

colors

cartography + spatial data visualization

2026.09.15

housekeeping stuff

- i owe you grades! i'm grading today! i promise 🤖
- some changes to "midterm"/course topics starting next week

Week 04	Color	T	9/15/26
	Type	R	9/17/26
Week 05	Data	T	9/22/26
	Viz	R	9/24/26
Week 06	Constraints (feat. Riley Champine)	T	9/29/26
	Debates	R	10/1/26
Week 07	Adobe	T	10/6/26
	Curatorial reflection due (No class)	R	10/8/26
Week 08	No class (Fall break)	T	10/13/26
	Final map project kickoff	R	10/15/26

cartography has ~5 core principles:

scale

selection

emphasis

symbolization

generalization

here are 6 principles of map design:

clarity: emphasize important points; eliminate what doesn't enhance message.

contrast: how are you utilizing difference? bright/dark, thick/thin, heavy/light.

balance: place weight at optical center of map (5% above Cartesian center).

unity: how are you building your map elements into a cohesive purpose?

harmony: how are the elements of your map working together visually?

order: logic of the map. is there clutter? how is it oriented (X or Y axis)?

scale, selection, emphasis, generalization, symbolization

**where does color fit into
these principles of map
design?**

clarity, contrast, balance, unity, harmony, order

**what should color do
on a map?**

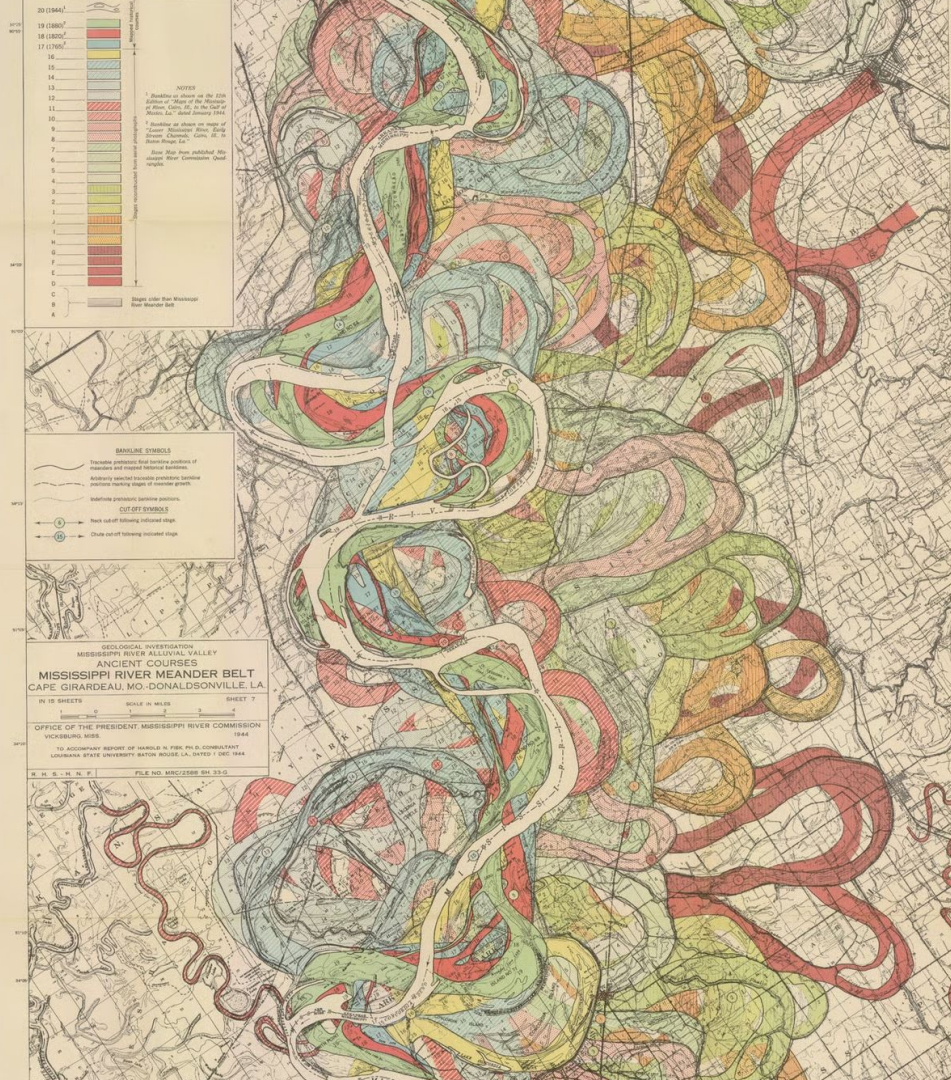
at least five things:

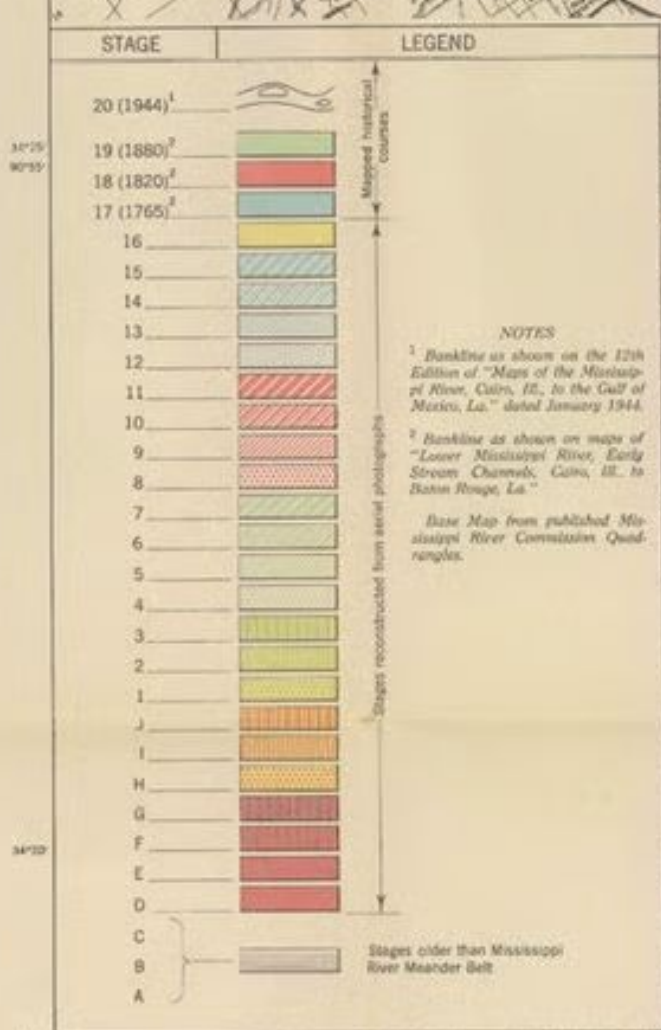
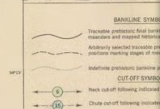
1. clarify/simplify
2. aid perceptibility
3. induce reactions
4. attract attention
5. lead the eye

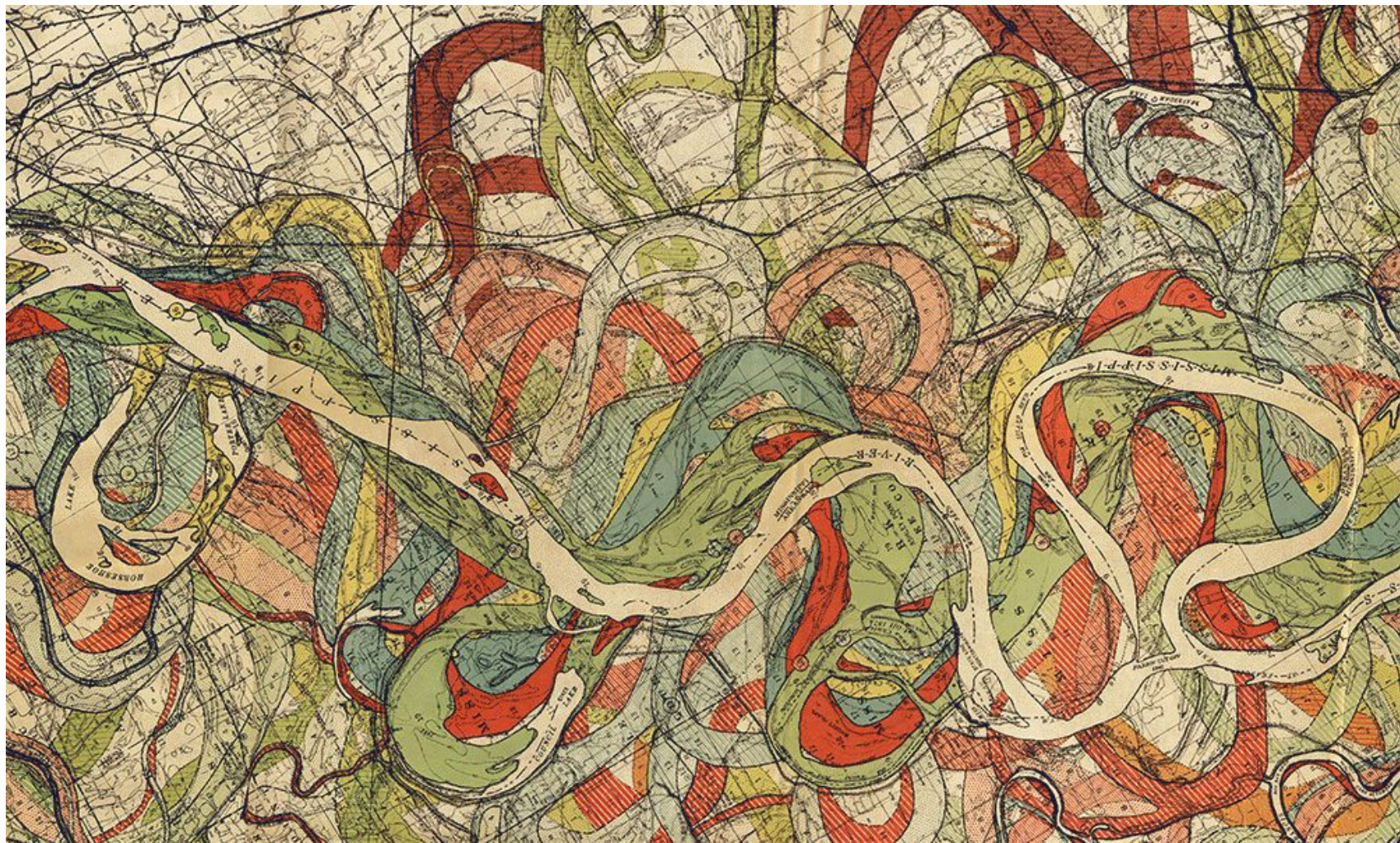
**these are all in
service of your
map's visual
hierarchy**

