

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

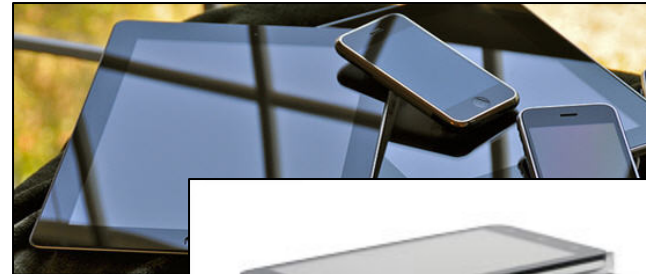
■ Map Quest	1996
■ Yahoo maps	2002
■ Open Street Map	2004
■ Google maps	2005
■ Bing maps	2005

- “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

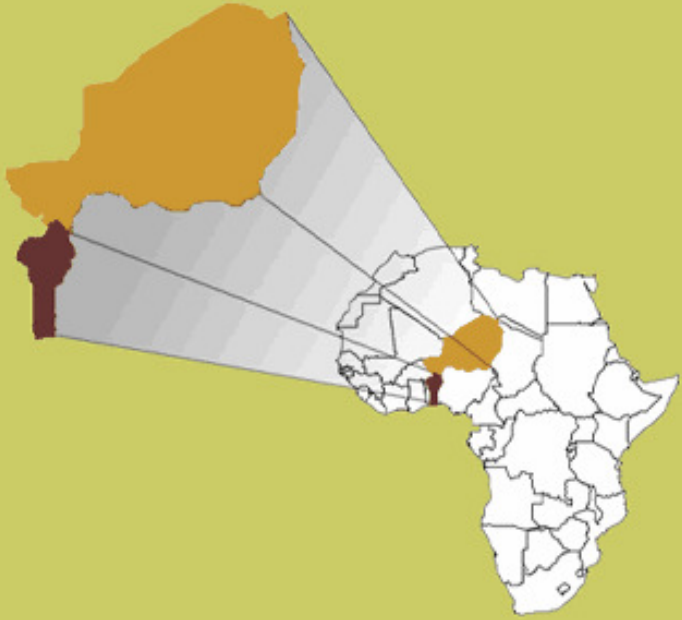
← → 🔒 https://www.uni-hohenheim.de/atlas308/startpages/page2/english/content/title_en.htm ▼ ↺


 Atlas of natural and agronomic resources of Niger and Benin

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

Example Year 1998

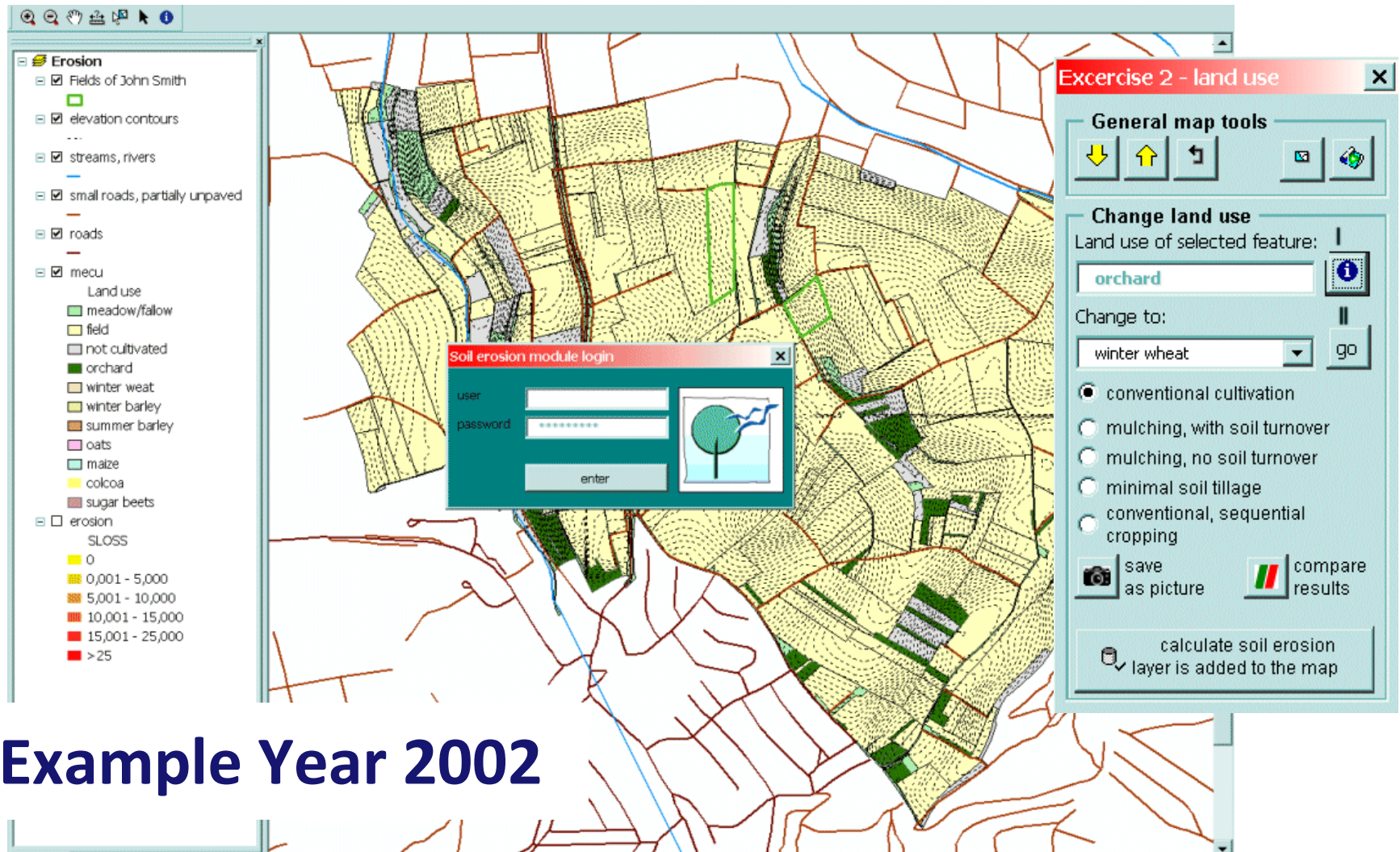
General Information
Niger
Benin
Appendix
Database
How to work with
Comments
Contact





