

C O L O R



Color



Session Objectives:

At the conclusion of this session, you will be able to:

- Develop a rudimental knowledge of the psychology of color.
- Distinguish the difference between complementary and analogous colors.
- Understand the application of hue, saturation and value to manipulating colors.
- Apply color conventions to map compositions.

Color Survey Results

COLOR

YELLOW

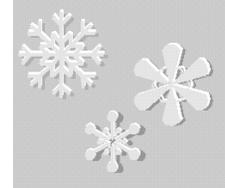
ASSOCIATED WITH ?

HAPPY



WHITE

PURE



GREEN

GOOD LUCK



Color Survey Results

COLOR

ASSOCIATED WITH ?

PURPLE

DIGNITY



SILVER

HIGH-TECH



GOLD

EXPENSIVE



Color Survey Results

COLOR

ASSOCIATED WITH ?

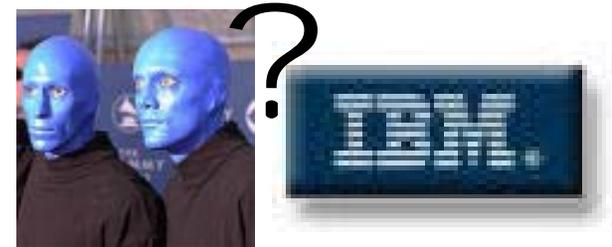
BROWN

INEXPENSIVE



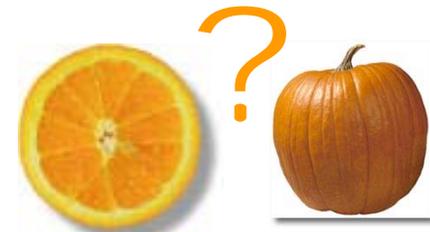
BLUE

DEPENDABLE



ORANGE

LEAST FAVORITE



Color Survey Results

COLOR

ASSOCIATED WITH ?

BLUE

FAVORITE



RED

POWERFUL



RED

GOOD-TASTING



Color Symbolism



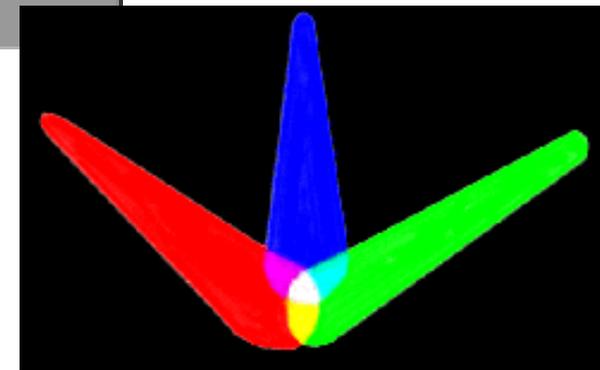
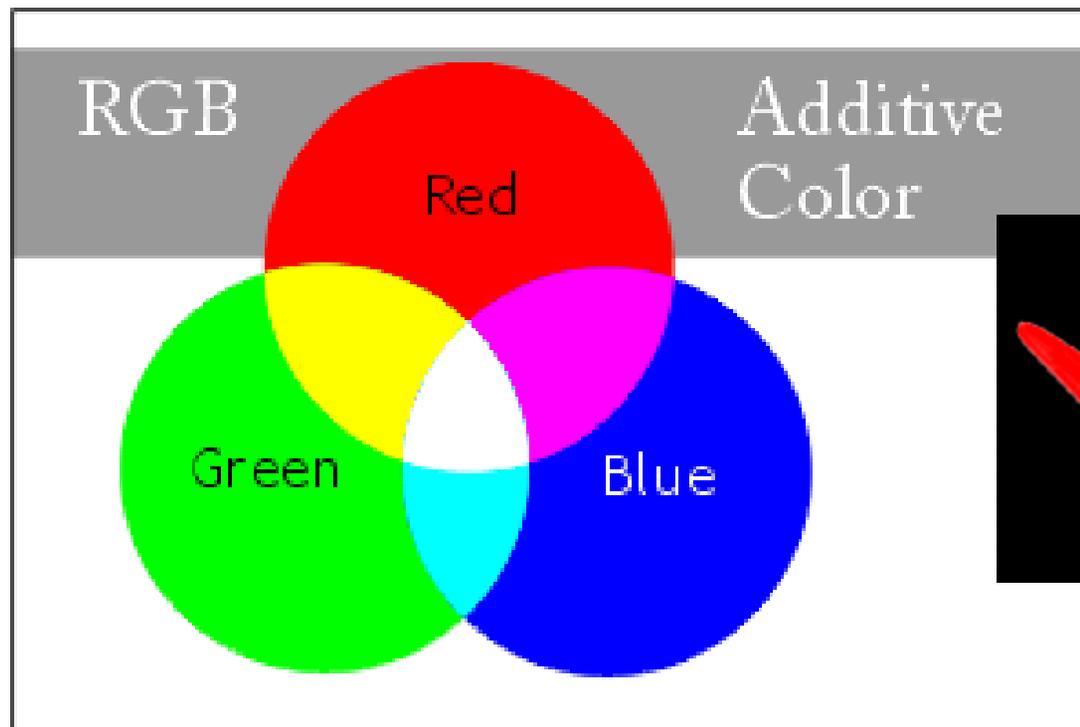
- don't use personal preference
- don't be trendy; stick to timeless symbolism
- be culturally sensitive
- be prepared for color mutation on the web and from “screen to printer”
- work on a computer with good “color vision”

Colors

on your monitor...



- are created using Red, Green, and Blue colored “phosphors” (RGB)

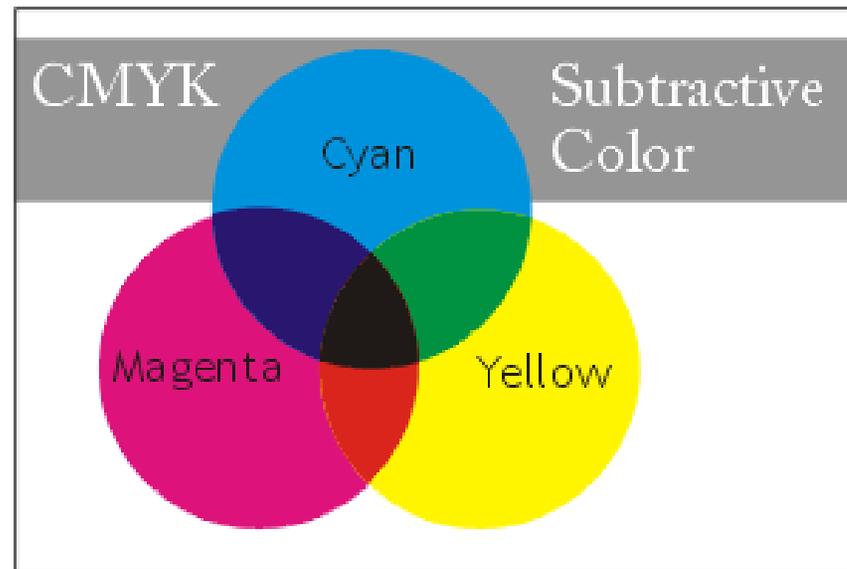


Colors

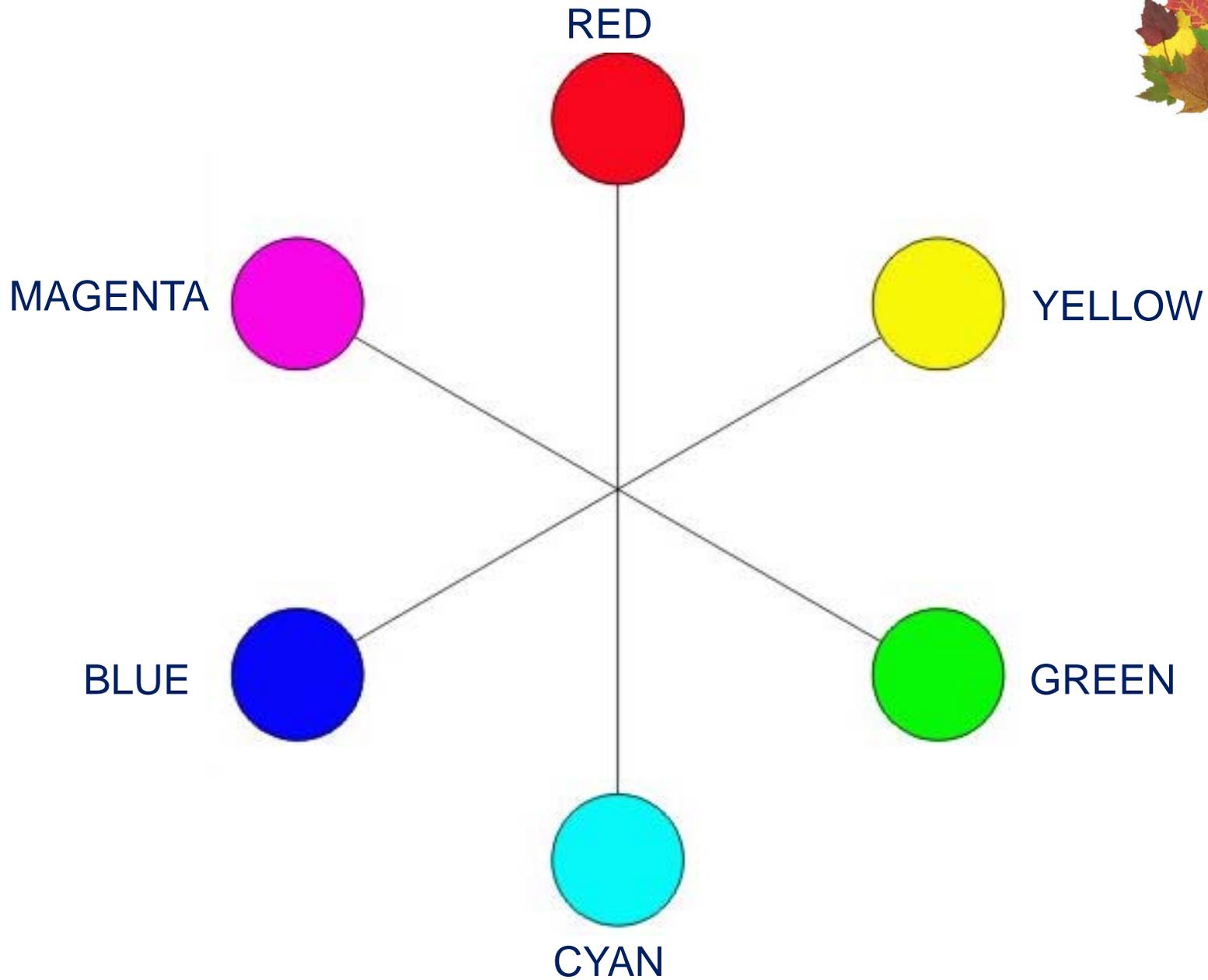
on your printer...

