

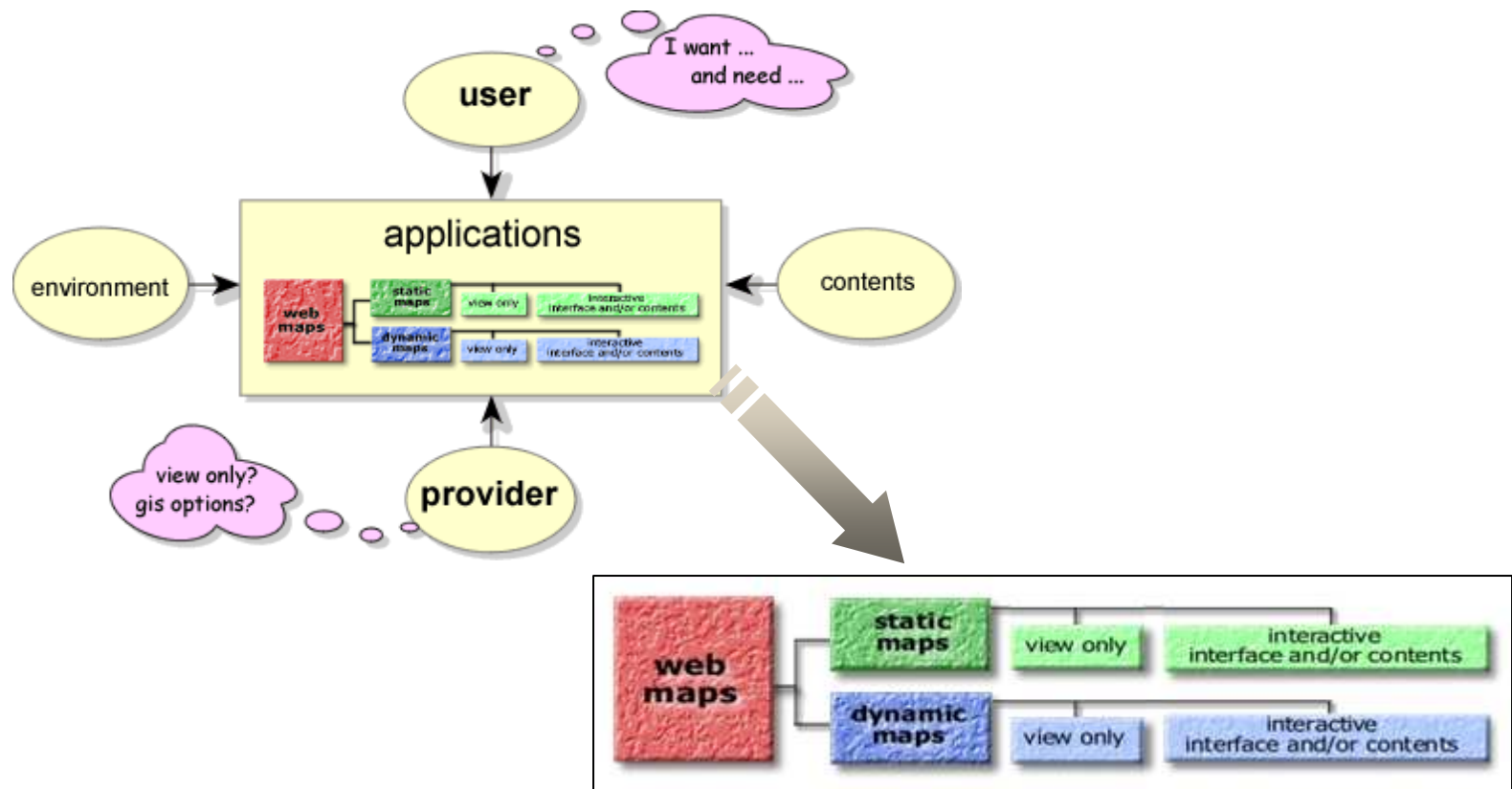
# EnvSci 360 – Computer and Analytical Cartography

## Lecture 9 *Web Mapping*



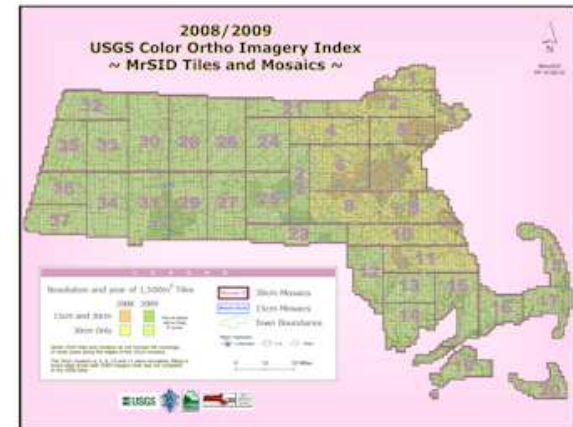
# Need for Web Cartography

## ✦ Current trend in map delivery

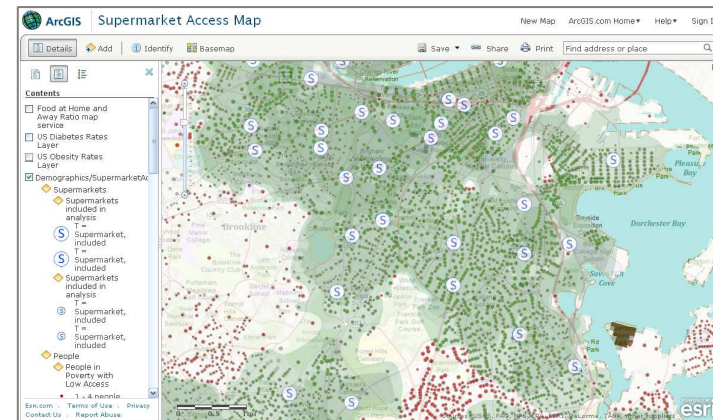


# Main Types of Web Maps

- ✦ Static images
  - Pre-made maps exported to web-compliant formats (JPG, PNG, GIF, PDF)
- ✦ Interactive/Dynamic applications
  - Similar to desktop platform maps
  - May include real-time data
  - May be customizable with JavaScript, Silverlight, Flash, etc.