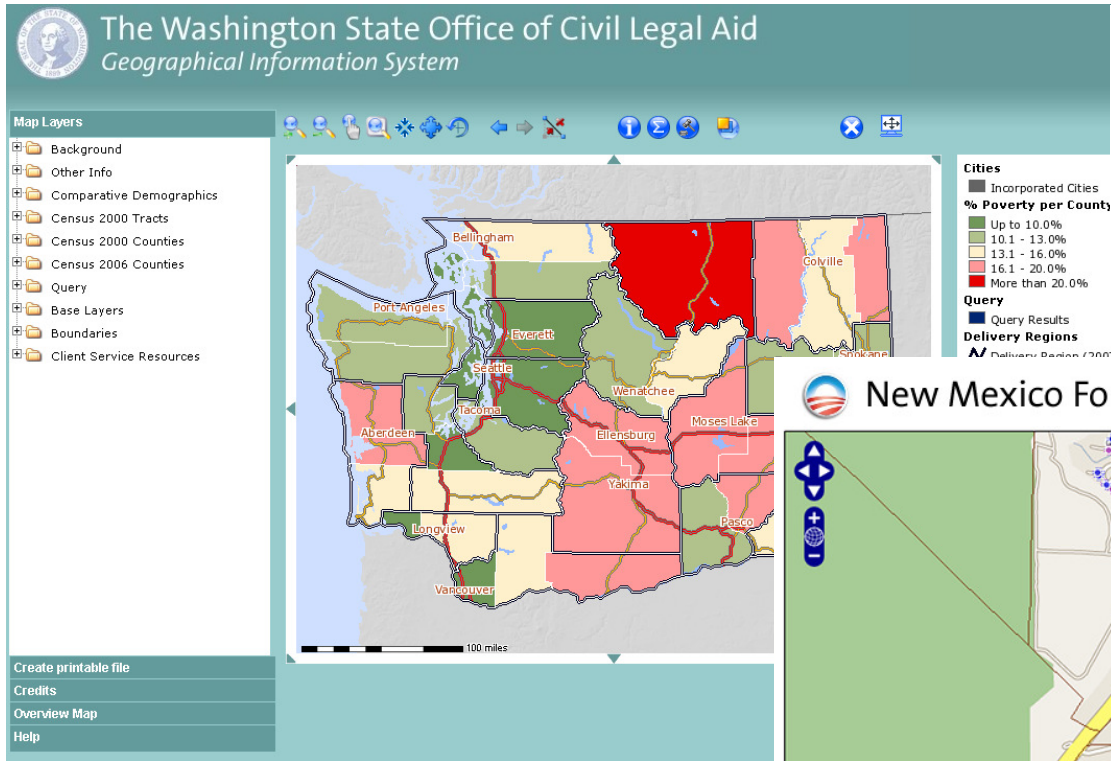
ArcGIS and Citrix-Metaframe - Soil Erosion Modeling