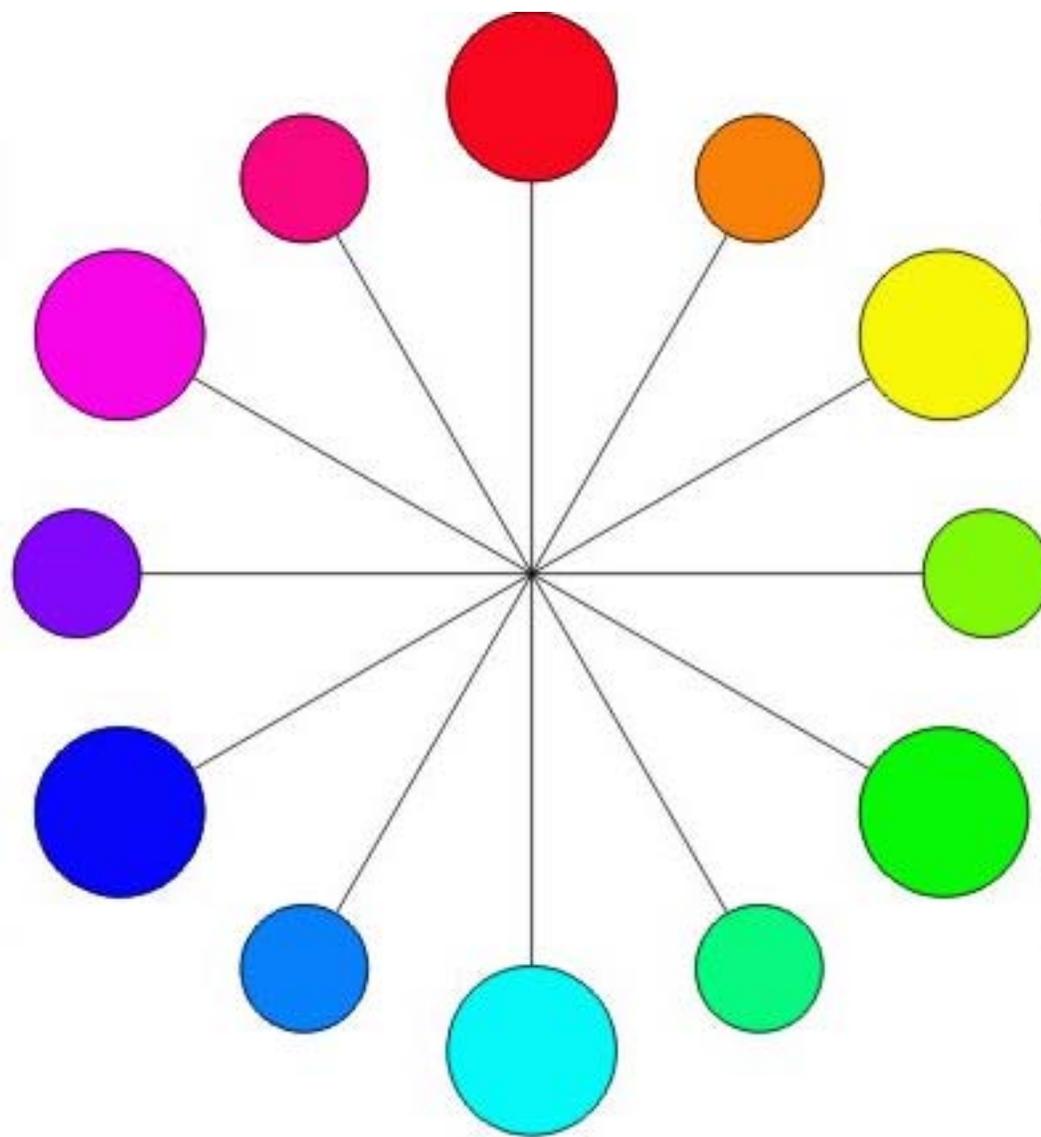


- are created using cyan, magenta, yellow, and black inks (CMYK)



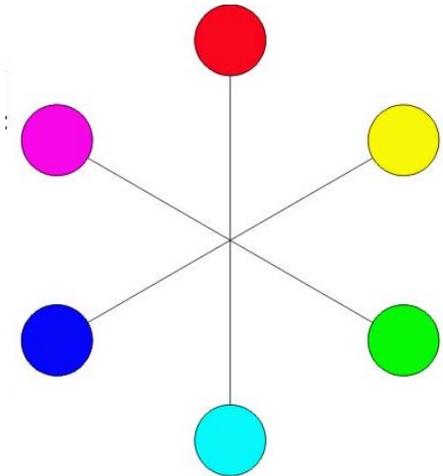
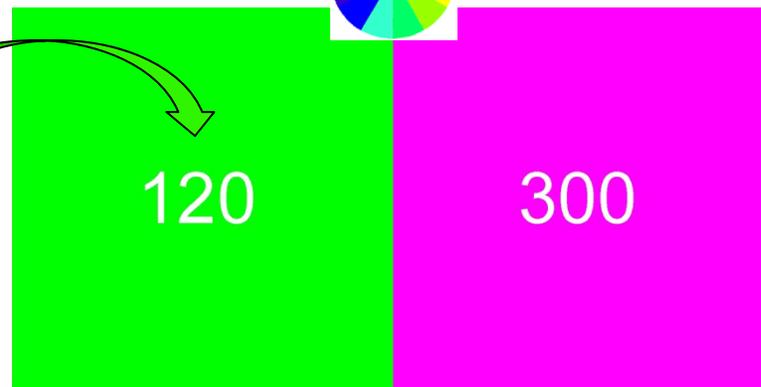
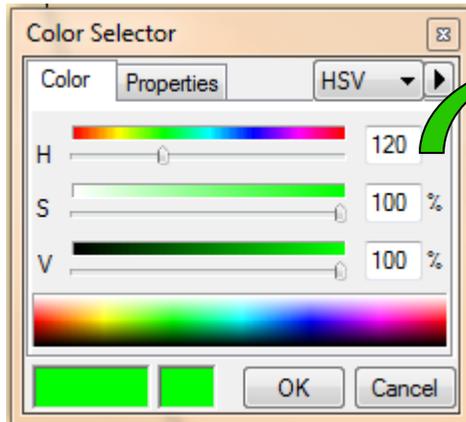
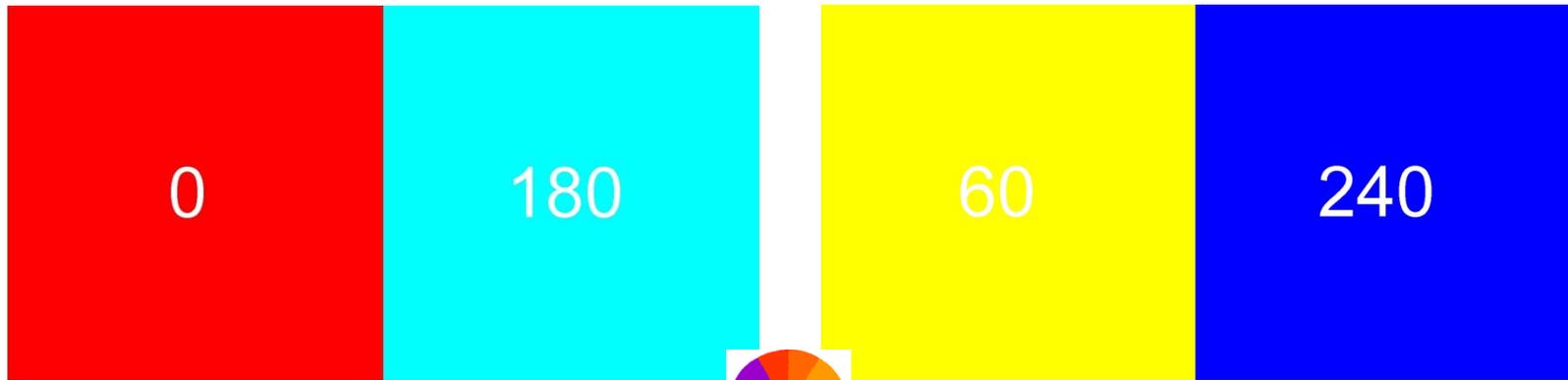
- black increases depth, adds definition



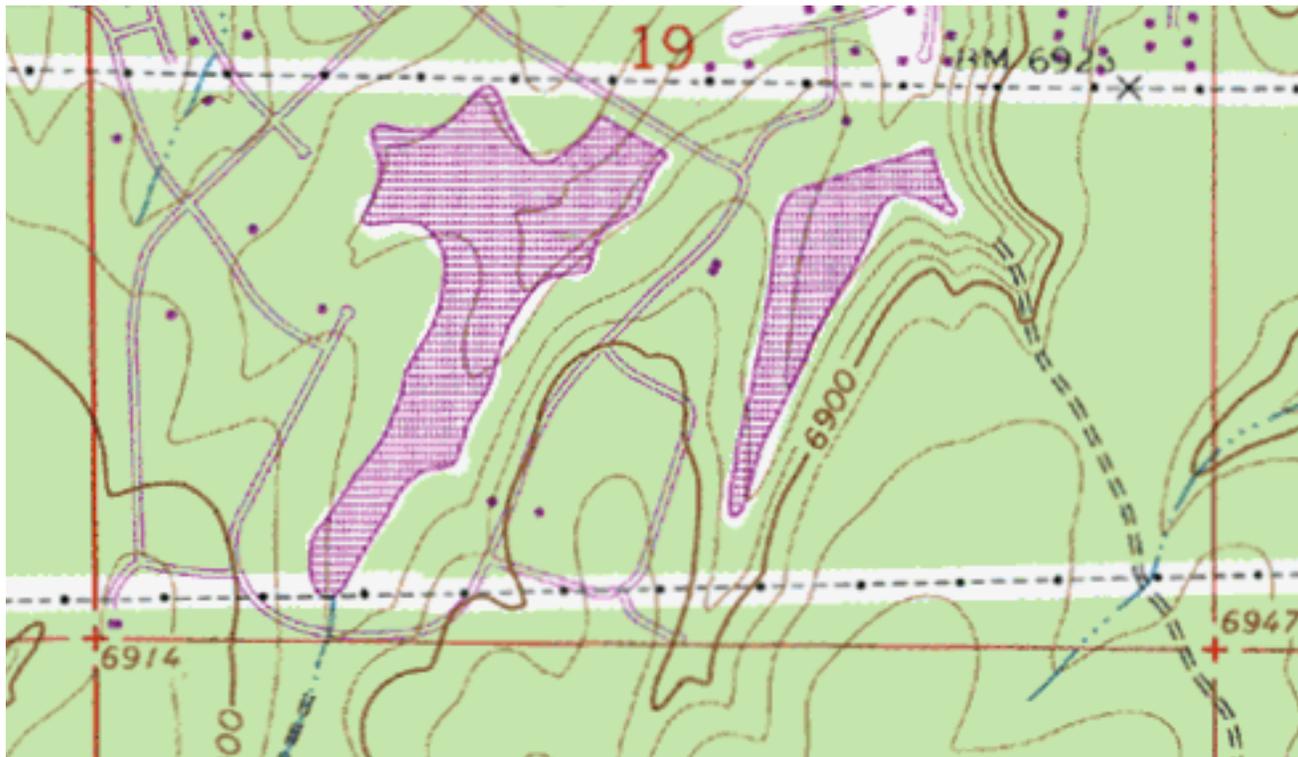




Complementary Colors



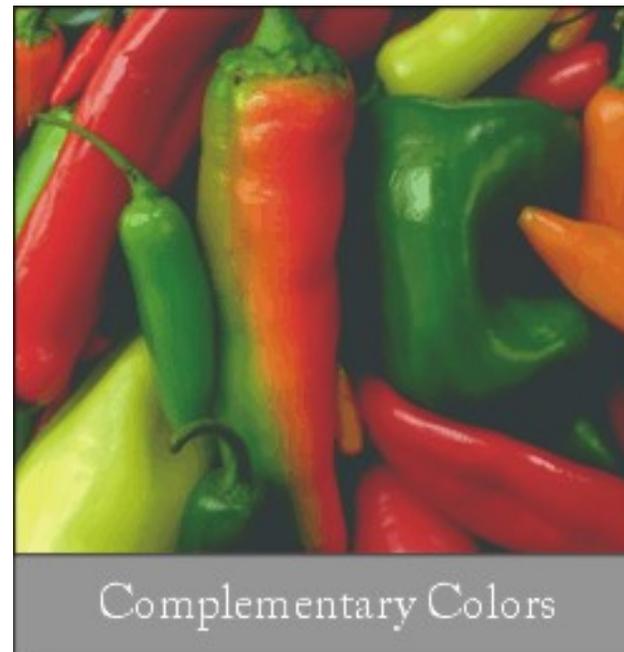
Complementary Colors





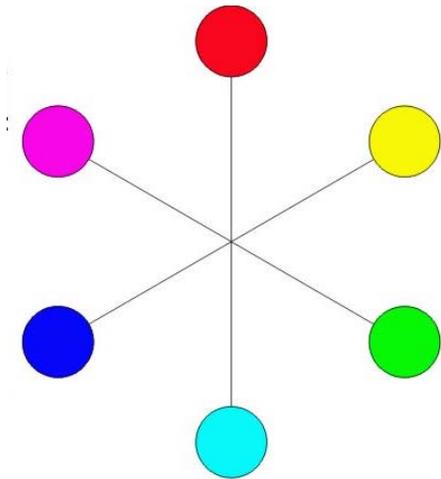
Complementary Choices

- complementary colors clash (especially when intensity and value are the same); draw contrast (create vibration)



