

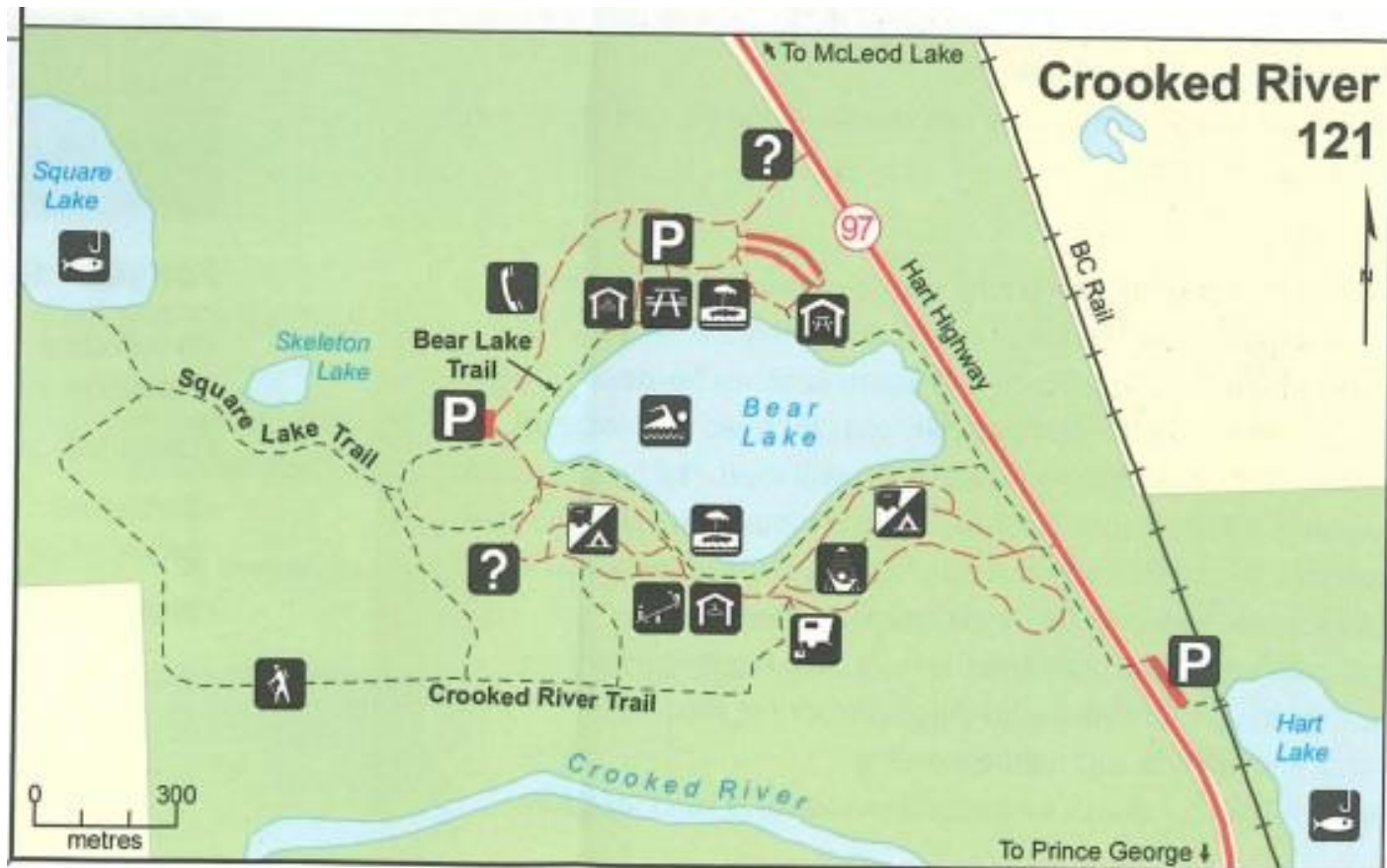
SYMBOLISATION (symbolization)

Generalisation: which / how many features we display..

Symbolisation: how to display them?

General Goal: “easy and effective communication” (without ambiguity)

– based on design principles and common sense as much as rules



Similar principles in traffic signs: Effective easy communication



Symbolisation (shapes)



Road sign in Belorussia

(next to historic church)

Symbols: Visual Design Variables

Shape: the detail or outline of a point symbol

Pattern: regular repetition of shapes

Texture: variation of tones or lines

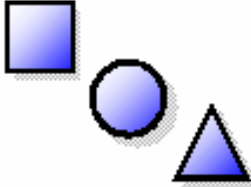

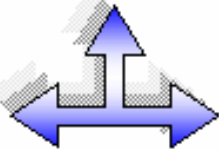
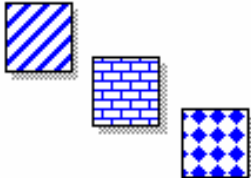
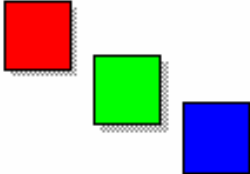
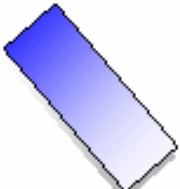
Orientation: direction of symbol element

Size: size of a point, width of a line

Tone: shades of gray (% black)

Colour: hue, chroma and value

Visual Variables

<p>Shape</p> 	<p>Size</p> 	<p>Orientation</p> 
<p>Pattern (texture)</p> 	<p>Hue (colour)</p> 	<p>Hue value</p> 

	Point	Line	Area
Shape			
Pattern			
Texture			
Orientation			
Size			
Tone			
<u>Colour:</u>			
Hue			
Chroma			
Value			

