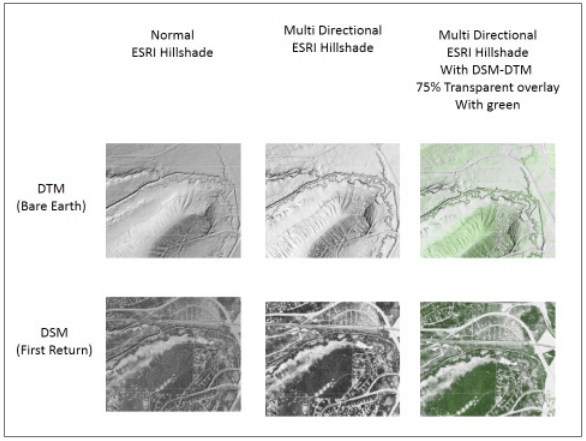
Primary Map Element with Smaller Scale Inset



Primary Map Element with Larger Scale Insets(s) to show Detail



Multiple Primary Map Elements in comparison



Break

Coming up

PART II

- **Understanding Color**
- **Symbolizing Features**

Agenda

PART I

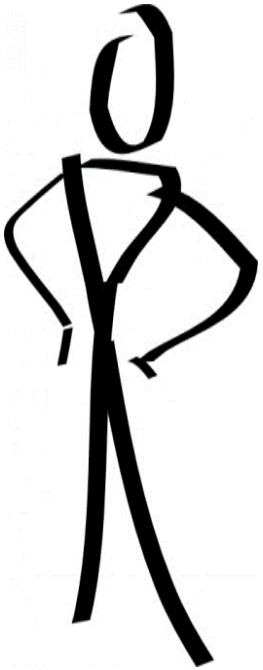
- The Map Design Process
- Fundamentals of Map Design
- Page Layout Design Considerations

PART II

- **Understanding Color**
- **Symbolizing Features**

PART III

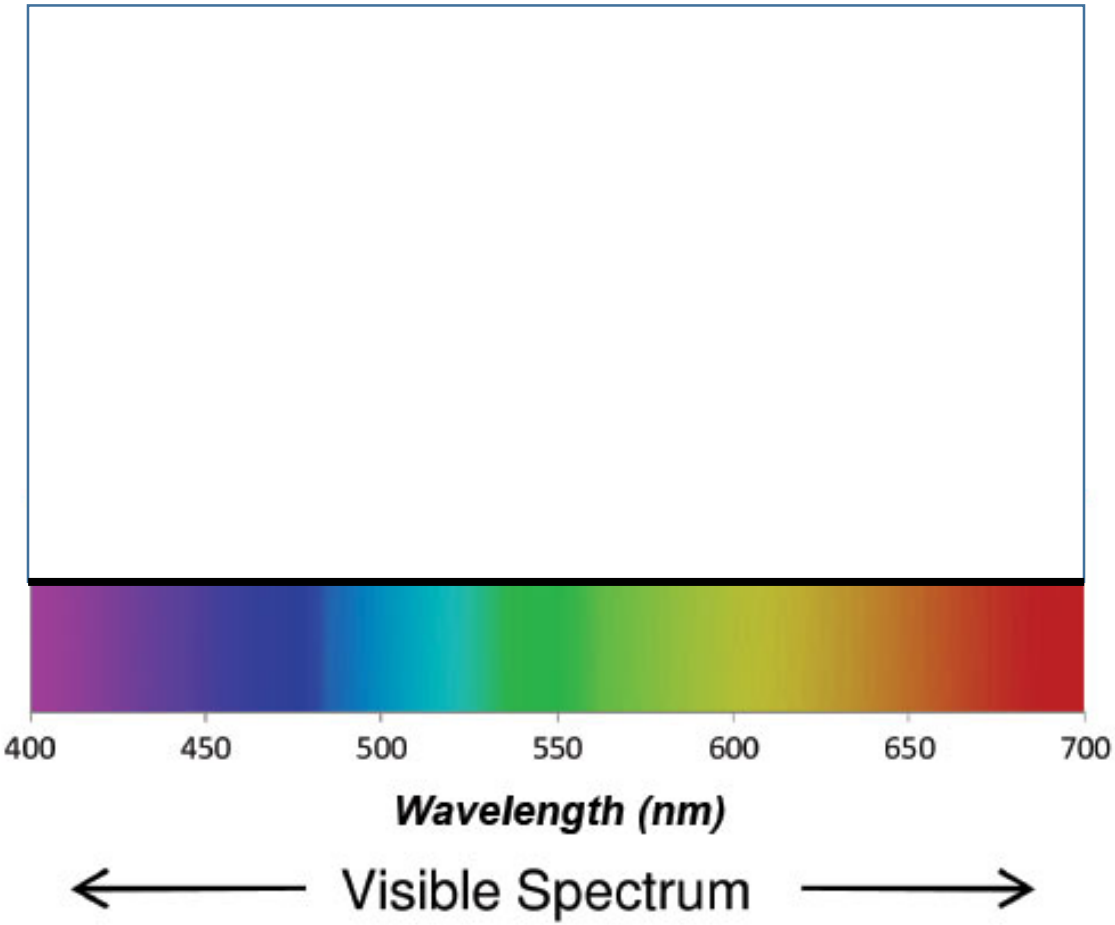
- Generalizing Features
- Labeling and Text



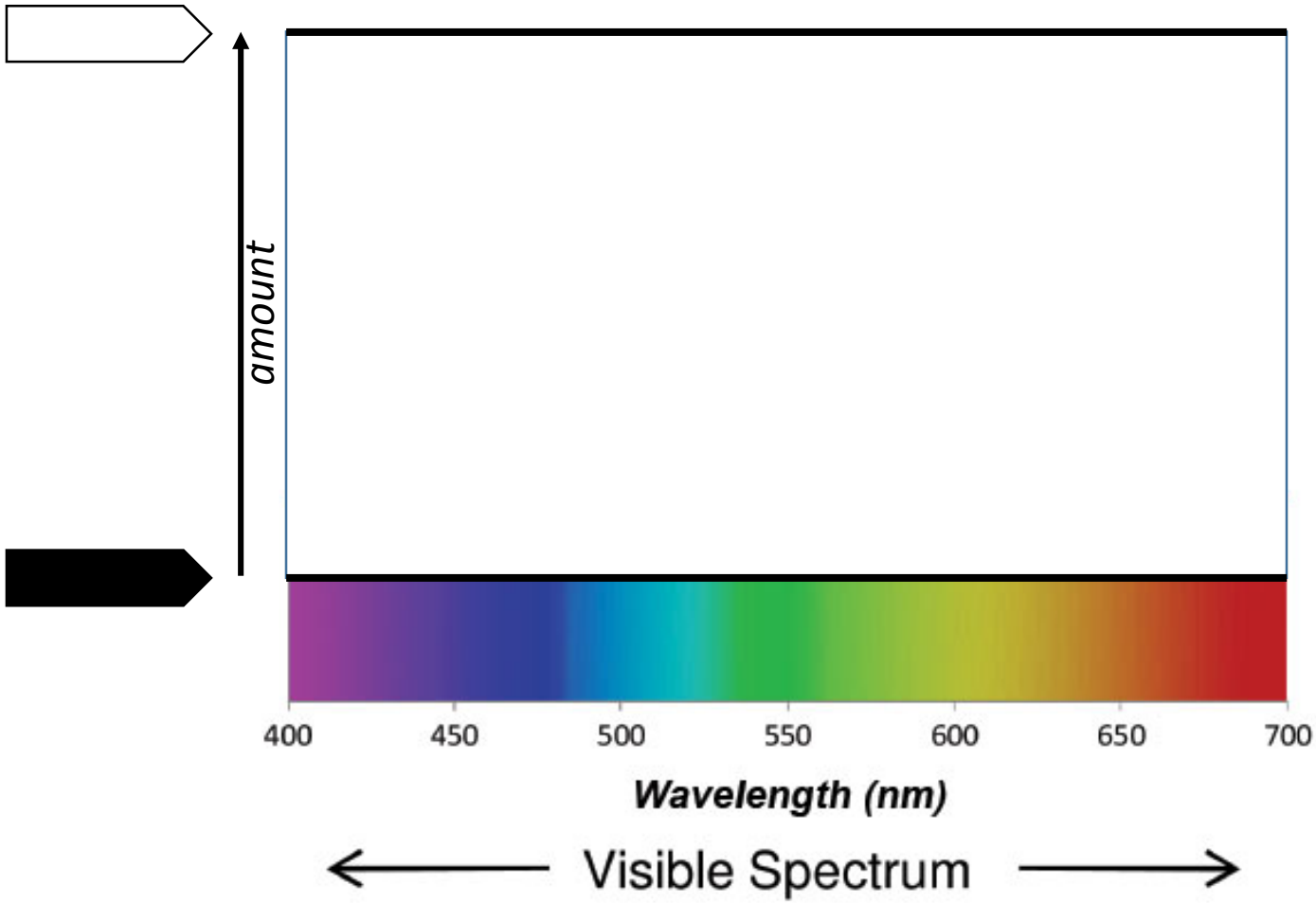
Color

Hue	Value	Saturation

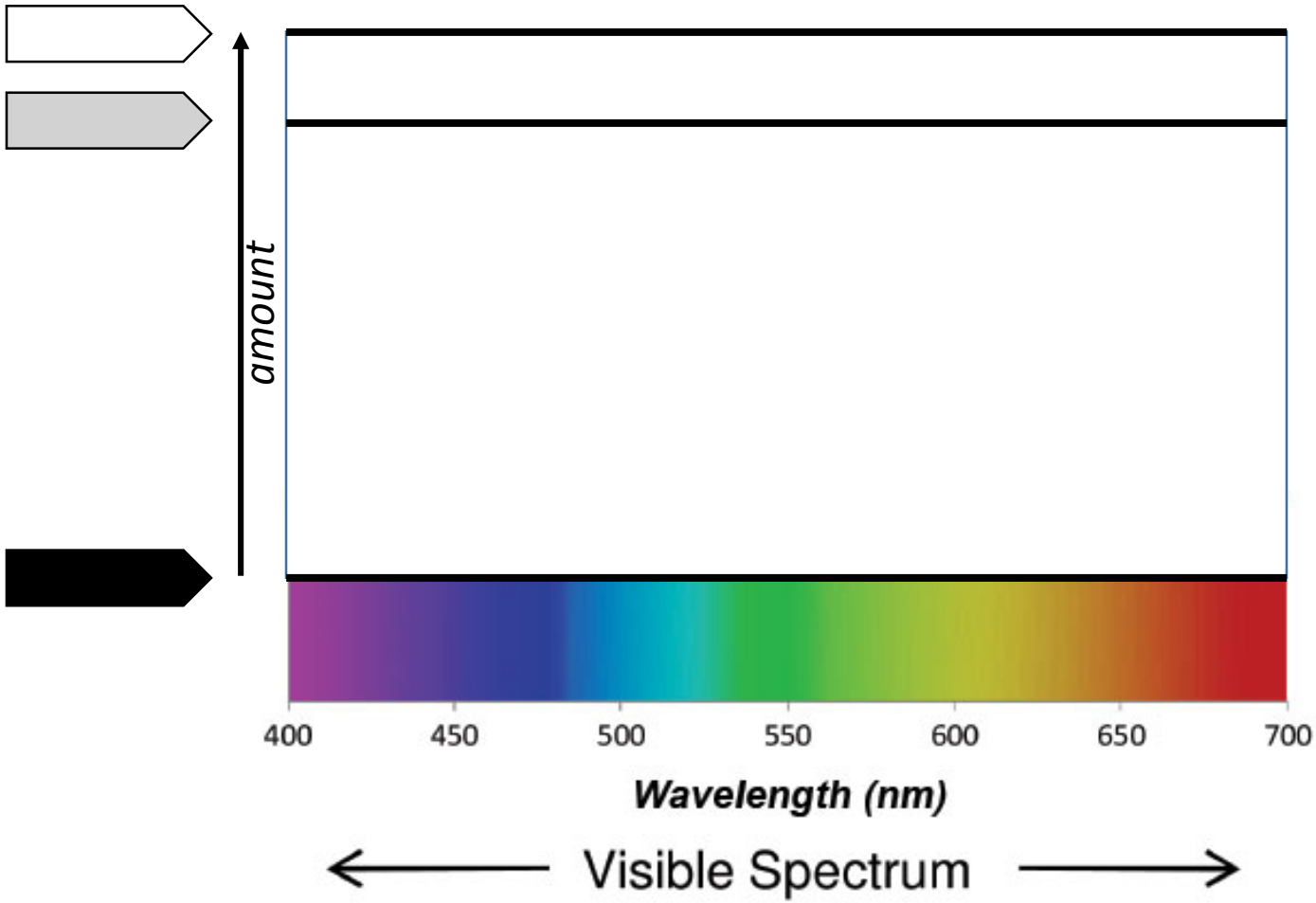
Color Fundamentals



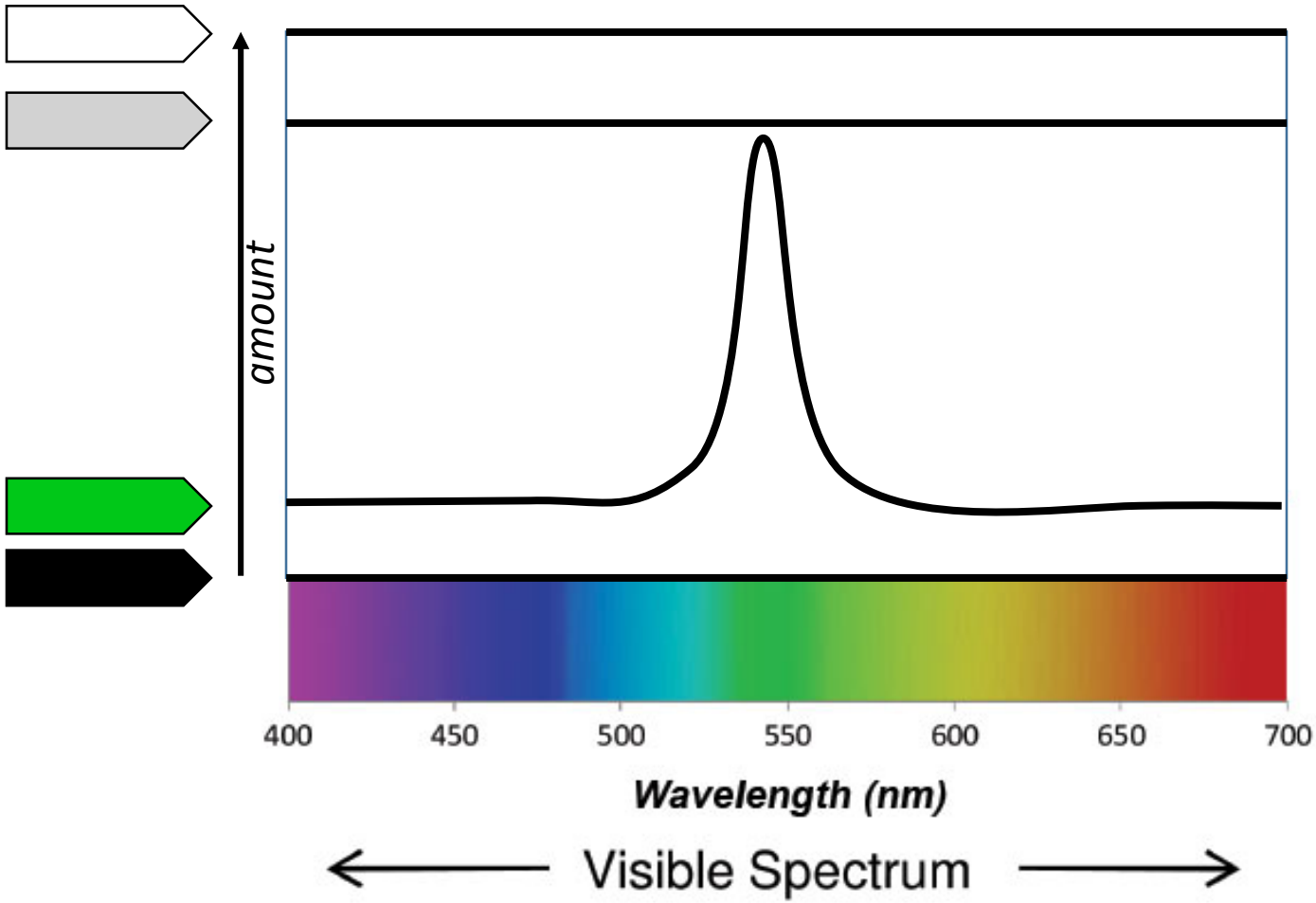
Color Fundamentals



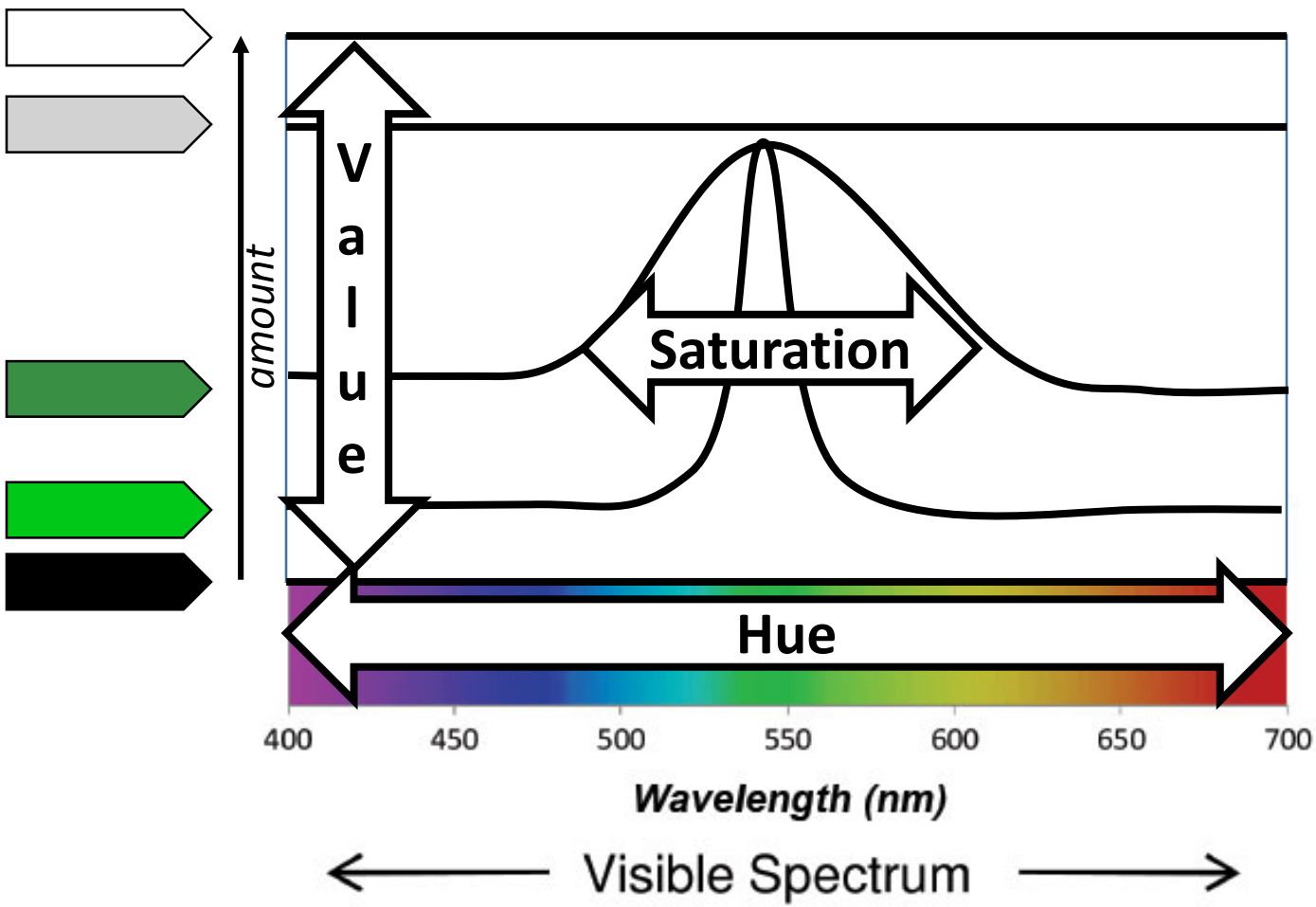
Color Fundamentals



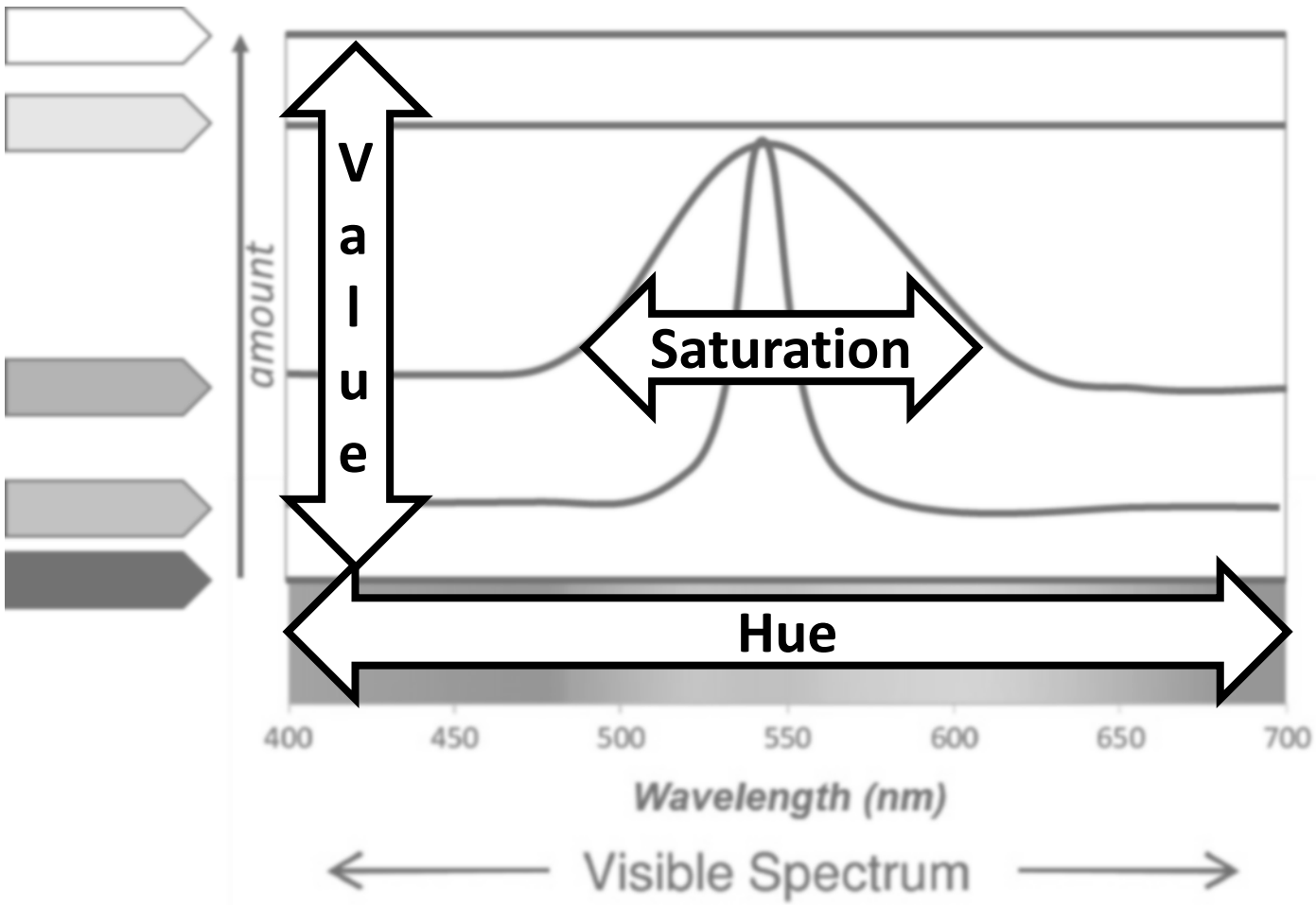
Color Fundamentals



Color Fundamentals



Color Dimensions

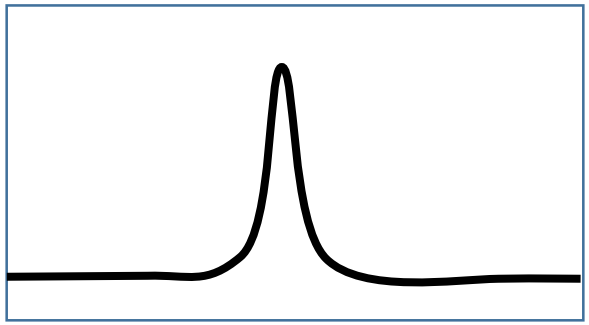


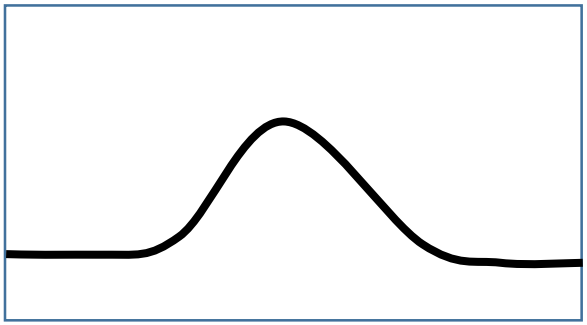
Hue
The Dominate wavelength of a color

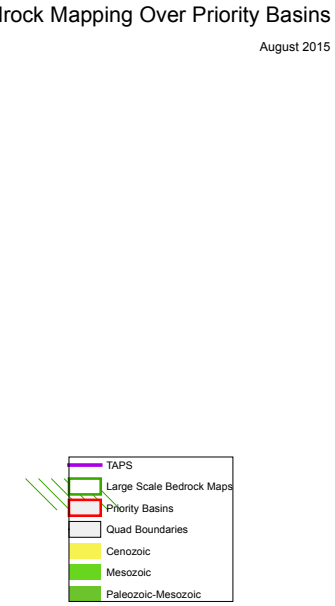
Value
The amount or Brightness of a color

