I. Color theory in cartography

a. We have certain colors that are consistent in mapping
    i. Water is usually blue, vegetation green
    ii. Sometimes that's boring
b. Knowing how to mix colors is very important
c. Knowing which colors to choose is important too

II. Color systems

a. HSV

i. **H**ue, **S**aturation, **V**alue

ii. Hue

1. Color names
    a. e.g. red, blue, etc.
2. 360° color wheel

iii. Saturation

1. Intensity of color
    a. How vivid and bright it is
2. Moving across the cone
3. Less = white
4. More = vivid

iv. Value

1. The lightness of a color
2. Moving down the cone
3. Less = darker from grays to black

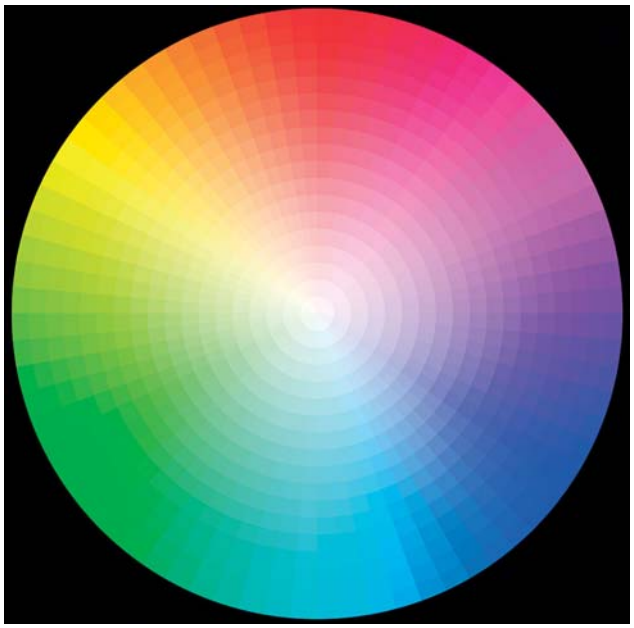

Figure 1. HSV color wheel

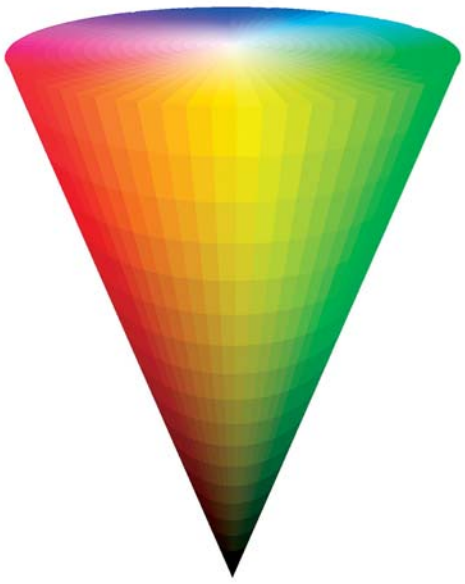

Figure 2. HSV Cone

b. CMYK

i. **C**yan, **M**agenta, **Y**ellow, Blac**K**
ii. Used for printing and graphic design
iii. Black extra for printing text

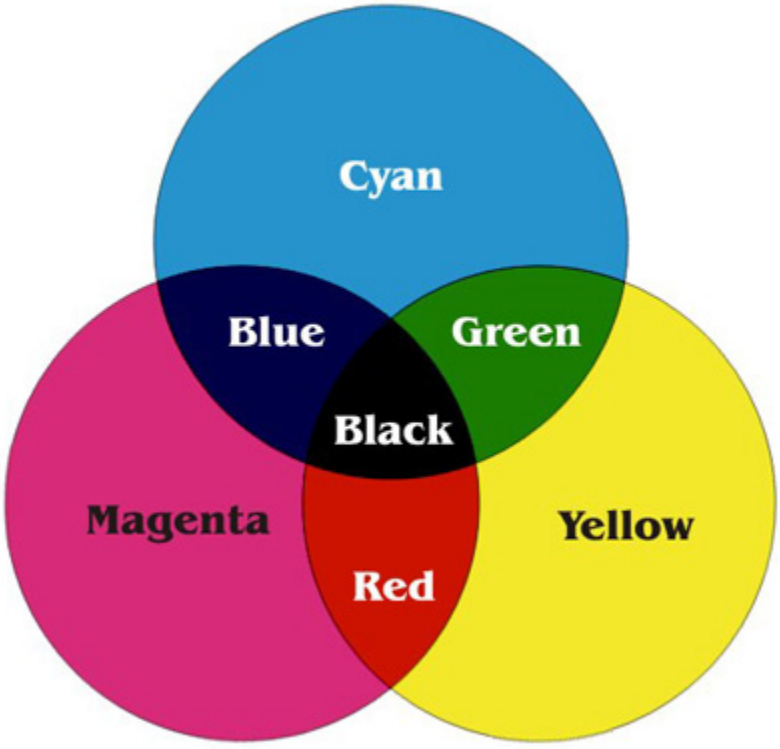

Figure 3. Mixing CMY colors

iv. filler

c. RGB

i. **R**ed, **G**reen, **B**lue
ii. Used for computer displays
iii. Expressed in **three numbers**
    1. (255, 0, 0) = Red
    2. (0, 255, 0) = Green
    3. (0,0, 255) = Blue
    4. (255, 255, 0) = Yellow
iv.

