

A5 critique

Notes

- We will critique everyone's submission
- Please refrain from speaking while your map is being discussed, you will have time at the end to talk about each of your design decisions

A5 overview

NYC Reference Map

- Must use data from either [NYC Open Data](#) or [NYC Geodatabase](#) (and/or additional sources if desired)
- Implement appropriate color scheme for your data
- Text layout done in Inkscape
- Use of two contrasting typefaces/fonts
- Effective labelling
- All basic cartographic elements present

L6

Design for Maps I

cartographic elements,
principles of design + layout

What is a map?

What is a map?

...we can all agree, any idea of what a map is or isn't covers a good deal of intellectual territory

But reduced to its simplest elements, a map is simply a means of communication

Therefore everything you do within the confines of the 'map-making process' should be to the betterment of this communication

Remember Occam's Razor—simple is better¹

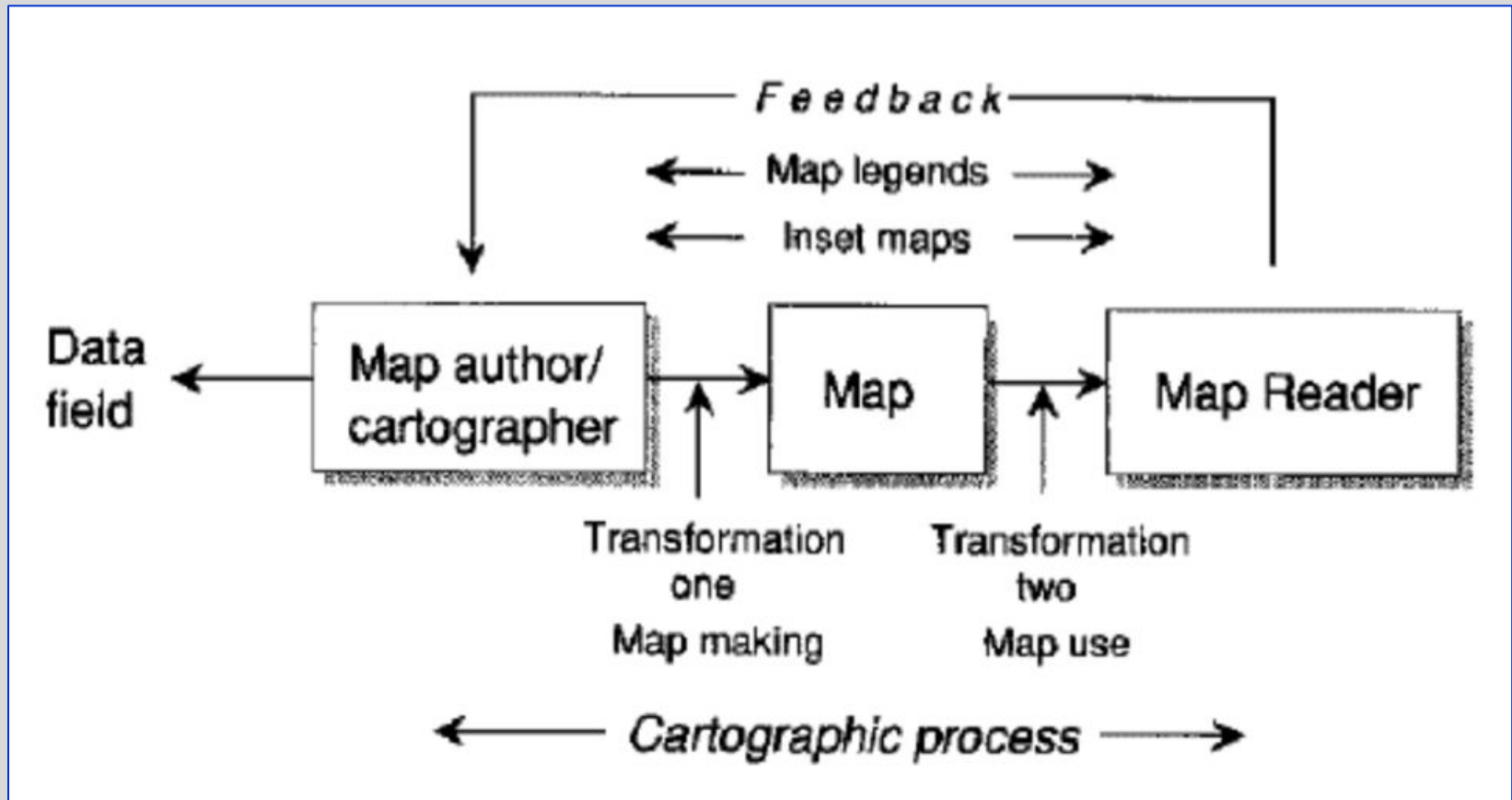
¹This concept wildly paraphrased here fyi

What is a map?

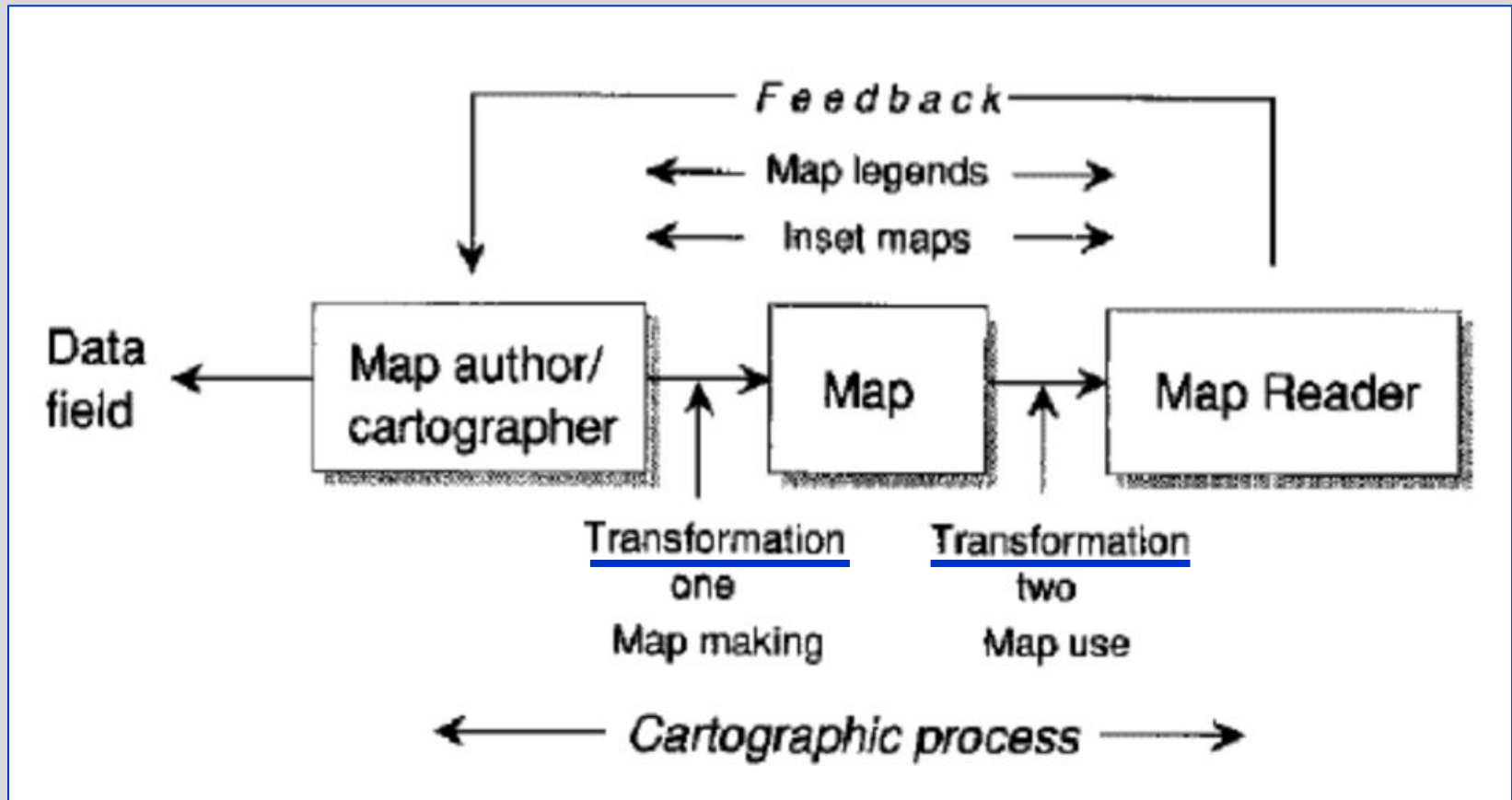


<< Looks like it's going to be a long ride to Grandma's house!

The Mapping Process



The Mapping Process



On Cartographic Design

Things to consider...

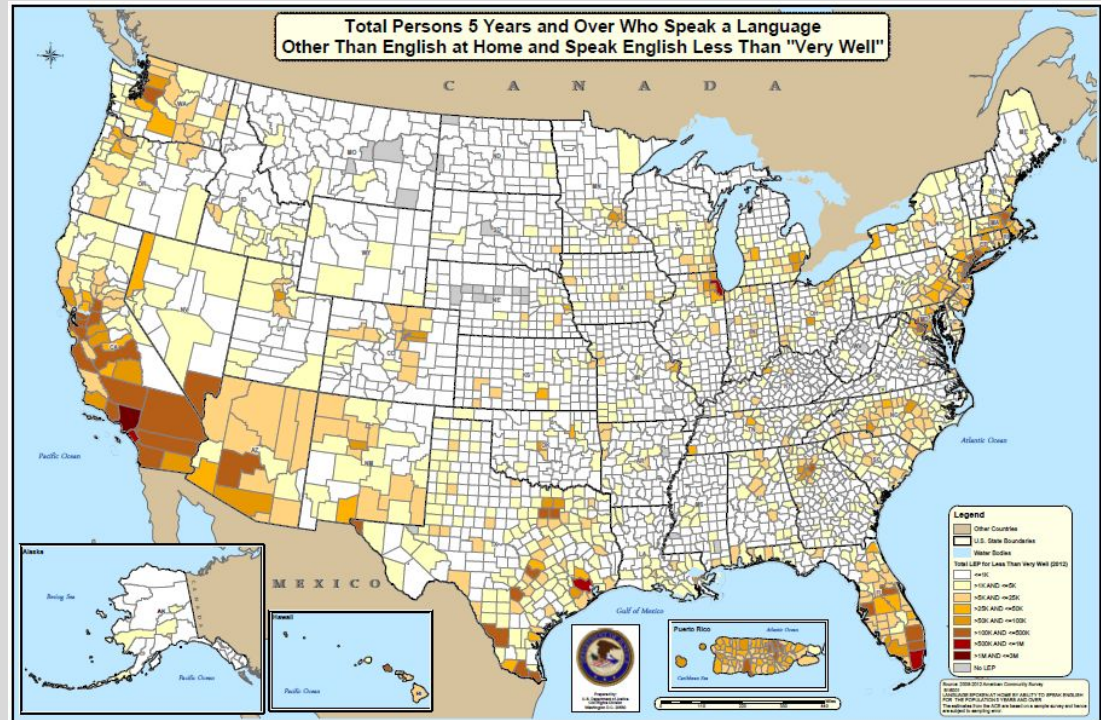
- Mental/physical map creation process
- Design relates to appearance, effectiveness in information communication
- Base level—follow rules, guidelines, and conventions
- Increasing body of research on how maps ‘work’ (ResearchGate, JSTOR, etc.)
- Artistic element of mapmaking should be guided less by experiment than intuition and critical examination (i.e. critique)
- Significant overlap with graphic design (concepts/practice)

What are the conventional map elements?