- also common on sports uniforms

Analogous Colors



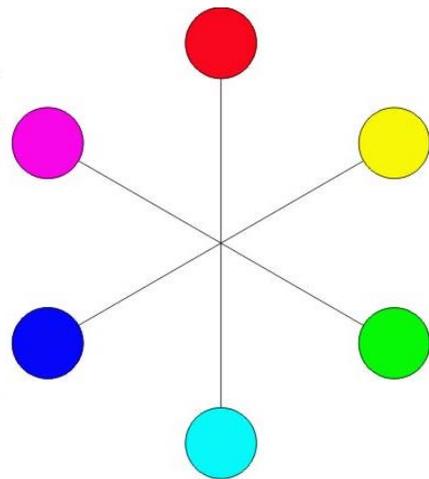
Analogous Colors



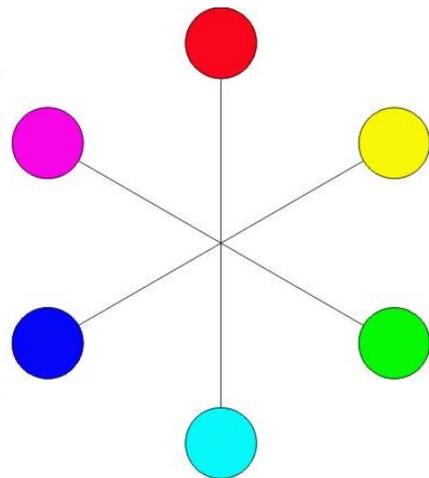
- analogous colors are less jarring and more pleasing to the eye when used together

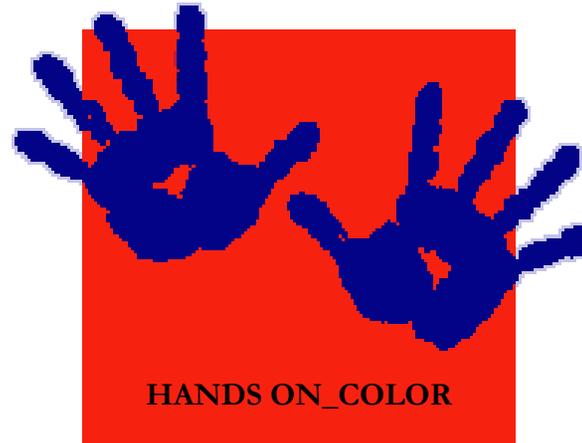


Warm Colors



Cool Colors





- find an example of complementary colors
- find an example of analogous colors
- find an example of warm colors
- find an example of cool colors



Color Perception



HUE

NOUN

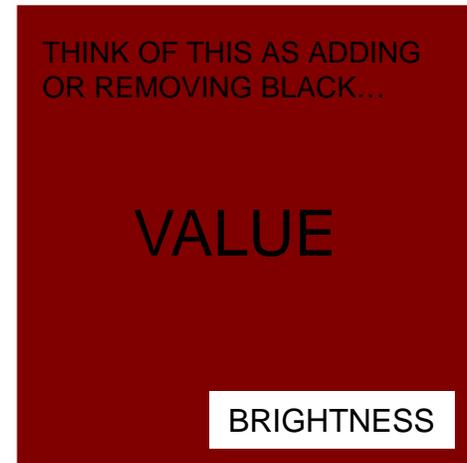


THINK OF THIS AS ADDING OR
REMOVING WHITE...

SATURATION

PURITY

ADJECTIVES



THINK OF THIS AS ADDING
OR REMOVING BLACK...

VALUE

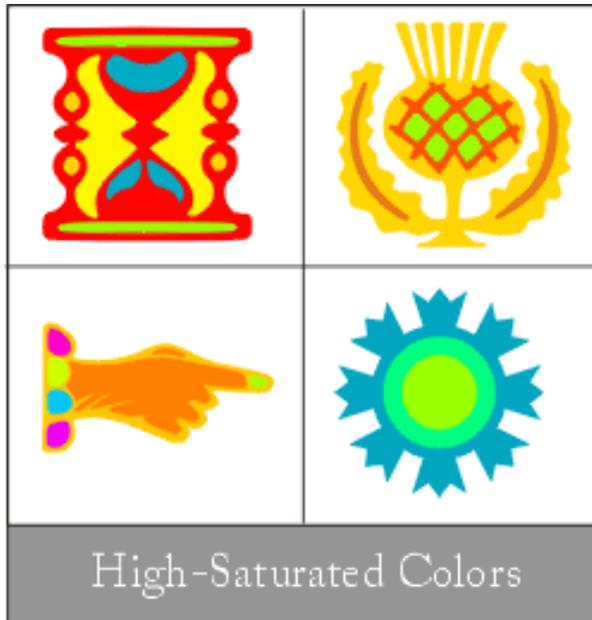
BRIGHTNESS

Color Perception



- high (S)aturation vs. low (S)aturation

100% (S)aturation/100% (V)alue



20% (S)aturation/100% (V)alue



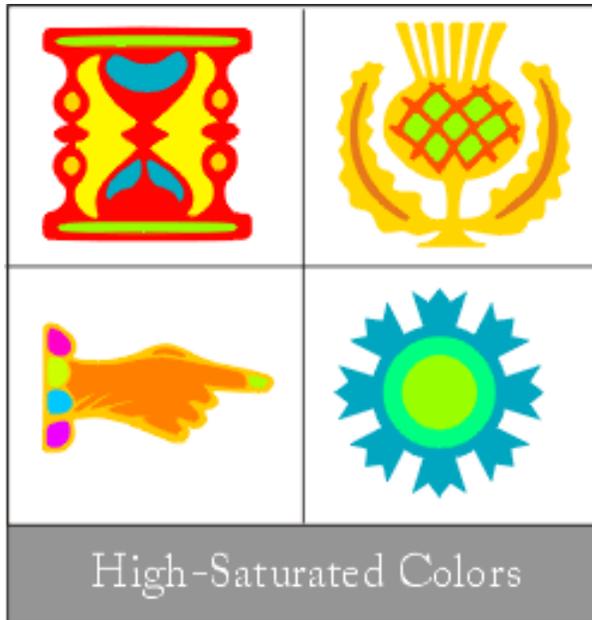
- bright, intense → delicate, pastel

Color Perception

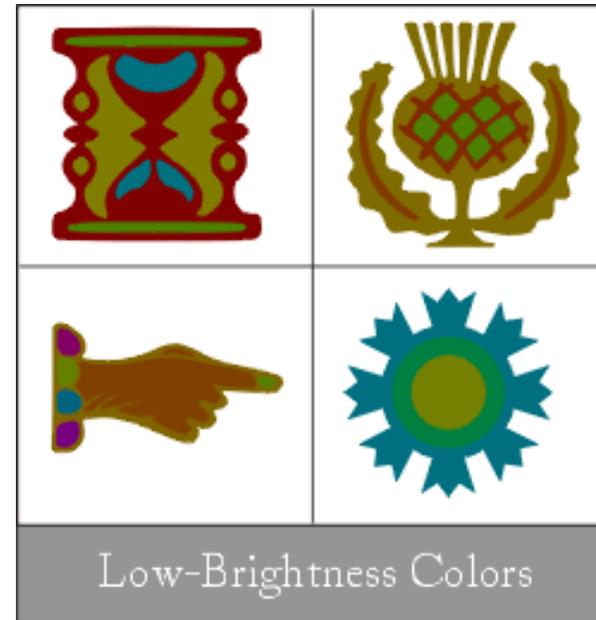


- high Value (lighter) vs. low Value (darker)

