DPH Guidelines for Map Presentation

Preface

Ever wonder: What data classification method to use? Will my map make it possible to identify individuals? Should I use ZIP codes or census tracts? These and other considerations are addressed in this guide. These guidelines apply to both static and interactive online maps.

Mission of Geography: Account for spatial variation in the human and physical environment.
-Meade, Florin, and Gesler

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1. Data Class Breaks

1.1. Range should not exceed the range of data presented.
e.g. If the data range from 44 – 354, then the first data class starts with 44, not 0.

1.2. Data classes should not overlap. Example: 22-45, 45-77 should be 22-45, 46-77.

1.3 Zeros: If the first data class break includes zero, such as 0-369, then consider why zeros are included, and how they should be handled. A histogram can help determine whether zero should be its own class break. The presentation result could be: First Data Class Break=0, and begin the Second Data Class Break with the first non-zero value (e.g. 1st=0, 2nd= 67-369, etc).

1.4. Number of Class Breaks: Cartographers recommend no more than five to seven classes, due to the difficulty in distinguishing between the symbols representing each class (e.g., colors in area symbols on a choropleth map).

2. Projections and Coordinate Systems

Mapping and analysis should be done within a single coordinate system zone. Use a single UTM or SPCS zone, if possible. However, since SPCS and UTM zones split the state of Georgia, the Georgia Statewide Lambert (NAD 1983) or a Georgia Statewide Albers (NAD 1927) are recommended to map the entire state with minimal error.

The parameters of Georgia Statewide Lambert coordinate system are listed below:

Map Projection: Lambert Conformal Conic
Ellipsoid: Geodetic Reference System of 1980 (GRS 80)
Datum: North American Datum of 1983 (NAD 83)
Longitude of Origin: Central Meridian
Latitude of Origin: 0 Degrees
Standard Parallel 1: 31 Degrees, 25 Minutes North (31.46666667)
Standard Parallel 2: 34 Degrees, 17 Minutes North (34.28333333)
Central Meridian: 83 Degrees, 30 Minutes West (- 83.5)
False Easting: None
False Northing: None
Unit of Measurement: Feet

While plotting latitudes and longitudes (XY points) on a map, if coordinate systems and datum of the map do not match the coordinate systems and datum of the points, the points might fall in the wrong census tracts. Also, “unprojected” maps are unsuitable for mapping, particularly when distance measurements are critical.

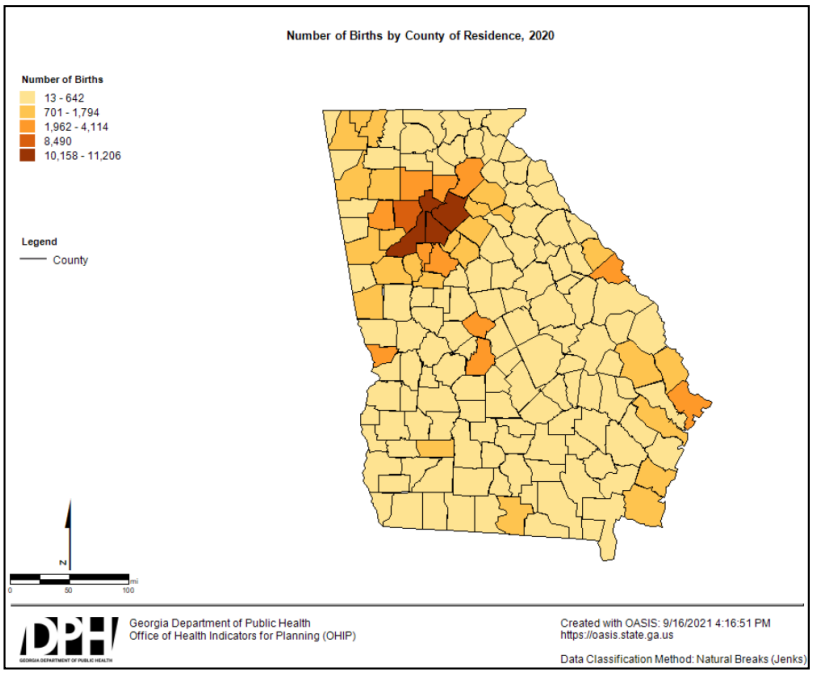
3. Data Classification Methods

Always include the data classification method on your map.

Classification matters because how we group our data into classes is one of the most fundamental aspects of map generalization, and small differences in how we do that **can dramatically change the look of the map, and thus, its message**.