Weak variable

Very weak

Strongest variable

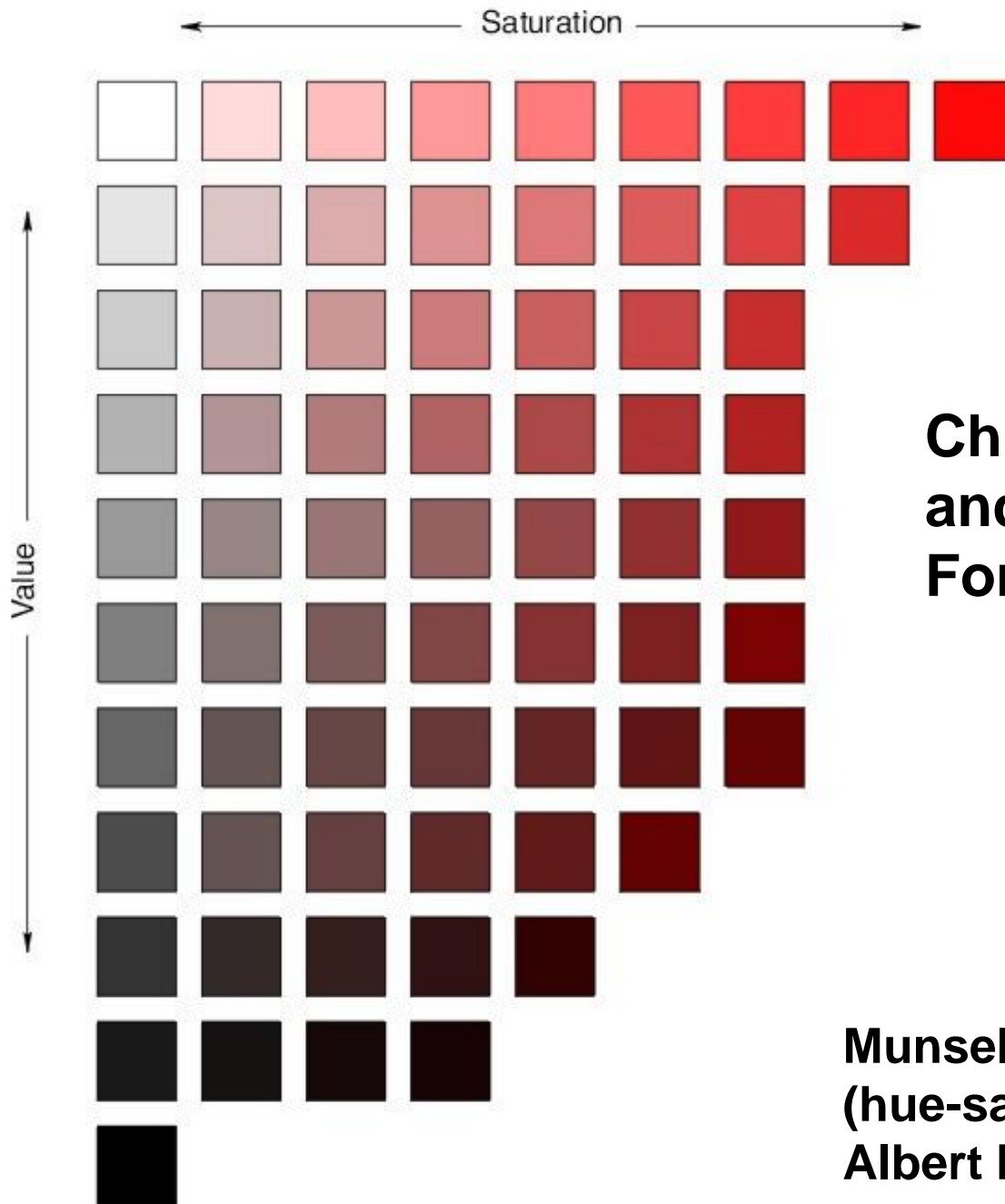
Visual Design Variables

Colour: has three 'dimensions'

hue (wavelength): "the visual sensations from different wavelengths of light " e.g. red, blue

chroma (saturation): saturation = tints,
e.g. pale v solid blue

value (intensity): purity- lightness or darkness = shades,
e.g. blue v blue/black



**Chroma / saturation
and value / intensity
For one hue (red)**

**Munsell soils color chart
(hue-saturation-intensity)
Albert Munsell, 1858 - 1918**

Design criteria: 1. 'Association'

Symbols should be 'associated' with their features, physically or by function

Vegetation



green

Contours



brown (*except on ice ...*)

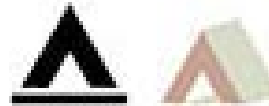
Battlefield



Winter sports



Camping



Railway line



Taking association too far ?



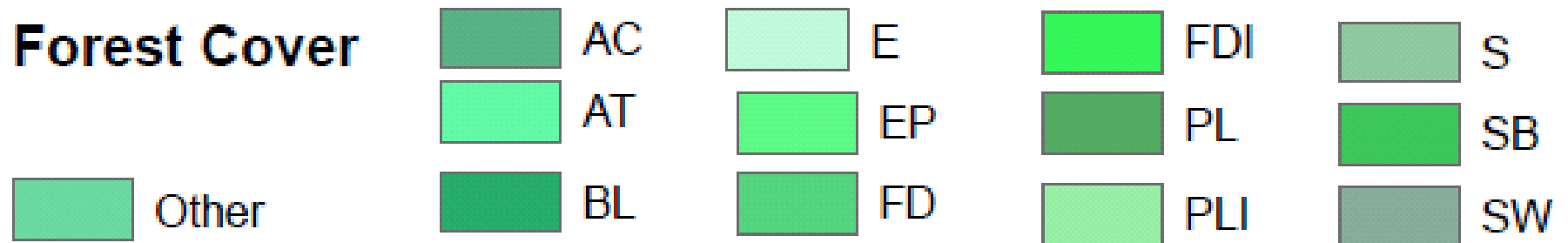
One man's campaign to make football (soccer) signs more realistic :

... missing the point of generalization/symbolisation

Association taken too far - ensure good contrast
Theses are too similar for the human eye

Example: unsuccessful forest classification (primary species)

colours: too many similar tints/shades of the same hue



Point symbols

Are mostly based on Shape
... and also colour

Solid or open ?

Letters are not used much

- can be confused with place names
except:

H Hospital

P Parking

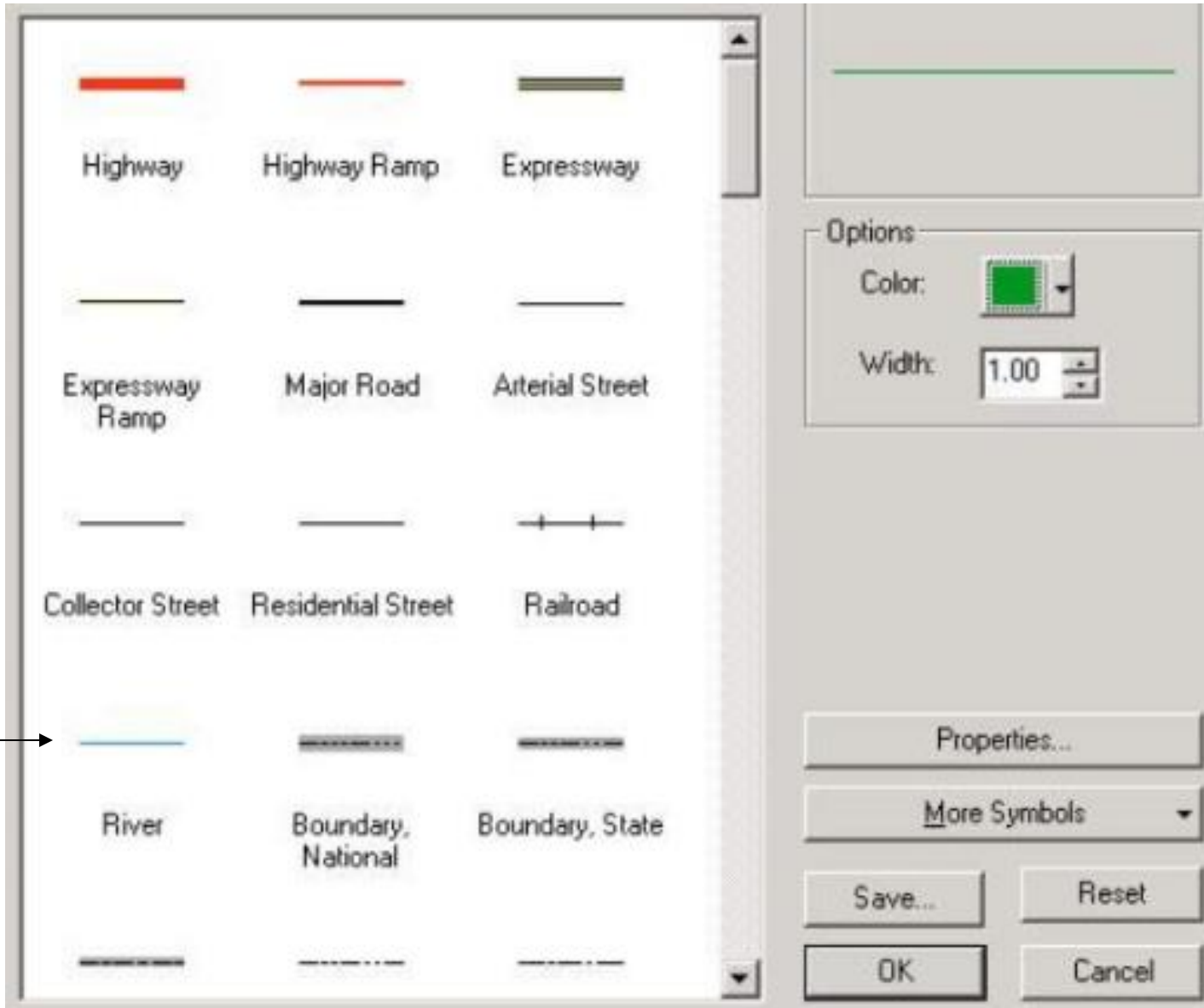
i Information (or I ?)