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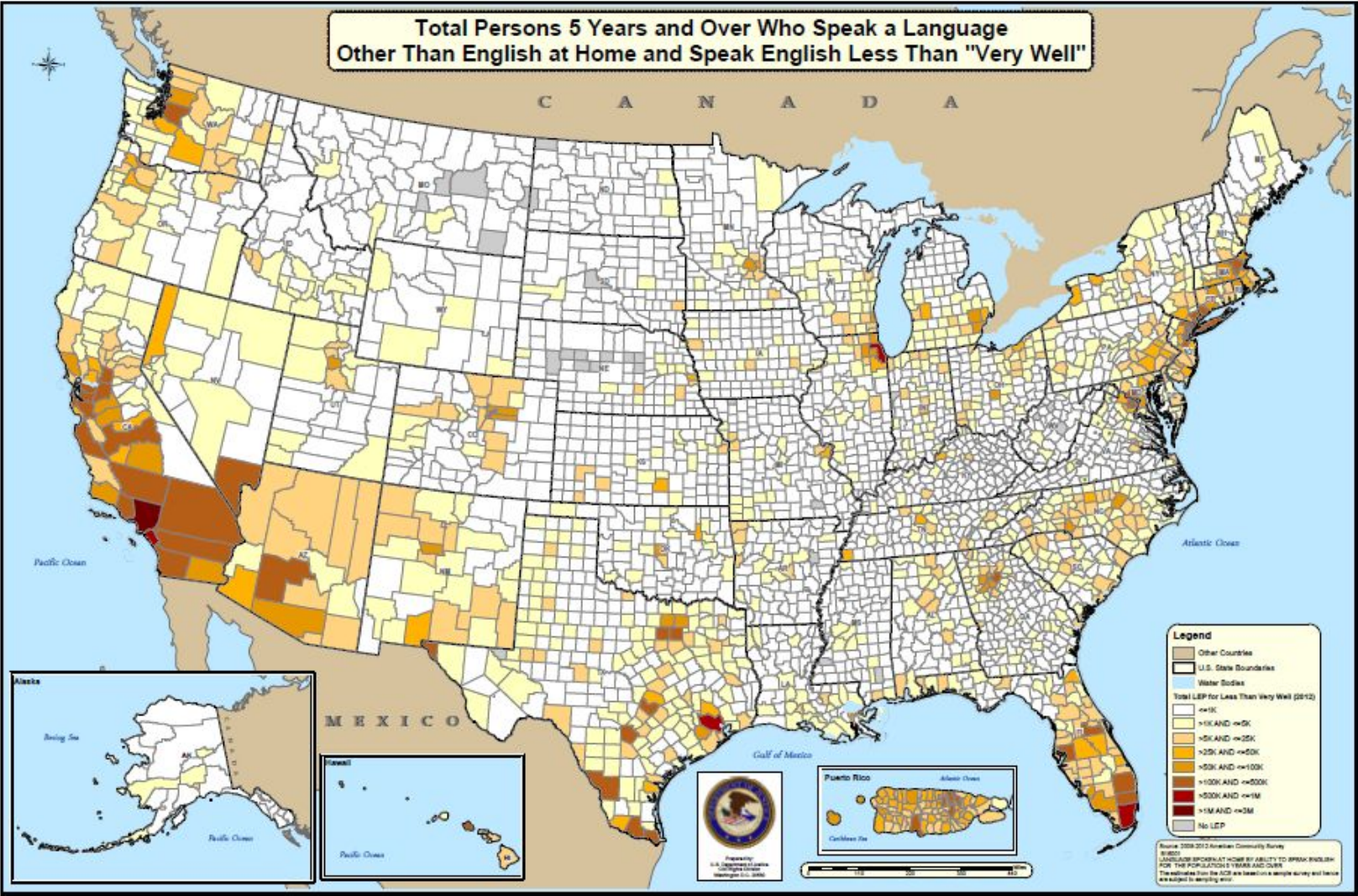
Slocum's² Map Elements

- Frame and neat line
- Mapped area (figure)
- Inset
- Title and subtitle
- Legend
- Data Source(s)
- Scale
- Orientation



² Slocum, Terry

What are the conventional map elements?



Sources: <http://www.geog.ucsb.edu/~kclarke/Geography183/Lecture09.pdf>

What are the conventional map elements?

...Also BOLTSS

- **B**order
- **O**rientation
- **L**egend
- **T**itle
- **S**cale
- **S**ource

'Gestalt'

Gestalt is a concept originating in the field of psychology which means unified whole

It refers to theories of *visual perception* developed by German psychologists in the 1920s

These theories attempt to describe how people tend to organize visual elements into groups or unified wholes when certain principles are applied

Gestalt Principles

- Similarity
- Continuation
- Closure
- Proximity
- Figure/Ground

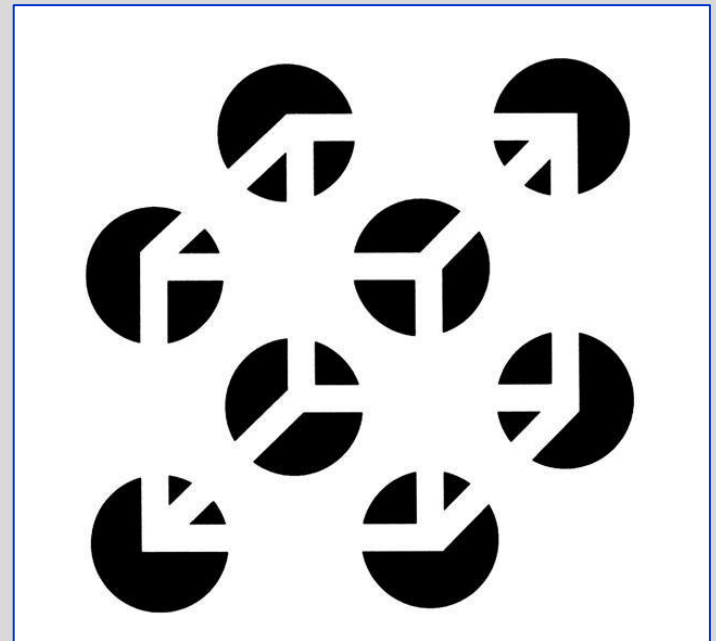
'Gestalt' applied to mapping

In mapping we interpret the gestalt principles a bit more loosely...

- Maps consist of elements
- Human cognition is based on **clumping**
- Elements are seen both *individually* and holistically
- Eye seeks similarity, proximity, continuity, and closure
- Symmetry, simplicity, and balance are favored



Gestalt figures, above and left



Cognition as function of clumping example

Which chair is out of place?



Cognition as function of clumping example

Which chair is out of place?



Slocum's design process

- Choose reproduction method
- Select scale/projection appropriate for theme
- Identify classification/symbolization method
- Select map elements required
- Rank symbols/elements into intellectual hierarchy
- Create a test map for design experiments (remember 'design thinking' from L1)
- Test map on audience prior to finalizing

Visual hierarchies (revisited)

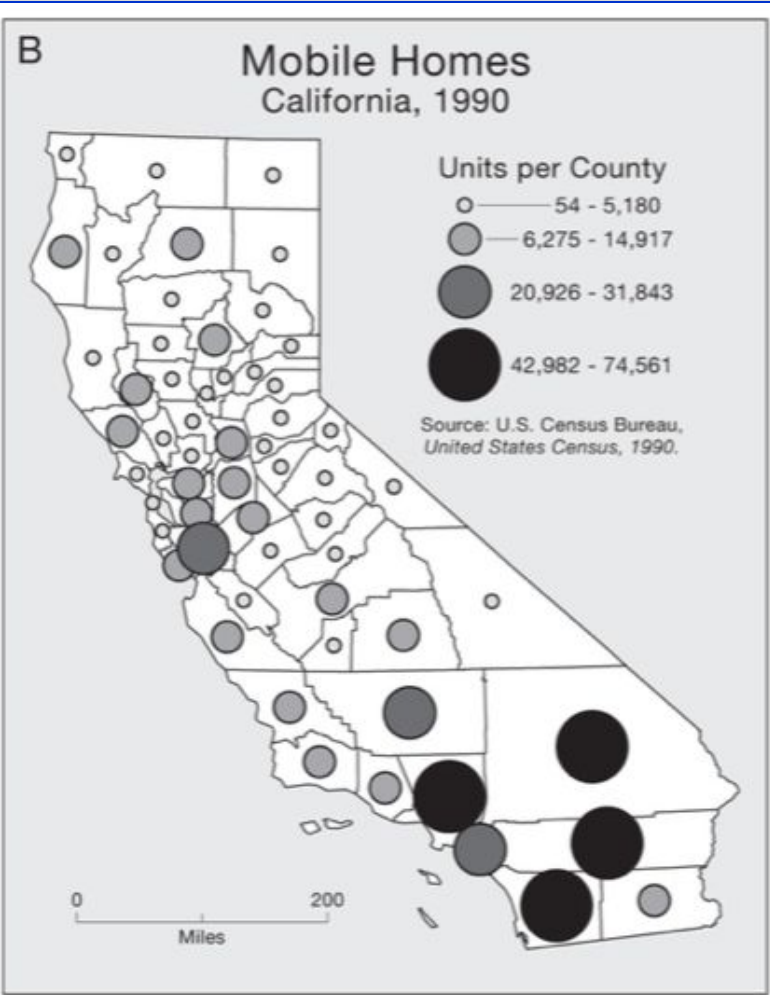
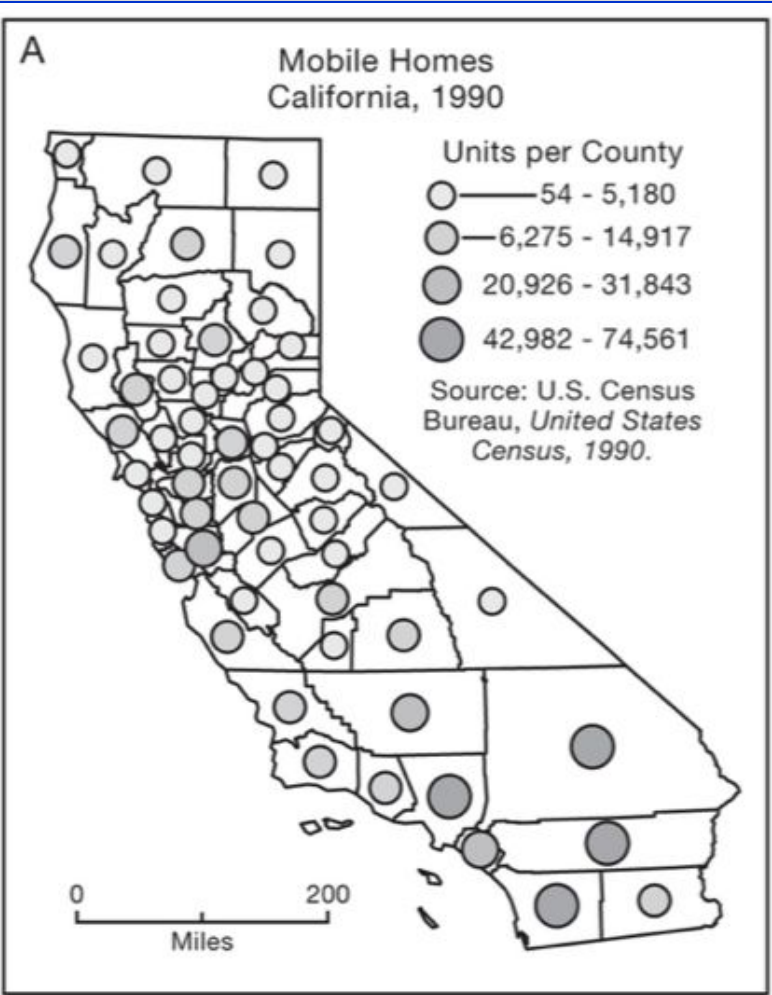
Given what you now know about gestalt principles vis a vis map-making (and a bit about how human cognition works) it should make sense to you why designers and cartographers alike utilize visual hierarchies...