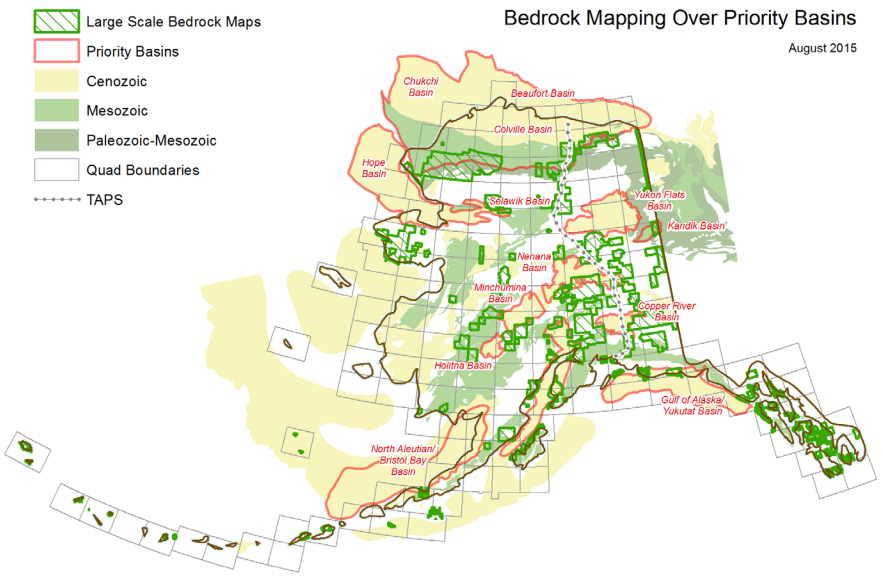
Saturation (Chroma)
The Intensity or purity of the Color

High Value and Saturation can be "Harsh"

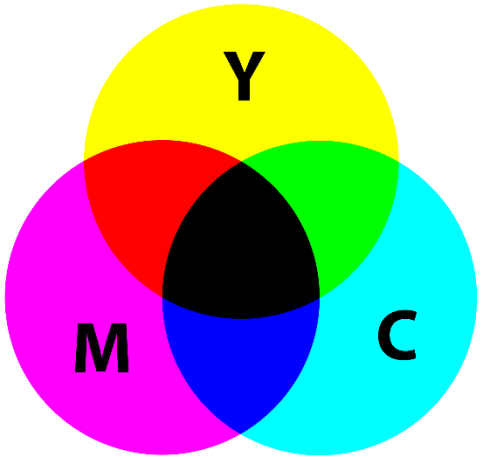


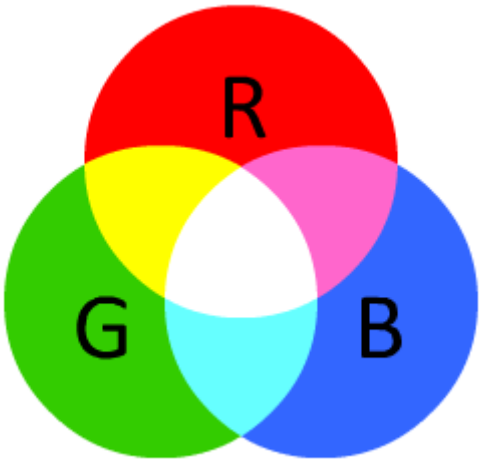






Subtractive vs Additive Colors

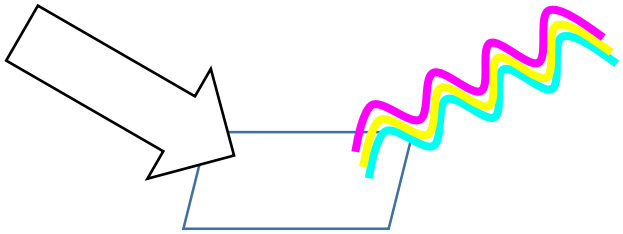




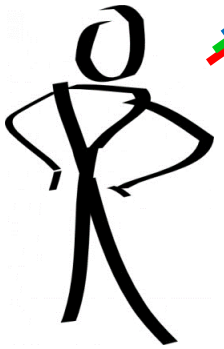
Subtractive Colors

Additive Colors

Reflective Light



Printed Map on Paper



Emitted Light

Color Perception

psychological primary colors

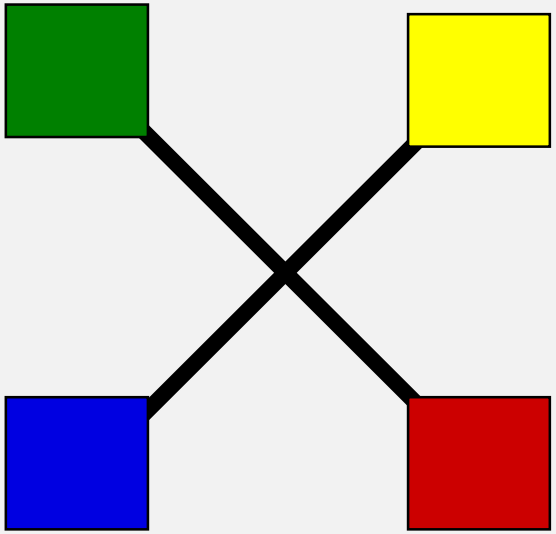
<u>Opponent Process Theory</u>:

We perceive colors as combinations of these three pairs

Red or Green

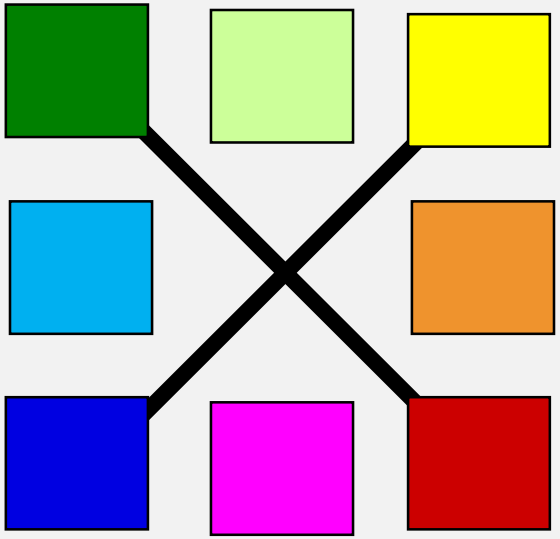
Blue or Yellow

Dark or Bright



Color Perception

psychological primary colors



<u>Opponent Process Theory</u>:
We perceive colors as combinations of these three pairs

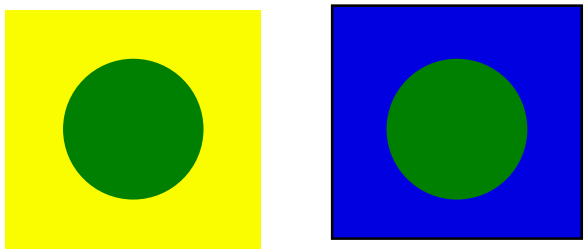
Red or Green

Blue or Yellow

Dark or Bright

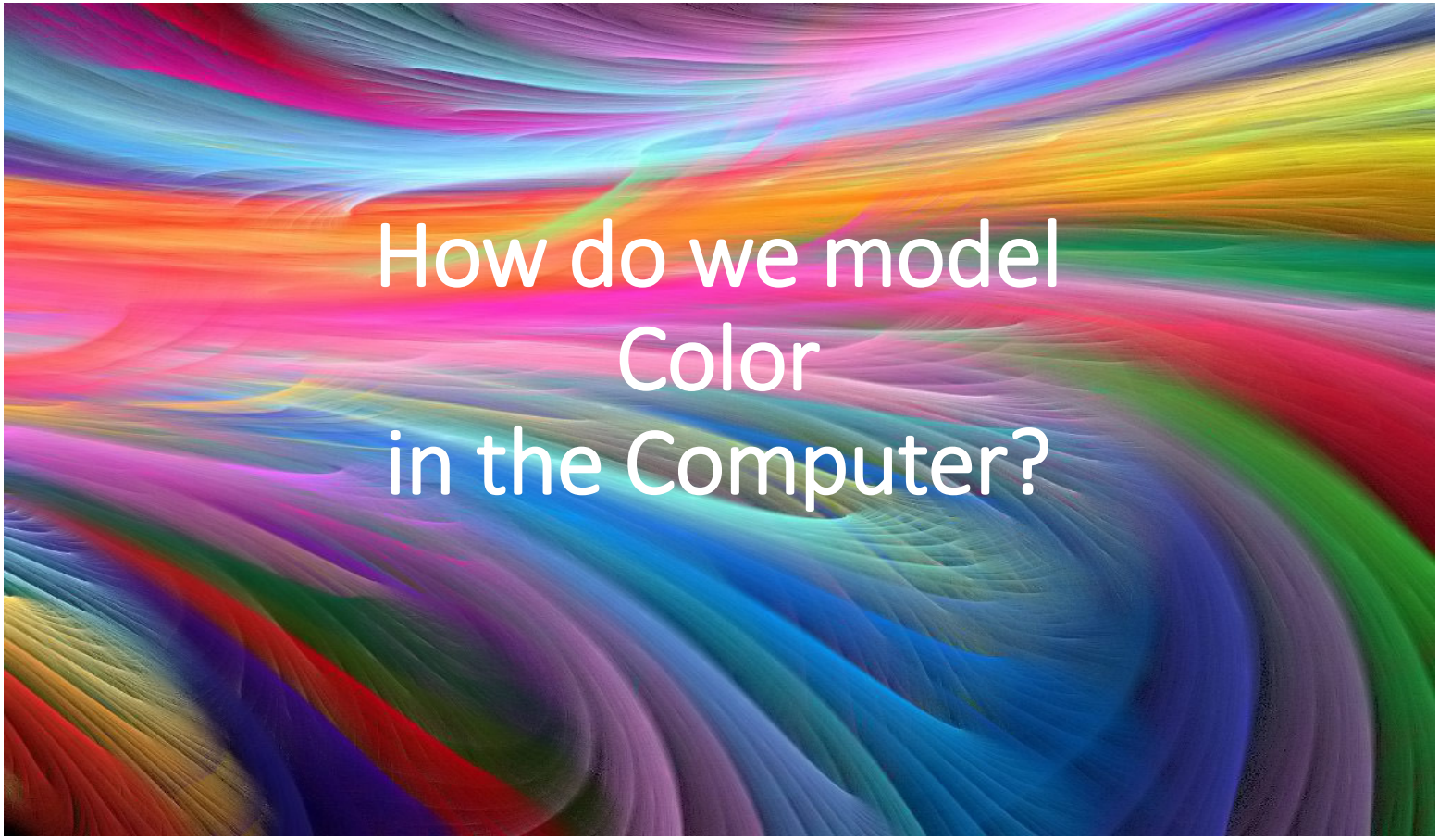
<u>Hue Sensitivity</u>: Maximum number of Different Hues a person can distinguish on a map is 8-15

<u>Simultaneous Contrast</u>: Adjacent Colors affect appearance of each other



Color

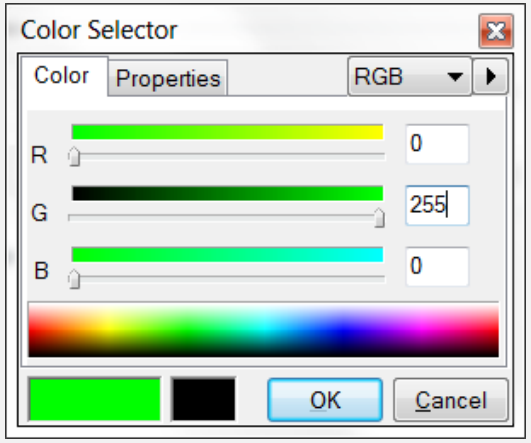
Hue	Value	Saturation

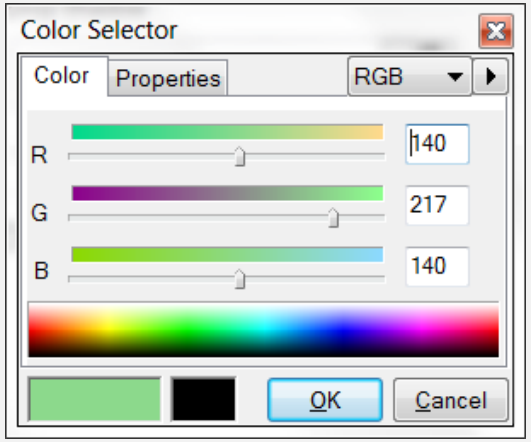


Color Models in ArcGIS

RGB

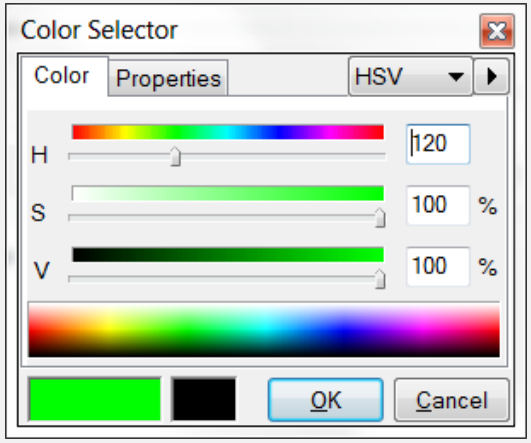
R (0-255)
G (0-255)
B (0-255)

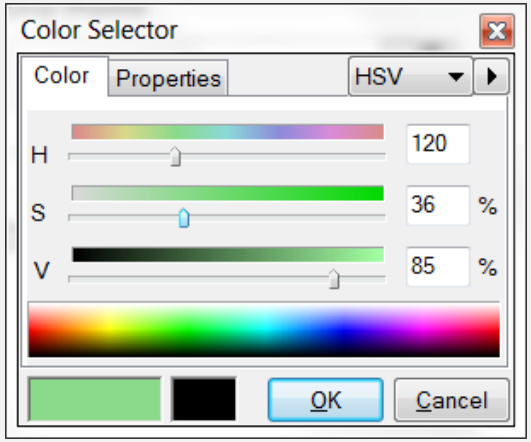




HSV

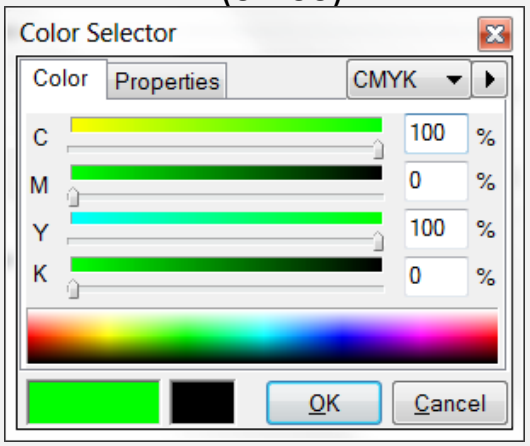
H (0-360)
S (0-100)
V (0-100)

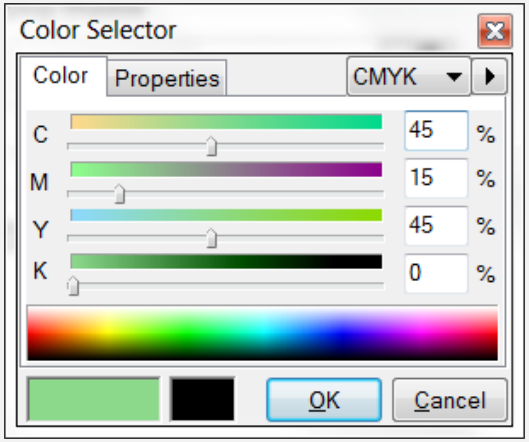




CMYK

C (0-100)
M (0-100)
Y (0-100)
K (0-100)





Other Color Models

- Hue, Saturation, and Luminosity (HSL)
- Hexidecimal triplet used for web
  - Black RGB 000,000,000 = 000000
  - White RGB 255,255,255 = #FFFFFF
  - Green RGB 000,255,000 = #00FF00
- Commercial Color Models

Munsell COLOR

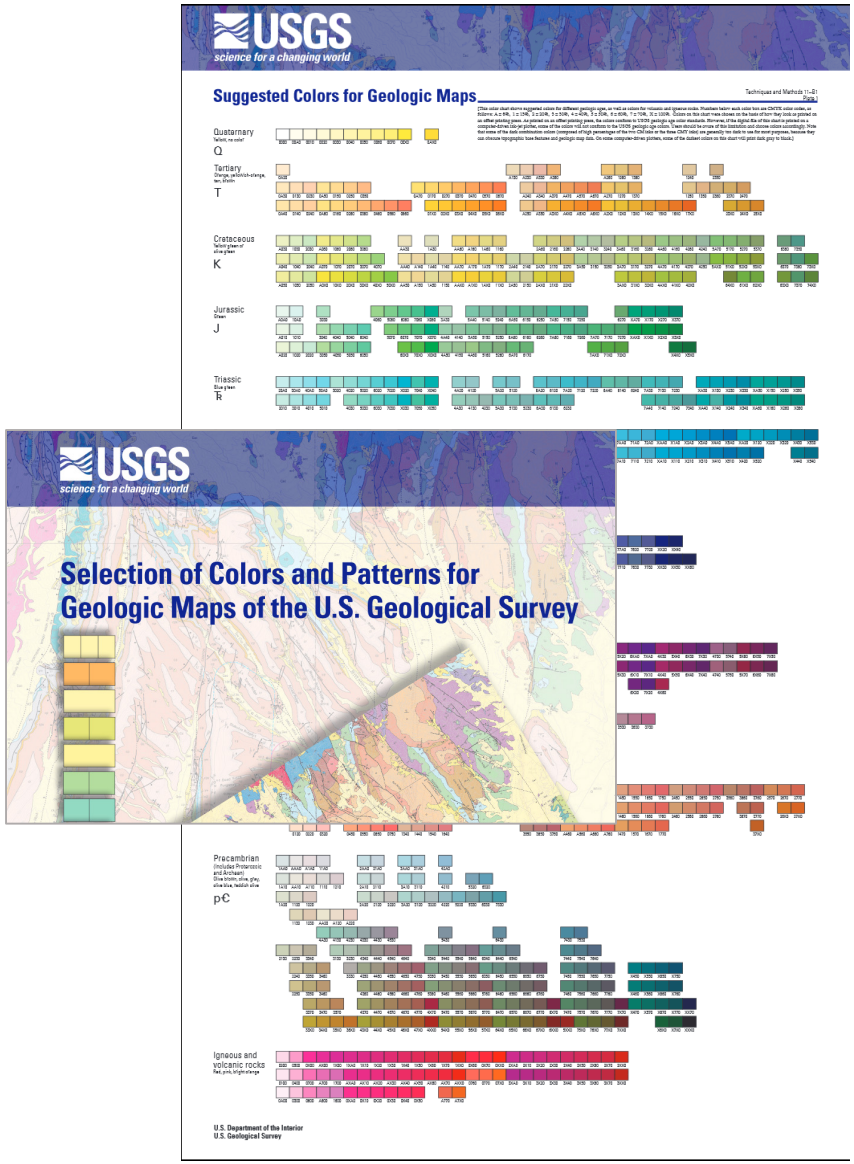
NCS

Natural Color System (NCS)

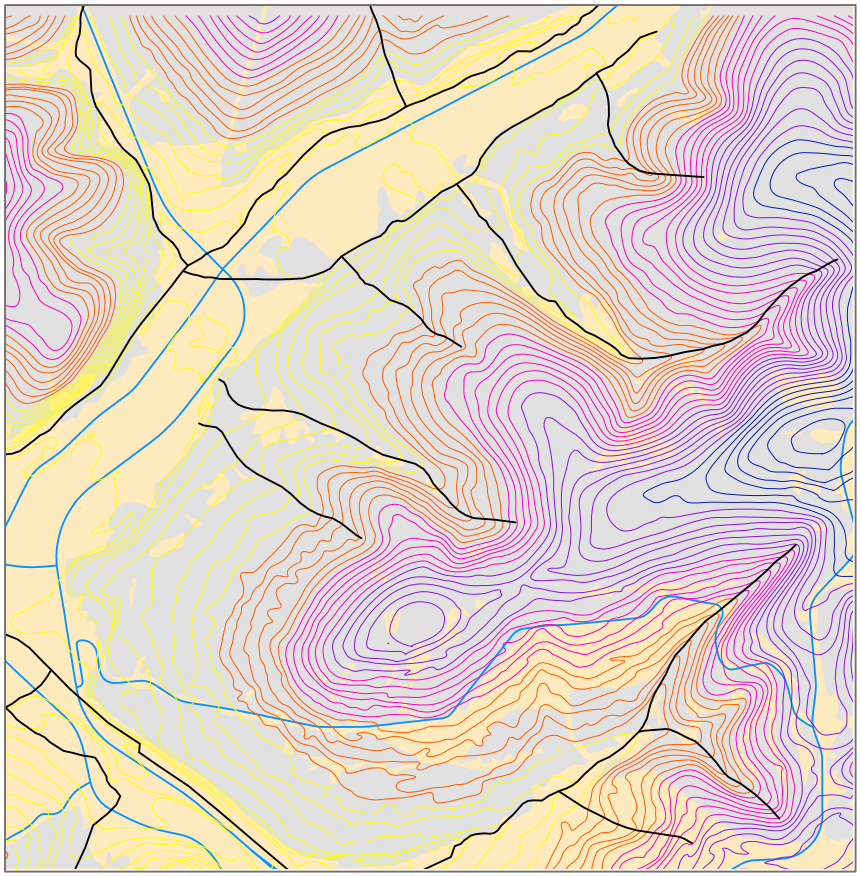
PANTONE®

Color Use while Mapping

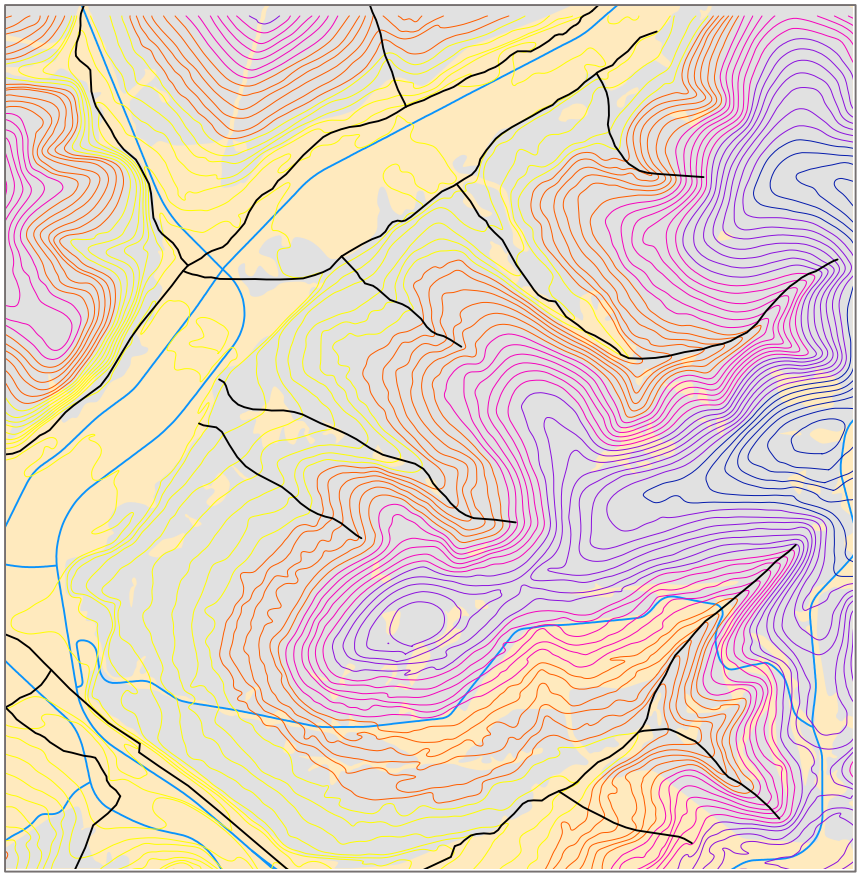
- Hue Conventions
  - Blue – Water
  - Brown – Land/Elevation
  - Yellow/Tan – Arid/Dry
  - Green – Vegetation
- Organizational Standards
  - Alaska
  - DNR
  - Geology
  - Many Many Others
- Consider color deficiencies