An example of Number of Births mapped via two methods (natural breaks and quintiles) follows. Note that the exact same data are displayed in each map…

The first map uses **Natural Breaks**. Note how it shows Fulton, DeKalb, Gwinnett as the top tier, Cobb 2nd, Muscogee, Bibb, Chatham, Richmond 3rd, and so on.

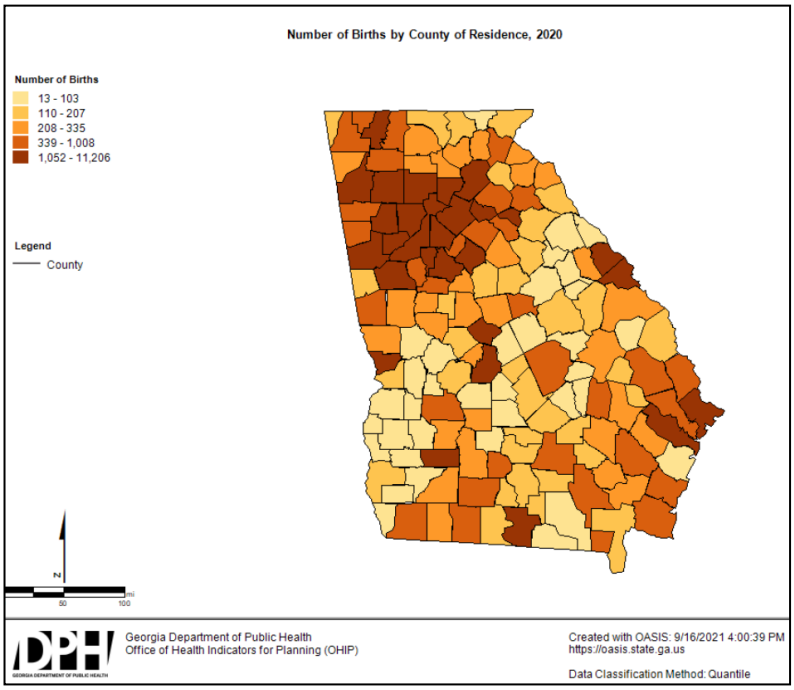


The second map uses **Quintiles**.

Here, the data (counties) are split into groups holding 20% of the counties each. Note the top 3 tiers shown in the first map are all contained in one data class break.

Again, both maps are using the same underlying data.

Neither is "right" or "wrong" in and of themselves. It depends on what you're trying to discover and communicate.



Five Classification Methods:
Quantiles: Each class contains the same number of observations (or geographic units); so with quintiles, one-fifth of the observations are in each group. Quantiles work well when data are normally distributed.
Natural Breaks: Class breaks occur where there are gaps in the distribution (i.e., few or no observations). The data distribution is explicitly considered; this is the major advantage. The major disadvantage is that the concept behind the classification may not be easily understood by all map users, and the legend values for the class breaks (e.g., the data ranges) may not be intuitive. This method maximizes between-class variation, and minimizes within-class variation.

Equal Interval: Divides the data into equal range classes (e.g., 0-10, 10-20, 20-30, etc.) and works best on data that is equally spread across an entire range.
Mean and Standard Deviation: Mean is computed and established as the center of the data distribution. Class intervals are determined by the standard deviation, a measure that indicates the spread of the data around the mean. Works best with a normal distribution.
Manual: Class breaks are set manually. Important if mapping for example eligibility criteria cut points.