<http://www.mass.gov/anf/docs/itd/services/massgis/coq2008-09-index.pdf>



<http://www.arcgis.com/home/webmap/viewer.html?webmap=153c17de00914039bb28f6f6efe6d322>

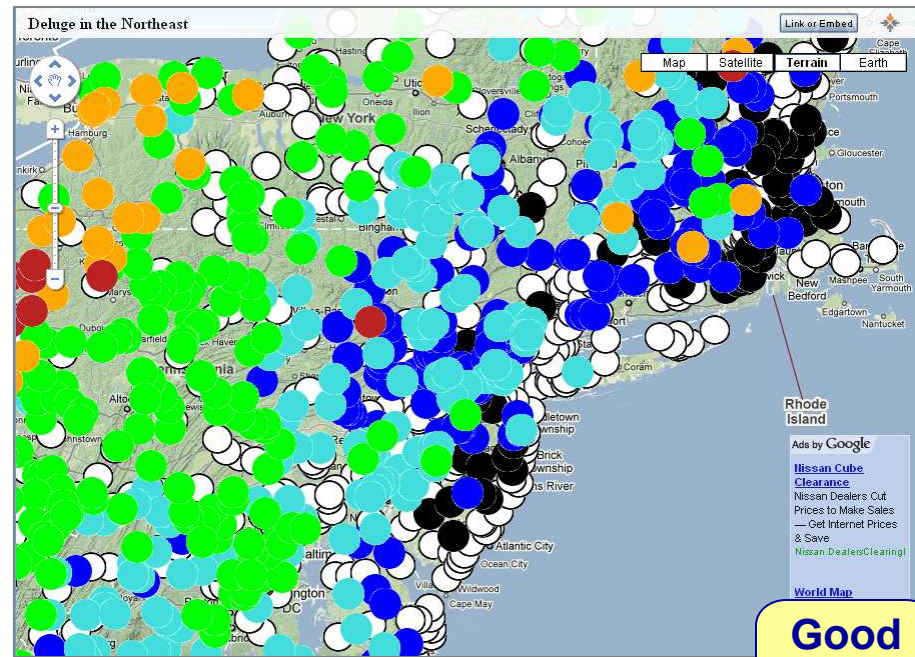
See <http://kartoweb.itc.nl/webcartography/webmaps/classification.htm>



# Cartography and Web Mapping

✦ You still have to follow the conventions and techniques used in “traditional” cartography – i.e., proper use of:

- Colors
  - Good contrast
- Labels
  - Easy to read
  - Often larger than on printed maps
- Symbolization
  - Can't be too complex



See <http://kartoweb.itc.nl/webcartography/webbook/ch07/ch07.htm>  
<http://www.esri.com/news/arcuser/0612/designing-great-web-maps.html>

# Cartography and Web Mapping

✦ You still have to follow the conventions and techniques used in “traditional” cartography – i.e., proper use of:

- Data classification
- Layout
  - Where to put legend and other marginalia?
- Scale
- Projections
- Etc. ...



See <http://gis.stackexchange.com/questions/3087/what-makes-a-map-be-classed-as-badly-designed>  
<http://cartastrophe.wordpress.com/>



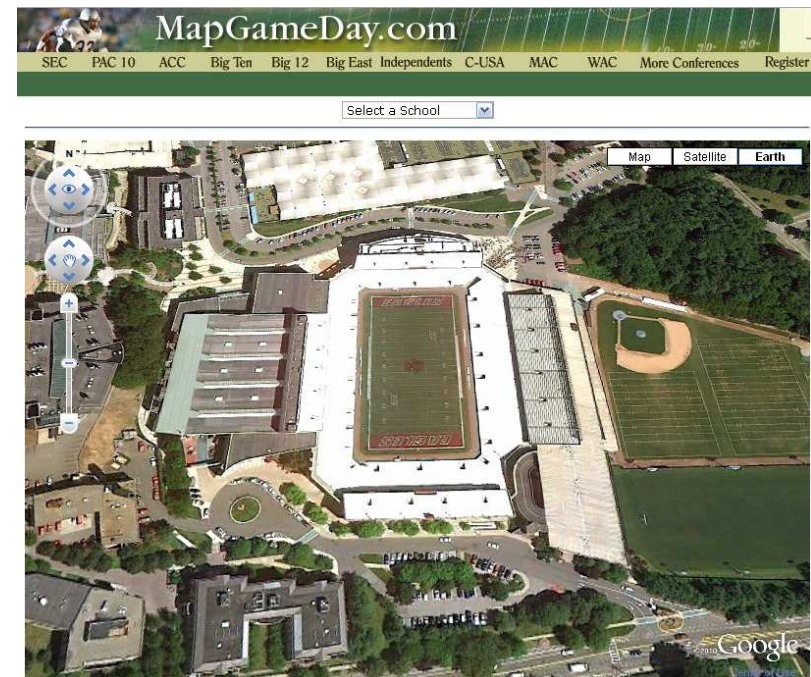
# Advantages of Web Maps

- ✦ Browser-based
  - Cross platform and multiple OS
  - Easy distribution
    - “let the user do the work”
- ✦ Can serve up-to-date, real-time data
  - Election results
  - Weather
  - Traffic
  - Tourism



# Advantages of Web Maps

- ✦ Interactive, dynamic nature
- ✦ Allow for collaboration and mash-ups
  - Combines content from more than one source into an integrated experience.
- ✦ Can use open standards (KML, JavaScript, e.g.) and free software (SketchUp, e.g. for 3-D mapping)
- ✦ Include hyperlinks
- ✦ Don't need to be printed





# *Disadvantages of Web Maps*

- ✦ Limited screen space
- ✦ Web access may be interrupted
- ✦ Bandwidth may be inadequate
- ✦ Data may be unavailable
- ✦ May require advanced programming skills
- ✦ Infrastructure and software may be costly
- ✦ Privacy concerns
- ✦ Hardware and network infrastructure may be insufficient



```
<script type="text/javascript"
src="http://serverapi.arcgisonline.com/jsapi/arcgis/?v=1.1"></script>
<script type="text/javascript">
dojo.require("esri,map");

var myMap, myTiledMapServiceLayer;
function init() {
  myMap = new esri.Map("mapdiv");

  myTiledMapServiceLayer = new
esri.layers.ArcGISTiledMapServiceLayer
("http://server.arcgisonline.com/ArcGIS/rest/services/ESRI_streetMap_world_20/MapServer");
  myMap.addLayer(myTiledMapServiceLayer);
}

dojo.addOnLoad(init);
</script>
```



# Example - Web Soil Survey

The screenshot displays the USDA Web Soil Survey interface. At the top, the USDA logo and "Natural Resources Conservation Service" are visible. The navigation bar includes links for "Contact Us", "Download Soils Data", "Archived Soil Surveys", "Soil Survey Status", "Glossary", "Preferences", "Logout", and "Help". The main content area is titled "Soil Data Explorer" and includes a "View Soil Information By Use:" dropdown menu set to "All Uses". Below this, there are tabs for "Intro to Soils", "Suitabilities and Limitations for Use" (which is active), "Soil Properties and Qualities", "Ecological Site Assessment", and "Soil Reports".

The "Suitabilities and Limitations Ratings" section is expanded, showing various categories with expand/collapse icons. The "Erosion Hazard (Road, Trail)" category is selected, and the "View Rating" button is visible. Below this, the "View Options" section is partially visible.