'Abstract': if space is limited



Lines symbols



Association - Lines

- 'permanent' physical features are shown as solid.

e.g. rivers, roads

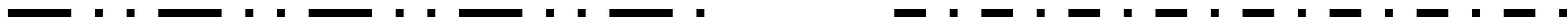


- Less certain features are shown in broken lines.

e.g. intermittent streams, trails



- Administrative boundaries use a dot-dash pattern



Areas / polygons

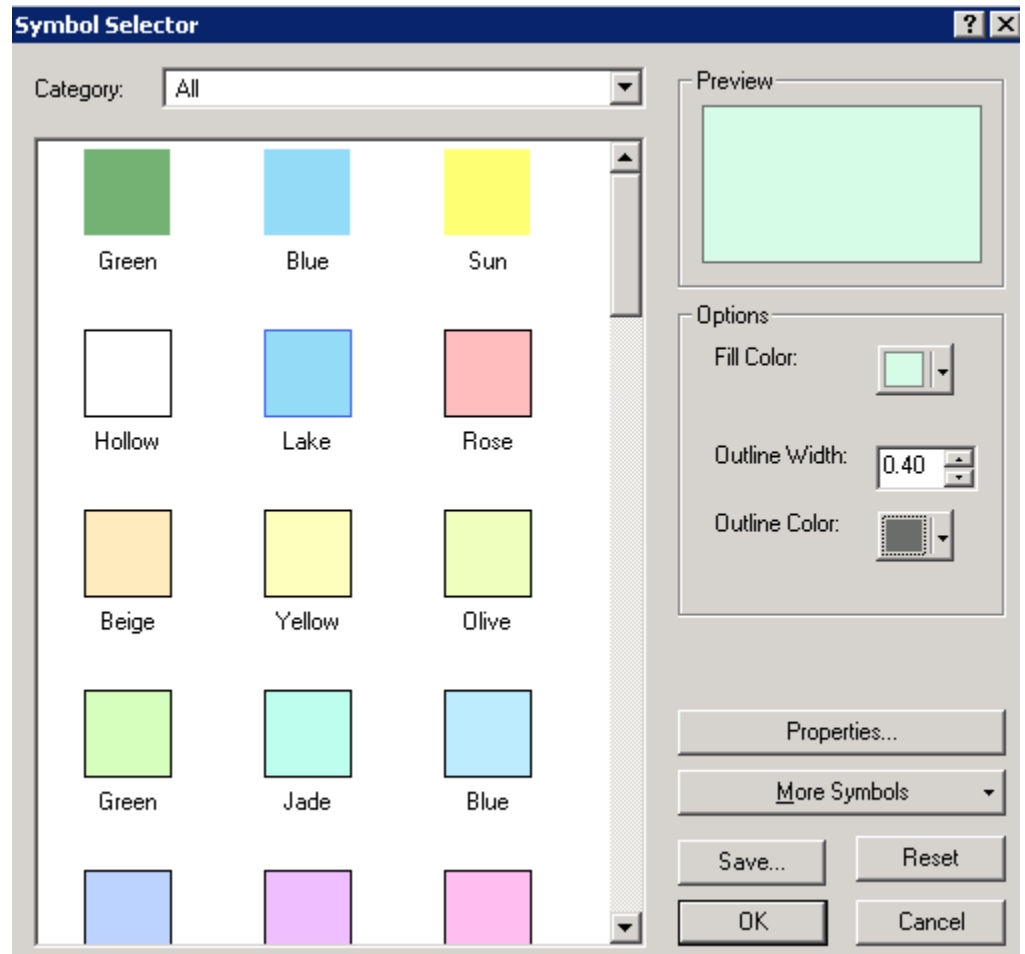
Fill - colour, pattern

Colours should be associative

Avoid really solid colours
(except for small areas)

















































Outline ? - colour, width

No polygon outline for
'uncertain' boundaries



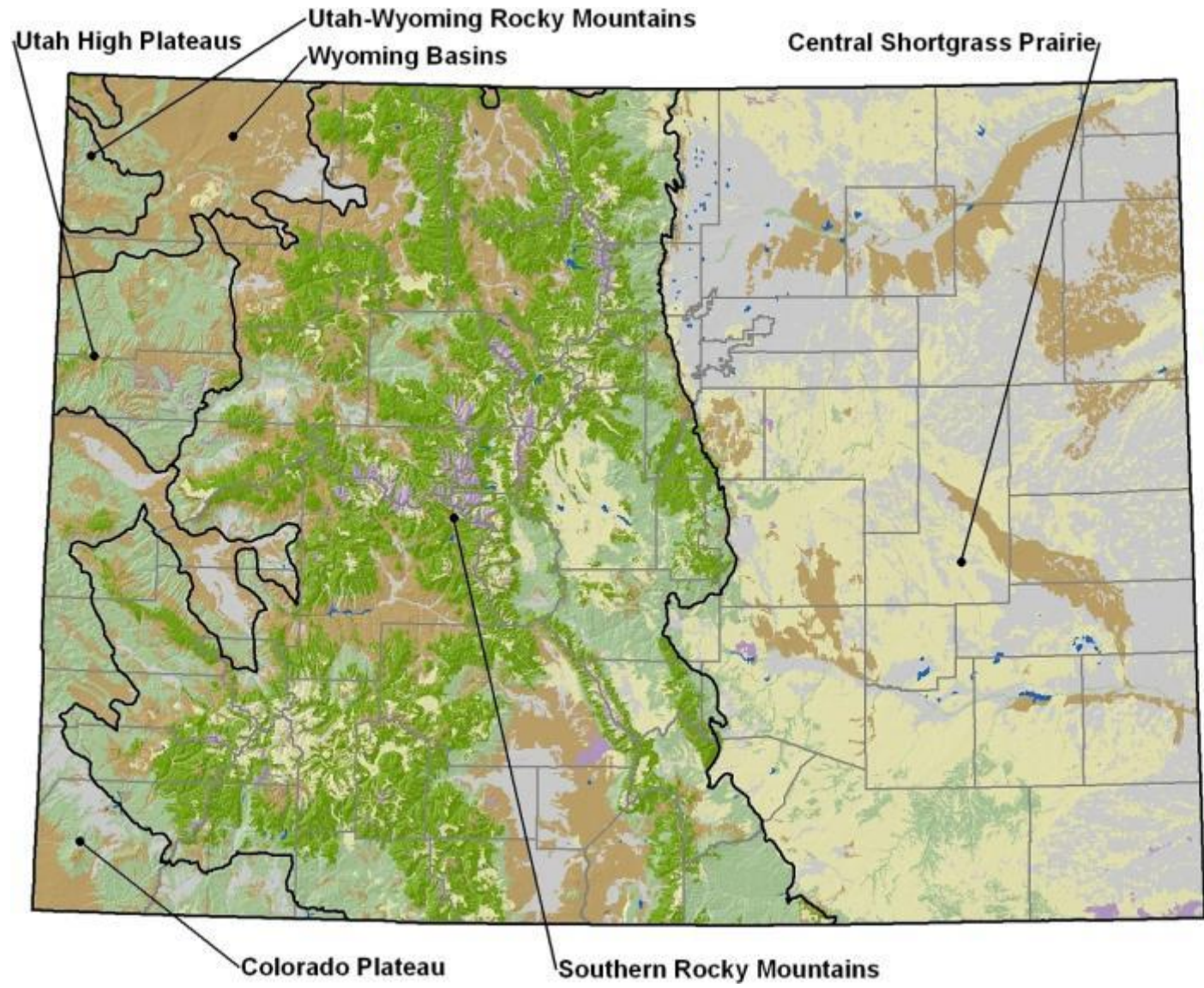
Some OK and ugly Esri polygon patterns – don't copy defaults ...