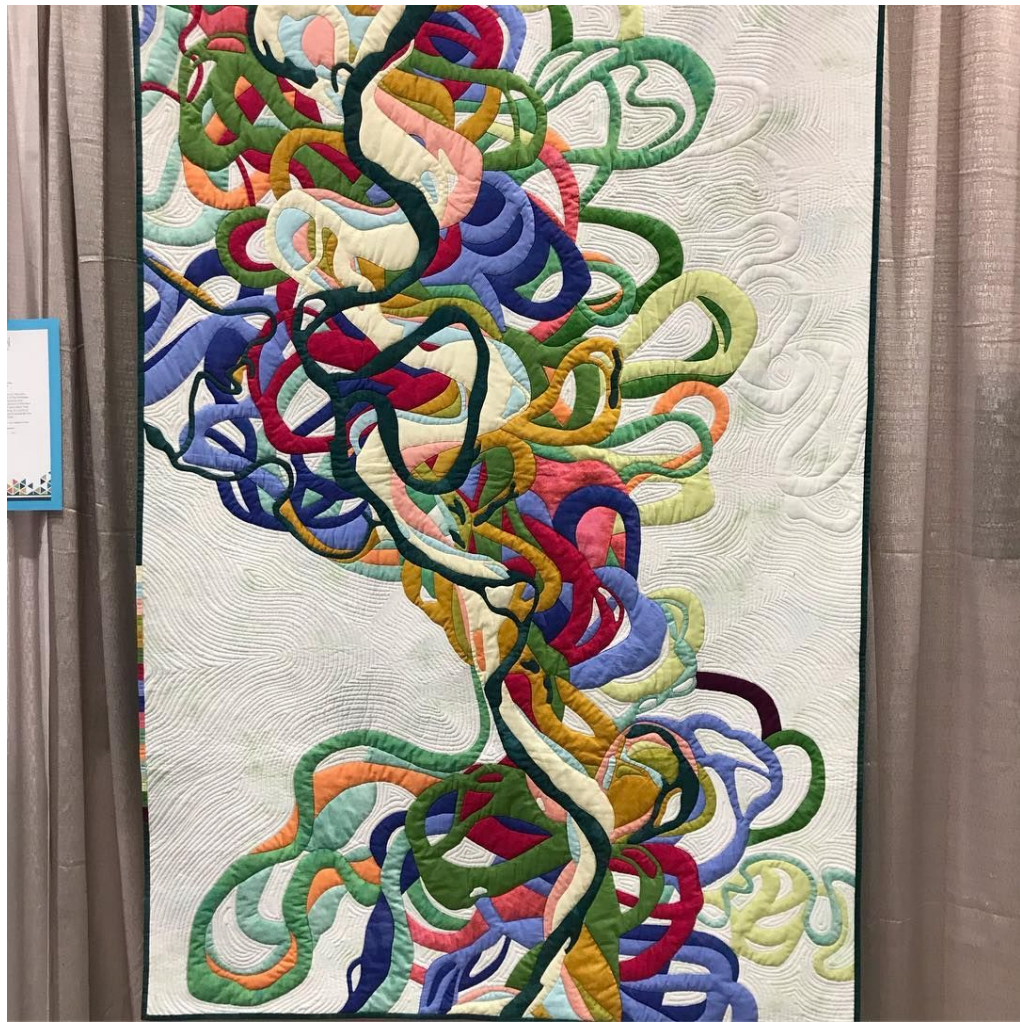
**which is itself
established based
on an intellectual
hierarchy**

now, let's look at some colorful maps









color can politicize



America's **OTHER** 60 Families The **REAL** Rulers Of America

**"Organize, Organize, Organize -- We Must Build
Communism With Non-Communist Hands" -- LENIN**

UNION SQUARE
UNITED STATES

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NEW YORK CITY

ALL DATA USED IN COMPILING THIS
CHART ARE FROM OFFICIAL DOCUMENTS
AND/OR ACCREDITED PUBLICATIONS
OF "AMERICA'S OTHER 60 FAMILIES"

A. Cloyd Gill

[Author, the forthcoming book,
AMERICA'S OTHER 60 FAMILIES]

ALSO AVAILABLE THROUGH
LEAGUE FOR CONSTITUTIONAL GOVERNMENT
18 East Forty-Eighth Street
New York City

Wake Up America-Repel the Grave Diggers of Capitalism!

"America is preeminently on the brink of revolution. It will be a simple matter for us to produce unrest and results in the United States," —*Shall Hoyer, in a statement to his student and wife Hermann Kuehnlen*

—Hull Nerve, in a statement to his parents and wife, Herman Rosenberg

"We hope that the Communist Party will, step by step, conquer the proletarian forces of America and in the not distant future raise the Red flag over the White House."

—Gregory Bessire, President of the Executive

—Gingery Elwood, President of the Executive

"We hope some time the Communists Internationale will be moved from Moscow to New York."

"The Government does not hesitate to conscript the lives of the people. Without giving that our approval, but rather condemning it, we demand that the government conscript the real education, the property of the plebeians, and put these under the control of the workers. "There are also about 100,000 workers in the class of the trades, who have no voice in the Government. Let them organize, unite and train new members, unite in a national union! Those with conscientious and capitalistic inclinations—organize the armed and unarmed defense of the workers, for the workers and by the workers."

—Program of the Workers (Communist) Party
of the United States, April 20th, 1961.

"The influence of the Communist Party in America will increase tremendously as a result of the break between Russia and China. All of those guerrillas and fellow travelers in America who aided the Communist cause prior to the alliance may be expected to resume their activities in behalf of Moscow.

"America must prepare at the earliest possible moment for an emergency unprecedented in her history. All strikes and sit-downs must cease. Thousands of 50th Anniversary workers in defense industries must be freed without delay. At least 1,000 Communists

—Hon. Martin Dies, Chairman, Special Committee on Un-American Activities, House of Representatives

- 1 the East"
- 2 "Department of the Middle West"
- 3 "Department of the West"

"The West shall be organized in departments, divisions, local units, and branches."

—*Grand Constitution*

[illegible][illegible]

Hill District Headquarters
 Communist Central Headquarters
 Nazi Propaganda Centers
 Communist District Headquarters
 Nazi Unit Headquarters
 Communist Workers' Schools
 Italian Fascist Centers
 Communist Training Camps
 Native Fucled Centers
 Communist Literature Centers
 Nazi Dispersed
 Communist Section Headquarters
 Road Camps
 Communist District Boundaries

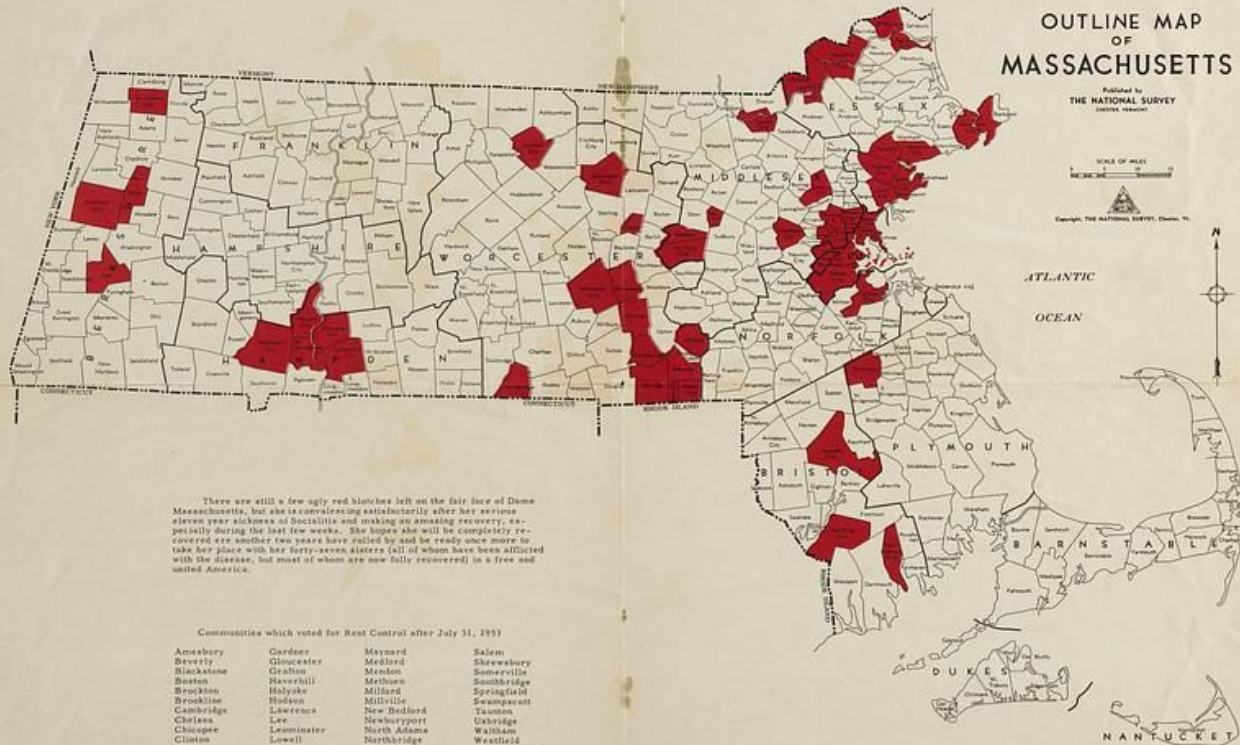
OUTLINE MAP OF MASSACHUSETTS

Published by
THE NATIONAL SURVEY
GEORGETOWN, VIRGINIA

SCALE OF MILES
0 10 20 30 40 50 60 70 80 90 100

Copyright, THE NATIONAL SURVEY, GEORGETOWN, VA.