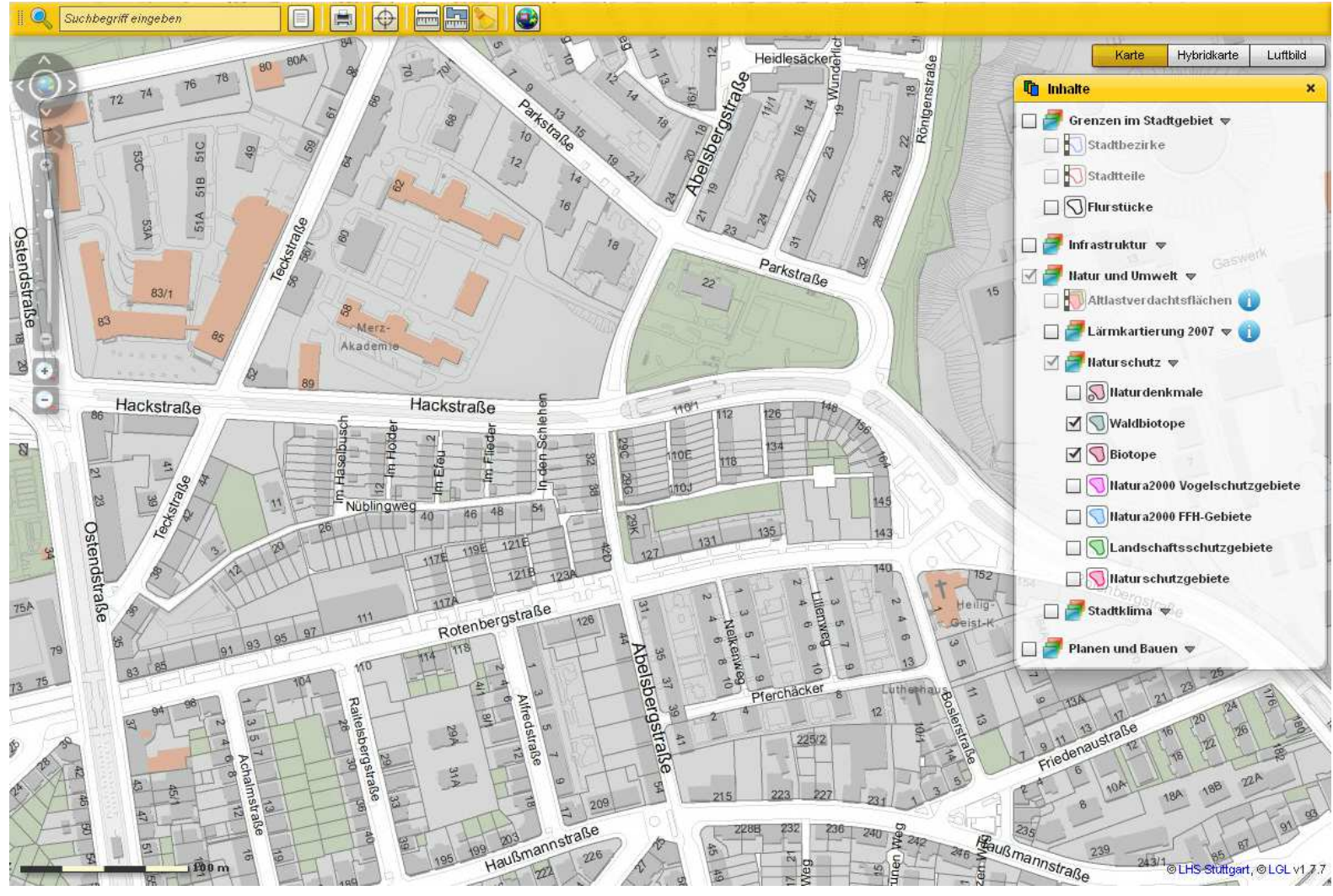
The central map, titled "Map - Erosion Hazard (Road, Trail)", shows a topographic map with color-coded erosion hazard levels. A scale bar indicates 2558ft. The map legend on the right side of the interface includes the following items:

- Area of Interest (AOI)
- Area of Interest (AOI)
- Soils
  - Soil Survey Areas
  - Soil Map Units
  - Soil Ratings
    - Very severe
    - Severe
    - Moderate
    - Slight
    - Not rated or not available
- Special Point Features
- Special Line Features
- Political Features
  - States
  - Counties
  - Urban Areas
  - Cities
  - Postal Code
  - PLSS Township and Range
  - PLSS Section
  - Local Land