Visual hierarchies (revisited)

Given what you now know about gestalt principles vis a vis map-making (and a bit about how human cognition works) it should make sense to you why designers and cartographers alike utilize visual hierarchies...so why do they?

Visual hierarchies (revisited)

Which is better? A or B?

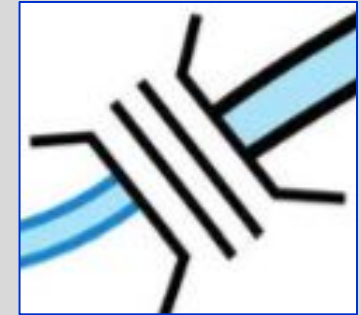


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Sources: <http://graphicdesign.spokanefalls.edu/tutorials/process/gestaltprinciples/gestaltprinc.htm>

Visual hierarchies tips and tricks

- Create figure-ground contrast
- Figure isolation, vignette
- Line weight and type
- Color, shading, and transparency
- Drop shadows, halos, masks, gaps
- Symbol overlap
- Extrusion, shading and 3D effects



Above: Poor figure-ground contrast on the right, but better on the left

Right: Nice example of a subtle *masking* effect to visually isolate the state of Washington from the surrounding territories



The city of Glasgow located south-centrally in the lowlands of Scotland is the most densely populous urban center in the country, home to some 600,000 people spread across 68 square miles. An historically rough and tumble city, Glasgow has made public health headlines recently due to researchers linking incidences of mental health illness with proximity to vacant and derelict land sites (VDLs). As of 2014 Glasgow had approximately 1,171 hectares of VDLs within city limits, one of the highest numbers for cities in all of the United Kingdom. In further exploration of this phenomena, we have run a number of regressions to measure the association between proximity from VDLs and the rate of prescription drugs related to anxiety, depression or psychosis while also adjusting educational attainment and income deprivation. Generally speaking a regression is a statistical method of measuring the relationship between one dependent variable and one or more independent variables (i.e. predictors). All of our data has been aggregated to the Data Zone which are the areas seen in the various maps.

Our initial regression was an Ordinary Least Squares regression (OLS) which is a rather simplistic linear regression model which models a dependent variable in terms of its relationship to a set of explanatory variables. The results from the OLS have been expressed in a tabular form in table 1. Right away we see positive relationships between two of our explanatory variables (percent low education and percent income deprived) and the rate of prescriptions meaning that as rates of these two explanatory variables go up, so too will Rx rates. We see a negative relationship between distance from VDL and Rx rates however indicating that Rx rates decrease with distance away from a VDL. Also we note that all our coefficients are statistically significant (indicated by an *) meaning that it is unlikely that these relationships have occurred due to random chance alone.

The second and final regression we ran was a Geographically Weighted Regression which is important to us because it measures the relationship between our variables per each individual data zone in addition to evaluating spatial non-stationarity. The large, centrally-featured map below shows the results for our GWR for the VDL distance regression coefficient with the local R² values added in the third dimension.

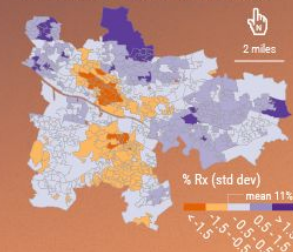
Table 2 features the diagnostics for our two models and gives us an idea as to how they performed. The R² and R² values are fairly similar for each model however the lower AIC (Akaike's Info Criterion) for the GWR tells us that it performed better than the OLS. However a close inspection of the GWR map yields some issues: we see that our coefficient

for the VDL distance variable goes in somewhat unexpected directions in areas proximal to VDLs. Using a more specific calculation for distance other than euclidian would improve the performance of our model (i.e. walking distance based on a road network). Additionally we can look at the local R² values to see how much variation in the dependent variable was explained by the independent variables per DZ where lower values are worse and higher values are better such as in the southwestern part of the city where we see a cluster of data zones with significantly low local R² values.

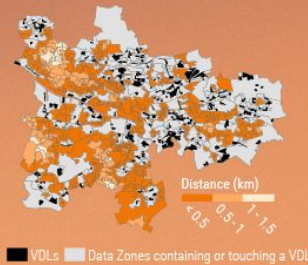
1 Variable	Coefficient	Probability
Intercept	7.6449	0.000*
% Low Education	0.0793	0.000*
% Income Deprived	0.0305	0.000*
Distance from VDL	-0.0005	0.016*

2 Parameters	OLS	GWR
R ²	0.48	0.89
R _a ²	0.48	0.84
AICc	2631.96	1969.56

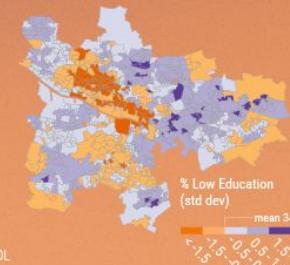
□ Percent of the population prescribed medication for anxiety and depression



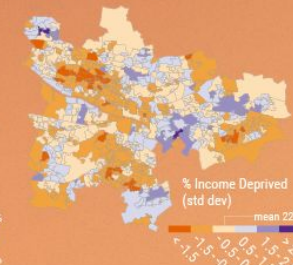
■ Distance from Vacant or Derelict Land (VDL) > 2 acres (prior to 2004)



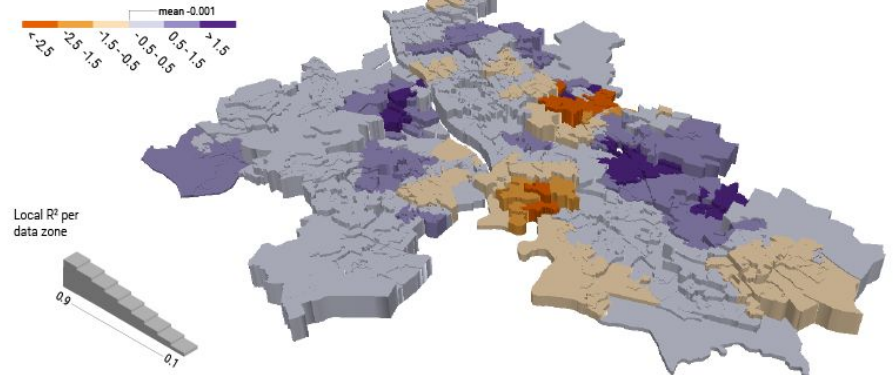
■ Percent of the population > 16 years old lacking qualified education (from 2011)



■ Percent of the population that is income deprived (from 2011)



■ Results from Geographically Weighted Regression (GWR) with 3D extruded regression coefficient for VDL distance variable



Profs. Juliana Maantay
and Andrew Maroko

*Improving Population
Mapping and Exposure
Assessment: 3-Dimensional
Dasymetric Disaggregation
in New York City and São
Paulo, Brazil (2017)*



Figure 1

Two dimensional view of a six block study area in Manhattan, New York City. Population density shown by census block group (n=7) and building footprints shown as either having property tax-lot derived residential area data (orange) or not (grey). Fifty meter impact zone is shown along Amsterdam Avenue between 104th and 110th Streets.

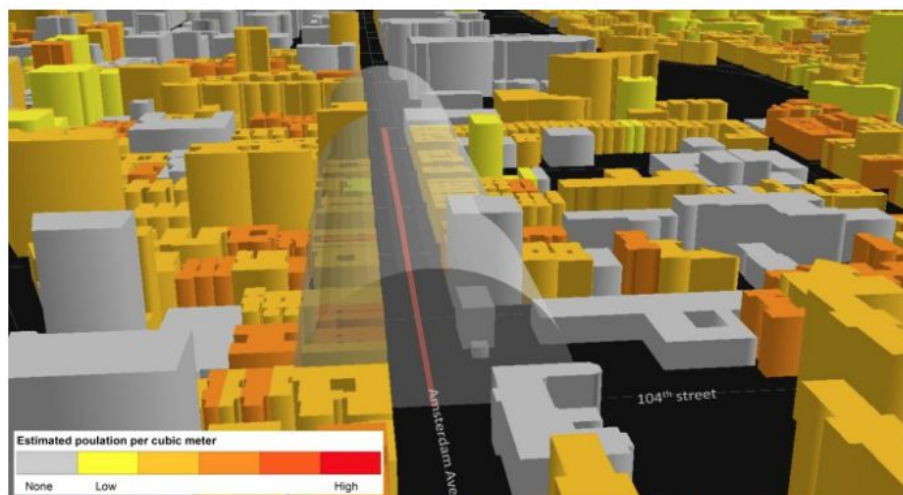


Figure 2 - 3-D depiction of population densities (by volume) and impact buffer for New York City study area

Three-dimensional oblique view of the Amsterdam Avenue study area. Impact zone is shown as a 3-dimensional 50m buffer, and volumetric population density by building (people per cubic meter) are shown. Estimate of potentially exposed population within impact buffer = 1,971.

Yellowstone National Park Wolf Project Reintroduction of Packs



Ragnar Thrastarson

GEP 605 lab B, 2013

The reintroduction of wolf packs to Yellowstone National Park is essential to maintain the balance between carnivores and herbivores. This requires a comprehensive understanding of the wolves' behavior. By using a Logistic Regression Model the most suitable areas for the release of packs can be found. The following factors all contribute to the model and can have positive or negative effects on the outcome.

Close proximity to human activity (roads and campsites) – **negative** (map B)

Close proximity to other wolf packs – **negative** (map C)

Close proximity to elk herds – **positive** (map C)

The outcome is a probability map that shows where it is most likely that the reintroduction will be successful (map A).