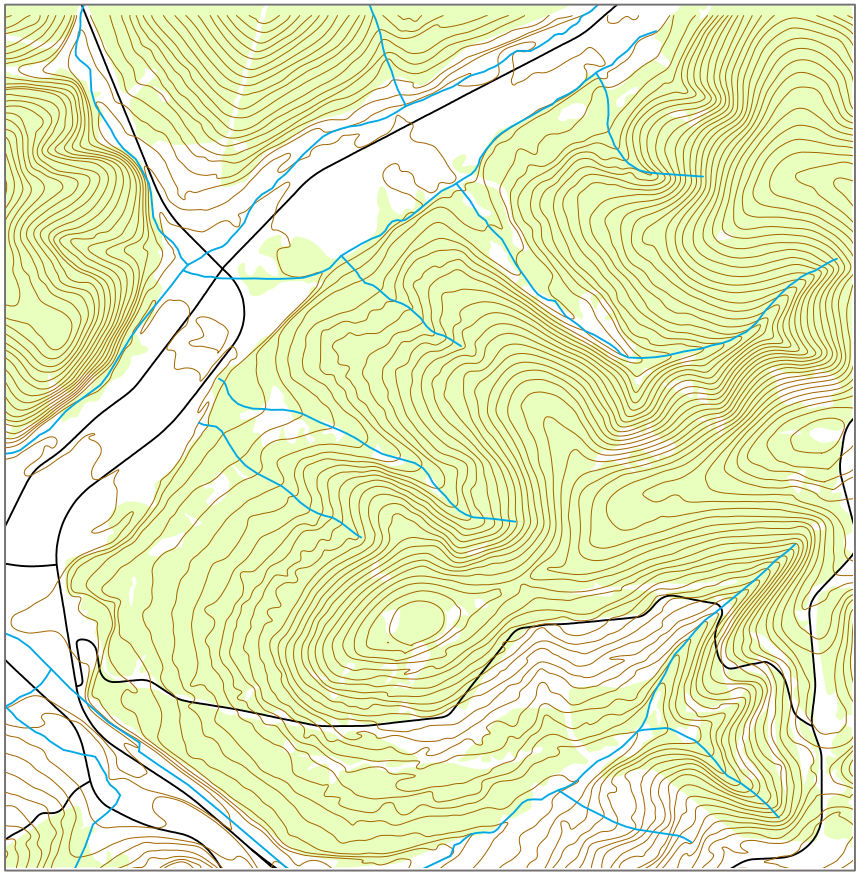
Unconventional Hues



Unconventional Hues



Conventional Hues

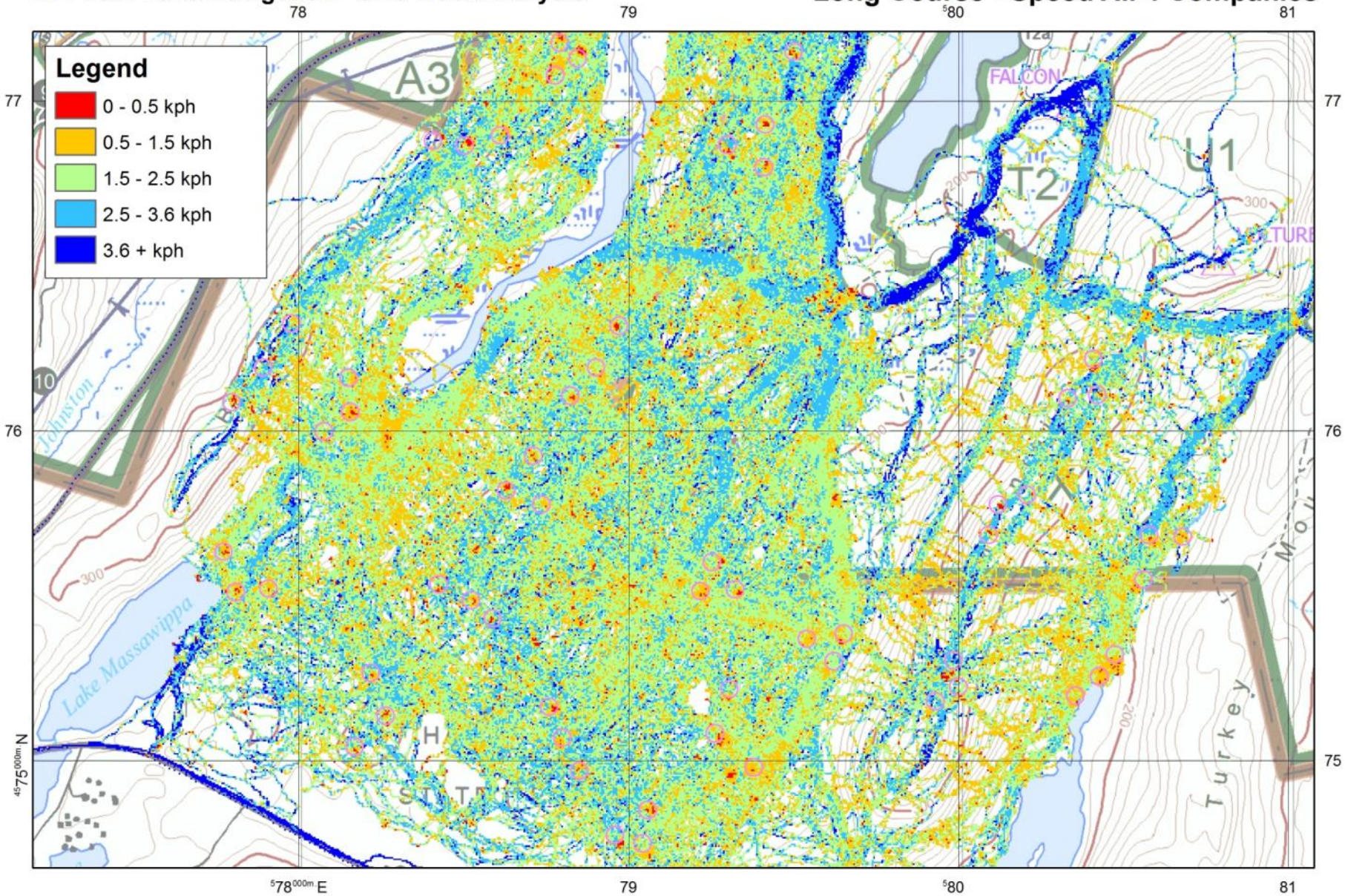


Color Progressions

- Value Progression
- Single Hue Progression
- Multi Hue Progression
  - Sequential (Low to High)
  - Diverging (Negative to Positive)
  - Quantitative (Nominal)
- Complex Multi Hue Progression
  - Elevation
  - Other

CFT 2011 Land Navigation - GPS Track Analysis

Long Course - Speed All 4 Companies



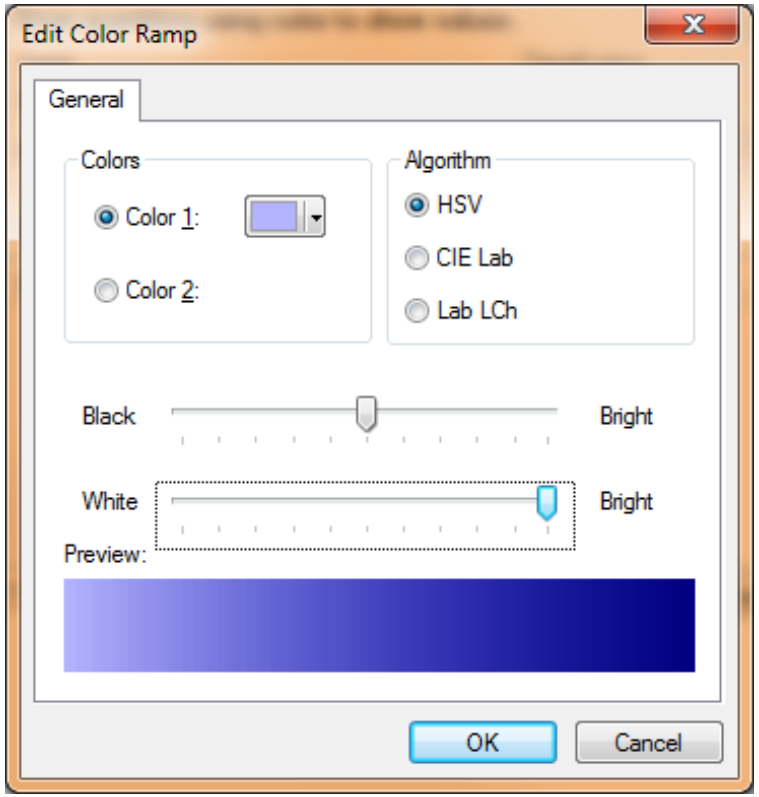
Map produced by:
Geospatial Information Science Program
COL Michael Hendricks
Dept of Geogrpahy & Env. Eng.
United States Military Academy

Datum: NAD1983 (~WGS84)
Projection: UTM Zone 18
Grid Zone Designation: 18T
100,000 meter square identifier: WL

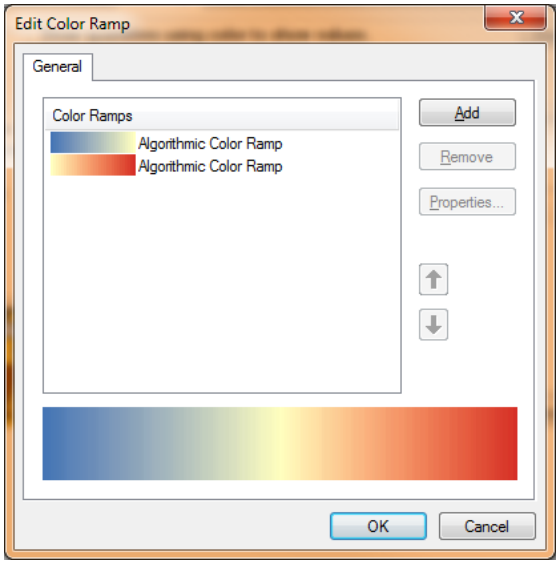
1:15,000

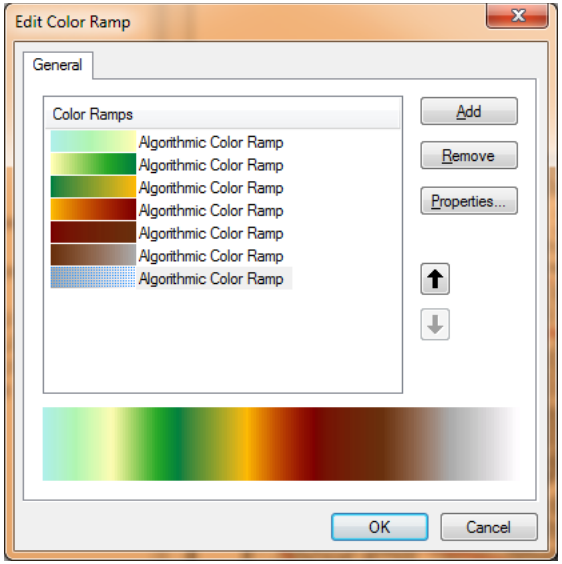
Date: 2/8/2012

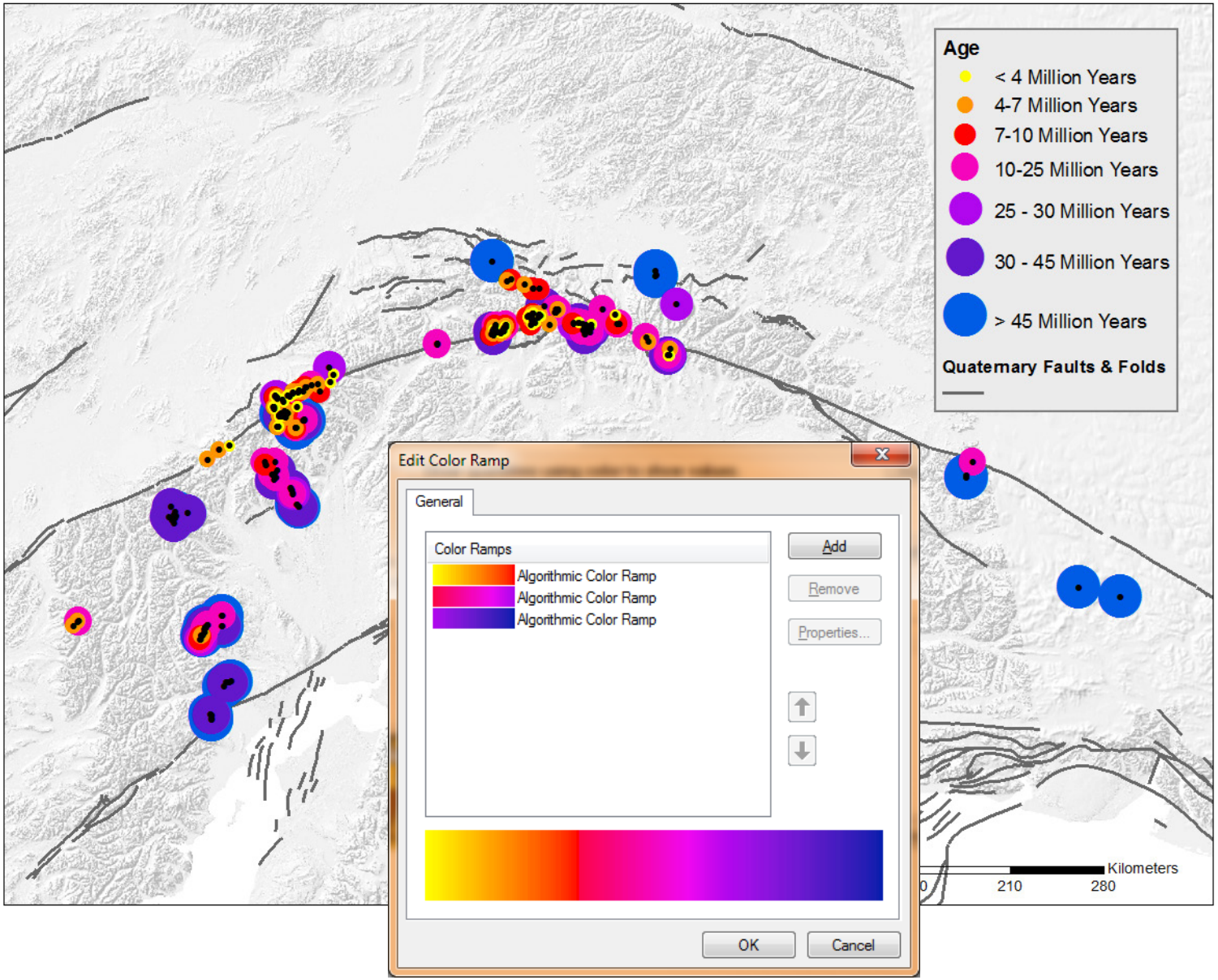
Color Progression/Ramps in ArcGIS



Color Ramps can be combined

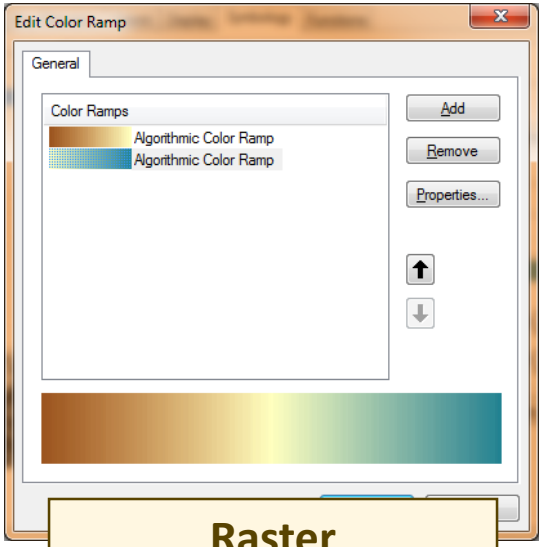


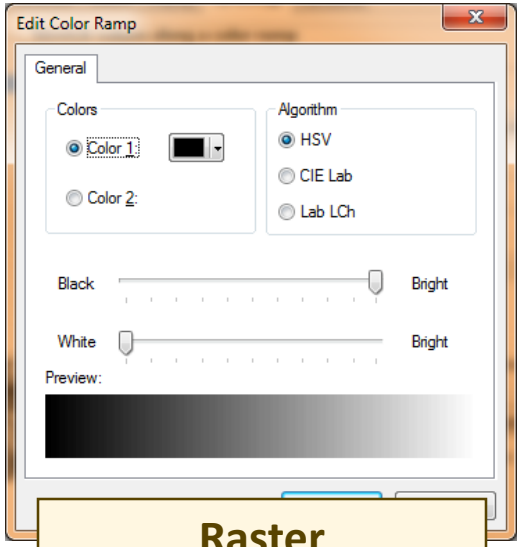



Age
< 4 Million Years
4-7 Million Years
7-10 Million Years
10-25 Million Years
25 - 30 Million Years
30 - 45 Million Years
> 45 Million Years
Quaternary Faults & Folds
Kilometers
0
210
280
Edit Color Ramp
General
Color Ramps
Algorithmic Color Ramp
Algorithmic Color Ramp
Algorithmic Color Ramp
Add
Remove
Properties...
OK
Cancel