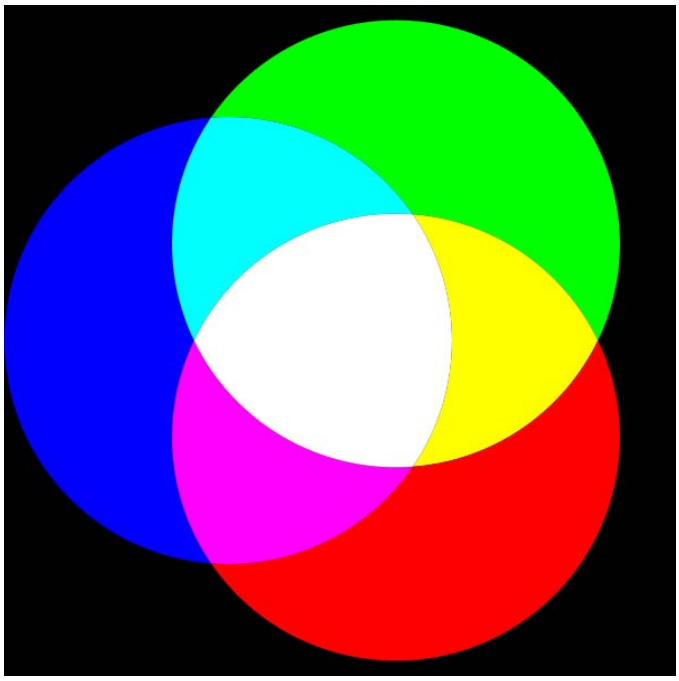

Figure 4. Mixing RGB colors

v.
vi. Filler

III. Picking colors for a map

a. Color progressions

i. Good for ordinal (ranked) data
ii. Single color progression
    1. One color decreasing in lightness (value)
        a. Can also fiddle with complementary hues for a new look
            i. Blue to purple, orange to red
    2. Also called sequential color scheme

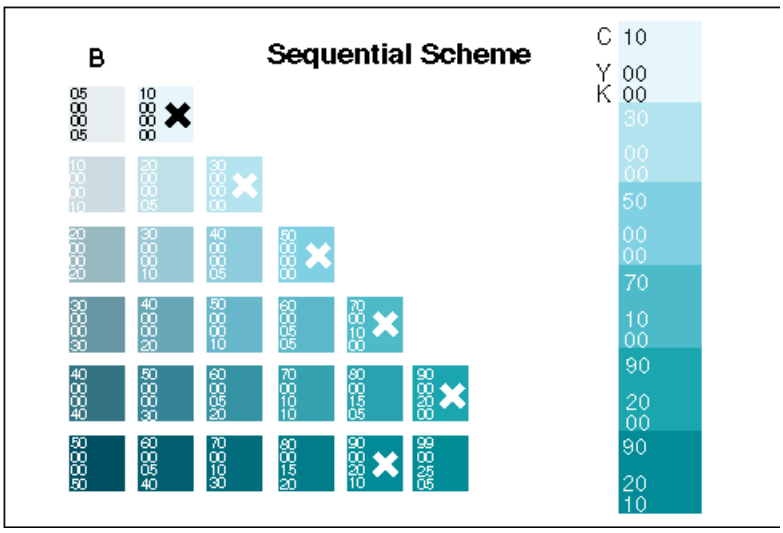

Figure 5. Single color progression

iii. Bipolar progressions

1. One hue increasing in lightness, then changing to another hue decreasing in lightness
2. Great for showing a median value, then extremes on both sides
    a. Poverty line, water levels, etc.
3. Red to blue good for showing "hot" to "cold"

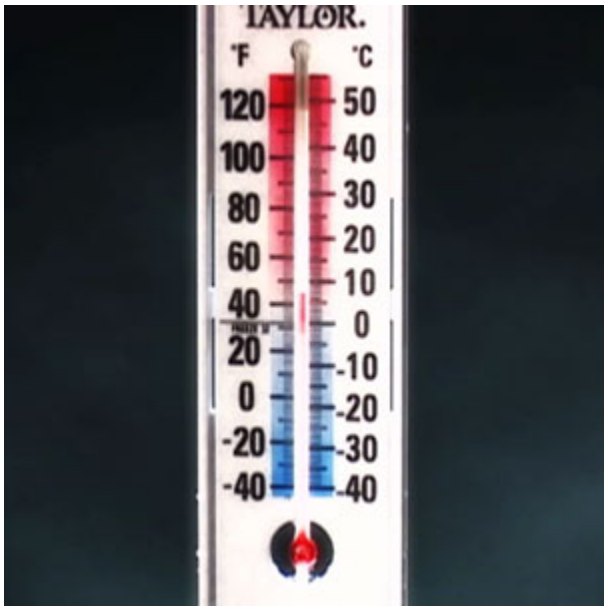

Figure 6. Bipolar progression

b. Qualitative colors

i. Good for **nominal** data
    1. Things that are different, but have no inherent rank
        a. Vegetation, race, land use, etc.

ii. Distinct change in hue

c. Four color theorem

i. Mathematical concept stating that only 4 colors are need for qualitative polygons
ii. Actually rarely used in cartography…

Figure 7. Four color map

d. Colors in context
i. Some colors look great by themselves, but change when placed against other hues.
1. Be sure to check your choices on the map itself
ii. Be aware of all of your layer color choices!
1. What you do for land use can affect your roads layer

e. Color blindness
i. Red-green
1. Most common
ii. Safe color pairings
1. red and blue
2. red and purple
3. orange and blue
4. orange and purple
5. brown and blue
6. brown and purple
7. yellow and blue
8. yellow and purple
9. yellow and gray
10. blue and gray

iii. Changing lightness can also help
1. Most color blind people can distinguish lightness, but have trouble with certain hues

f. Reproduction
i. Printing in color can be expensive and time consuming
ii. Maps that need to go to many viewers often need to be made in black and white or at least grayscale
1. Grayscale only works with about 4 levels
iii. Always test them first before you make 100 copies!