Internet GIS and Geospatial Web Services

- Introduction
- Section 1 -- What is Internet GIS?
- Section 2 -- Internet GIS: state of practice
- Section 3 -- Future development of Internet GIS
- Section 4 -- Function comparisons of current Internet GIS programs
- Section 5 -- Internet GIS applications
- Section 6 – Issues in the Development of Internet GIS

These Internet GIS lecture slides for the MIT class 11.520/11.188 were originally developed by Prof. Joseph Ferreira (MIT) and Prof. Zhong-Ren Peng (UW-Milwaukee) and used as one part of the URISA Internet GIS Workshop (Vancouver, 2006). They were modified/augmented for Fall 2006-2008 for use at MIT by Professors Mike Flaxman and Joe Ferreira.

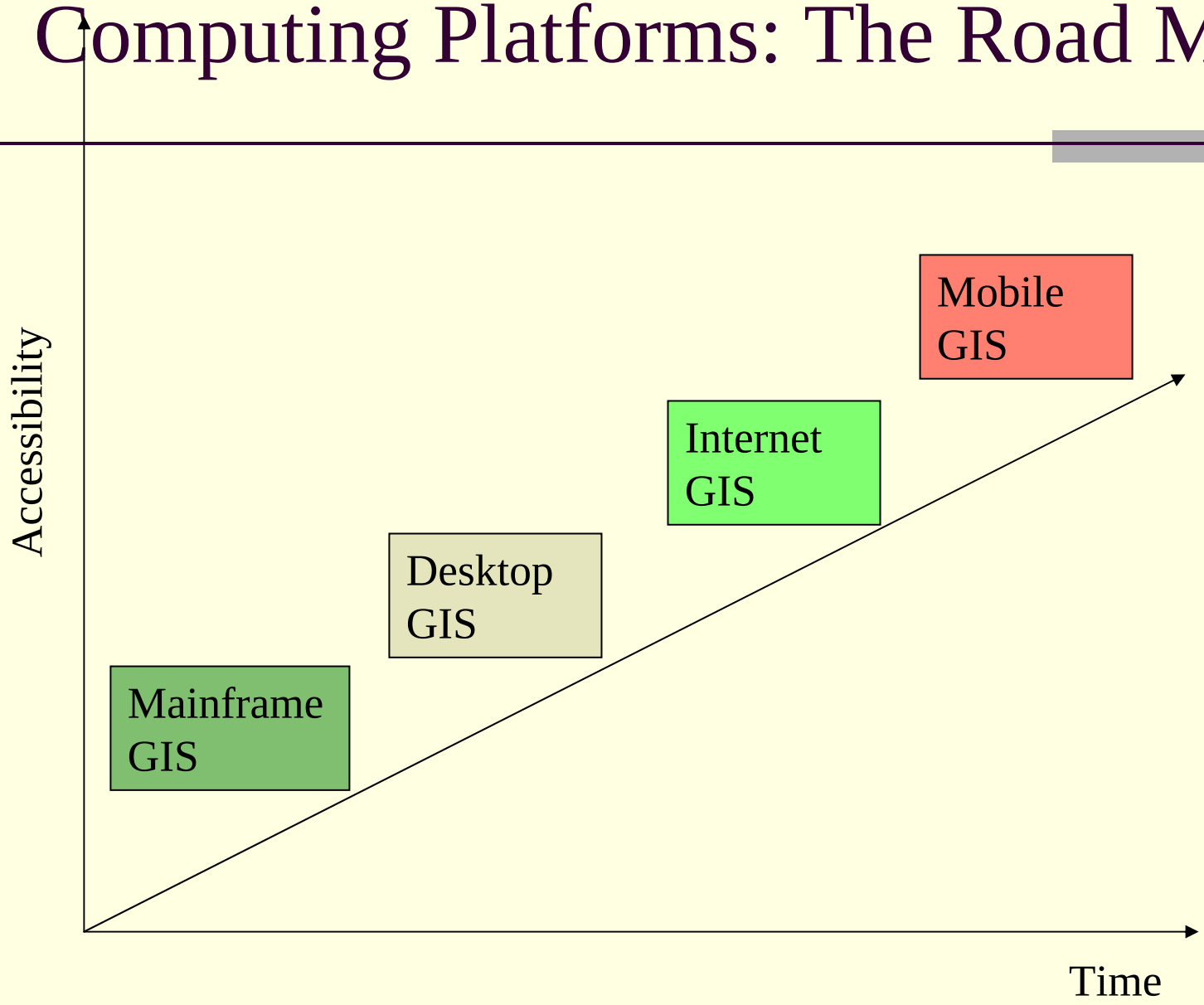
Session Objectives

- Become familiar with some existing Internet GIS applications in city, county and state governments.
- Examine Some National & International GIS Services which provide useful “base data”
- Look critically at services/methods being proposed

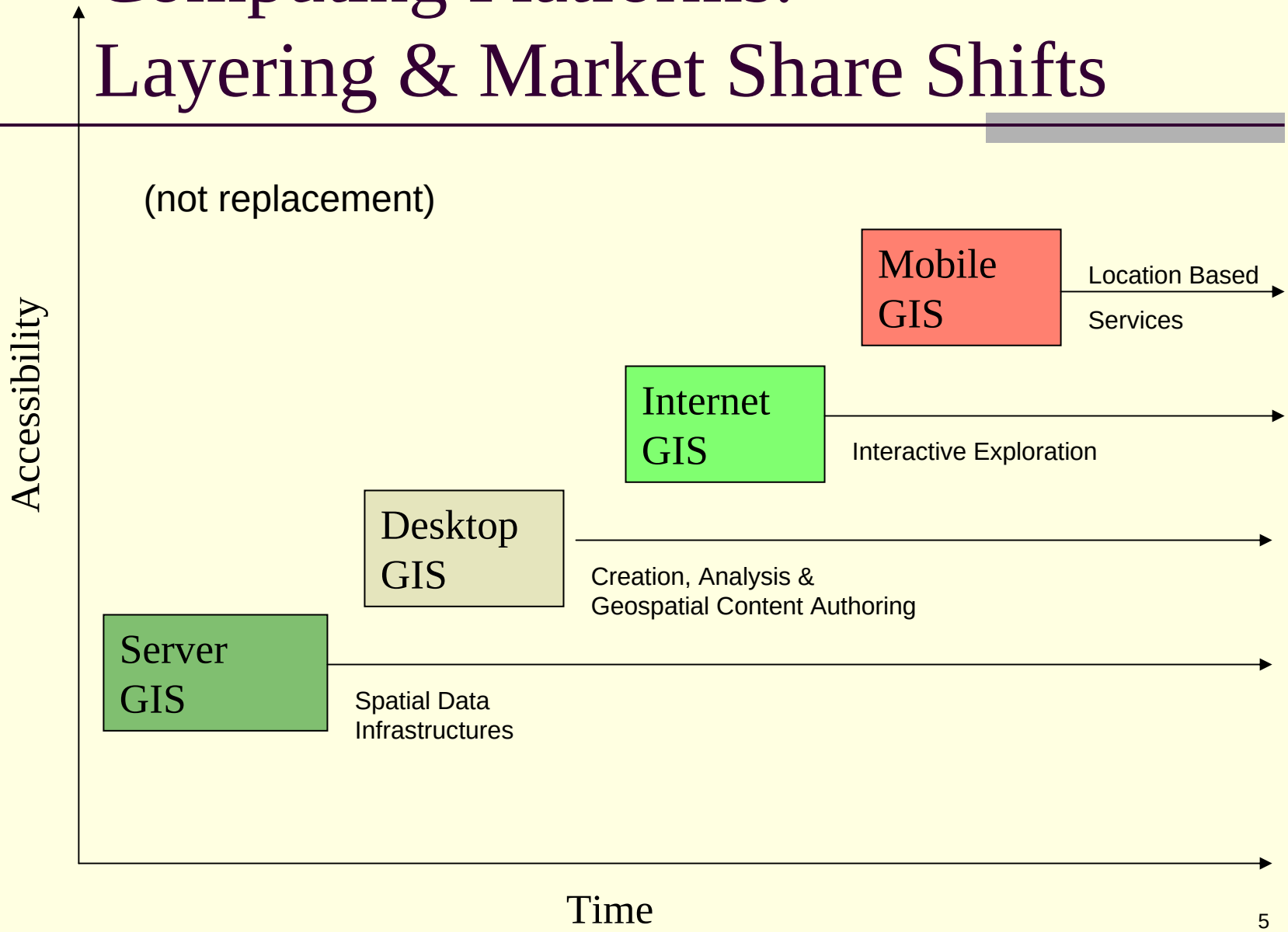
Types of Internet GIS Applications

- Data Sharing and disseminations;
  - Raw GIS data, requires installed software & expertise to use
- Geospatial Information Sharing and publishing
  - Often includes cartographic representations
  - Can produce single purpose human-readable images
- Web Data Services
  - Produce machine-readable geospatial information
- Distributed Analysis Functions (GIS Anywhere);
- Interoperable GIS Web Services (GIS Anyone Anywhere).

Computing Platforms: The Road Map



Computing Platforms: Layering & Market Share Shifts



Computing Architecture Issues: Internet GIS Interfaces

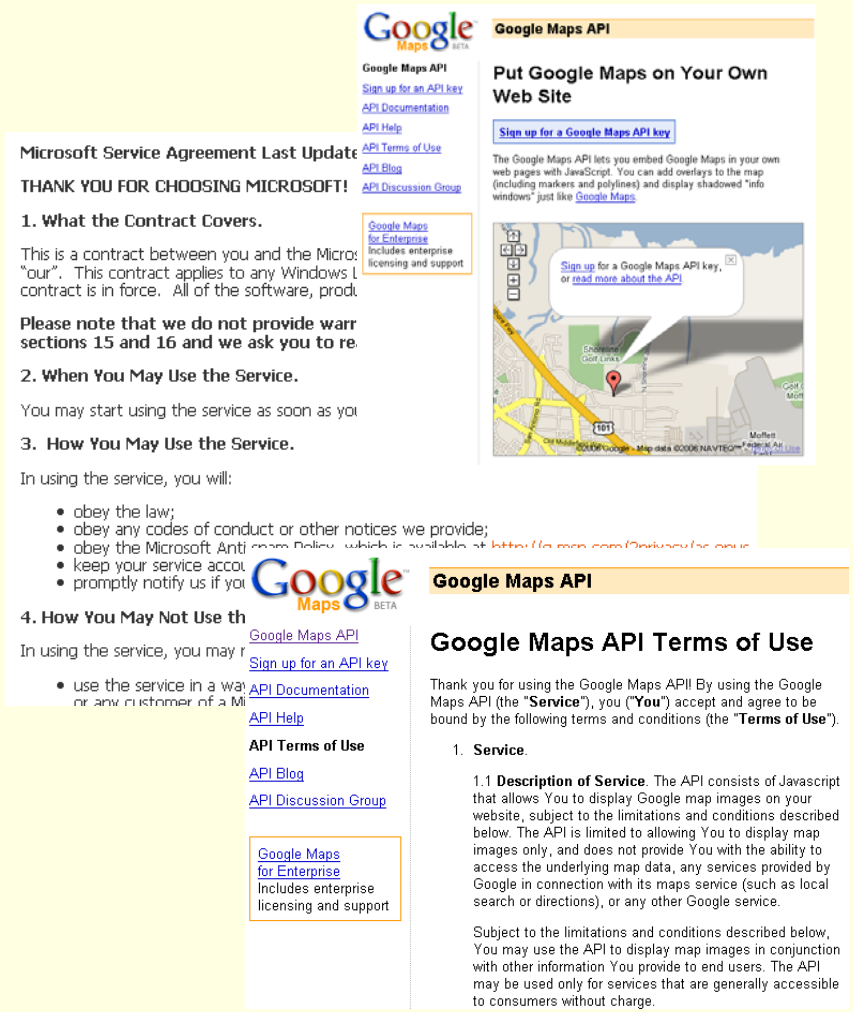
- Single User Interfaces
  - Isolated User
  - User as Part of Enterprise GIS
  - User as Part of Cybershere
- Groupware
  - Multiple users, one location
  - Multiple distributed users

Computing Architecture Issues: Openness to…

- Modification of System
- Use / Repurposing of Data
- Comment / Markup of Data
- Data Editing

Computing Architecture Issues: Openness to…

- Modification of System
  - Closed / Proprietary
  - Semi-open / Public API
  - Open Source – noncommercial use only
  - Open Source – allowing commercial uses



Computing Architecture Issues: Openness to

- Repurposing of Data
  - Flattened image or graphics (picture of a map)
  - Georeferenced Imagery
  - Layer visibility control
  - Layer symbolization control
- Examples
  - Re-use of Google Earth imagery (only allowed in their context)
  - Map layers with fixed opaque backgrounds

Computing Architecture Issues: Types of Geospatial Data

- Vector Features
- Raster (Gridded) Data
- Geo-associated Database Records
- Imagery
- Metadata
- Perspective Views
- Geotagged Photos
- Streaming Position Data

Computing Architecture Issues: Standards for Geospatial Data

- For many years, proprietary data formats most common
- Two issues
  - Vendor interest in capturing/maintaining users
  - Efficiency in operation
    - Often by having data formats mirror internal structuring
    - Vendors provide “value added” in software, but then need means to “persist” data associated with those features

Computing Architecture Issues: Standards for Geospatial Data

- Many government standards attempted
  - Some “de facto” such as USGS Digital Elevation Models (DEM), TIGER line files
  - Some more formal – National Spatial Data Transfer Standard
  - Generally ended up being either
    - Too specific
    - Too unweildy
- Lead to Public/Private Partnership Approach
  - Resulting in Federal Geographic Data Committee
  - Increased interest in open interoperability standards

Computing Architecture Issues: Standards for Geospatial Data

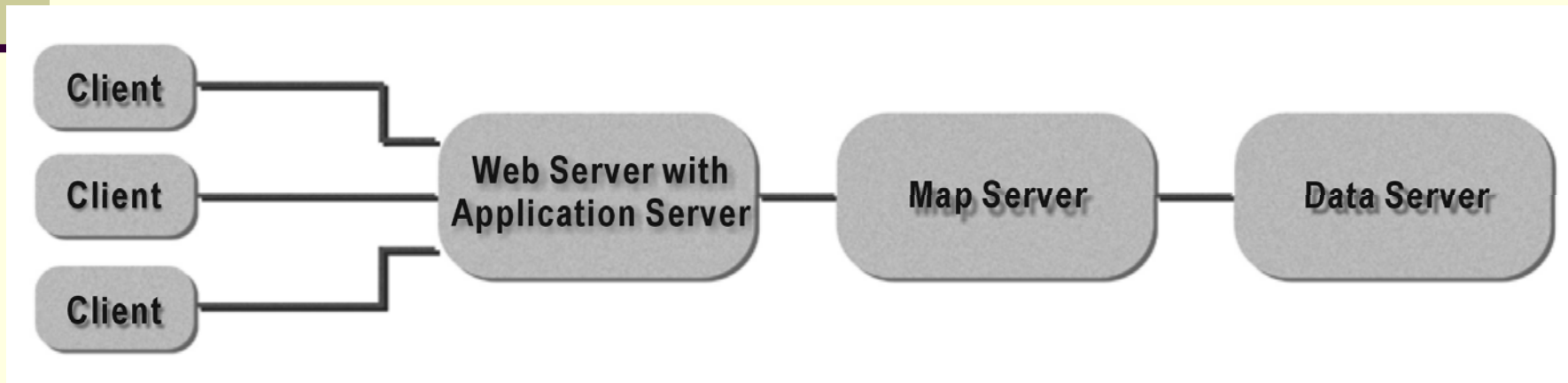
- Vector Features
  - “Simple Features” specification (2D points, lines, polys)
  - Geographic Markup Language (GML)
- Raster (Gridded) Data & Imagery
  - GeoTIFF (geographically tagged TIFF images)
  - JPEG2 (includes GML metadata)
- Geo-associated Database Records
  - SQL + Simple Features
- Metadata
  - Federal Geographic Data Committee Standards (FGDC)

Computing Architecture Issues: Standards for GeoData Transfer

- Rendered Maps
  - Web Mapping Service (WMS)
- Vector Features
  - Web Feature Service (WFS) for Read-Only
  - Web Feature Service – Transactional (WFS-T) for Read/Write
- Raster (Gridded) Data & Imagery
  - Web Coverage Service (WCS)
- Perspective View
  - Web Terrain Service (WTS) [– bad name!]

