



Building Interoperable Web Map Services for Cross-Border Environmental-Health Applications



My Background

- **Director**, New Brunswick Climate Change Hub
www.nbhub.org – 7 years
- **Chair**, multi-stakeholder Advisory Committee consisting of 3 Levels of Government, Industry, NGOs, First Nations (around 40 stakeholders) – 7 years
- **Appointed Member**, Privacy Task Force, Policy Task Force, National Committees in Geomatics, Health, and Climate Change (ongoing)
- **Canadian Delegate**, United Nations Climate Change Conference of the Parties 11, Montreal, 2005
- **Canadian Ambassador**, Climate Change and Health, International Colloquium, Boulder Colorado (sponsored by NASA, NOAA, CDC) – July 2006
- **Speaker** at CEC 10-year Review of North American Agreement on Environmental Cooperation, making recommendations on Public Education Strategies
- **Participant**, CEC meeting in Monterrey, Transportation of Hazardous Chemicals and CEC 5 year strategy, introducing innovative mapping techniques
- **Manage** Public Education and GHG emissions reduction programs involving 25 Municipal Governments



Why I'm Here

To recommend to the CEC ways to improve PRTR data sharing, web map analysis and visualization, collaboration and decision-making across Canada, USA, and Mexico

- **Managed** 3 Web-Mapping Projects for the New Brunswick Lung Association – including:
 - **New Brunswick Environmental Health Portal** – 1,600 layers of climate, air quality, health, and community information
 - **A cross-border pandemic influenza exercise** using GIS pandemic simulations, involving over 80 participants from US and Canada, in health and emergency preparedness.
 - *Current:* **National Lung Health Framework** – respiratory health education, prevention, research, advocacy
- Developed web-based **collaboration forum** capable of sharing maps, hyperlinks, and supporting advanced message and notification systems.

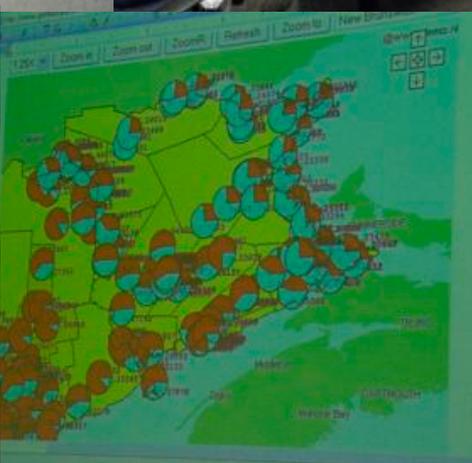
- **Our team** consists of 15 permanent employees, 5 PhDs, with specialization in Geographic Information Systems, Database Management, statistical methods, scientific research, public education, health prevention programs, + Development Team of 25 in collaboration with UNB & CARIS, + 50 colleagues in US & Canada.

The screenshot displays the website for The Lung Association of New Brunswick. The header includes the organization's name and logo, along with navigation links for Home and Contact Us. Below the header is a menu with categories: Applications, Resources, Calendar, About Us, and Partners. The main content area is titled 'Introduction' and contains text describing the web-based mapping portal, its purpose, and the technology used (CARIS Spatial Fusion Enterprise). A 'Quick Links' section lists various resources. To the right, a map of New Brunswick is shown with several cities labeled: Campbellton, Bathurst, Miramichi, Moncton, Saint John, and Fredericton. Below the map is a 'Partners' section with logos for Caris, New Brunswick Canada (Emergency Measures Organization), American Lung Association of Maine, UNB (University of New Brunswick), Cox & Palmer, University of Southern Maine, GeoConnections, Canadian Geospatial Data Infrastructure, and fgdc.

- We built robust GIS **infrastructure** in Maine and New Brunswick, using high-speed fiber connectivity, webconferencing, exercise and training facilities, 3 dedicated servers, and 3 remote servers and growing
- Data Licenses, MOUs, Non-Disclosure Agreements, and Data management records are kept.
- NBLA – CEPA Review, US-Canada Air Quality-Health Index, UNFCCC – Montreal Convention, NEGECP

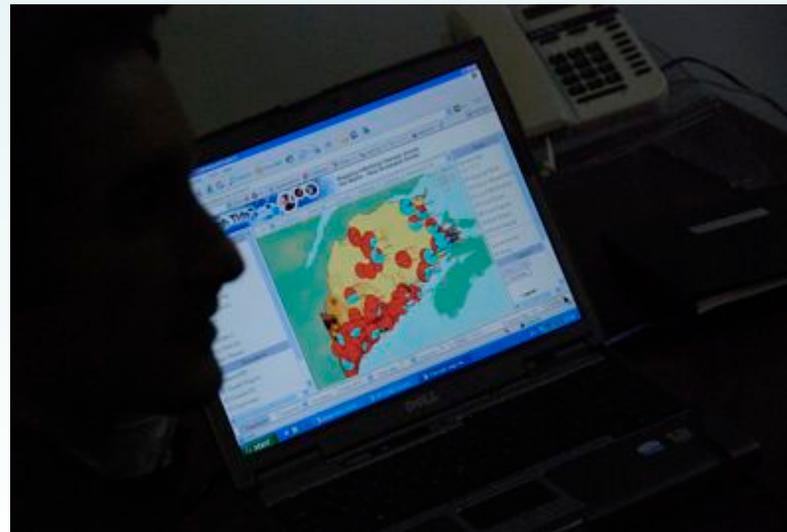


Pandemic Flu Exercise



SECTION TWO – 1 minute

A Context for Web Mapping Services for
Cross Border Applications



Scalability – Data Mining

Continental Scale:

- *Focus of CEC*

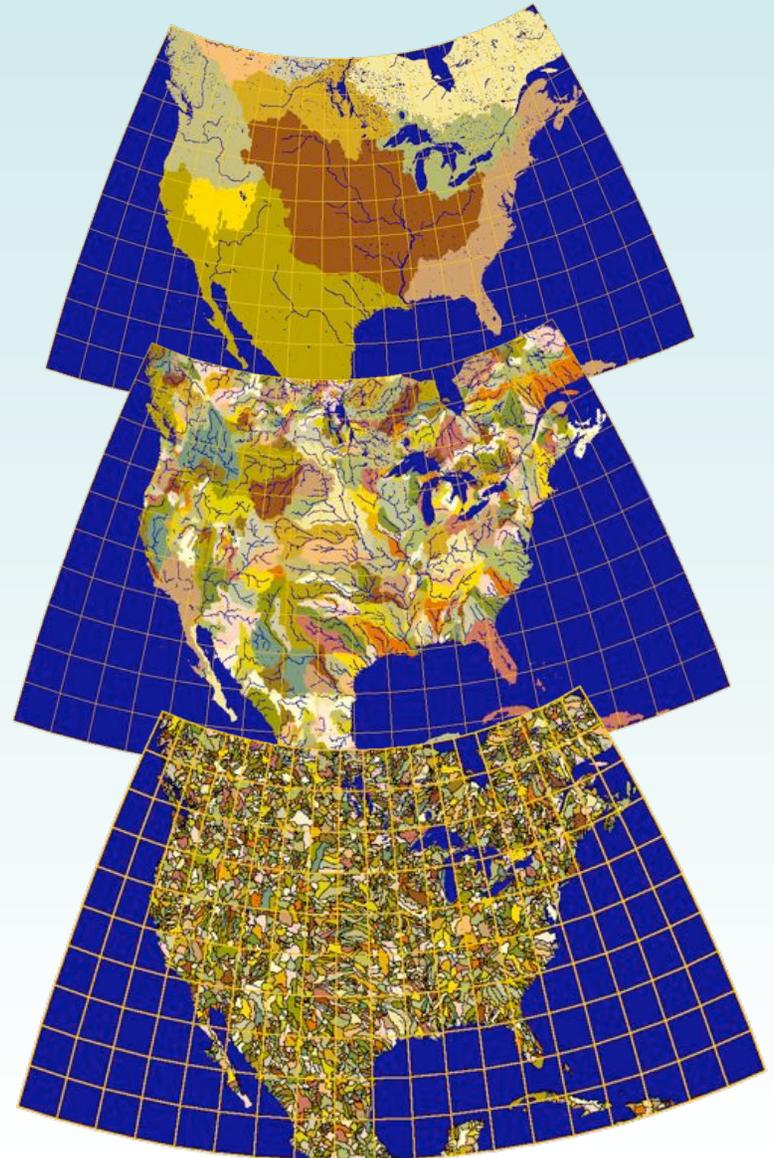
Different Scales (time & space)

Different Issues

Different Stakeholders

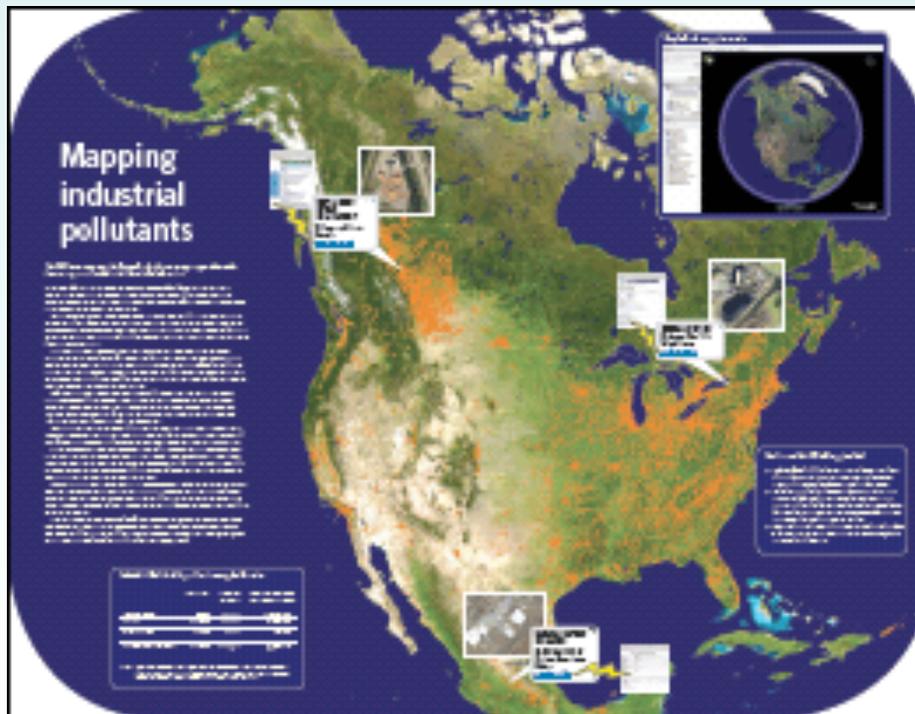
Local Scale:

- *Where emissions happen*
- *Where stakeholders exist*
- *Where data originates*



In June 2007, the CEC launched a North American PRTR mapping tool for *Google Earth* <http://www.cec.org/naatlas/prtr>.

1. This mapping tool is a downloadable file that can be opened with *Google Earth*
2. Displays over 30,000 industrial facilities in North America reporting to PRTRs in 2004. Creates a seamless map of PRTR reporting in Canada, Mexico and the United States
3. Provides access to pollutant data in PRTR databases in each country.
4. Allows users to quickly find places of interest, identify nearby industrial PRTR facilities, view detailed satellite or aerial imagery, and
5. Allows users to access, using a direct hyperlink, detailed pollutant data for these facilities.

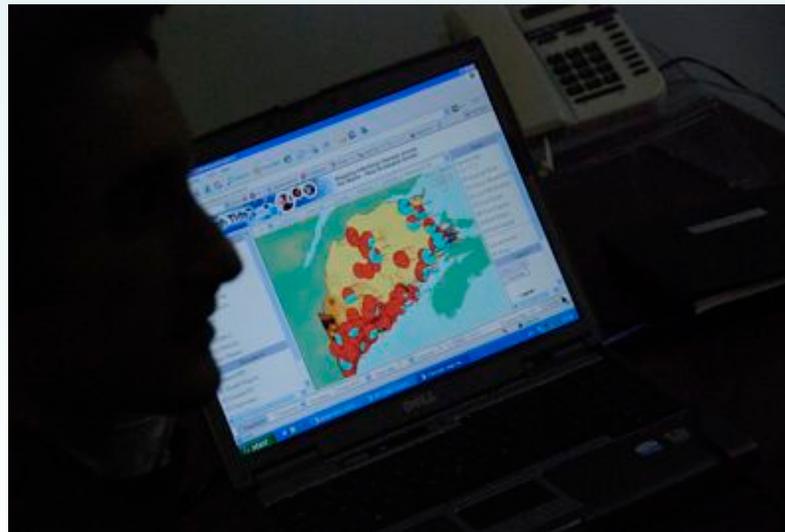


- *Taking Stock 2004* included new types of maps, including **point maps** and proportional **symbol maps** to display facility locations and chemical amounts.
- In earlier *Taking Stock* reports, the common type of map used was the choropleth map. In **choropleth maps**, each spatial unit is filled with a uniform color or pattern that represents the data associated with that spatial unit. For instance, in the map of jurisdictions (e.g., states/provinces) in *Taking Stock*, the jurisdictions are shaded according to the amount of releases and transfers. Each color represents one quarter of the total amounts.
- While these maps can be familiar and useful to some readers, choropleth maps may imply a false sense of geographic pattern of the underlying point data... It might be useful to consider other mapping methods, such as emission **density heat maps**, or normalized **bar charts**.

- *Are the maps in Taking Stock report useful? **YES***
- *Are there other themes that could be mapped? **YES***
- *Are there any other mapping techniques that could enhance communication? **YES***
- *Are there any other improvements that could be made to the figures, tables in the Taking Stock report? **YES***