ATLANTIC
OCEAN



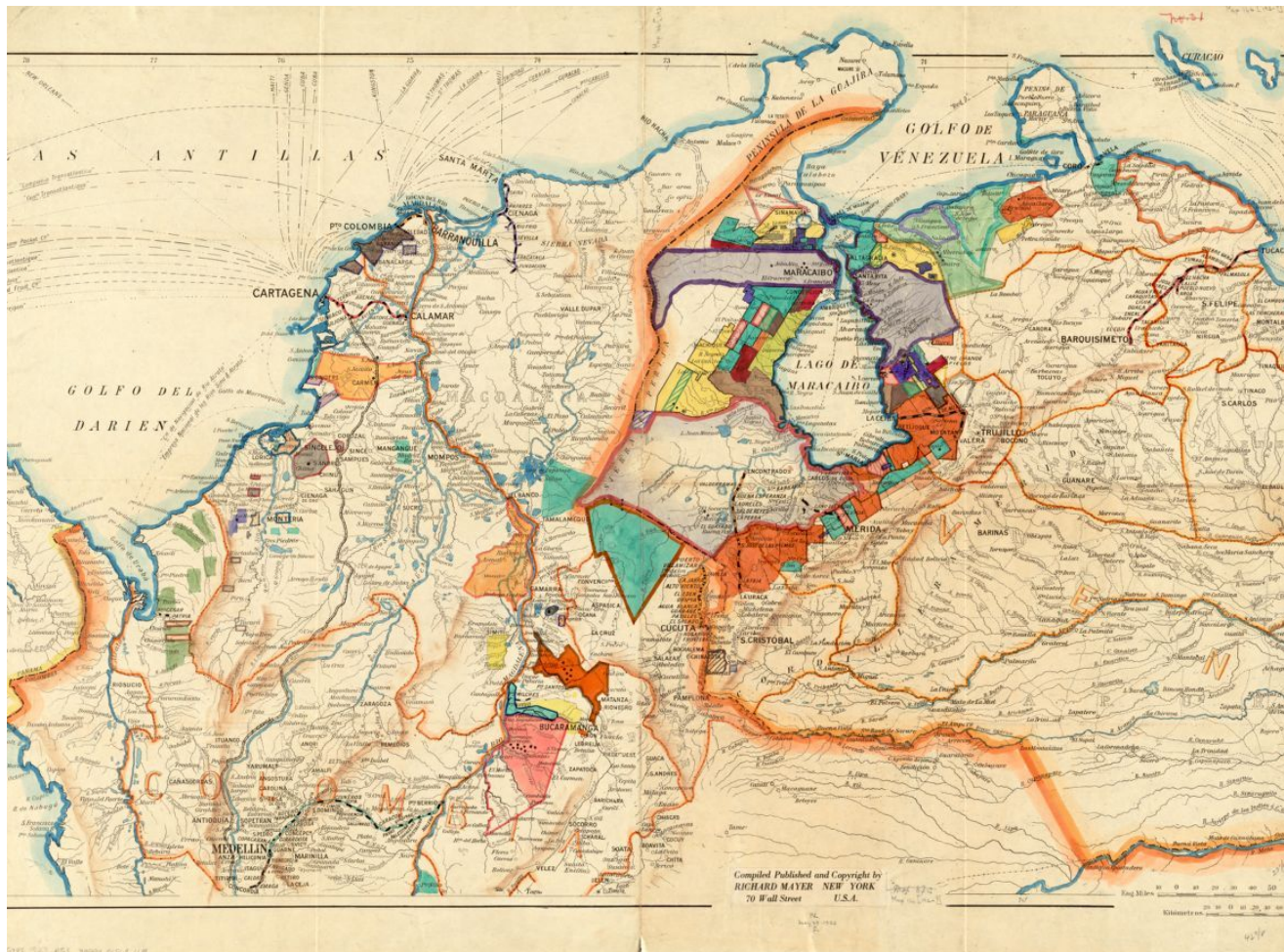
There are still a few ugly red blotches left on the fair face of Dome Massachusetts, but she is convalescing satisfactorily after her serious eleven year sickness of Socialism and making an amazing recovery, especially during the last few weeks. She hopes she will be completely recovered ere another two years have rolled by and be ready once more to take her place with her forty-seven sisters (all of whom have been afflicted with the disease, but most of whom are now fully recovered) in a free and united America.

Communities which voted for Rent Control after July 31, 1953

Amesbury	Cardor	Maynard	Salem
Beverly	Gloucester	Medford	Shrewsbury
Blackstone	Granton	Mendon	Somerville
Boston	Haverhill	Methuen	Southbridge
Brockton	Holyoke	Milford	Springfield
Brookline	Hudson	Milville	Swampscott
Cambridge	Lawrence	New Bedford	Taunton
Chelsea	Lee	Newburyport	Uxbridge
Chicopee	Leominster	North Adams	Walsham
Clinton	Lowell	Northbridge	Westfield
Danvers	Lynn	Pittsfield	West Springfield
Dorchester	Malden	Quincy	Waltham
Everett	Marlborough	Revere	Worcester
Fall River			

Compiled by
Lester C. Gustin, President
Middlesex Apartment Owners' Assn.

color can claim



大清萬年一統地理全圖

本圖用舊清康熙年所製各省分圖已歷百餘年而地輿變遷甚多故特重加修訂以應時勢之變
今會同各省督撫將山川險阻和利源等項悉心勘測繪成此圖其地輿之變遷
如各省之疆界之變遷如各省之山川之變遷如各省之利源之變遷如各省之險阻之變遷
如各省之交通之變遷如各省之人口之變遷如各省之物產之變遷如各省之風俗之變遷
如各省之政教之變遷如各省之刑罰之變遷如各省之禮儀之變遷如各省之文藝之變遷
如各省之學術之變遷如各省之宗教之變遷如各省之語言之變遷如各省之文字之變遷
如各省之音樂之變遷如各省之舞蹈之變遷如各省之戲劇之變遷如各省之體育之變遷
如各省之衛生之變遷如各省之醫藥之變遷如各省之農工之變遷如各省之商業之變遷
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如各省之衛生之變遷如各省之醫藥之變遷如各省之農工之變遷如各省之商業之變遷



渾天而畫統星象全圖

此圖釋天父名義也日月星辰皆繫出於天安得豁然於心月茲期稽
致其連行希別爰繪其圖以備藝林之輩易於指歸雖先我而為之者
盛行於世朕未見紛譯言所漏畧余艾仰觀宇宙之大奉斤全體而言
亦非敢謂繪圖中申蘇少錯也廣之博雅君子聊以共賞鑑焉可耳
龍飛漸次祀年歲在甲申季冬之月金匱梅溪錢詠書

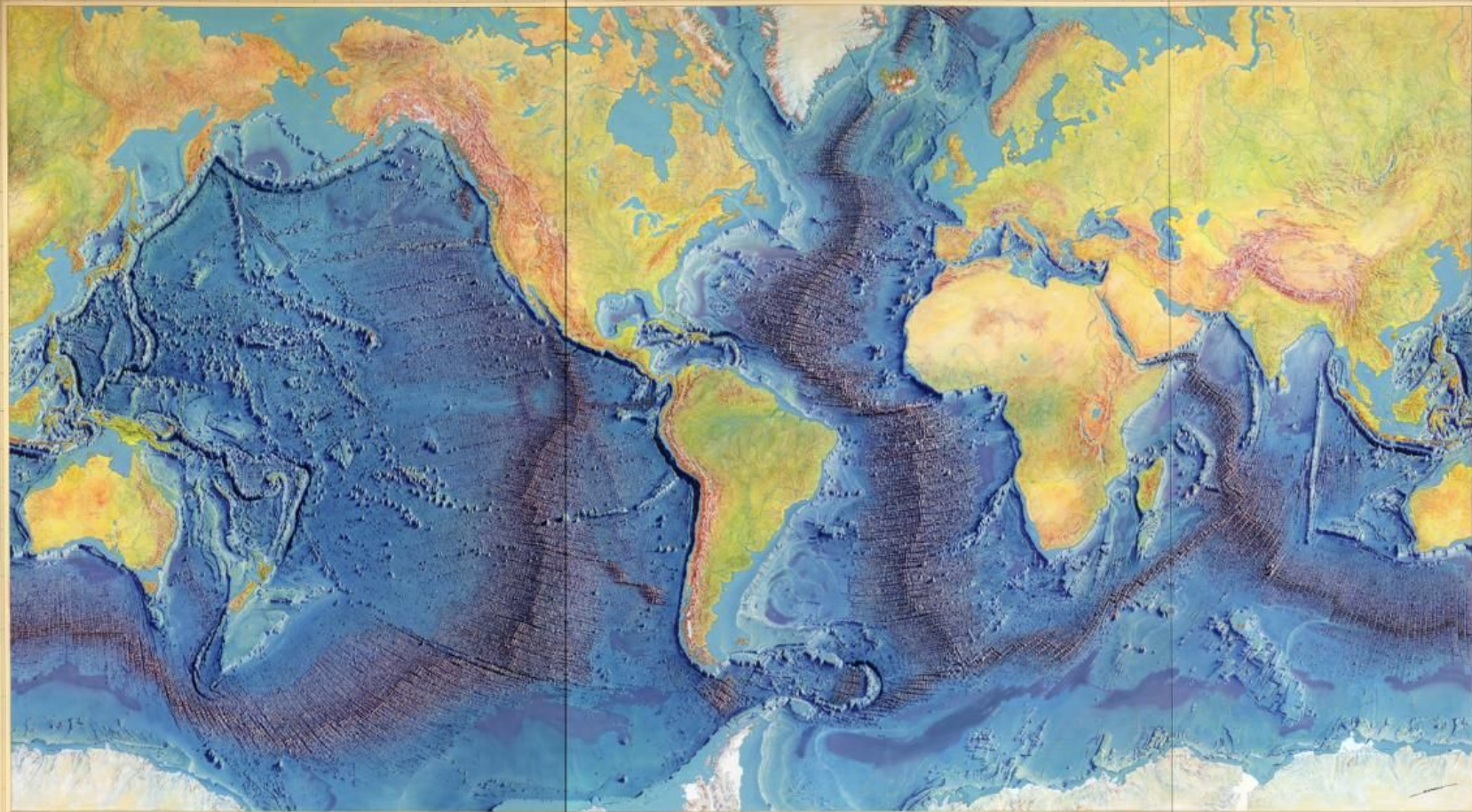
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龍飛漸次祀年歲在甲申季冬之月金匱梅溪錢詠書

color can communicate



Recommended Colors and Patterns for Geologic Maps

[Modified and updated from USGS Publications Division Technical Standards Paper No. 9.03.1, dated September 30, 1971.]