Graduate classes, e-learning in landscape planning



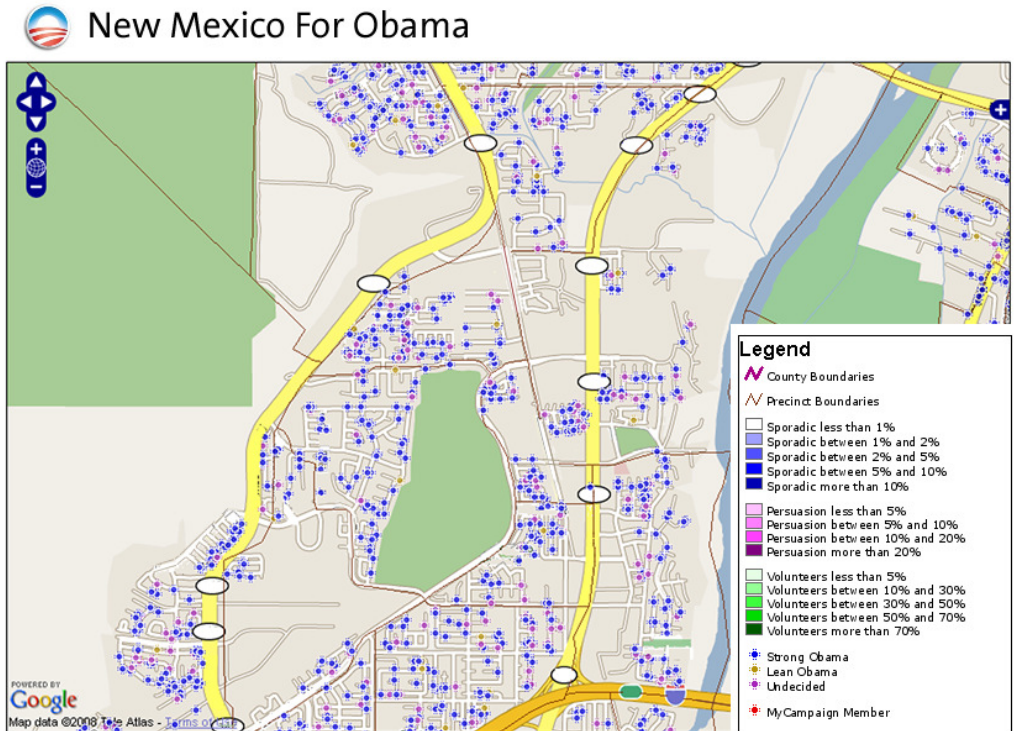
Example Year 2002

Year 2008 - Examples



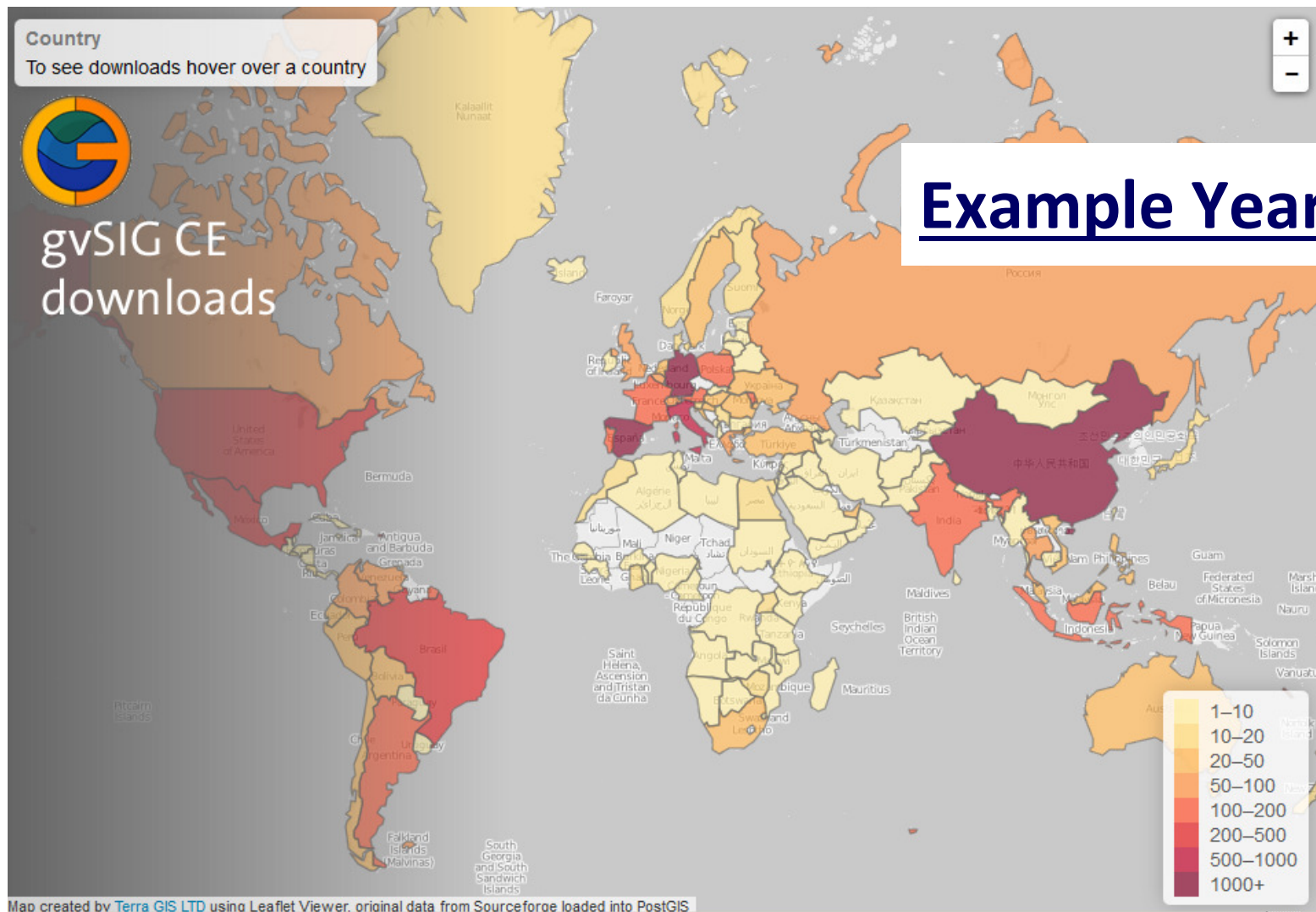
Mapping People in Need The WA State Office of Civil Legal Aid Web GIS