SECTION THREE – 5 minutes

New ways to present PRTR data

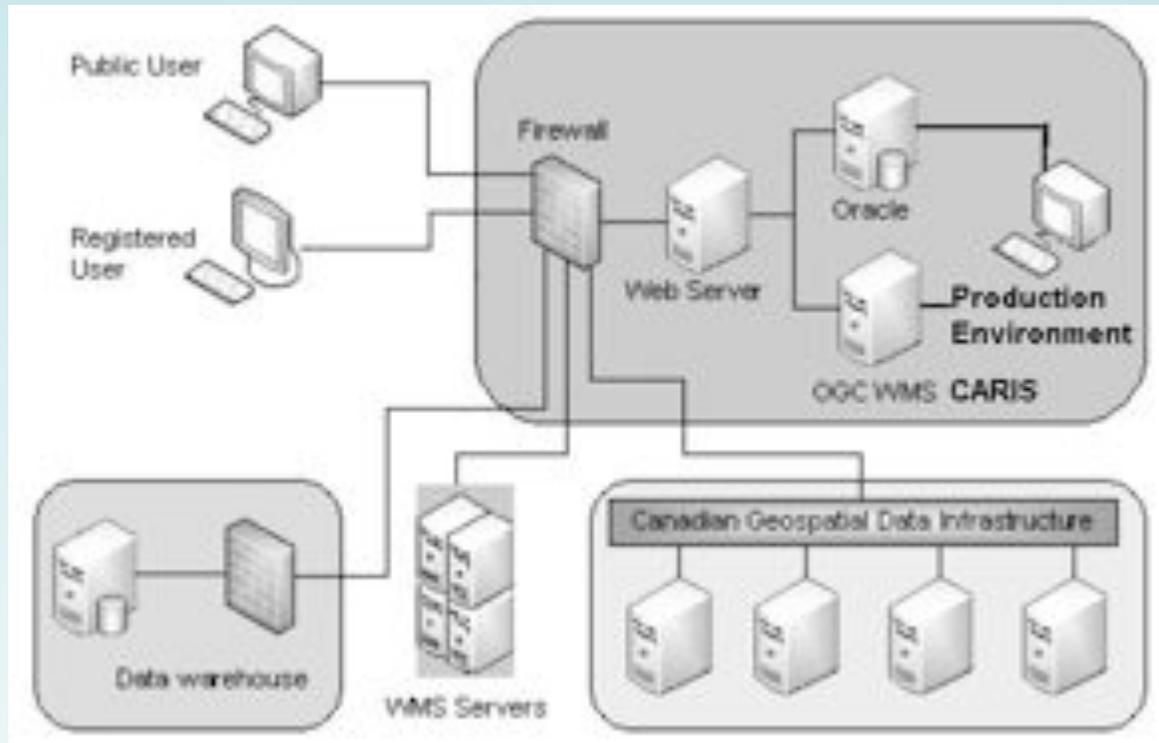


How Web Mapping Systems could *Enable*:

1. **Reporting** by facility
2. **Active dissemination** to a wide range of users in both raw and summarized form
3. **Identification** of local industrial sources of releases and
4. **geographically-based analyses.**