100% (S)aturation/100% (V)alue



100% (S)aturation/50% (V)alue



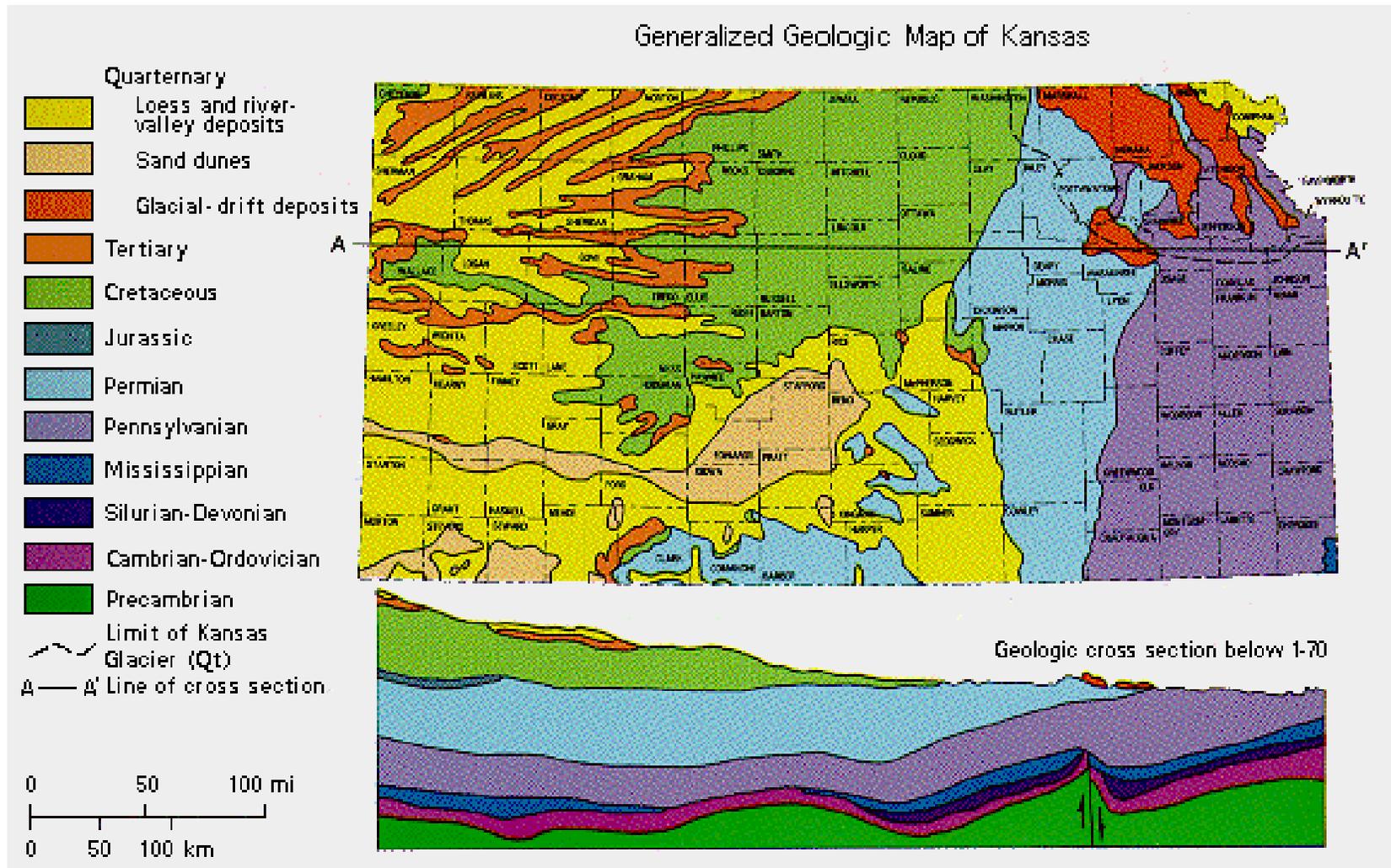
- bright, intense → darker, more somber

Color Decisions

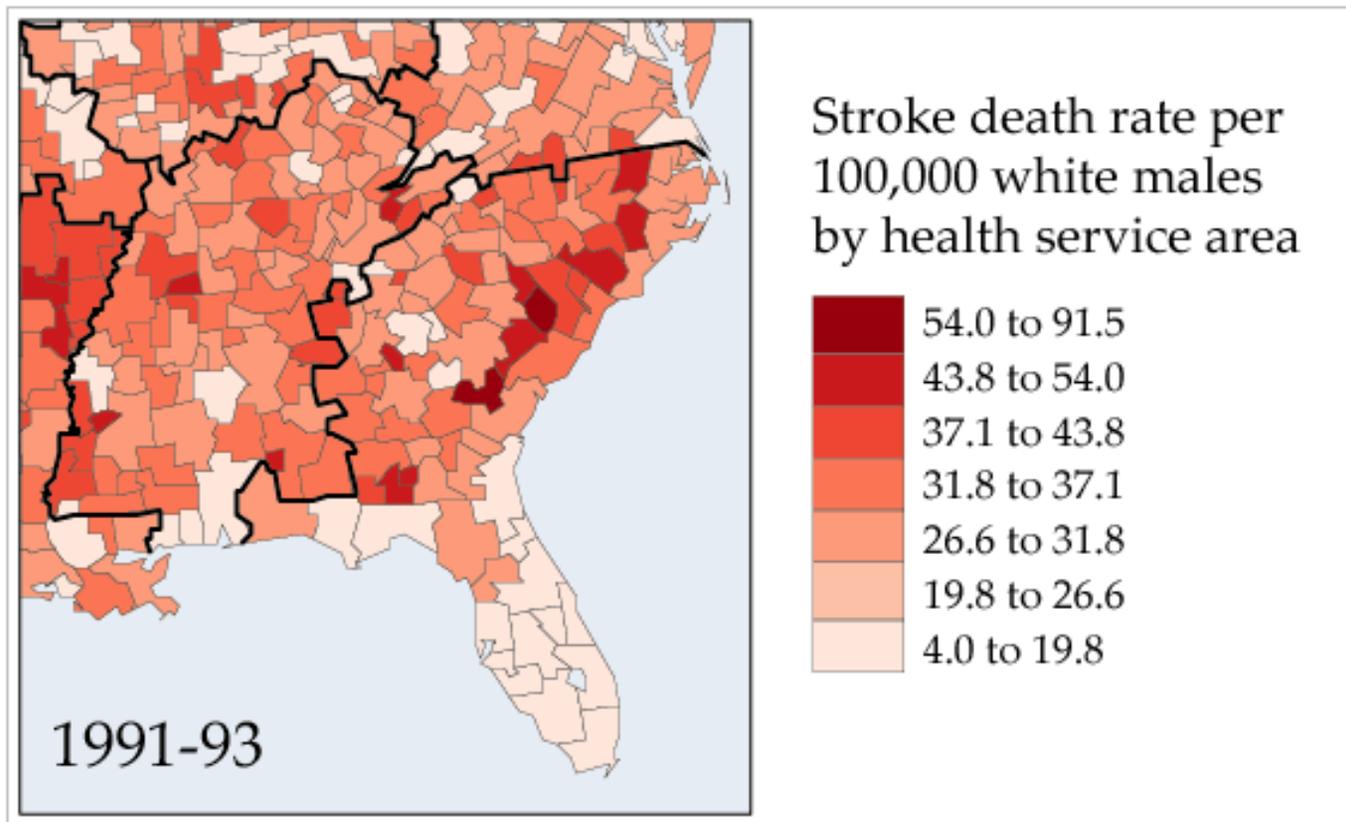


- hue is a visual variable better suited for *qualitative data*
- saturation and value are better suited for *quantitative data*

Color Decisions



Color Decisions

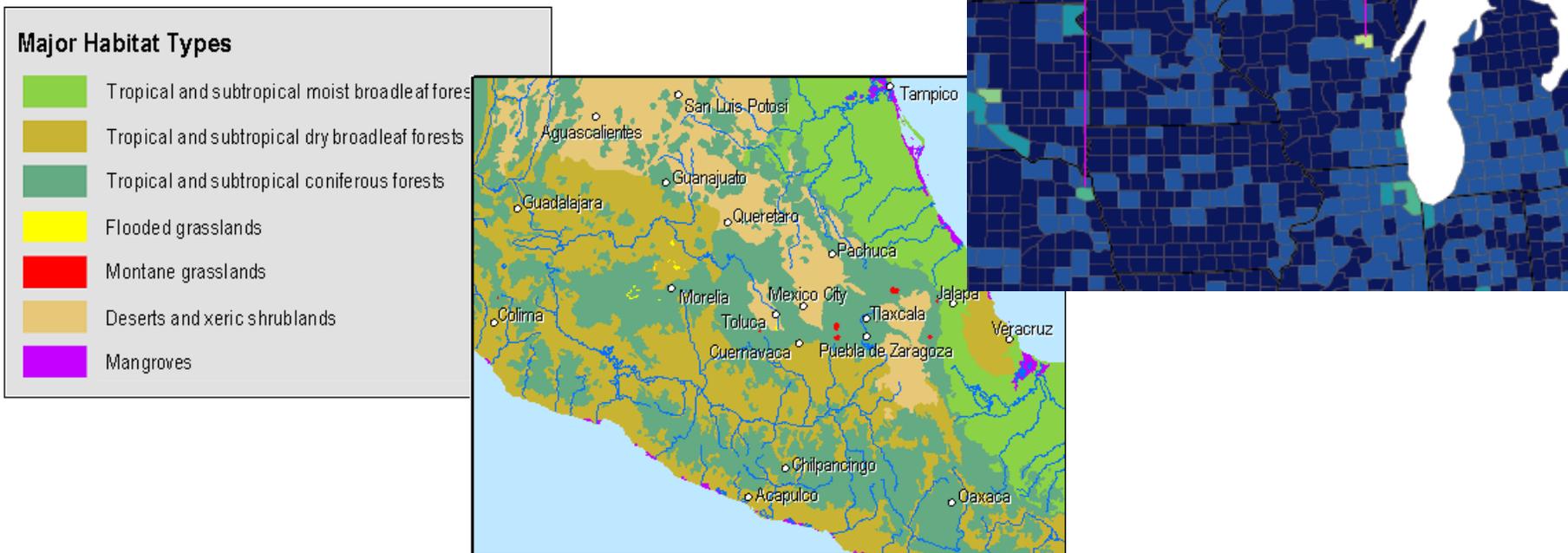


Source : Penn State/ESRI

Color Schemes



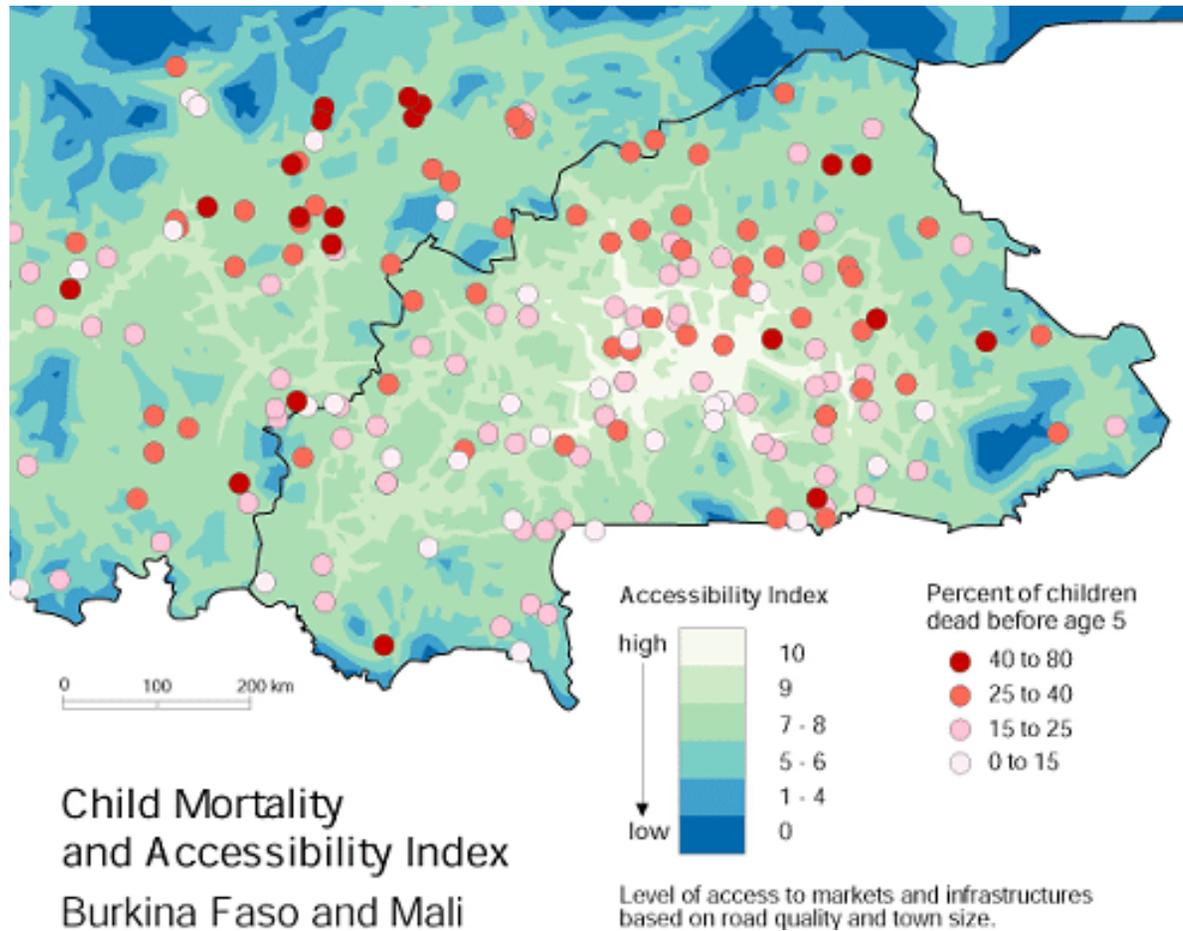
*use “higher sat/value” hues in areas that are small



Color Schemes

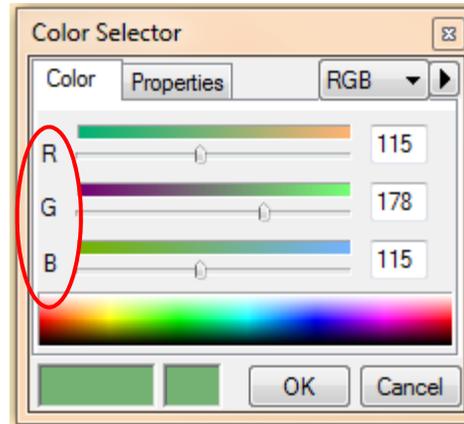
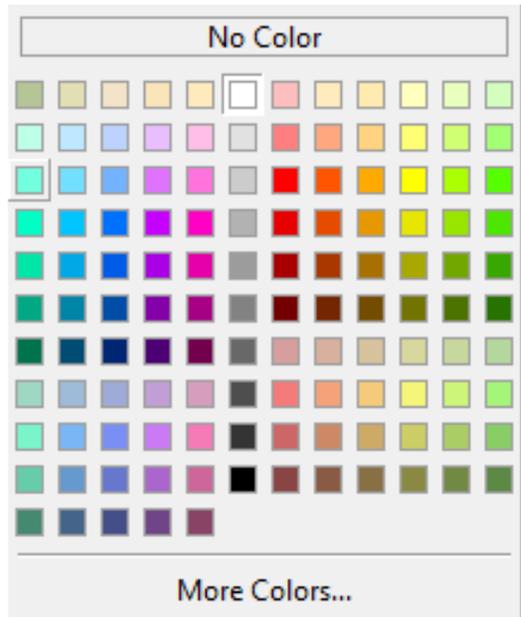


* higher “data” value can also be “lighter” color

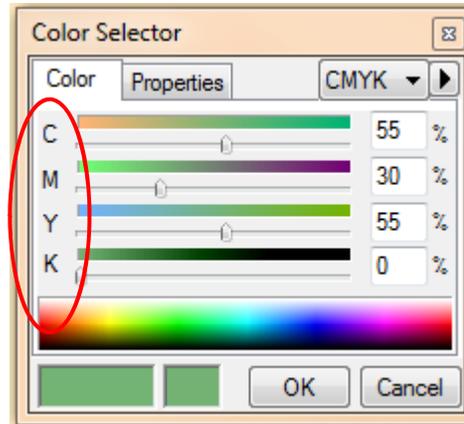


Source : Penn State/ESRI

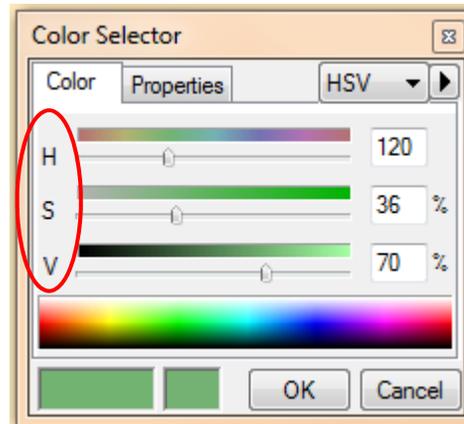
In ArcMap



how we create color on our computer monitor.



how we create color on our printer.



how we perceive and talk about color.