ESRI

							
Green	Blue	Sun	Hollow	Lake	Rose	Beige	Yellow
							
Olive	Green	Jade	Blue	Med Blue	Lilac	Violet	Grey
							
Orange	Coral	Pink	Tan	Lt Orange	Med Green	Med Yellow	100 Year Flood Overlay
							
500 Year Flood Overlay	Potential Flood Overlay	Biohazard Overlay	Chemical Overlay	Radiation Overlay	Poison Overlay	Noise Overlay	Historic Site
							
Cropland	Open Pasture	Orchard or Nursery	Vineyard	Scrub 1	Grassland	Scattered Trees 1	Sand
							
Water Intermittent	Reservoir	Wetlands	Swamp	Mangrove	Glacier	Snowfield/Ice	10% Simple hatch

Mostly avoid

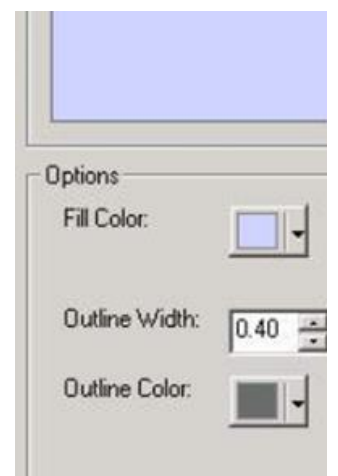
Example 1



- Forest
- Woodland
- Shrubland
- Grassland/Herbaceous
- Sparsely vegetated
- Non-natural
- Open Water

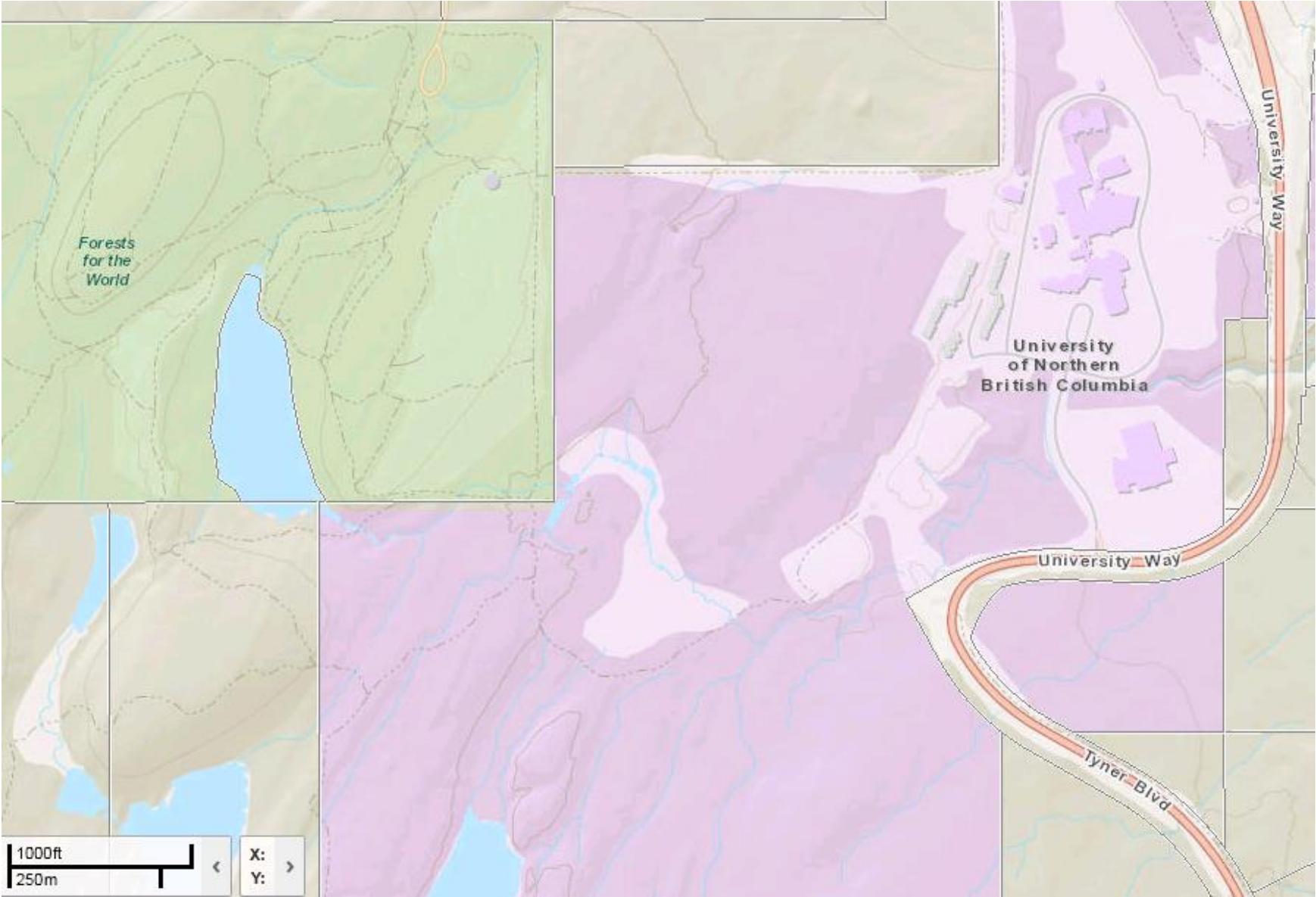
No polygon outlines for vegetation,

outlines only for regions



Use of fill vs outline vs both depends on: significance of area edge, scale
Lakes: outline (+ colour fill)
Forest /vegetation: fill only (no outline)

Example 2: PGMap – use of area transparency – but outline only might be better



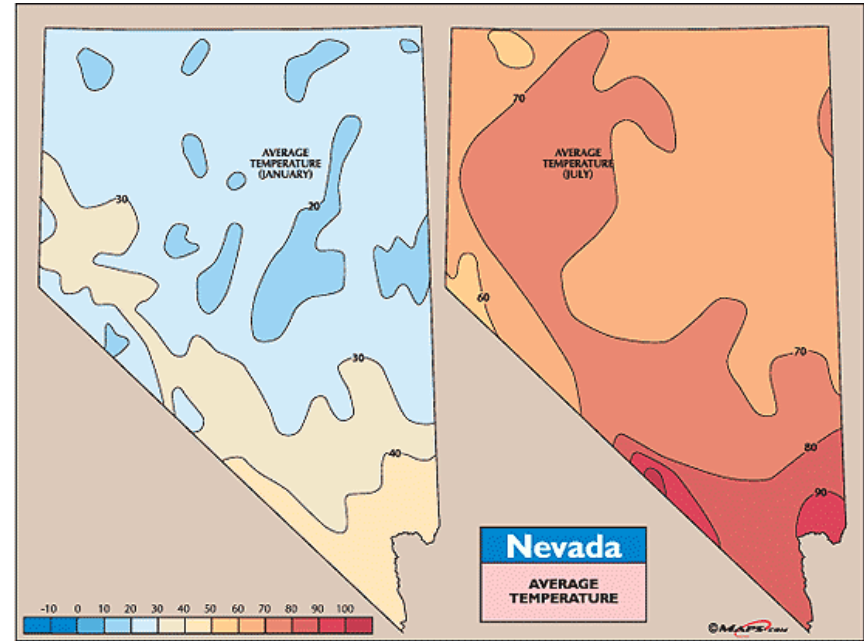
Colour associations: physical and psychological

Yellow - sun, bright (cheery..) ;

Blue - water, calm, cool etc..