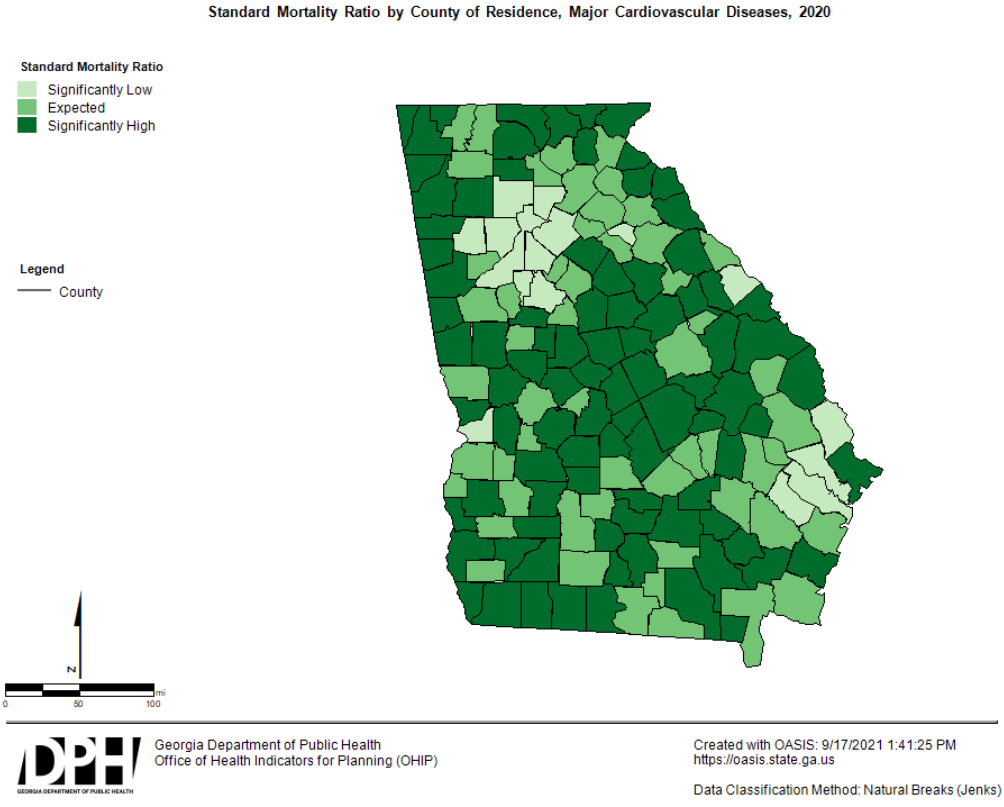
4. Color Palettes / Schemes

The following applies to *ordered* data. Color Palettes/schemes in data class break legends should flow from light to dark (or dark to light), using one of the following sequences:

Consistent gray scale
Single sequence, single-hue scale (similar to consistent gray, except using one color)
Single sequence, multi-hue scale (e.g. light yellow-brown-black, or yellow-orange-red)

Benefits of these *sequential* color schemes include: 1) helping assure colorblind audiences can interpret the map, and 2) retaining readability if printed on a black and white printer or photocopied.

Exceptions may include for example mapping standard deviations from a mean, standardized ratios, or positive and negative growth/decline. In such cases a *diverging* color scheme may be more effective. Nevertheless, a sequential approach may still be better for metrics that involve a "center" or true zero because the *information* displayed is still sequential in nature (low, average, high), and the benefits listed above are retained. Example using statistically significant Standardized Mortality Ratios below:



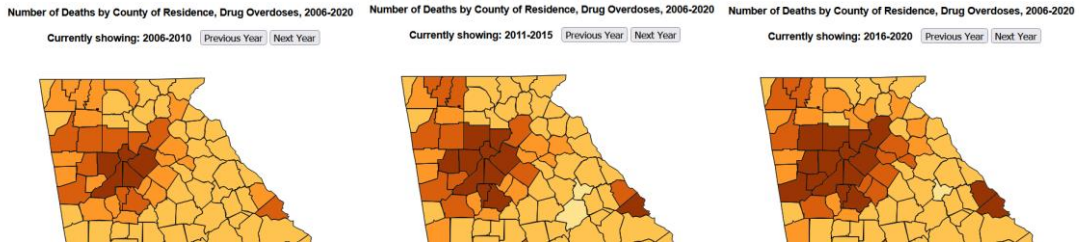
Appendix A contains the set of sequential color schemes used on OASIS developed by OHIP. These are colorblind-safe. A great resource is ColorBrewer, which provides color advice for cartography, including sequential and divergent color schemes that are colorblind safe, print friendly, and photocopy-able.

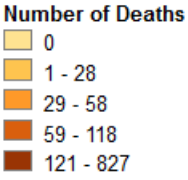
5. Legend

Always display a legend. In addition to the data class breaks, every feature (layer) in a map should be represented in the legend. For an interactive online choropleth map, show its legend prominently; don't hide it behind a "more info" button.

6. Time series/Trend maps

If you want to show a time-series of maps, it's important to pool all years of data you wish to trend, to create one set of data class breaks that apply to all maps in a series. OASIS Mapping Tool (https://oasis.state.ga.us) can do this if the "Show Trendable Map" box is checked. Example:





Each map in the series shares the same data class breaks so comparison over time is possible. If however, each map is created from data limited to only its own time period, the result will be visually non-compatible and potentially misleading. This is because data class-breaks will change from time-period to time-period due to different data ranges and distributions.

7. Mapping by Geographies Smaller than County

There are many sub-county areal units by which one can display data: ZIP codes, census tracts, census blockgroups, blocks, county commission districts, neighborhood planning units, arbitrary square-mile grids, etc. Not all sub-county areal units are created equal, and which to use can depend on the purpose of the map, availability of data, audience, etc. Special attention to a common question follows.