<http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>

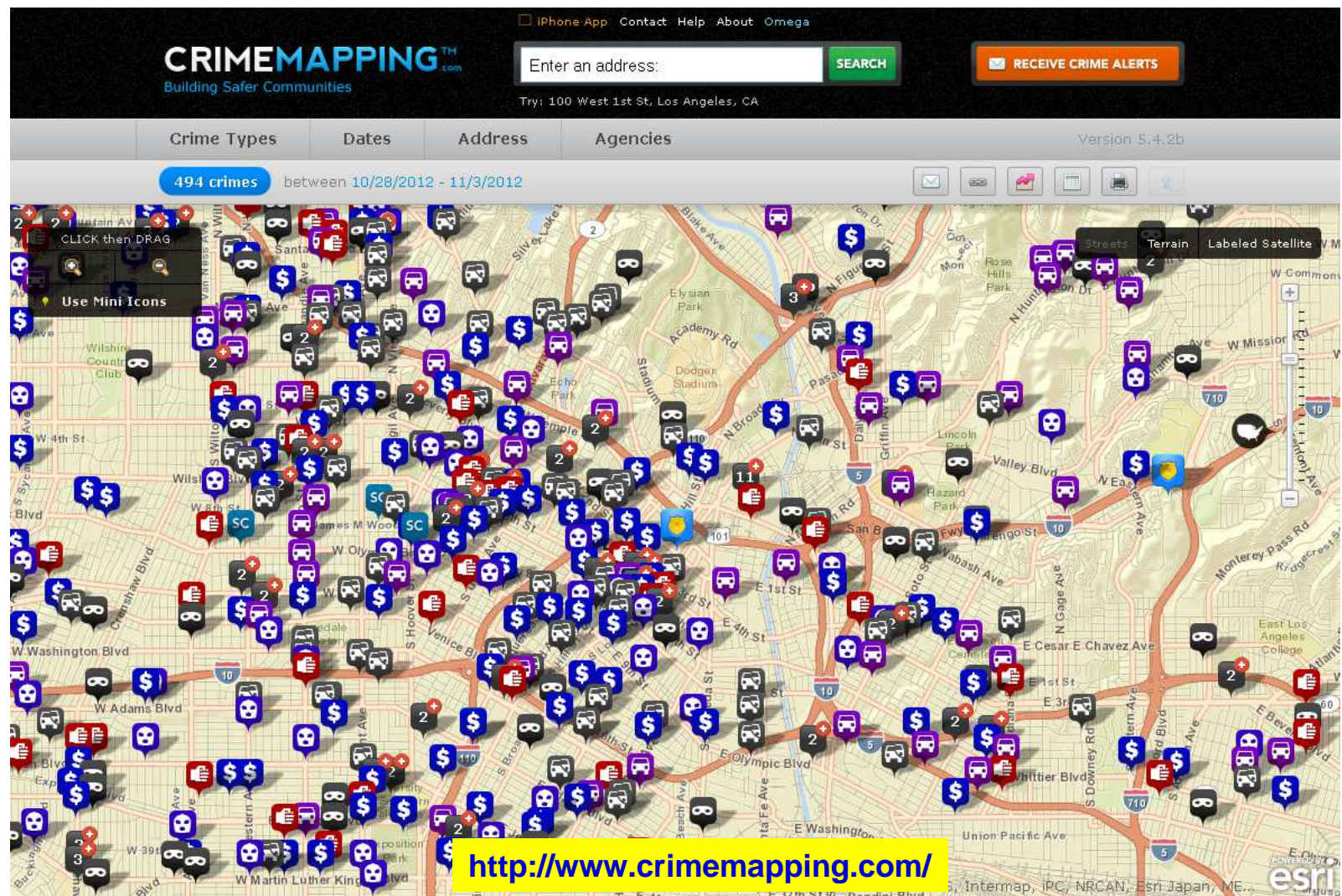


# Example - City of Stuttgart



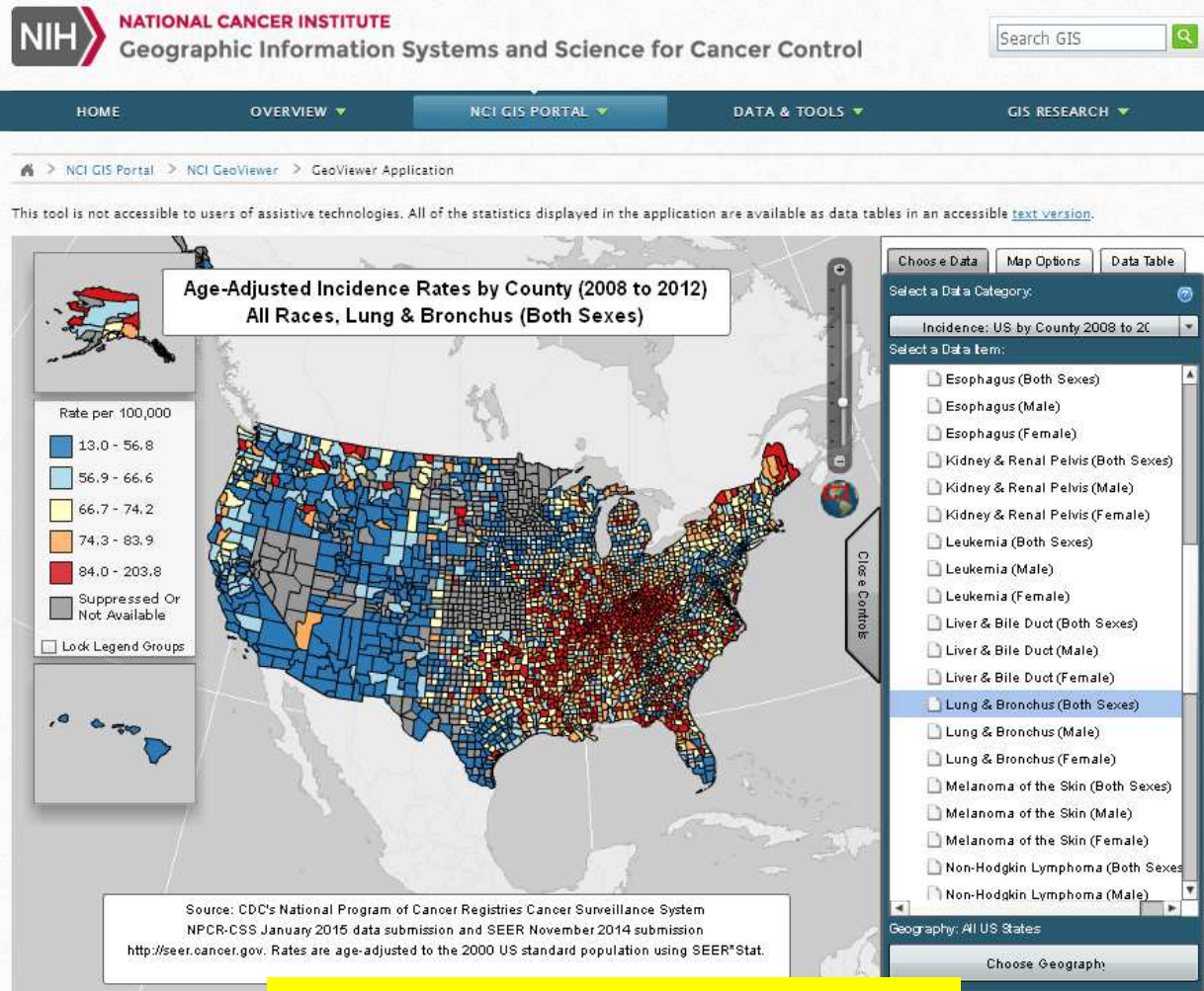


# Example – Crime Mapping





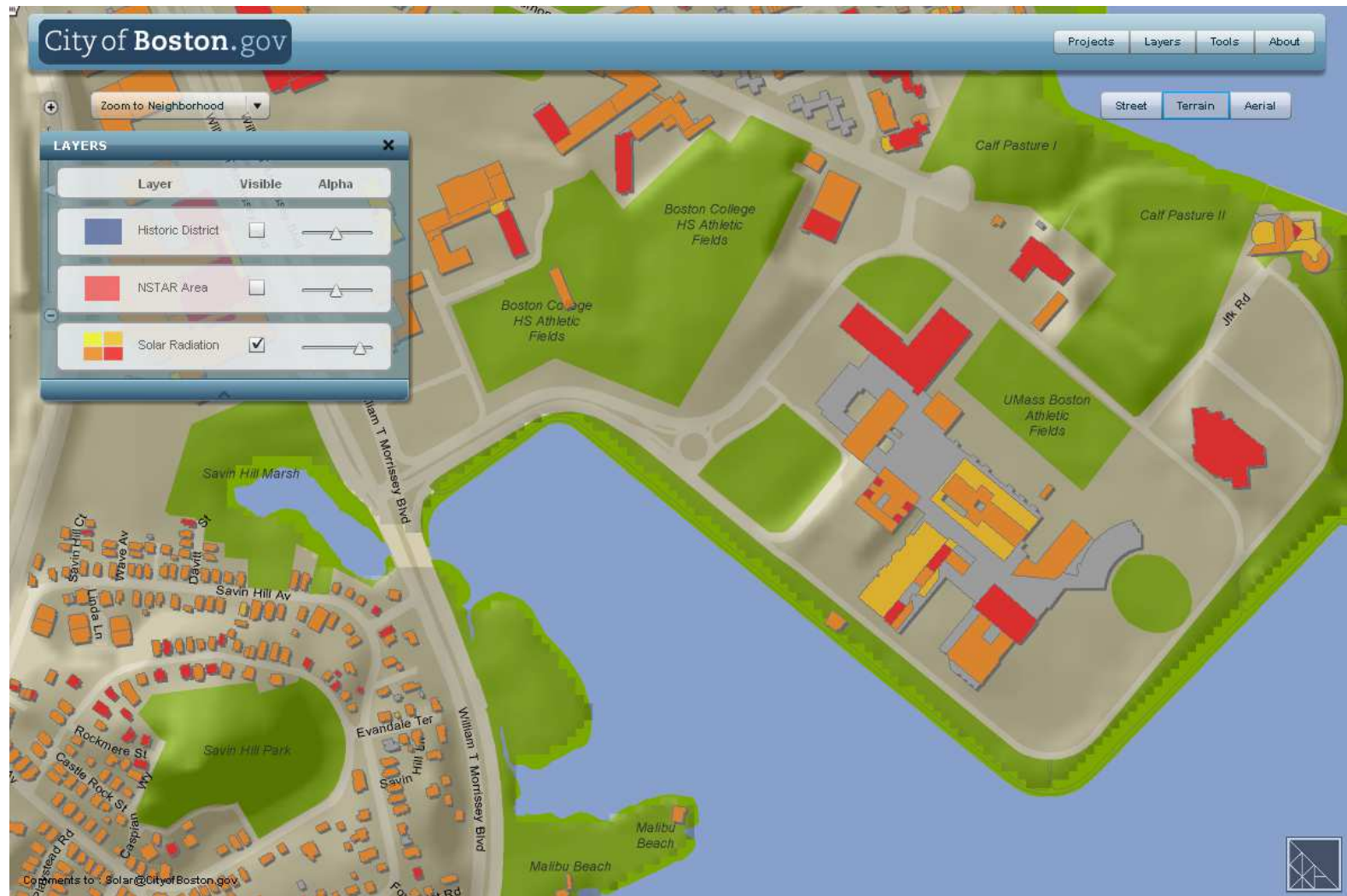
# Example – Disease Mapping



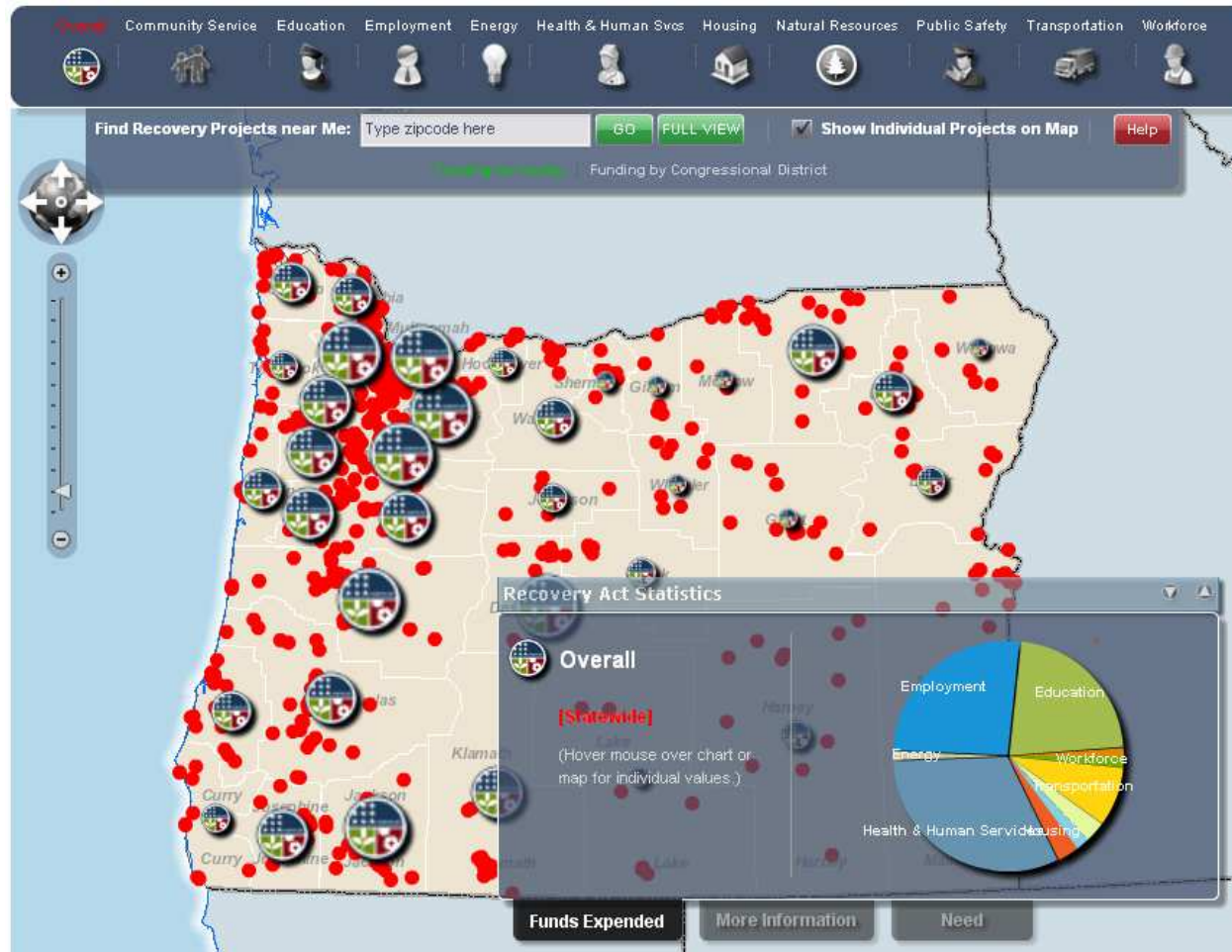
<https://gis.cancer.gov/geoviewer/app/>



# Example – Renew Boston Solar



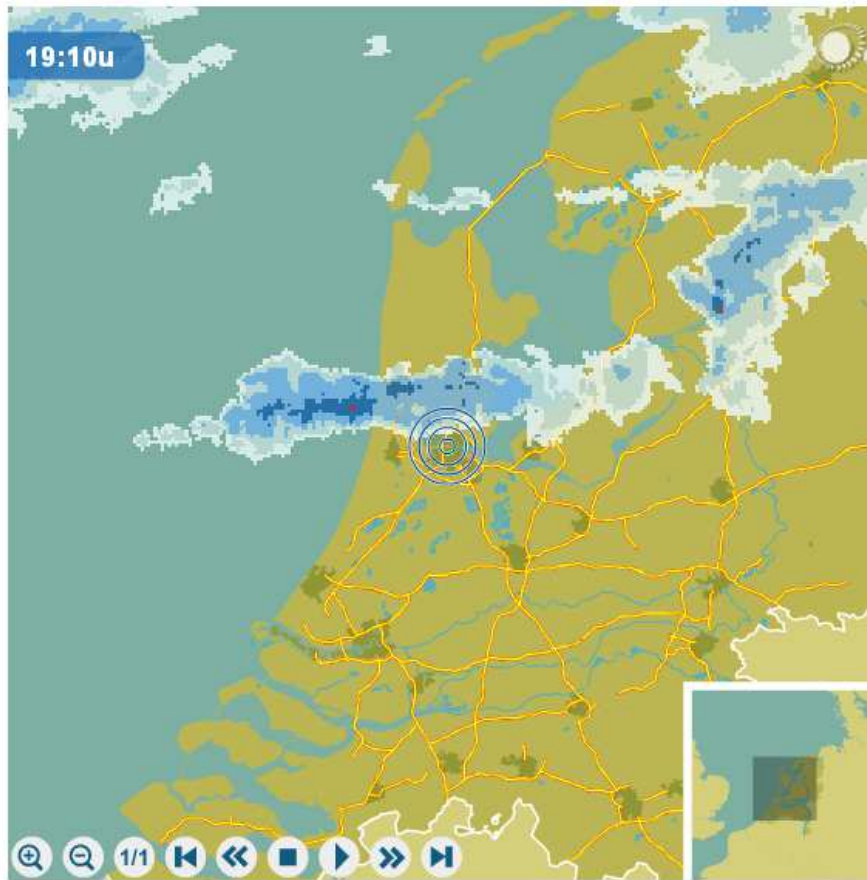
# Example – Recovery Act in Oregon





# Example – Netherlands Weather

Regen Radar Amsterdam Vind ik leuk 0



Bekijk de regenradar in jouw plaats

- Actueel
- Laatste uur + 2 uur
- Laatste 24 uur

Buienverwachting in Amsterdam



Neerslag (mm/uur)

- |           |         |
|-----------|---------|
| 0.1 - 0.3 | 3 - 10  |
