

Cartography and composition of interactive Maps

Talk Focus

- Motivation and Goals
- Rapid Evolution of Interactive Maps (Short Review)
- Goals of Map Communication
 - Composition of Interactive Maps
 - Cartography of Interactive Maps
 - ⇒ Highlight differences web vs. static maps
- Conclusions

1. Motivation and Goals

- rapid evolution of interactive maps
- few resources regarding design and composition
- overview of differences between static maps and interactive maps
- introduce a selection of concepts (design and composition)
- NOT covered here
 - complete guidelines
 - web map production
 - technical implementation and software
 - animation, sound, and touch in interactive maps

2. Rapid Evolution of Interactive Maps

■ 1994/95 early web maps

Internet just starting to take off

■ Tile services and mapping APIs emerge

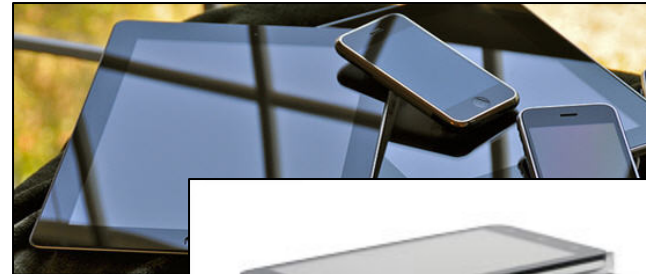
■ Map Quest	1996
■ Yahoo maps	2002
■ Open Street Map	2004
■ Google maps	2005
■ Bing maps	2005

- “Mash-ups” appear
 - ⇒ many created by “non-cartographers”

- Map Rendering Server software releases

- 1994 MapServer (NASA/ForNet)
- 1997 ArcView Internet Map Server
- 2000 ArcIMS 3
- 2001 GeoServer
- 2004 ArcGIS Server
- 2005 Mapnik (OSM)
- 2006 MapGuide Open Source

■ Over time many different display devices




Four examples from my work

1998
to
2014

Atlas of Natural and Agronomic Resources of Niger and Benin - static map images, legends and data base

← → https://www.uni-hohenheim.de/atlas308/startpages/page2/english/content/title_en.htm ▼ ↺




Atlas of natural and agronomic resources of Niger and Benin

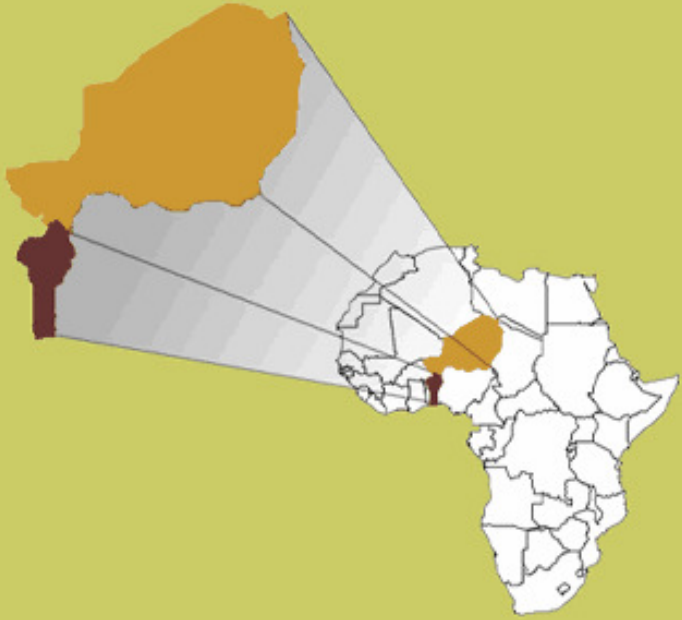
eds. Herrmann, L. & Vennemann, K. & Stahr, K. & von Oppen, M.

Example Year 1998

General Information

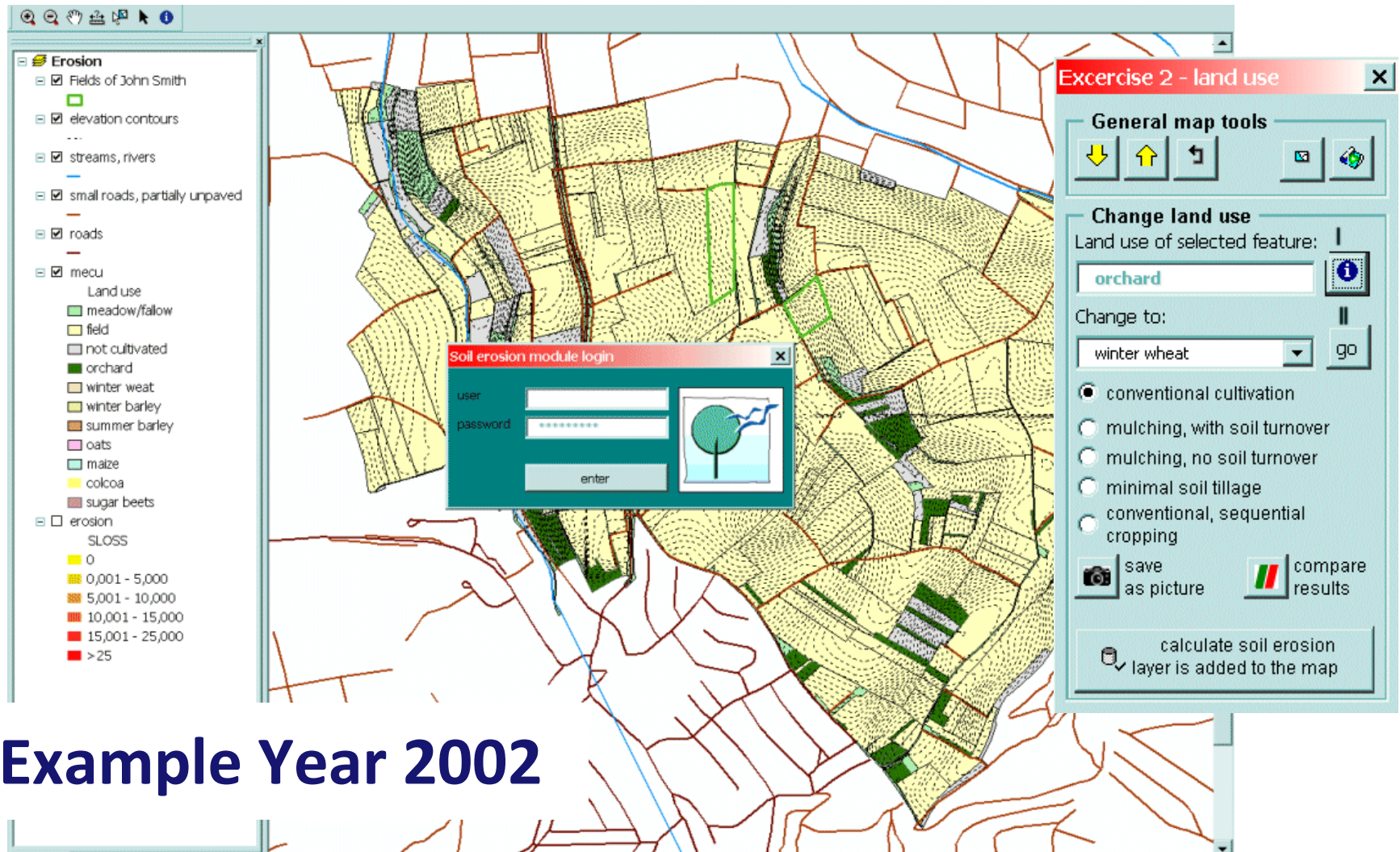
- Niger**
- Benin**
- Appendix**
- Database**
- How to work with**
- Comments**
- Contact**