Color Decisions



The screenshot displays the ArcMap interface with the following elements:

- Table of Contents:** Lists several layers, with 'us_lower_48' selected.
- Symbol Selector:** A dialog box showing a list of styles (Green, Blue, Sun, Hollow, Lake, Rose, Beige, Yellow, Olive) and a 'Current Symbol' preview area.
- Color Selector:** A dialog box showing the HSV color model with values H: 120, S: 36%, and V: 70%. This dialog is circled in orange.

The map background shows a light orange area with red lines representing features. The status bar at the bottom indicates the coordinates 126907.935 1470480.724 Meters.

Color Decisions



The screenshot shows the 'Layer Properties' dialog box in a GIS application, specifically the 'Symbology' tab. The layer is named 'AREA'. The symbology is set to 'Draw categories using unique values of one field'. The 'Value Field' is set to 'AREA'. A color ramp palette is open, showing various color schemes for selection. The palette includes a 'Color Ramp' dropdown menu and a list of color swatches. The 'Symbol' column shows a purple square for the '<all other values>' category. The 'Value' column shows '<all other values>' and the 'Label' column shows '<all other values>'. The 'Apply' button is visible at the bottom right of the dialog.

Symbol	Value	Label
<input checked="" type="checkbox"/>	<all other values>	<all other values>

Color Decisions



Style Manager

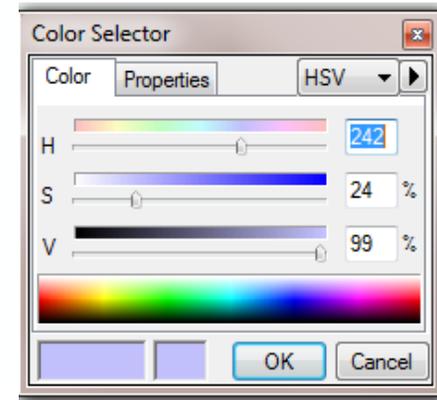
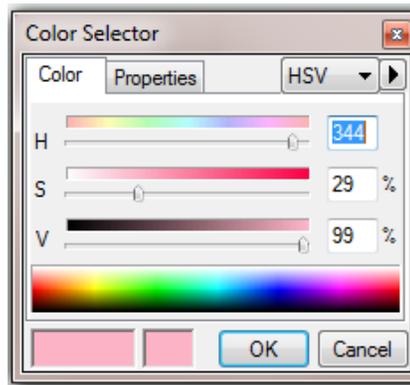
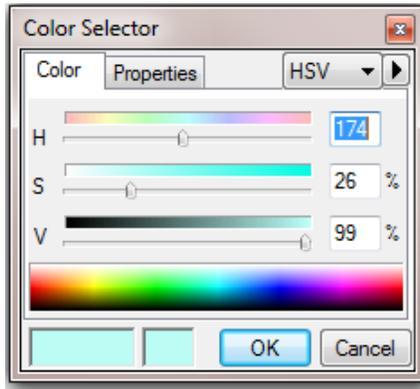
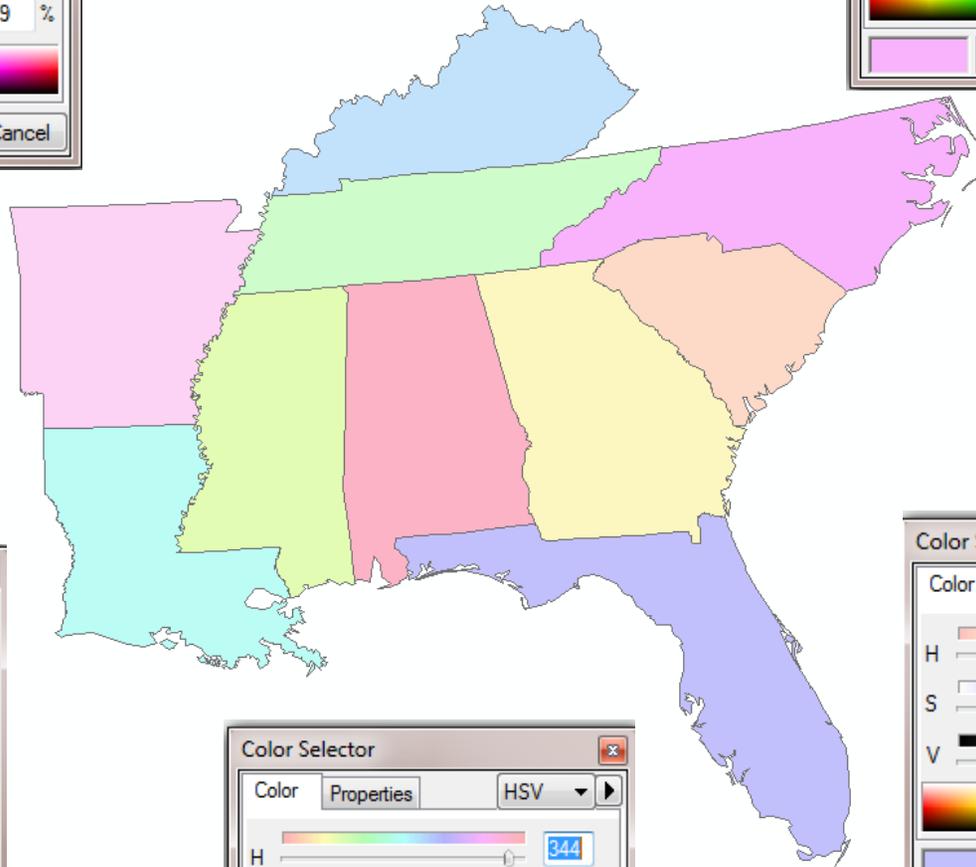
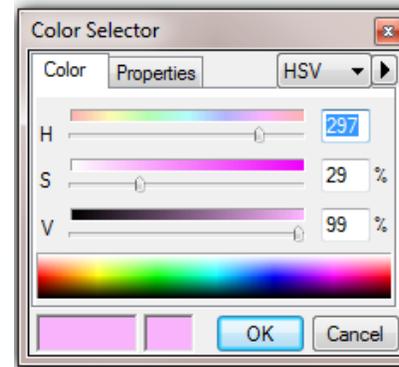
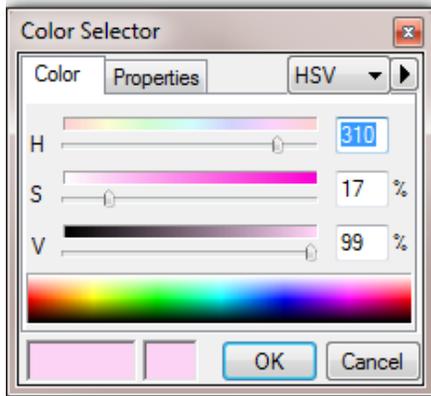
ESRI.style

- Reference Systems
- Maplex Labels
- Shadows
- Area Patches
- Line Patches
- Labels
- Representation Markers
- North Arrows
- Scale Bars
- Legend Items
- Scale Texts
- Color Ramps**
- Borders
- Backgrounds
- Colors
- Vectorization Settings
- Fill Symbols
- Line Symbols
- Marker Symbols
- Text Symbols
- Representation Rules
- Hatches

Name	Category
Yellow to Dark Red	Default Ramps
Blue Light to Dark	Default Ramps
Purple-Blue Light to Dark	Default Ramps
Blue-Green Light to Dark	Default Ramps
Green Light to Dark	Default Ramps
Purple-Red Light to Dark	Default Ramps
Red Light to Dark	Default Ramps
Yellow-Green Light to Dark	Default Ramps
Gray Light to Dark	Default Ramps
Brown Light to Dark	Default Ramps
Orange Light to Dark	Default Ramps
Blue Bright	Default Ramps
Purple-Blue Bright	Default Ramps
Blue-Green Bright	Default Ramps
Green Bright	Default Ramps
Purple Bright	Default Ramps
Purple-Red Bright	Default Ramps
Red Bright	Default Ramps
Yellow-Green Bright	Default Ramps
Orange Bright	Default Ramps
White to Black	Default Ramps
Black to White	Default Ramps

Close

Styles...



Color Perception



- WYSI**N**WYG

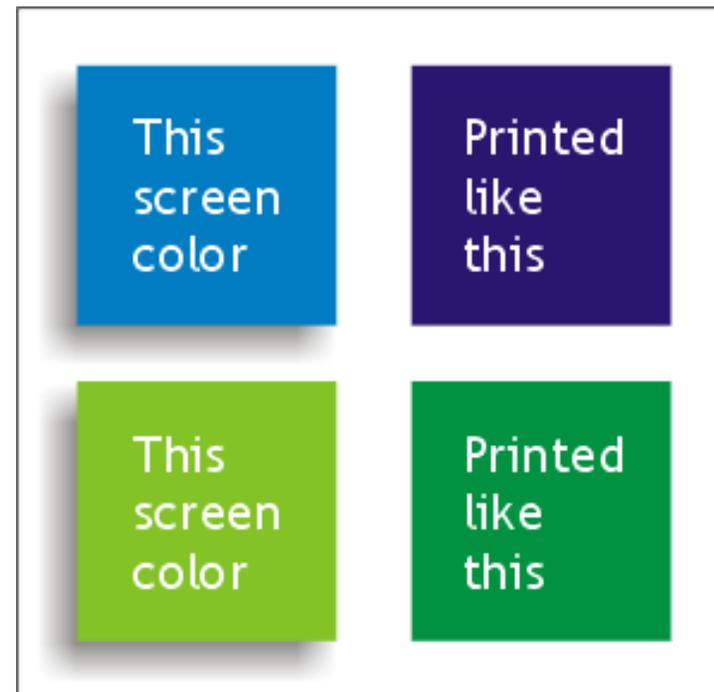


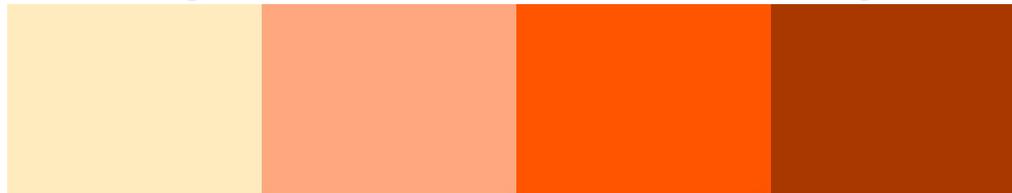


Photo-copy Safe Colors

- b/w copiers : white – light gray- dark gray – black



- include large differences in color lightness



- better yet, add patterns



- print, copy, adjust...print, copy, adjust...print, copy, adjust or, design for black and white