Suggested Colors for Geologic Maps

Table 1. Suggested colors for geologic maps. CMYK values: A = 8%, 1 = 13%, 2 = 20%, 3 = 30%, 4 = 40%, 5 = 50%, 6 = 60%, 7 = 70%, X = 100%.

Geologic age	Basic color	Color combination	Selected color samples
Quaternary Q	Yellow or no color (white)	Tints of yellow (30% and 50% are best to use, except in narrow bands or very small areas) or no color (white).	   
Tertiary T	Orange, yellowish orange, tan, brown	Combinations of yellow and magenta, with proportionally more yellow than magenta.	   
Cretaceous K	Yellow green or olive green	Combinations of yellow and cyan, with proportionally more yellow than cyan; the addition of a small proportion of magenta produces olive greens.	   
Jurassic J	Green	Combinations of yellow and cyan in equal or nearly equal proportions. Note: in theory, this is the correct color for Jurassic; however, in practice it is well to lean toward the conventional "blue greens" when possible.	   
Triassic R	Blue green	Combinations of yellow and cyan, with proportionally more cyan than yellow.	   
Permian P	Blue	Tints of cyan; a small proportion of magenta is often needed to increase contrast.	   
Pennsylvanian P	Blue with red	Combinations of cyan and magenta, with a much higher proportion of cyan than magenta.	   
Mississippian M	Bluish purple	Combinations of cyan and magenta, with the proportion of cyan only slightly higher than magenta.	   
Devonian D	Grayish purple	Combinations of equal or nearly equal proportions of magenta and cyan plus a low proportion of yellow.	   
Silurian S	Reddish purple	Combinations of magenta and cyan, with proportionally more magenta than cyan.	   
Ordovician O	Subdued red	Light tints of magenta or combinations of a high proportion of magenta with low proportions of yellow and cyan.	   
Cambrian C	Reddish brown	Combinations of magenta and yellow in equal or nearly equal proportions plus a low proportion of cyan.	   
Precambrian* pC	Olive brown, olive, gray, olive blue, reddish olive	Combinations of equal or nearly equal proportions of yellow, magenta, and cyan.	   
			   

*Includes Proterozoic and Archean.

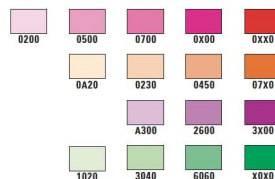
Igneous and Volcanic Colors

The colors used for igneous and volcanic units should contrast strongly with adjoining sedimentary units. Reds are generally preferred; however, any strongly saturated color may be used. Large areas should be in light tints of magenta; small areas should be in the brighter tints. In other words, the smaller the area, the brighter the color.



Related Igneous or Volcanic Units

A total sequence of a color should be used when related groups of igneous or volcanic units are shown on a map. The groups may be related by age, chemical composition, or type of igneous activity. Reds, oranges, and reddish-purples are most commonly used. Blues, greens, and purples are used when a map has several groups of igneous or volcanic units, or when these colors are needed to create contrast.



Dikes and Sills

Narrow dikes and sills that cannot be shown as polygons are shown as solid lines overprinting other geologic units and must be printed in a bright or strong color so they will be seen.



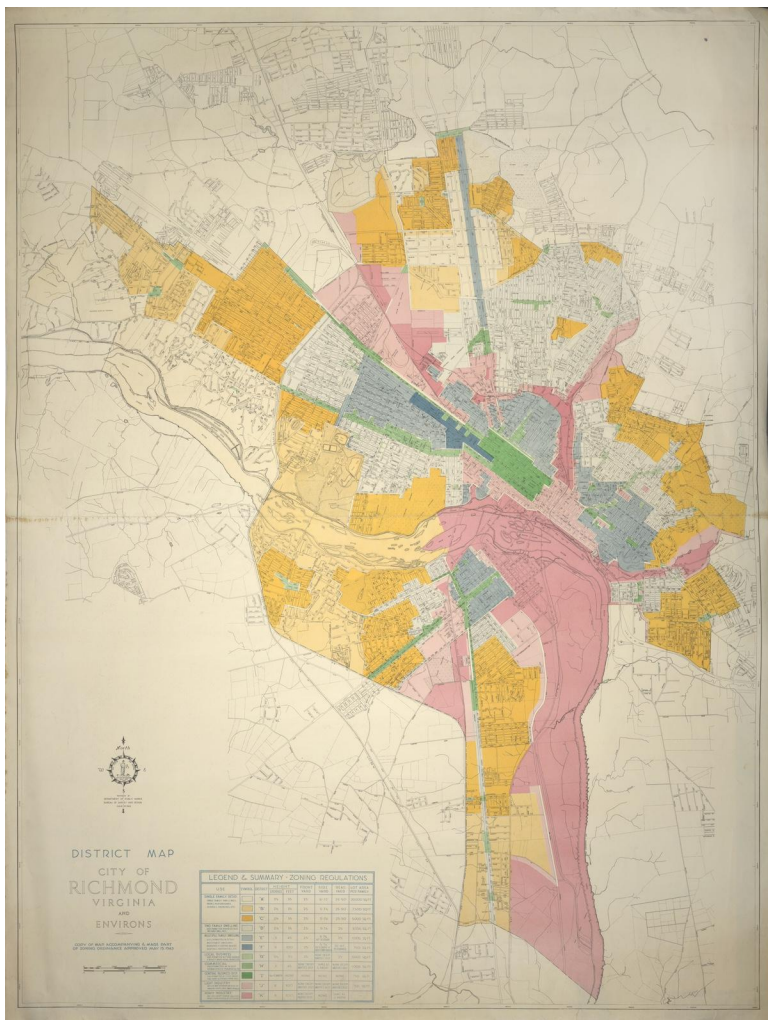
When To Break Color Standards

The age color scheme is most easily applied to geologic maps that do not have many units of any one geologic age. On large geologic maps that have many map units, it is sometimes impossible to maintain the standard geologic age colors. Some of the ways to modify the color selections for complex or otherwise challenging maps are described below.

A common problem is when there are map units of many geologic ages on the map, but one or more ages have too many units. To solve this problem, select colors that maintain the relative order of colors on the geologic age column but move up and (or) down on the column. For example, for a geologic age that has too many units, use the color immediately above the geologic age color for the youngest units, the correct color for the middle units, and the color immediately below the geologic age for the older units.

Even when breaking color standards, it is important to maintain the modified spectral order of the colors so that the map reader is able to identify the relative age of the units by color. In other words, orange areas represent units younger than those that are green, and green areas represent units younger than those that are blue.

Another situation in which color standards need to be broken is when all of the map units are of one geologic age, and there aren't enough different shades of the recommended color to show all of the different map units. An example is USGS map I-2225 (Moore, and Trusdell, 1991), which has about 120 map units, all of Quaternary age. Yellow could not be used to distinguish all 120 map units, so the entire spectrum of colors was used on this map.