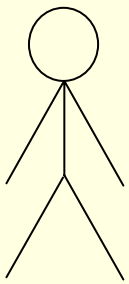
Client/Server

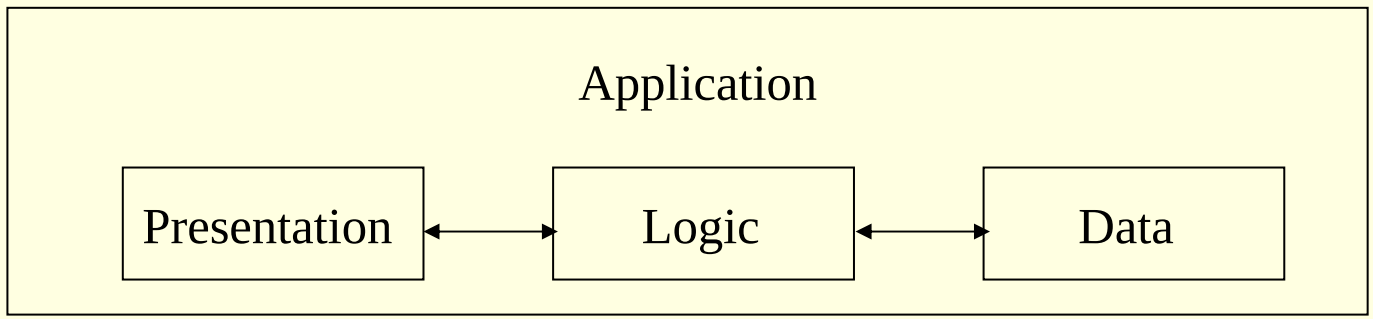
- System that divides processing between client (desktop) and server.
- Client (desktop) requests data, server only transmits the result of the request, not the entire file.



Components of Client/Server Systems

- **Client**,
- **Middleware (optional - the glue)**
- **Server**.





The Client

The Client has three functions:

- Presents an interface to the user.
- Formats requests for data.
- Displays data it receives from the server.

The Server

- Provides shared resources, such as databases or applications, that can be connected to multiple clients.

- It has three functions:
  - receives the structured requests from the clients;
  - processes them;
  - sends the results back to the client;

The Middleware

- Middleware is software that connects dissimilar applications and enables them to communicate and exchange data.
- *Middleware* sometimes used to translate between different communication protocols
- Also used to enhance scalability (many more clients can be served simultaneously) through load balancing and other smart features
- WebLogic or TomCat are examples of middleware.

Internet GIS Applications in Urban Planning

- Planning information dissemination
  - Comprehensive planning information
  - Zoning information
  - Property and census data
- Public participation in the planning process
  - Scenario analysis
  - Online feedback
- Economic Development site selection

Internet GIS Applications in Transportation

- Real-time advanced traffic information system.
- Real-time traffic congestion management.
- Automatic trip planning.
- Transportation and land use integration.
- Public participation in transportation planning process.
- Real Time Traffic - http://traffic.houstontranstar.org/layers/

SmarTraveler offers real time up to the minute Interstate and local traffic information all regions of the United States. - M...

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http://www.smartraveler.com/

traffic congestion sar

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SmarTraveler®

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Choose a city below

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Smartraveler is a service from SmartRoute Systems, a Westwood One company. Westwood One is the leading supplier of local traffic reports in the U.S.. We provide traffic information to more than 100 million commuters daily through an affiliate network more than 2500 broadcast and digital media customers.

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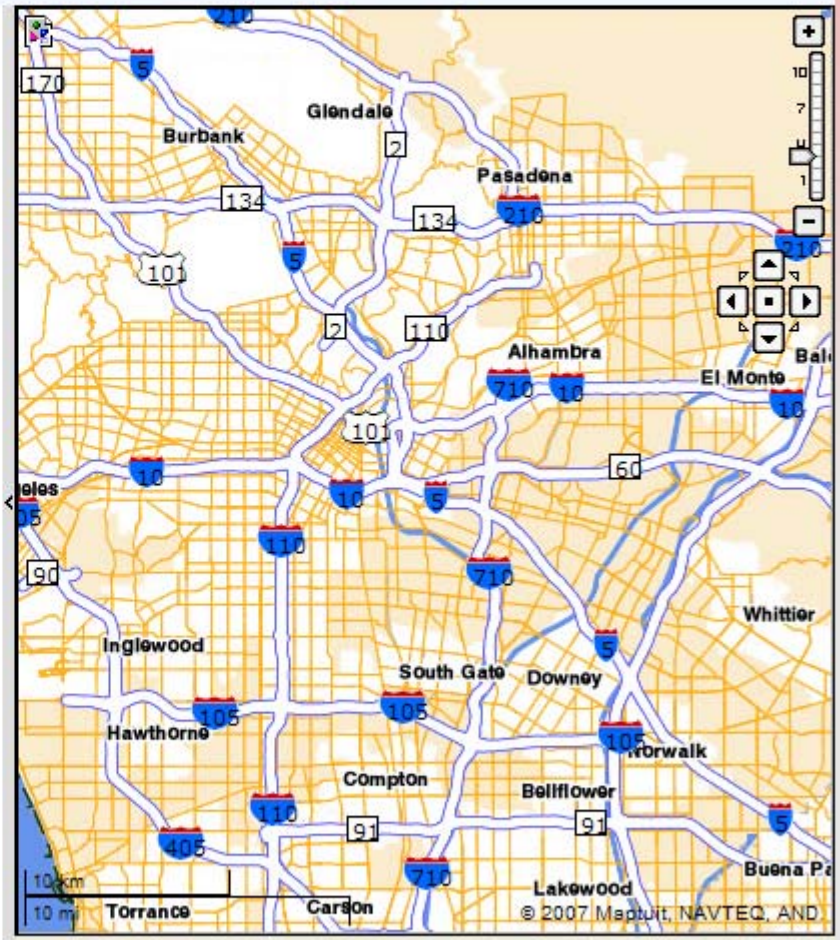
Job Postings

Los Angeles Traffic

Incidents | Key Routes | My Commute & Alerts | Driving Directions | Incident List



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traffic congestion san francis

SmarTraveler offers rea... | cbs2.com - Los Angeles ... | SoCal Honda | cbs2.com - Los Angeles ... | http://mar...afficT.LOS

INCIDENTS | KEY ROUTES | MY COMMUTE & ALERTS | DRIVING DIRECTIONS | INCIDENT LIST

9:21 PM 2007/7/31 **605 FWY** Both ways at **SOUTH ST: Traffic flowing freely** Details..

All Roads | Time

Help Only list incidents in map area.

9:33 PM 2007/7/31 **CROSSTOWN FWY (HWY 30)** WB at **N H ST: Animals on roadway** Map..

9:33 PM 2007/7/31 **I 15** NB before **OAK HILL RD: Disabled vehicle** Map..

9:22 PM 2007/7/31 **HWY 138** Both ways between **ANGELES CREST HWY** and **LONE PINE CANYON RD: Closed** Map..

9:22 PM 2007/7/31 **I 5** SB at **E AVENIDA PICO: Road construction** Map..

9:21 PM 2007/7/31 **605 FWY** Both ways at **SOUTH ST: Traffic flowing freely** Map..

9:21 PM 2007/7/31 **SANTA ANA FWY (I 5)** SB at **I 710: Accident** Map..

9:21 PM 2007/7/31 **SAN DIEGO FWY (I 405)** SB at **PALO VERDE AV: Vehicle on fire** Map..

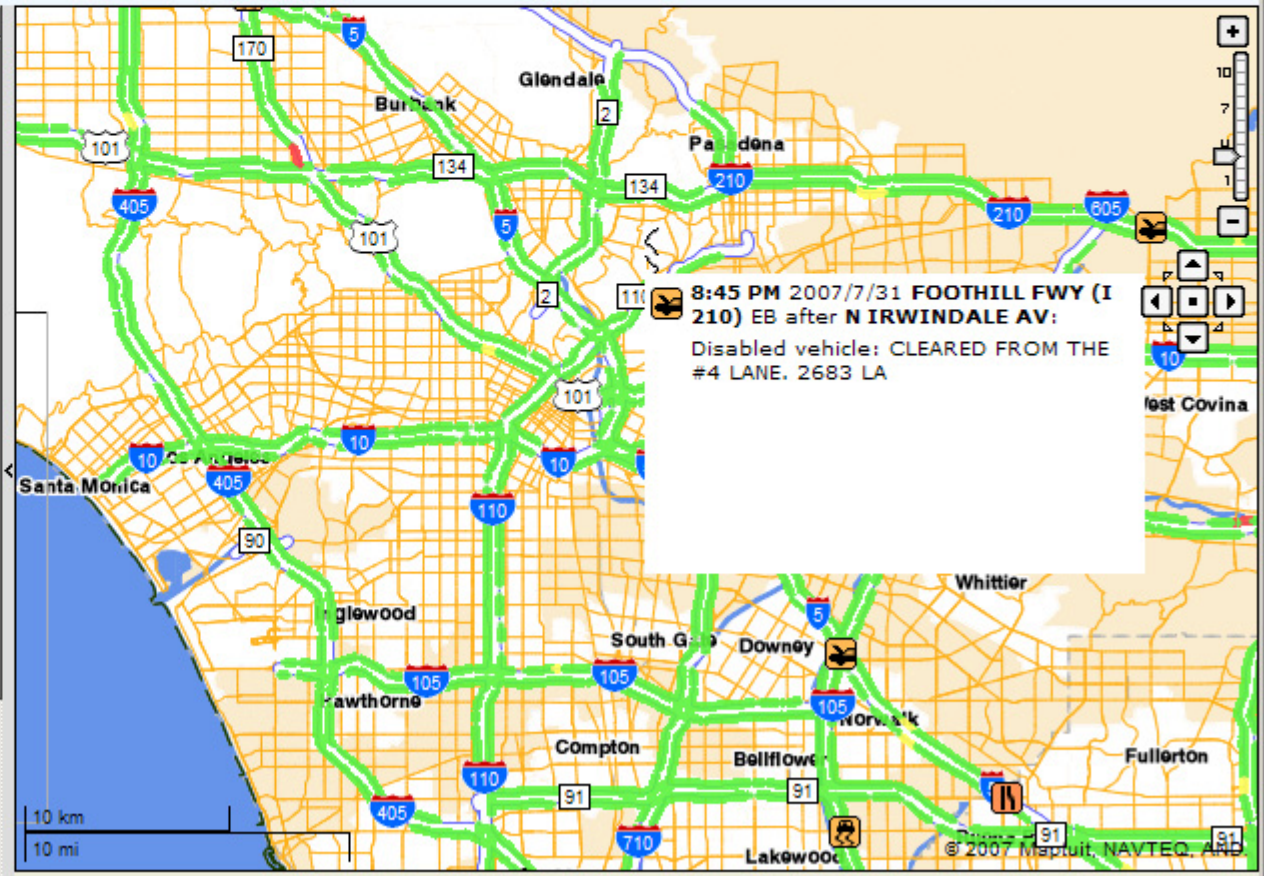
9:21 PM 2007/7/31 **PACIFIC COAST HWY (HWY 1)** SB at **DEER CREEK RD: Injury accident** Map..

9:20 PM 2007/7/31 **I 10** EB before **APACHE TR/MAIN ST: Injury accident** Map..

8:48 PM 2007/7/31 **605 FWY** SB at **FLORENCE AV: Disabled vehicle** Map..

8:48 PM 2007/7/31 **GOLDEN STATE FWY (I 5)** SB at **HWY 170: Accident cleared** Map..

8:46 PM 2007/7/31 **LONG BEACH FWY (I 710)**



Legend | Landmarks

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Los Angeles – online traffic reporting Observations

Financing and Corporate Structure

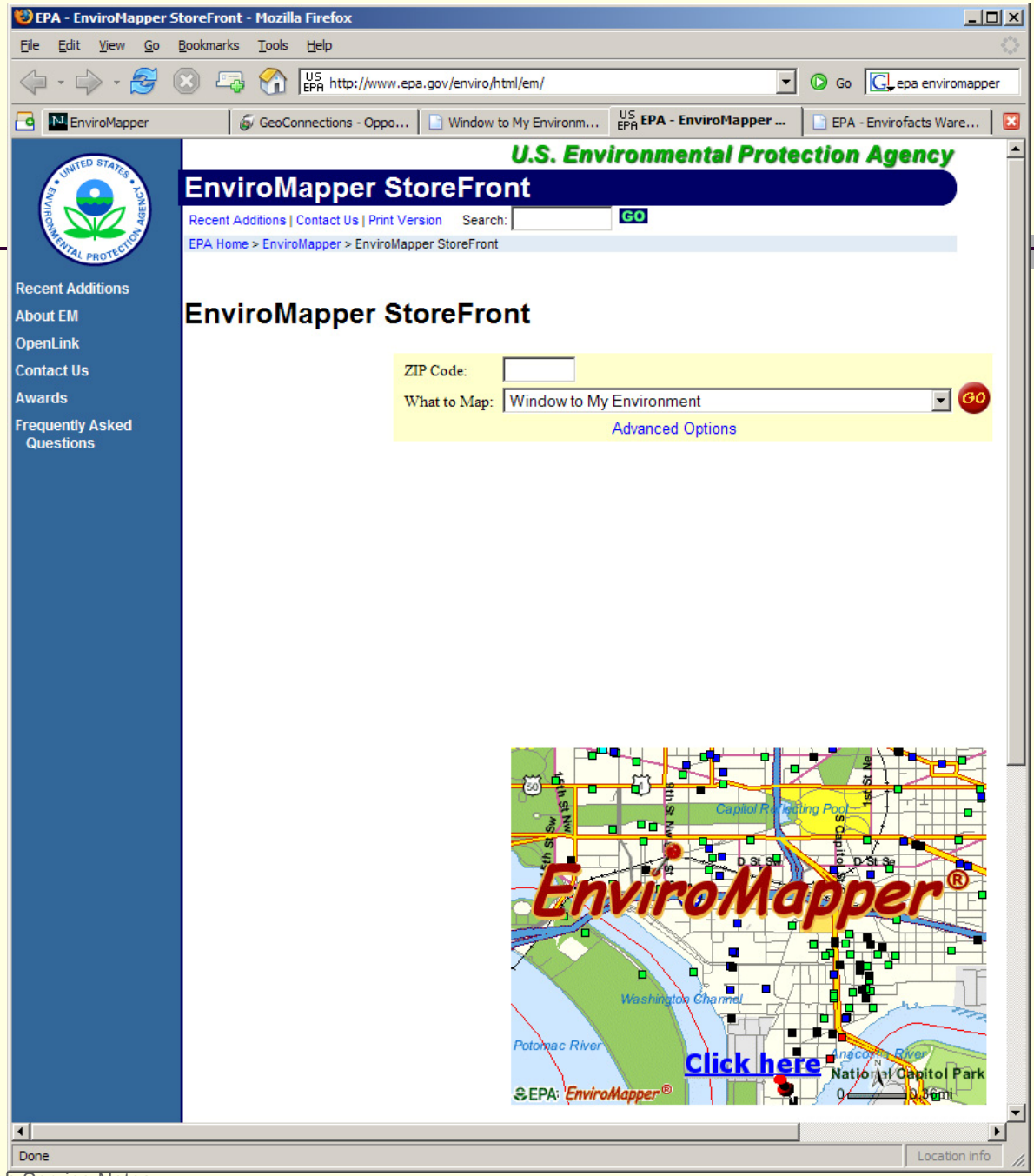
- Website of local CBS TV/Radio station: http://cbs2.com/traffic
- Traffic data from **SmartRoute Systems** (formed in 1988)
  - Via Smartraveler Service: http://www.smartraveler.com
- Owned (since 2000) by **Westwood One**
  - A national radio ***content*** company
- Using **Maptuit** Corporation web services
  - Specializes in fleet tracking and management
- And **Navteq** road data
  - Road basemap data and navigation tools
- With various advertisements using Google services

Los Angeles – online traffic reporting Observations (#2)

- Various client traffic applications built from
  - Core set of data and tools
    - Road map, incident data, routing, advertising
  - Via realtime chaining of many services
    - To overlay new incidents or congestion icon on basemap
    - To display context and time-sensitive ads
- Complex layering of public/private services
- Complex partnerships and financing