Obama Campaign 2008 Mapping voters with MapServer, PostGIS and OpenLayers



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, menus, 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

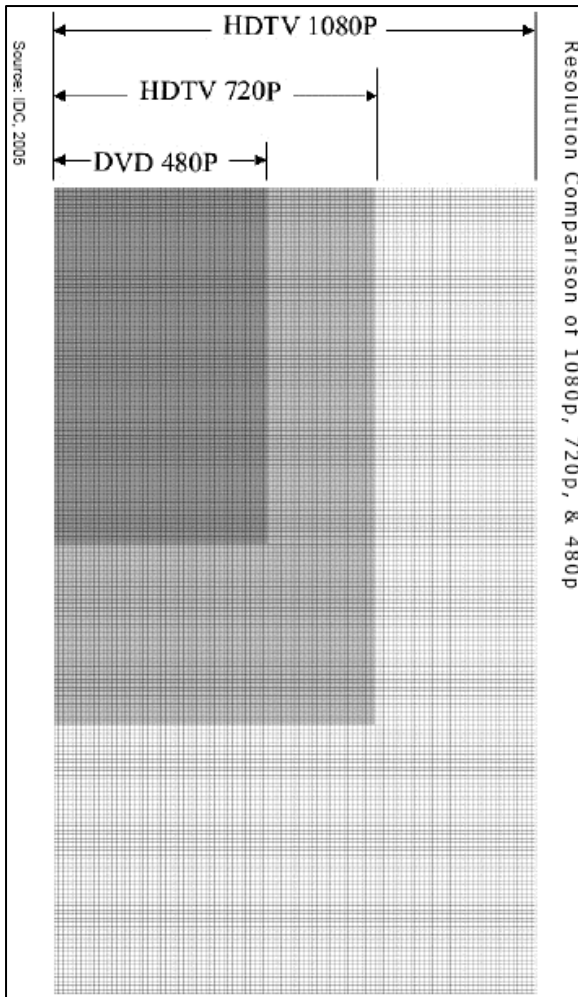
Adapted from Muehlenhaus, I. (2014)