Color-blind Safe Colors

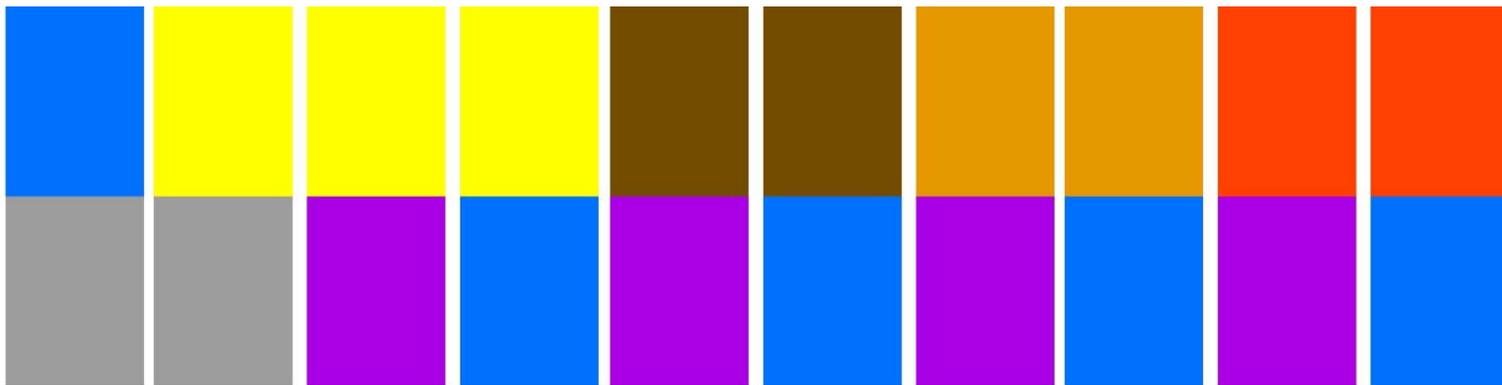


- 8% men/1% women have some color-vision impairment

- red-green colorblindness is most common

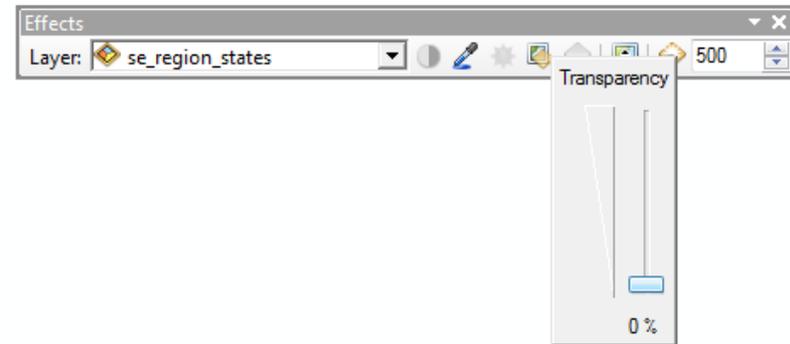
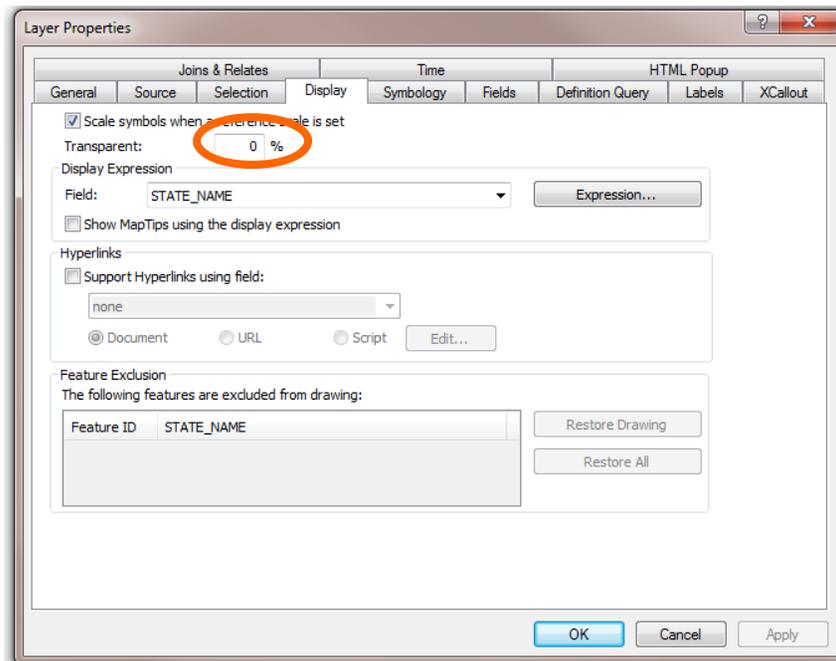


- better 2-color combinations are :



- lightness variation improves colorblind interpretation

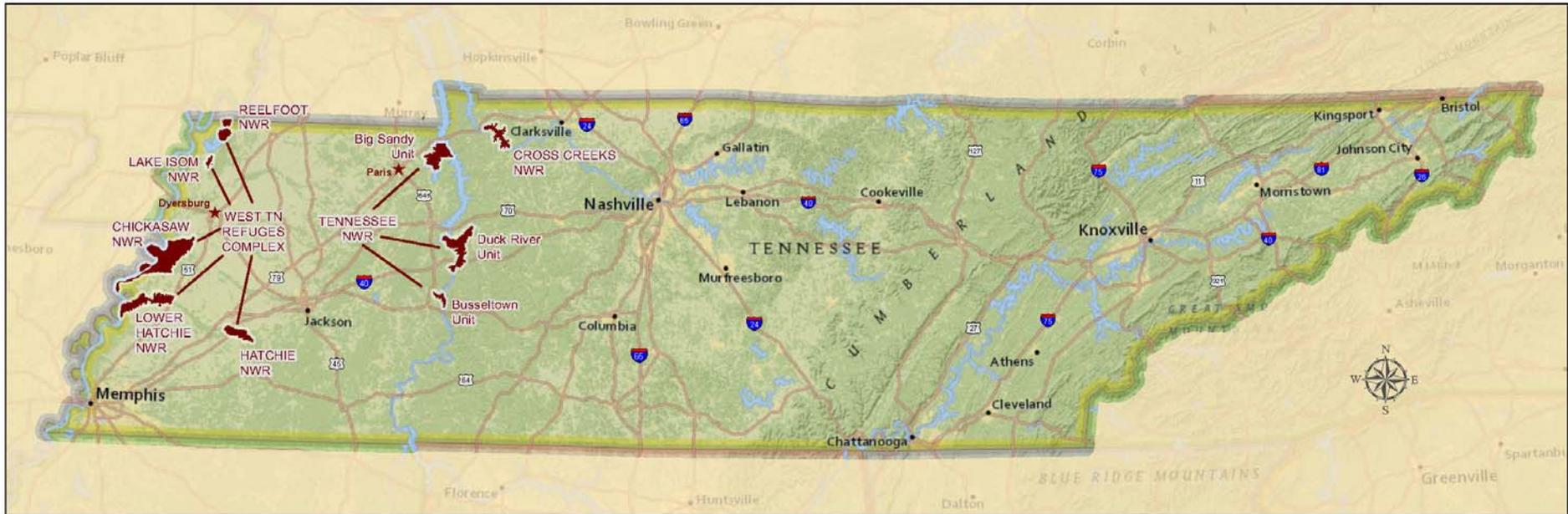
Transparency



Transparency

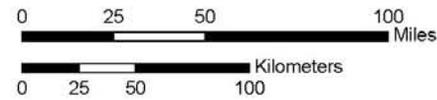


National Wildlife Refuges in Tennessee



Coordinate System: State Plane Tennessee FIPPS 4100
Datum: NAD 83
Units: Feet

★ Refuge Complex Headquarters

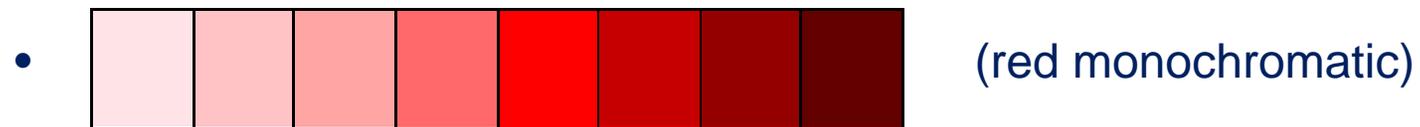
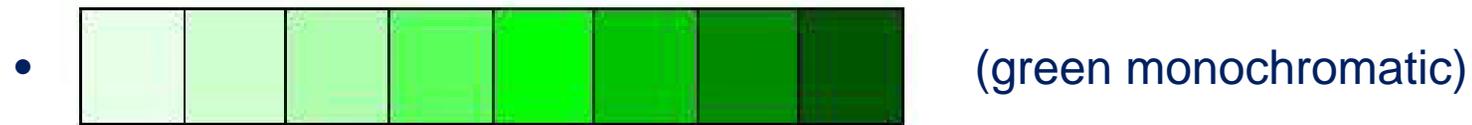


Map Production: Southeast Region GIS Center in Cookeville, TN
Map Production Date: September 11, 2012
File Location: G:\projects\TN_NWR_map\tn_nwr_map.pdf



Sequential Color Ramp

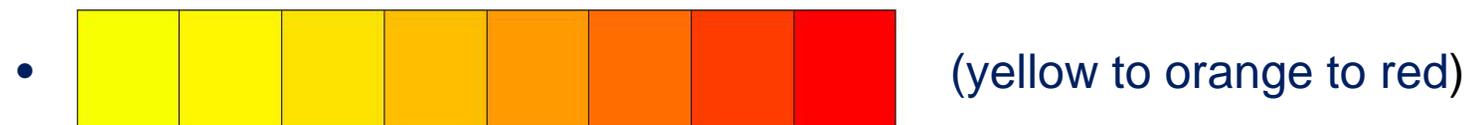
- single hue scheme: simplest and most effective for quantitative data



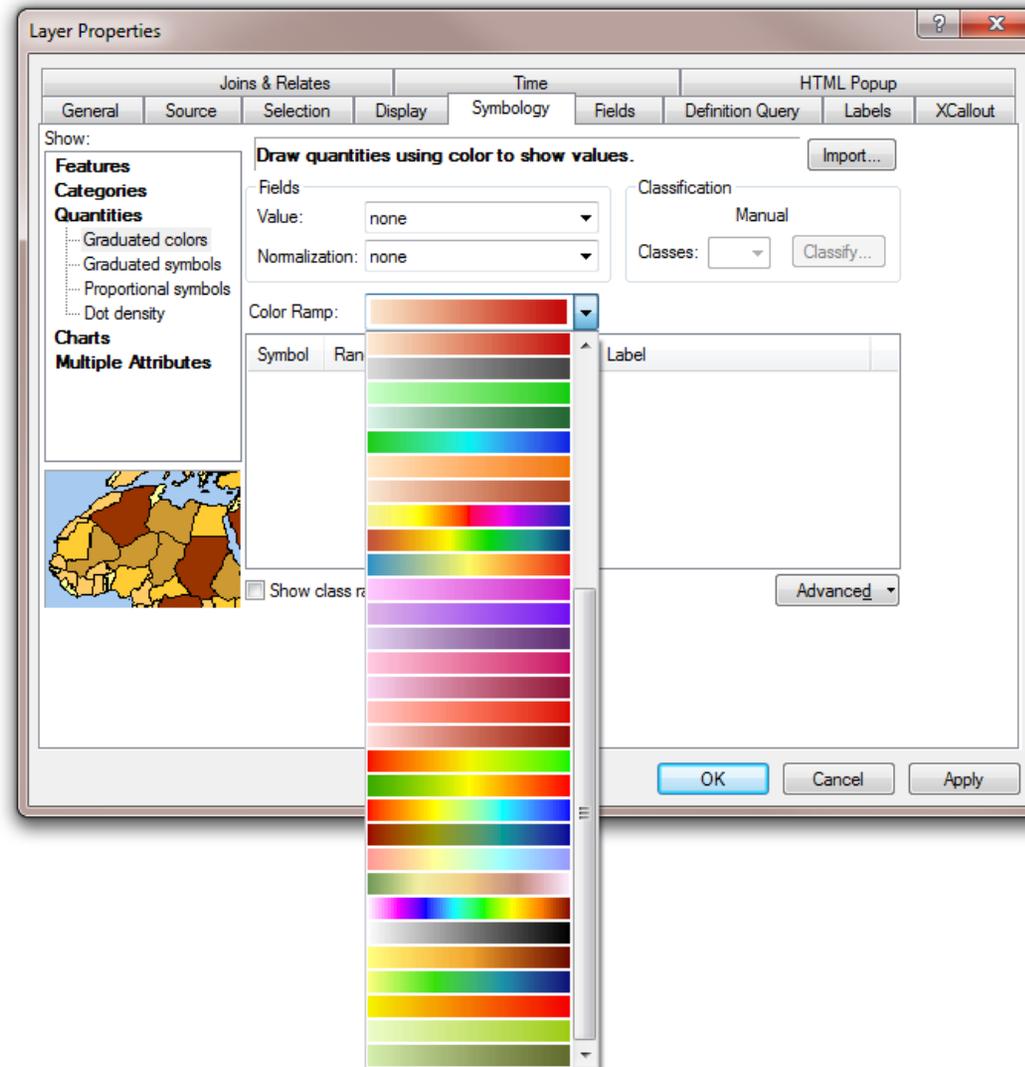


Sequential Color Ramp

- part-spectral scheme : uses adjacent colors of the color-wheel to show variations in magnitude