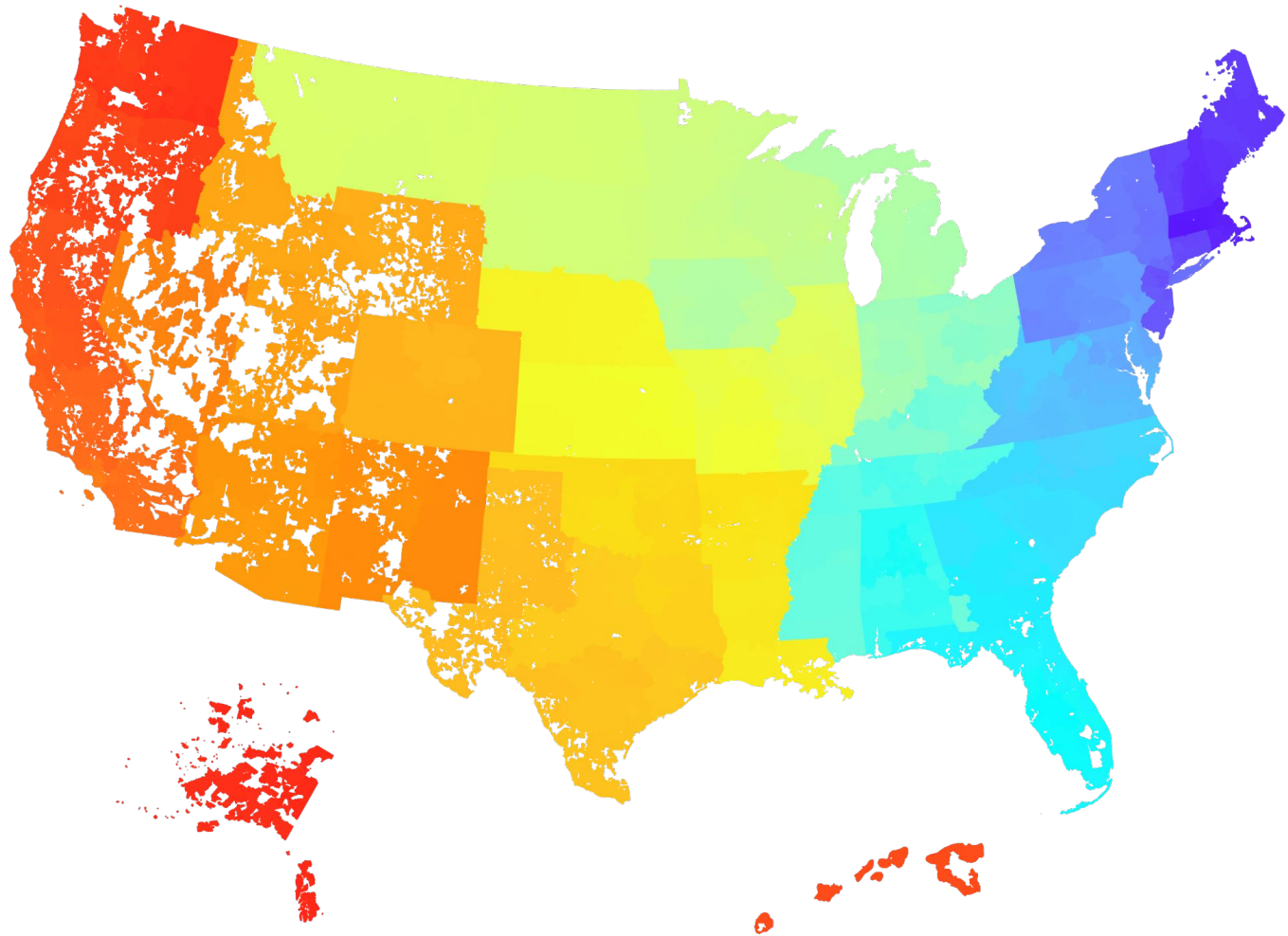


LEGEND & SUMMARY - ZONING REGULATIONS								
USE	SYMBOL	DISTRICT	HEIGHT		FOUNT YARD	SIDE YARD	REAR YARD	LOT AREA PER FAMILY
			STORIES	FEET				
SINGLE FAMILY RESID. SINGLE FAMILY DWELLINGS SMALL PORCHES SMALL SHEDS, ETC.	[Yellow]	"A"	2 1/2	35	15	6-12	25-50	20,000 SQ. FT.
	[Orange]	"B"	2 1/2	35	25	6-15	25-50	15,000 SQ. FT.
	[Light Orange]	"C"	2 1/2	35	25	5-15	25-50	5,000 SQ. FT.
TWO FAMILY DWELLING SINGLE DETACHED HOUSES WITH DETACHED GARAGE, ETC.	[Light Green]	"D"	2 1/2	35	25	6-15	25	8,000 SQ. FT.
MULTIPLE FAMILY DWELLING SINGLE DETACHED HOUSES WITH DETACHED GARAGE, ETC. SINGLE DETACHED HOUSES DETACHED GARAGE, ETC.	[Blue]	"E"	3	45	25	6-25 BY SETBACK	25	10,000 SQ. FT.
	[Dark Blue]	"F"	3	60	25	6-25 BY SETBACK BY SETBACK	25	7,000 SQ. FT.
LOCAL BUSINESS SINGLE DETACHED HOUSES WITH DETACHED GARAGE, ETC. SINGLE DETACHED HOUSES DETACHED GARAGE, ETC.	[Light Green]	"G"	3 1/2	55	25	NONE BY SETBACK	25	10,000 SQ. FT.
COMMERCIAL SINGLE DETACHED HOUSES WITH DETACHED GARAGE, ETC. SINGLE DETACHED HOUSES DETACHED GARAGE, ETC.	[Green]	"H"	3	45	NONE BY SETBACK	15-25 BY SETBACK	NONE BY SETBACK	10,000 SQ. FT.
CENTRAL BUSINESS DIST. SINGLE DETACHED HOUSES WITH DETACHED GARAGE, ETC. SINGLE DETACHED HOUSES DETACHED GARAGE, ETC.	[Dark Green]	"I"	4-10 BY SETBACK	NONE	NONE	NONE	NONE	7,000 SQ. FT.
LIGHT INDUSTRIAL SINGLE DETACHED HOUSES WITH DETACHED GARAGE, ETC. SINGLE DETACHED HOUSES DETACHED GARAGE, ETC.	[Pink]	"J"	4	50	NONE BY SETBACK	NONE BY SETBACK	NONE BY SETBACK	15,000 SQ. FT.
HEAVY INDUSTRIAL SINGLE DETACHED HOUSES WITH DETACHED GARAGE, ETC. SINGLE DETACHED HOUSES DETACHED GARAGE, ETC.	[Red]	"K"	4	60	NONE BY SETBACK	NONE	NONE BY SETBACK	15,000 SQ. FT.

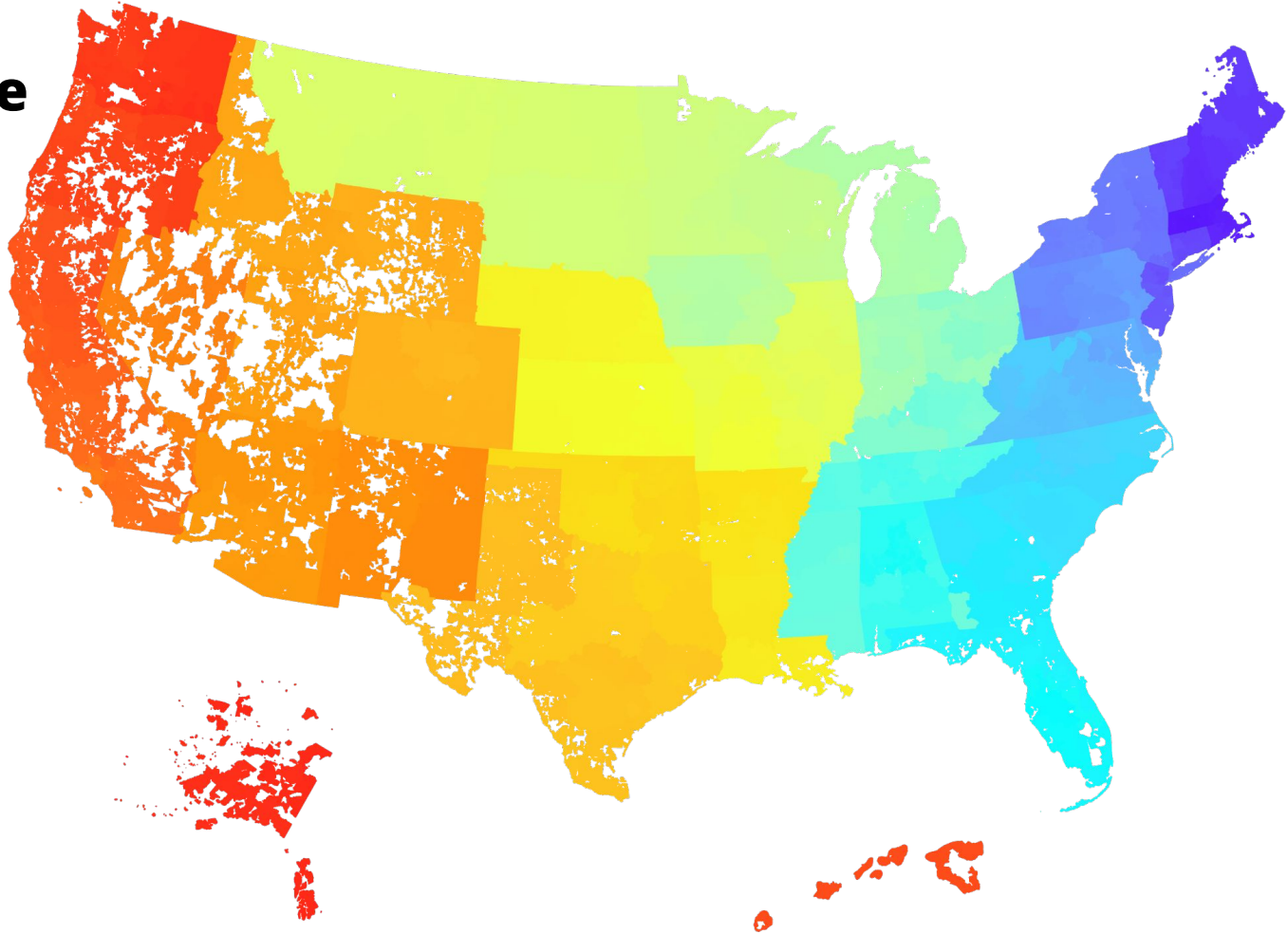
Land-use	Standard Color
Residential	Yellows
<i>Single-Family Residential</i>	Yellows and light Browns
<i>Duplex</i>	Dark Yellow
<i>Multi-family</i>	Dark Brown
Commercial	Reds
<i>Commercial Light Density</i>	Light Red and Orange
<i>Office and Commercial Uses</i>	Red
Mixed Uses	Purple and hatched patterns
Institutional Uses	Blues
Open Space	Green
Transportation	Blacks and Grays
Public and Governmental Lands	Pink
Environmental Areas	Greens and Blues