7.1 ZIP Codes vs Census Tracts

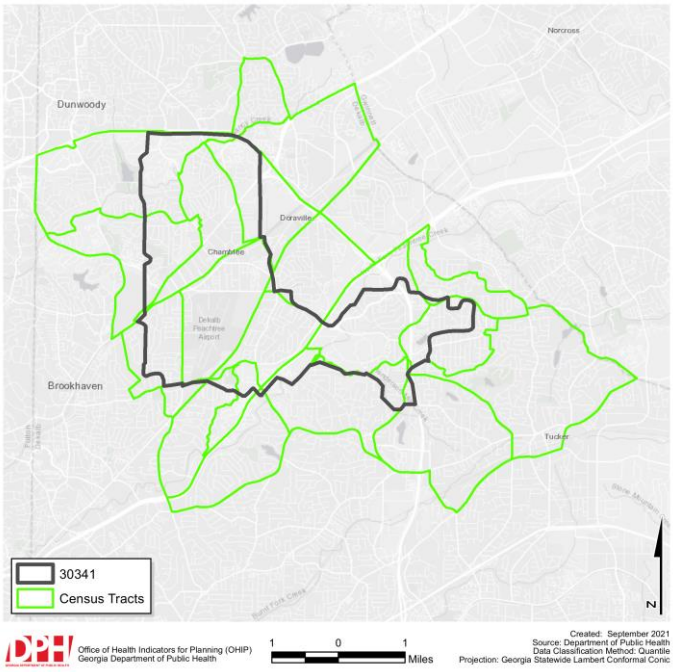
Regarding sub-county mapping, many requests are for data by ZIP code. If one has the choice however, Census Tracts offer important advantages over ZIPs.

Census Tracts: Generally, census tracts have between 2,500 and 8,000 residents and boundaries that follow visible features. When first established, census tracts are designed to be as homogeneous as possible with respect to population characteristics, economic status, and living conditions. Tracts line up with county boundaries and cover all land area. Their spatial size is dependent on density of population settlement.

ZIP Codes: ZIPs are established by the U.S. Postal Service for distribution of mail, and do not account for underlying population characteristics. ZIP codes do not line up with county boundaries, serve a continually changing area, are changed periodically (as often as every 2 years) to meet postal requirements, and do not cover all land area in the U.S. Total population contained within ZIP codes can vary widely (Ranges of 1 to 100,000 are possible).

The main pitfall of using ZIP codes as opposed to tracts is the likely masking of important underlying spatial variation of population and health outcome differences. Here is an example in DeKalb county: ZIP code 30341 includes parts of Dunwoody, downtown and west-of-downtown Chamblee, PDK airport/Buford Highway, and Tucker outside of I-285. This ZIP code comprises four different socio-economic populations that likely have different health outcomes.

ZIP Code 30341 and Census Tracts



In other words, if your purpose is to discover spatial variation reflected in different populations (e.g. health disparities), you are more likely to discover such differences via tracts, whereas in this example such differences are masked if looking at the single ZIP code. Tracts enable health policy and programs to be tailored to meet community-specific need. Lastly, if your community groups are organized by zipcode, then an option is to present the data by tract, and overlay ZIP code boundaries for reference.

7.2 Confidentiality and Sub-county Data

Regarding confidentiality at sub-county geographies, there are no hard and fast rules. As a guide, the following approach with **counts** at the tract level has proven to protect confidentiality: a) offer non-overlapping 5-year aggregate time-periods (non-overlapping 5-year aggregates prevent determining the count for a single year); b) a manual/forced first data class of 0-4; this way audiences don't know if a tract contains only a single case.

But then again, some research suggests Census Tract by itself is enough, with no time-period or low-count modifications. Others go further and state that only when the geographic resolution of data is fine enough to identify fewer than four addresses, the data are no longer tools of research, but tools to potentially target and expose individuals. Census tracts meet the four-address criteria.

A note on Dot Density maps: When plotting the latitude/longitude of actual locations, whether privacy is a concern is a matter of scale (large scale = small area). For example, at the state extent, a true dot distribution is fine. However at large scales, geomasking is an option: randomly shift the location of each point (aka spatial perturbation), or make each dot represent >1 case (e.g. 1 dot = 5 cases) and place randomly within an area, thereby concealing the location of any one case. If used, geomasking methods should be declared on a dot distribution map.