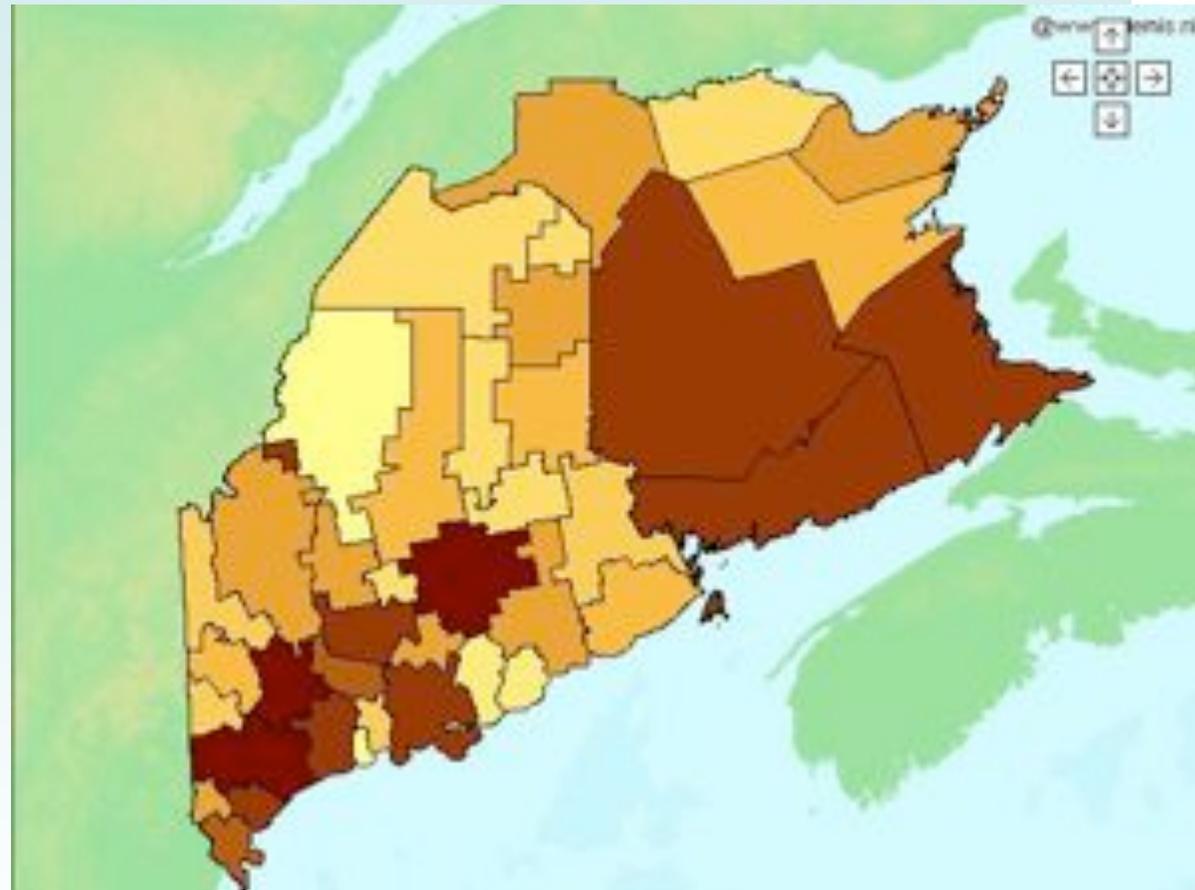
Development Process



1. **User Needs Identification**
2. **Cross-Border Data Assessment** – Create Dictionary / Definitions
3. **Database Design:** Relational, Hierarchical, Temporal (embed procedures)
4. **Statistical Design** (embed procedures)
5. **Build Web Services using Standard Protocols**
6. **Thin Client Interface (Quick Map Viewer)**
7. **Thick Client Interface and Collaboration Forum**
8. **High Speed Fiber Connectivity for distributed web map services / data**
9. **Training, Exercise and Evaluation**

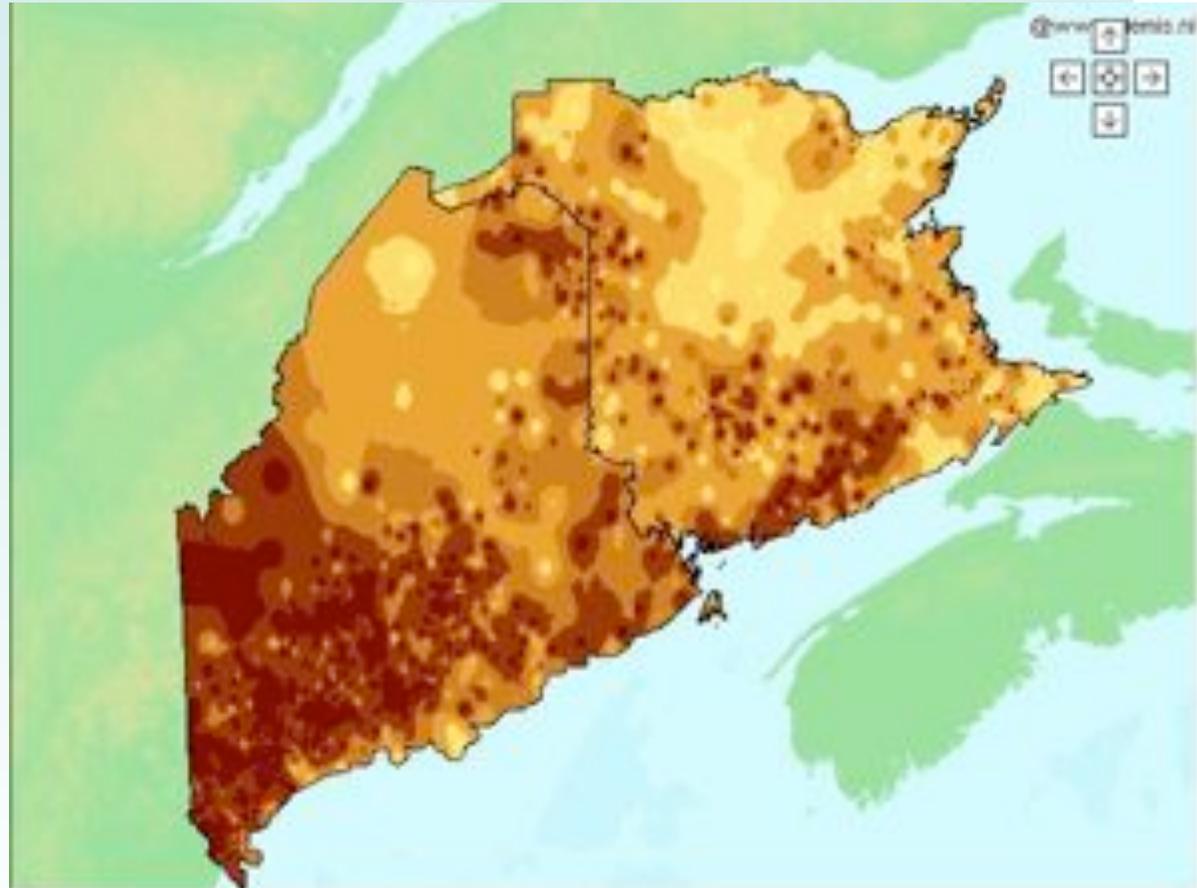
Mapping Methods

- **Cell distribution**
 - Frequency, cumulative, Normative distribution methods
 - Four geolayers: Province, Health Region, County, Dissemination Area