([adapted from this article](#))

color can clarify



**zip codes
across the
united
states**

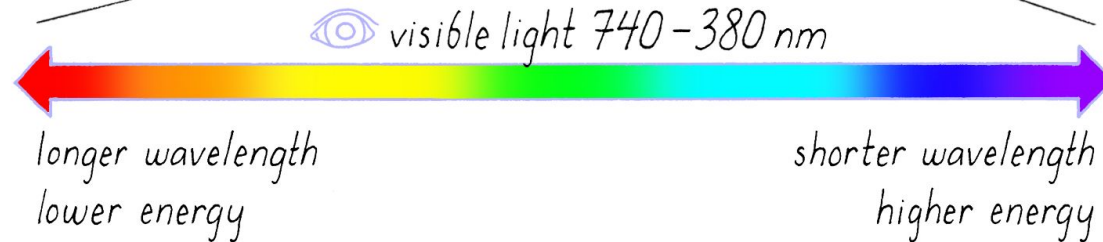
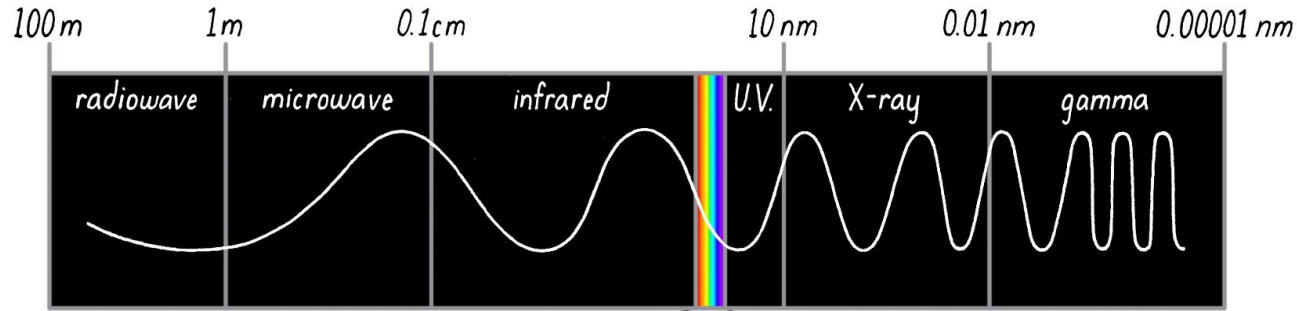


some basic color theory stuff

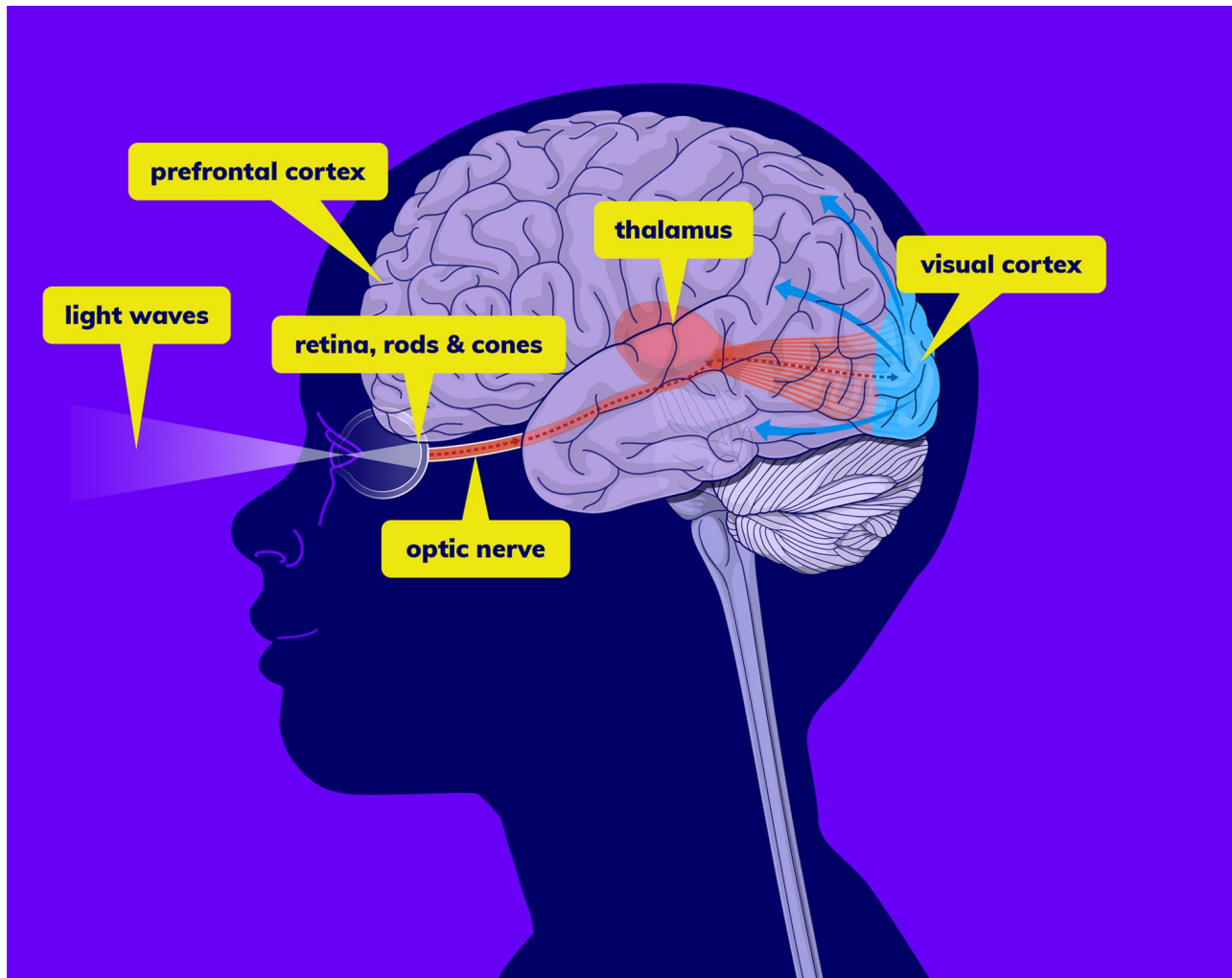
VISUAL SPECTRUM



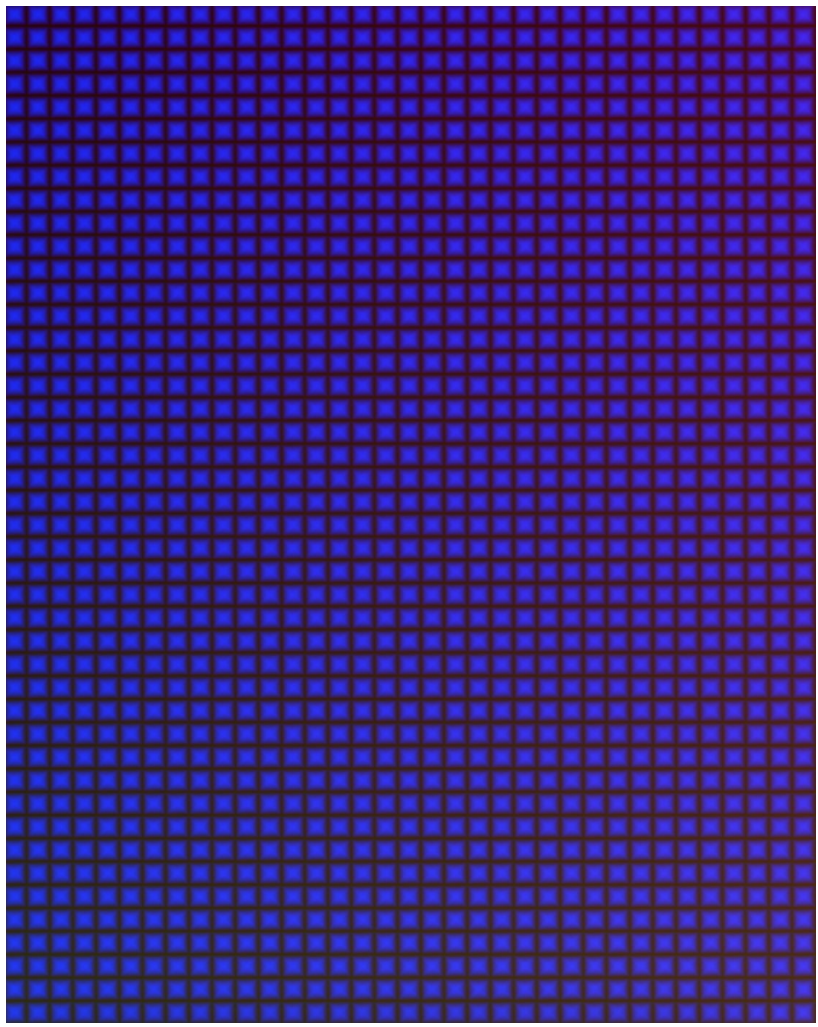
VISUAL SPECTRUM



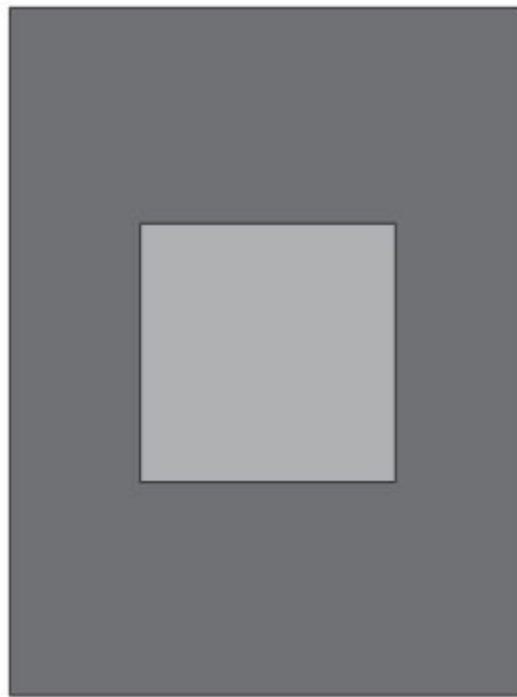
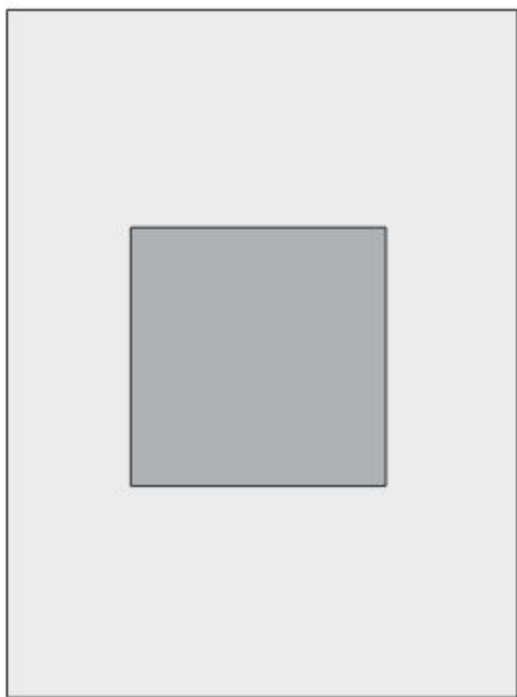
m—meter cm—centimeter nm—nanometers