Red - heat, danger, blood ?

Green - vegetation, parks, recycling ?



<http://visual.ly/meaning-colour-marketing>



Association
Conventional symbols -
e.g. topographic mapping

Canada NTS conventions

Green - forest vegetation

Red - main roads

Orange - minor roads

Black - buildings

Urban - pink

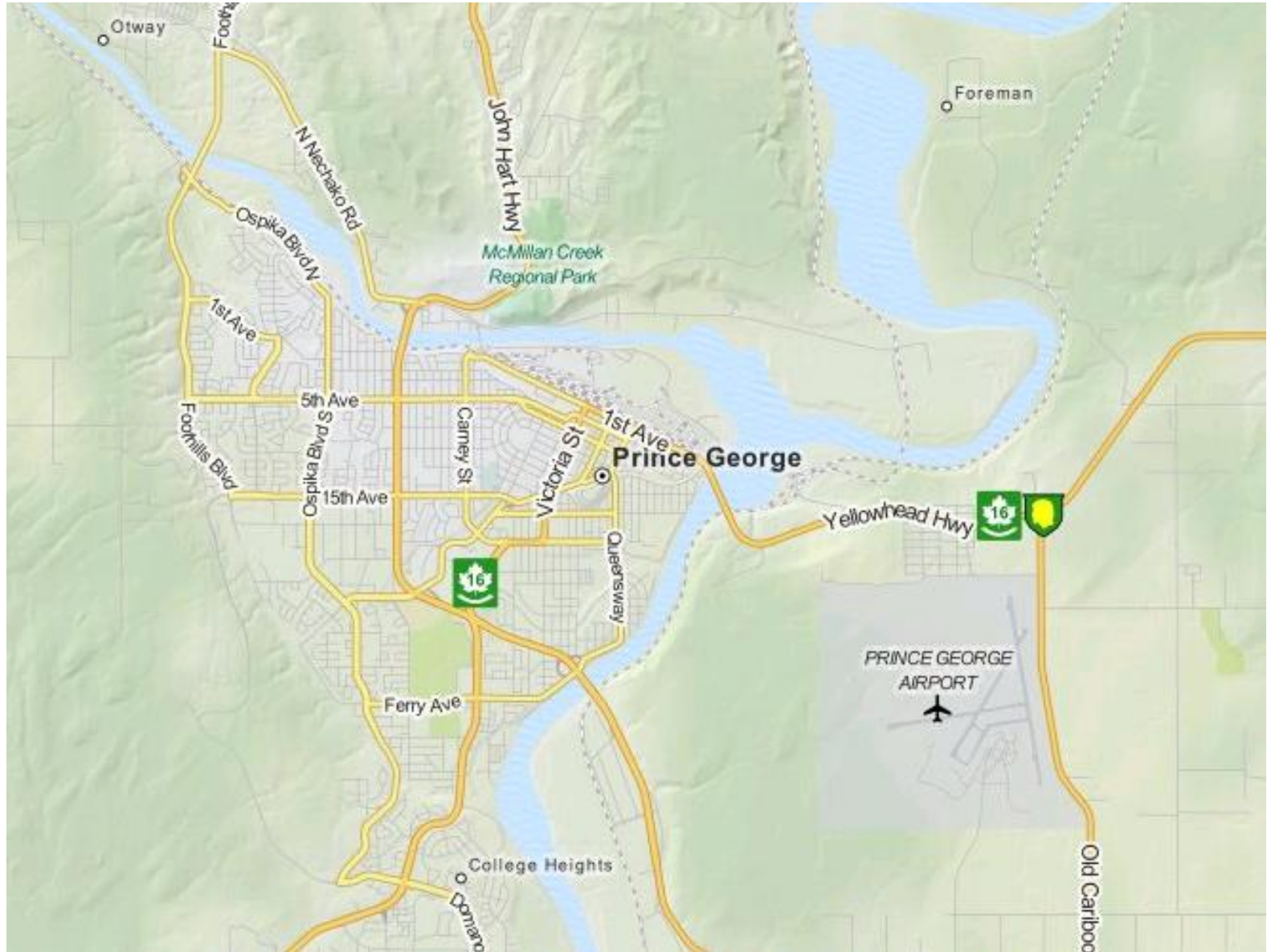


most conventions are based on association e.g. blue for water, while others are less obvious, e.g. pink / orange for urban.



Association - size

larger / more important features e.g. road width



2. Qualitative versus quantitative a type of 'data association'

Qualitative: [nominal / categorical]

HUE *, shape, pattern e.g. soil types, schools versus churches

** see upcoming slides*

Quantitative: [interval / ordinal]

SIZE, tone, chroma, value e.g. population densities, city sizes

ArcGIS - categories v quantities menus

Layer Properties

XCallout Joins & Relates

General Source Selection Display Symbology

Show:

Features

Categories

- Unique values
- Unique values, many to one
- Match to symbols in a layer

Quantities

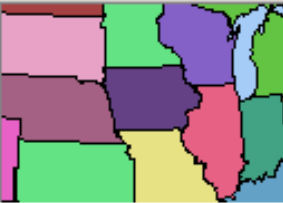
Charts

Multiple Attributes

Draw categories using unique values

Value Field: BRYOID_PCT

- CRUISE_NO
- CRUISE_CD
- INV_REGION
- COMPARTMNT
- COMP_LET
- FIZ_CD
- ATRIE_DATE
- PROJ_DATE
- SHRB_HT
- SHRB_CC
- SHRB_PATT
- HERB_TYPE
- HERB_COVER
- HERB_PCT
- BRYOID_PCT
- NVEG_COV_1
- NVEG_PCT_1
- NVEG_TYP_1



Layer Properties

XCallout Joins & Relates

General Source Selection Display Symbology

Show:

Features

Categories

Quantities

- Graduated colors
- Graduated symbols
- Proportional symbols
- Dot density

Charts

Multiple Attributes

Draw quantities using color to show values.

Fields:

Value: none

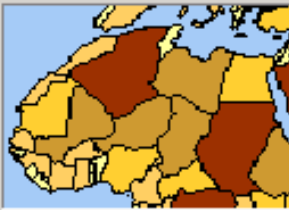
Normalization: none

Color Ramp:

Symbol Range

- FEATURE_ID
- POLY_ID
- FEAT_SKEY
- POLY_AREA
- REF_YR_ID
- CRUISE_NO
- INV_REGION
- COMPARTMNT
- SHRB_HT
- SHRB_CC
- HERB_PCT
- BRYOID_PCT
- NVEG_PCT_1
- NVEG_PCT_2
- NVEG_PCT_3
- COV_PCT_1
- COV_PCT_2