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>

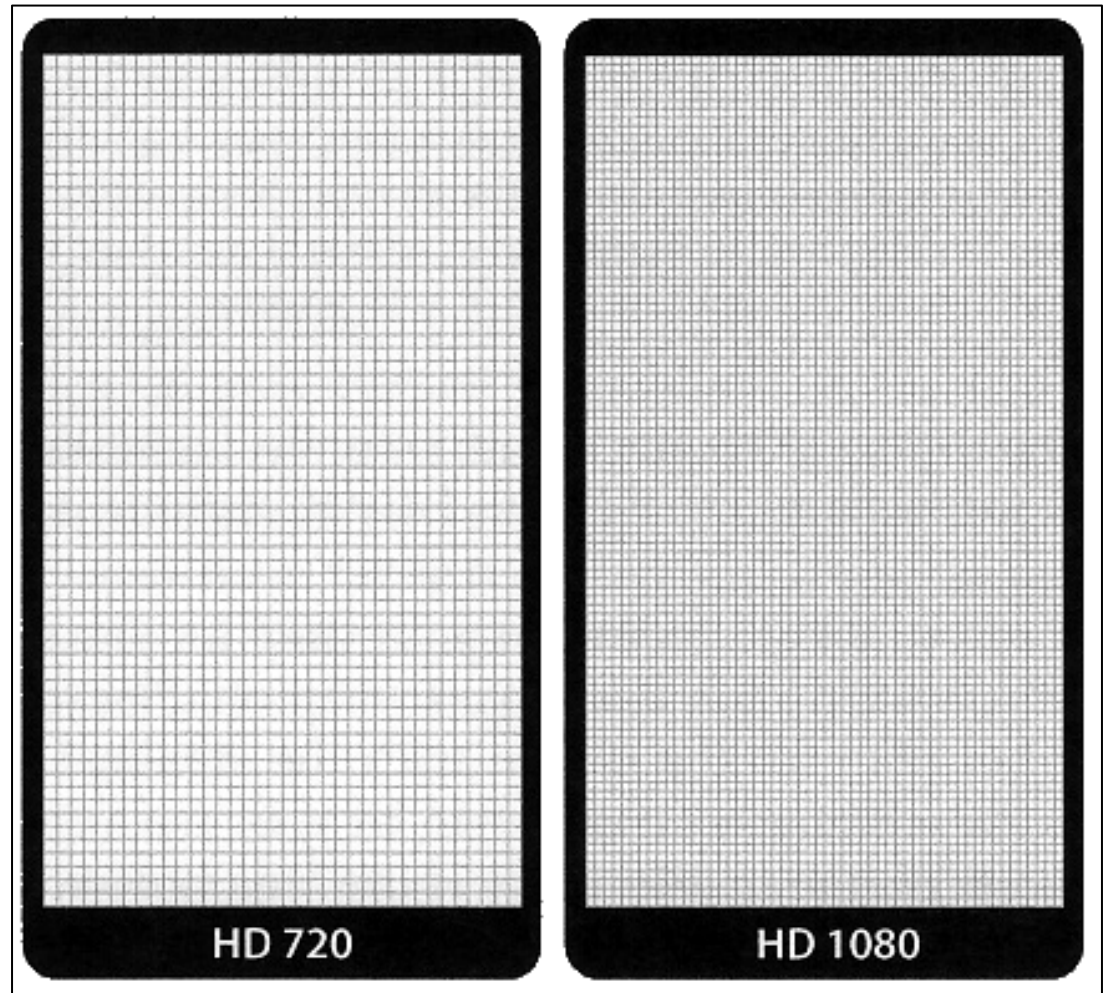
Layout + Organization depends on

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

Pixels per inch - implications

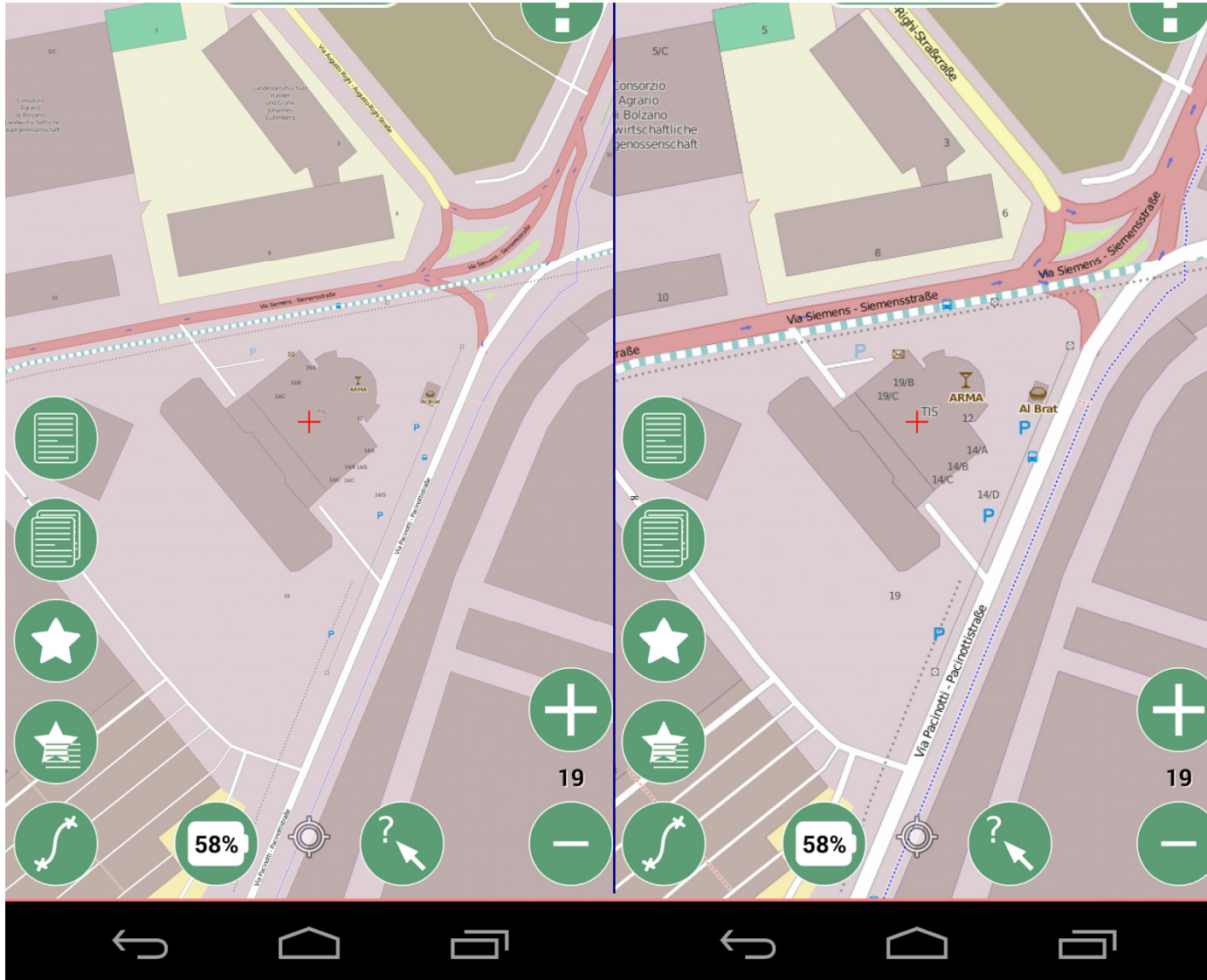


SOURCE IDC 2005

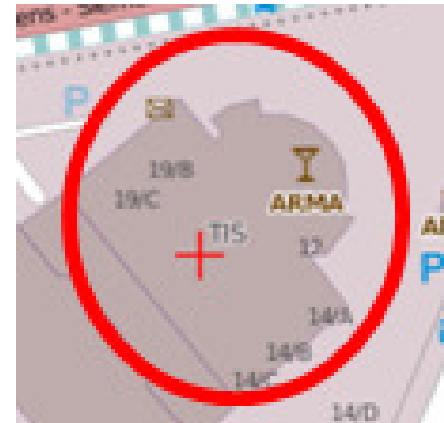
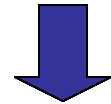