Predicted probability

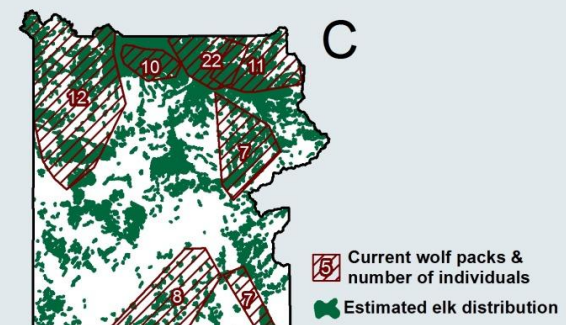
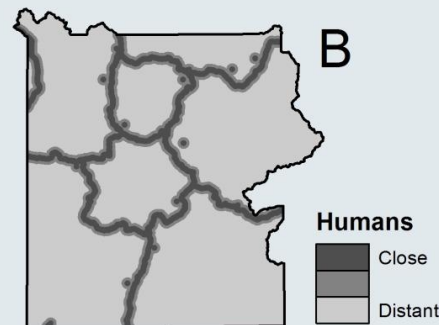
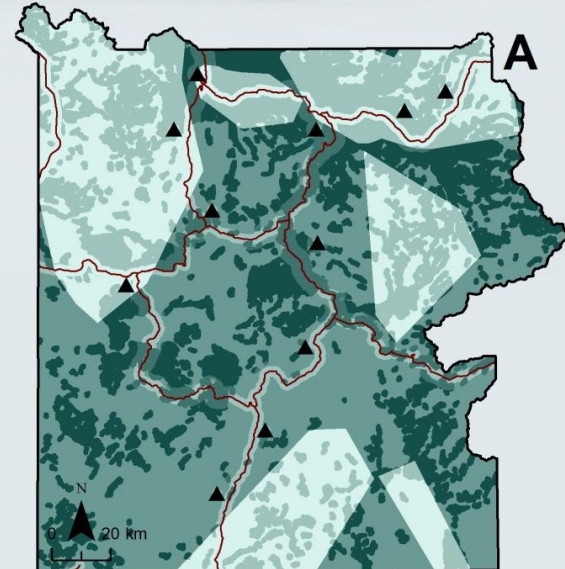
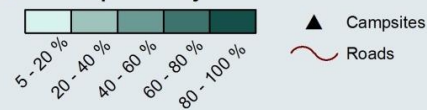
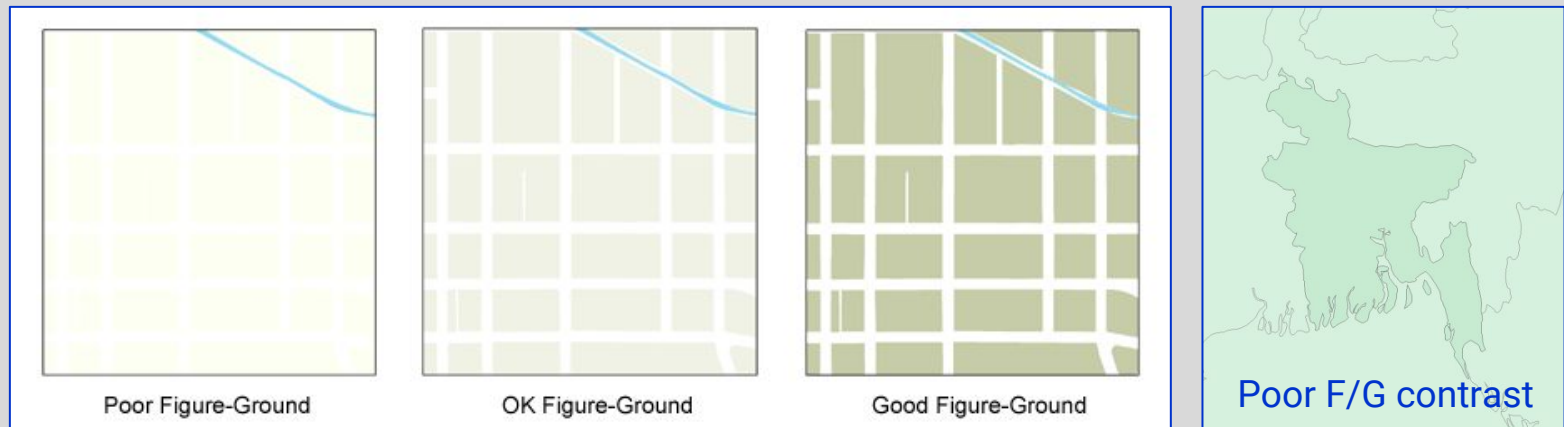


Figure-ground relationships

- Elements that are 'lower' in the intellectual hierarchy should be styled accordingly (i.e. such that they recede into the background as opposed to blending with the foreground)



On Cartographic Design

What do you think the real job of the cartographer/map-maker is?

On Cartographic Design

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>> to create a **visual balance** with the map elements necessary to tell your story (either yours, or that of the data, or some combination of both)

On Cartographic Design

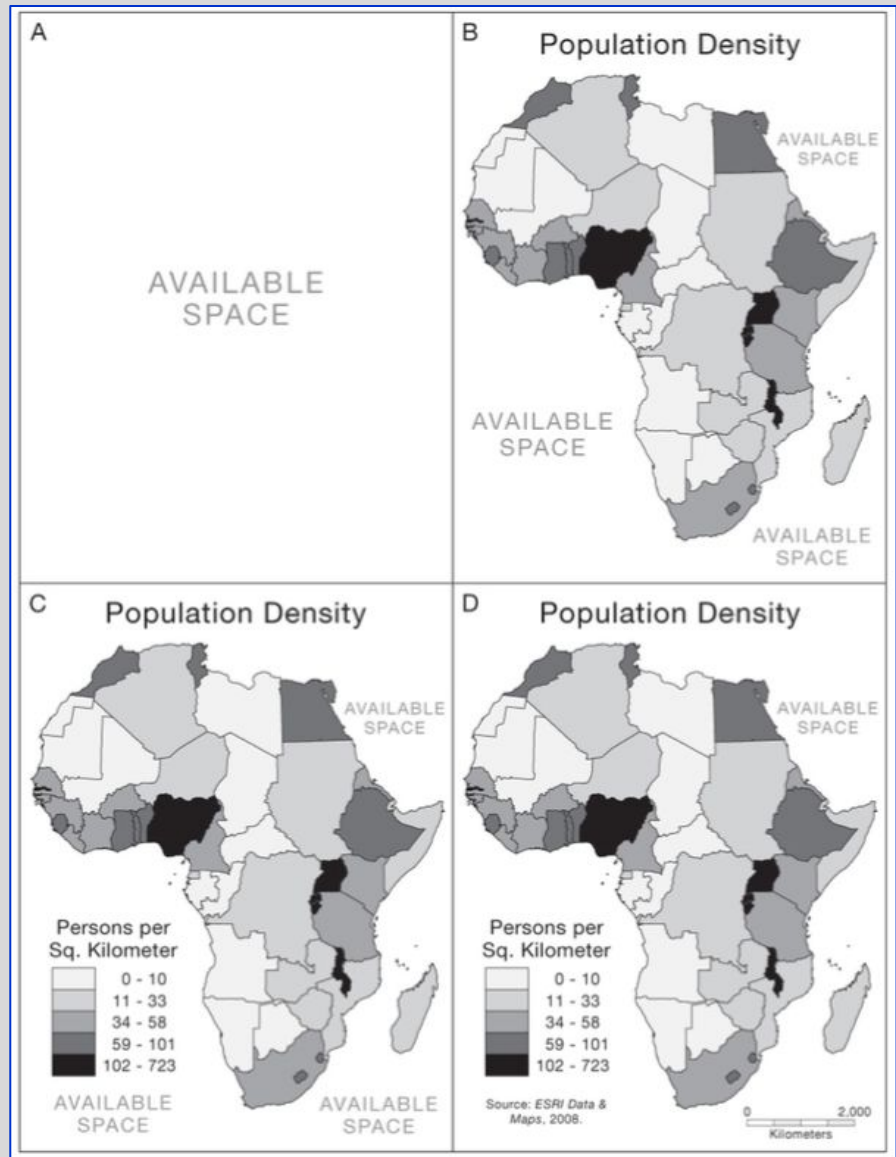
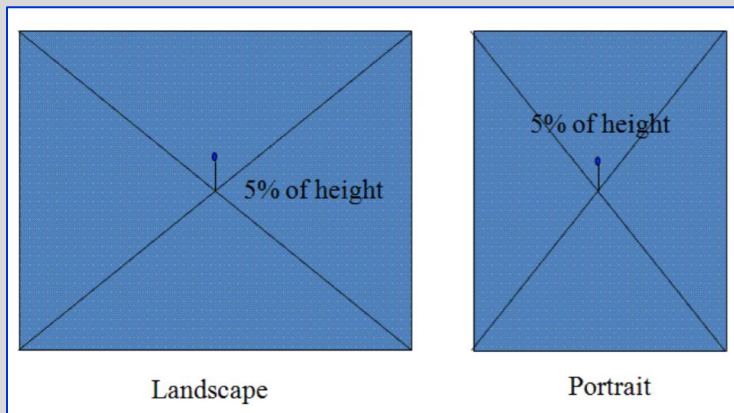
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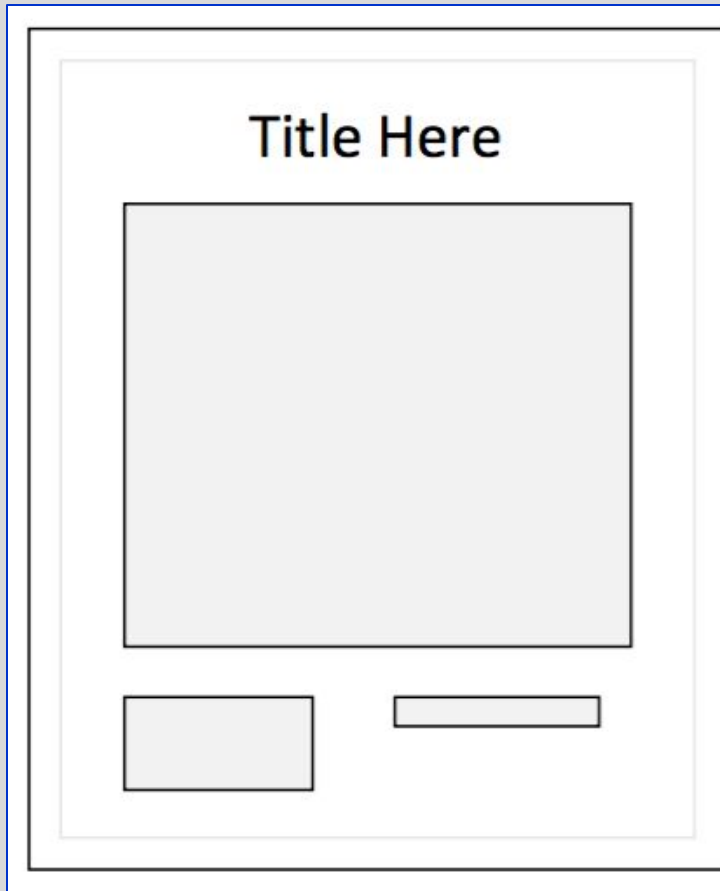
But which factors affect **Visual Balance**?