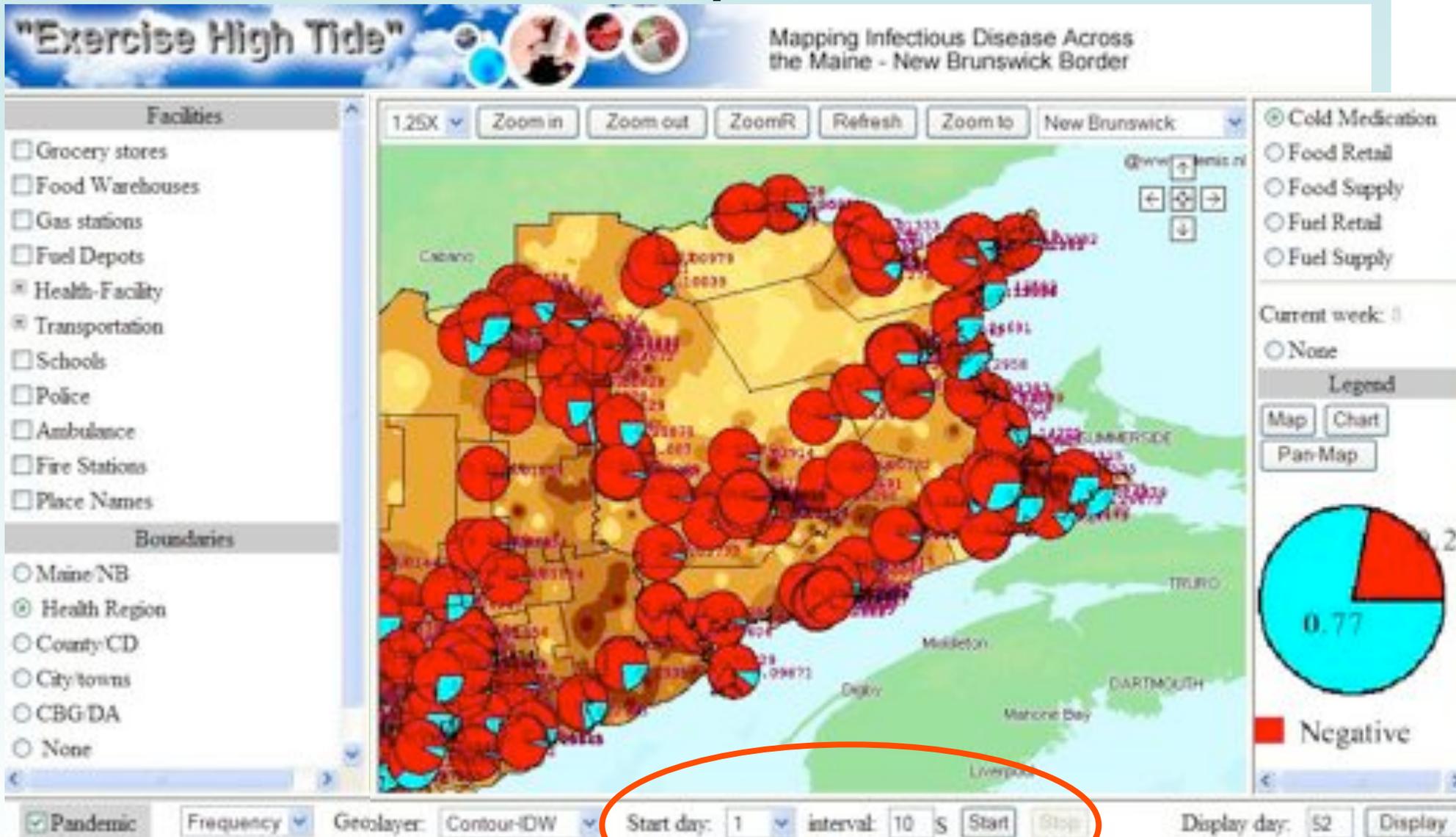


Mapping Methods

- **Contour distribution**
 - Inverse Distance Weighting method
 - One geolayer: Province/State; with 4 boundary overlays (Health Region, County, Metropolitan, and DAUID levels)