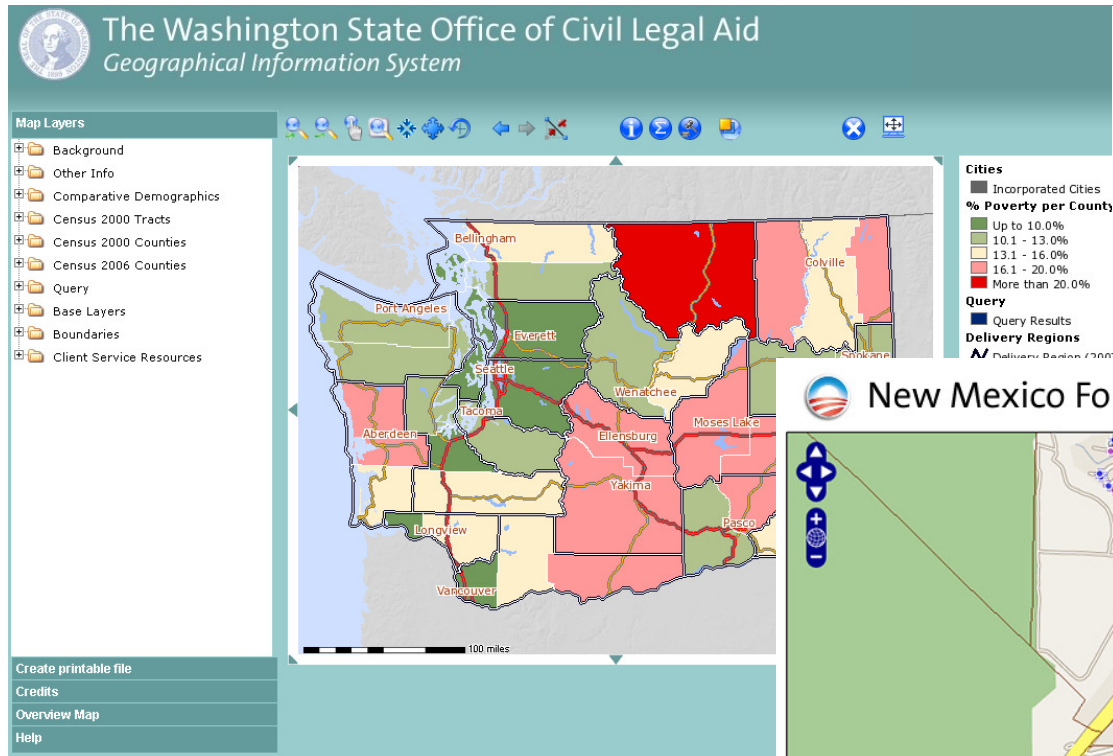
ArcGIS and Citrix-Metaframe - Soil Erosion Modeling