Show class names



Qualitative (nominal/categorical) data



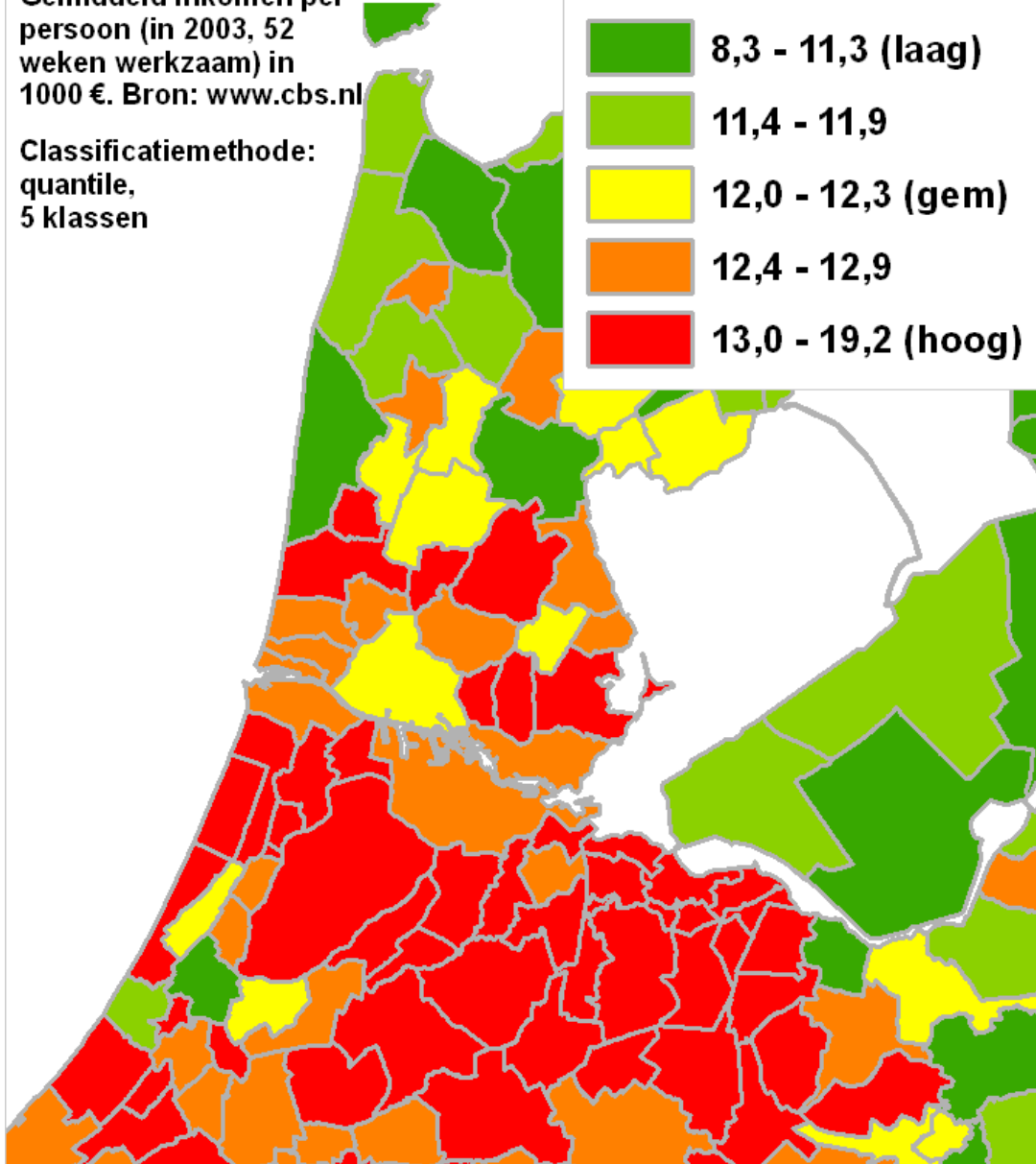
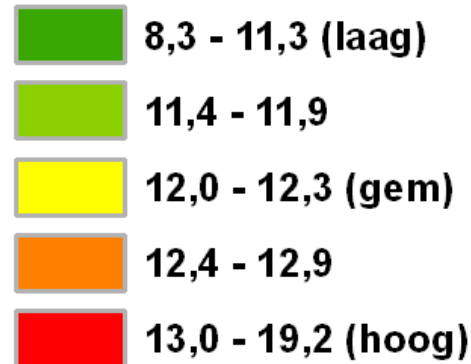
Categorical (nominal) classes



Besteedbaar inkomen per gemeente

Gemiddeld inkomen per
persoon (in 2003, 52
weken werkzaam) in
1000 €. Bron: www.cbs.nl

Classificatiemethode:
quantile,
5 klassen



Colour ramp for
quantitative data

(good example)

Red = highest values

•RED is reserved for importance due to its visual impact
- as it has the longest wavelength and 'advances' (blue retreats)

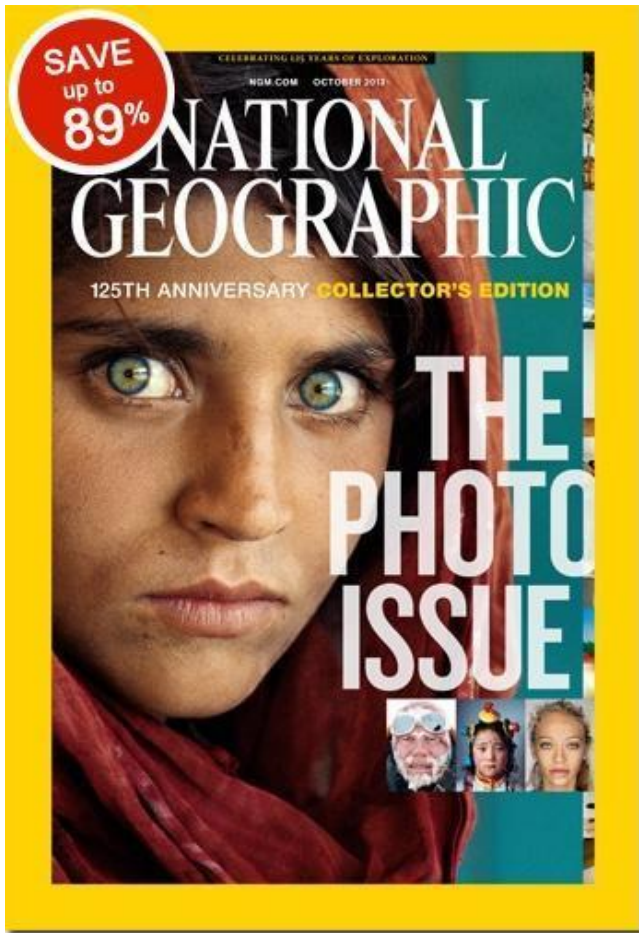
** Red - implies importance: / 'danger' (roads)