| 0.3 - 1   | 10 - 30 |
| 1 - 3     | > 30    |



<http://www.weeronline.nl/regenradar/Amsterdam/4058223>

# Keys to Good Web Maps

- ✦ Simple, intuitive design – don't make it look like a GIS
- ✦ Properly-sized labels and features
- ✦ Distinguishable colors
- ✦ Remember to include supporting elements
- ✦ Caching for speed
- ✦ **Scale limits**
  - **Layers**
  - **Labels**

**Often, you design a web map to be displayed at specific scales**



Images from <http://maps.google.com>



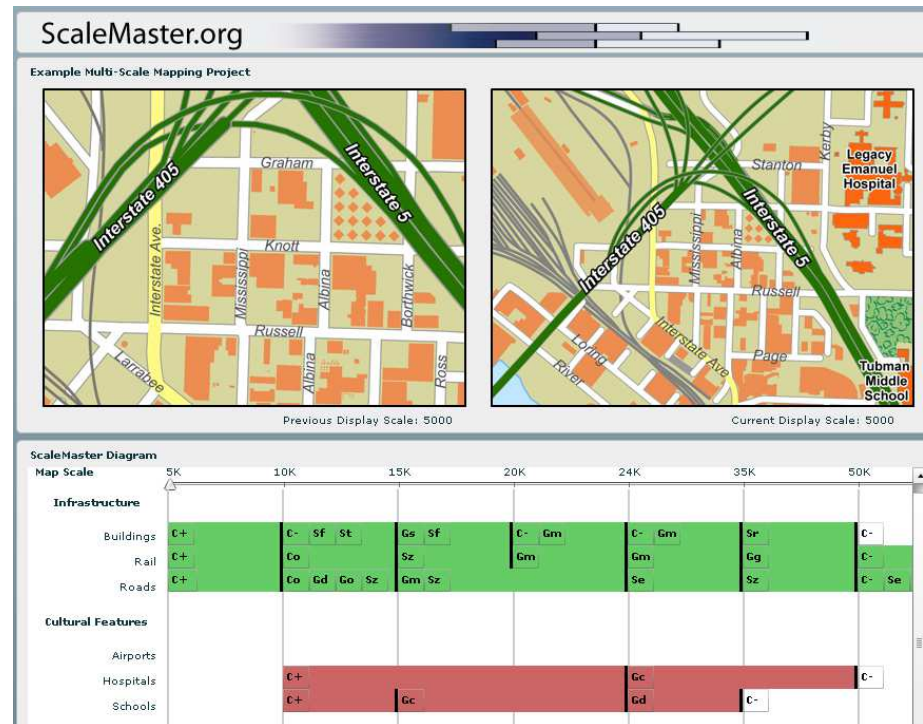
# Choosing Web Map Colors

- ✦ You can use the ColorBrewer site to view color schemes that are friendly for CRT and LCD devices
  - <http://colorbrewer2.org>

The screenshot displays the ColorBrewer website interface. On the left, a panel shows color selection options: 'cmyk', 'rgb', 'hex', 'Lab', and 'AV3'. Below these are icons for different devices: a monitor (checked with a red checkmark), a printer (checked with a red checkmark), a laptop (checked with a red checkmark), a tablet (unchecked), and a smartphone (unchecked). A 'color specs' button and a 'print' button are at the bottom of this panel. The main interface shows 'number of classes' set to 5, 'legend type' set to 'qualitative', and '5-class qualitative Paired' selected. A map visualization shows a geographic area divided into five colored regions: light blue, dark blue, light green, dark green, and pink. The bottom of the interface has controls for 'map zoom', 'map borders' (on), 'city symbols' (on), 'road network' (on), and 'background color' (white, black).