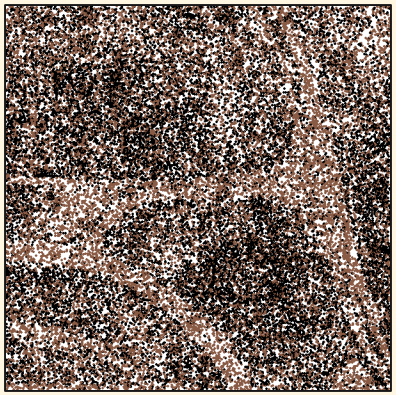
Color Ramp Example

With Lidar Derived Elevation Data

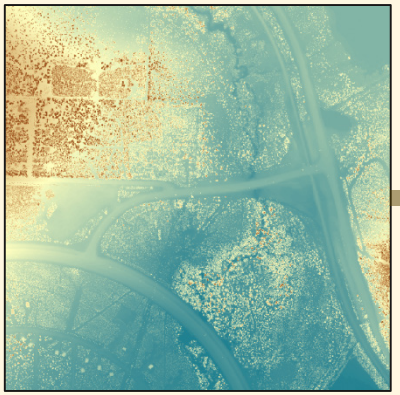




Lidar Point Cloud

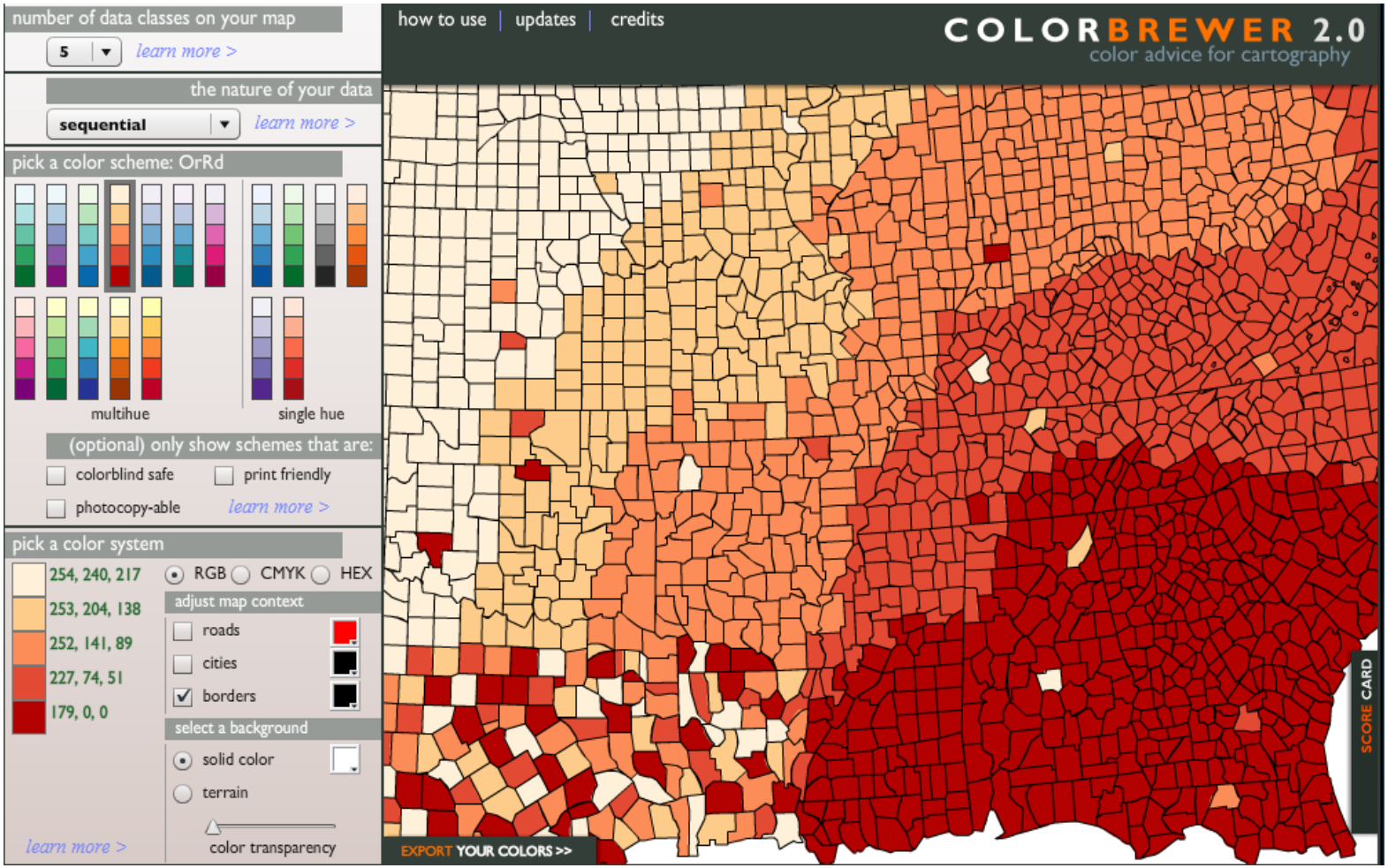


Raster Layer Tinting

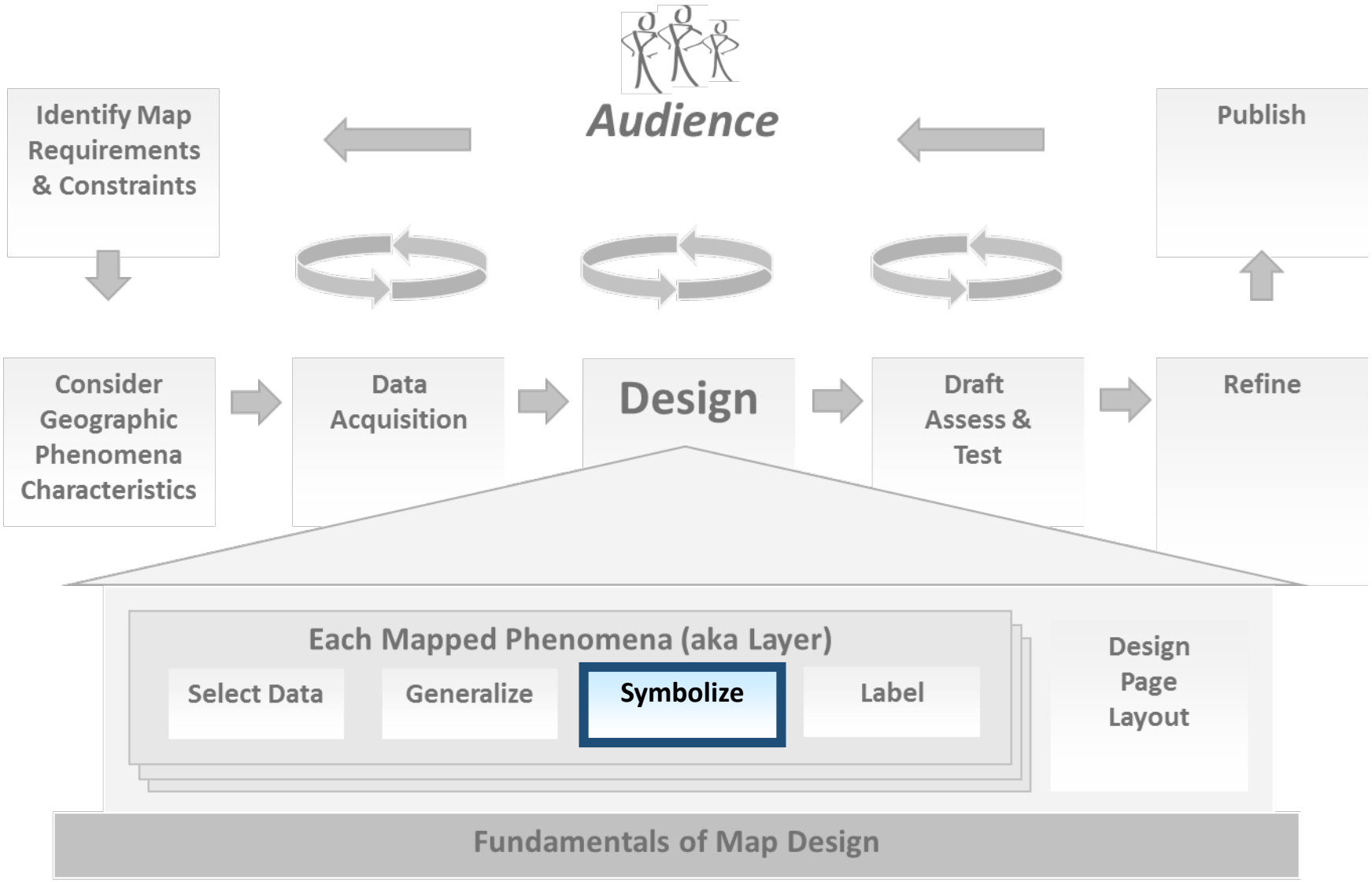


Raster Hillshade

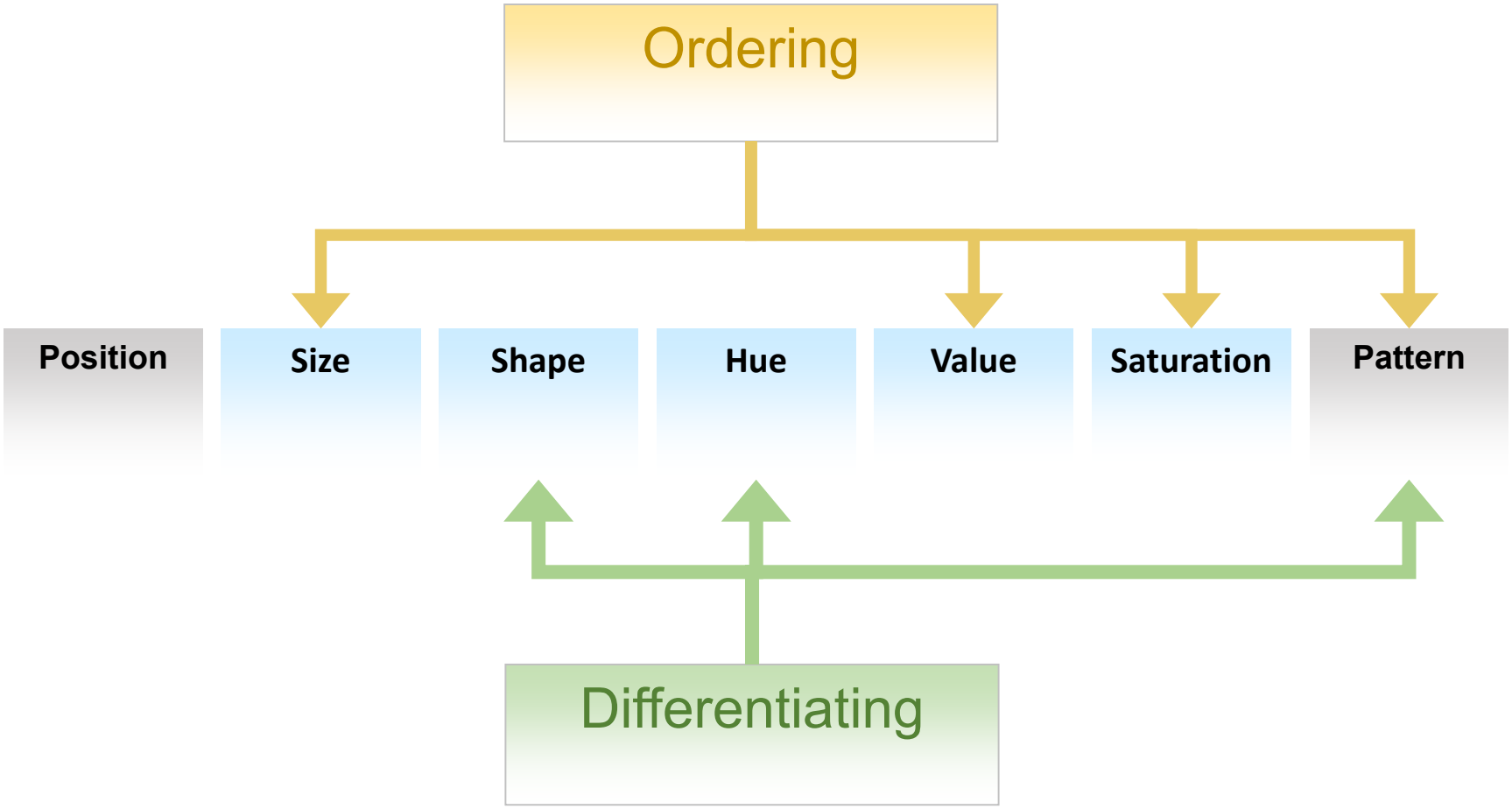
Color Brewer Web App:
http://colorbrewer2.org



Symbolizing Phenomena

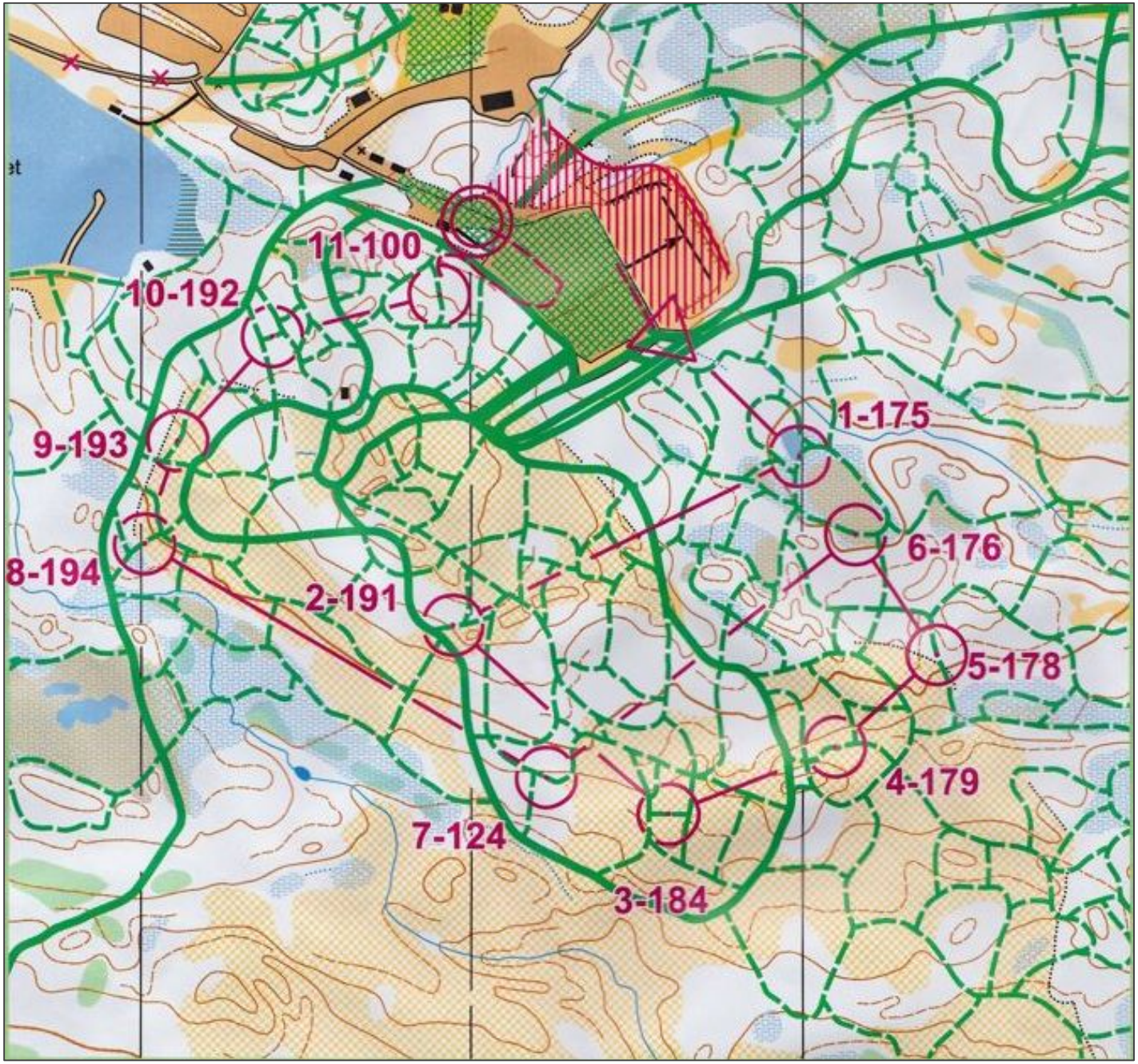


Graphic Variables



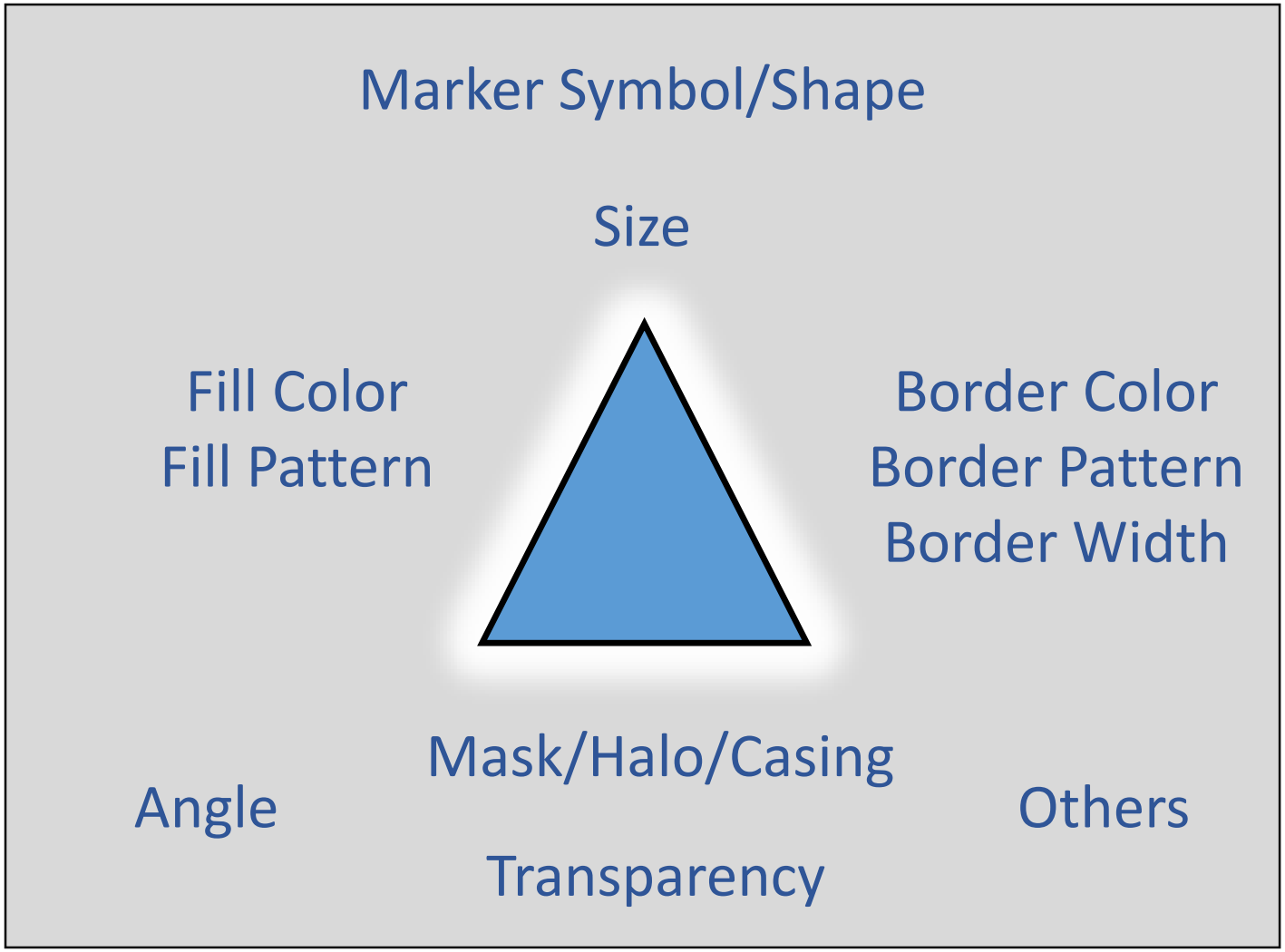
Graphic Variables	Graphic Primitives		
	Point	Line	Polygon
Position	*Hard to use effectively on a map*		
Shape			
Hue			
Size			
Value			
Saturation			
Pattern			

Ski Orienteering Map

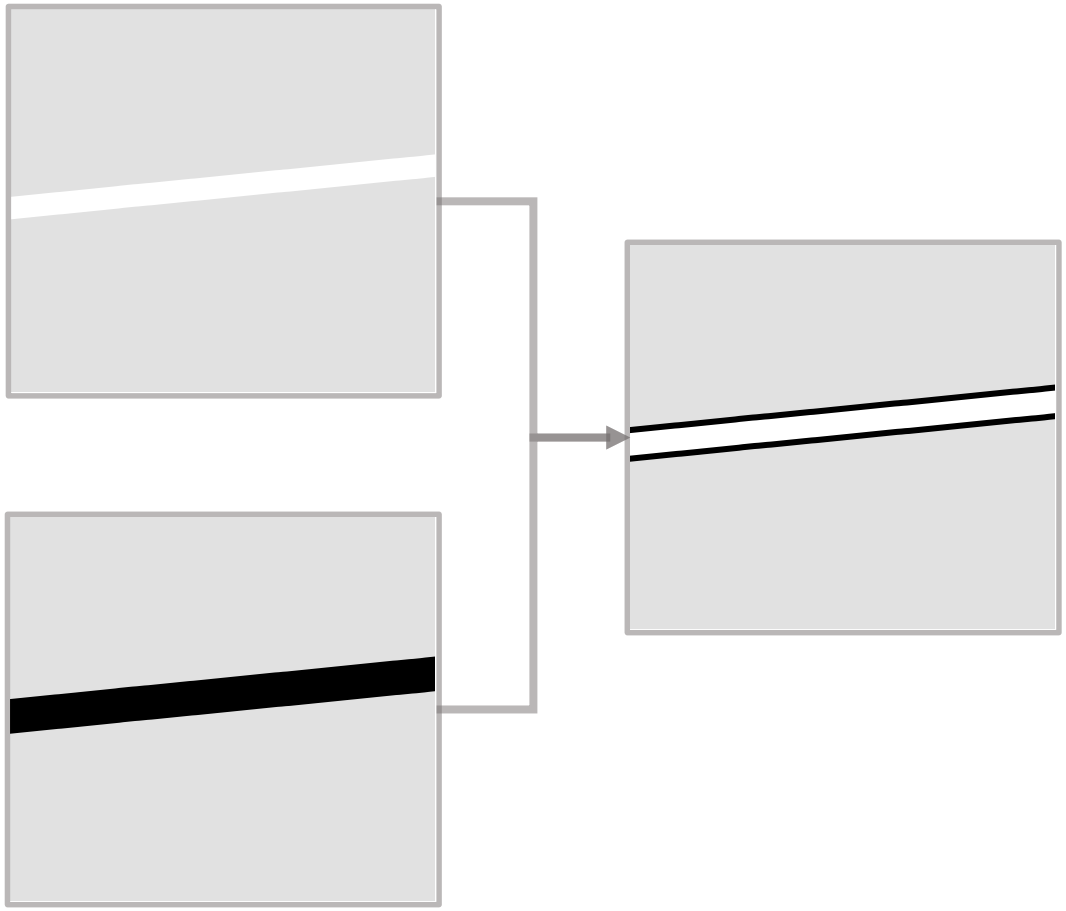


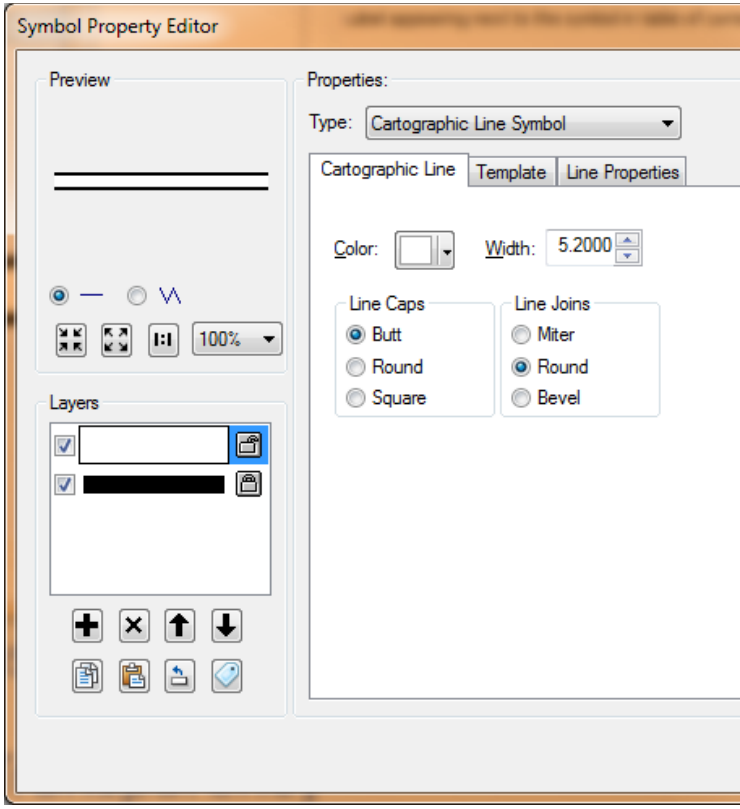
Nikolay at map exchange 2012 SkiO WC1. Photo: Eddie Bergeron

Symbol Characteristics



Building Complex Symbols by Layers





Drawing Order in ArcGIS

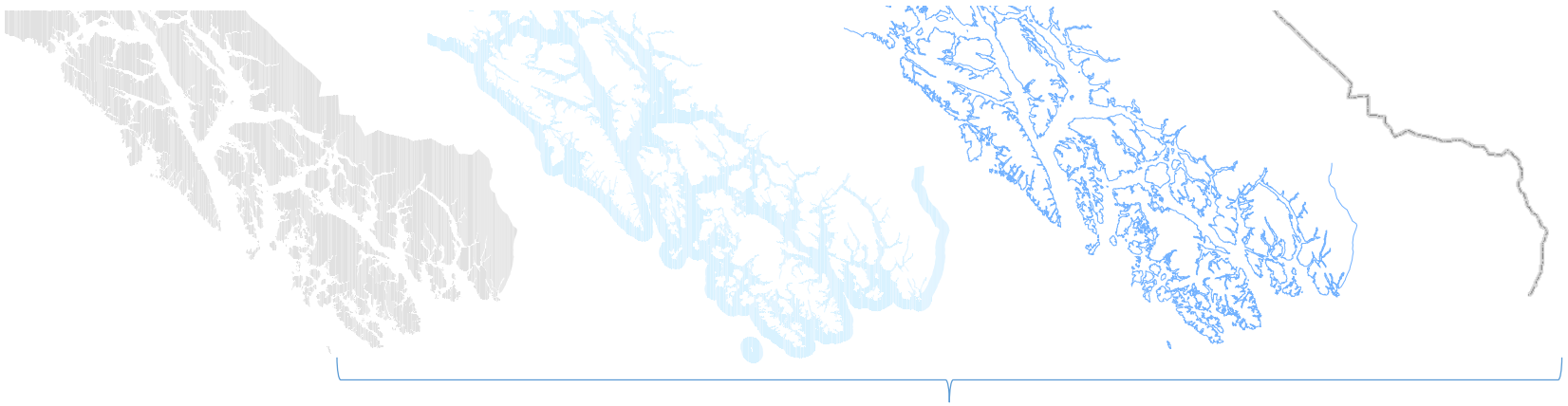
By Default ArcGIS draws by Layer, from bottom to top of the table of Contents

Alaska
Polygon
Fill: HSV 0, 0, 88

Off Shore
Buffer 10km
Fill: HSV 201, 15, 100

Alaska
Shoreline
Outline: HSV 213, 55, 100

Canada
Land Border
Outline: HSV 0, 0, 67



- AK 1:1M Boundary and Coast with 10km Buffer
  - AK_Boundary_1M_Canada_AK_border_line
  - AK_Coast_1M_line_NAD83_Albers
  - AK_Coast_1M_10km_Buffer_NAD83_Albers
  - AK_Boundary_1M_poly_NAD83_Albers

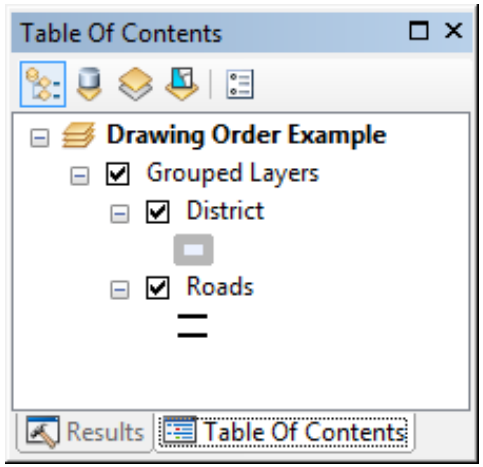
More Advanced Drawing Order Issues

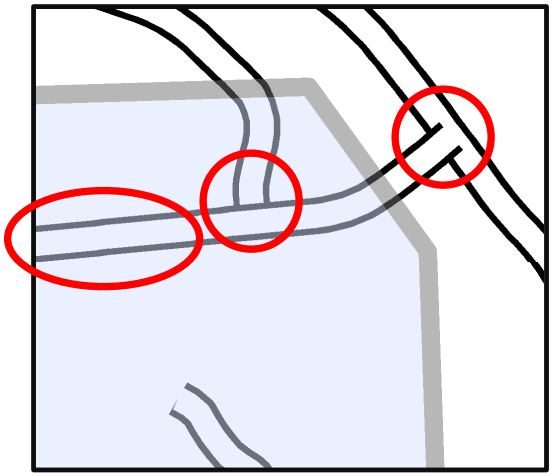
By Default ArcGIS draws by Layer, from bottom to top of the table of Contents

And Then…

- **Each feature within the Feature Class is Drawn in the Order it is stored in its Data Table, and…**
  - **Each Symbol Part is Drawn in Order of Symbol Layers**

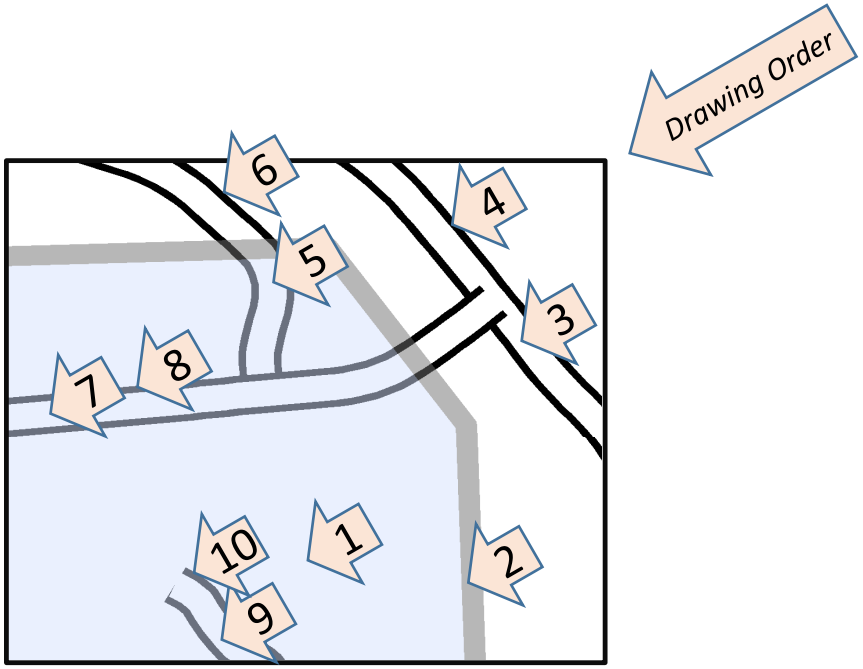
This can cause your map look odd at times

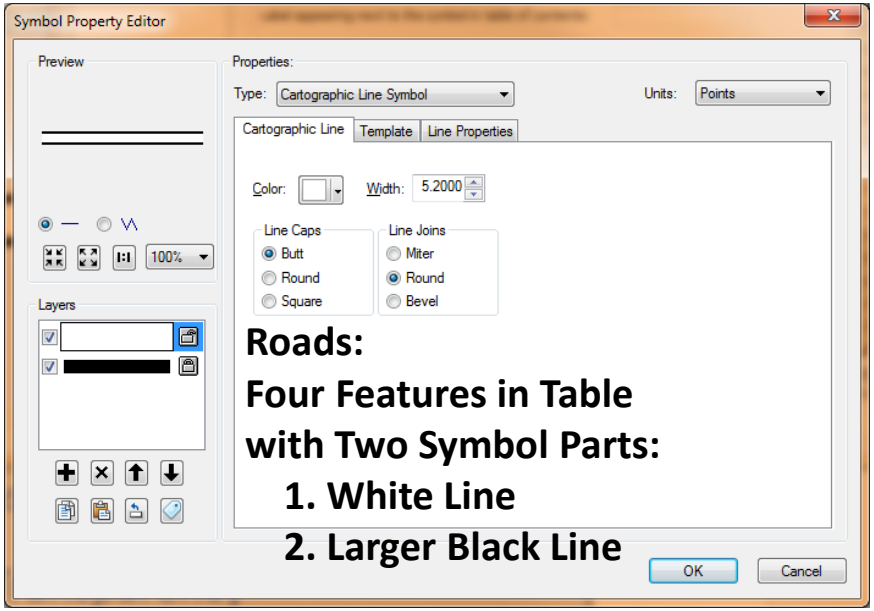




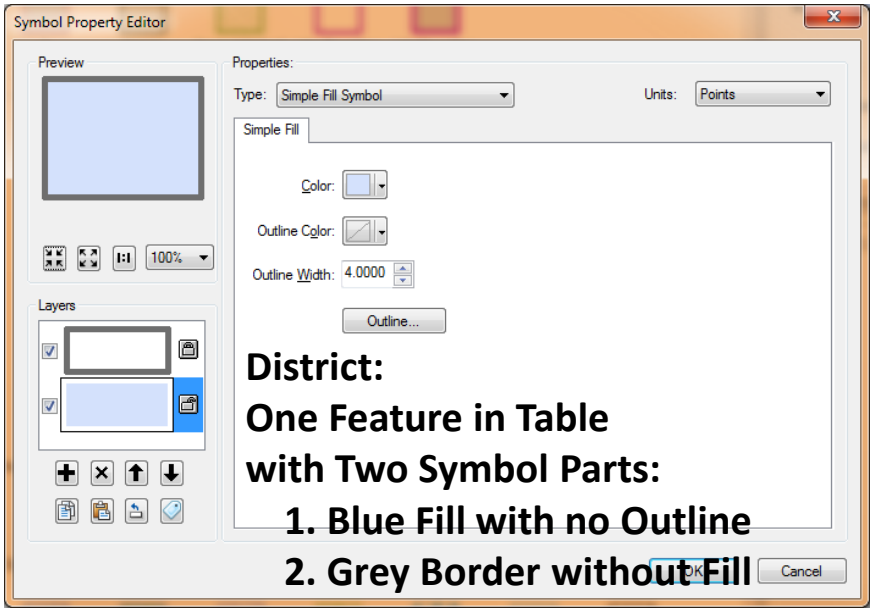
Drawing Order Example

- Grouped Layers
  - Roads
  - District





Roads:
Four Features in Table with Two Symbol Parts:
1. **White Line**
2. **Larger Black Line**