US EPA: Enviromapper

- Online mapping website
  - http://www.epa.gov/enviro/html/em
  - Basic mapping via ArcIMS website
    - choose layers, zoom, identify
  - Overlay ‘framework’ layers and EPA administrative data
    - Roads, political boundaries, census data, …
    - EPA’s data: AIRS, TRI, Superfund, ...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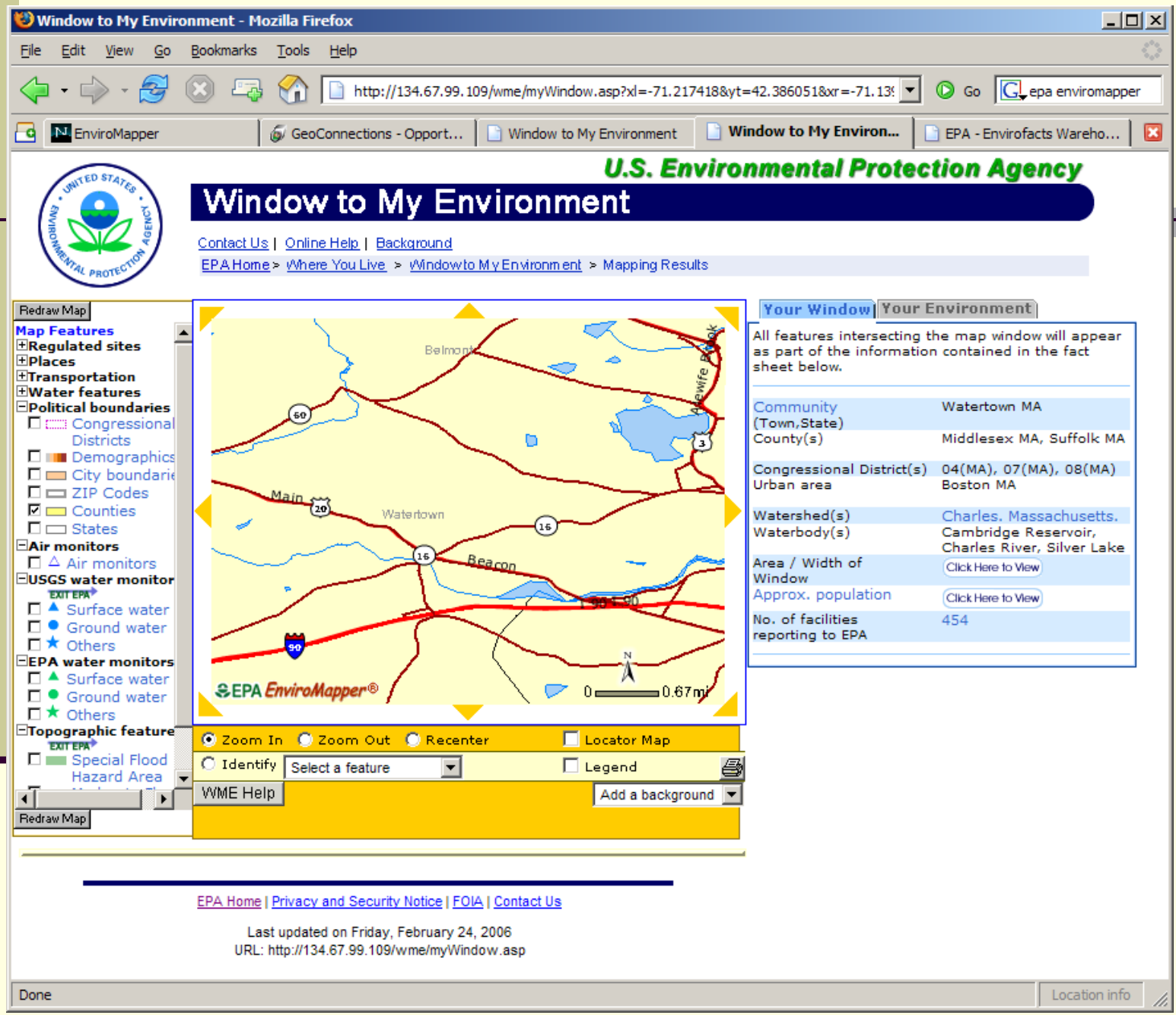
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Water features
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Counties
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Air monitors
USGS water monitor
Surface water
Ground water
Others
EPA water monitors
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Beacon
Alewife Brook
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Select a feature
Legend
WME Help
Add a background
Your Window
Your Environment
All features intersecting the map window will appear as part of the information contained in the fact sheet below.
Community (Town,State) Watertown MA
County(s) Middlesex MA, Suffolk MA
Congressional District(s) 04(MA), 07(MA), 08(MA)
Urban area Boston MA
Watershed(s) Charles. Massachusetts.
Waterbody(s) Cambridge Reservoir, Charles River, Silver Lake
Area / Width of Window Click Here to View
Approx. population Click Here to View
No. of facilities reporting to EPA 454
EPA Home | Privacy and Security Notice | FOIA | Contact Us
Last updated on Friday, February 24, 2006
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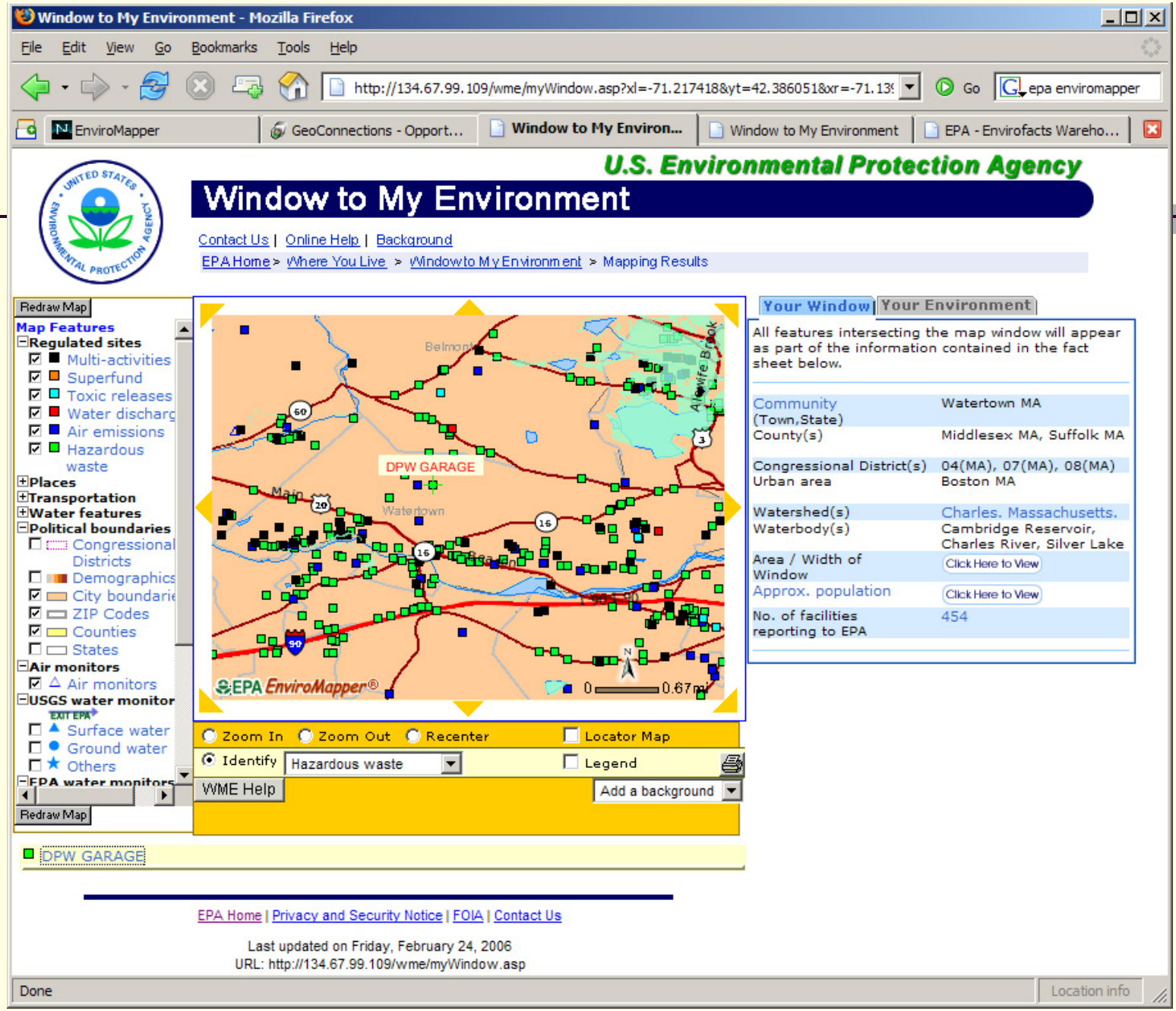
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Your Window
Your Environment
All features intersecting the map window will appear as part of the information contained in the fact sheet below.
Community (Town,State)
Watertown MA
County(s)
Middlesex MA, Suffolk MA
Congressional District(s)
04(MA), 07(MA), 08(MA)
Urban area
Boston MA
Watershed(s)
Charles. Massachusetts.
Waterbody(s)
Cambridge Reservoir, Charles River, Silver Lake
Area / Width of Window
Click Here to View
Approx. population
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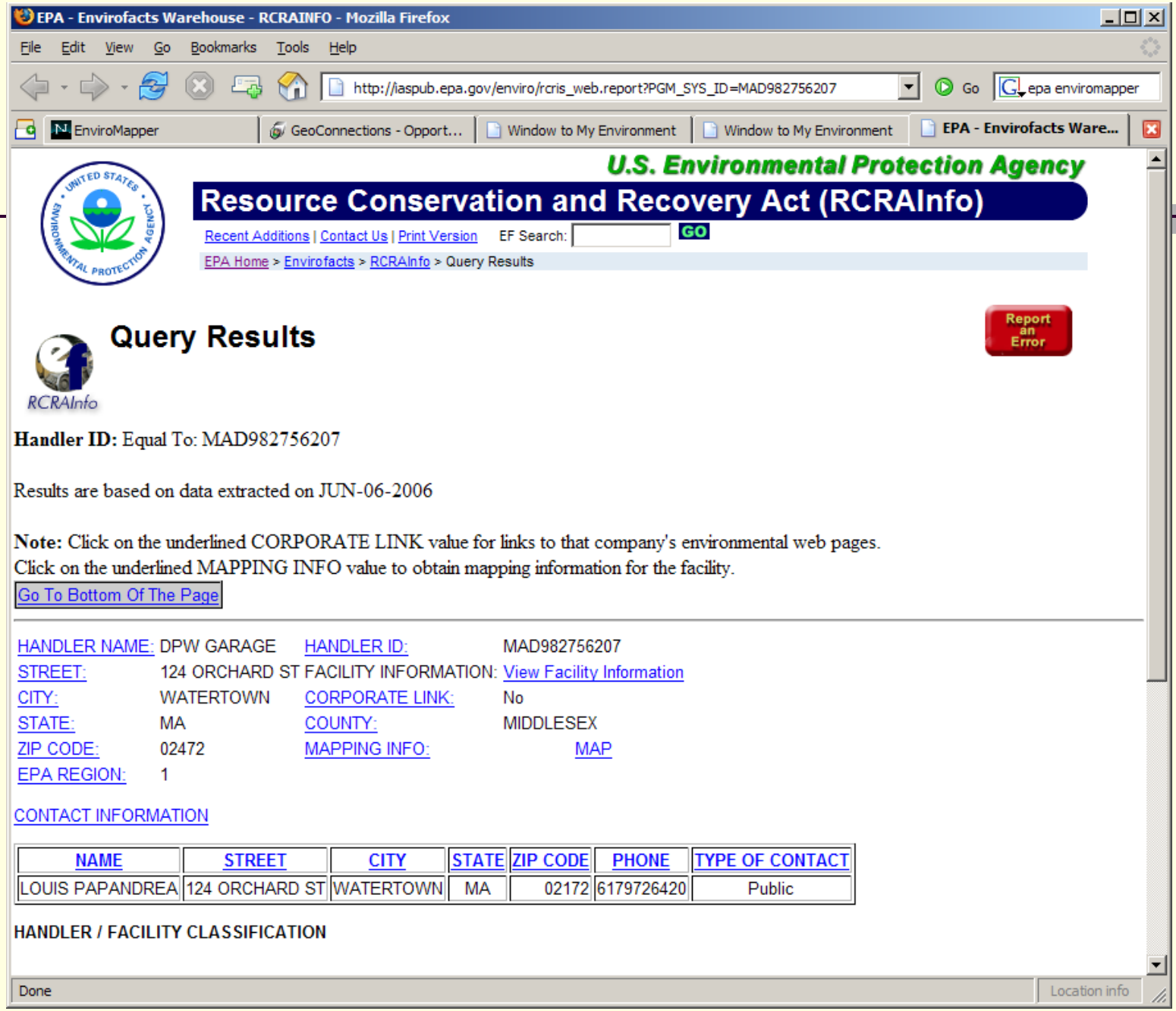
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EPA Home > Envirofacts > RCRAInfo > Query Results
Query Results
RCRAInfo
Report an Error
Handler ID: Equal To: MAD982756207
Results are based on data extracted on JUN-06-2006
Note: Click on the underlined CORPORATE LINK value for links to that company's environmental web pages.
Click on the underlined MAPPING INFO value to obtain mapping information for the facility.
Go To Bottom Of The Page
HANDLER NAME: DPW GARAGE
HANDLER ID: MAD982756207
STREET: 124 ORCHARD ST
FACILITY INFORMATION: View Facility Information
CITY: WATERTOWN
CORPORATE LINK: No
STATE: MA
COUNTY: MIDDLESEX
ZIP CODE: 02472
MAPPING INFO: MAP
EPA REGION: 1
CONTACT INFORMATION
NAME | STREET | CITY | STATE | ZIP CODE | PHONE | TYPE OF CONTACT
LOUIS PAPANDREA | 124 ORCHARD ST | WATERTOWN | MA | 02172 | 6179726420 | Public
HANDLER / FACILITY CLASSIFICATION
Done
Location info

Accessing Data and Geospatial Services Behind the Scenes

- Enviromapper is very useful, but ‘read only’
- AIRS, TRI… data already in Oracle
  - So are Census, USGS, and other datasets
  - Data could be accessed via other protocols and tools
- If site is built from chained web services
  - Can focus on data ***services*** instead of ***datasets***
  - Use OGC’s WMS and WFS protocols for interoperability
  - Then, many customized client applications ***could share the same data sets*** without duplication

First, a Simple Example –
MIT OrthoTools

- Orthophotos via plain vanilla web browser
  - MIT Ortho Server (12 years old! 1995-2007)
    - Main page: http://ortho.mit.edu
    - 'Seamless' interface:
      - http://ortho.mit.edu/nsdi/seamless6.cgi
      - Server-side perl scripts slice and dice orthos to fit size/scale of view window
    - Requesting only the ortho snippet:
      - http://ortho.mit.edu/nsdi/seamless8.cgi?zoom=8&x0=237000&y0=902000&action=pan&pwidth=400&pheight=300&x=123&y=169

MIT/MassGIS orthophoto server: 8 m/pixel, center (x,y)=(237000,902000) - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://ortho.mit.edu/nsdi/seamless6.cgi

OGC Cookbooks | OGC®

MIT/MassGIS orthophoto server: 8 ...

MIT/MassGIS orthophoto server: 8 m/pixel, center (x,y) = (237000,902000)

Project Homepage *FGDC Metadata* *Download Options*

NW N NE
W E
SW S SE

Click on the image to

- Recenter image
- Zoom IN
- Zoom OUT

or to set a scale of

- 200m pixels
- 40m pixels
- 8m pixels *
- 2m pixels
- 0.5m pixels

(* Current zoom level)

View Width: 400 pixels Height: 300 pixels

Submit Changes

This Topographic Map view measures width=3200 and height=2400 meters on the ground, with **8**m pixels. The view is centered on X=**237000**, Y=**902000** (Massachusetts State Plane meters, Mainland Zone, NAD 83).

Authors: John D. Evans

Last Modified February 22, 1999 by John Evans.