- The size of the symbols
- The pattern of the symbols
- The color of the symbols
- The visual hierarchy of the symbols and their elements
- The location of these elements *vis a vis* each other and the 'visual center' of the map

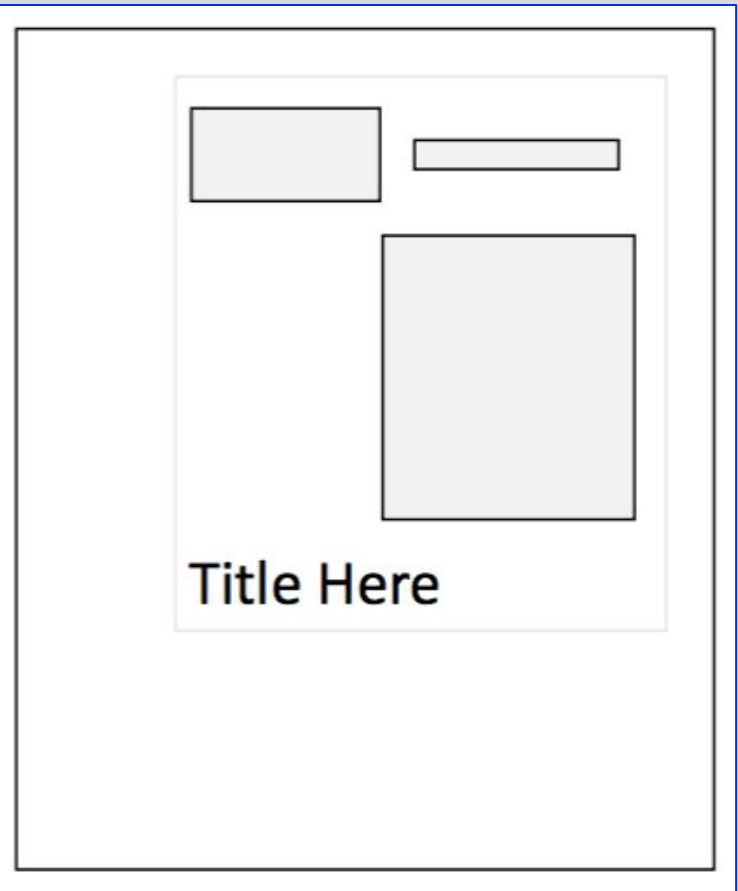
On Cartographic Design



On Cartographic Design



Good :)



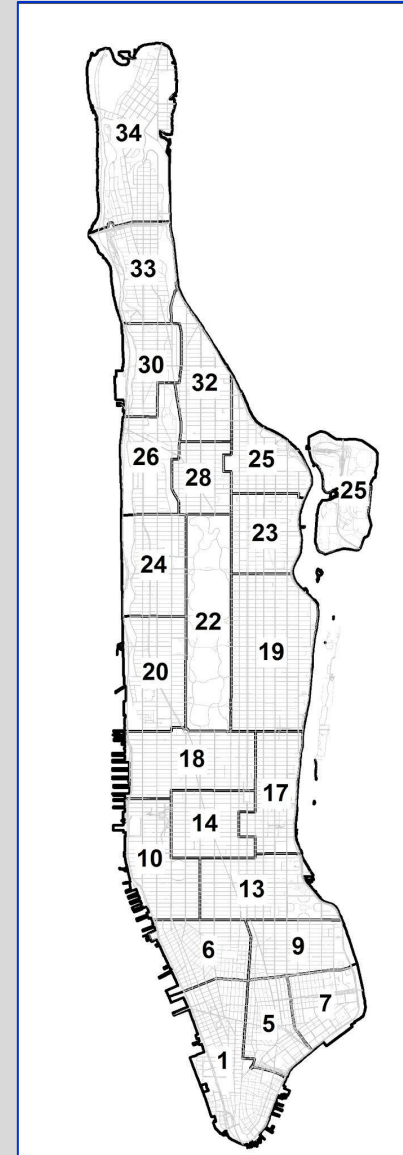
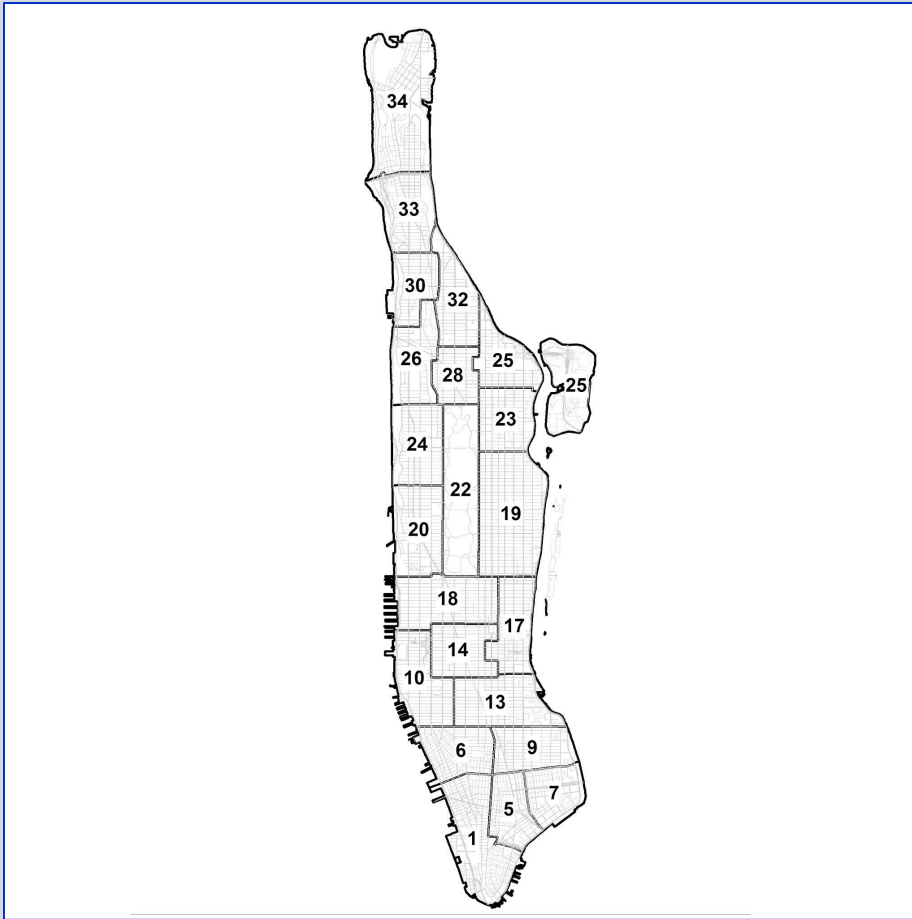
Not so good :(

On Cartographic Design

Visual Balance basics

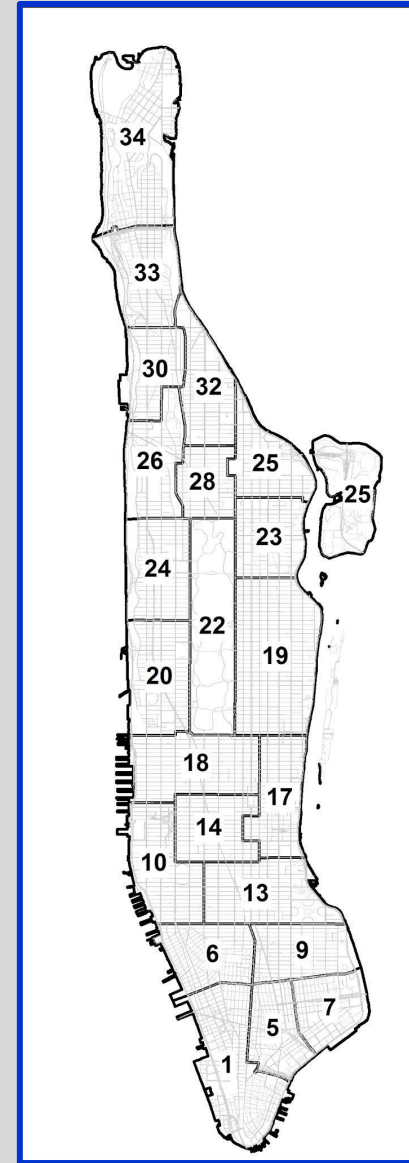
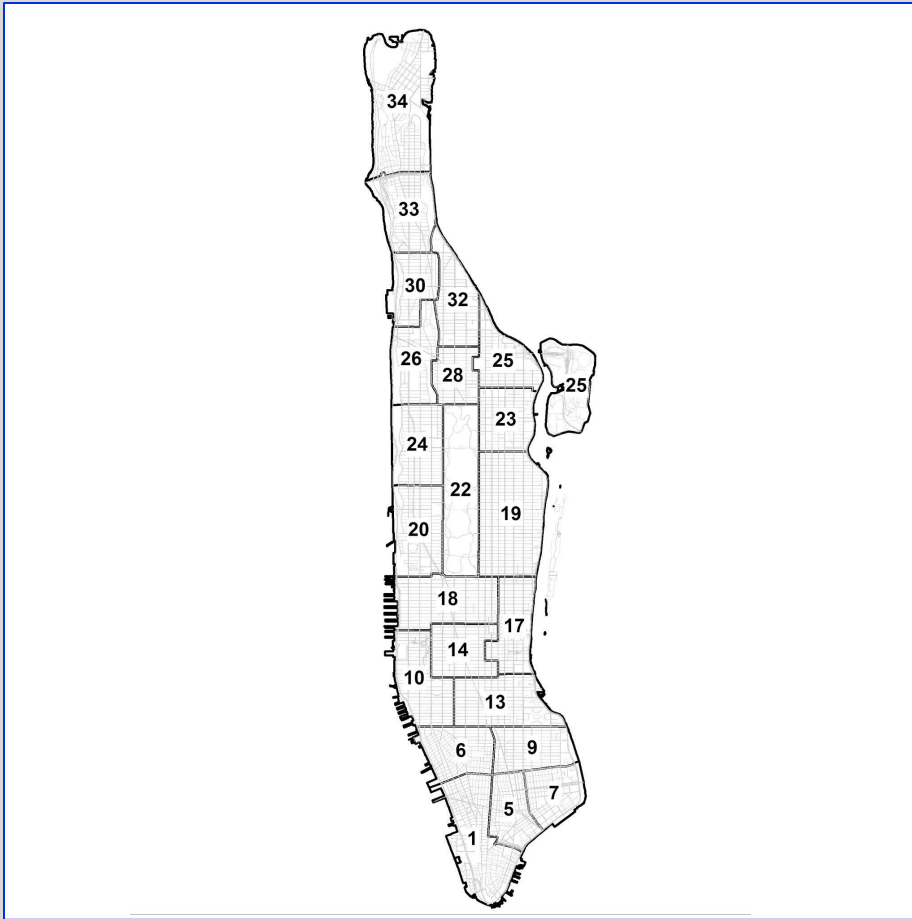
- Left to right/top-down orientation
- Several smaller objects can counter (or balance) one larger
- Alignment sensitivities
- Text and legend can be used to fill spaces
- Including graticule or 'unmapped areas' to neat line (i.e. map) can be effective
- Shape of mapped area should *make sense* with size/shape/orientation of map frame area on layout

On Cartographic Design



Which is a better use of space?