District:
One Feature in Table with Two Symbol Parts:
1. **Blue Fill with no Outline**
2. **Grey Border without Fill**

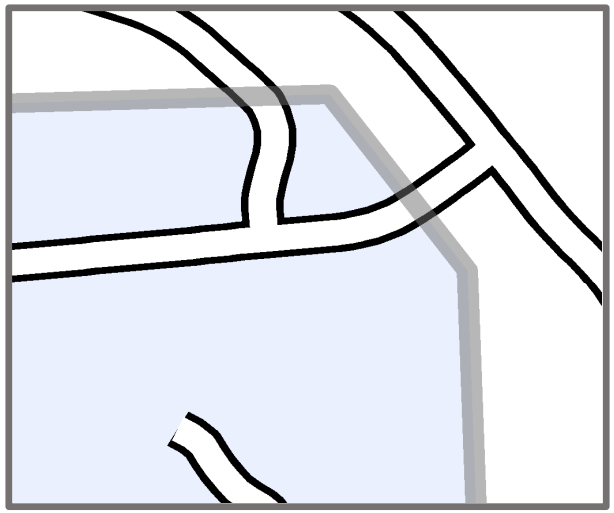
Draw layers by Symbol Level

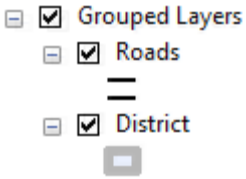
Allows you to customize Drawing Order

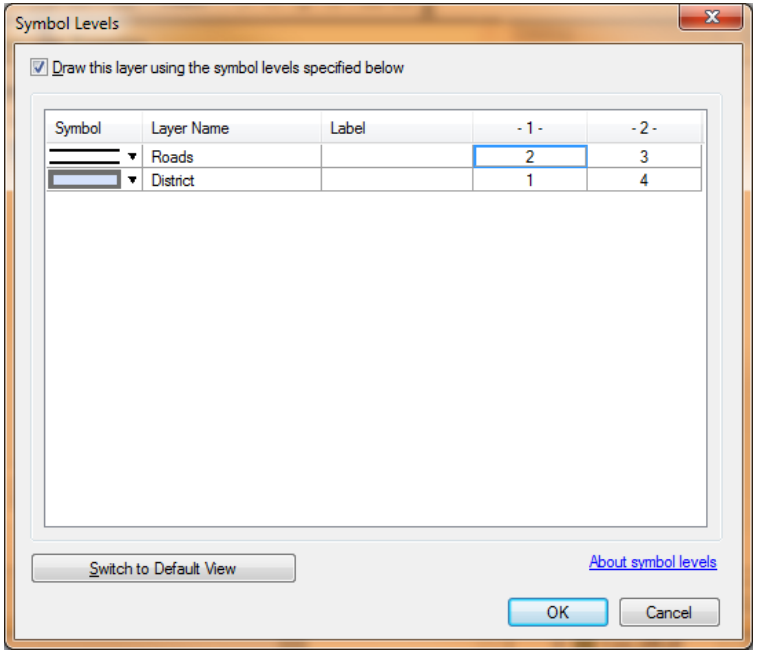
This does slow rendering times!

New Drawing Order

1. District Blue Fill
2. Roads White Line
3. Roads Black Line
4. District Boundary



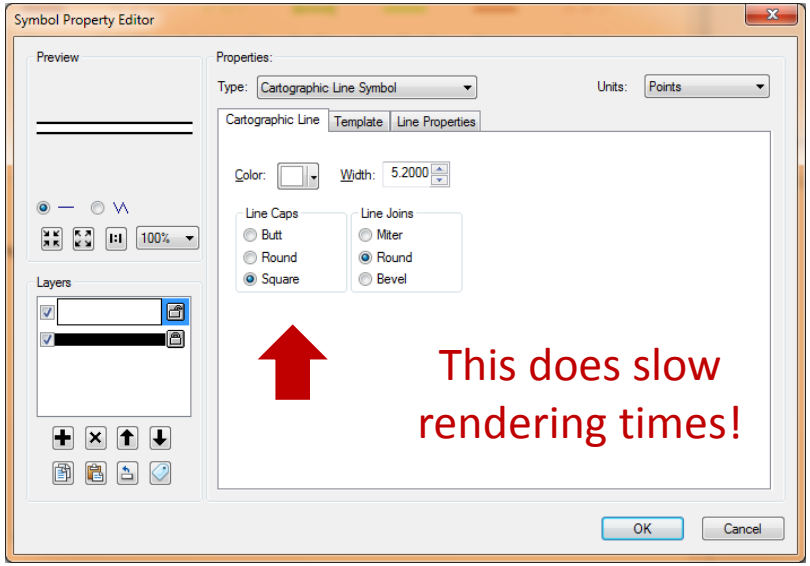


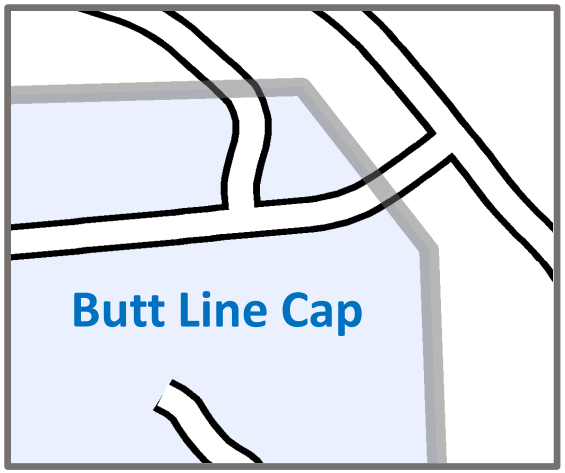


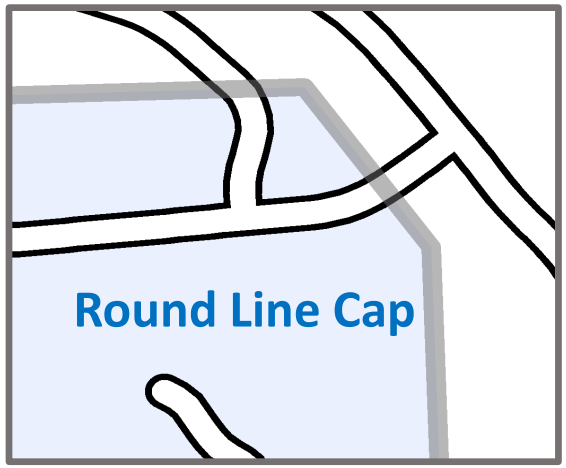
Customizing End Caps

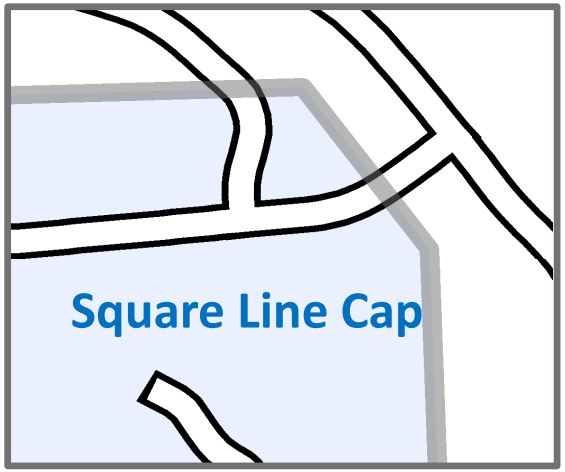
Specifies the way that the endpoints of cartographic line symbols are drawn

Options for caps are: butt, round, and square



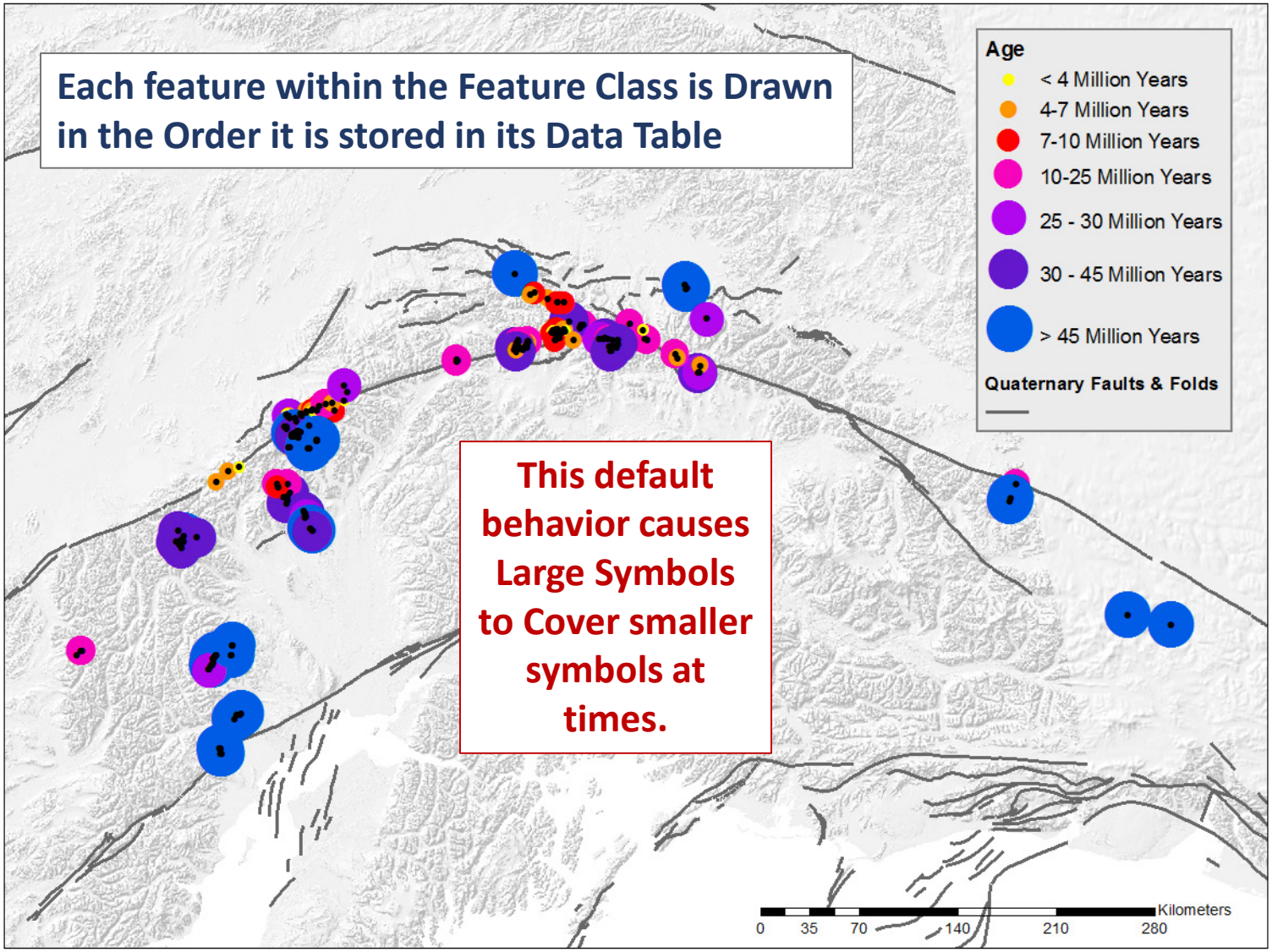




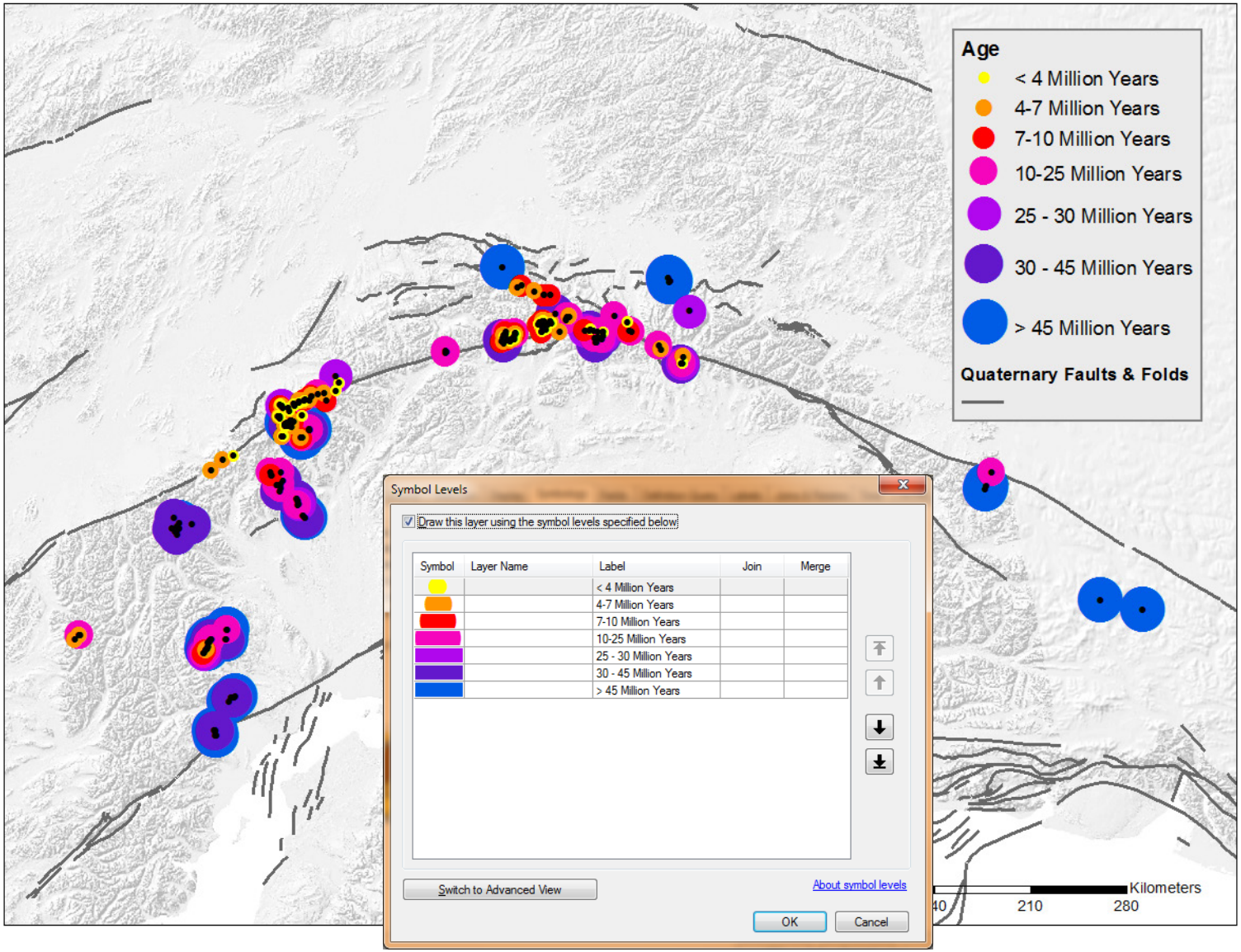


Symbol Level Drawing Order Example

Symbol Level Drawing Order Example

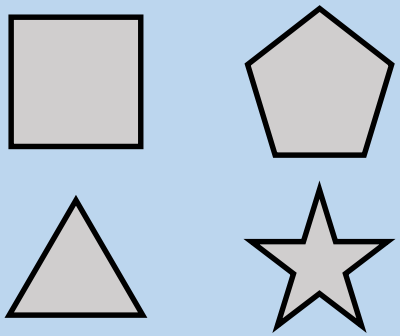


Symbol Level Drawing Order Example



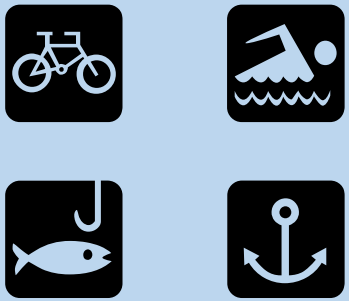
Other Symbol Characteristics

Geometric



vs

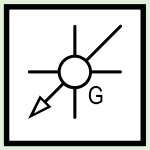
Mimetic (realistic)



Symbol Complexity

Potential Legibility & Visual Hierarchy Difficulties along with drawing speed issues

Thin Lines hard to see and slower to draw

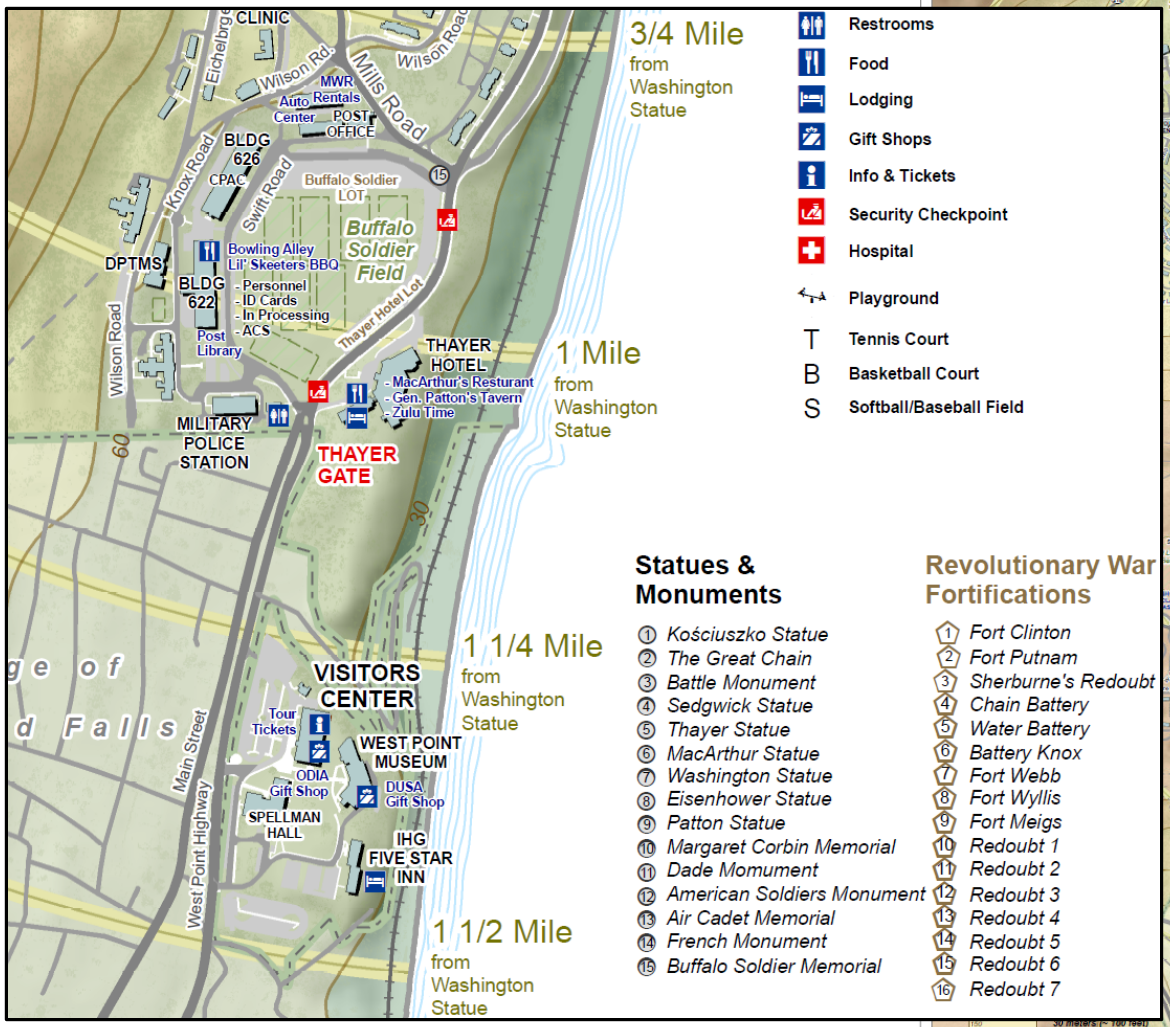


Box helps, but takes up space

Transparency of Mimetic possibly a problem

United States Military Academy
Reference Map

1:12,000



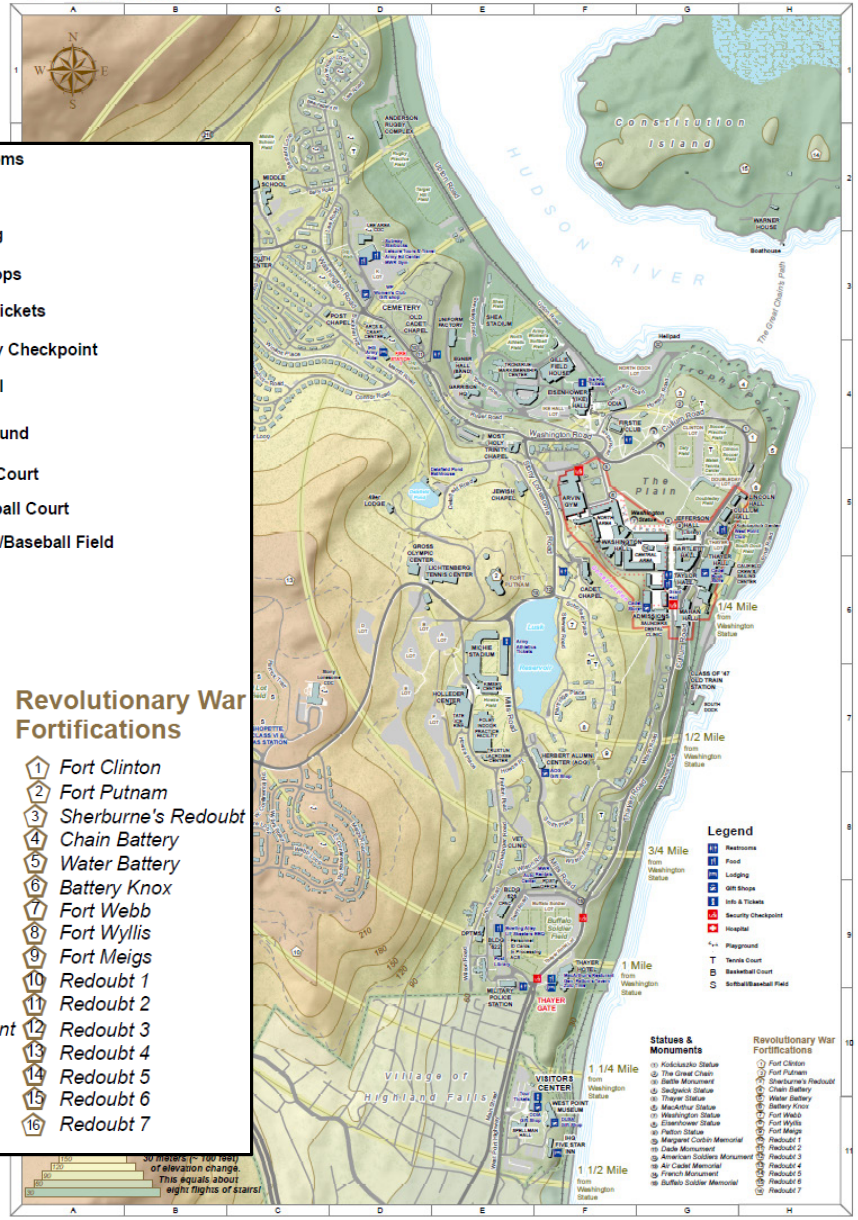
- Restrooms
- Food
- Lodging
- Gift Shops
- Info & Tickets
- Security Checkpoint
- Hospital
- Playground
- T Tennis Court
- B Basketball Court
- S Softball/Baseball Field

Statues & Monuments

1. *Kościuszko Statue*
2. *The Great Chain*
3. *Battle Monument*
4. *Sedgwick Statue*
5. *Thayer Statue*
6. *MacArthur Statue*
7. *Washington Statue*
8. *Eisenhower Statue*
9. *Patton Statue*
10. *Margaret Corbin Memorial*
11. *Dade Momument*
12. *American Soldiers Monument*
13. *Air Cadet Memorial*
14. *French Monument*
15. *Buffalo Soldier Memorial*