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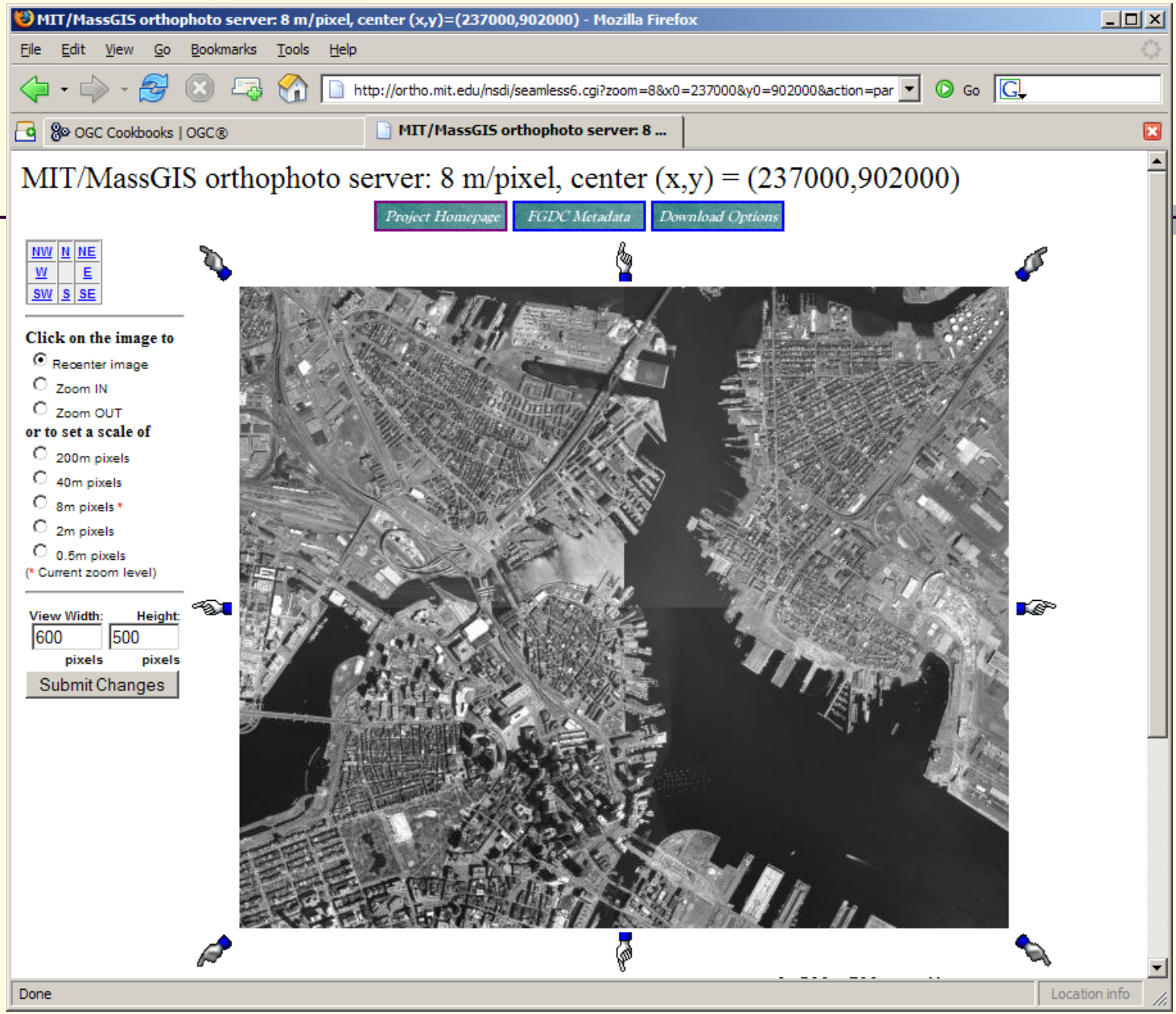
MIT/MassGIS orthophoto server: 8 m/pixel, center (x,y)=(237000,902000) - Mozilla Firefox
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OGC Cookbooks | OGC®
MIT/MassGIS orthophoto server: 8 ...
MIT/MassGIS orthophoto server: 8 m/pixel, center (x,y) = (237000,902000)
Project Homepage
FGDC Metadata
Download Options
NW N NE
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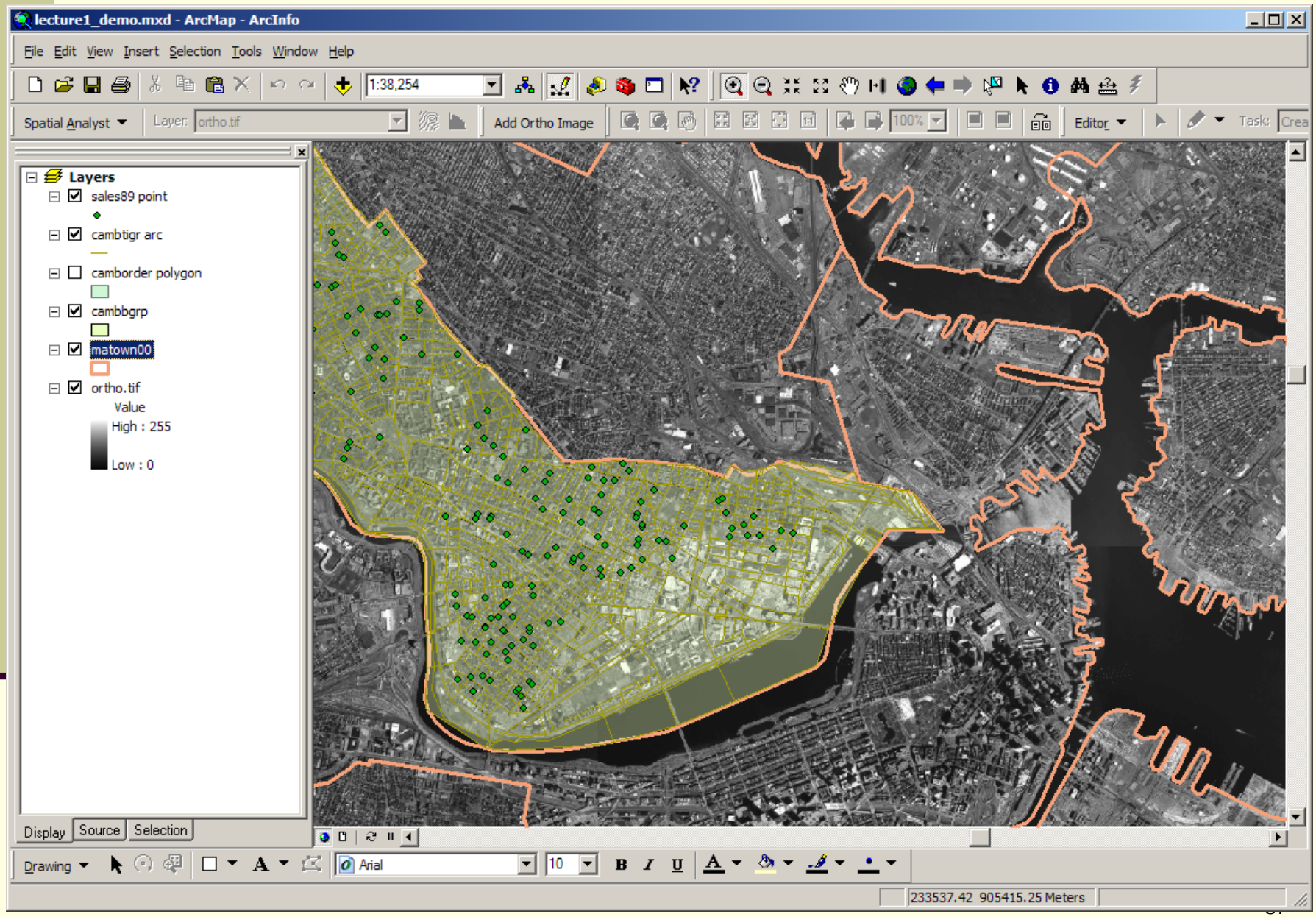
Click on the image to
Recenter image
Zoom IN
Zoom OUT
or to set a scale of
200m pixels
40m pixels
8m pixels *
2m pixels
0.5m pixels
(* Current zoom level)
View Width:
Height:
600
500
pixels
pixels
Submit Changes
Done
Location info

Accessing MIT OrthoServer from ArcMap

- MIT OrthoServer as a web service
  - Send URL with parameters
  - Receive PNG, JPG, or Tiff image for desired location
- Write ArcMap extension ‘dll’ that
  - Adds ortho ‘button’ to ArcMap menu
  - Sends appropriate URL based on ArcMap view
  - Slips returned JPG under ArcMap view window
- Idea: Preserve only one copy of orthos - on server
  - Throw away local copy
  - Can always retrieve and use when needed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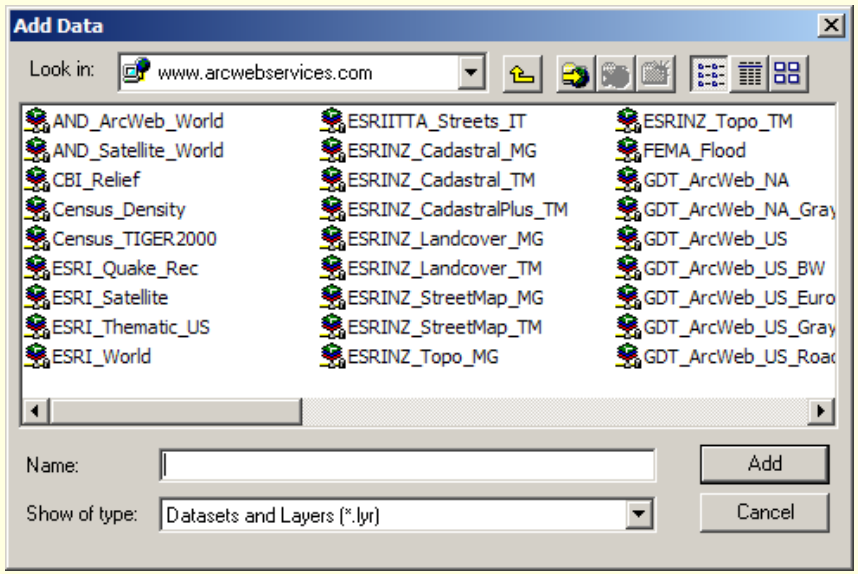
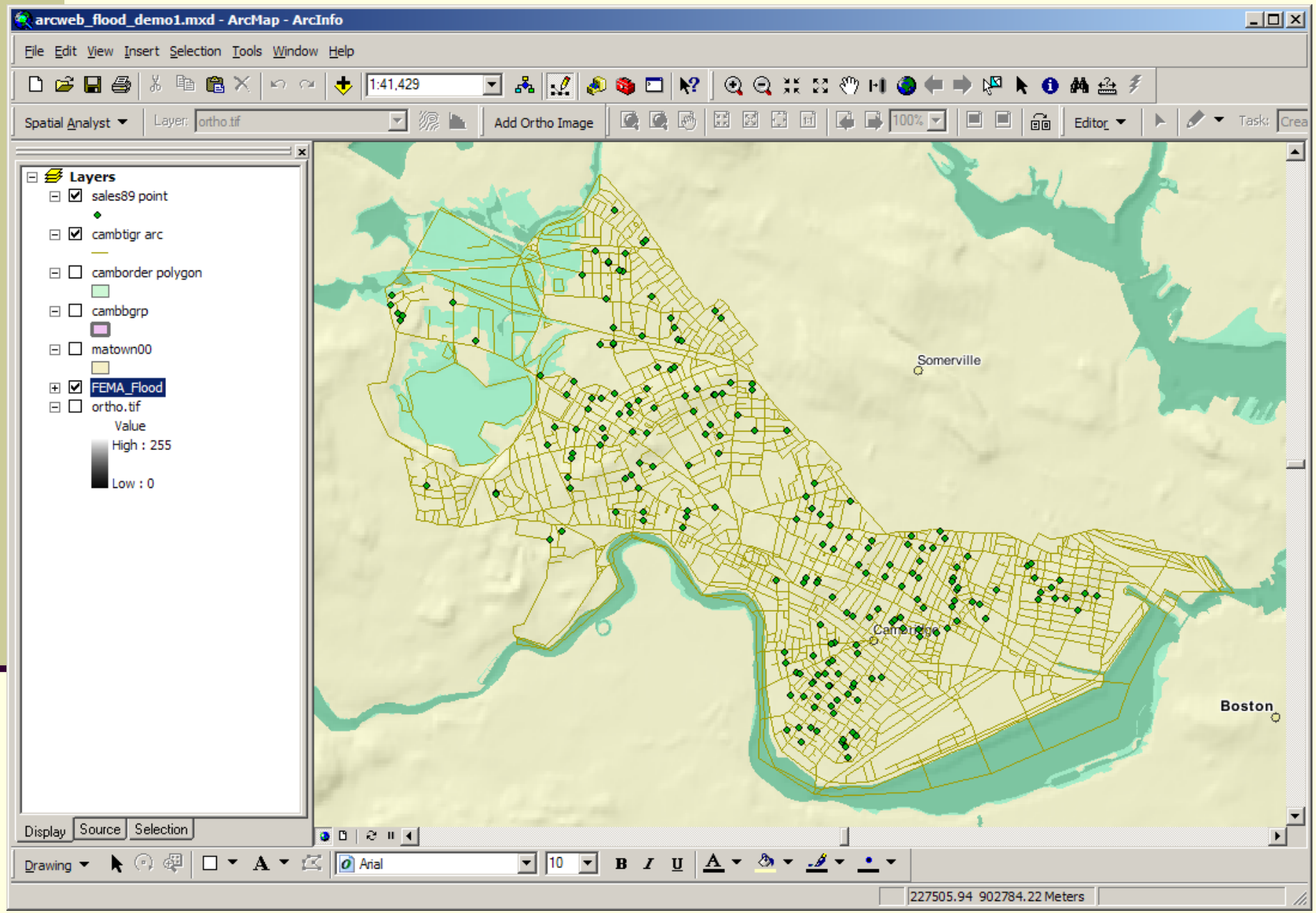
Next: add in ArcWeb Services

- ESRI offers many proprietary web services…
- Must be registered for ArcWeb Services from ESRI:
  - Sign up for trial evaluation
  - http://www.arcwebservices.com
- In ArcMap (or ArcExplorer) click ‘Add Data’ select GIS Servers, then ArcIMS servers, then log in
- Select FEMA_Flood service from the menu

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camborder polygon
cambbgrp
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Value
High : 255
Low : 0
Display
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Using ArcWeb Services

- Requires user registration with ESRI
- Accessible from clients that use ArcIMS protocols (ESRI's flavor of XML = AXL)
- Free ArcExplorer 9.1can access ArcWeb services
  - Save from ArcExplorer into arcexplorer_flood1.axl
  - Saved file is AXL text file
- At 9.1 ArcGIS has WMS connector built-in
  - Can turn sublayers on/off, but no legend color or transparency control
  - No WFS support

Saved AXL File

Using ArcExplorer to access FEMA_Flood web services

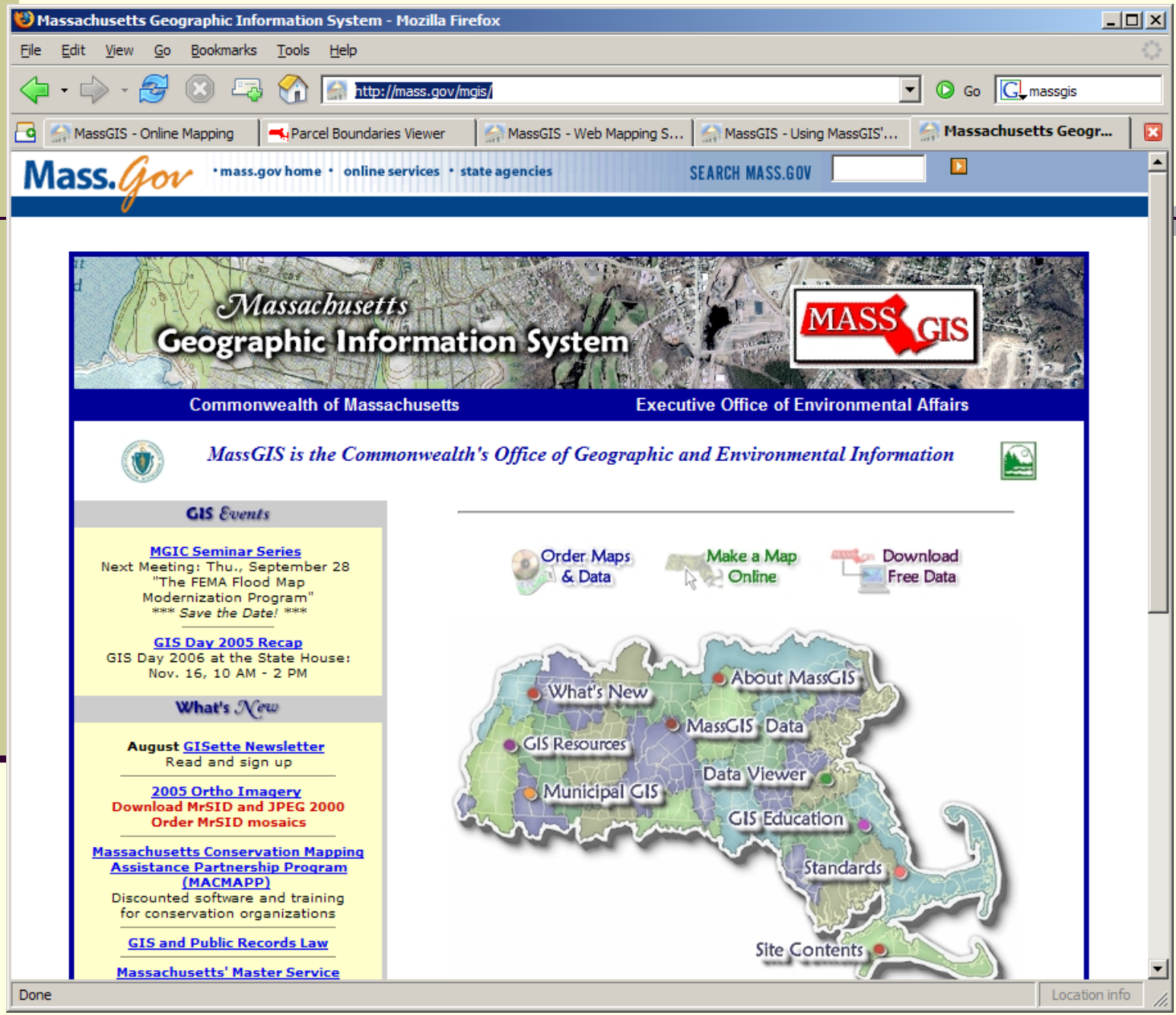
```
<?xml version="1.0" encoding="UTF-8"?>

<ARCXML version="1.1">
  <CONFIG>
    <ENVIRONMENT>
      <LOCALE country="CA" language="en" variant="" />
      <UIFONT color="0,0,0" name="SansSerif" size="12" style="regular" />
      <SCREEN dpi="96" />
    </ENVIRONMENT>
    <MAP>
      <PROPERTIES>
        <ENVELOPE minx="-71.24827637959767" miny="42.25863121969604" maxx="-70.98993634926948" maxy="42.45238624244218"
        name="Initial_Extent" />
        <MAPUNITS units="decimal_degrees" />
      </PROPERTIES>
      <WORKSPACES>
        <IMAGESERVERWORKSPACE name="mapper_ws-0" url="http://www.arcwebservices.com/servlet/com.esri.esrimap.Esrimap"
        service="FEMA_Flood" />
      </WORKSPACES>
      <LAYER type="image" name="FEMA_Flood" visible="true" id="0">
        <DATASET name="FEMA_Flood" type="image" workspace="mapper_ws-0" />
      </LAYER>
    </MAP>
  </CONFIG>
</ARCXML>
```