SOURCE Muehlenhaus, I. (2014): Web Cartography

Scaling of OSM online tiles on high resolution devices



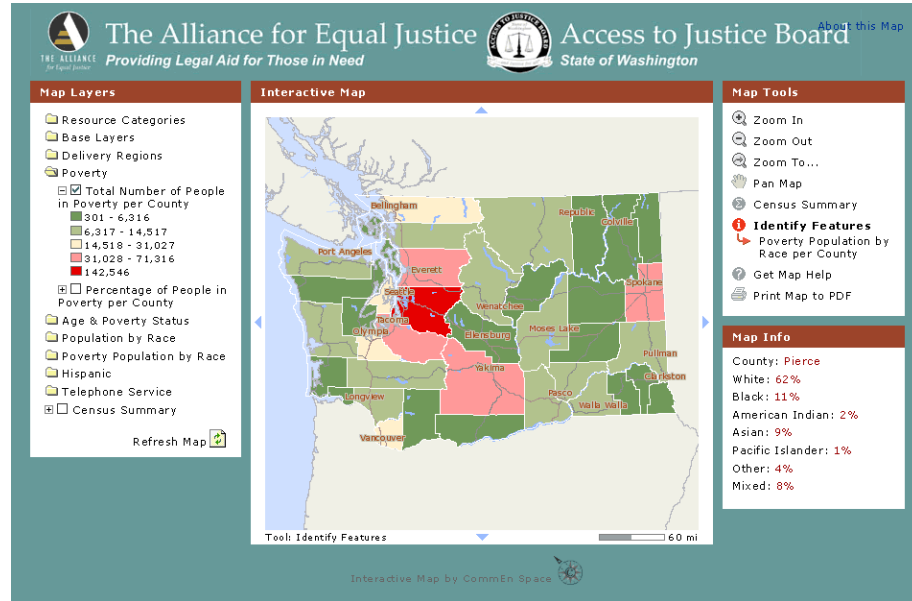
NOT scaled, tiny labels



scaled, bigger labels

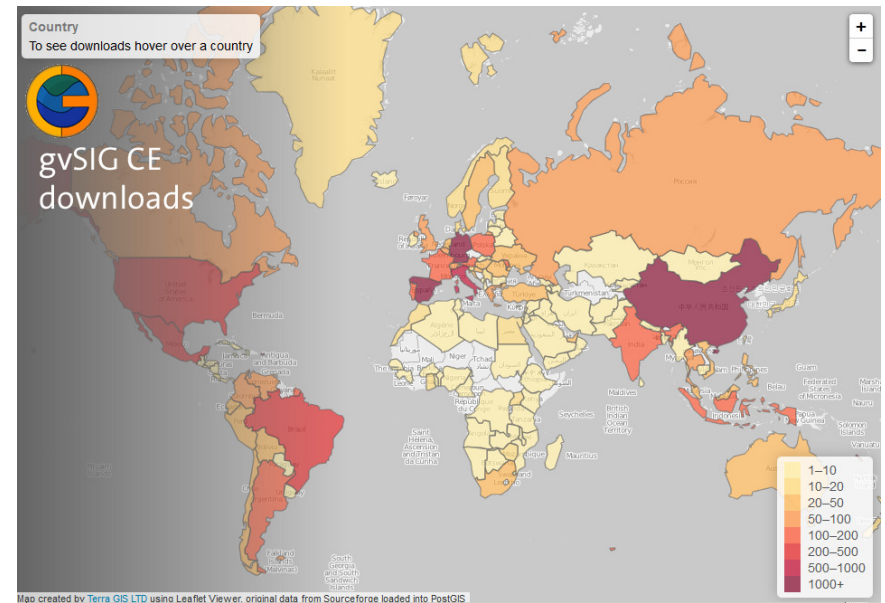
Web map layout types

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