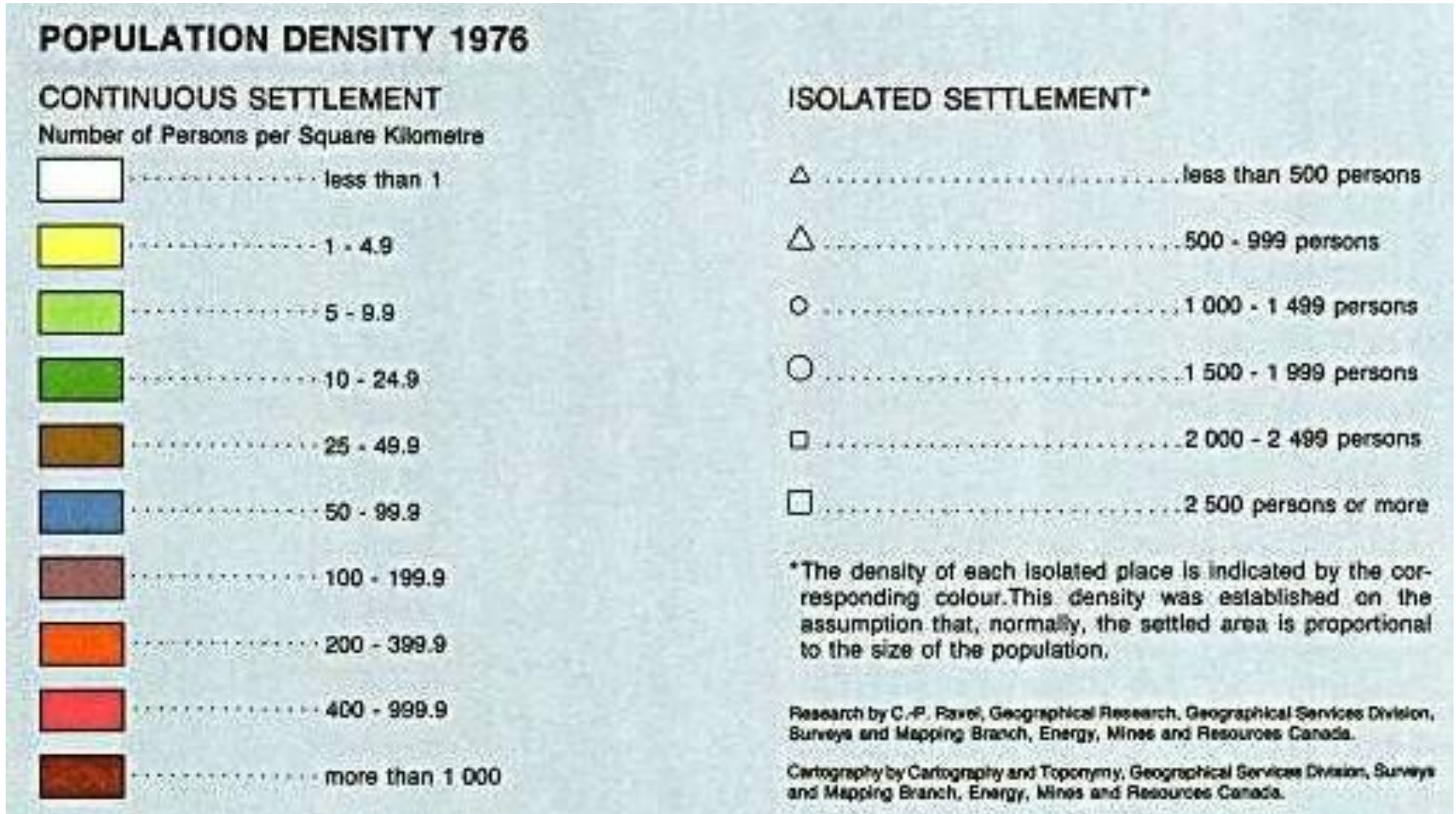
Universal STOP sign



Yellow is next to red in the colour spectrum

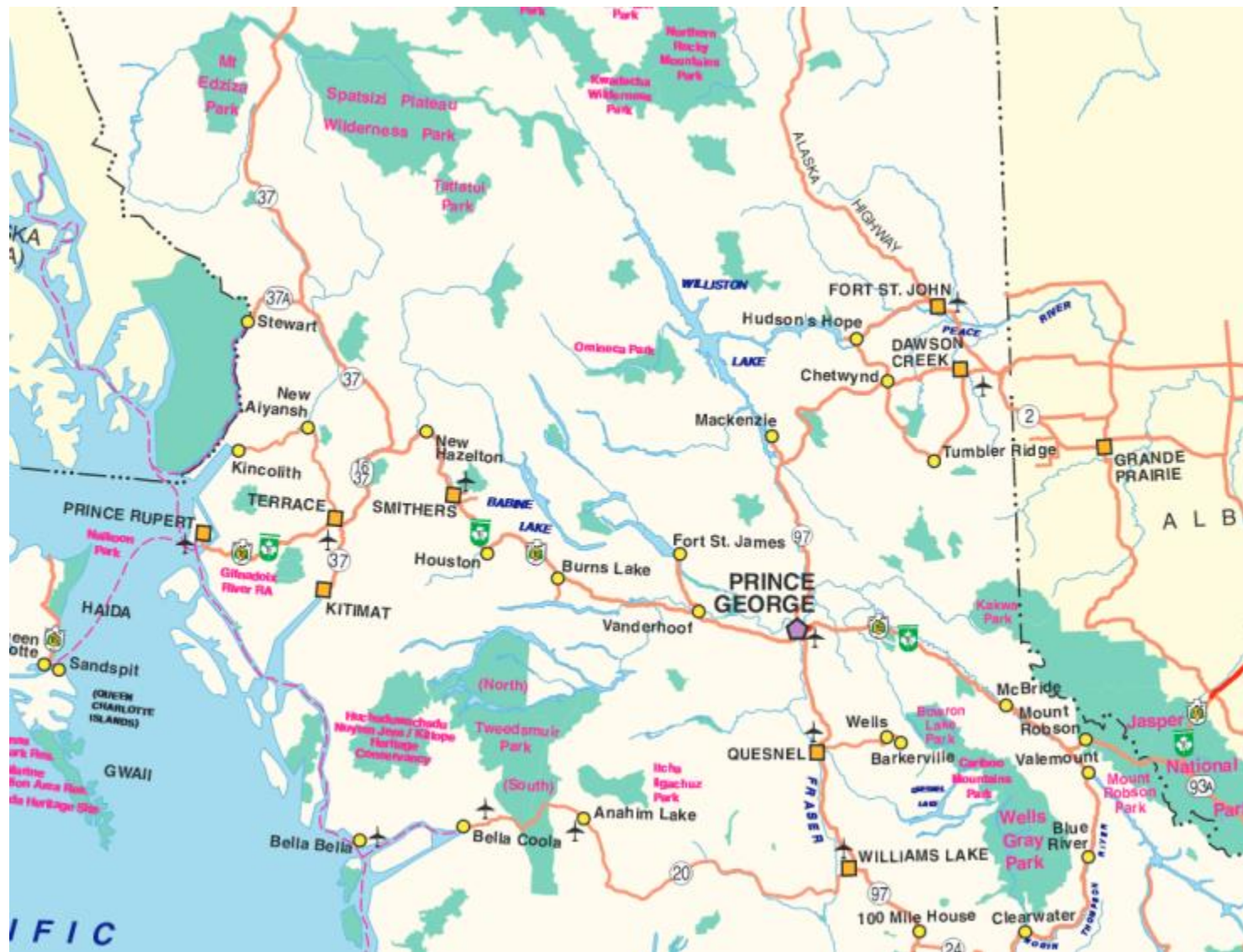


Poor use of colour ramp, size and shape quantitative (interval) data but no clear sequence