8. Other Map Elements to Consider for Inclusion

- Author.
- Date created.
- Date of the data displayed.
- Data source(s).
- Depending on the map's scale and purpose, a Scale.
- Depending on the map's scale, a North Arrow.
- Depending on the distribution, a Histogram of data presented.
- The N (number of events) for the total geography (e.g. the state).

Prepared by Freymann, G., Roberts, R., Hallisey, E., Smith, C., Tobias, J., Pokharel, S., Grimes, J.

Sources:

Monmonier, M (1996) *How to Lie with Maps (2nd ed.).* University of Chicago Press.

Hallisey, E., Brantley, D., Elmore, K., Holt, J., Lash, R., Murphy, A., Young, R. (2012) *Cartographic Guidelines for Public Health.* Geography and Geospatial Science Working Group, Centers for Disease Control and Prevention.

Axis Maps *Cartography Guide* https://www.axismaps.com/guide/data-classification.

Projection Guidelines: GIS Standards and Guidelines of the Base-Map Technical Working Group for the GIS Advisory Committee of the State of Georgia's Information Technology Policy Council. https://gagiohome-gagio.hub.arcgis.com/#initiatives and https://studylib.net/doc/8136484/georgia-gis-standards-and-guidelines.

U.S. Dept. of Commerce, Bureau of the Census, STF 2 documentation for 1990 Census.

Axis Maps *Should a map be interactive?* https://www.axismaps.com/guide/should-a-map-be-interactive.

Liao, H-H., Laymon, P., Shull, K. (1998). *Automated Process for Accessing Vital Health Information at Census Tract Level* GEOGRAPHIC INFORMATION SYSTEMS IN PUBLIC HEALTH, THIRD NATIONAL CONFERENCE.

Alpert S, Haynes KE. 1994. *Privacy and the intersection of geographical information and intelligent transportation systems*. In: Proceedings of the Conference on Law and Information Policy for Spatial Database. Tempe, AZ: National Center for Geographic Information and Analysis/Center for the Study of Law, Science, and Technology, Arizona State University College of Law. 198–211.

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Appendix A

Through the use of ColorBrewer, and The RGB Color Calculator (http://www.drpeterjones.com/colorcalc/index.html), the Office of Health Information and Policy (OHIP) has developed a standard set of color palette scales (otherwise known as sequential color schemes).

A series of color palette scale value codes are presented for the four most common industry standard color value schemas: Red-Green-Blue (RGB), Hexadecimal (HEX), Cyan-Magenta-Yellow-black (CMYK), and Hue-Saturation-Value (HSV).

For each of these standards we have provided the appropriate color value codes for the creation of five separate scales: 1) a Green Scale; 2) a Yellow-to-Brown Scale; 3) a Brown Scale; 4) a Yellow-to-Green Scale; and 5) a Red Scale. Each of these scales was tested with a colorblind test subject.

The color palette values are presented for each of the five color scales for 5-, 4-, 3-, and 2-Class Breaks.

Red-Green-Blue (RGB).