Graduate classes, e-learning in landscape planning



Example Year 2002

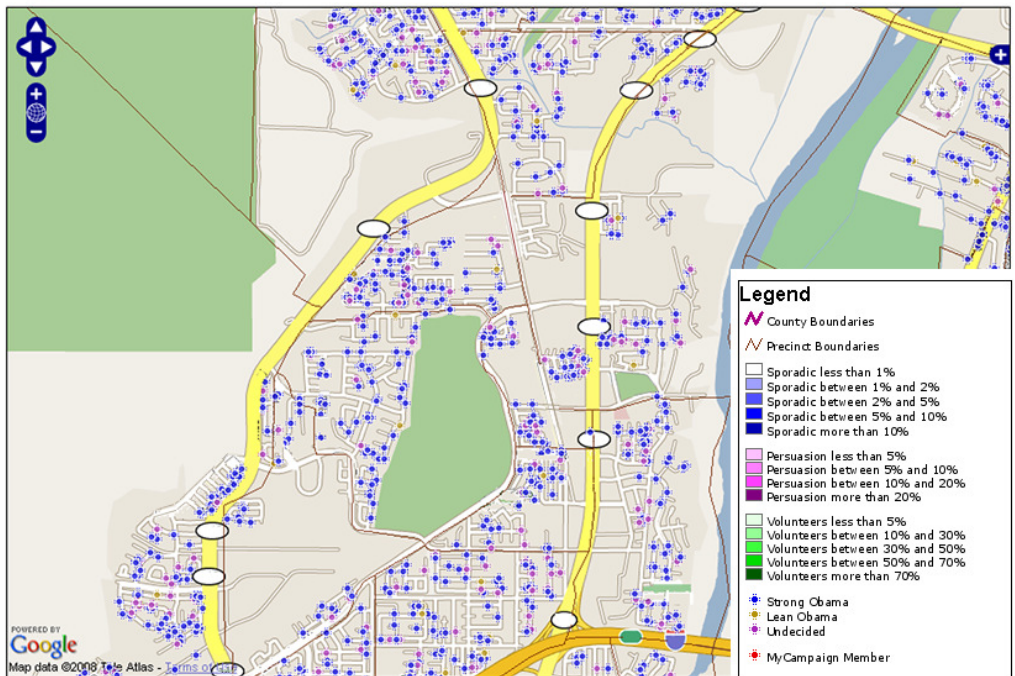
Year 2008 - Examples



Mapping People in Need The WA State Office of Civil Legal Aid Web GIS

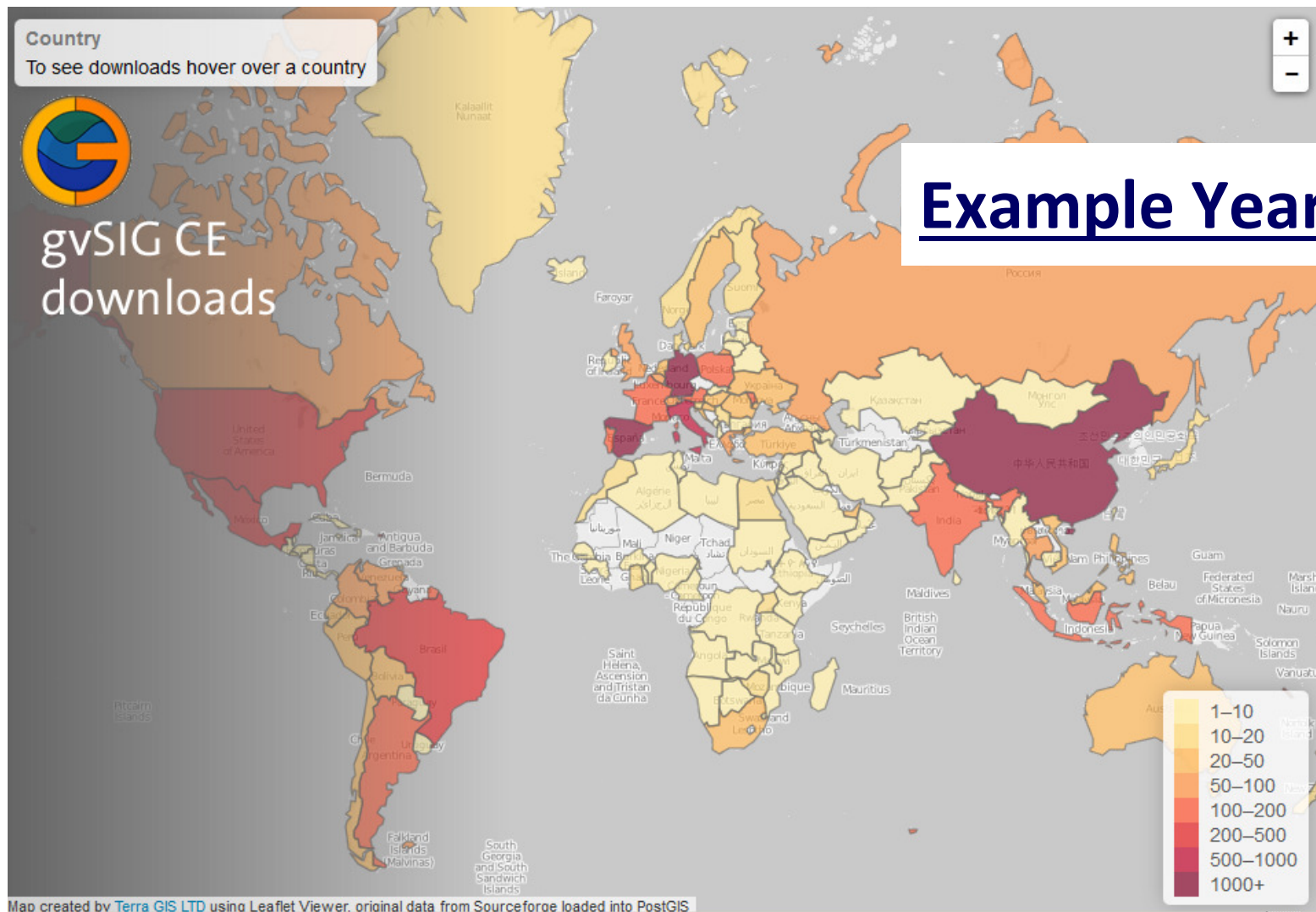
Obama Campaign 2008 Mapping voters with MapServer, PostGIS and OpenLayers

New Mexico For Obama



JS Library Leaflet + GeoJSON + data base (PostGIS)

Downloads of gvSIG desktop GIS



3. Goals of Map Communication

Purpose of a Map

Goals of Map Communication

- Maps are a form of spatial communication
- Presentation medium does not matter
 - most maps are designed to communicate and convey information to a map user / reader
- Effective map design:
 - Establish the communicative purpose of the map !