# Guide to Scale and Mapping

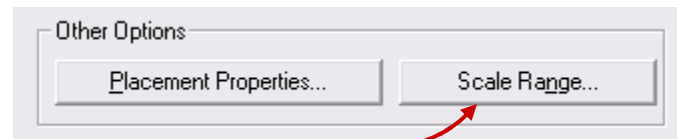
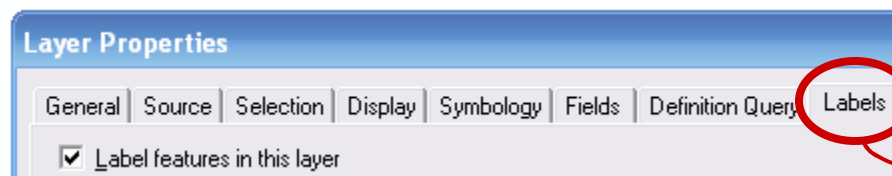
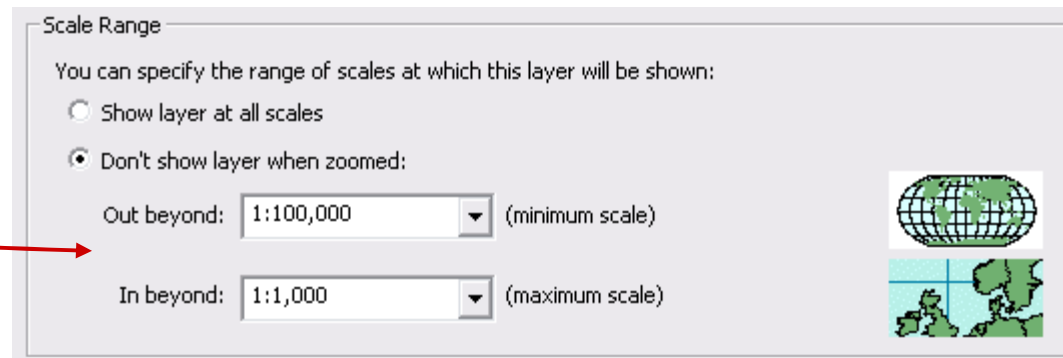
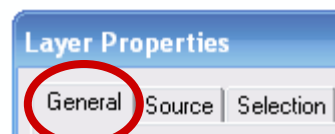
- ✦ You can use the ScaleMaster site to see how different features look at different scales
  - <http://www.personal.psu.edu/mzs114/ScaleMaster/ScaleMasterv0.html>





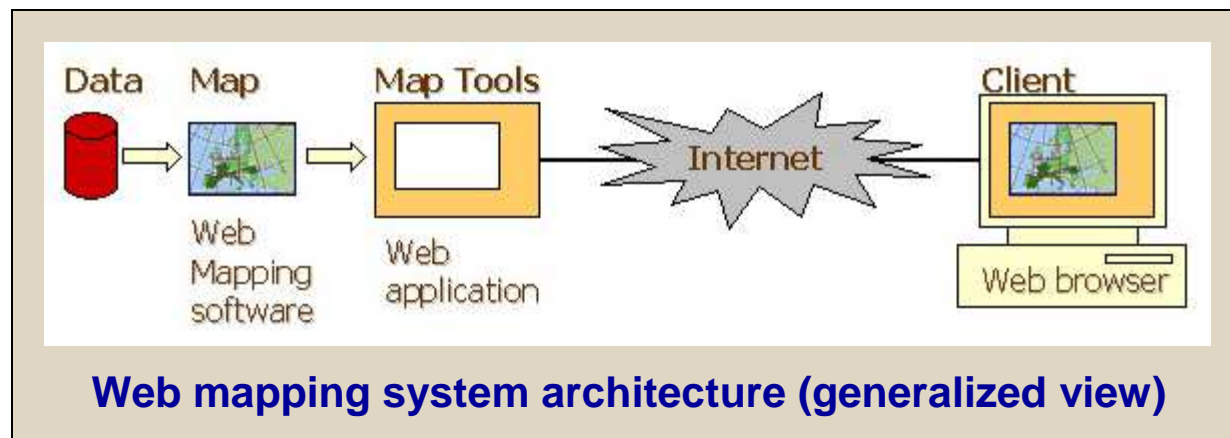
# Scale Limits in ArcMap

- ✦ Set maximum and minimum scale thresholds for both layers and labels (i.e., at what scale will these first appear on your map) – **carry over in ArcGIS Server published maps**
  - May require you to use different versions of a layer and label classes, all based on scale



## ***Behind the Scenes – Dynamic Web Mapping***

- ✦ Data
- ✦ Mapping software (ArcGIS Server, GeoServer, etc. ...)
- ✦ Application code (provides tools)
- ✦ Network (Internet or intranet)
- ✦ Client (browser, other software)



From <http://www.territorial-intelligence.eu/index.php/eng/What%27s-new/Editorials/caENTI-Interactive-Map-%E2%80%93-application-of-the-web-mapping-technology-in-socio-economic-studies>

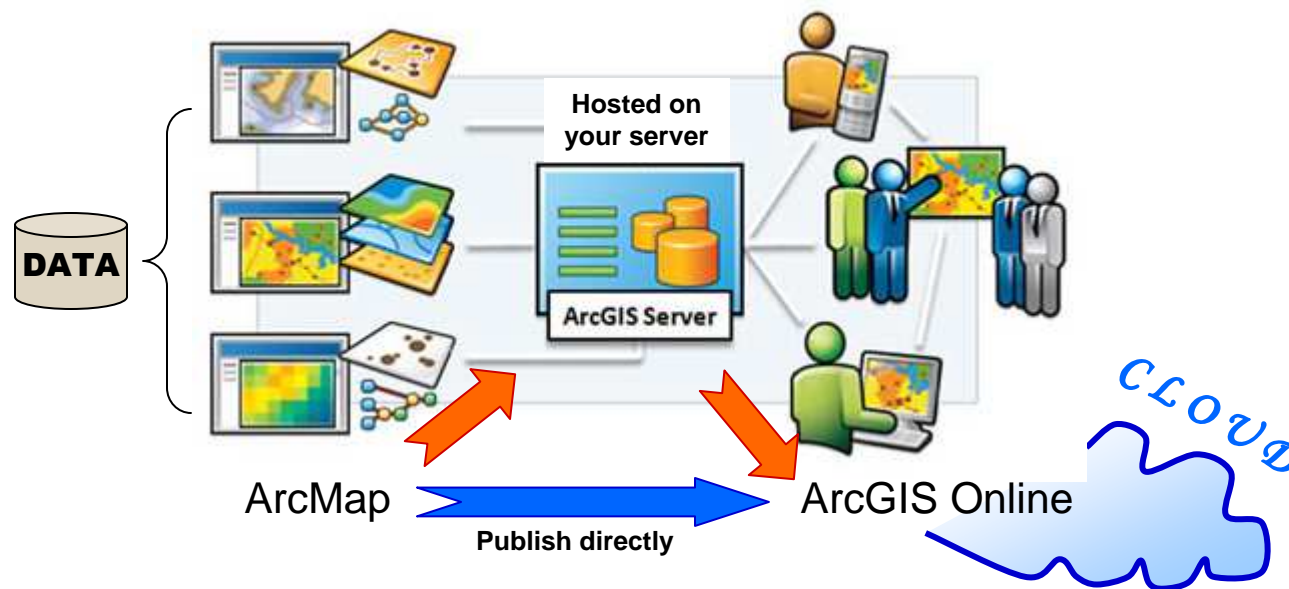
See <http://kartoweb.itc.nl/webcartography/webbook/ch06/ch06.htm>