RGB	FIVE CLASS BREAKS				FOUR CLASS BREAKS				THREE CLASS BREAKS				TWO CLASS BREAKS			
GREEN SCALE		**R**	**G**	**B**		**R**	**G**	**B**		**R**	**G**	**B**		**R**	**G**	**B**
	1st - light (2)	199	233	192	1st - light (2)	199	233	192	1st - light (2)	199	233	192	1st - middle (3)	161	217	155
	2nd -pale (3)	161	217	155	2nd - middle (4)	116	196	118	2nd - middle (4)	116	196	118	2nd - darker (5)	49	163	84
	3rd - middle (4)	116	196	118	3rd - darker (5)	49	163	84	3rd - darkest (6)	0	109	44				
	4th - darker (5)	49	163	84	4th - darkest (6)	0	109	44								
	5th - darkest (6)	0	109	44												
YELLOW/BROWN		**R**	**G**	**B**		**R**	**G**	**B**		**R**	**G**	**B**		**R**	**G**	**B**
	1st - light (2)	254	227	145	1st - light (2)	254	227	145	1st - light (2)	254	227	145	1st - middle (3)	254	196	79
	2nd - pale (3)	254	196	79	2nd - middle (4)	254	153	41	2nd - middle (4)	254	153	41	2nd - darker (5)	217	95	14
	3rd - middle (4)	254	153	41	3rd - darker (5)	217	95	14	3rd - darkest (6)	153	52	4				
	4th - darker (5)	217	95	14	4th - darkest (6)	153	52	4								
	5th - darkest (6)	153	52	4												
BROWN SCALE		**R**	**G**	**B**		**R**	**G**	**B**		**R**	**G**	**B**		**R**	**G**	**B**
	1st - light (2)	253	208	162	1st - light (2)	253	208	162	1st - light (2)	253	208	162	1st - middle (3)	253	174	107
	2nd -pale (3)	253	174	107	2nd - middle (4)	253	141	60	2nd - middle (4)	253	141	60	2nd - darker (5)	230	85	13
	3rd - middle (4)	253	141	60	3rd - darker (5)	230	85	13	3rd - darkest (6)	166	54	3				
	4th - darker (5)	230	85	13	4th - darkest (6)	166	54	3								
	5th - darkest (6)	166	54	3												
YELLOW/GREEN		**R**	**G**	**B**		**R**	**G**	**B**		**R**	**G**	**B**		**R**	**G**	**B**
	1st - light (2)	217	240	163	1st - light (2)	217	240	163	1st - light (2)	217	240	163	1st - middle (3)	173	221	142
	2nd -pale (3)	173	221	142	2nd - middle (4)	120	198	121	2nd - middle (4)	120	198	121	2nd - darker (5)	49	163	84
	3rd - middle (4)	120	198	121	3rd - darker (5)	49	163	84	3rd - darkest (6)	0	104	55				
	4th - darker (5)	49	163	84	4th - darkest (6)	0	104	55								
	5th - darkest (6)	0	104	55												
RED SCALE		**R**	**G**	**B**		**R**	**G**	**B**		**R**	**G**	**B**		**R**	**G**	**B**
	1st - light (2)	252	187	161	1st - light (2)	252	187	161	1st - light (2)	252	187	161	1st - middle (3)	252	146	114
	2nd -pale (3)	252	146	114	2nd - middle (4)	251	106	74	2nd - middle (4)	251	106	74	2nd - darker (5)	222	45	38
	3rd - middle (4)	251	106	74	3rd - darker (5)	222	45	38	3rd - darkest (6)	165	15	21				
	4th - darker (5)	222	45	38	4th - darkest (6)	165	15	21								
	5th - darkest (6)	165	15	21												

Hexadecimal (HEX).

HEX	FIVE CLASS BREAKS		FOUR CLASS BREAKS		THREE CLASS BREAKS		TWO CLASS BREAKS	
GREEN SCALE		**HEX**		**HEX**		**HEX**		**HEX**
	1st - light (2)	0xc7e9c0	1st - light (2)	0xc7e9c0	1st - light (2)	0xc7e9c0	1st - middle (3)	0xa1d99b
	2nd -pale (3)	0xa1d99b	2nd - middle (4)	0x74c476	2nd - middle (4)	0x74c476	2nd - darker (5)	0x31a354
	3rd - middle (4)	0x74c476	3rd - darker (5)	0x31a354	3rd - darkest (6)	0x6d2c		
	4th - darker (5)	0x31a354	4th - darkest (6)	0x6d2c				
	5th - darkest (6)	0x6d2c						
YELLOW/BROWN		**HEX**		**HEX**		**HEX**		**HEX**
	1st - light (2)	0xfee391	1st - light (2)	0xfee391	1st - light (2)	0xfee391	1st - middle (3)	0xfec44f
	2nd - pale (3)	0xfec44f	2nd - middle (4)	0xfe9929	2nd - middle (4)	0xfe9929	2nd - darker (5)	0xd95f0e
	3rd - middle (4)	0xfe9929	3rd - darker (5)	0xd95f0e	3rd - darkest (6)	0x993404		
	4th - darker (5)	0xd95f0e	4th - darkest (6)	0x993404				
	5th - darkest (6)	0x993404						
BROWN SCALE		**HEX**		**HEX**		**HEX**		**HEX**
	1st - light (2)	0xfdd0a2	1st - light (2)	0xfdd0a2	1st - light (2)	0xfdd0a2	1st - middle (3)	0xfdae6b
	2nd -pale (3)	0xfdae6b	2nd - middle (4)	0xfd8d3c	2nd - middle (4)	0xfd8d3c	2nd - darker (5)	0xe6550d
	3rd - middle(4)	0xfd8d3c	3rd - darker (5)	0xe6550d	3rd - darkest (6)	0xa63603		
	4th - darker (5)	0xe6550d	4th - darkest (6)	0xa63603				
	5th - darkest (6)	0xa63603						
YELLOW/GREEN		**HEX**		**HEX**		**HEX**		**HEX**
	1st - light (2)	0xd9f0a3	1st - light (2)	0xd9f0a3	1st - light (2)	0xd9f0a3	1st - middle (3)	0xaddd8e
	2nd -pale (3)	0xaddd8e	2nd - middle (4)	0x78c679	2nd - middle (4)	0x78c679	2nd - darker (5)	0x31a354
	3rd - middle (4)	0x78c679	3rd - darker (5)	0x31a354	3rd - darkest (6)	0x6837		
	4th - darker (5)	0x31a354	4th - darkest (6)	0x6837				
	5th - darkest (6)	0x6837						
RED SCALE		**HEX**		**HEX**		**HEX**		**HEX**
	1st - light (2)	0xfcbba1	1st - light (2)	0xfcbba1	1st - light (2)	0xfcbba1	1st - middle (3)	0xfc9272
	2nd -pale (3)	0xfc9272	2nd - middle (4)	0xfb6a4a	2nd - middle (4)	0xfb6a4a	2nd - darker (5)	0xde2d26
	3rd - middle (4)	0xfb6a4a	3rd - darker (5)	0xde2d26	3rd - darkest (6)	0xa50f15		
	4th - darker (5)	0xde2d26	4th - darkest (6)	0xa50f15				
	5th - darkest (6)	0xa50f15						