Principles of effective Map Communication

Adapted from Muehlenhaus, I. (2014): Web Cartography

- Purpose of the map is essential and should drive all design decisions
- Appeal to audience, but not necessarily everyone
- Limit what the map tries to convey
- Add interactive elements not by default BUT only if they facilitate communication goals

3. Goals of Map Communication

3a. Composition of Interactive Maps

Differences vs paper maps

- Map reader is now a map user
- Form of multimedia mapping
- Human – map interactivity
 - can change state of the map
- Interactive Elements
- Many unknowns
 - viewing device resolution
 - screen real estate
 - representation

Human interaction with a map

■ Mice vs touch screens

■ WIMP interfaces

windows, icons, menues, pointer based

■ Touch screens

multi touch, can also have gesture control, eye tracking etc

■ New interactive elements (vs paper maps)

■ map elements have become part of the GUI

Interactive elements - Examples

- Title and splash screen
- Map area
- Pan or Zoom user interfaces
- Info Window
- Locator Maps
- Menu and its design, Neat lines, Help Menu
- Smart Legends

- Other
 - Multimedia graphics, Images, Videos, Graphs + Highlighting

Visual Hierarchy Levels & relative importance

STATIC MAPS

Adapted from Dent et al (2008)

Level	Map Element
1a	Thematic Symbols
1b	Title
	Legend
	Map Symbols
	Labels
2	Base Map
	Land areas
	Political Boundaries
	Significant Physical Features
2-3	Explanatory Materials
	Map sources
	Credits
3	Base Map:
	Water Features
4	Other Base Map Elements
	Labels
	Grids
	Scales

INTERACTIVE MAPS

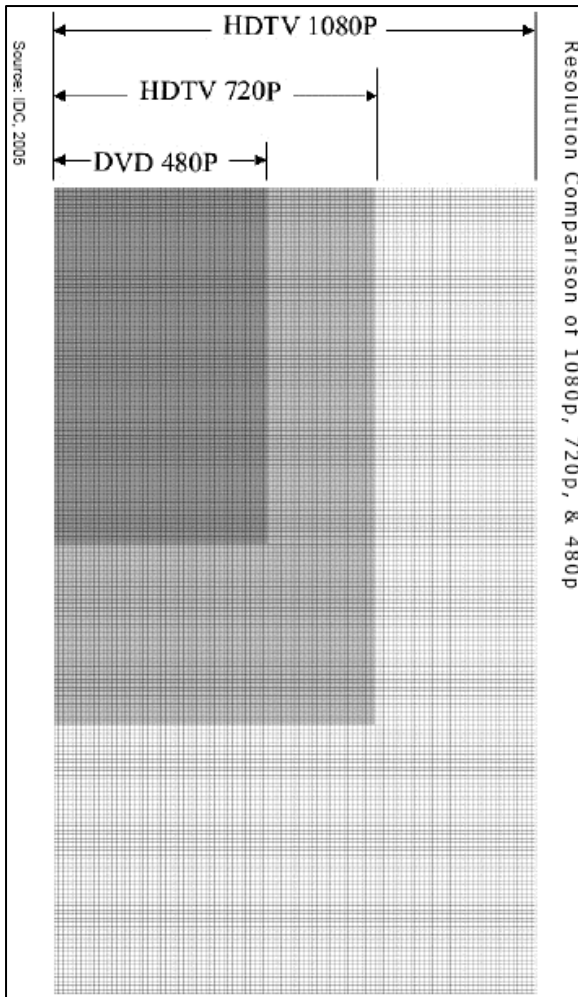
Adapted from Muehlenhaus, I. (2014)

Level	Map Element
1	Title /Splash Screen
	Thematic Visualizations
	Legend
2	Base Map
	Info Windows
	Chart Graphics
3	Base Map Labels
	Map Interactivity
	<i>pan /zoom/rotation etc</i>
	<i>menus with additional tools</i>
4	Locator Maps
	Multimedia Supplements
5	Map Interactivity
	<i>Attribution and copyright</i>
	<i>Neatlines /Grids/Graticules</i>
	<i>Tool Tips</i>