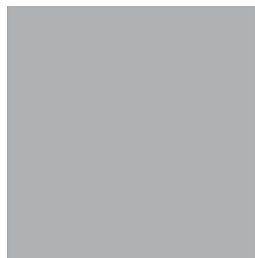
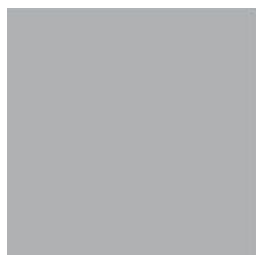


**the human eye can perceive
something like ten million colors**



**but our brains interpret those
colors in puzzling ways**





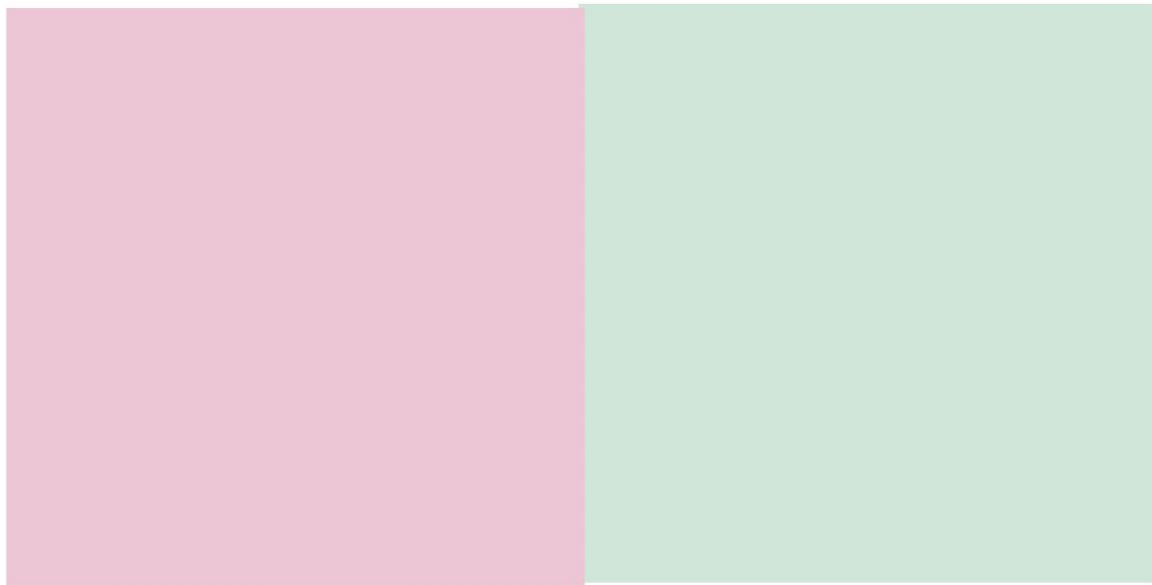
**these dots are the same color,
but the one on the left looks
darker**



the small squares are different colors, but they appear similar

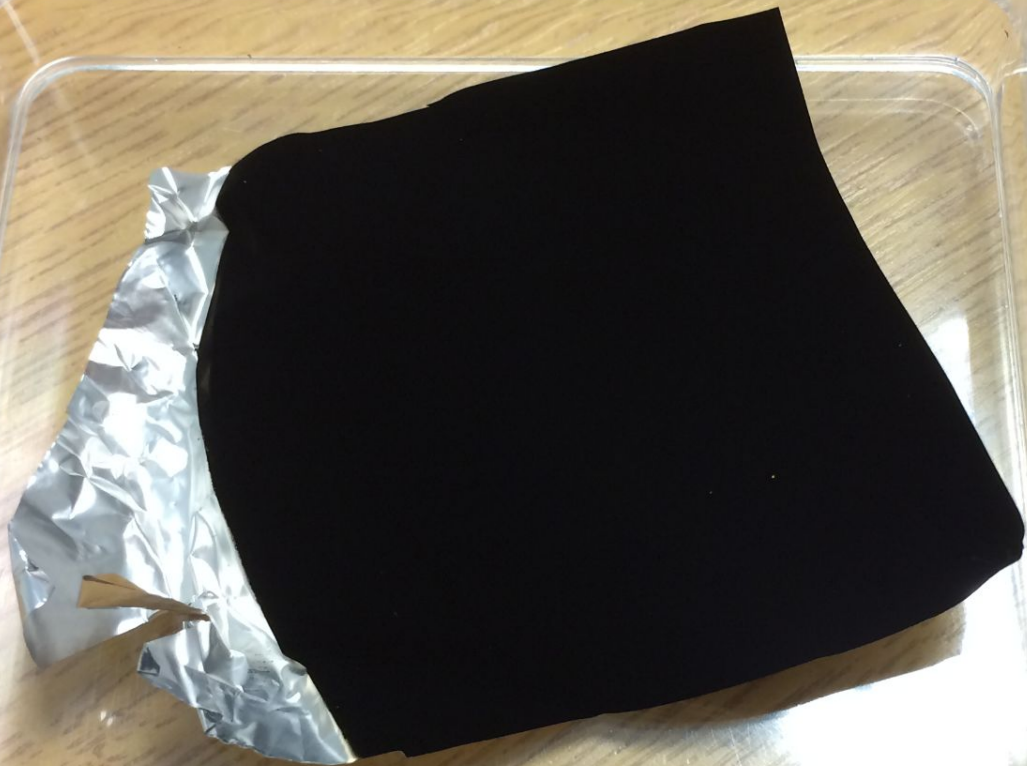


**the small squares are different
colors, but they appear similar**



similar thing here



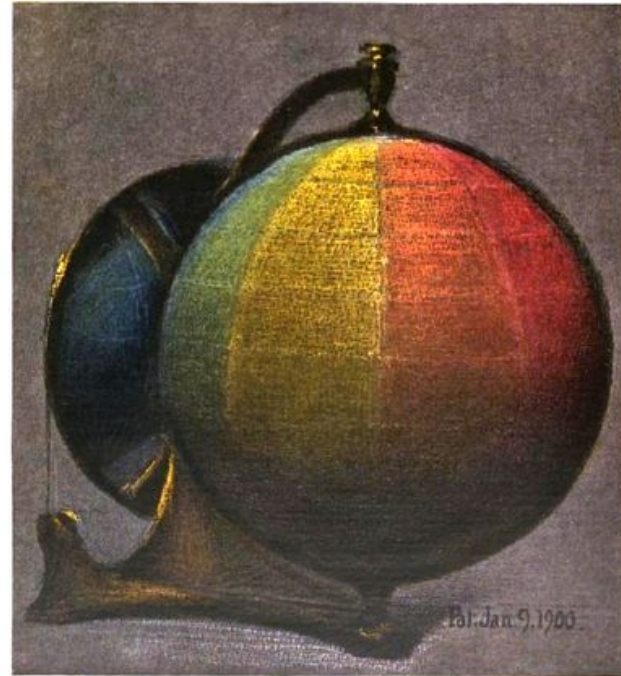


practical cartographic stuff

Munsell's color sphere, c. 1900

munsell's color sphere highlights the three dimensions of color:

- **hue**: basic color (red, green)
- **saturation** (chroma): purity
- **value**: lightness

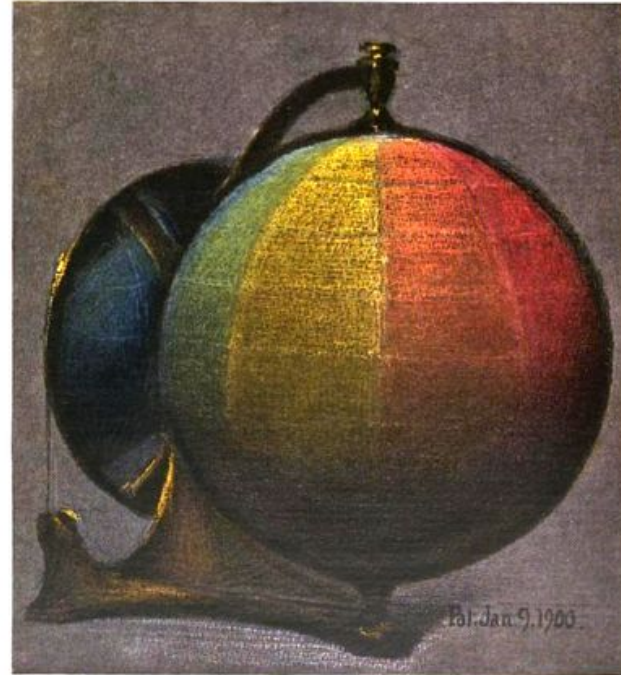


A BALANCED COLOR SPHERE

Munsell's color sphere, c. 1900

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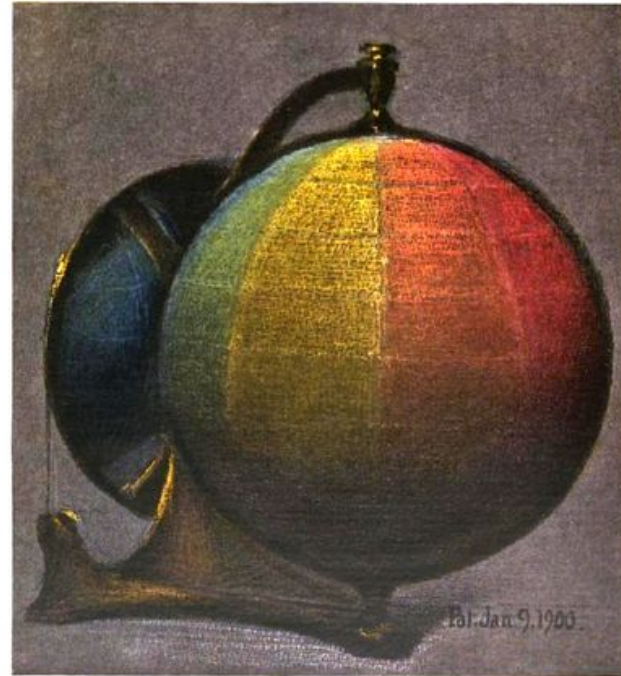
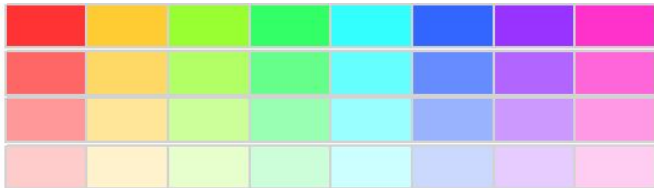