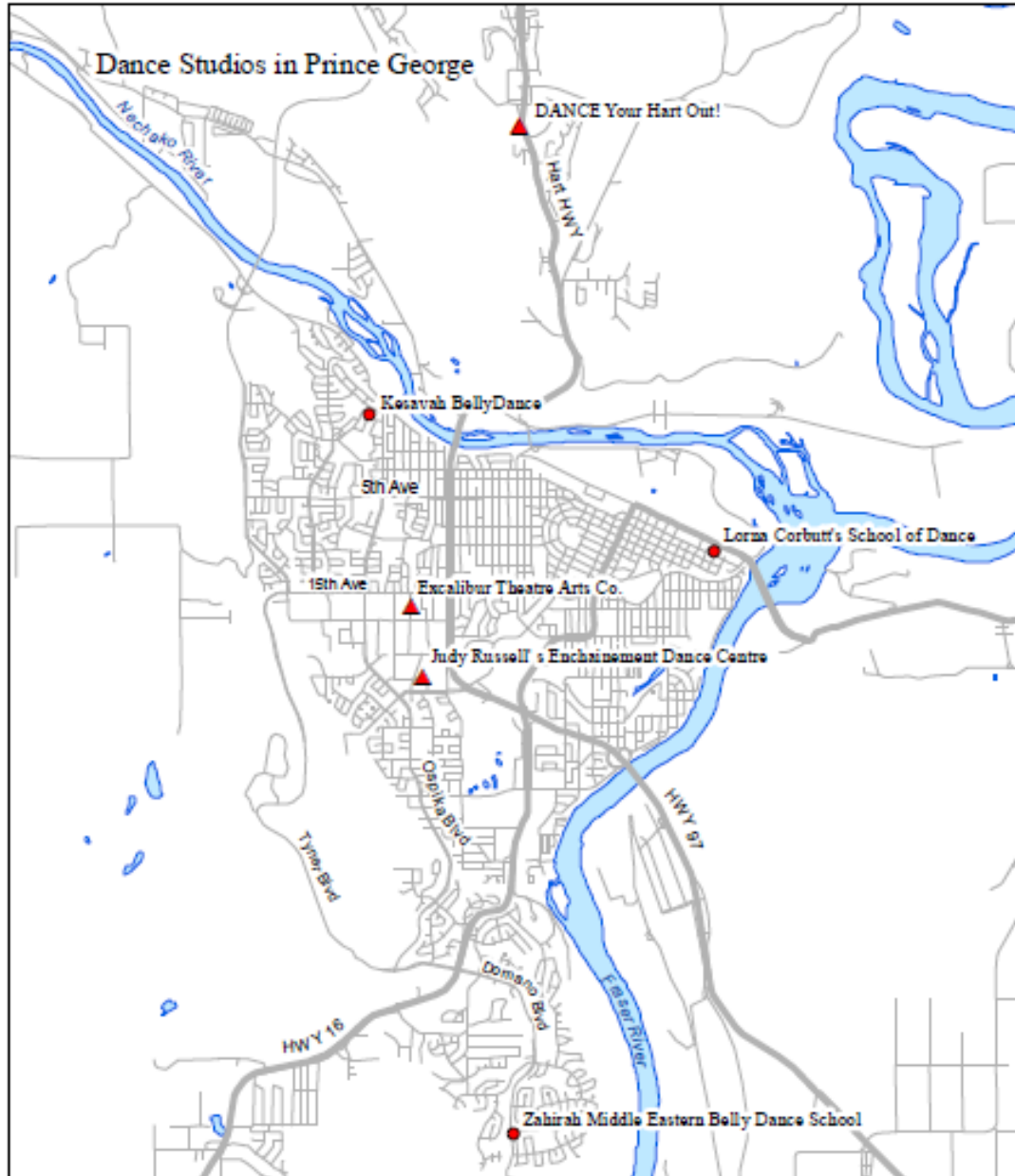


3a. Other factors: map purpose

e.g. parks / road map - what features are more important ...



3b. Other factors: cost and media



Colour costs v Monochrome:

- In this case, colour could be avoided if not needed

➤ online no cost

➤ monochrome 1x

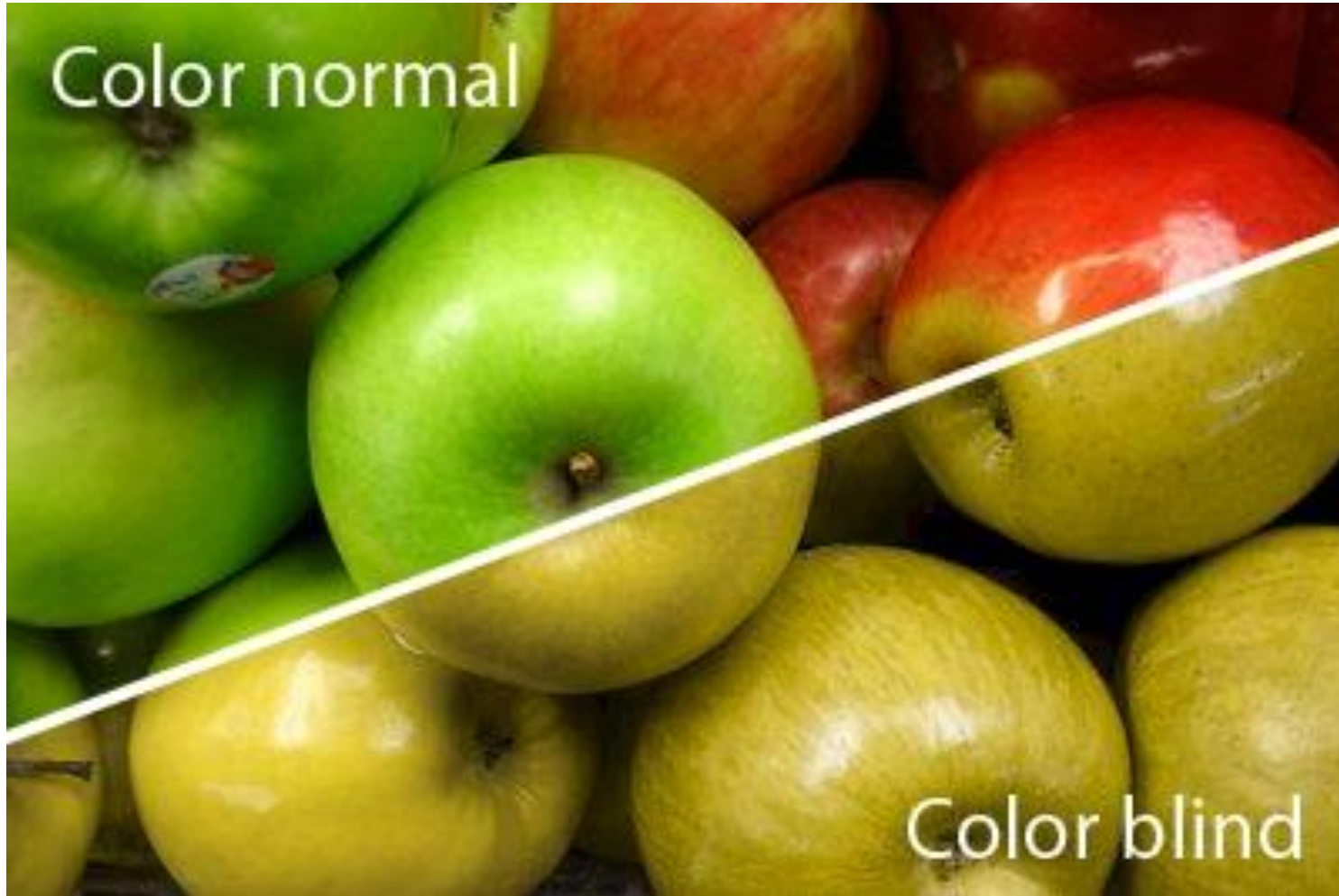
➤ colour photocopy 10x

➤ publication 1000x

➤ Don't always use colour, just because you can ... but in 2025, you often can ...

3c. More on colour

- colour blindness ~5% men and 1% of women



<https://www.washingtonpost.com/travel/2023/01/12/color-blindness-glasses-museums>
<https://pro.arcgis.com/en/pro-app/latest/get-started/color-vision-deficiency-simulator.htm>

Summary on symbol design

Symbols - design variables:

Qualitative

shape, pattern,

colour - hue (except red)

Quantitative

size, tone

colour - chroma / value

Symbols - use of design variables:

1. Association: form, size, colour, convention
2. Qualitative or quantitative data
3. Output purpose, cost and media

Much of this is common sense - design enables good communication