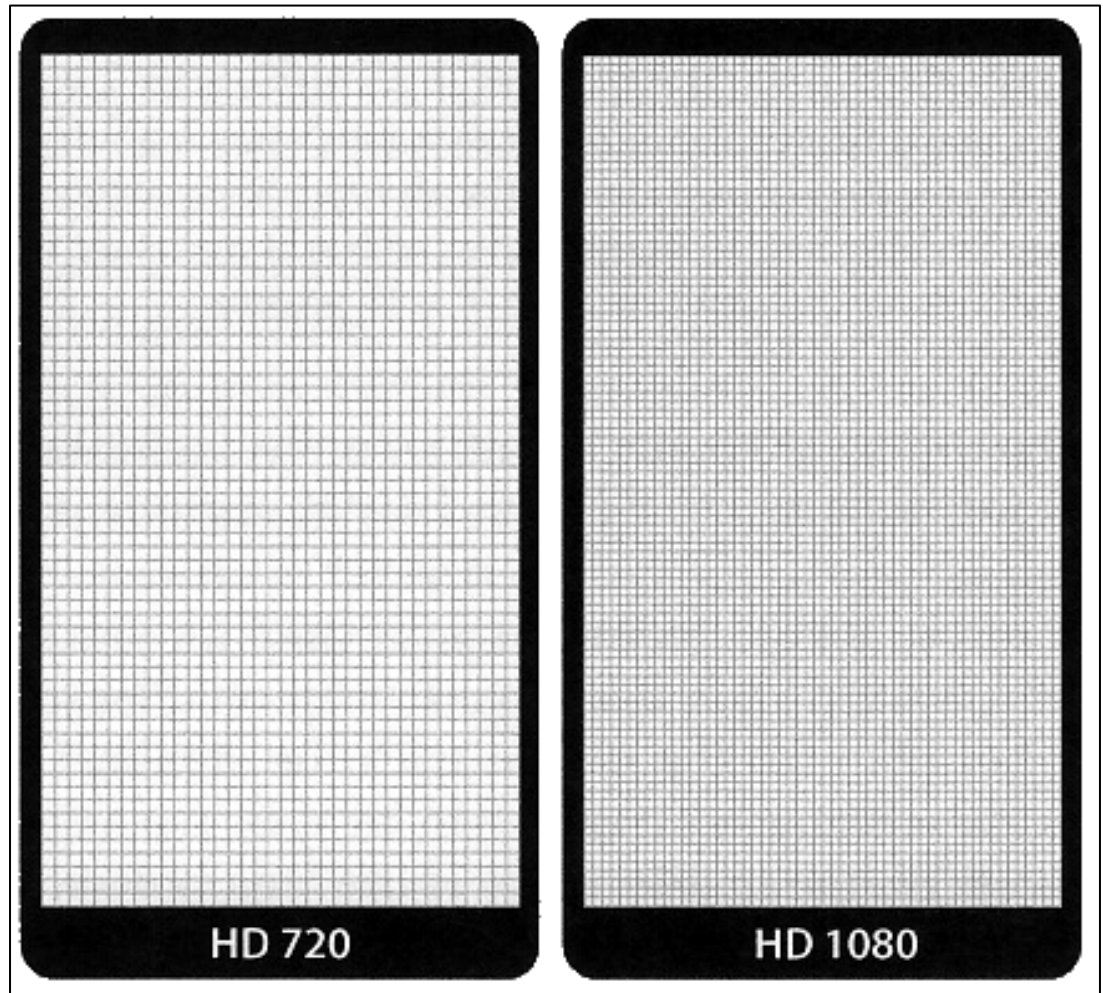
Layout + Organization depends on

- screen real estate
- resolution
(size in pixel vertical columns * horizontal rows)
- pixels per inch another thing (size of each pixel)

Pixels per inch - implications

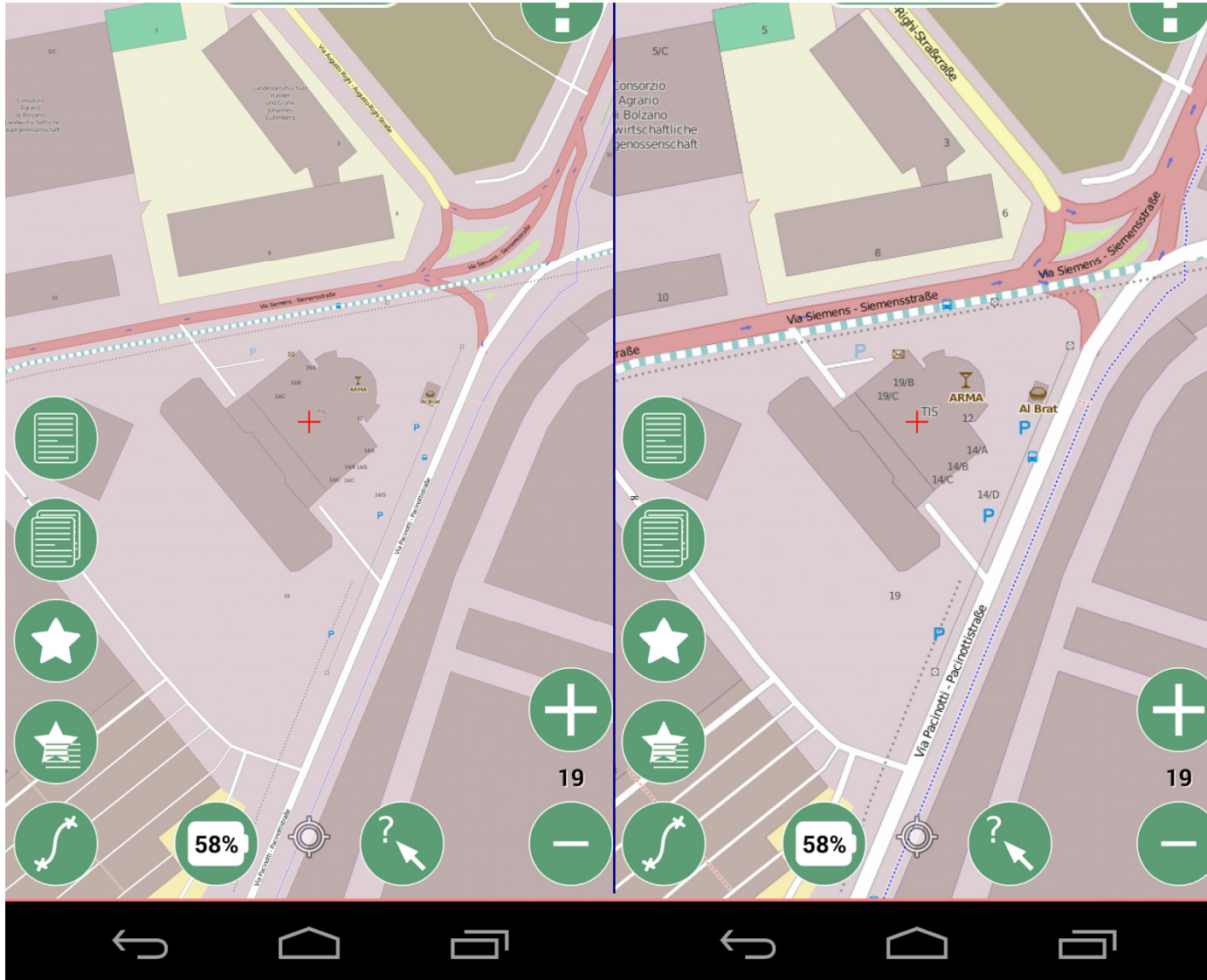


SOURCE IDC 2005

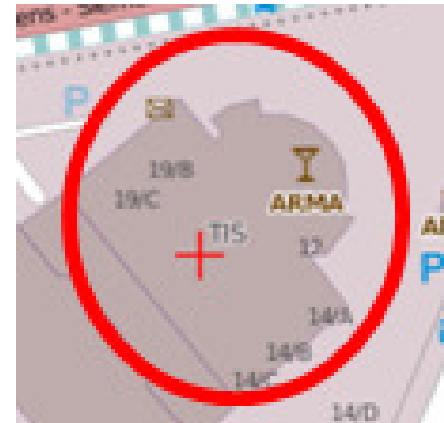
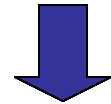