On Cartographic Design

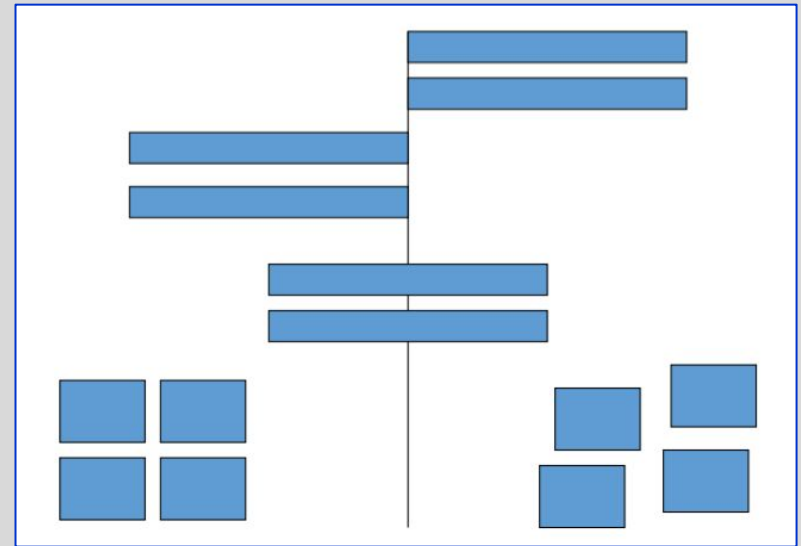


Which is a better use of space?

On Cartographic Design

Alignment

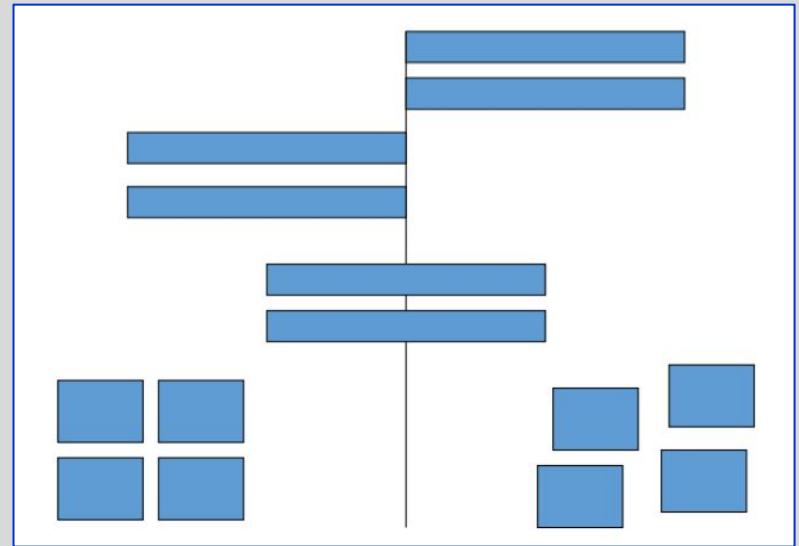
- Precision matters!
- A 'loose' alignment is not bad necessarily, but in general arranging your map elements such that the edges all align rectilinearly is the conventional, professional standard
- Also, it's incredibly easy to align elements in Inkscape



On Cartographic Design

Alignment

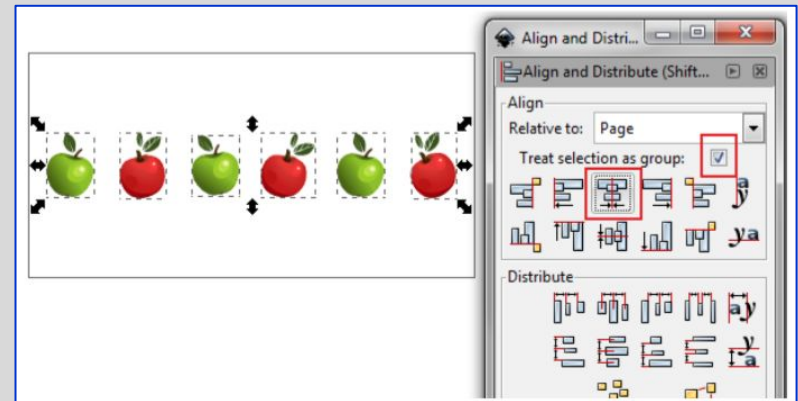
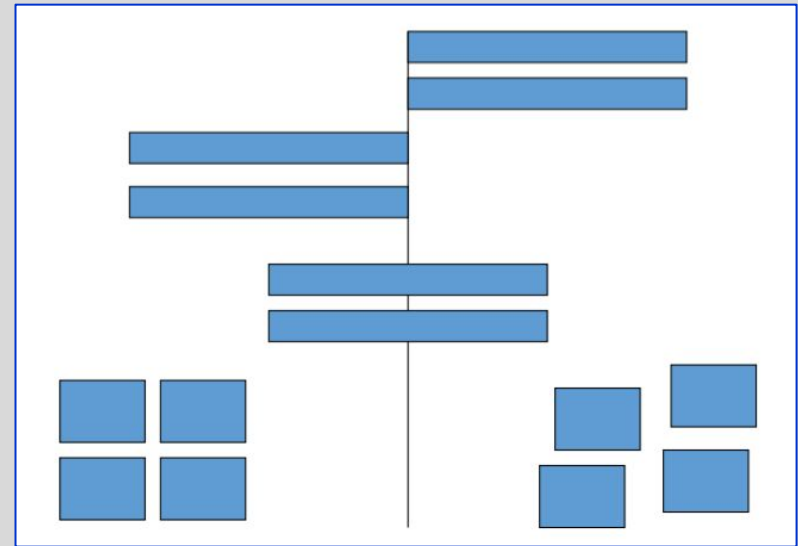
- Precision matters!
- A 'loose' alignment is not bad necessarily, but in general arranging your map elements such that the edges all align rectilinearly is the conventional, professional standard
- Also, it's incredibly easy to align elements in Inkscape...**anyone know how?**



On Cartographic Design

Alignment in Inkscape

- Select all the elements you want to align
- Open the Alignment and Distribution dialogue box (Shift+Ctrl+A)
- Configure settings in accordance with your desired alignment (by left edges, align centers, etc.)



On Cartographic Design

Screening



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On Cartographic Design

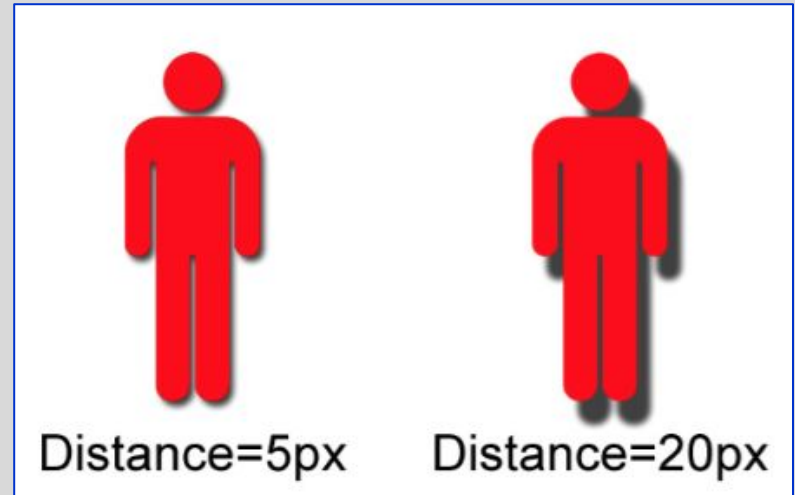
Vignettes



On Cartographic Design

Drop Shadows in Inkscape

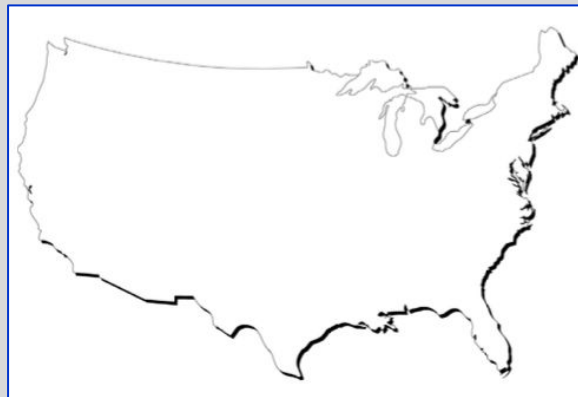
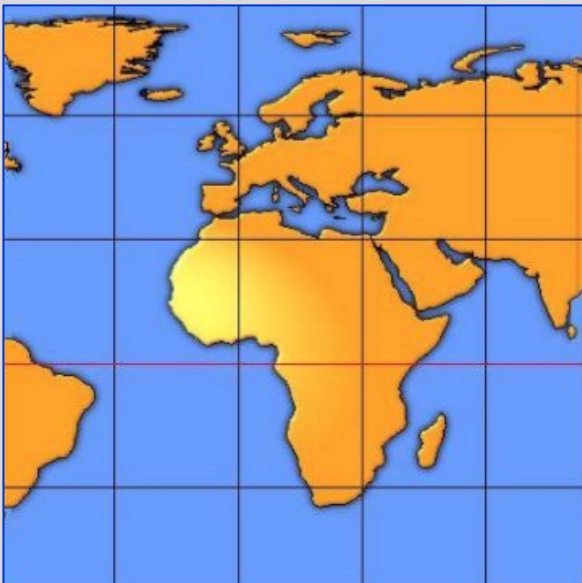
- Select feature -> group
- Copy and paste
- Select new object, change color to gray or black
- Apply blur (optionally)
- Displace it slightly
- Push it into the background
- ; Separate process for text (this is shapes only)



On Cartographic Design

Other applications of the drop shadow

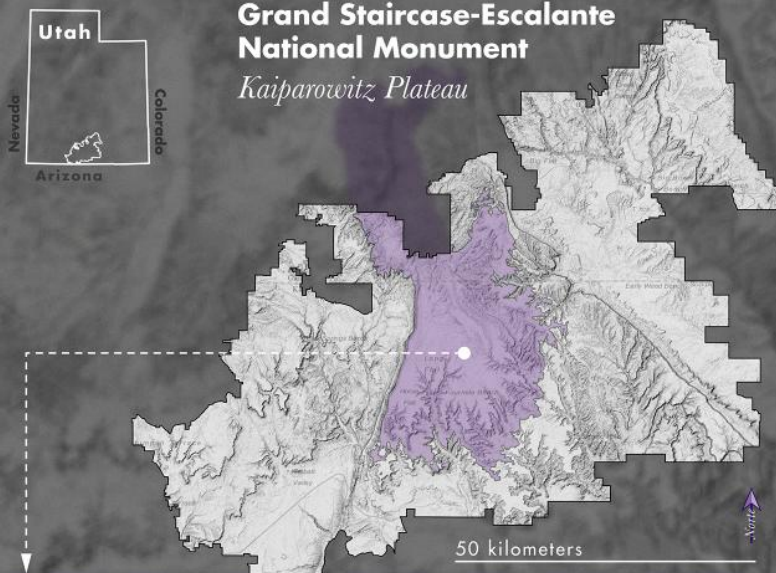
- Apply to coastlines
- Embossing
- Highlighting



We Found Cool Dinosaur Fossils in Utah and Now Trump Might Ruin Them **Mary Papenfuss**

Grand Staircase-Escalante National Monument

Kaiparowits Plateau



Paleontological Discoveries in the Kaiparowits Formation



The Kaiparowits Formation is a sedimentary rock formation found in the Kaiparowits Plateau in Grand Staircase-Escalante National Monument, in the southern part of Utah in the western United States. It is over 2800 feet (850 m) thick, and is Campanian in age. This Upper Cretaceous formation was formed from alluvial floodplains of large rivers in coastal southern Laramidia; sandstone beds are the deposit of rivers, and mudstone beds represent floodplain deposits. It is

fossiliferous, with most specimens from the lower half of the formation, but exploration is only comparatively recent, with most work being done since 1982. It has been estimated that less than 10% of the Kaiparowits formation has been explored for fossils. Most fieldwork has been conducted by The Natural History Museum of Utah.