Revolutionary War Fortifications

1. *Fort Clinton*
2. *Fort Putnam*
3. *Sherburne's Redoubt*
4. *Chain Battery*
5. *Water Battery*
6. *Battery Knox*
7. *Fort Webb*
8. *Fort Wyllis*
9. *Fort Meigs*
10. *Redoubt 1*
11. *Redoubt 2*
12. *Redoubt 3*
13. *Redoubt 4*
14. *Redoubt 5*
15. *Redoubt 6*
16. *Redoubt 7*



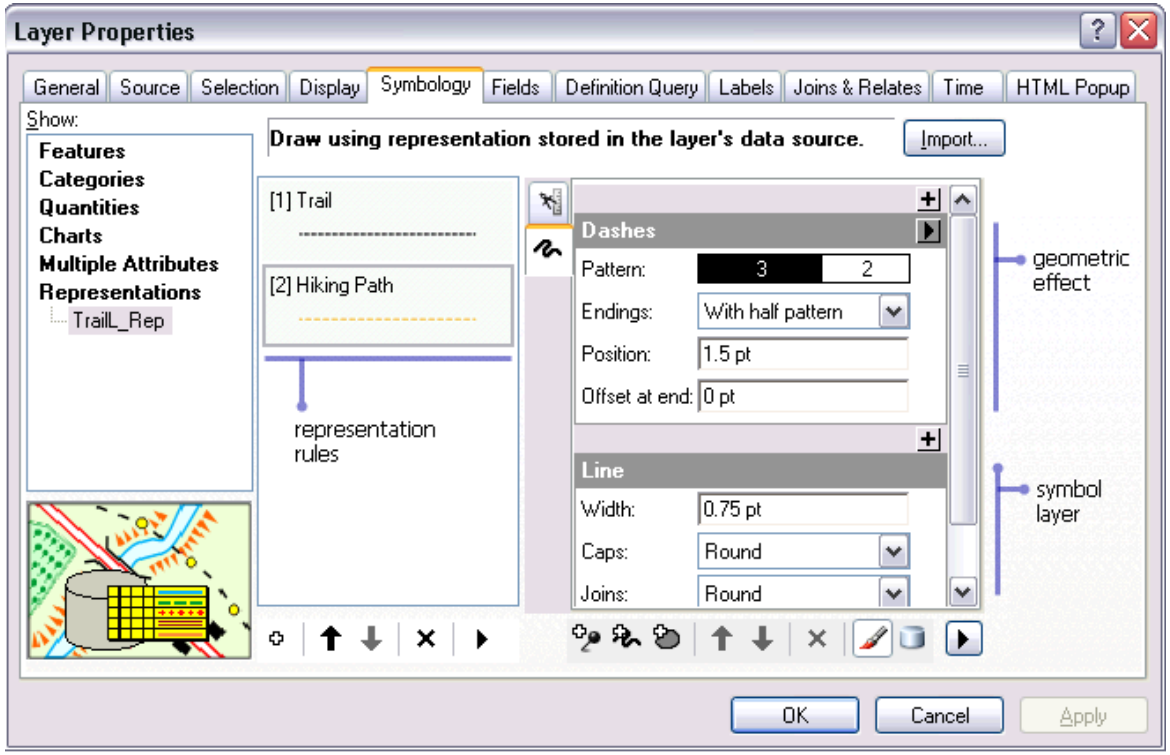
July 2014
Ver 1.0

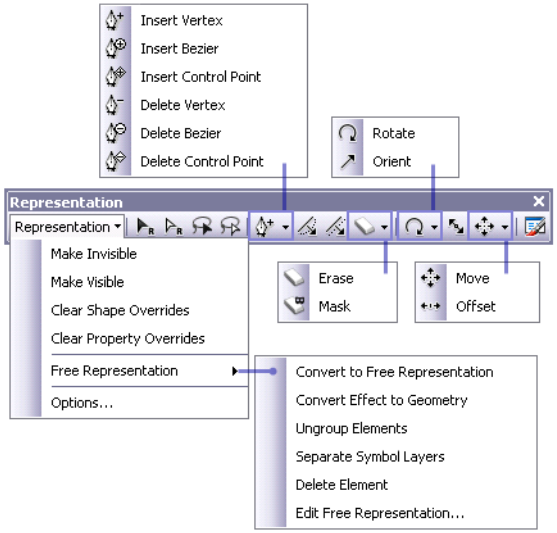
Map Designed by
COL Michael D. Hendricks
The Department of Geography & Environmental Engineering
Data Provided by GIS Office, DPW

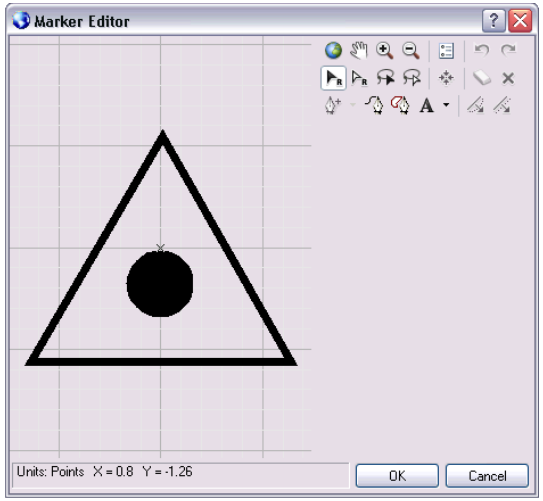
Achieving more Cartographic Control: Representations in ArcGIS

- Representations allow you to customize the appearance of features by storing symbol information with the feature geometry inside feature classes.
- This additional control can help you meet stringent cartographic specifications or simply improve the display.
- Representations are a property of a feature class that are stored in system tables inside the geodatabase and in the feature class itself.

Some Representation Dialog Boxes in ArcGIS

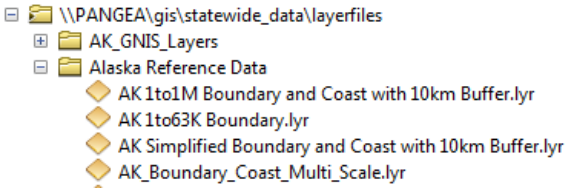


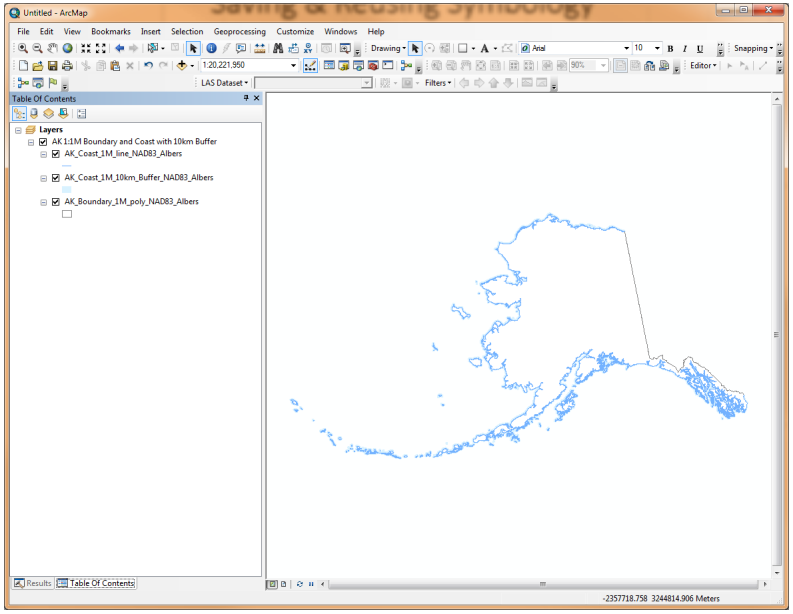




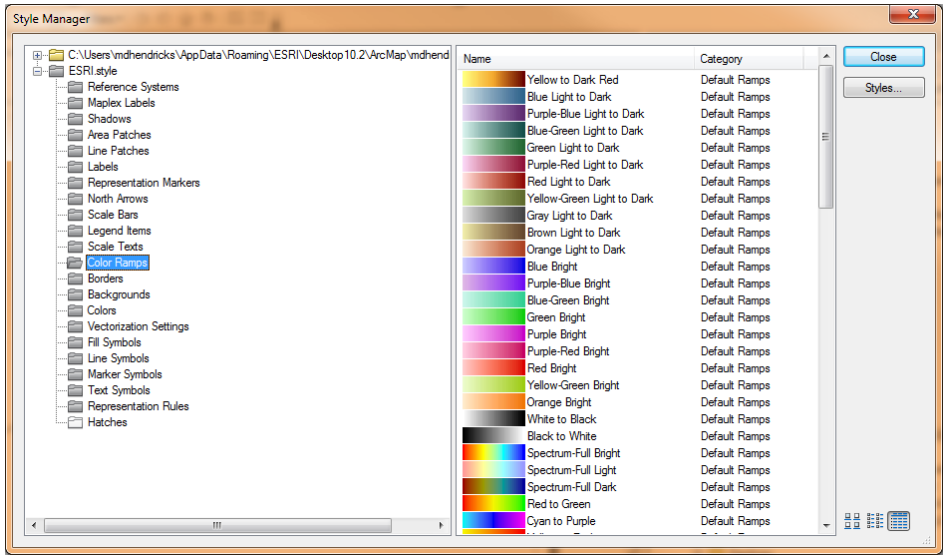
Saving & Reusing Symbology in ArcGIS

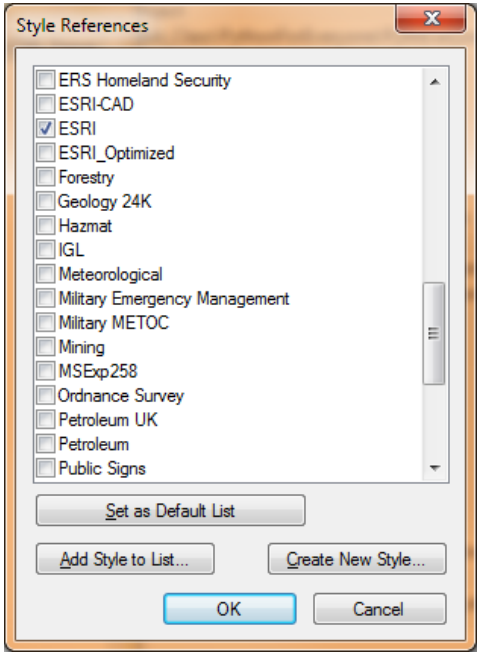
- Layer Files (.lyr)
- Styles (.style)
- Representation in a Feature Class
- Within a Map Document/Templates (.mxd)

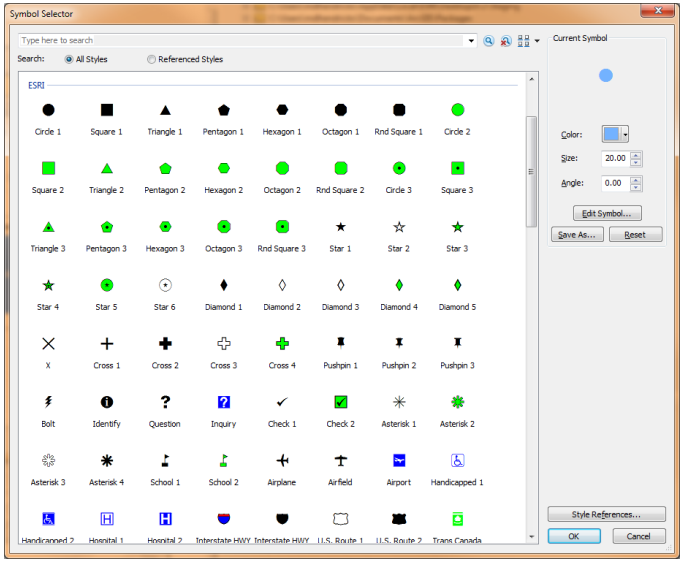


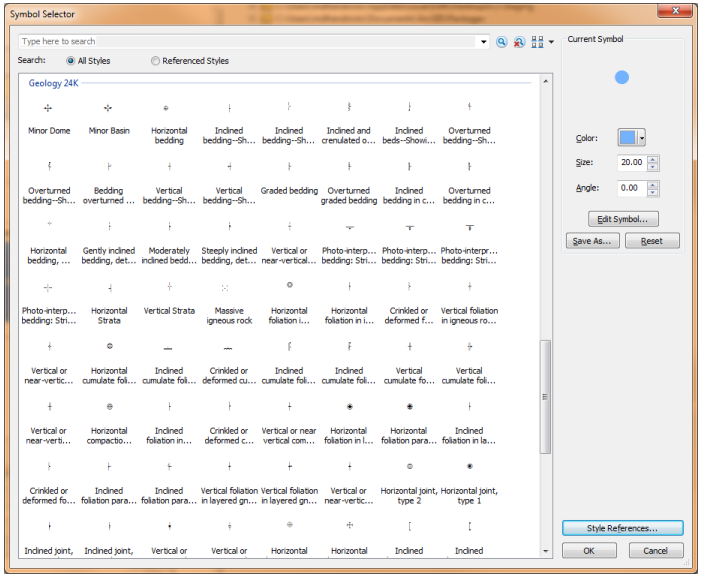


Styles (.style)









Break

Coming up

PART III

- **Generalizing Features**
- **Labeling and Text**

Agenda

PART I

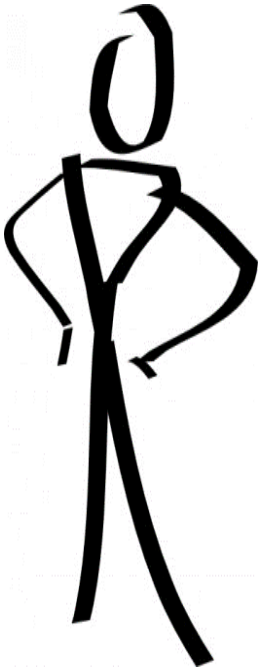
- The Map Design Process
- Fundamentals of Map Design
- Page Layout Design Considerations

PART II

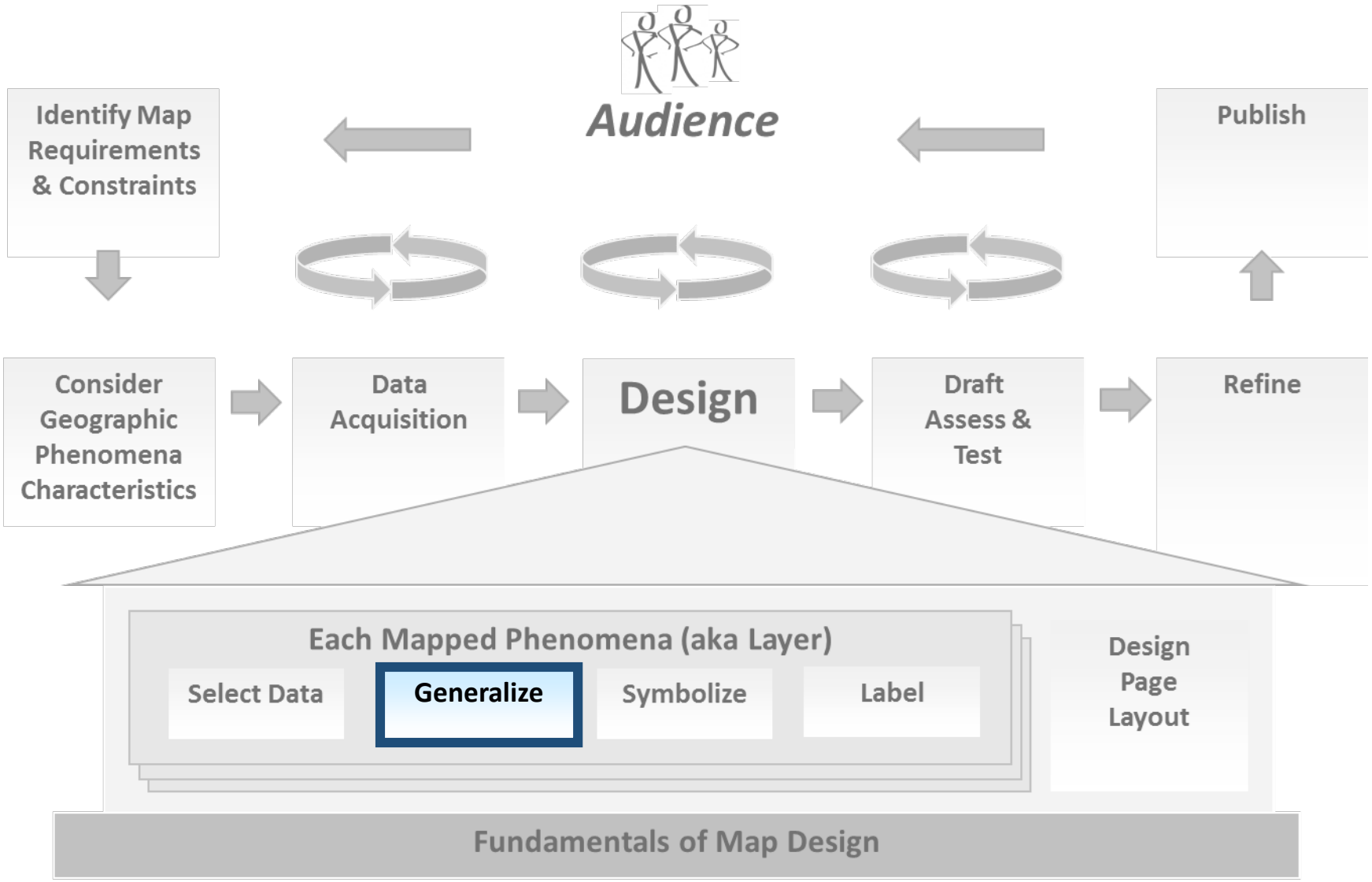
- Understanding Color
- Symbolizing Features

PART III

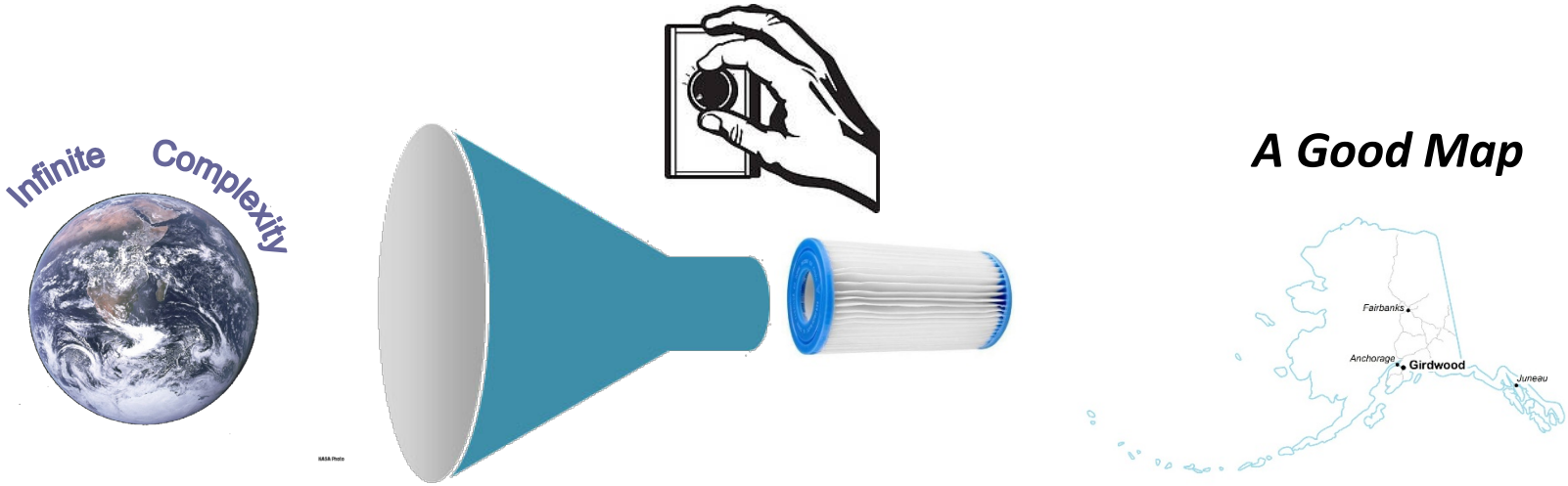
- **Generalizing Features**
- **Labeling and Text**



Generalizing



Generalizing

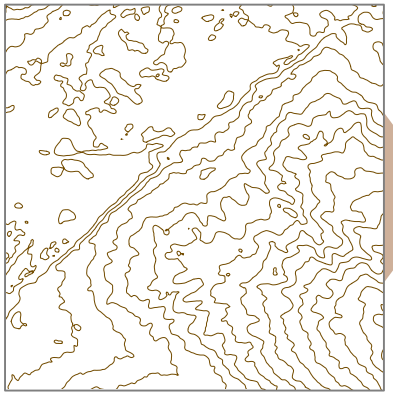


Classify
Simplify
Exaggerate

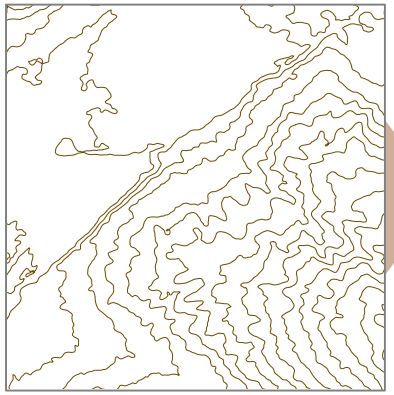
Generalizing Example

Create a simple contour layer

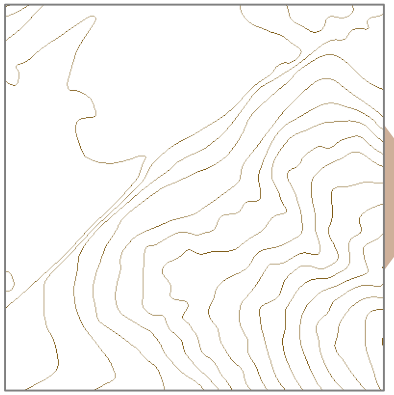
10m Contours Derived From IFSAR Data



Simplify by **Elimination** of short contour lines

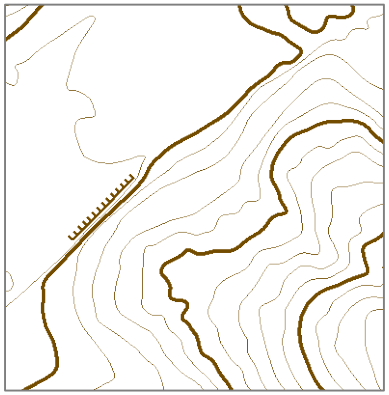


Simplify by **Smoothing** the complex contour lines



Classify Index Lines

Exaggerate & Offset Cliff

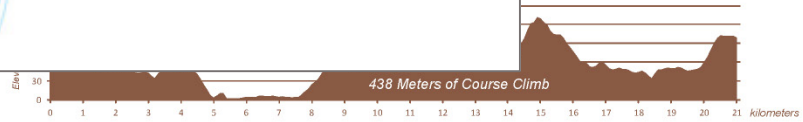


United States Military Academy
2014 Half Marathon
Route & Reference Map

WEST POINT MARATHON

0 0.125 0.25 0.375 0.5 Kilometers
0 500 1,000 1,500 2,000 Feet
0 0.125 0.25 0.375 0.5 Miles

1:15,000



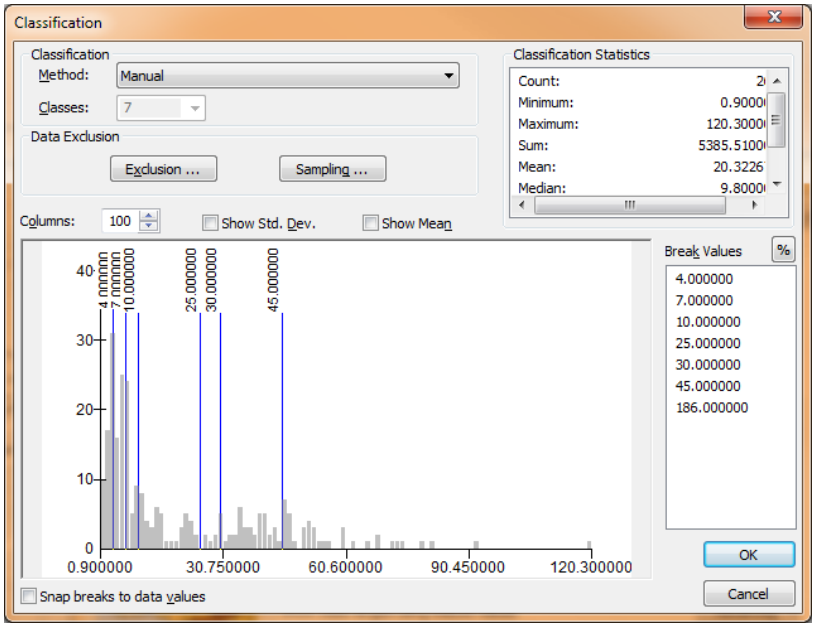
Each elevation contour represents 30 meters (~ 100 feet) of elevation change This equals approximately eight flights of stairs!

ver 1.0

Map Designed by
COL Michael D. Hendricks
The Department of Geography & Environmental Engineering
Data Provided by GIS Office, DPW
17 Dec 2013