# ESRI and Web Mapping

## ✦ ArcGIS for Server (aka "ArcGIS Server")

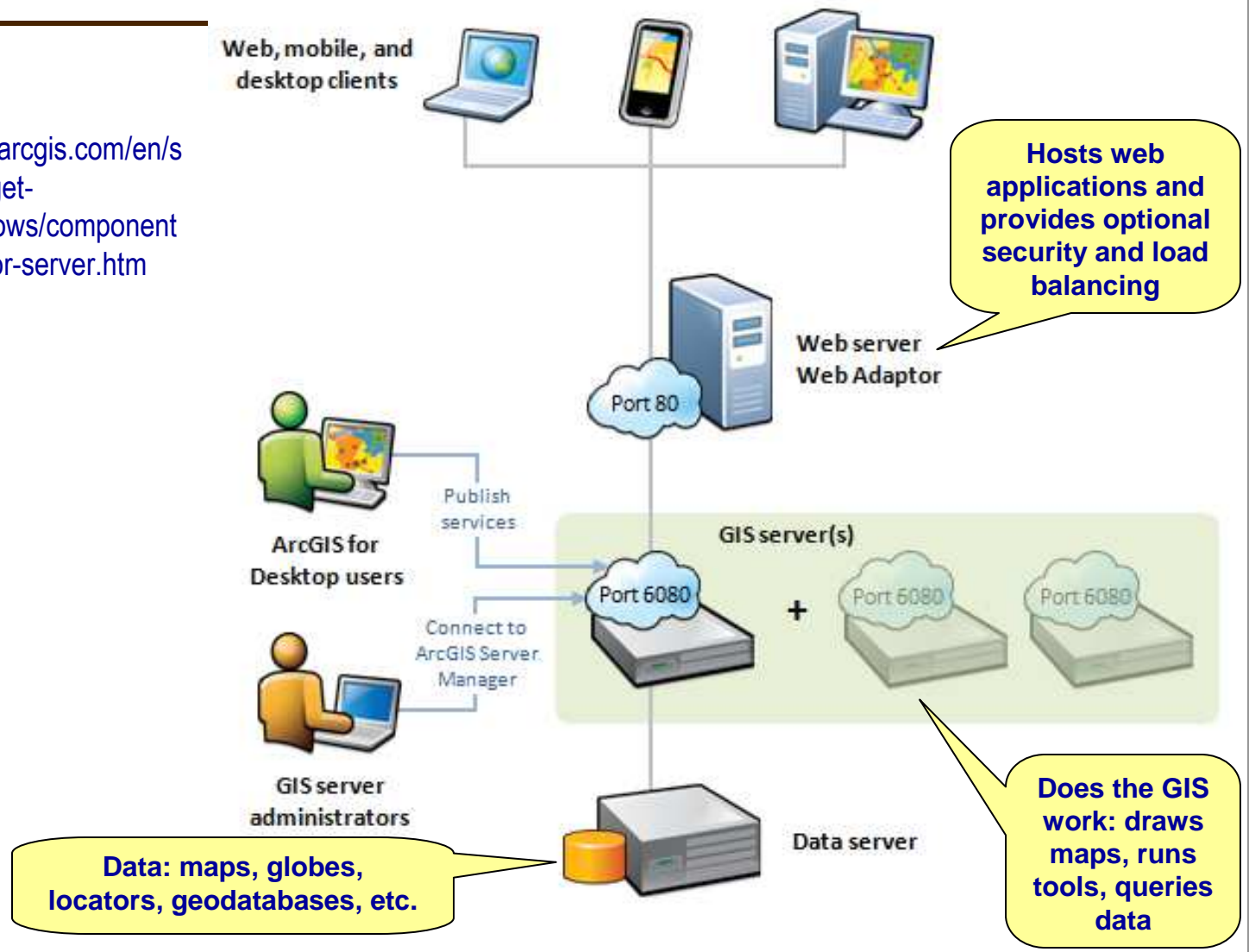
- ESRI software gives you the ability to create, manage, and distribute GIS services over the Web to support desktop, mobile and Web mapping applications.
  - <http://server.arcgis.com/en/server/latest/get-started/windows/what-is-arcgis-for-server-.htm>



# ArcGIS Server

<http://server.arcgis.com/en/server/latest/get-started/windows/components-of-arcgis-for-server.htm>

## ArcGIS Server site architecture





# ***ESRI and Web Mapping***

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## **ArcGIS Online, according to Esri:**

- Cloud-based geospatial content management system for storing and managing maps, data, and other geospatial information. Built on Esri's cloud infrastructure, it gives you access to geographic content shared and registered by Esri and GIS users around the world.
- A website for working with maps and other types of geographic information. (C)reate maps; find and use maps, applications, and tools; edit data; and share maps and applications with others.

<http://doc.arcgis.com/en/arcgis-online/reference/what-is-agol.htm>

<http://www.esri.com/software/arcgis/arcgisonline>

<http://www.arcgis.com/features/index.html>

# ***ArcGIS Online***

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- ✦ Organizational accounts
  - Users, groups
- ✦ Web maps, apps, templates
- ✦ Map services, feature services, image services
- ✦ Caching; tiled maps
- ✦ [massgis.maps.arcgis.com](http://massgis.maps.arcgis.com)
- ✦ [umb.maps.arcgis.com](http://umb.maps.arcgis.com)



# Open Source Web Mapping

## ✦ Example: MassGIS' **OLIVER**



- Browser-based viewer
- Written in Java
- Uses GeoServer as map server, with ArcSDE data
- Users can mix and match datasets and export/download shapefiles
- [http://maps.massgis.state.ma.us/map\\_ol/oliver.php](http://maps.massgis.state.ma.us/map_ol/oliver.php)



# *Other Resources*

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- ✦ <https://carto.com/>
- ✦ Importing GIS data into Google Earth
  - [http://earth.google.com/outreach/tutorial\\_importgis.html](http://earth.google.com/outreach/tutorial_importgis.html)
- ✦ SketchUp
  - <http://www.sketchup.com/>
- ✦ Web Cartography
  - <http://kartoweb.itc.nl/webcartography/webbook/index1.htm>
- ✦ Open Source Web Mapping Links -  
<http://www.maptools.org/>