SOURCE Muehlenhaus, I. (2014): Web Cartography

Scaling of OSM online tiles on high resolution devices



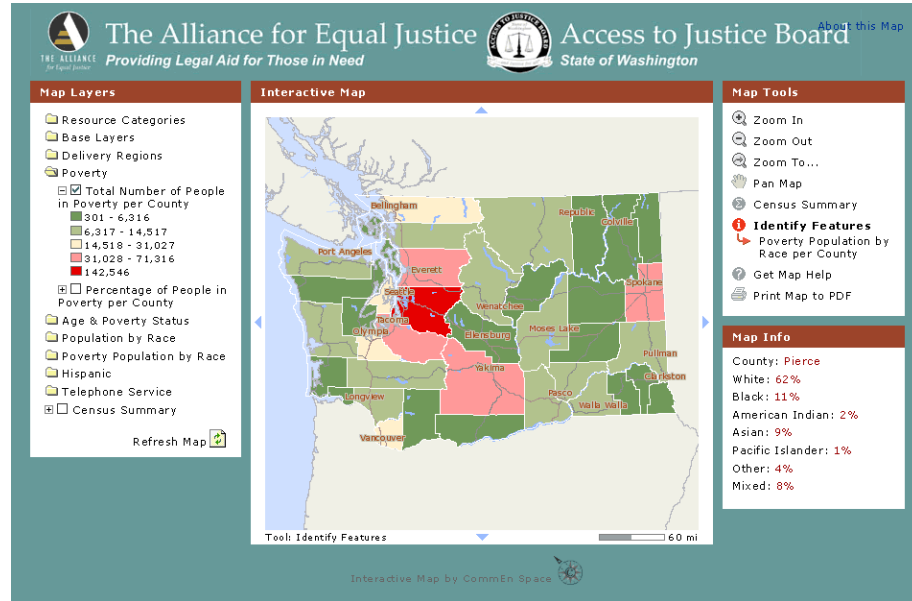
NOT scaled, tiny labels



scaled, bigger labels

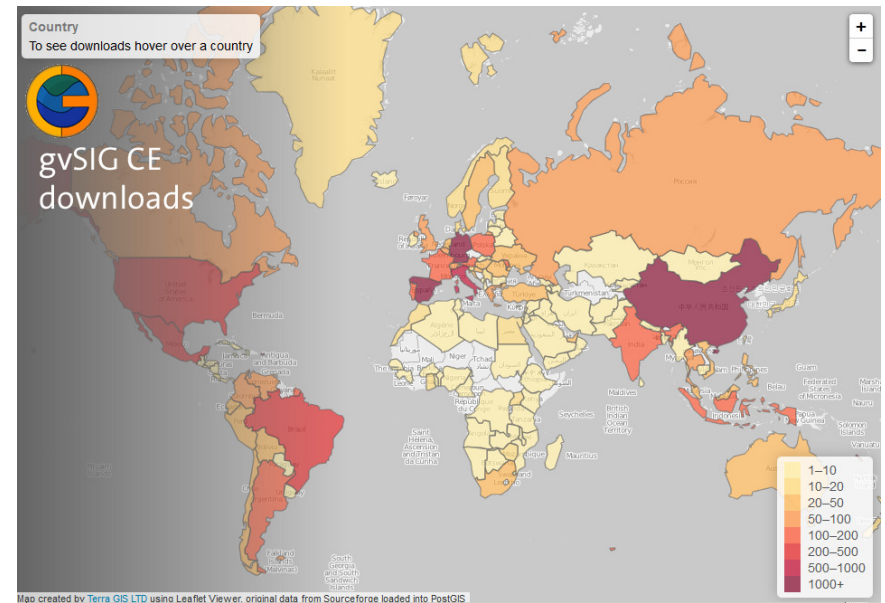
Web map layout types

compartmentalized



- formal presentation
- separation of mapped area and other map elements
- work well on big screens

fluid



- map elements distributed around the mapped area
- best choice for mobile devices

Effective Web map Design – short „How to“

according to Muehlenhaus 2014

- Identify user audience & expectations
- Determine type of Interactive map
- Select Map elements
- Design mock-up and user test
- Finalize map and user test

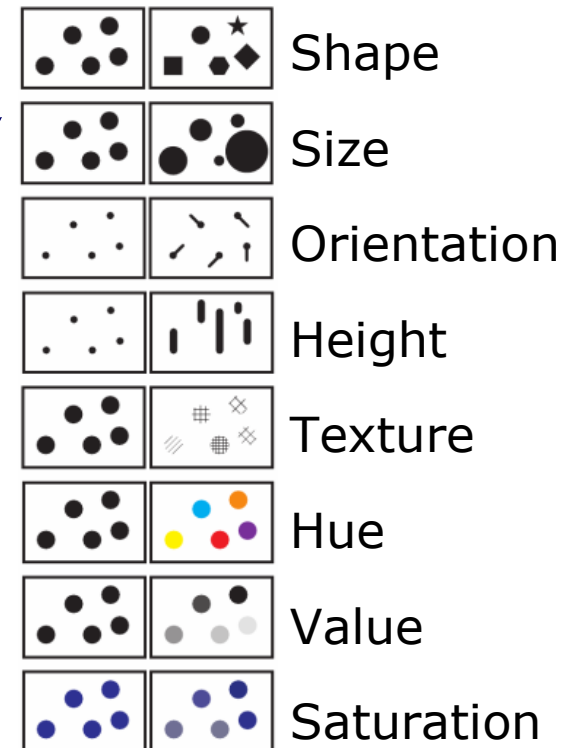
3. Goals of Map Communication

3b. Cartography of Interactive Maps

Cartography of Interactive Maps

Many of the following apply largely unchanged

- Color
- Typography
- Core Visual Variables
- Symbolization
- Thematic Visualization