Quick Map Viewer



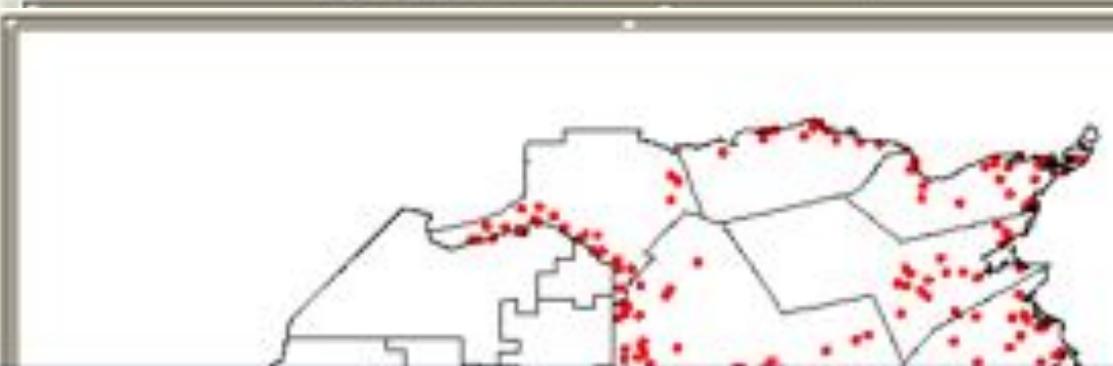
NBLA Web Mapping Portal

Spatial Fusion Enterprise 4.2 Public Module Logout (nbla) | Map | Options | Contact
Change Language: français

Launch forum

Layers

- ME_Airports
- ME_Mjr_Hwys
- ME_Other_Rds
- ME_Mjr_Rails
- ME_Boundary
- Land
- nblaGraph_SimulationData



Selection Results

NB_Hospitals (5)

POI_ID	NAME	ADDRESS	ADDRESS2	CITY	COUID	COUNTY	STATE	ZIPCODE	PHONE	FAX
POI2167743	Oromocto Public Hospital	333 Winnebago St.		Oromocto	1303	Sunbury	NB	E2V 3C6	506-357-4700	
POI2167715	Queens North Health Complex	186 Pleasant Dr	PO Box 309	Minto	1304	Queens	NB	E0E 1J0	506-327-7800	
POI2167680	The Stan Cassidy Centre For Rehabilitation	180 Woodbridge St.		Fredericton	1303	Sunbury	NB	E3B 4R3	506-452-5225	
POI2167677	Dr Everett Chalmers Hospital	700 Priestman St	PO Box 9000	Fredericton	1303	Sunbury	NB	E3B 5V5	506-452-5400	
POI4522727	Oromocto Public Hospital - Patients Care	333 Winnebago St.		Oromocto	1303	Sunbury	NB	E2V 3C6	506-357-4940	506-357-4741

NB_Nursing_Homes (21)

NB_Pharmacies (24)

NB_Schools (55)

Gazetteer

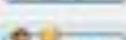
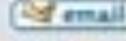
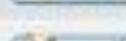
Classifier

Points Of Interest

Map Tool:  Latitude: 45-55-40N Longitude: 66-40-01W Scale 1: 2,429,673

Collaboration Forum

Facilitate Research, Reporting, Response

21		Cathy Belmore		Fredericton Ops Center (NB EMO)	30 Jan 2007	1
22		Cathy Mallet		NB EMO - administrator	09 Mar 2007	8
23		CFIA		Canadian Food Inspection Agency	08 Mar 2007	0
24		Chantale Caron		CARIS, Fredericton	02 Feb 2007	0
25		Charles Jacobs		Maine Emergency Management Agency	19 Feb 2007	0
26		Chris		University of Southern Maine, Portland, Maine	01 Feb 2007	0
27		Christa Wang		National Research Council, Fredericton	03 Feb 2007	0
28		Clairine Hamilton		NB EMO - Administrator	09 Mar 2007	6
29		Col. Roch Lacroix		COS LFAA	09 Feb 2007	0
30		Col. Tony Stack		Canadian Forces	09 Feb 2007	0
31		Craig Oldham		Public Safety and Emergency Preparedness Canada	09 Feb 2007	0
32		d oldfield		Saint Louis MO	25 Jul 2007	0
33		Darka Mioc		University of New Brunswick, Faculty, Department of Geodesy and Geomatics Engineering	09 Feb 2007	0
34		Dave Finley		Services New Brunswick	21 Feb 2007	0
35		David Buckeridge		McGill University, Montreal, Quebec	05 Feb 2007	0
36		David Coleman		University of New Brunswick, Fredericton, NB	02 Feb 2007	0
37		David Fraser		University of New Brunswick	23 Mar 2007	0
38		David Harris		University of Southern Maine, Portland ME	29 Jan 2007	6
39		David Lewis		Public Health Agency of Canada, Ottawa	02 Feb 2007	0

Share Map Views / POIs

Post a new topic

Subject

Message body

B **I** **U** Quote Code List List= Img URL

Font colour: Default Font size: Normal Close Tags

Code display: [code]code[/code] (alt+c)