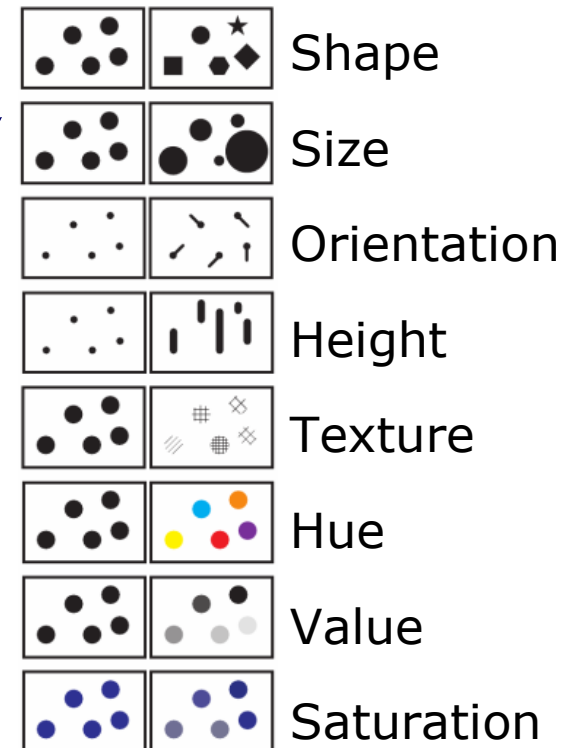
3. Goals of Map Communication

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,

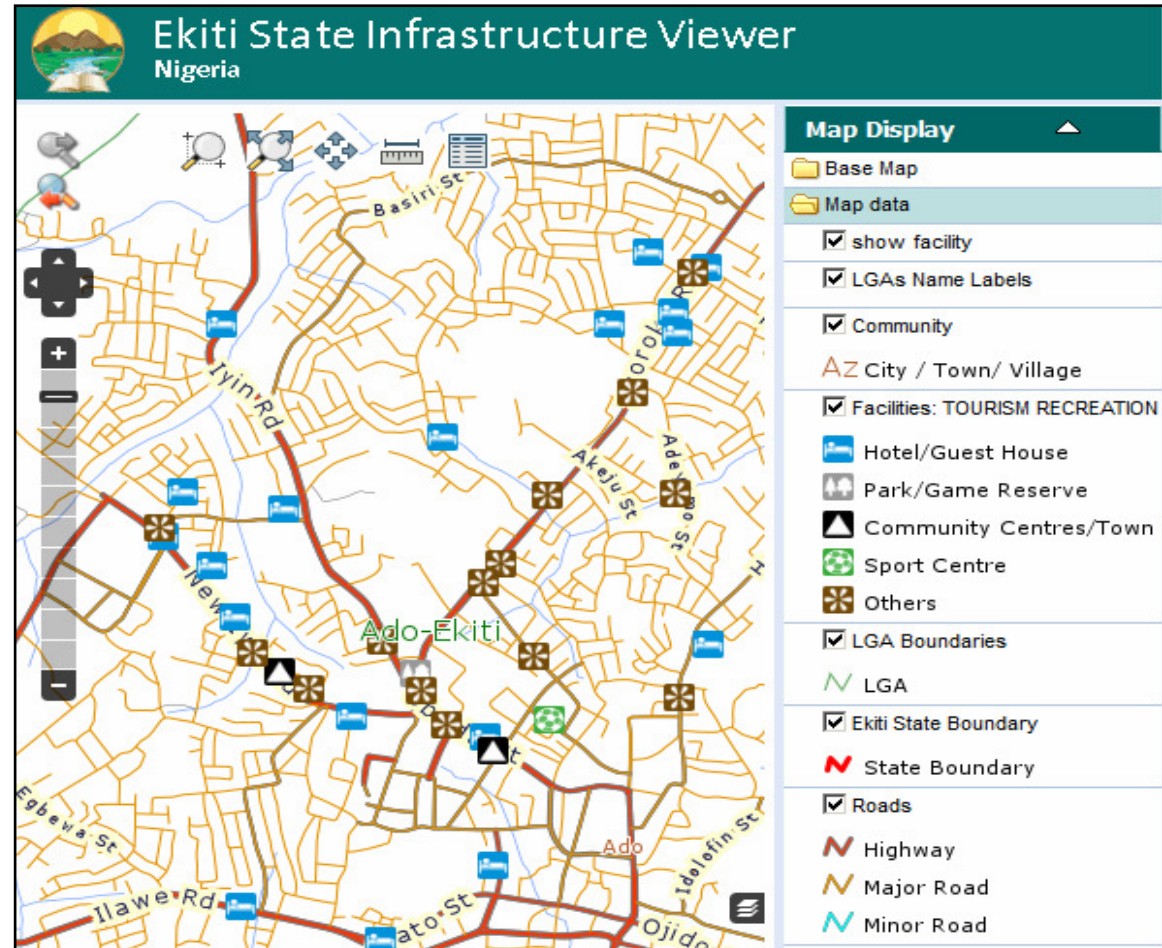
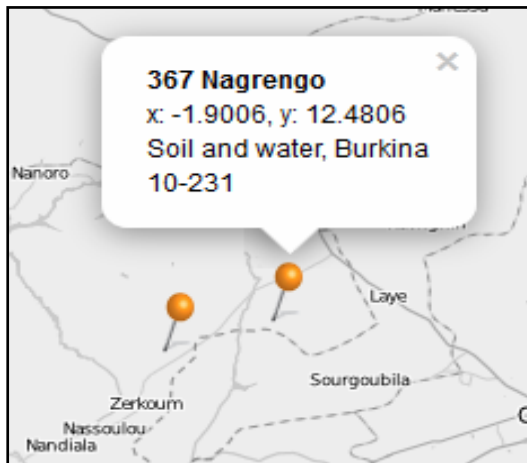
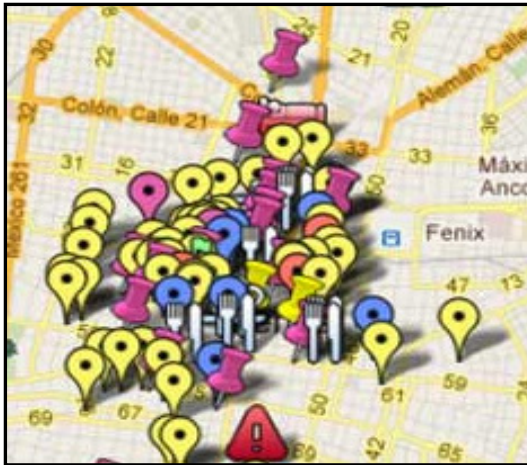
css style specifies font family