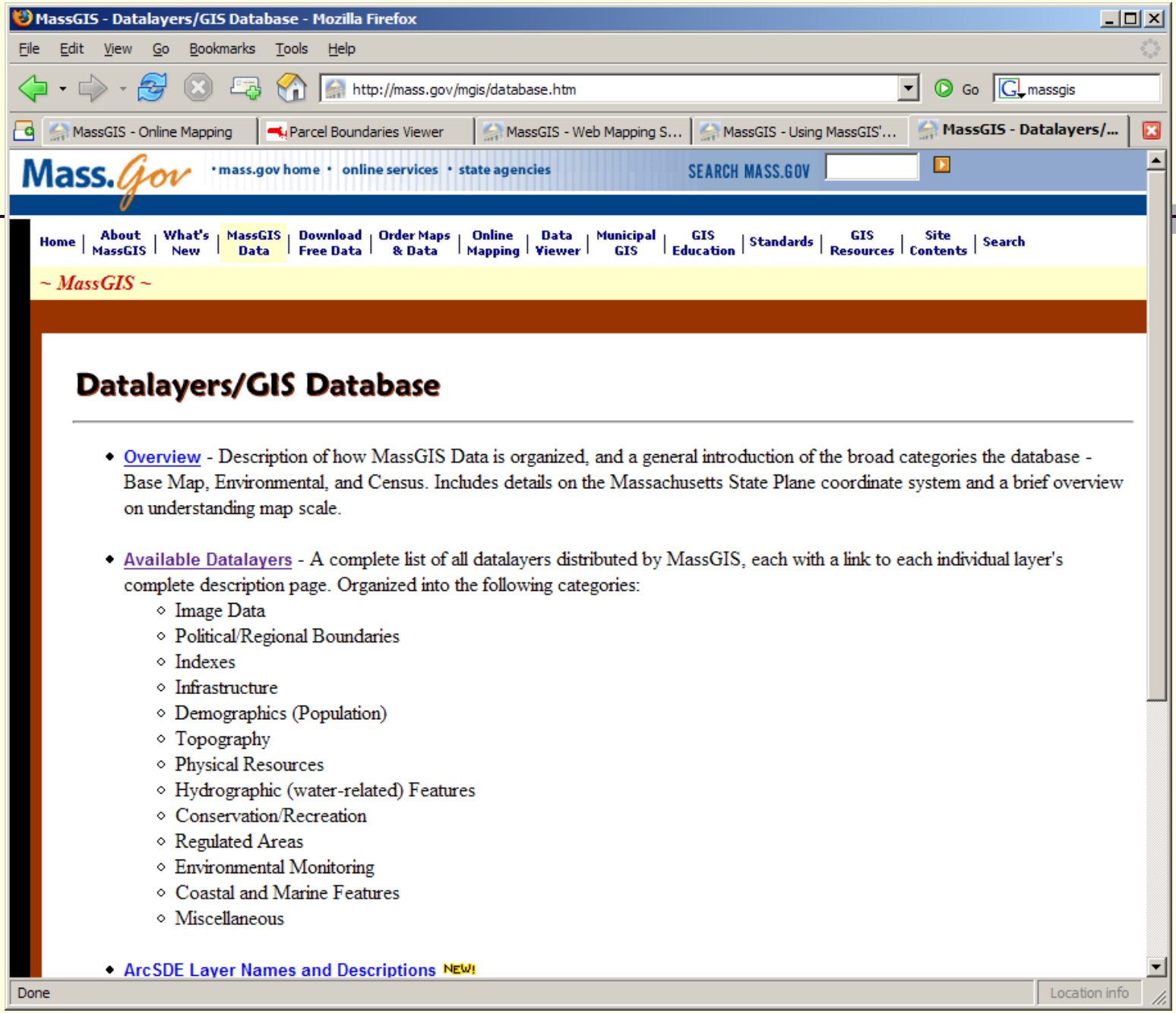
Generalizing this ***Web Service*** Idea

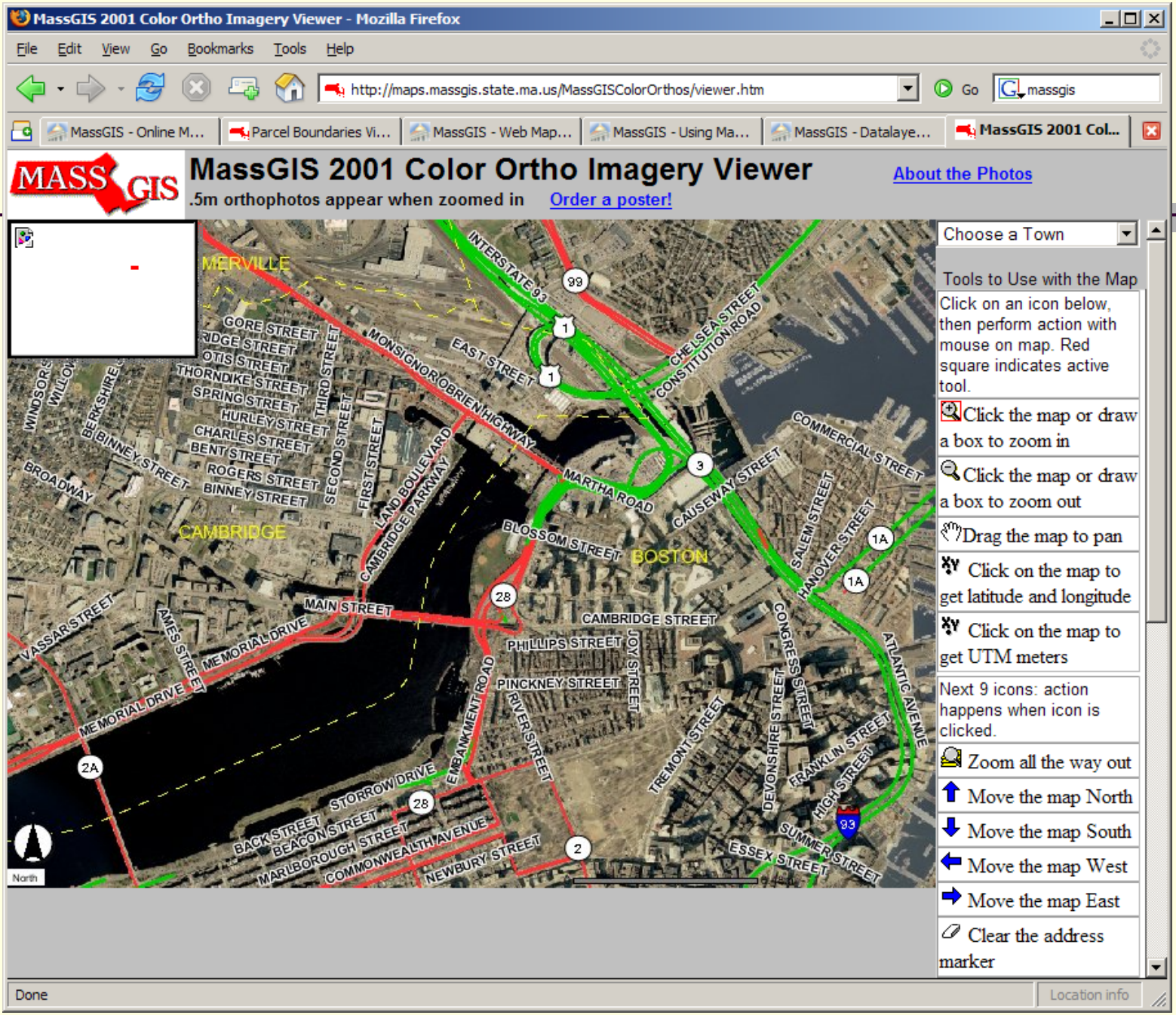
- Make service interoperable using Open Geospatial Consortium (OGC) standards
  - Standard URL request parameters
  - Standard XML response (using GML)
  - WMS and WFS protocols
- We will examine several current examples
  - MassGIS
  - Google mashups
  - Middleware tools to tweak and chain services

MassGIS – Web Service Example

- ‘End User’ websites
  - Home page for MassGIS: http://mass.gov/mgis/
  - Data layers and download info: http://mass.gov/mgis/database.htm
  - ‘Oliver’ online mapping java application: http://mass.gov/mgis/mapping.htm
- Web Services underneath: http://mass.gov/mgis/websrv.htm
  - Winner of 2005 URISA ESIG award
  - Access via WMS and WFS protocols: http://www.opengeospatial.org/resource/cookbooks
  - ArcMap and ArcExplorer example (in exercise)
  - Example URL requesting WMS image (street map): http://maps.massgis.state.ma.us/mapaccess/main.jsp?dpi=120&request=GetMap&layers=MHD+Roads&styles=Class&srs=EPSG:26986&bbox=233500,900000,236500,902500&width=640&height=480&format=image/png&service=wms


Massachusetts Geographic Information System - Mozilla Firefox
File Edit View Go Bookmarks Tools Help
http://mass.gov/mgis/
Go
massgis
MassGIS - Online Mapping
Parcel Boundaries Viewer
MassGIS - Web Mapping S...
MassGIS - Using MassGIS'...
Massachusetts Geogr...
Mass.Gov
• mass.gov home • online services • state agencies
SEARCH MASS.GOV
Massachusetts
Geographic Information System
MASS GIS
Commonwealth of Massachusetts
Executive Office of Environmental Affairs
MassGIS is the Commonwealth's Office of Geographic and Environmental Information
GIS Events
MGIC Seminar Series
Next Meeting: Thu., September 28
"The FEMA Flood Map Modernization Program"
*** Save the Date! ***
GIS Day 2005 Recap
GIS Day 2006 at the State House:
Nov. 16, 10 AM - 2 PM
What's New
August GISette Newsletter
Read and sign up
2005 Ortho Imagery
Download MrSID and JPEG 2000
Order MrSID mosaics
Massachusetts Conservation Mapping Assistance Partnership Program (MACMAPP)
Discounted software and training for conservation organizations
GIS and Public Records Law
Massachusetts' Master Service
Order Maps & Data
Make a Map Online
Download Free Data
About MassGIS
What's New
MassGIS Data
GIS Resources
Data Viewer
Municipal GIS
GIS Education
Standards
Site Contents
Done
Location info


MassGIS - Datalayers/GIS Database - Mozilla Firefox
File Edit View Go Bookmarks Tools Help
http://mass.gov/mgis/database.htm
Go
massgis
MassGIS - Online Mapping
Parcel Boundaries Viewer
MassGIS - Web Mapping S...
MassGIS - Using MassGIS'...
MassGIS - Datalayers/...
Mass.Gov
• mass.gov home • online services • state agencies
SEARCH MASS.GOV
Home | About MassGIS | What's New | MassGIS Data | Download Free Data | Order Maps & Data | Online Mapping | Data Viewer | Municipal GIS | GIS Education | Standards | GIS Resources | Site Contents | Search
~ MassGIS ~
Datalayers/GIS Database
Overview - Description of how MassGIS Data is organized, and a general introduction of the broad categories the database - Base Map, Environmental, and Census. Includes details on the Massachusetts State Plane coordinate system and a brief overview on understanding map scale.
Available Datalayers - A complete list of all datalayers distributed by MassGIS, each with a link to each individual layer's complete description page. Organized into the following categories:
Image Data
Political/Regional Boundaries
Indexes
Infrastructure
Demographics (Population)
Topography
Physical Resources
Hydrographic (water-related) Features
Conservation/Recreation
Regulated Areas
Environmental Monitoring
Coastal and Marine Features
Miscellaneous
ArcSDE Layer Names and Descriptions NEW!
Done
Location info


