Basin Design Principles in Cartography

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Cartographic concepts

- Cartography defined
- Objectives & limitations affecting design
- The communication channel
- Types of maps
- The design steps
- Classes of symbols
- The graphic characteristics and interpretation
- Perception of graphic visuals
- Issues in cartographic design
Cartography defined

• Art, science, and technology of making maps
• Presentation and USE
The communication channel

Reality ...
The geographic environment

Mental image of reality

Imagine

Map user

Map

Compile

Cartographer GIS/CAD specialist

Recognize
Select
Classify
Simplify
Symbolize

Read
Analyze
Interpret

Sharing Geographic Knowledge

ESRI Nineteenth Annual User Conference
Map objectives

- Share information
- Highlight relationships
- Illustrate results
Design objectives

- Manipulate the graphic characteristics

Fulfill the intended purpose
Types of maps

- General maps
- Thematic maps

Different objectives, different cartographic designs
General maps

Locational

Positional

Variety of features
Thematic maps

Structure of a distribution

Single attribute or relationship
Cartographic design

- A complex task
  - Unlimited options

- Aims
  - Think in VISUAL terms
  - Simple and clear map
  - Excellent communication
  - Useful map
  - Beauty is NOT the MAIN objective
The design steps

• Imagination

• Graphic plan
  – Kind of symbol, color, typography ...

• Detailed specifications
  – red circle, size .3, 80% red 10% green 10% blue
Factors controlling cartographic design

- Objective ➜ map form
- Audience ➜ easy / complex
- Reality ➜ authenticity
- Generalization ➜ authenticity
- Scale ➜ quantity of info
- Technical limits ➜ quality
- Day / night use ➜ symbol size, color
- Static / moving use ➜ symbol size
Generalization

• Thematic

• Locational
Classes of symbols and graphic characteristics

• Qualitative
  - Color
  - Shape
  - Texture (area only)
  - Orientation
  - Placement

• Quantitative
  - Graytone value
  - Size
Perception of graphic visuals

• Eye limitation
  – 12 colors
  – 7 shades of the same color

• Texture vibration
Issues in cartographic design

- Clarity and legibility
- Visual contrast
- Visual balance
- Visual hierarchy
- Color
- Shading patterns
- Text
Clarity and legibility

• Clarity
  – Proper choice of symbols
  – Precisely & correctly delineated

• Legibility
  – Size of symbols
  – Perfect vision?
Thresholds (legibility)

- Perception threshold
  - legibility of the smallest detail
    - Points
      - diameter 0.2 mm
    - Lines
      - thickness 0.1 mm
    - Squares
      - full 0.4 mm side
      - empty 0.6 mm side
Thresholds (legibility)

- Separation threshold
  - Distinction between adjacent details
    - 0.2 mm
Thresholds (legibility)

- Differentiation threshold
  - Smallest difference between nearly same size symbols
Visual contrast

• Basis of seeing
• Easier map reading
• Easier differentiation
• Hierarchy of importance

• Caution:
  - similar contrast (map vs. legend)
Patterns

• Dots / halftones
• Lines / hatches
• Markers / stipples

Mainly for areal, qualitative symbology
Visual balance

- Layout of map objects
- Visual center

- Visual weight

Size, value (contrast), brilliance, close to edge
Visual balance test
Visual balance test
Visual balance test
Visual hierarchy

• Visual perception
Color

- Clarify facts
- More details and more design possibilities
- More visual interest and aesthetic reactions
- Connotes concepts
  - Red: warm, danger, ...
Color dimensions

• Hue
  – Red, orange, blue, ...

• Value
  – Light / dark

• Saturation
  – Rich / bright
Hue

- Wavelength and the eye
- Qualitative symbology
- Thin symbols vs background
- Majority agrees upon
- 4 - 5% color blind
Value

• Quantitative symbology
• Symbol vs background
Saturation

- Also chroma, purity
- Less controllable
- Affected by difference in value
- Larger areas appear more intense
Text

• Qualitative
  – Color > style > form

• Quantitative
  – Size > form > value > color

• Text color vs background color

• Uppercase vs lowercase

• No fancy fonts
Text placement

• Priorities for POINT features

1. Makville
2. Jackville
3. Marville
4. Lauraville
5. Majdville
6. Shirville
Text placement

• Resolve ambiguity
Text placement

• Help map reader read faster
Text placement

• Text orientation
Urban

Grass

Shrubs

Forest

Farms

Do NOT scale independently
Consider

• Think of final production process at the very start
• Effect of reduction
• Symbol choice and condition of map use
• Screen colors vs color on paper
More to consider

- Scale bar vs ratio scale
- Map date vs Data date
- Data source, projection
- Data quality
- 20/20 vision?
- Your “taste” vs others
ALWAYS

THINK of the USER

Map
References


References (continued)

Managing a GIS, Environmental Systems Research Institute, Inc.; 1996.