Classification

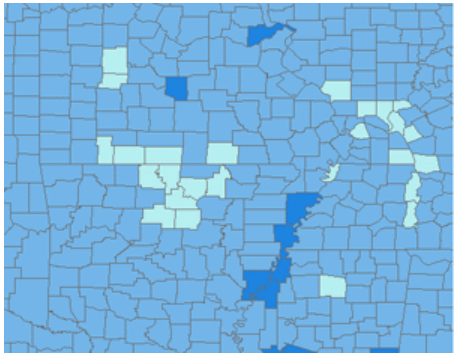
- When you perform a classification, you group similar features into classes by assigning the same value or symbol to each member of the class.
- By altering the class breaks (the boundary between classes), you can create very different-looking maps.
- Classes can be created manually, or you can use a standard classification scheme.
  - Equal Interval
  - Defined Interval
  - Quantile
  - Natural Breaks
  - Geometric Interval
  - Standard Deviation



Taken from ESRI ArcGIS 10.0 help

Effects of Different Classifications

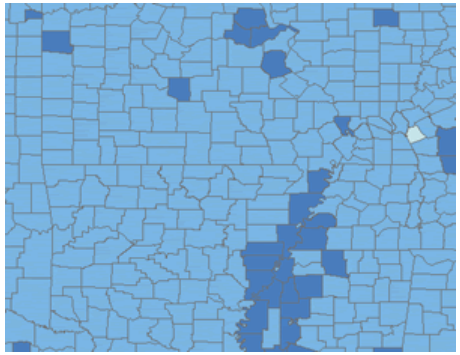
Equal Interval



Percent Population Under 5

- 3% - 6%
- 6% - 9%
- 9% - 12%
- 12% - 15%
- 15% - 18%

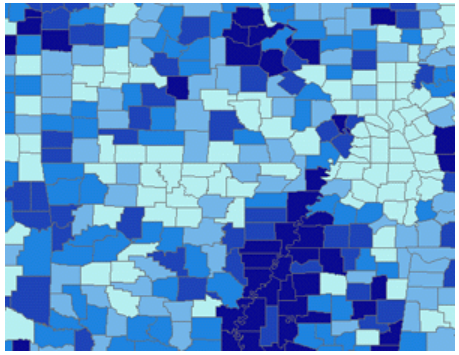
Defined Interval



Percent Population Under 5

- 3% - 4%
- 5% - 8%
- 9% - 12%
- 13% - 16%
- 17% - 20%

Quantile

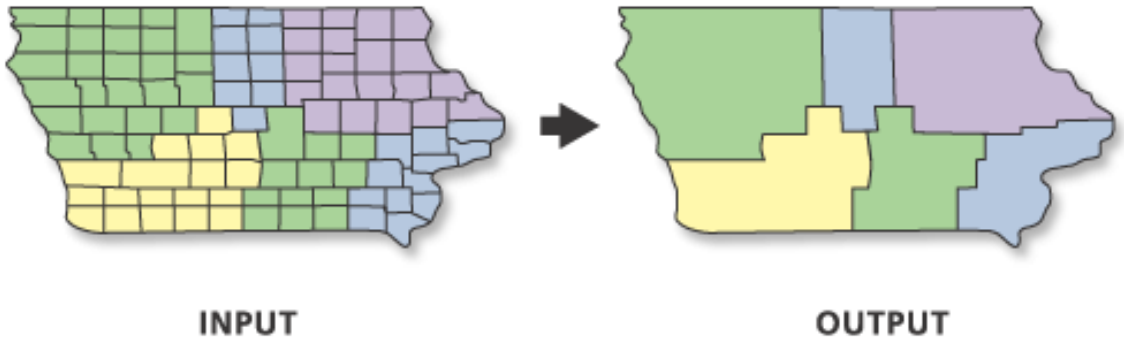


Percent Population Under 5

- 2.7% - 6.3%
- 6.3% - 6.8%
- 6.8% - 7.2%
- 7.2% - 7.8%
- 7.8% - 18%

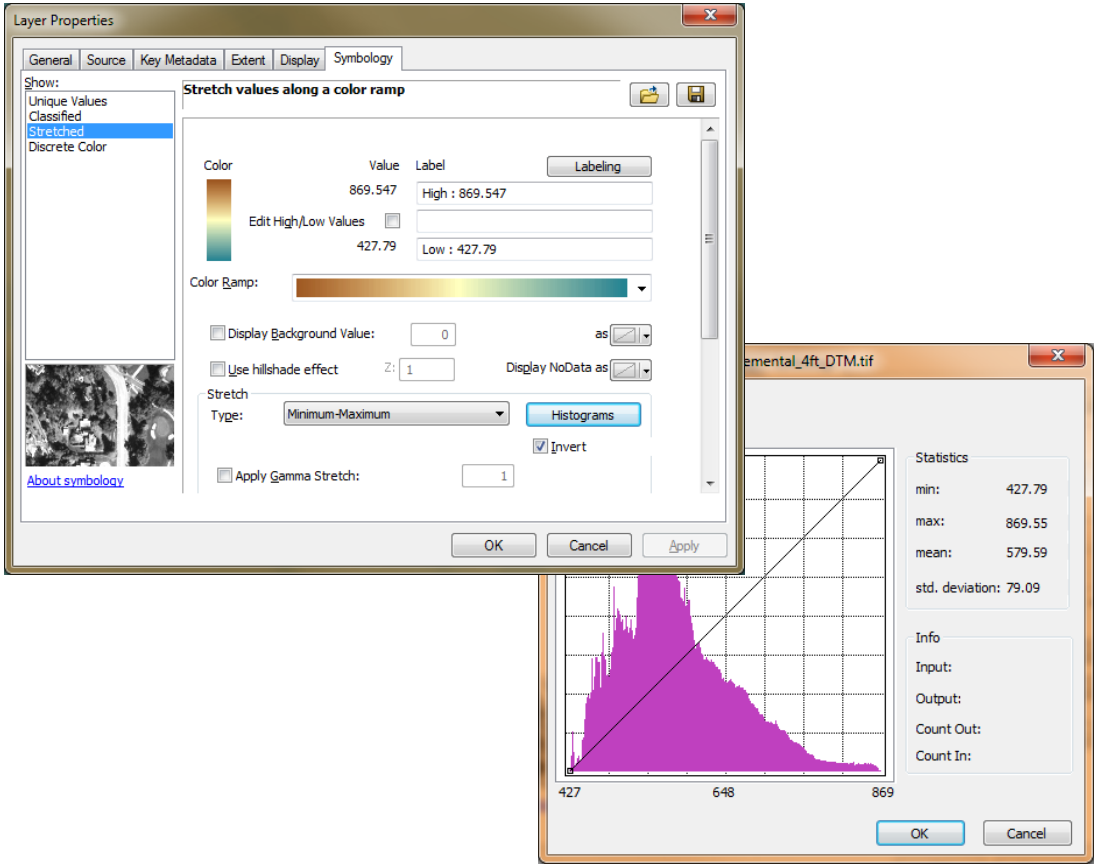
Dissolve Boundaries

A geoprocessing command that removes boundaries between adjacent polygons that have the same value for a specified attribute.



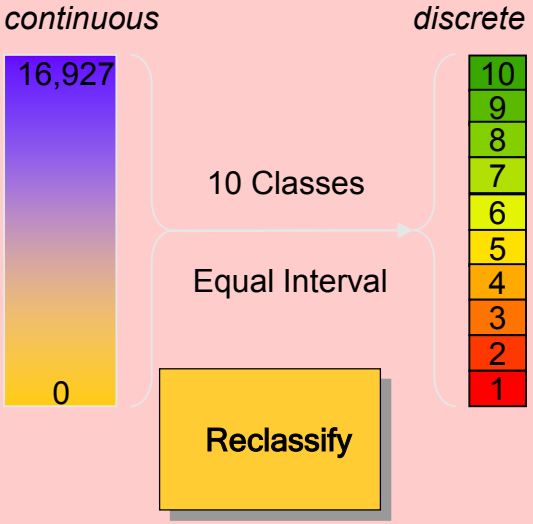
Classifying Rasters

Reclassify: The process of taking input cell values and replacing them with new output cell values.



Reclassify

The process of taking input cell values and replacing them with new output cell values. Reclassification is often used to simplify or change the interpretation of raster data by changing a single value to a new value, or grouping ranges of values into single values



Raster Resampling

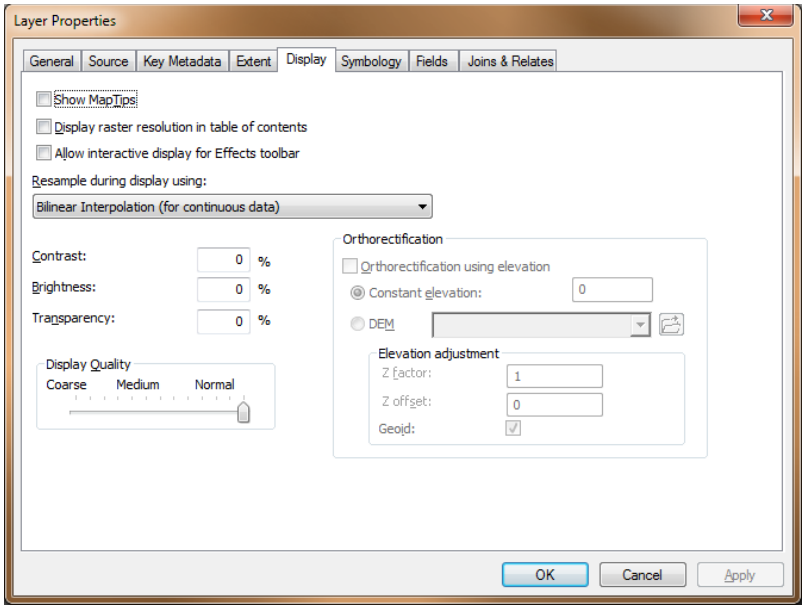
Rarely do you see 1 for 1 the pixels of a raster on your screen. You typically are seeing pixels & parts of pixels grouped into one.

Set Resampling

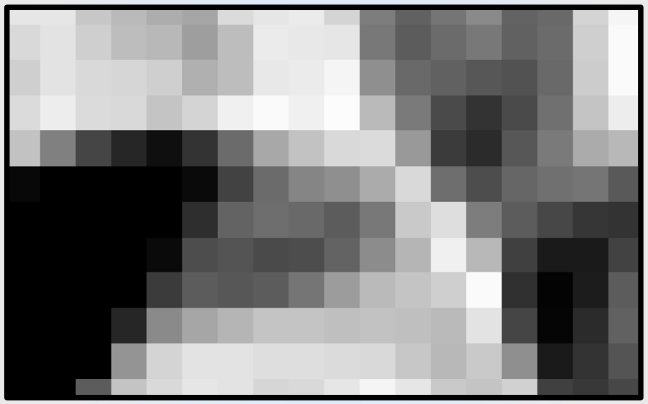
- For on-the-fly viewing in Layer Properties
- When Projecting Data & Building Pyramids
- Others

Methods

- Nearest Neighbor
- Bi-Linear Interpolation
- Cubic Convolution
- Majority



Raster Resampling Example

	Nearest Neighbor	Bi-Linear Interpolation
Zoomed Out		
Zoomed In		

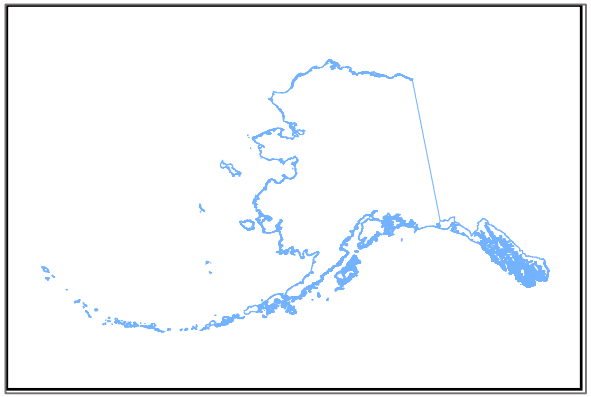
Simplification

- Point Removal
- Line Elimination
- Line Simplification
- Line Smoothing
- Polygon Removal
- Polygon Edge Simplification
- Polygon Edge Smoothing
- Other

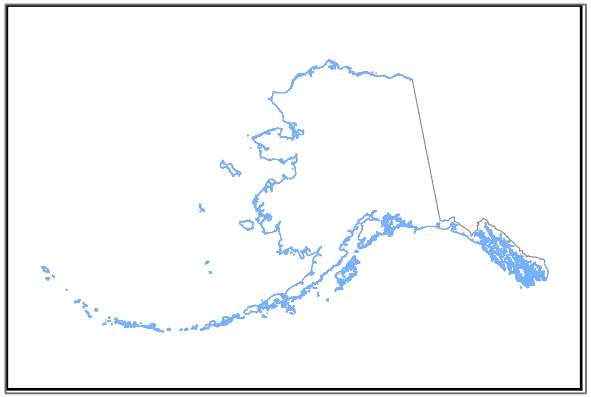
You can achieve Visual Hierarchy on map with simplification

1:55,000,000

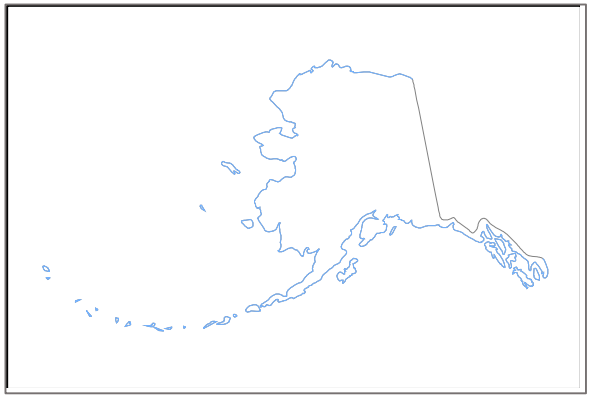
1:63,500 Shoreline

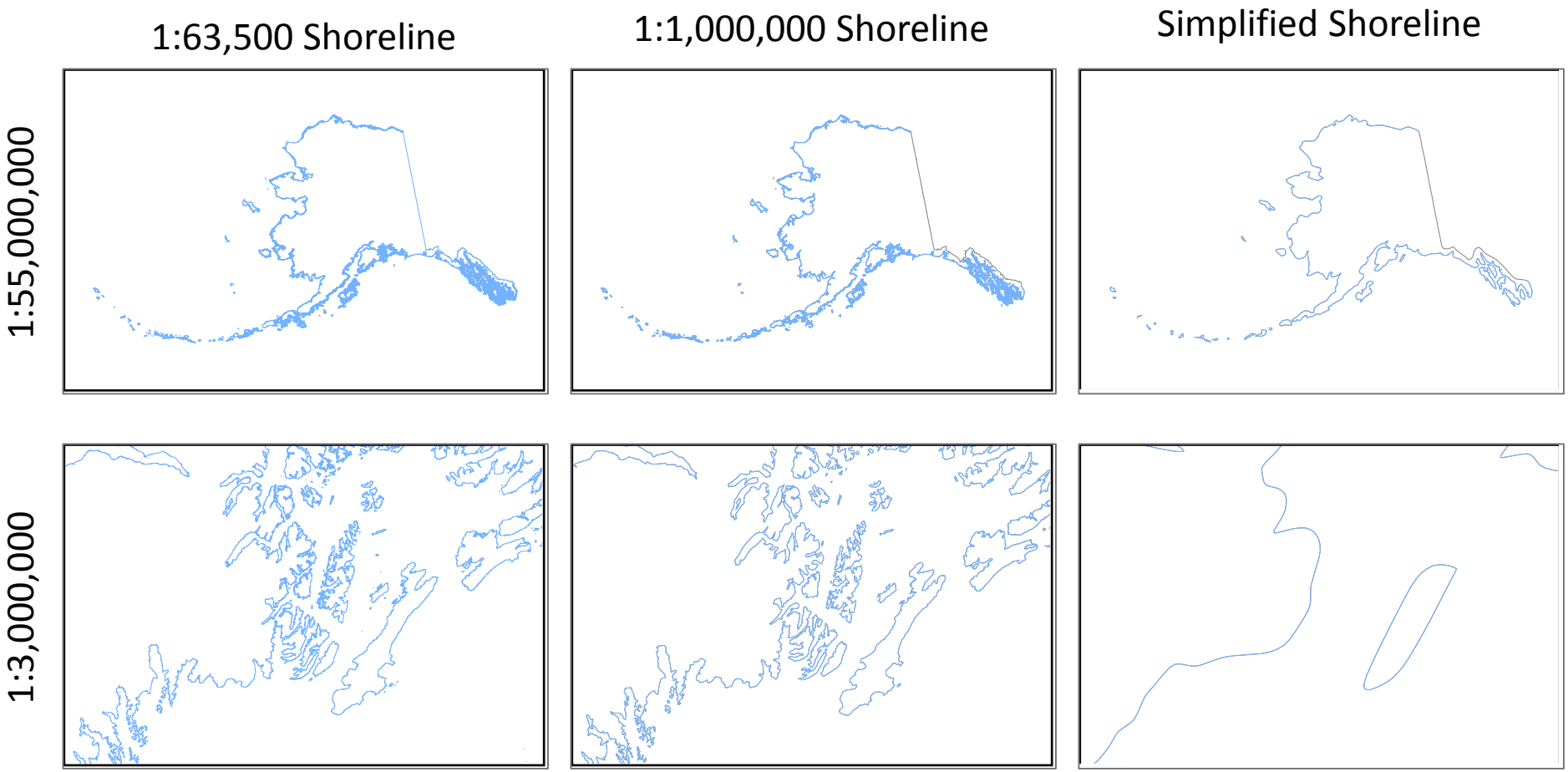


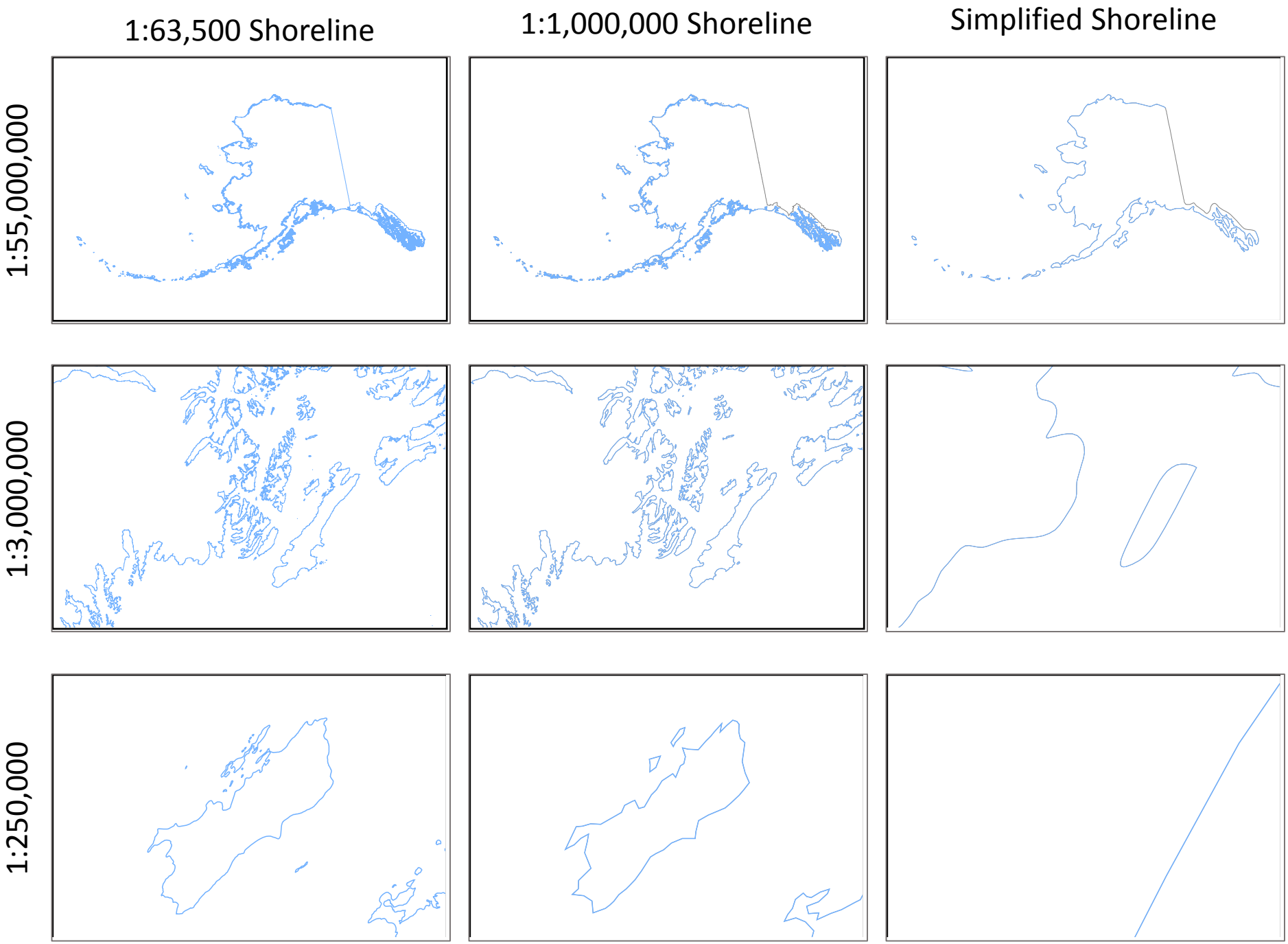
1:1,000,000 Shoreline



Simplified Shoreline




1:63,500 Shoreline
1:1,000,000 Shoreline
Simplified Shoreline
1:55,000,000
1:3,000,000


1:63,500 Shoreline
1:1,000,000 Shoreline
Simplified Shoreline
1:55,000,000
1:3,000,000
1:250,000

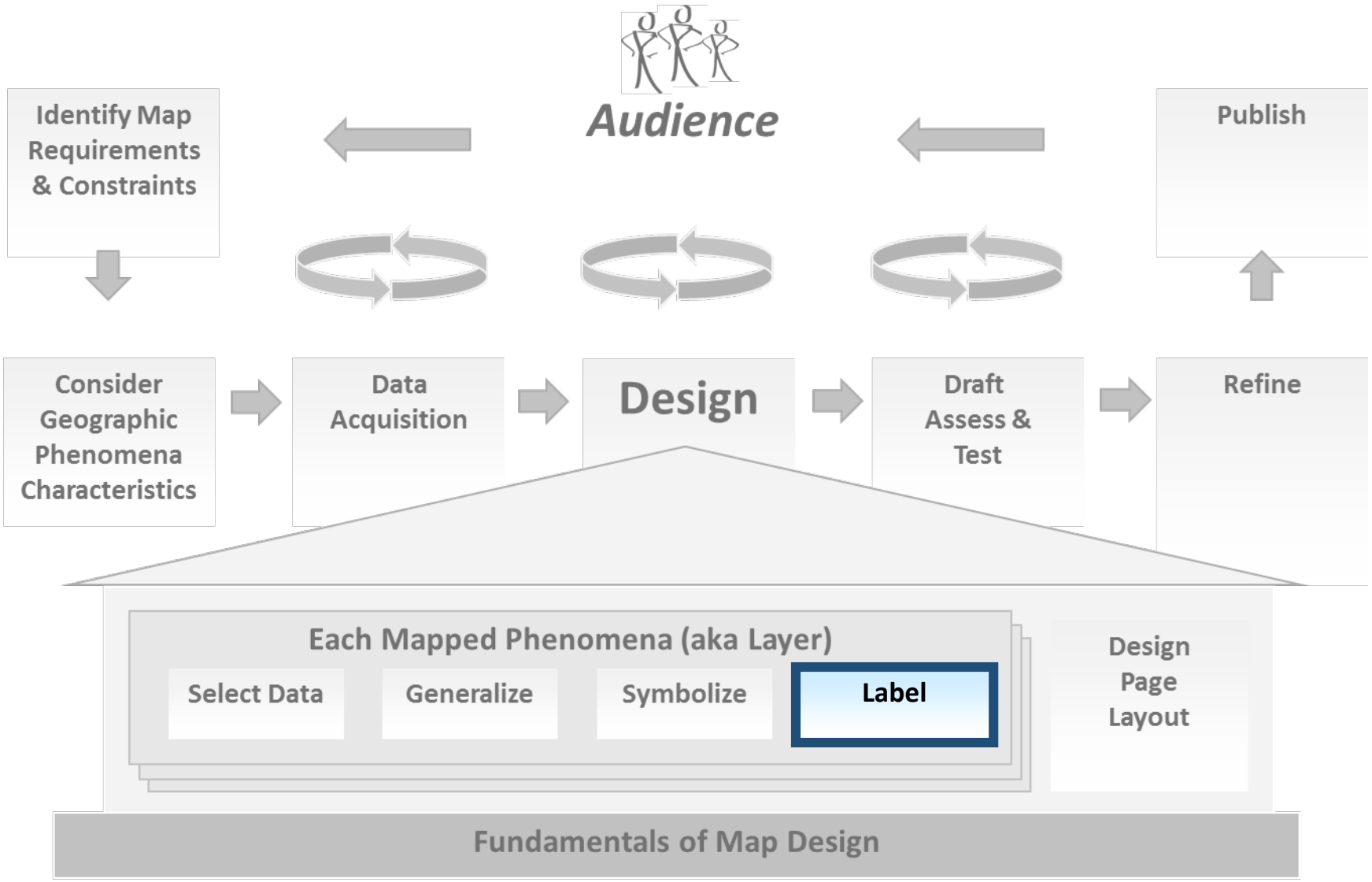
Exaggeration

Exaggerate the characteristic of a feature to bring feature forward in visual hierarchy or increase legibility.