MassGIS 2001 Color Ortho Imagery Viewer - Mozilla Firefox
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http://maps.massgis.state.ma.us/MassGISColorOrthos/viewer.htm
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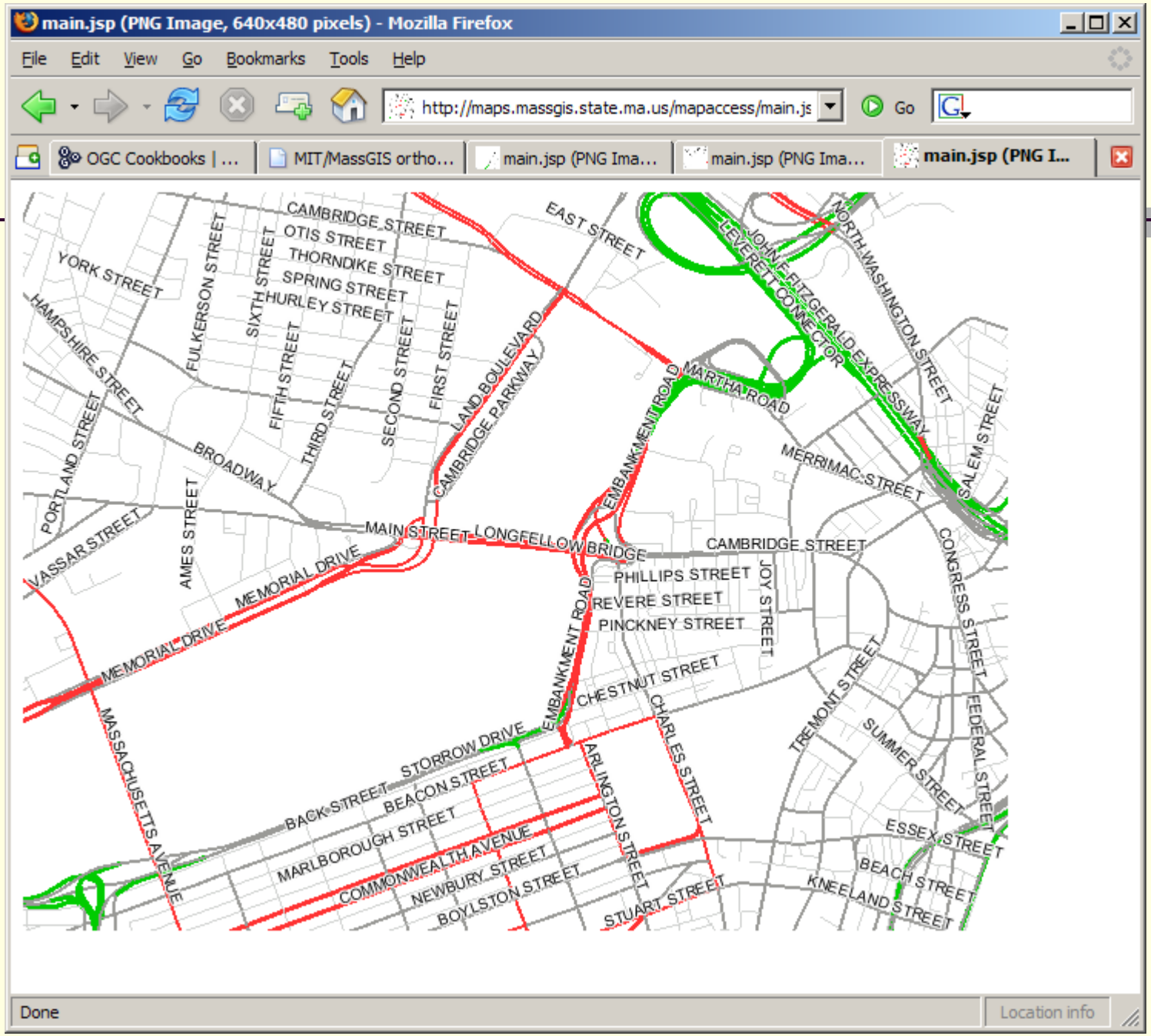
massgis
MassGIS - Online M...
Parcel Boundaries Vi...
MassGIS - Web Map...
MassGIS - Using Ma...
MassGIS - Datalaye...
MassGIS 2001 Col...
MASS GIS
MassGIS 2001 Color Ortho Imagery Viewer
.5m orthophotos appear when zoomed in
Order a poster!
About the Photos
Choose a Town
Tools to Use with the Map
Click on an icon below, then perform action with mouse on map. Red square indicates active tool.
Click the map or draw a box to zoom in
Click the map or draw a box to zoom out
Drag the map to pan
Click on the map to get latitude and longitude
Click on the map to get UTM meters
Next 9 icons: action happens when icon is clicked.
Zoom all the way out
Move the map North
Move the map South
Move the map West
Move the map East
Clear the address marker
MERVILLE
CAMBRIDGE
BOSTON
INTERSTATE 93
EAST STREET
CHELSEA STREET
CONSTITUTION ROAD
MONSIGNOR O'BRIEN HIGHWAY
MARTHA ROAD
CAUSEWAY STREET
COMMERCIAL STREET
SALEM STREET
HANOVER STREET
GORE STREET
RIDGE STREET
OTIS STREET
THORNDIKE STREET
SPRING STREET
HURLEY STREET
CHARLES STREET
BENT STREET
ROGERS STREET
BINNEY STREET
THIRD STREET
SECOND STREET
FIRST STREET
LAND BOULEVARD
CAMBRIDGE PARKWAY
BROADWAY
BINNEY STREET
BERKSHIRE
WILLOW
WINDSOR
BLOSSOM STREET
MAIN STREET
CAMBRIDGE STREET
PHILLIPS STREET
PINCKNEY STREET
JOY STREET
CONGRESS STREET
ATLANTIC AVENUE
VASSAR STREET
AMES STREET
MEMORIAL DRIVE
EMBANKMENT ROAD
RIVER STREET
TREMONT STREET
DEVONSHIRE STREET
FRANKLIN STREET
HIGH STREET
SUMMER STREET
ESSEX STREET
STORROW DRIVE
BACK STREET
BEACON STREET
MARLBOROUGH STREET
COMMONWEALTH AVENUE
NEWBURY STREET
North
Done
Location info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YORK STREET
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SIXTH STREET
FIFTH STREET
THIRD STREET
SECOND STREET
FIRST STREET
LAND BOULEVARD
CAMBRIDGE PARKWAY
HAMPSHIRE STREET
PORTLAND STREET
BROADWAY
AMES STREET
VASSAR STREET
MAIN STREET
LONGFELLOW BRIDGE
MEMORIAL DRIVE
MEMORIAL DRIVE
MASSACHUSETTS AVENUE
JOHN F. FITZGERALD EXPRESSWAY
LEVERETT CONNECTOR
NORTH WASHINGTON STREET
EMBANKMENT ROAD
MARTHA ROAD
MERRIMAC STREET
SALEM STREET
CAMBRIDGE STREET
PHILLIPS STREET
REVERE STREET
PINCKNEY STREET
JOY STREET
CONGRESS STREET
FEDERAL STREET
CHESTNUT STREET
CHARLES STREET
TREMONT STREET
SUMMER STREET
ESSEX STREET
BEACH STREET
KNEELAND STREET
STORROW DRIVE
BACK STREET
BEACON STREET
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BOYLSTON STREET
ARLINGTON STREET
STUART STREET
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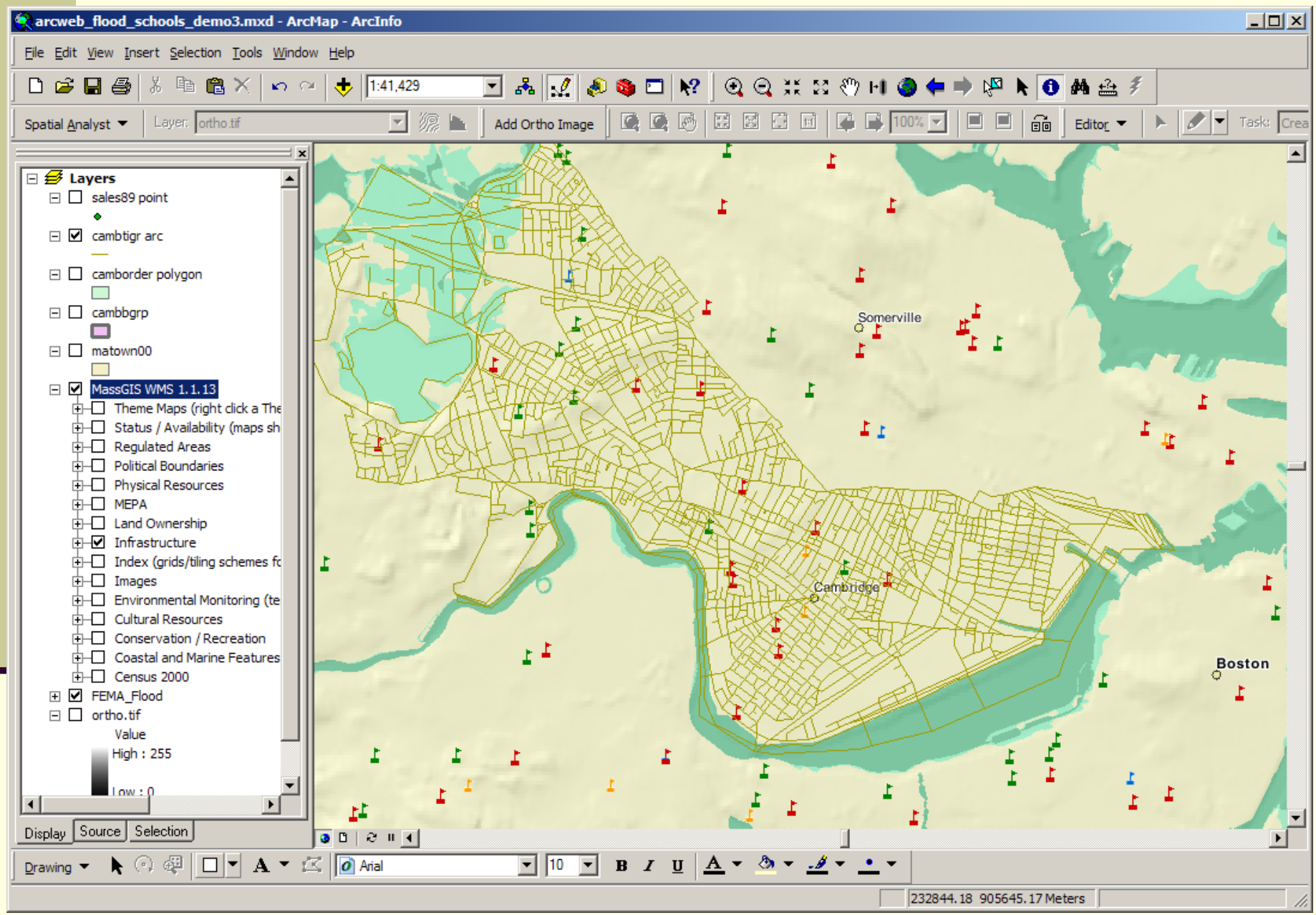
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Regulated Areas
Political Boundaries
Physical Resources
MEPA
Land Ownership
Infrastructure
Index (grids/tiling schemes fc
Images
Environmental Monitoring (te
Cultural Resources
Conservation / Recreation
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Census 2000
FEMA_Flood
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Value
High : 255
Low : 0
Somerville
Cambridge
Boston
Display
Source
Selection
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Boston Globe Article:
Mashup of Election Campaign Contributions

- Website on Boston.com
  - http://www.boston.com/news/special/bigarticles/campaign_finance/page2.html?p1=email_to_a_friend
- Live Google 'mashup' webpage (for Back Bay):
  - http://boston.faneuilmedia2.com/gov/detail_map.html?from=top&zip=02116&z=13
  - View source and look for:
    - http://maps.google.com/maps?file=api&v=2.60&key=AB...
    - Rest is javascript to interact with Google maps and overlay/identify entries in local election contribution database maintained by consultant (Faneuil Media, Inc.)
    - Note: you can 'pan' the map or click on dots for further info
- Google mashup protocols are proprietary but open
- Google earth protocols use 'KML' – a variation of OGC's GML

Campaign 2006: Contributions to the Massachusetts gubernatorial candidates - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Search Favorites

Address http://www.boston.com/news/special/bigarticles/campaign_finance/page1.html Go Links

Google Search 0 blocked Check AutoLink AutoFill Options

The Boston Globe boston.com

E-mail to a friend

Campaign 2006: Contributions to the Massachusetts gubernatorial candidates

Thousands of Massachusetts residents have donated millions of dollars to the 6 candidates for governor: Democrats Christopher Gabrieli, Deval Patrick, and Thomas F. Reilly; Republican Kerry Healey; Independent Christy Mihos, and Green-Rainbow candidate Grace Ross.

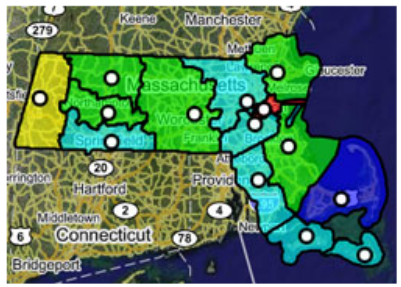
We have placed all contributions since Jan. 1, 2003 on maps according to the addresses of the donors (the large map below is the Back Bay section of Boston). We will update these maps when the candidates file new reports twice a month.

Each county, town, and zip code is tinted according to which candidate received the most contributions (see the legend below).

Out-of-state contributions are on a clickable map of the United States lower on the page.

(Editor's note: The maps may take a few minutes to load.)

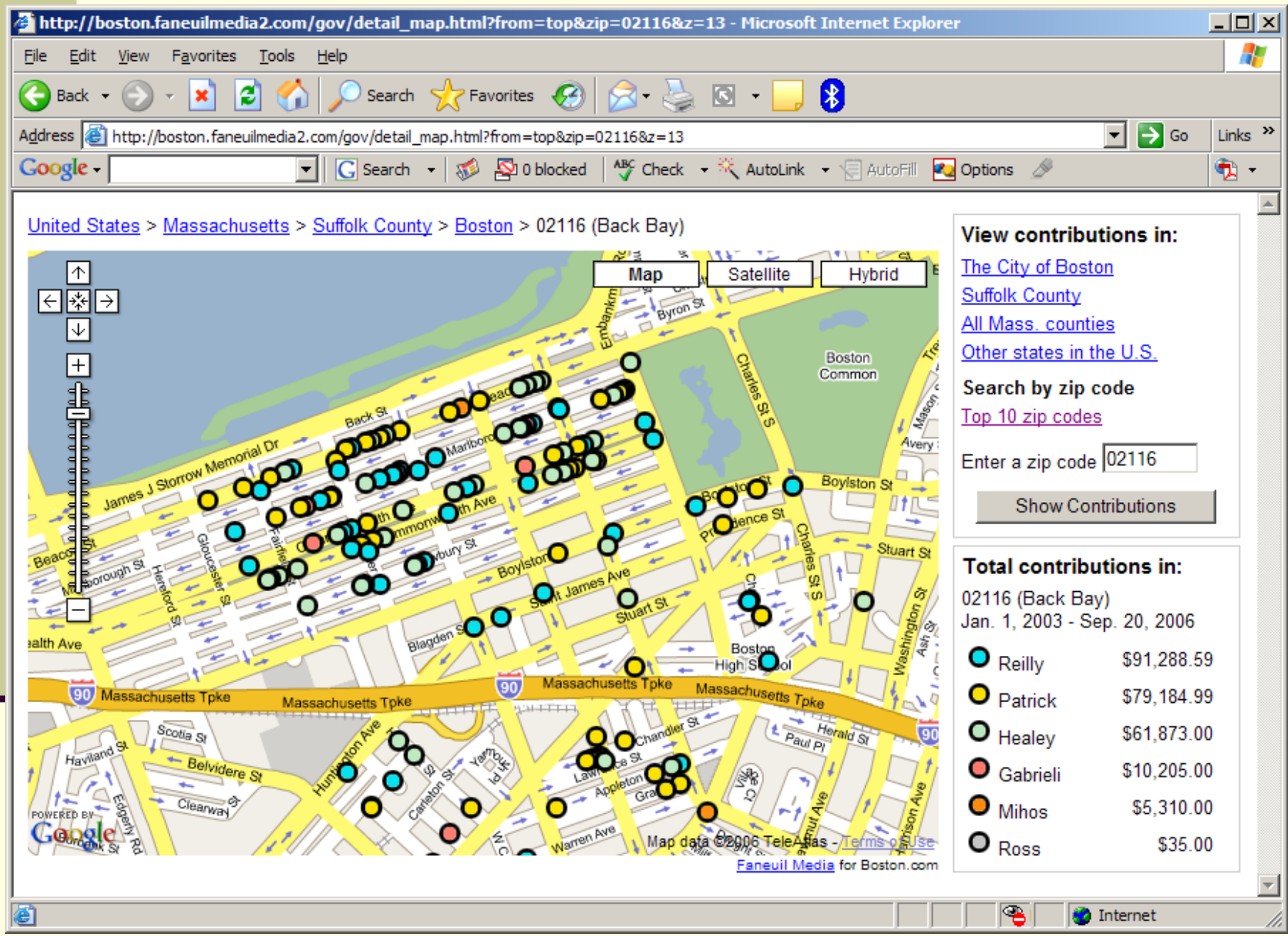
Enter Zip: Show Contributions ▸ Top 10 zip codes



HOW TO USE THE MAPS

Click a flag on any county above to see a summary of all contributions made in that county.