Since 2000, numerous dinosaur fossils over 75 million years old have been found at Grand Staircase-Escalante. In 2002, a volunteer at the Monument discovered a 75-million-year-old dinosaur near the Arizona border. On October 3, 2007, the dinosaur's name, *Gryposaurus monumentensis* (hook-beaked lizard from the monument) was announced in the *Zoological Journal of the Linnean Society*. *G. monumentensis* was at least 30 feet (9.1 m) long and 10 feet (3.0 m) tall, and has a powerful jaw with more than 800 teeth. In 2013 the discovery of a new species, *Lythronax argestes*, was announced. It is a tyrannosaur that is approximately 13 million years older than *Tyrannosaurus*, named for its great resemblance to its descendant.

Environmentalists and scientists were rattled last week following a report that President Donald Trump plans to scale back two of southern Utah's national monuments. Not only would the project endanger sacred Native American sites and breathtaking Western vistas open to the public — but also some of the most important dinosaur fossils in the world.

Scientists worry that removing the land from federal protection and opening it up to coal mining will jeopardize critical fossils in the 1.9 million-acre Grand Staircase-Escalante National Monument.

“My fear is that opening up the monument to energy extraction will threaten our ability to uncover the secrets that we know must still be buried in the monument,” Canadian paleontologist Scott Sampson told the *Los Angeles Times*.

In a phone call Friday with Sen. Orrin Hatch (R-Utah), Trump reportedly said he planned to follow the recommendation of Interior Secretary Ryan Zinke to shrink the size of Grand Staircase-Escalante and the 1.2 million-acre Bears Ears National Monument, which could be reduced more than 90 percent. Carved-out areas would be open to both mining and oil drilling.

The decision is part of a review of monuments across the nation.

Zinke's recommendation would open up the Kaiparowits Plateau in the Grand Staircase, which includes an incredibly rich collection of dinosaur fossils dating to the Cretaceous.

Earlier this month, a nearly complete fossilized skeleton of a 76 million-year-old *Tyrannosaurus* was airlifted from the plateau for further study at the Natural History Museum in Salt Lake City.

The remarkable find — with many bones frozen in life-like movements — was discovered two years ago. It's the most complete *Tyrannosaurus* fossil discovered in the American Southwest. Researchers believe it may be a rare fossil of the *Teratophoneus curriei*, a relative that predated the *T. rex* and stood about 12 feet tall.

Digs in the area have also uncovered other important fossils of unusual or new species of dinosaurs, like the

duck-billed *Crested Hadrosaur*, horned *Ceratopsians* and the dome-headed *Pachycephalosaur*.

“These are things found only in Grand Staircase,” Randy Irmis, the paleontology curator at the Natural History Museum, told *The Salt Lake Tribune*. “These are world-class paleontological resources.”

Paleontologist Alan Titus, who discovered the *Tyrannosaurus* fossil, described the Kaiparowits Plateau as a 5,000-foot-thick “sequence of rocks that records the life and times of the dinosaurs during their swan song, the end of the age of dinosaurs” between 100 and 75 million years ago.

“The monument tells a story to scientists” about an ancient North American ecosystem “that we can't see anywhere else,” he told *The Los Angeles Times*. “It's one of the last places where you can almost predictably come out and make new scientific discoveries year after year.”

The Grand Staircase has been federally protected since it was declared a monument 21 years ago by then-President Bill Clinton. “The empty spaces are filling up in the

West. We have to imagine what the western landscape is going to look like in 50 years and try to anticipate, rather than wait for conflicts to happen,” Clinton said when he designated the area a monument.

No president in history has shrunk a national monument since the law creating the public lands — the Antiquities Act — was passed over a century ago in 1906.

Trump plans to travel to Utah in December to officially announce his decision to carve out sections of the Utah monuments, which is likely to trigger an immediate court challenge.

A video ad released Thursday by the National Wildlife Federation features Navajo Nation delegate Davis Filfred, who has spoken out against changes to the Bears Ears monument. In the video, he pleads with the president to leave national monuments intact.

“Not all monuments divide us. Some bring us together,” Filfred said. “If you destroy these monuments, our public land could be auctioned off. Our sacred tribal sites would be in danger.”

“It's one of the last places where you can almost predictably come out and make new scientific discoveries year after year.”

On Cartographic Design

“Good Design Is As Little Design As Possible.

Less, but better – because it concentrates on the essential aspects, and the products are not burdened with non-essentials.

Back to purity, back to simplicity.”

–Dieter Rams, iconic former Creative Director at **Braun**

Simplicity

- Easy to recognize, difficult to realize
- Effective because with fewer visual elements, there are thus fewer visual symbols to parse and contextualize
- Reduce unnecessary complexity!
- Strip your designs (maps) of unnecessary ornamentation

On Cartographic Design



The London Underground "Tube Map"

1933 by Henry C. Beck

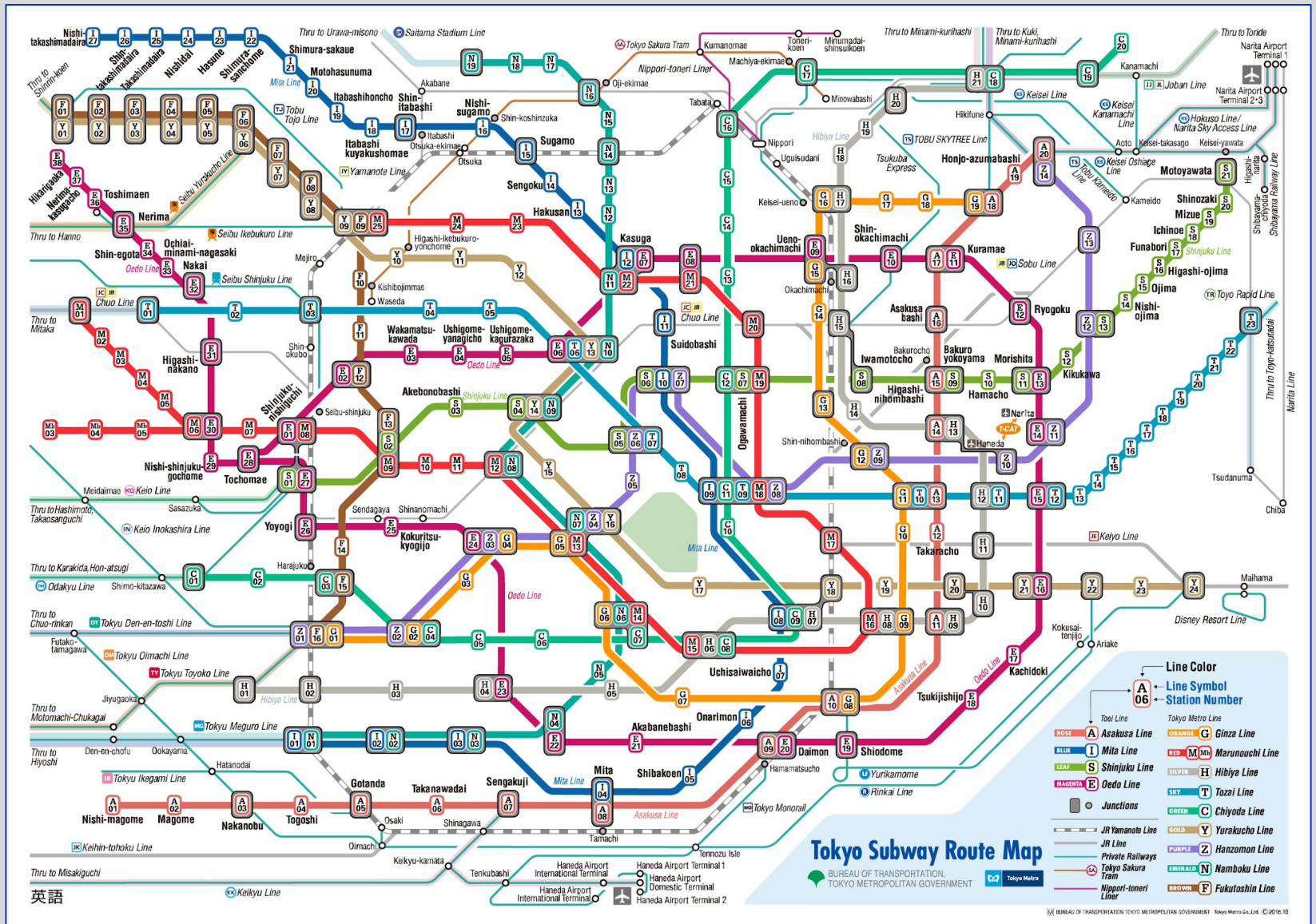
On Cartographic Design



The famed "Vignelli Map" of the NYC MTA System Map

Massimo Vignelli, 1976

On Cartographic Design

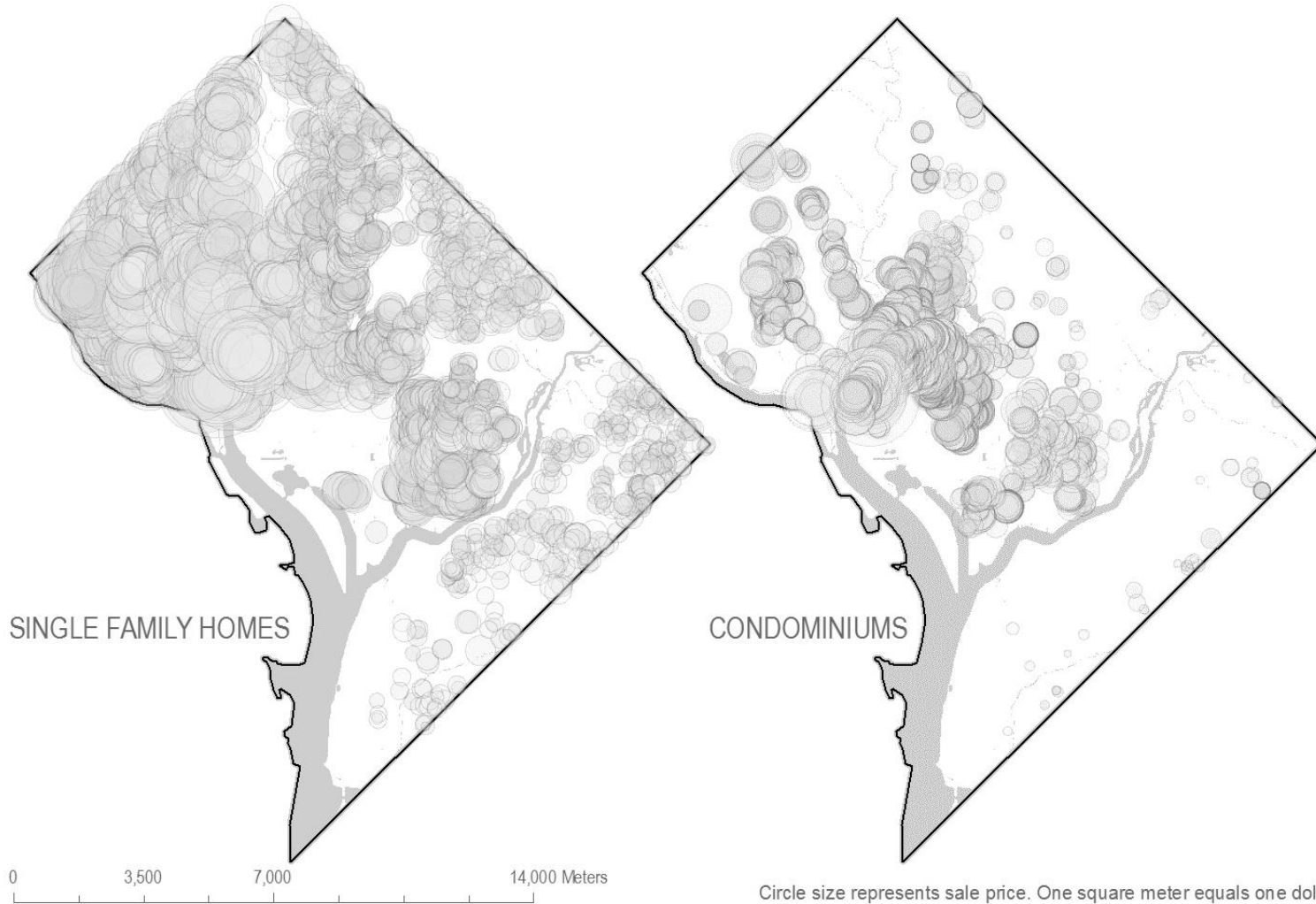


Sources: <http://graphicdesign.spokanefalls.edu/tutorials/process/gestaltprinciples/gestaltprinc.htm>