For example:

- Road/Trail symbol widths often greatly exaggerate actual road width
- Polygon Features such as town boundaries at small scale are exaggerate with a point symbol
- Increase curviness of river to highlight that characteristic
- Exaggerate Height in Hillshade to highlight topography

Labeling


Audience
Identify Map Requirements & Constraints
Publish
Consider Geographic Phenomena Characteristics
Data Acquisition
Design
Draft Assess & Test
Refine
Each Mapped Phenomena (aka Layer)
Select Data
Generalize
Symbolize
Label
Design Page Layout
Fundamentals of Map Design

A **Label** is just a Special Symbol

Labels are a <u>Literal Symbol</u>

ie. the word themselves

Labels can also be:

a <u>Locative Symbol</u>

along rivers, mountains

on lakes, fields, etc.

also <u>Quantitative Symbols</u>

variation of

Size, Case, Value & Saturation

Characteristic of Type *in ArcGIS*

Type Family
- Arial
- Times
- Calibri

Type Size
- *14*
- **20**

Type Style
- Normal
- **Bold**
- *Italic*
- Underlined

Type Color
- **Red**
- **Green**
- **Blue**

Case
- **UPPERCASE**
- **Lowercase**
- **Title Case**
- **Sentence Case**

Spacing

Character Spacing

Character Spacing

Word Spacing

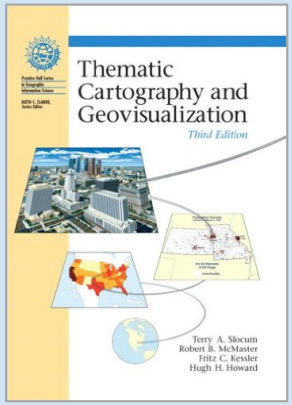
Orientation

Angle

Curving Text

Labeling General Guidelines

- Do not Passively Use Software Defaults
- Avoid Decorative Type
- Use Bold and Italic Sparingly
- Two or less type families
- Use Smallest Font Size Possible
- Type Size Should relate to importance
- Spelll Cheeck ☺

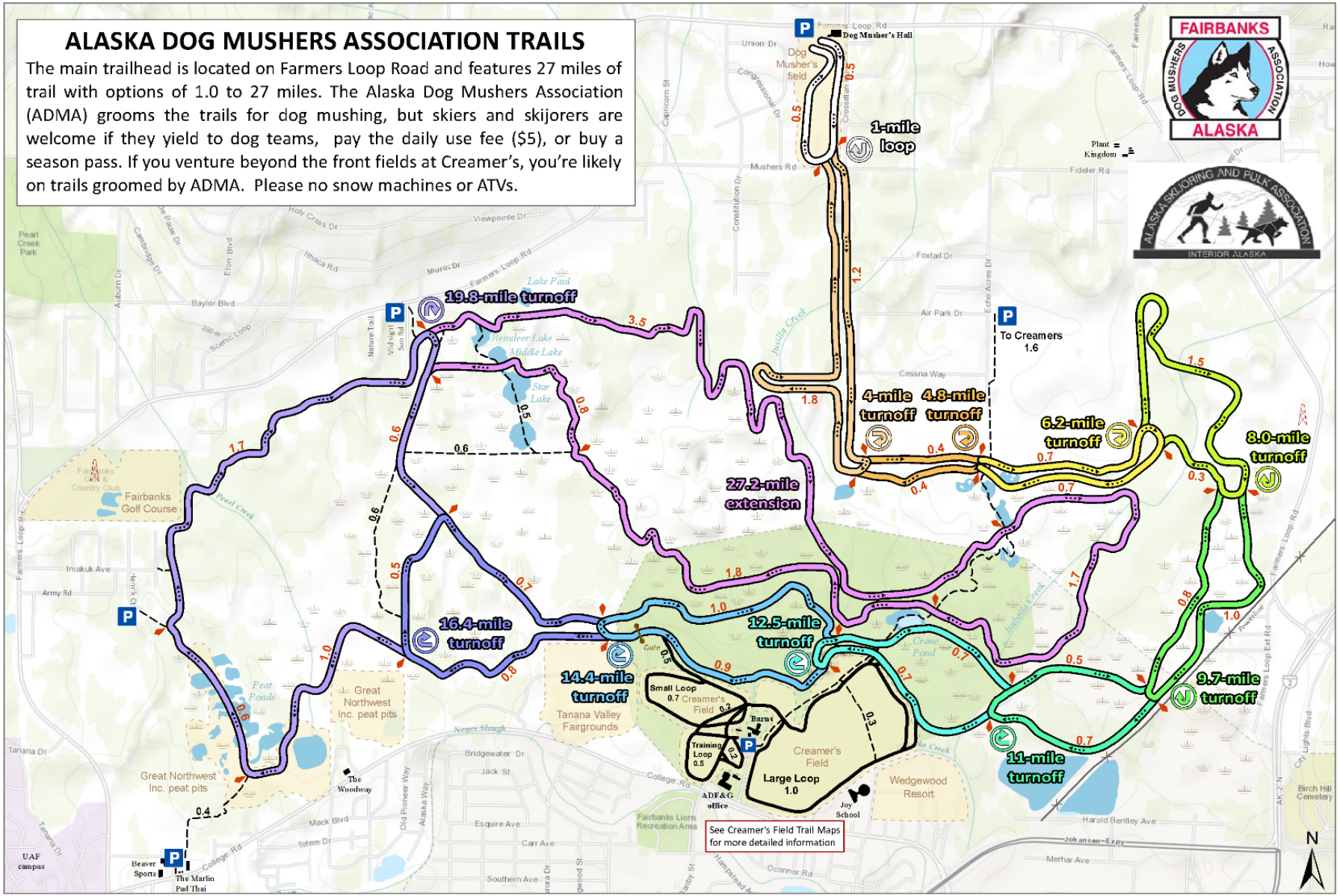


(Slocum, 2005)

- Clearly associate Labels with features
- Avoid overprinting features, particularly boundaries & lines: *consider Masks, Halos, Callouts*
- Normally Orient Type Horizontally

ALASKA DOG MUSHERS ASSOCIATION TRAILS

The main trailhead is located on Farmers Loop Road and features 27 miles of trail with options of 1.0 to 27 miles. The Alaska Dog Mushers Association (ADMA) grooms the trails for dog mushing, but skiers and skijorers are welcome if they yield to dog teams, pay the daily use fee ($5), or buy a season pass. If you venture beyond the front fields at Creamer's, you're likely on trails groomed by ADMA. Please no snow machines or ATVs.



P	Parking area
	Radio tower
	Gate
	Wet areas (summer)
1.2	ADMA trail, showing direction of travel and distance between markers
10.0-mile turnoff	Turnoff for total loop distance from Musher's Hall
0.4	Narrow trail or footpath, showing distance
0.2	Creamers Field Trails, showing distance

0 0.25 0.5 1 Mile

All trail distances are shown in miles.
No significant elevation change along trails.

Trails mapped using differentially corrected GPS in March of 1999 by Northern Associates, Inc. Cartography by Patricia Gallagher. Basemap from ESRI World Topo Map service.

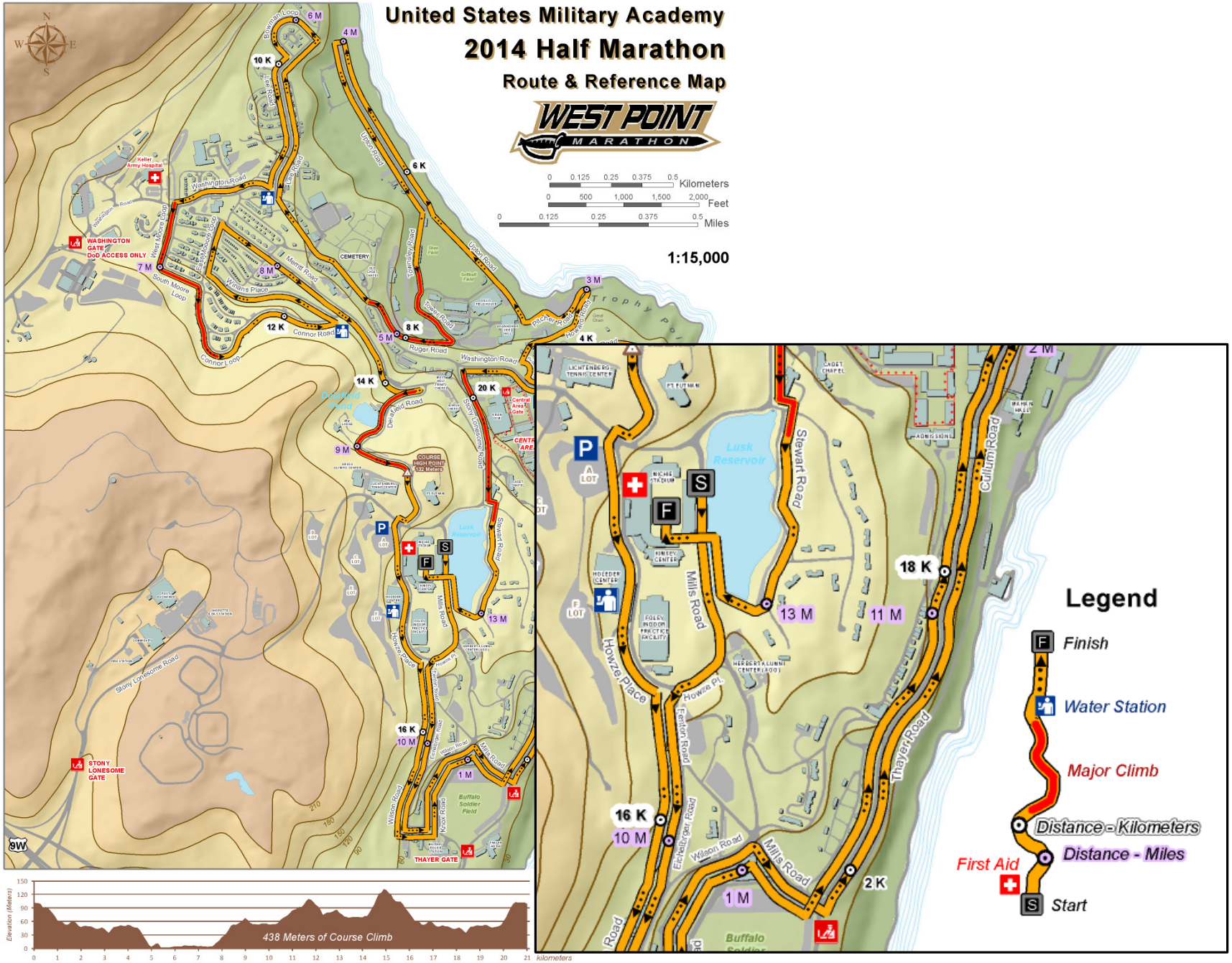
ALGERIA
TUNISIA
Tripoli
GREECE
Ankara
TURKEY
ARMENIA
Yerevan
AZERBAIJAN
Baku
TURKMENISTAN
Ashgabat
Caspian Sea
Tehran
IRAN
Mediterranean Sea
CYPRUS
Nicosia
LEBANON
Beirut
SYRIA
Damascus
ISRAEL
Jerusalem
Amman
JORDAN
Baghdad
IRAQ
LIBYA
Cairo
Suez Canal
EGYPT
Nile River
KUWAIT
Kuwait City
Persian Gulf
BAHRAIN
Manama
QATAR
Doha
Abu Dhabi
U.A.E.
Muscat
OMAN
SAUDI ARABIA
Riyadh
NIGER
CHAD
Ndjamena
SUDAN
Khartoum
Red Sea
ERITREA
Asmara
ETHIOPIA
Sanaa
YEMEN

United States Military Academy
2014 Half Marathon
Route & Reference Map

WEST POINT MARATHON

0 0.125 0.25 0.375 0.5 Kilometers
0 500 1,000 1,500 2,000 Feet
0 0.125 0.25 0.375 0.5 Miles

1:15,000



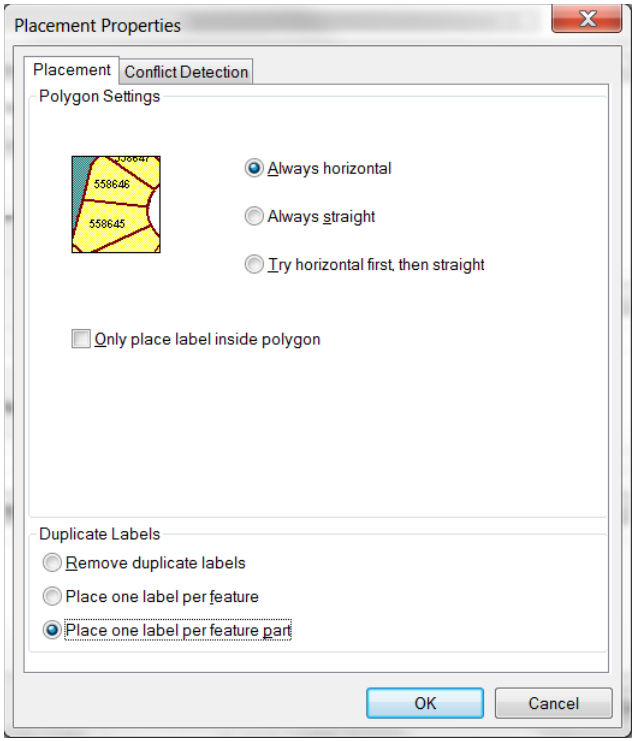
Types of Text in ArcGIS

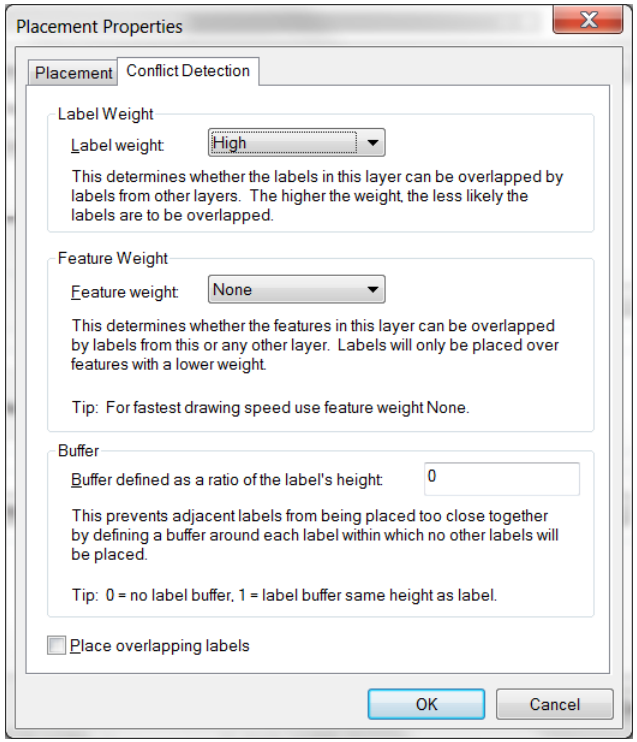
- **Labels**: A label is a piece of text that is automatically positioned and whose text string is based on feature attributes
  - Two Label Engines (1) Standard and (2) Maplex

- **Annotations**: Annotations provide more flexibility over the appearance and placement of your text because you can select individual pieces of text and edit their position and appearance
  - Stored in Map or Geodatabase

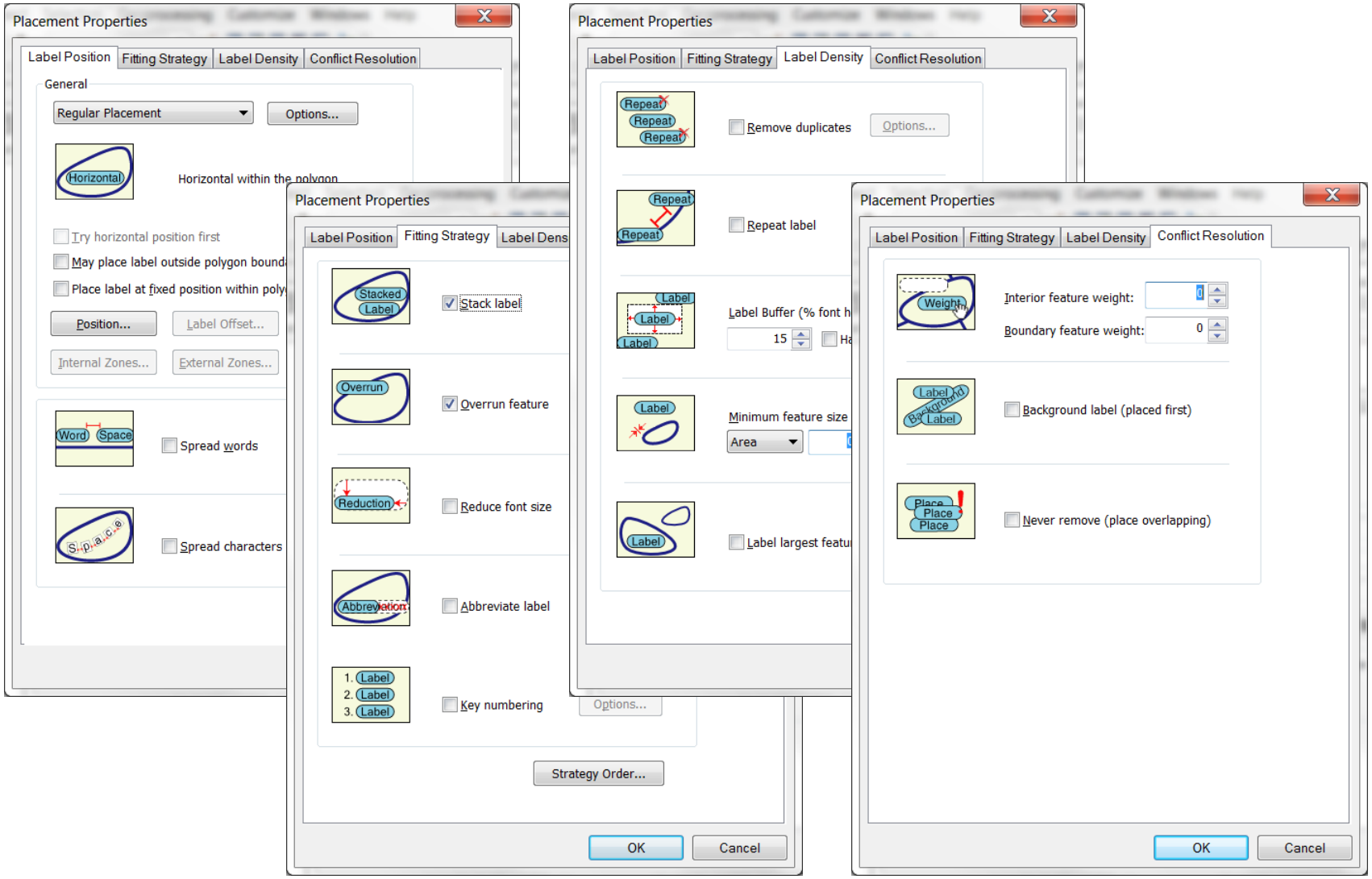
- **Graphic Text**: Graphic text is useful for adding information on and around your map that exists in page space—as opposed to annotation, which is stored in geographic space.

Placement Options
ArcGIS Standard Label Engine





Placement Options
ArcGIS Maplex Label Engine



Extending Basic Labeling with Label Expressions

- You can use **label expressions** to further adjust the formatting of your labels
- Requires some coding (choices are Python, VBScript, or Jscript)

Basic Examples:

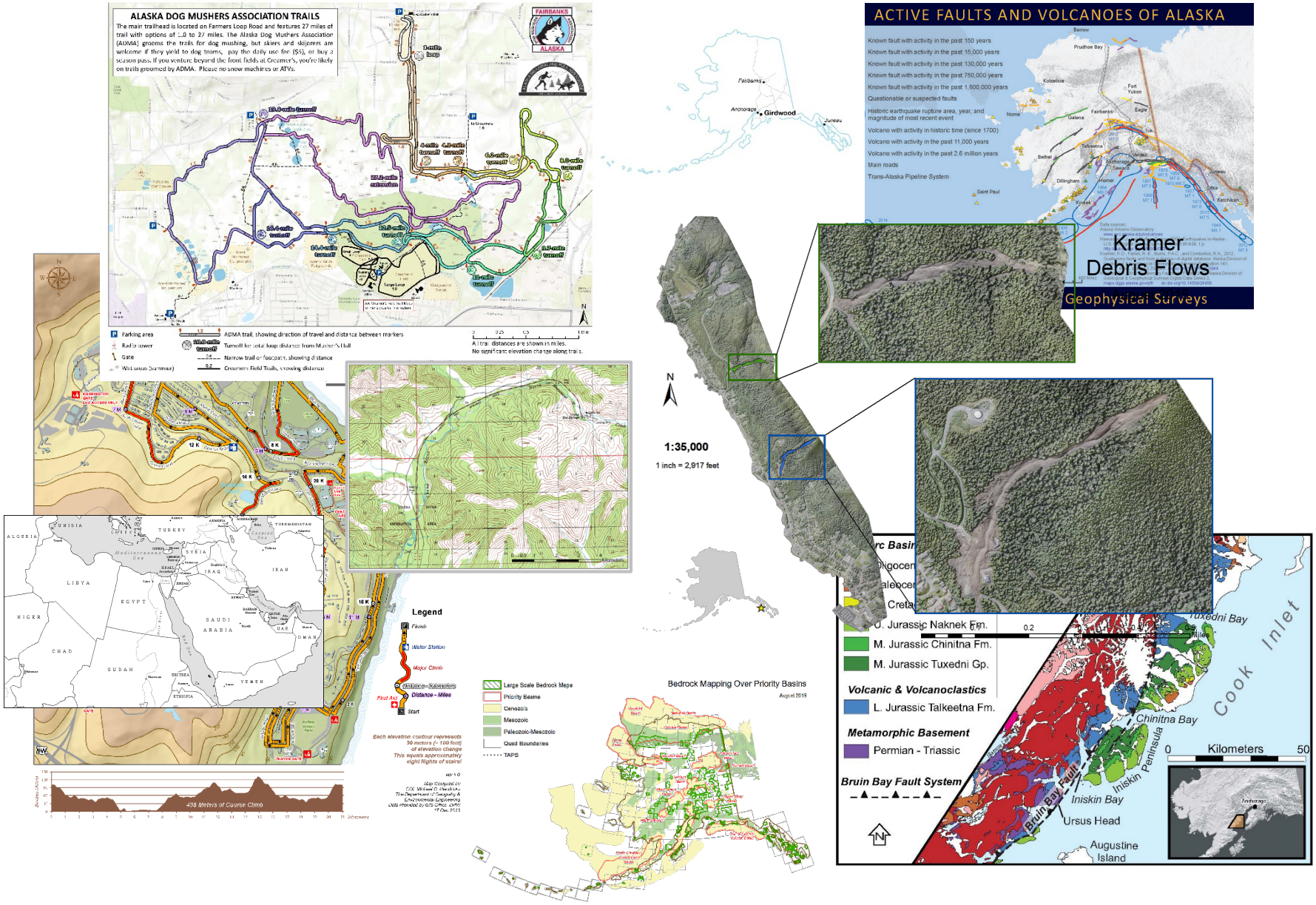
Concatenate a string
to the value in a field.

```
"Parcel no: " + [PARCELNO]
```

Create stacked text based
on text from a field value.
For example, this expression uses the comma to specify where the stack happens:

```
def FindLabel ([LABELFIELD]):
  S = [LABELFIELD]
  S = S.replace(', ', '\n')
  return S
```

Some Maps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FAIRBANKS
ALASKA
Parking area
Radio tower
Gate
Wetlands (summer)
ADMA trail, showing direction of travel and distance between markers
Turnoff for total loop distance from Musher's Hull
Narrow trail or footpath, showing distance
Creamers Field Trails, showing distance
All trail distances are shown in miles.
No significant elevation change along trails.
Legend
Finish
Water Station
Major Climb
Distance - Kilometers
Distance - Miles
Start
Each elevation contour represents 30 meters (~ 100 feet) of elevation change
This equals approximately eight flights of stairs!
Large Scale Bedrock Maps
Priority Basins
Cenozoic
Mesozoic
Paleozoic-Mesozoic
Quad Boundaries
TAPS
Bedrock Mapping Over Priority Basins
August 2015
ACTIVE FAULTS AND VOLCANOES OF ALASKA
Known fault with activity in the past 150 years
Known fault with activity in the past 15,000 years
Known fault with activity in the past 130,000 years
Known fault with activity in the past 750,000 years
Known fault with activity in the past 1,600,000 years
Questionable or suspected faults
Historic earthquake rupture area, year, and magnitude of most recent event
Volcano with activity in historic time (since 1700)
Volcano with activity in the past 11,000 years
Volcano with activity in the past 2.6 million years
Main roads
Trans-Alaska Pipeline System
Kramer
Debris Flows
Geophysical Surveys
1:35,000
1 inch = 2,917 feet
M. Jurassic Chinitna Fm.
M. Jurassic Tuxedni Gp.
Volcanic & Volcanoclastics
L. Jurassic Talkeetna Fm.
Metamorphic Basement
Permian - Triassic
Bruin Bay Fault System
Cook Inlet
Chinitna Bay
Iniskin Peninsula
Iniskin Bay
Ursus Head
Augustine Island
Kilometers
0
50