Internet


http://boston.faneuilmedia2.com/gov/detail_map.html?from=top&zip=02116&z=13 - Microsoft Internet Explorer
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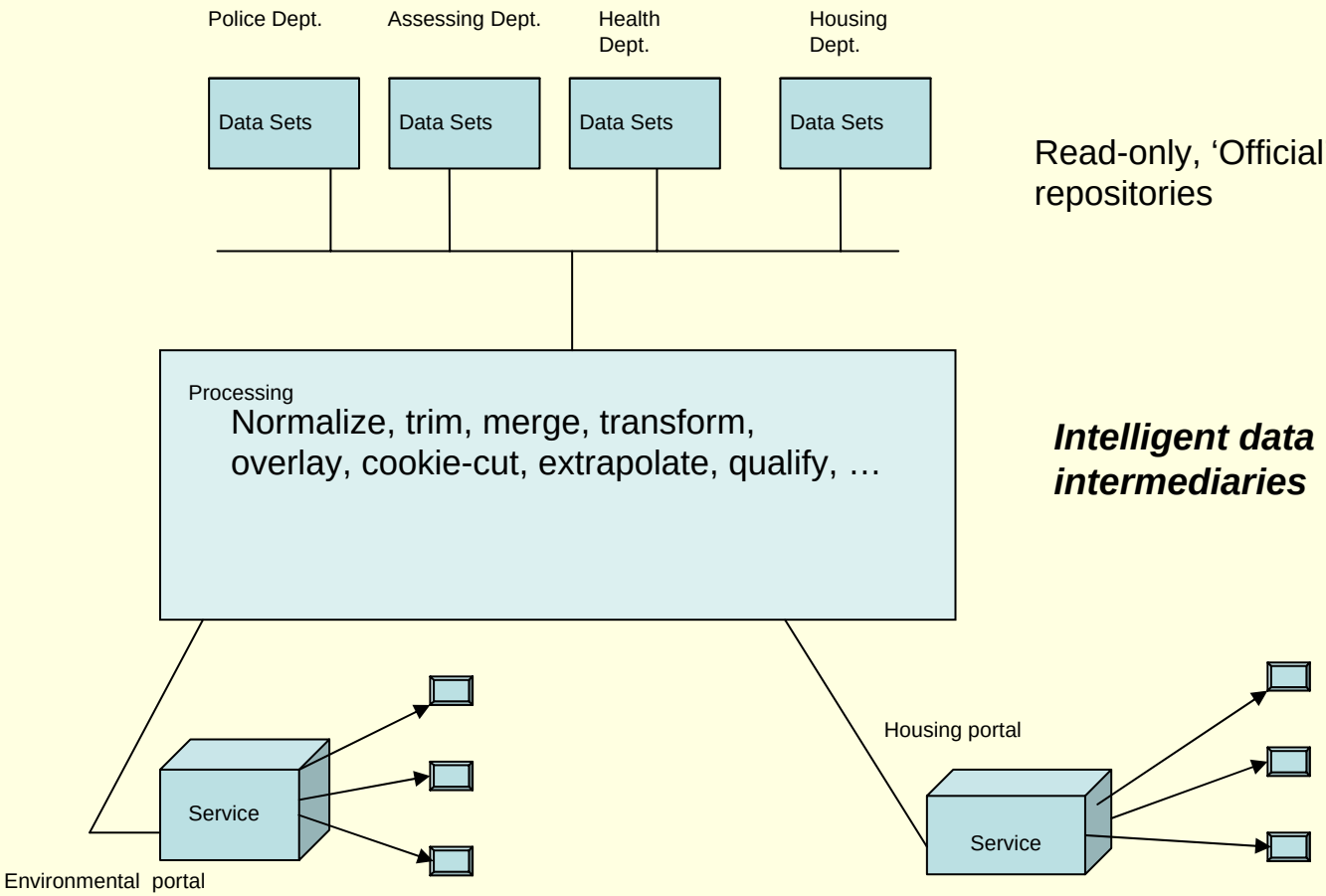
Map Satellite Hybrid
Boston Common
Charles St S
Boylston St
Stuart St
Massachusetts Tpke
Belvidere St
Scotia St
Clearway St
Warren Ave
Map data ©2006 TeleAtlas - Terms of Use
Faneuil Media for Boston.com
View contributions in:
The City of Boston
Suffolk County
All Mass. counties
Other states in the U.S.
Search by zip code
Top 10 zip codes
Enter a zip code 02116
Show Contributions
Total contributions in:
02116 (Back Bay)
Jan. 1, 2003 - Sep. 20, 2006
Reilly $91,288.59
Patrick $79,184.99
Healey $61,873.00
Gabrieli $10,205.00
Mihos $5,310.00
Ross $35.00
Internet

Web Service Chaining using Open Source Tools and Middleware for Customization

- Effort by MIT Urban Information Systems group (with local partners and with Brookings support)
- Goals:
  - Deliver maps/analyzes onto desktop
  - Utilize Google, Excel, … client-side capabilities
  - Allow user-customizable editing to
    - Accumulate and use ‘local knowledge’
    - Share interpretations of ‘official’ data
  - Prototype use open source tools and open standards for web service interoperability
    - Linux, Apache, PHP, Postgres/postgis, MapServer
    - OGC protocols and AJAX clients

Intelligent Middleware for Understanding Neighborhood Markets

A collaborative effort by the Massachusetts Institute of Technology, the Metropolitan Area Planning Council, Boston's Department of Neighborhood Development, and The Boston Foundation with support from the Urban Markets Initiative of The Brookings Institution.



Examples from MIT ‘Middleware’ Project

- Community Development Corporation webpage showing owned properties
- Spreadsheet showing ‘top-10’ landowners – before and after standardizing owner names
- Middleware management tools for editing/publishing Reports, Maps, and ‘Facades’
- ArcMap GIS session with
  - Local shapefiles
  - Roads via WMS layer from MassGIS
  - DSNI properties via WMS layer from MIT middleware

Boston DNI Properties - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

file:///D:/urisaims06/urisashare/demos/middleware/dni_mashup_v2.htm

CNN.com - Breaking News, U.S., World, W... | NASA World Wind | Boston DNI Properties

Dudley Street Neighborhood Initiative

Massachusetts Institute of Technology
Department of Urban Studies and Planning

Development in the Dudley Neighborhood

MIT Urban Information Systems
Intelligent Middleware Project

DUDLEY NEIGHBORS INCORPORATED
The Community Land Trust

Dudley Neighbors, Inc. is a Community Land Trust that implements the community revitalization plans of the Dudley Street Neighborhood Initiative (DSNI), which espouses development without displacement and includes affordable housing, economic development, open space, and other amenities of the Urban Village.

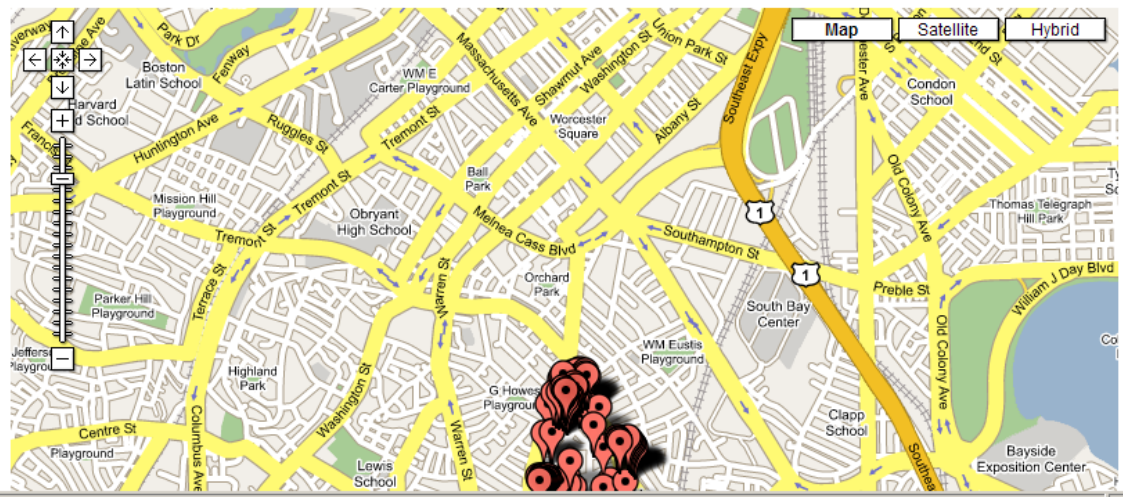
The **table to the right** shows the number of parcels and total acreage purchased by DNI by year of purchase.

The **pinmap (below)** displays the location of the DNI parcels on top of a Google (tm) map. Click on the pins to see additional information about each property.

This web page is part of a larger MIT project that is prototyping and testing an 'intelligent middleware' approach for sharing data within a metropolitan area in a manner that permits accumulating and utilizating local knowledge about neighborhood-scale land use, ownership, and market potential.

DNI Parcels by Year Purchased

year_purch	parcels	acres
In Progress	14	0.719
2004	23	1.451
2000	11	1.186
1999	9	0.876
1998	2	0.377
1997	1	0.108
1996	52	5.895
1995	3	0.330
1994	26	2.206
1993	46	3.332



Done

Location info

Microsoft Excel - basic8.xls

File Edit View Insert Format Tools Data Window Help

Step 1: Select a study area ===>

TOP-10 Landowners in Boston Neighborhoods

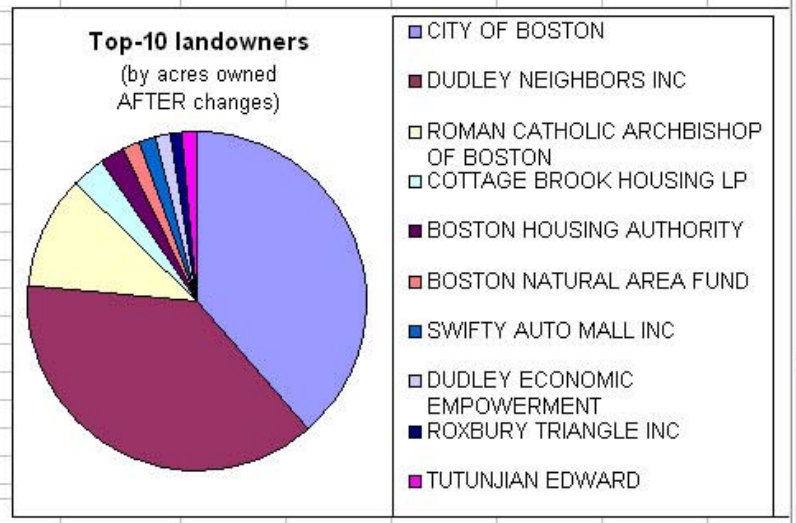
Step 1: **Select a study area ===>** triangle

Step 2: **Click Button to Refresh ===>** Refresh Data

Results AFTER Standardizing Owner Names:

Using Façade: DM_OWNER05

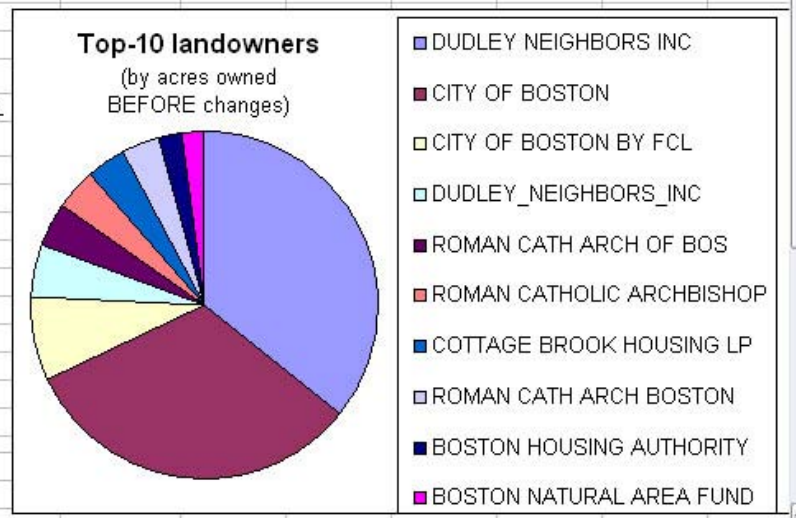
owner	parcels	acres
CITY OF BOSTON	137	14.27631
DUDLEY NEIGHBORS INC	144	13.94128
ROMAN CATHOLIC ARCHBISHOP OF BOSTON	6	4.039118
COTTAGE BROOK HOUSING LP	26	1.245087
BOSTON HOUSING AUTHORITY	4	0.803352
BOSTON NATURAL AREA FUND	7	0.6295
SWIFTY AUTO MALL INC	5	0.611593
DUDLEY ECONOMIC EMPOWERMENT	2	0.484137
ROXBURY TRIANGLE INC	3	0.470409
TUTUNJIAN EDWARD	3	0.468251
Total Parcels/Acres owned by largest owners	**337**	**36.97**



Results BEFORE Standardizing Owner Names

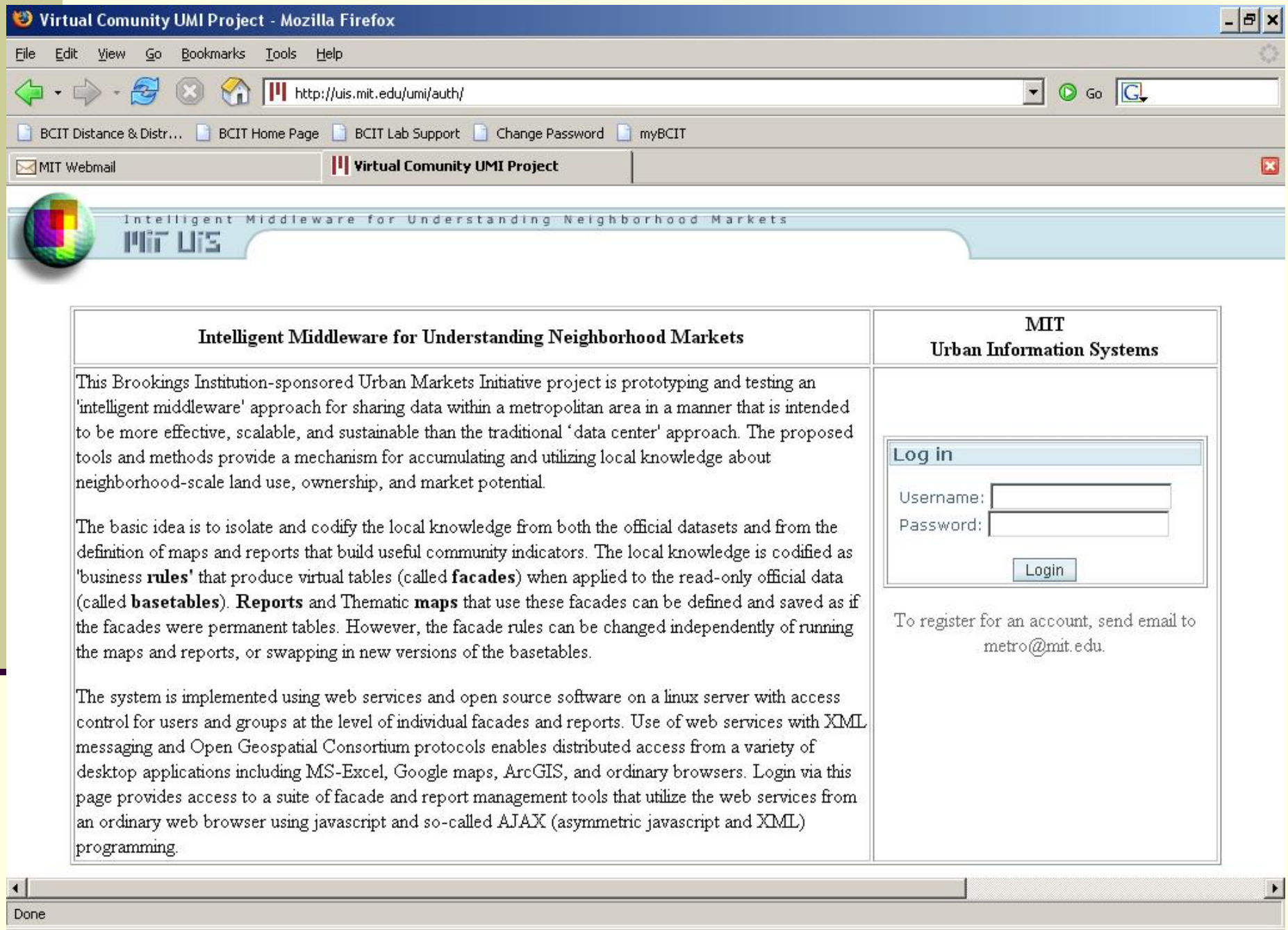
Using Façade: DM_OWNER05_ORIGINAL

owner	parcels	acres
DUDLEY NEIGHBORS INC	120	12.01876
CITY OF BOSTON	83	10.75567
CITY OF BOSTON BY FCL	41	2.63921
DUDLEY_NEIGHBORS_INC	21	1.682415
ROMAN CATH ARCH OF BOS	1	1.422957
ROMAN CATHOLIC ARCHBISHOP	1	1.291552
COTTAGE BROOK HOUSING LP	26	1.245087
ROMAN CATH ARCH BOSTON	3	1.151722
BOSTON HOUSING AUTHORITY	4	0.803352
BOSTON NATURAL AREA FUND	7	0.6295
Total Parcels/Acres owned by largest owners	**307**	**33.64**