Cyan-Magenta-Yellow-black (CMYK).

CMYK	FIVE CLASS BREAKS					FOUR CLASS BREAKS					THREE CLASS BREAKS					TWO CLASS BREAKS				
GREEN SCALE		**C**	**M**	**Y**	**K**		**C**	**M**	**Y**	**K**		**C**	**M**	**Y**	**K**		**C**	**M**	**Y**	**K**
	1st - light (2)	22	0	22	0	1st - light (2)	22	0	22	0	1st - light (2)	22	0	22	0	1st - middle (3)	37	0	37	0
	2nd -pale (3)	37	0	37	0	2nd - middle (4)	55	0	55	0	2nd - middle (4)	55	0	55	0	2nd - darker (5)	81	0	76	0
	3rd - middle (4)	55	0	55	0	3rd - darker (5)	81	0	76	0	3rd - darkest (6)	100	20	100	0					
	4th - darker (5)	81	0	76	0	4th - darkest (6)	100	20	100	0										
	5th - darkest (6)	100	20	100	0															
YELLOW/BROWN		**C**	**M**	**Y**	**K**		**C**	**M**	**Y**	**K**		**C**	**M**	**Y**	**K**		**C**	**M**	**Y**	**K**
	1st - light (2)	0	11	40	0	1st - light (2)	0	11	40	0	1st - light (2)	0	11	40	0	1st - middle (3)	0	23	65	0
	2nd - pale (3)	0	23	65	0	2nd - middle (4)	0	40	80	0	2nd - middle (4)	0	40	80	0	2nd - darker (5)	15	60	95	0
	3rd - middle (4)	0	40	80	0	3rd - darker (5)	15	60	95	0	3rd - darkest (6)	40	75	100	0					
	4th - darker (5)	15	60	95	0	4th - darkest (6)	40	75	100	0										
	5th - darkest (6)	40	75	100	0															
BROWN SCALE		**C**	**M**	**Y**	**K**		**C**	**M**	**Y**	**K**		**C**	**M**	**Y**	**K**		**C**	**M**	**Y**	**K**
	1st - light (2)	0	19	30	0	1st - light (2)	0	19	30	0	1st - light (2)	0	19	30	0	1st - middle (3)	0	32	50	0
	2nd -pale (3)	0	32	50	0	2nd - middle (4)	0	45	70	0	2nd - middle (4)	0	45	70	0	2nd - darker (5)	10	65	95	0
	3rd - middle (4)	0	45	70	0	3rd - darker (5)	10	65	95	0	3rd - darkest (6)	35	75	100	0					
	4th - darker (5)	10	65	95	0	4th - darkest (6)	35	75	100	0										
	5th - darkest (6)	35	75	100	0															
YELLOW/GREEN		**C**	**M**	**Y**	**K**		**C**	**M**	**Y**	**K**		**C**	**M**	**Y**	**K**		**C**	**M**	**Y**	**K**
	1st - light (2)	15	0	35	0	1st - light (2)	15	0	35	0	1st - light (2)	15	0	35	0	1st - middle (3)	32	0	43	0
	2nd -pale (3)	32	0	43	0	2nd - middle (4)	53	0	53	0	2nd - middle (4)	53	0	53	0	2nd - darker (5)	81	0	76	0
	3rd - middle (4)	53	0	53	0	3rd - darker (5)	81	0	76	0	3rd - darkest (6)	100	25	90	0					
	4th - darker (5)	81	0	76	0	4th - darkest (6)	100	25	90	0										
	5th - darkest (6)	100	25	90	0															
RED SCALE		**C**	**M**	**Y**	**K**		**C**	**M**	**Y**	**K**		**C**	**M**	**Y**	**K**		**C**	**M**	**Y**	**K**
	1st - light (2)	0	27	27	0	1st - light (2)	0	27	27	0	1st - light (2)	0	27	27	0	1st - middle (3)	0	43	43	0
	2nd -pale (3)	0	43	43	0	2nd - middle (4)	0	59	59	0	2nd - middle (4)	0	59	59	0	2nd - darker (5)	12	82	75	0
	3rd - middle (4)	0	59	59	0	3rd - darker (5)	12	82	75	0	3rd - darkest (6)	35	95	85	0					
	4th - darker (5)	12	82	75	0	4th - darkest (6)	35	95	85	0										
	5th - darkest (6)	35	95	85	0															