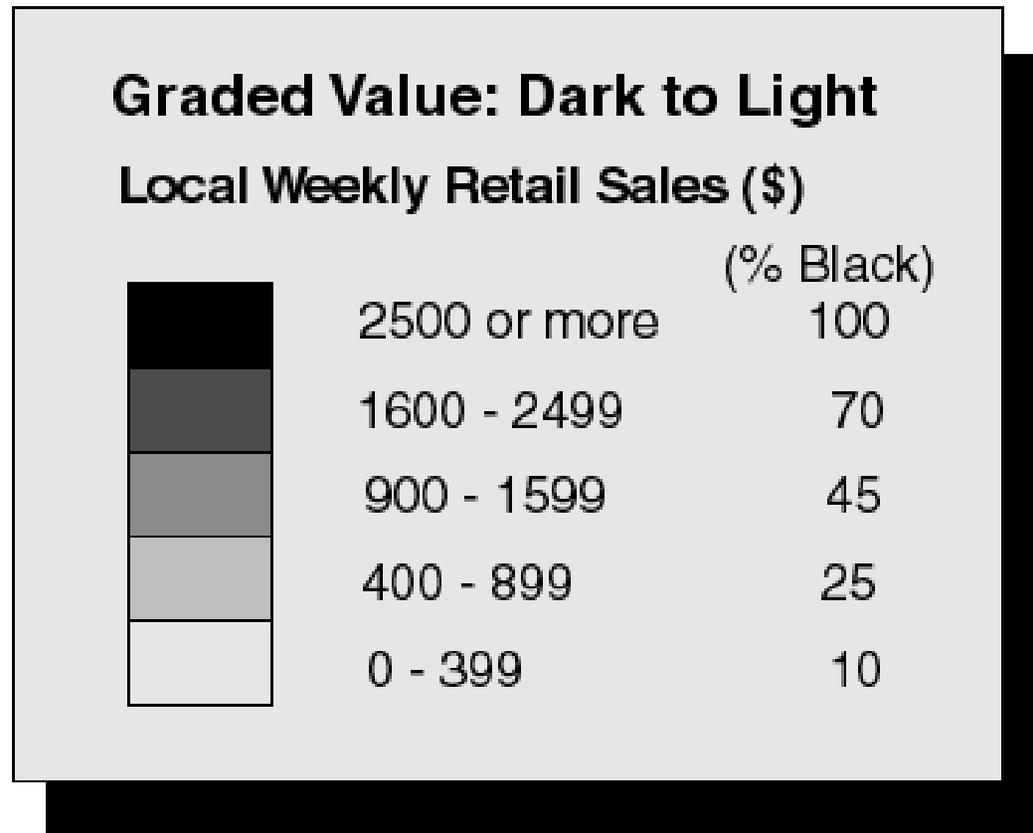
Sequential Color Ramp





Making good color choices...

- limit gray scales to 5





Making good color choices...

- limit “single hue” scales to 5-6

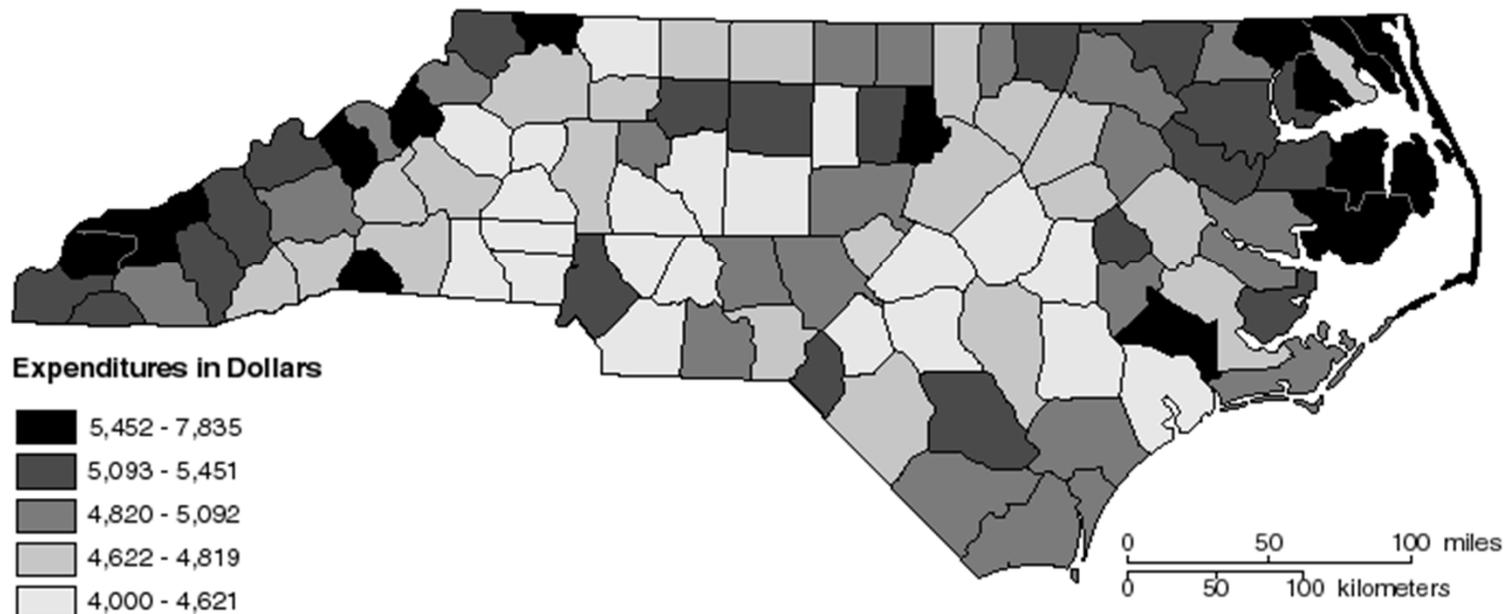
Graded Hue: Dark to Light Green
Average Annual Income

		(% C	M	Y	K)
	100000 or more	100		100	35
	70000 - 99999	100		100	
	30000 - 69999	70		70	
	10000 - 29999	45		45	
	2500 -9999	24		24	
	0 - 2499	9		9	

Making good color choices...



Per Pupil Expenditure for Public Education in North Carolina, 1994-1995



Source: NC Department of Public Instruction, *Statistical Profile*, 1996.

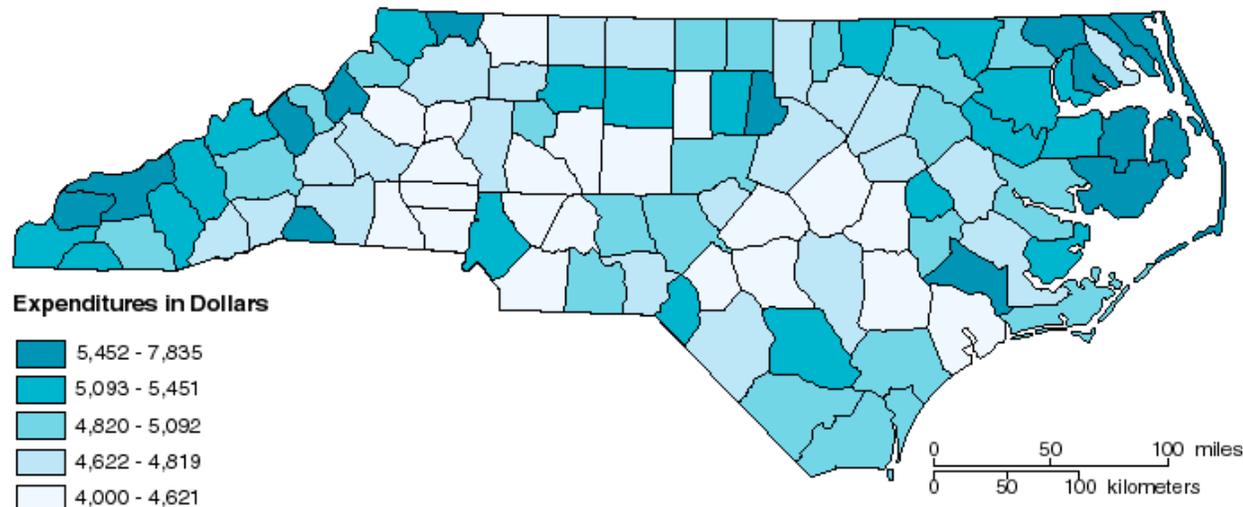
5 Classes can be represented sufficiently in black and white as well as by a single hue. The top class must be black and there must be at least 15% difference at the lower end of the value/chroma scale, at least 20% difference in the mid range and at least 25% for dark ranges. Percentages of black used here are: 8, 24, 50, 70 and 100%. Note that when adjacent polygons have black, the dividing lines are not visible when also in black. The polygon outlines must, in this case, be shown in a light gray or white. They are shown here in light gray where 2 or more adjacent counties are filled with black.



Making good color choices...

- limit “single hue” scales to 5-6 (good example)

Per Pupil Expenditure for Public Education in North Carolina, 1994-1995



Source: NC Department of Public Instruction, *Statistical Profile*, 1996.

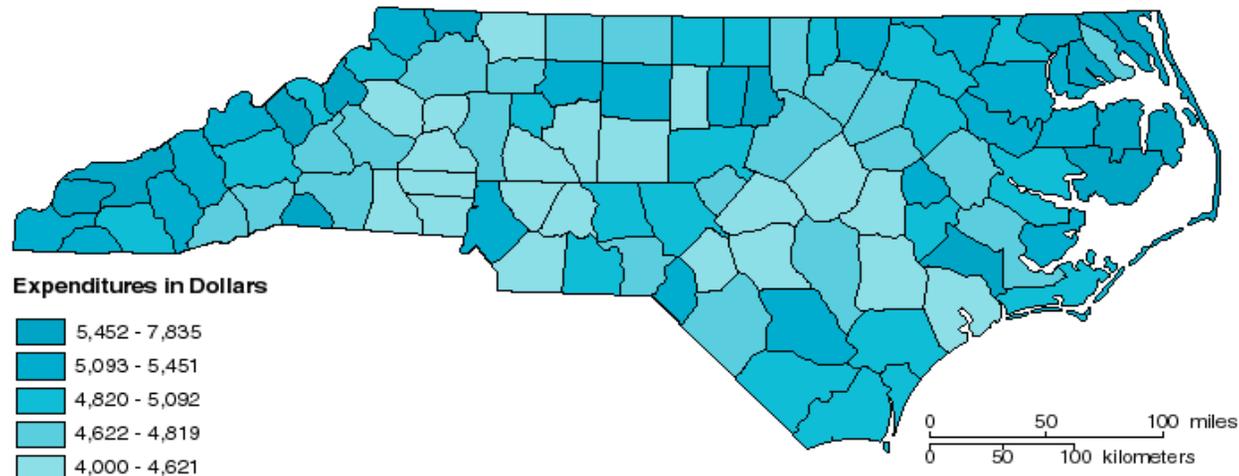
Shown here is an example of a single-hue graded series for a 5-class choropleth map. Single-hue series' really work better for 4 or fewer classes but a single hue can be "stretched" to 5 distinct value/chroma steps by varying the percentage of the hue, and decreasing the value (adding black) of the hue for the highest data class. Percentages shown here are: 8, 24, 48, 80, and 100% Cyan with 10% Black added to the 100% Cyan. Percentages will vary depending on the hue used. Green works well for a 5-class single-hue graded series. Magenta, red, orange and brown can also form 5-class single hue series' but yellow would not work well.

Making good color choices...



- limit “single hue” scales to 5-6 (bad example)

Per Pupil Expenditure for Public Education in North Carolina, 1994-1995



Source: NC Department of Public Instruction, *Statistical Profile*, 1996.