Top_Landowners | dm_owner05_original | dm_owner05_fixed | buildout_report

Ready NUM


Virtual Comunity UMI Project - Mozilla Firefox
File Edit View Go Bookmarks Tools Help
http://uis.mit.edu/umi/auth/
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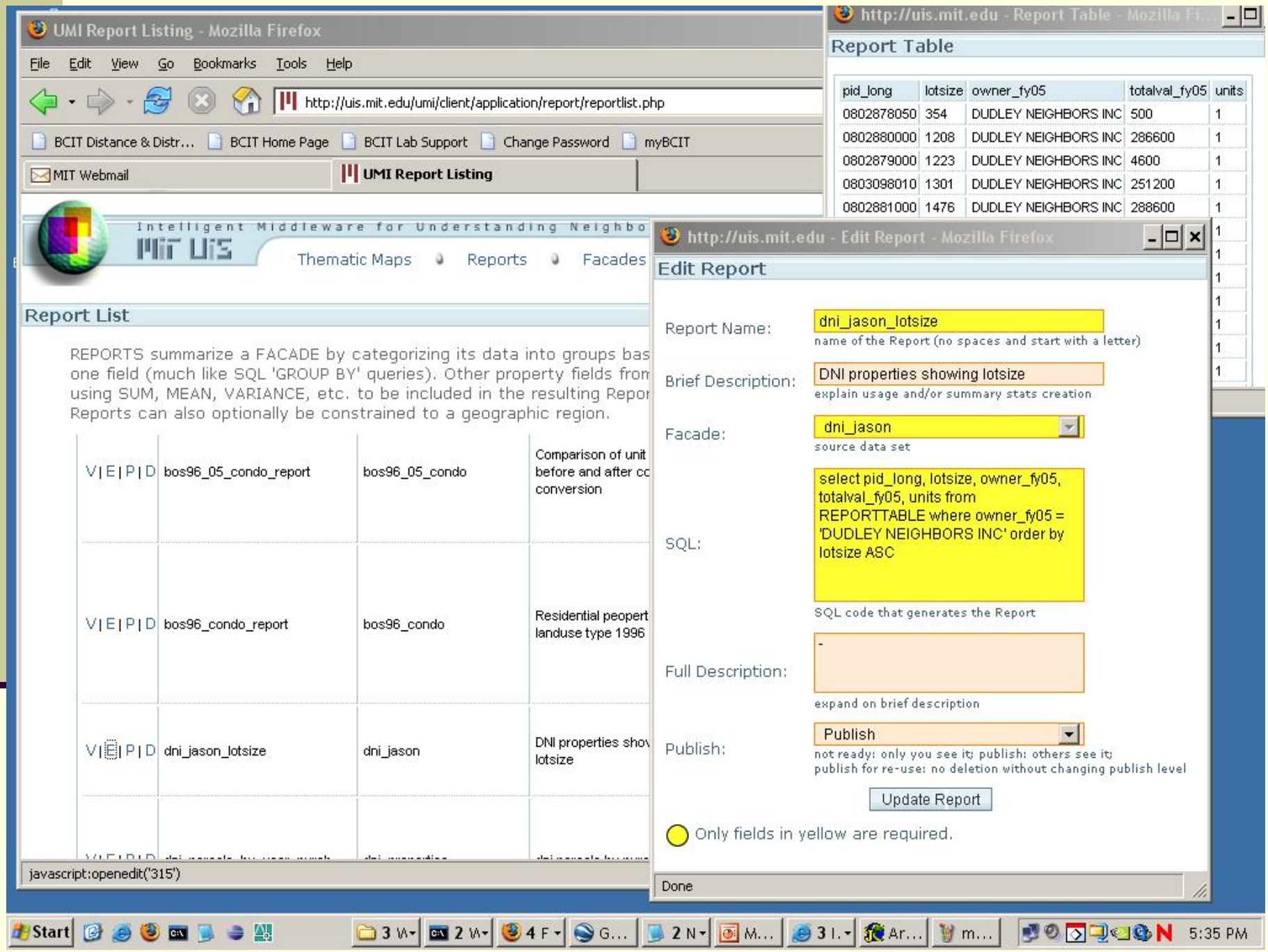
MIT Webmail
Virtual Comunity UMI Project
Intelligent Middleware for Understanding Neighborhood Markets
MIT UIS
Intelligent Middleware for Understanding Neighborhood Markets
MIT
Urban Information Systems
This Brookings Institution-sponsored Urban Markets Initiative project is prototyping and testing an 'intelligent middleware' approach for sharing data within a metropolitan area in a manner that is intended to be more effective, scalable, and sustainable than the traditional 'data center' approach. The proposed tools and methods provide a mechanism for accumulating and utilizing local knowledge about neighborhood-scale land use, ownership, and market potential.
The basic idea is to isolate and codify the local knowledge from both the official datasets and from the definition of maps and reports that build useful community indicators. The local knowledge is codified as 'business rules' that produce virtual tables (called facades) when applied to the read-only official data (called basetables). Reports and Thematic maps that use these facades can be defined and saved as if the facades were permanent tables. However, the facade rules can be changed independently of running the maps and reports, or swapping in new versions of the basetables.
The system is implemented using web services and open source software on a linux server with access control for users and groups at the level of individual facades and reports. Use of web services with XML messaging and Open Geospatial Consortium protocols enables distributed access from a variety of desktop applications including MS-Excel, Google maps, ArcGIS, and ordinary browsers. Login via this page provides access to a suite of facade and report management tools that utilize the web services from an ordinary web browser using javascript and so-called AJAX (asymmetric javascript and XML) programming.
Log in
Username:
Password:
Login
To register for an account, send email to metro@mit.edu.
Done


UMI Report Listing - Mozilla Firefox
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BCIT Distance & Distr... BCIT Home Page BCIT Lab Support Change Password myBCIT
MIT Webmail
UMI Report Listing
Intelligent Middleware for Understanding Neighbo
MIT UIS
Thematic Maps
Reports
Facades
Report List
REPORTS summarize a FACADE by categorizing its data into groups bas
one field (much like SQL 'GROUP BY' queries). Other property fields from
using SUM, MEAN, VARIANCE, etc. to be included in the resulting Repor
Reports can also optionally be constrained to a geographic region.
V | E | P | D bos96_05_condo_report bos96_05_condo Comparison of unit before and after cc conversion
V | E | P | D bos96_condo_report bos96_condo Residential peopert landuse type 1996
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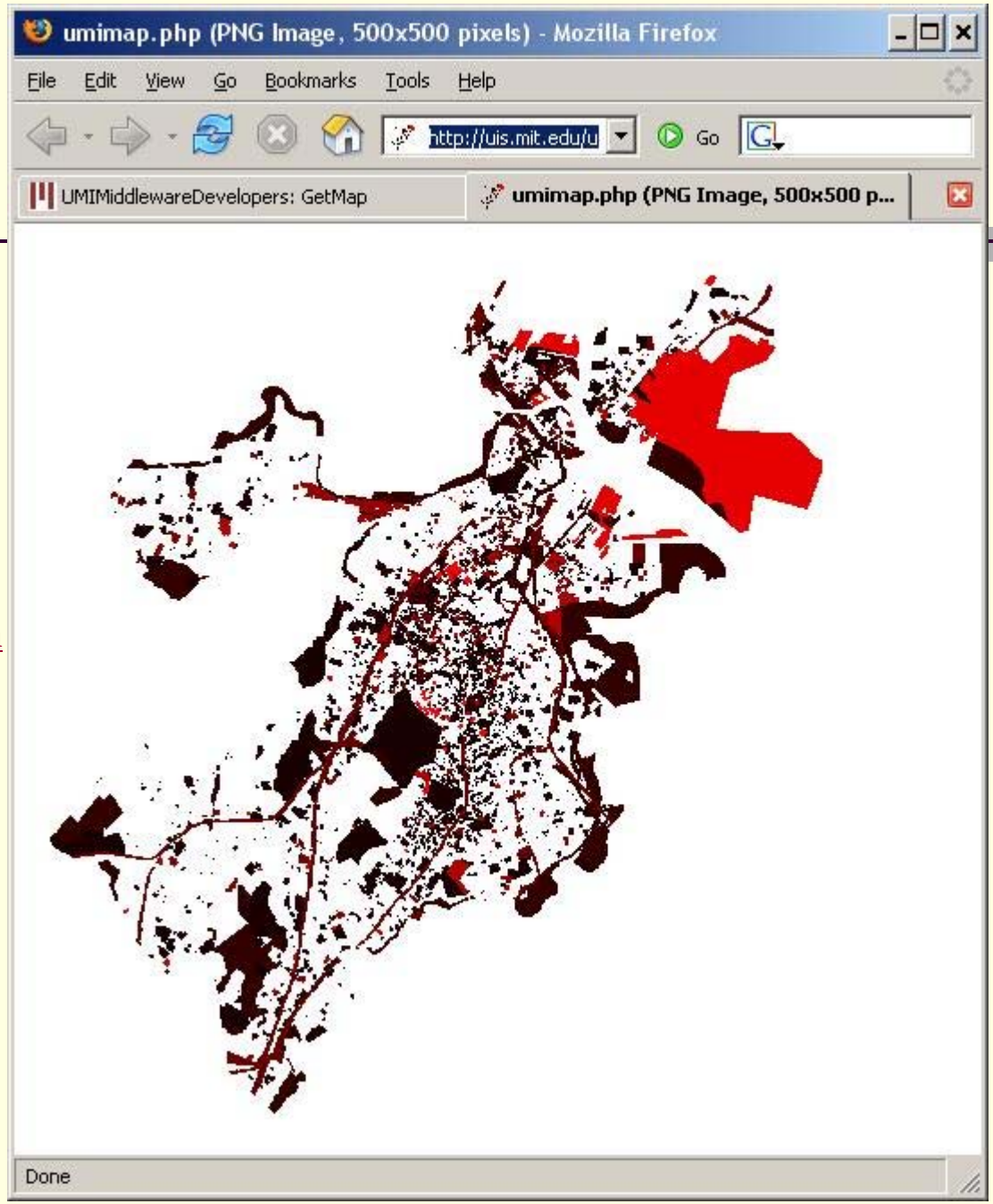
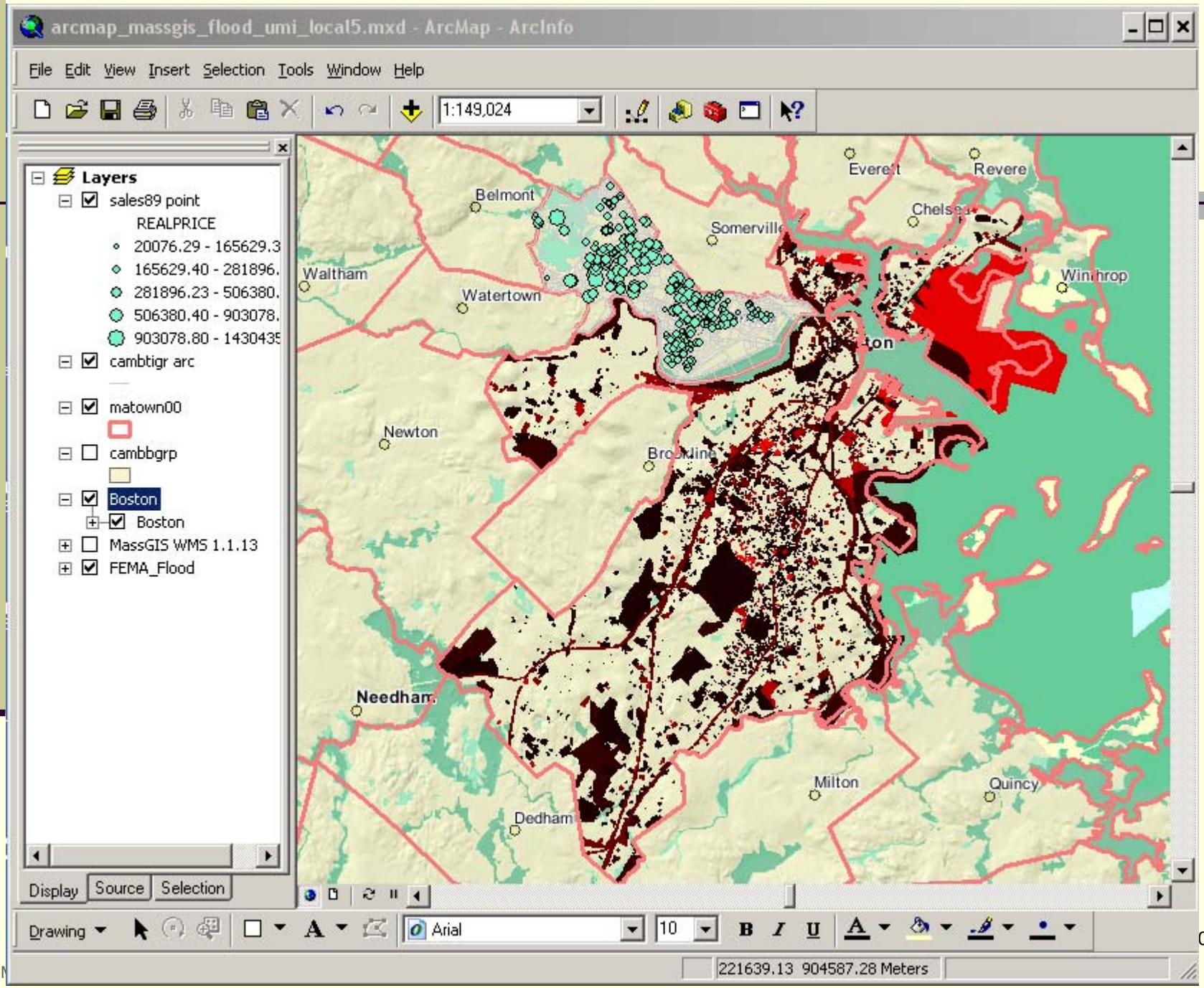
0802879000 1223 DUDLEY NEIGHBORS INC 4600 1
0803098010 1301 DUDLEY NEIGHBORS INC 251200 1
0802881000 1476 DUDLEY NEIGHBORS INC 288600 1
http://uis.mit.edu - Edit Report - Mozilla Firefox
Edit Report
Report Name: dni_jason_lotsize
name of the Report (no spaces and start with a letter)
Brief Description: DNI properties showing lotsize
explain usage and/or summary stats creation
Facade: dni_jason
source data set
SQL: select pid_long, lotsize, owner_fy05, totalval_fy05, units from REPORTTABLE where owner_fy05 = 'DUDLEY NEIGHBORS INC' order by lotsize ASC
SQL code that generates the Report
Full Description: -
expand on brief description
Publish: Publish
not ready: only you see it; publish: others see it;
publish for re-use: no deletion without changing publish level
Update Report
Only fields in yellow are required.
Done
Start
5:35 PM

A WMS call to the middleware services yields a thematic map of the properties owned by Boston's top-10 landowners

The URL:

http://uis.mit.edu/umi/mapservice/umimap.php?request=GetMap&layers=testjf0004




arcmap_massgis_flood_umi_local5.mxd - ArcMap - ArcInfo
File Edit View Insert Selection Tools Window Help
1:149,024
Layers
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cambtigr arc
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FEMA_Flood
Display Source Selection
Belmont
Waltham
Watertown
Somerville
Everett
Revere
Chelsea
Winthrop
Newton
Brookline
Needham
Dedham
Milton
Quincy
Drawing
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10
221639.13 904587.28 Meters

Workshop Sections

- Introduction
- Section 1 -- What is Internet GIS?
- Section 2 -- Internet GIS: state of practice
- Section 3 -- Future development of Internet GIS
- Section 4 -- Function comparisons of current Internet GIS programs
- Section 5 -- Internet GIS applications
- Section 6 – Issues in the Development of Internet GIS

Section 6

Issues in the Development of Internet GIS

Section Objective

Familiar with issues involved in the development of Internet GIS, including

- performance,
- data access,
- security,
- interoperability, etc.

Performance

- Server performance
  - Speed of the server
  - Multi-threaded functionality
  - Scalability
- Client performance
  - Local computer power
  - Thin or thick client?
- Network performance
  - Increase the speed of Internet connection
  - Stream data to the client in an intelligent fashion

Interoperability

- Technical issues
  - what standards are needed for spatial data representation and for application programming interfaces for spatial data processing?
- Semantic issues
  - what metadata, domain-specific vocabulary, etc. are needed for data to be appropriately interpreted?
- Institutional issues
  - what agreements, trust, skills, reorganization, etc. is needed for organizations to coordinate effectively in the generation and use of spatial information.

Interoperability (II)

- Online references concerning interoperability
- Technical issues: ORM – OGC Reference Model (http://www.opengeospatial.org/specs/?page=orm)
- Research issues: A summary report of the NCGIA's specialist meeting on "Interoperability of GIS": http://www.ncgia.ucsb.edu/conf/interop97/interop_toc.html,

  and the University Consortium on GIS (UCGIS) white paper on interoperability research issues: http://www.ncgia.ucsb.edu/other/ucgis/research_priorities/paper5.html

Cost Recovery

- Should the Internet GIS user be charged?
- How much?
  - Everyone the same or depending on use?
- Under what conditions?
  - Does “fair use” imply freedom to “mash up”?
  - Shoud and will governments continue to invest in expensive data acquisition when advertising-sponsored data are “free”

Other Issues

- Data Sharing- will you allow downloads of your Internet GIS data?
- Data security- are you protecting your data? Firewalls, DMZs (***dem****ilitarized* ***z****one*).
- Updates- how difficult is it to update your data? Is your data getting static, even though it is in an interactive Internet environment?
- How much support can you count on from your IT department? Internet GIS requires a lot of IT support.

Summary and Conclusions

- Internet GIS will make it easier for data sharing and dissemination within and among organizations.
- Internet GIS will help facilitate planning integration and public involvement.
- Internet GIS will continue to evolve. Four directions:
  - Distributed GIS Components;
  - Web Services;
  - Open and Standards-based;
  - Open Source Software.
  - Watch the commercial companies like Google and Microsoft; they may lead the way.
    - But watch them closely, less they lock you into proprietary dead-ends…

References

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