Hue-Saturation-Value (HSV).

HSV	FIVE CLASS BREAKS				FOUR CLASS BREAKS				THREE CLASS BREAKS				TWO CLASS BREAKS			
GREEN SCALE		**H**	**S**	**V**		**H**	**S**	**V**		**H**	**S**	**V**		**H**	**S**	**V**
	1st - light (2)	78	45	233	1st - light (2)	78	45	233	1st - light (2)	78	45	233	1st - middle (3)	81	73	217
	2nd -pale (3)	81	73	217	2nd - middle (4)	86	104	196	2nd - middle (4)	86	104	196	2nd - darker (5)	98	178	163
	3rd - middle (4)	86	104	196	3rd - darker (5)	98	178	163	3rd - darkest (6)	102	255	109				
	4th - darker (5)	98	178	163	4th - darkest (6)	102	255	109								
	5th - darkest (6)	102	255	109												
YELLOW/BROWN		**H**	**S**	**V**		**H**	**S**	**V**		**H**	**S**	**V**		**H**	**S**	**V**
	1st - light (2)	32	109	254	1st - light (2)	32	109	254	1st - light (2)	32	109	254	1st - middle (3)	28	176	254
	2nd - pale (3)	28	176	254	2nd - middle (4)	22	214	254	2nd - middle (4)	22	214	254	2nd - darker (5)	17	239	217
	3rd - middle (4)	22	214	254	3rd - darker (5)	17	239	217	3rd - darkest (6)	14	248	153				
	4th - darker (5)	17	239	217	4th - darkest (6)	14	248	153								
	5th - darkest (6)	14	248	153												
BROWN SCALE		**H**	**S**	**V**		**H**	**S**	**V**		**H**	**S**	**V**		**H**	**S**	**V**
	1st - light (2)	22	92	253	1st - light (2)	22	92	253	1st - light (2)	22	92	253	1st - middle (3)	20	147	253
	2nd -pale (3)	20	147	253	2nd - middle (4)	18	195	253	2nd - middle (4)	18	195	253	2nd - darker (5)	14	241	230
	3rd - middle (4)	18	195	253	3rd - darker (5)	14	241	230	3rd - darkest (6)	13	250	166				
	4th - darker (5)	14	241	230	4th - darkest (6)	13	250	166								
	5th - darkest (6)	13	250	166												
YELLOW/GREEN		**H**	**S**	**V**		**H**	**S**	**V**		**H**	**S**	**V**		**H**	**S**	**V**
	1st - light (2)	55	82	240	1st - light (2)	55	82	240	1st - light (2)	55	82	240	1st - middle (3)	68	91	221
	2nd -pale (3)	68	91	221	2nd - middle (4)	86	100	198	2nd - middle (4)	86	100	198	2nd - darker (5)	98	178	163
	3rd - middle (4)	86	100	198	3rd - darker (5)	98	178	163	3rd - darkest (6)	108	255	104				
	4th - darker (5)	98	178	163	4th - darkest (6)	108	255	104								
	5th - darkest (6)	108	255	104												
RED SCALE		**H**	**S**	**V**		**H**	**S**	**V**		**H**	**S**	**V**		**H**	**S**	**V**
	1st - light (2)	12	92	252	1st - light (2)	12	92	252	1st - light (2)	12	92	252	1st - middle (3)	10	140	252
	2nd -pale (3)	10	140	252	2nd - middle (4)	8	180	251	2nd - middle (4)	8	180	251	2nd - darker (5)	2	211	222
	3rd - middle (4)	8	180	251	3rd - darker (5)	2	211	222	3rd - darkest (6)	253	232	165				
	4th - darker (5)	2	211	222	4th - darkest (6)	253	232	165								
	5th - darkest (6)	253	232	165												