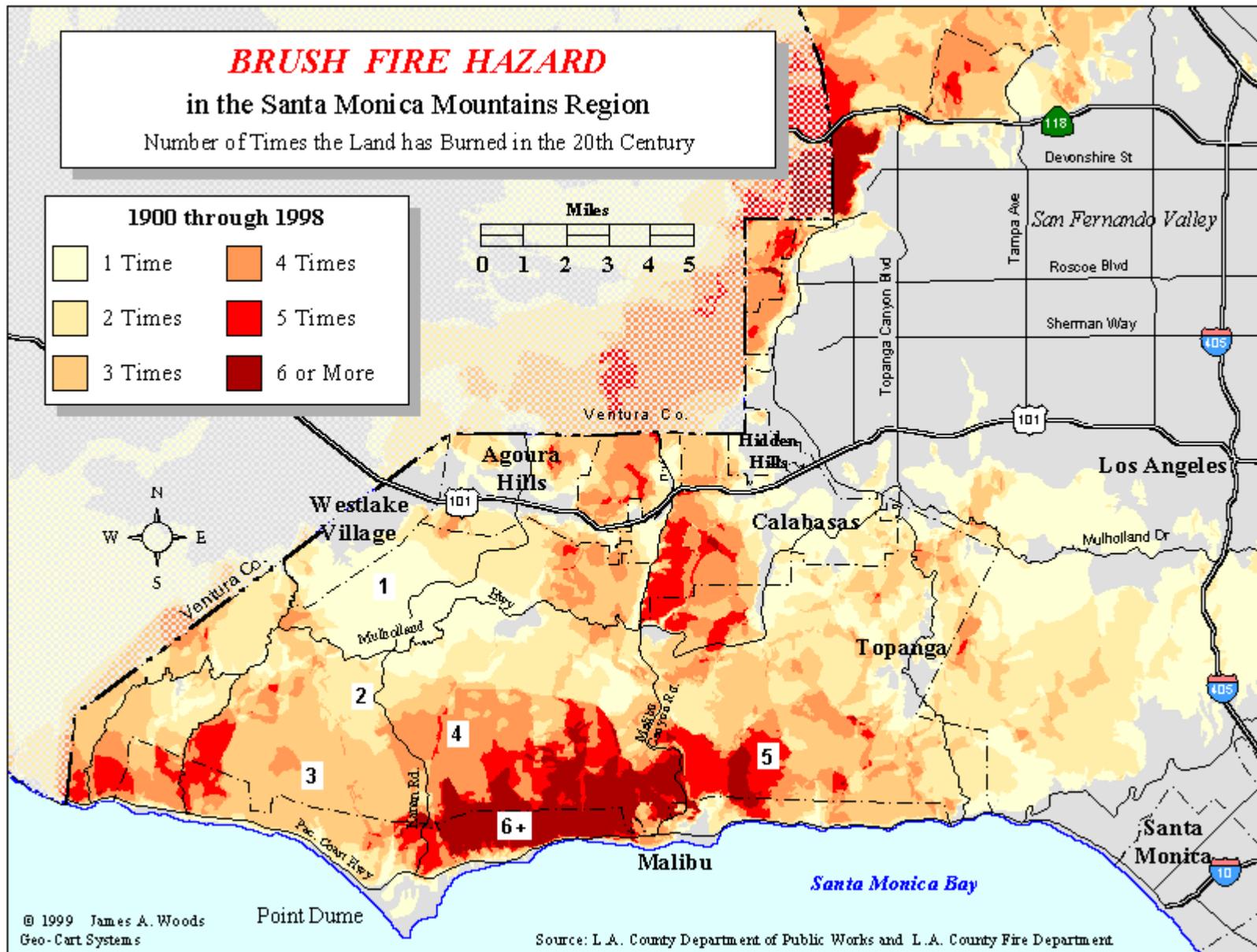
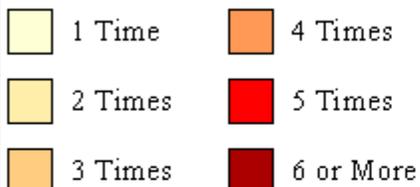
In this single-hue, 5-class choropleth map, the hue cyan is used to represent education expenditures. The percentage of cyan is varied ineffectively for providing a clear distinction between each class and for highlighting the highest data quantities. The percentages used are: 100, 85, 70, 55, and 40. A difference of 15% per step is not visually distinct enough to make for an effective single-hue series. There should be 20% or more difference in chroma (the amount of hue used, expressed in percent) between the darker hues in the single-hue series. At the lighter end of the scale, the lightest hue should be quite light (e.g., 10%) with at least 15 to 20% to the next hue for effective differentiation of low chroma hues. With 4 or fewer classes, it is not necessary to vary the value (i.e., no need to use black). But with 5 classes and a single hue, decreasing the value (adding small amounts of black) for the darkest hue helps with differentiation per hue and with highlighting the highest data quantities.

BRUSH FIRE HAZARD

in the Santa Monica Mountains Region

Number of Times the Land has Burned in the 20th Century

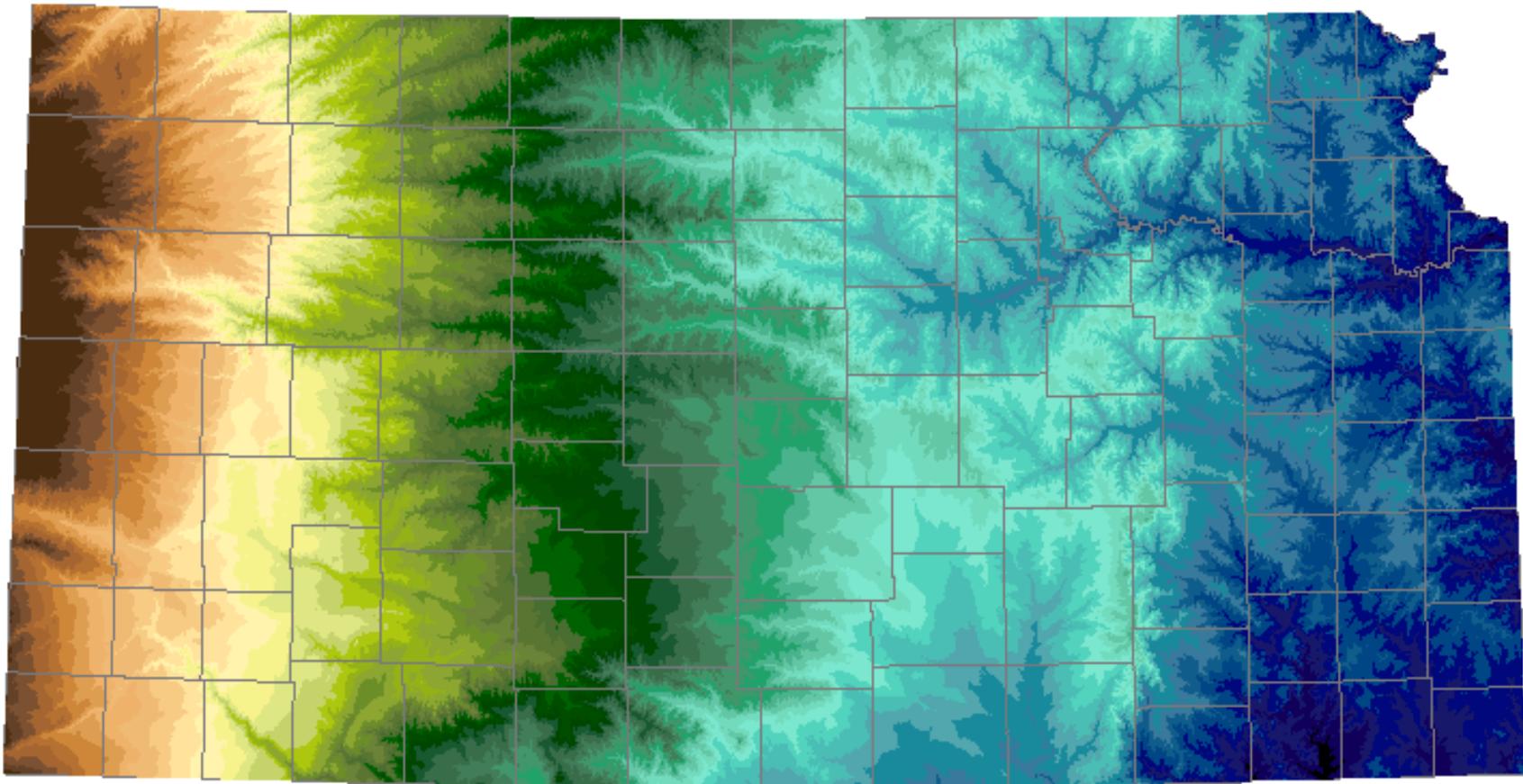
1900 through 1998





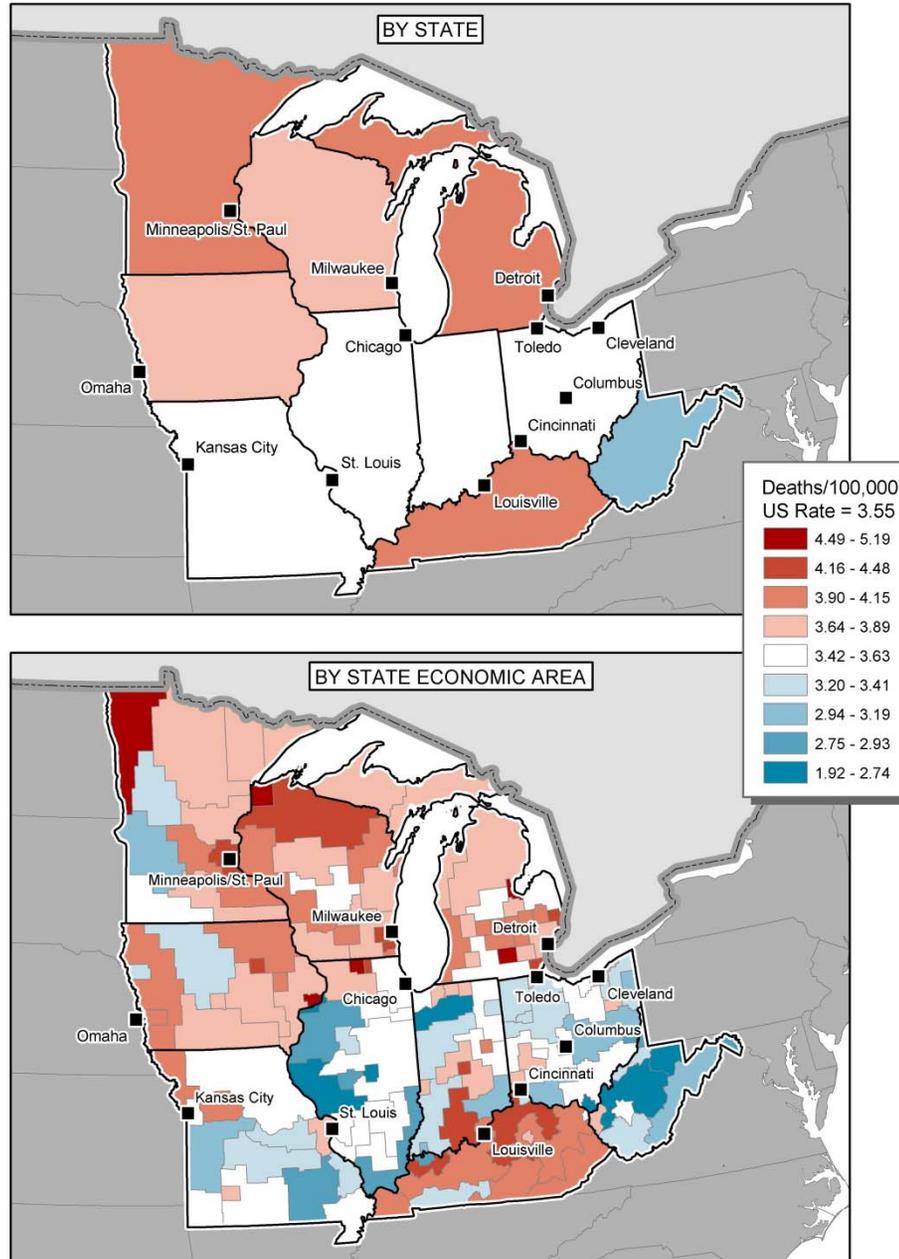
Making good color choices...

- to show a continuous variable



Cancer Mortality Rates in the Central United States

Brain and Other Nervous System : White Females, 1970-94





Color conventions...

- Blues for water
- Greens for vegetation
- Browns for hills
- Yellows for dryer areas
- Red for roads*

Book Recommendation