Good map/bad map?

District of Columbia Home Sales: 2012

@ruSERIOUSIN Gme



Good map/bad map?

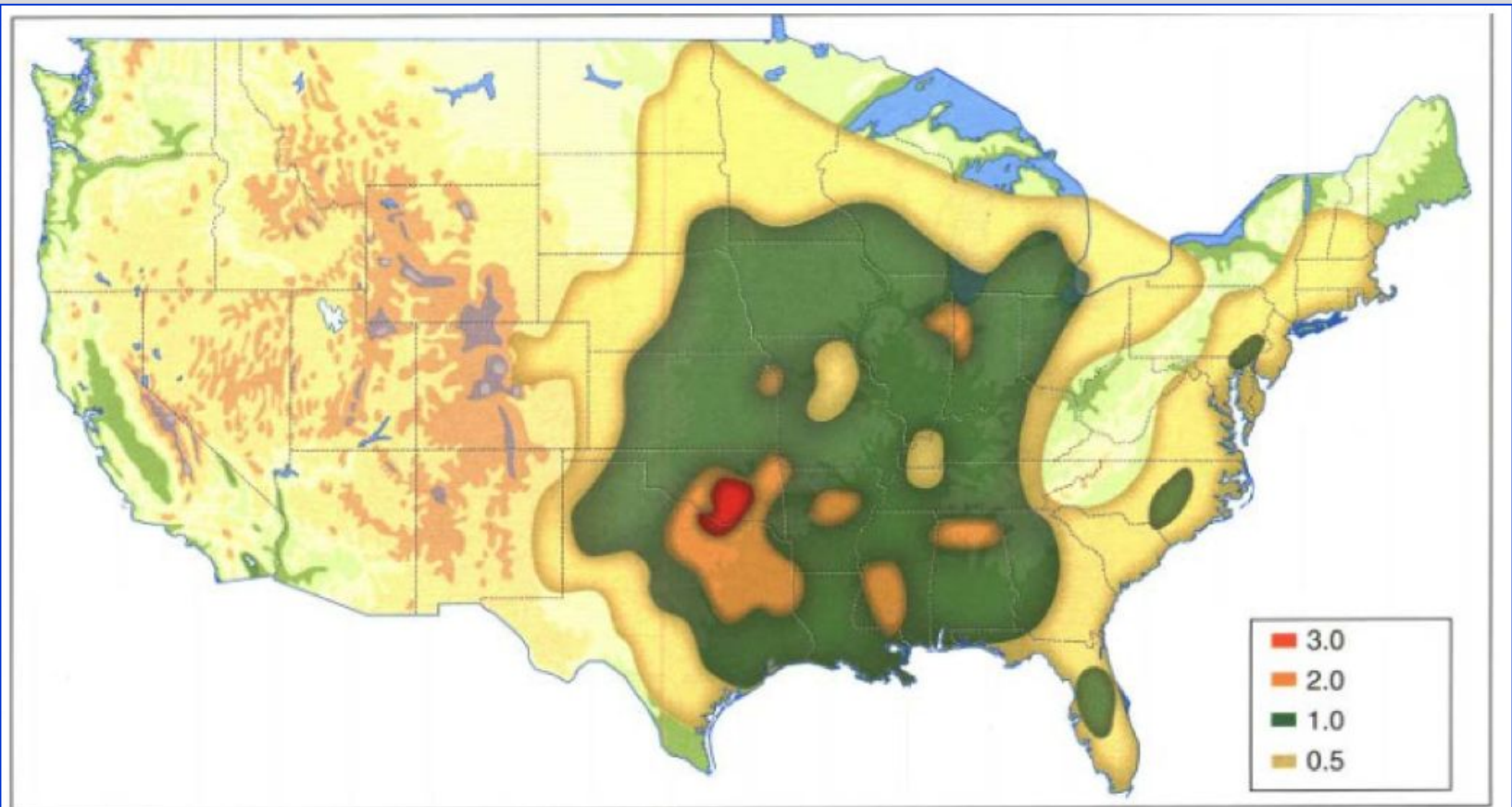
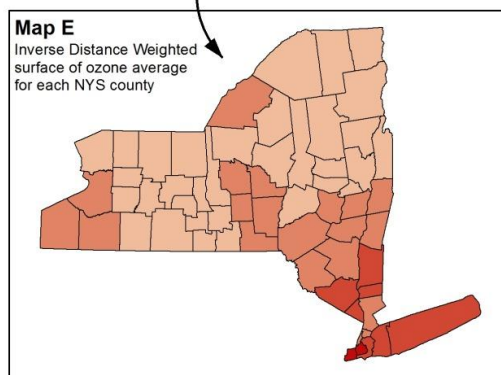
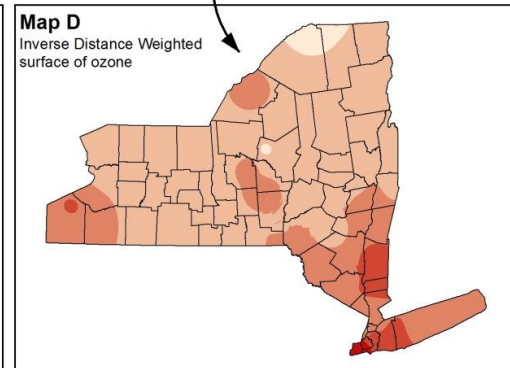
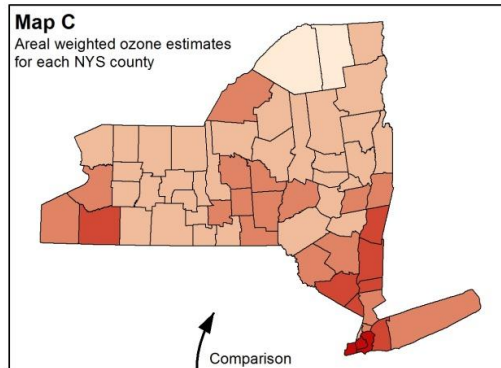
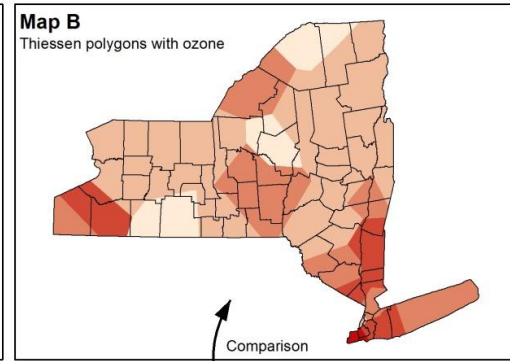
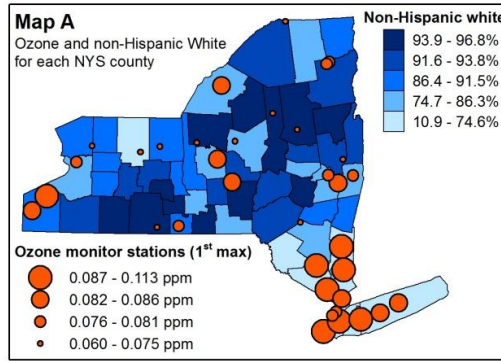


Figure 1.47 Annual incidence of tornadoes in the United States. Central, eastern and north eastern states are most affected. Source: Redrawn from Monmonier 1998.

Good map/ bad map?



Exploring ozone concentrations in New York State
Are there differences in exposure between ethnic groups?

In this exercise we explore two different ways of estimating ozone (O₃) concentrations for New York State counties and compare the exposure levels to ethnic groups. Valid 1 hour O₃ data series for 2010 was used with the first maximum value in the series as an input for all analysis. Maps **B** and **C** were created by using Thiessen polygons to estimate the county exposure level. Map **B** shows the polygons and Map **C** shows the counties where the areal weighted average has been calculated for each. Maps **D** and **E** use a different method of estimating the exposure level, but based on the same O₃ values. Map **D** was created from an Inverse Distance Weighted (IDW) surface with average values for each county shown in Map **E**.

Pearson's correlation was calculated for 3 ethnic groups shown in a table below. Although not strong, there is a positive relationship between O₃ exposure and non-Hispanic Blacks and Hispanic/Latino groups for both methods. The relationship is reversed for non-Hispanic white. This might call for further analysis in terms of environmental justice.

Interpolation Method	Ethnic group	Pearson's correlation	Trend
Thiessen Polygons Maps B and C	Non-Hispanic white	-0.568	Negative
	Non-Hispanic Black	0.501	Positive
	Hispanic/Latino	0.505	Positive
Inverse Distance Weighting Maps D and E	Non-Hispanic white	-0.616	Negative
	Non-Hispanic Black	0.517	Positive
	Hispanic/Latino	0.588	Positive
IDW method vs. Thiessen Polygon method		0.966	Positive

Estimated O₃ Concentration

- 0.094 - 0.113 ppm
- 0.088 - 0.093 ppm
- 0.079 - 0.087 ppm
- 0.071 - 0.078 ppm
- 0.060 - 0.070 ppm

0 50 100 miles

Map created with ArcGIS 10.3. All data classified with a quantile method with 5 classes. Class breaks for ozone are synced across maps. North arrow and scale bar apply to all maps.

Summary

- Good design makes a map more effective and interpretable
- The eye seeks similarity, proximity, continuity, and closure
- Symmetry, simplicity, and balance are favored
- Mind your figure–ground relationships
- Alignment, balancing space in your layout
- Follow convention, except when you need/want to emphasize or challenge
- When in doubt, reduce complexity (Occam's Razor)

For next week...

A6 due at 12pm on 10/23

T5 due at 12pm on 10/23

Readings by Turchi and Crampton available on the course website tomorrow