Source: Muehlenhaus, I. (2014):
Web Cartography, page 127

Less certainty of representation than print maps

many unknowns

■ Color

RGB, additive color model for all screens

Depending on screen, not 100% sure of representation

■ Typography

Vector labels depend on installed fonts,

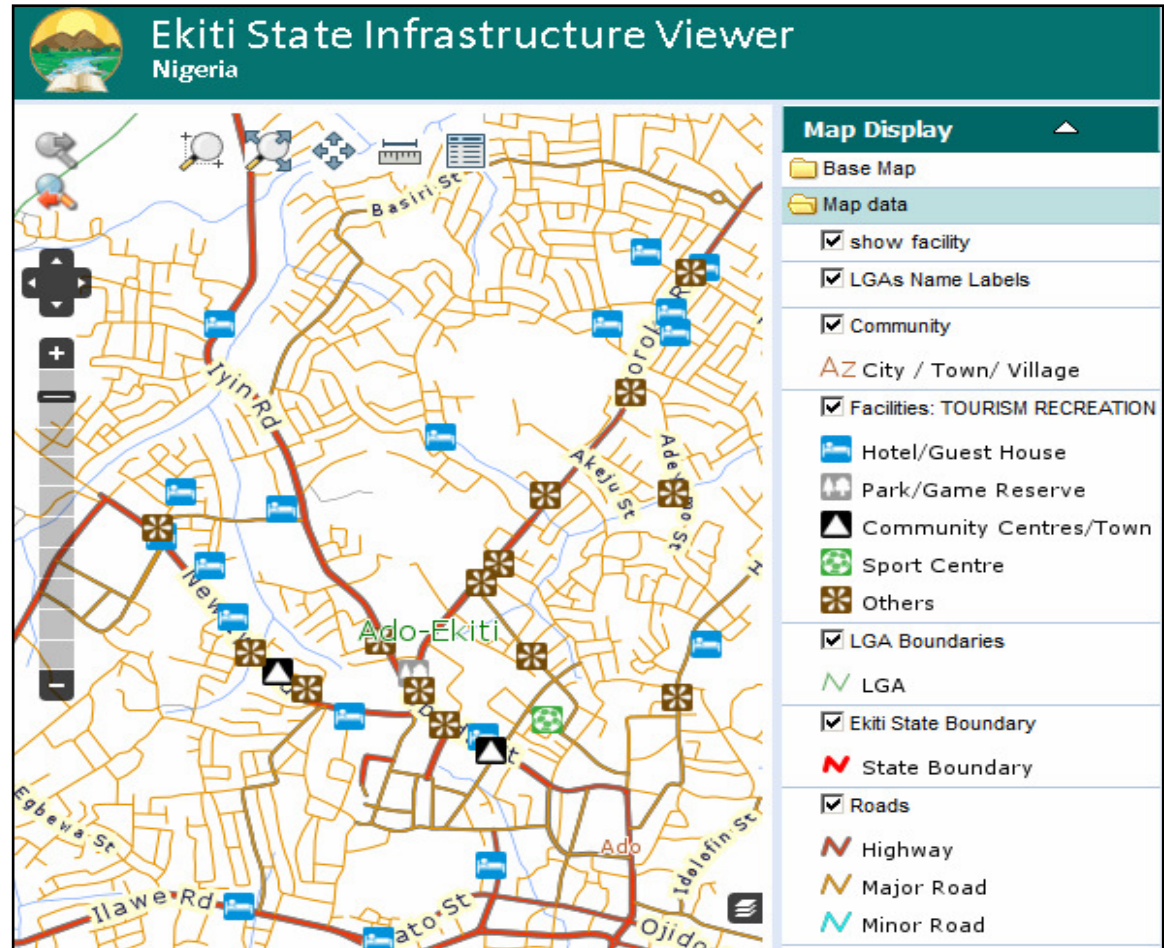
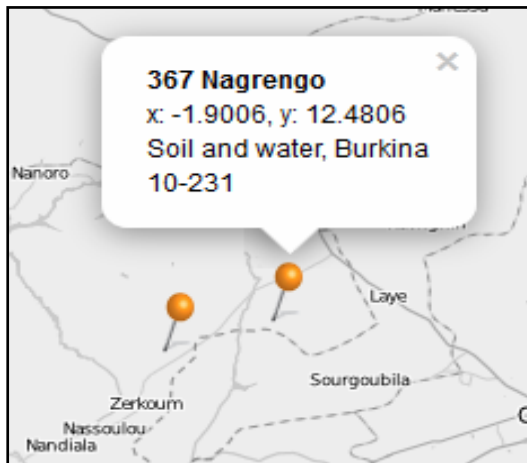
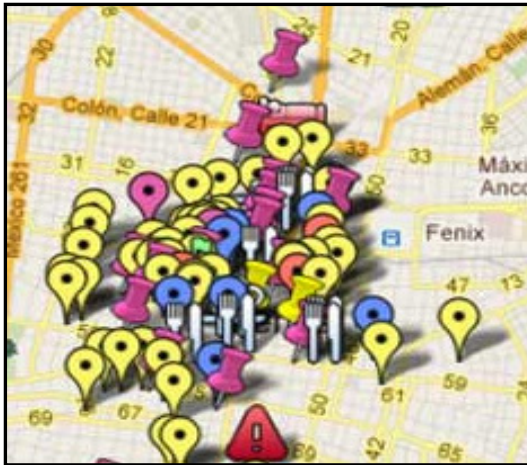
css style specifies font family

Sans serif face types recommended (often called fonts)

per map 2 types of fonts maximum

Symbolization

- Mash-up syndrom - just say „web map“ and everybody instantly sees a Google base map with upside down teardrops



Default or custom symbols



Mercator Web Projection - Issues

■ How Google ~~enabled~~ ~~Withanized~~ Web mapping ?