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~~ ~~With an~~ ~~Mapping~~ ~~Web~~ ~~2~~ ~~enabled~~ 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:

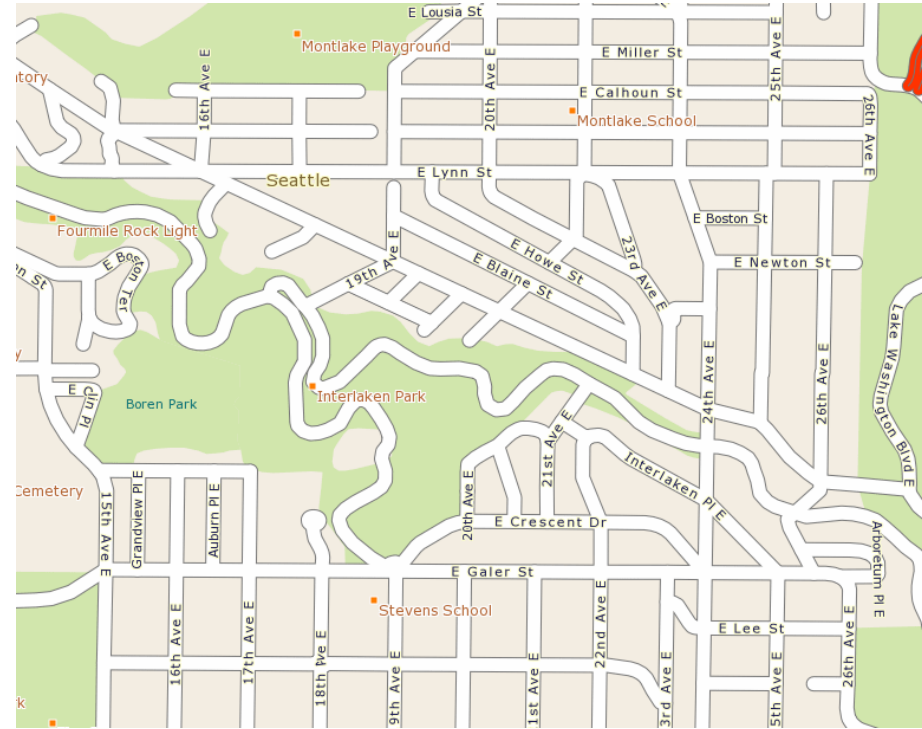
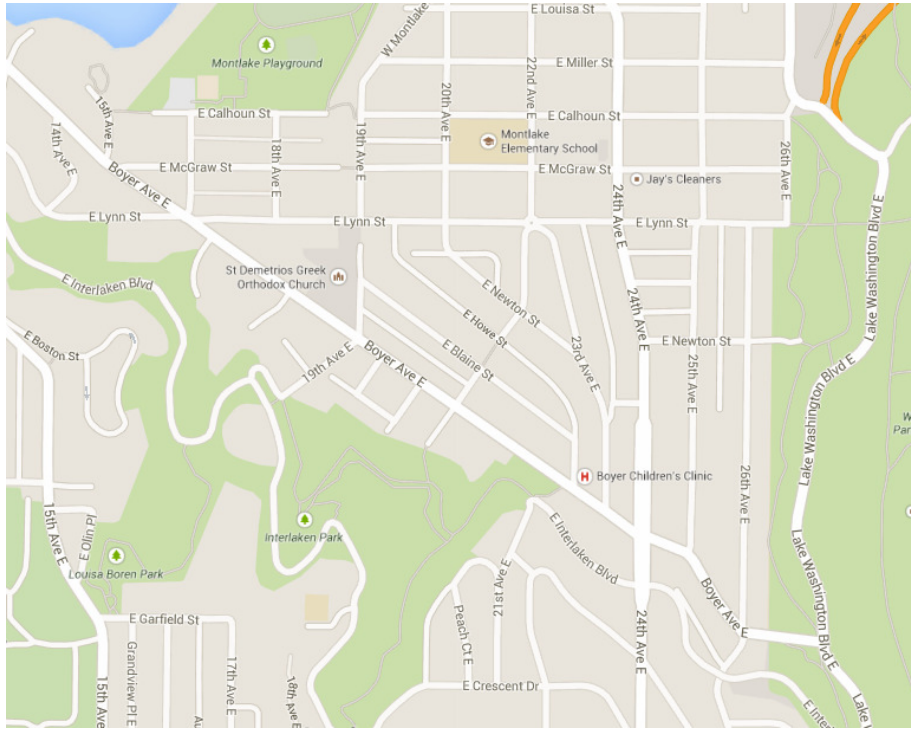
does color scheme match the communicative message?

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.**