A BALANCED COLOR SPHERE

Munsell's color sphere, c. 1900

munsell's color sphere highlights the three dimensions of color:

- **hue**: basic color (red, green)
- **saturation** (chroma): purity
- **value**: lightness



A BALANCED COLOR SPHERE

qualitative maps show
difference of *type*

quantitative maps show
difference of *magnitude*

Color Editor



Color Mode RGB ▾



Red

0 ▴ ▾



Green

209 ▴ ▾



Blue

214 ▴ ▾

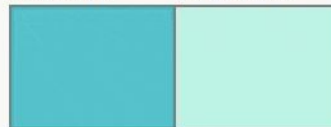


Transparency

0% ▴ ▾

Current

Previous



HEX # 00DBCC

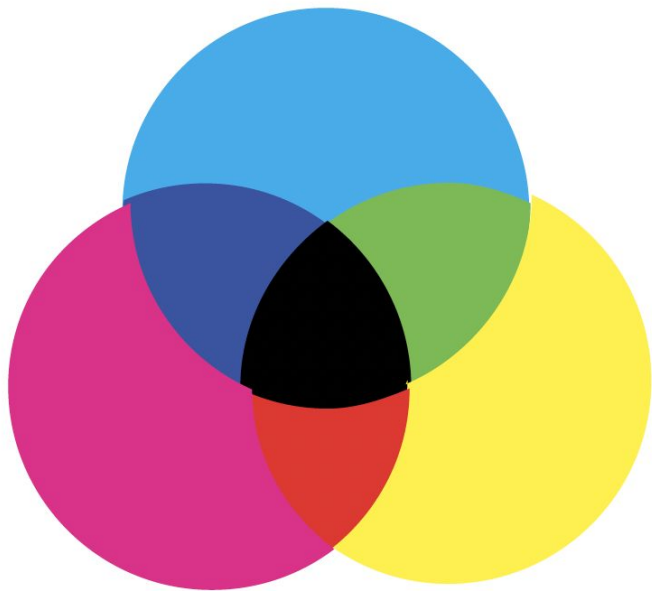
Save color to style...

OK

Cancel

for printing

cyan-magenta-yellow, *subtractive primaries*



for monitors

red-green-blue, *additive primaries*



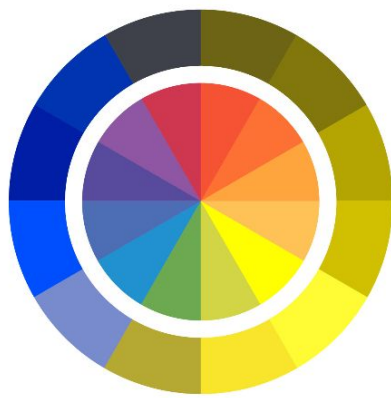
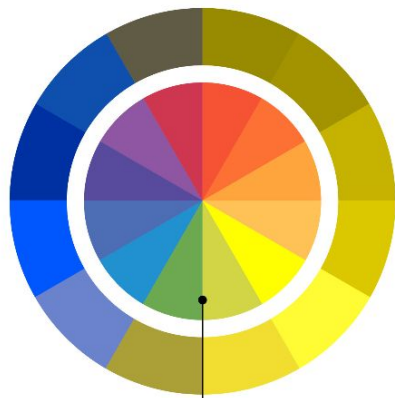
colorblindness

ArcGIS Pro has off-the-shelf support for colorblindness

Red–green colour blindness

Deuteranopia 🟢

Protanopia 🔴



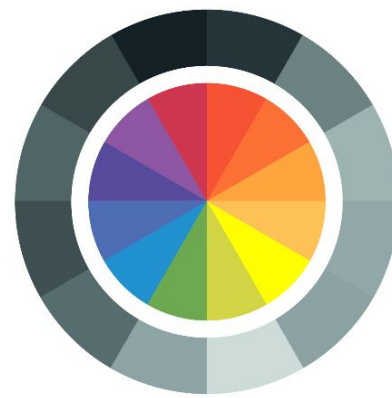
Blue–yellow colour blindness

Tritanopia 🔵



Complete colour blindness

Monochromatism



Normal colour vision

general readability

you want ~70% contrast
between the text/features on
your map and their
background

ArcGIS Pro doesn't have a
built-in contrast-checker, but
[you can do it manually here](#)

TOUGH

BETTER

picking harmonious colors

- **analogous**: next to one another
- **complementary**: 180° opposite
- **triadic**: three colors equally spaced
- **tetradic**: like triadic, but four
- **achromatic**: black & white
- **monochromatic**: single color

Triadic



9D8C62

629D8C

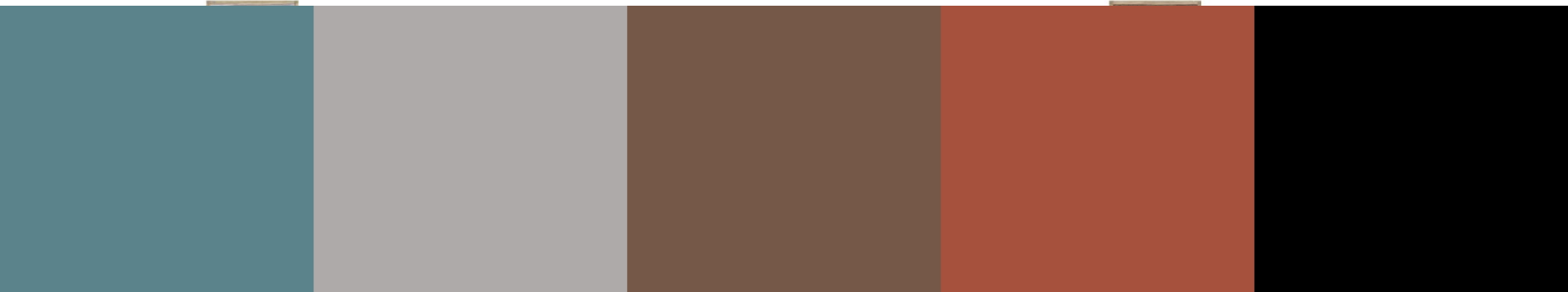
8C629D

good tools for color stuff

- [Paletton](#), [HTML Color Codes](#), [Adobe Color Wheel](#), and [MyColor.space](#) are all great for picking palettes
- [Coolors](#) and [Image Color Summarizer](#) are interesting for color analysis, even generating ramps from input images
- more about Munsell colors [here](#) and [here](#)
- check out this amazing book, *The Art of Color*,
- [free to read on Internet Archive](#)

**lastly, draw color inspiration
from things around you...
art, landscape, life!**

JACOB LAWRENCE THE MIGRATION SERIES



Artwork by Paul Klee



Dance You Monster to My Soft Song!



Runner at the Goal



Night Feast

Artwork by Paul Klee



Dance You Monster to My Soft Song!



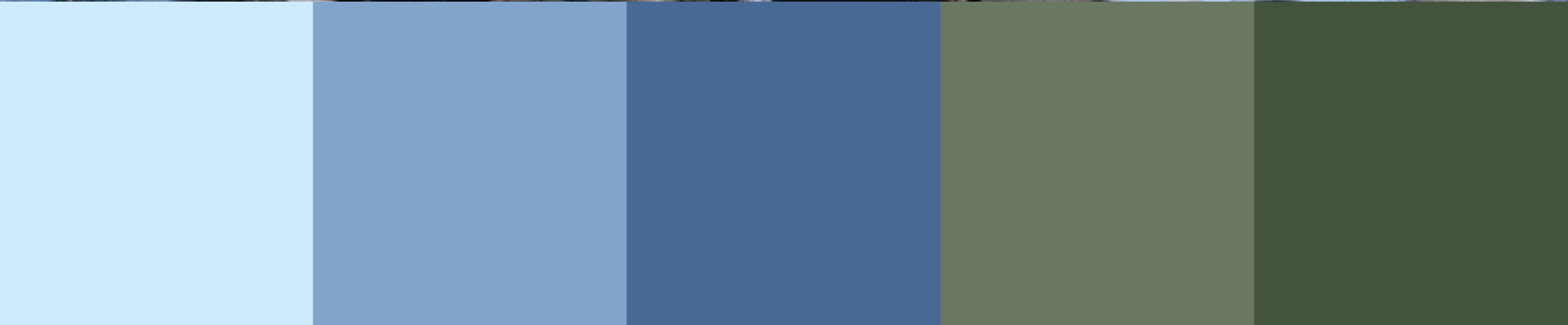
Runner at the Goal



Night Feast







let's actually do this!

step 1: find image

visit a (map) collection in a library, art collection, etc., for instance:

1. [Library of Congress](#)
2. [Boatwright](#)
3. [David Rumsey Map Collection](#) (can search by text on maps or metadata)
4. [American Geographical Society Library](#)
5. [Library of Virginia](#)
6. [Digital Commonwealth](#)

search topics that you are interested in, find something that is visually compelling to you

step 2: reflect

consider (independently), what do you like about how this object is using colors? then, how does this image use color to...

1. clarify and/or simplify?
2. induce an emotion/reaction?
3. aid perceptibility?
4. lead the eye?
5. translate intellectual hierarchy into visual hierarchy?

we'll do this for like 5 mins solo, then share w/ each other