- Ubiquitous Google type layers

Arnulf Christl at FOSS4G 2010 (2008-2012 President of OSGeo):

“In 2008: All maps have become static and street maps”

- Familiarity of users with these set expectations

- Often web map makers do not create their own base maps

- consequently often overlooked:

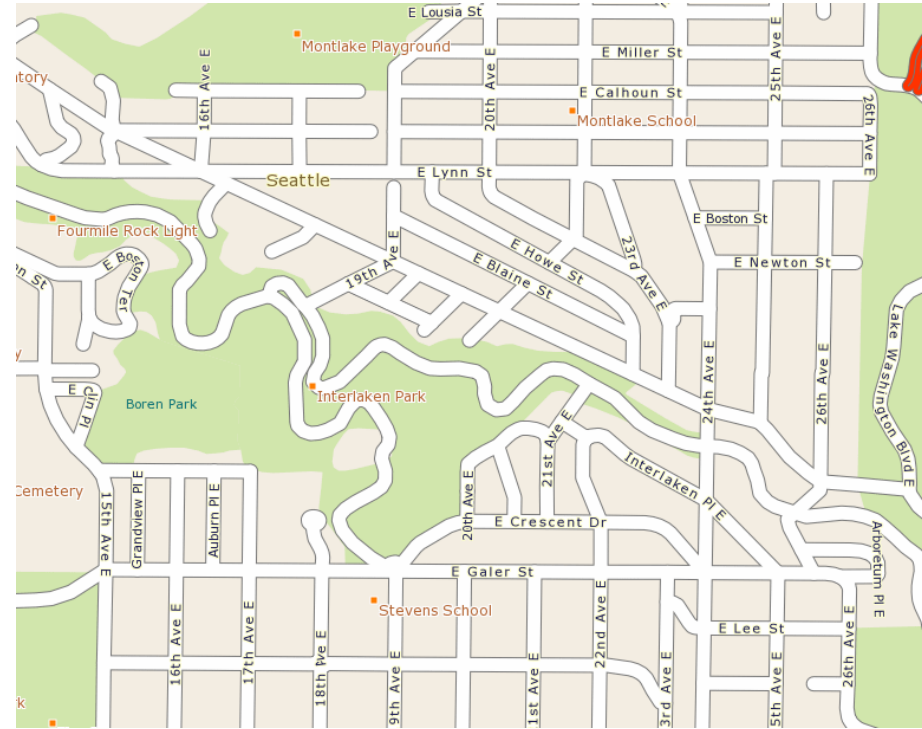
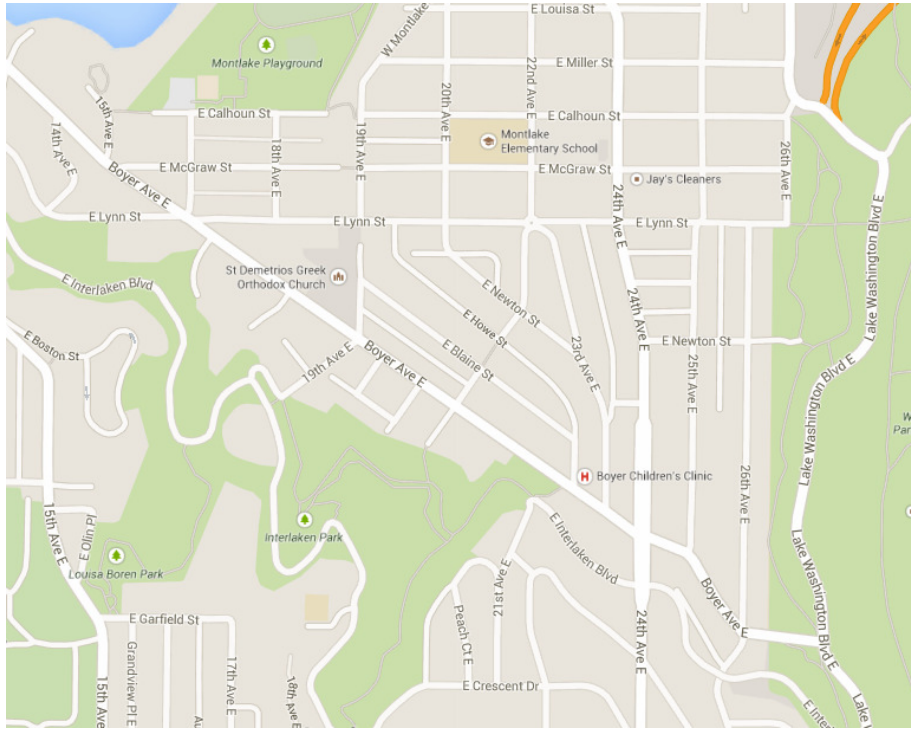
does color scheme match the communicative message?

does the base map match the web site style it is embeded into?

Base Map Google

vs

Custom



Aerial Photography Layers

- traditionally goal was to abstract reality
- mimicking reality, makes decision making harder, less predictable
- often does not add communicative value
- difficult to make important other information noticeable

 better avoided

Thematic maps

- best choice is to use equal area map projections

4. Conclusions

- Many factors play a role how well an interactive map „works“ for the audience
- Technology anxiety - Don't worry about it
 - it is **NOT** about using the latest or coolest technology
 - it is **about communicating well**
- Main Goal: communicate clearly and intuitively

References

- **Muehlenhaus, I. (2014): Web Cartography. Map design for Interactive and Mobile devices. 240 pages. CRC Press, Boca Raton**
- **Dent, B. D., Torguson J. et al (2008): Cartography: Thematic Map Design. 369 pages. New York. McGraw-Hill. Edition 6.**