Emoticons

View more Emoticons

Add Map View to the post

Map View ID: OR

Disable BBCode in this post

Notify me when a reply is posted

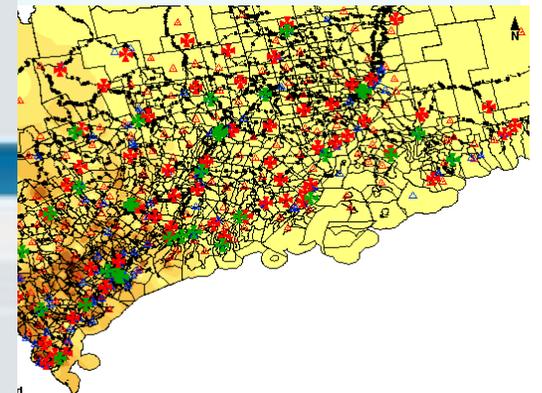
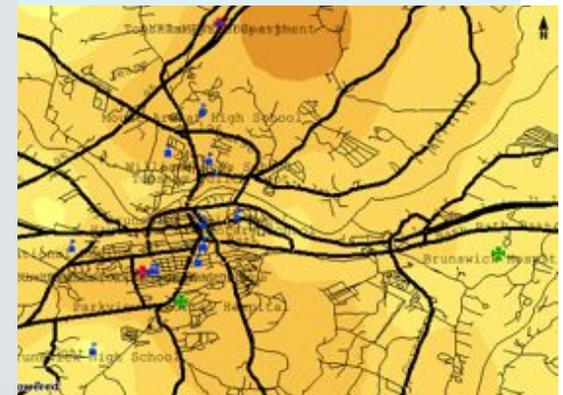
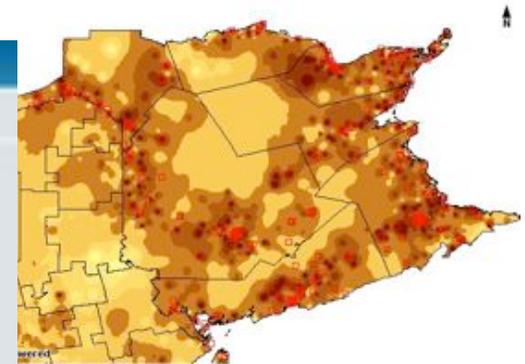
Post topic as: Normal Sticky Announcement

Add an Attachment

If you do not want to add an Attachment to your Post, please leave the fields blank:
[Allowed Extensions and Sizes](#)

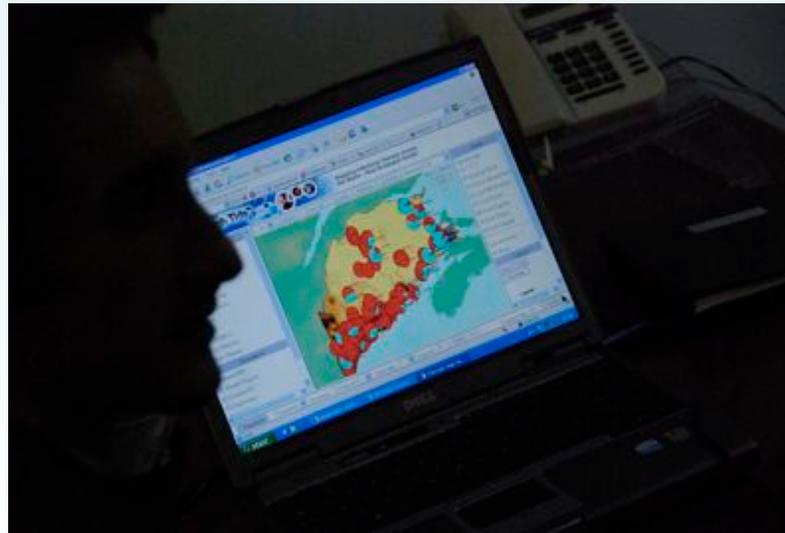
Filename

File Comment



SECTION FOUR – 3 minutes

Measurable Results



H5N1  Human cases
 Bird outbreaks

Period	Number of bird deaths
 Jan-Apr 2006	 = 10
 Sep-Dec 2001	 = 100
 May-Aug 2001	 = 1,000
 Jan-Apr 2001	 = 10,000
 Sep-Dec 2004	 = 100,000
 May-Aug 2004	 = 100,000
 Jan-Apr 2004	 = 100,000
 Sep-Dec 2003	 = 100,000

Poultry density (heads per km²)

	< 1
	1 - 5
	5 - 10
	10 - 20
	20 - 50
	50 - 100
	100 - 200
	> 250



Image ©2006 NASA
Image ©2006 TerraMetrics

©2006 Google

Pointer lat 33.795660° lon 39.466246°

Streaming 100%

Eye alt 8458.36 km

Google Earth

- **QUESTION?**

- Mass Market Geomatics or International Spatial Data Infrastructure?

- **WEAKNESSES:**

- Google Earth not hosted by CEC, Data Providers, or Clients
- Google Earth packages have a cost
- Limited analysis capability
- Heavy User System Requirements
- Not Service Oriented (apart from map visualization)
- No real-time data or web map uplinks
- Missing out on interoperable CGDI (national spatial data infrastructure)

- **RECOMMENDATIONS**

- Develop KML parser and reader (to access data over the web in Google Earth)
- Matched Taking Stock Data should be published using Web Mapping Services or Web Feature Services and published to CGDI, FGDC / NSDI
- Host Map Portals for each country, eco-region, or industrial sector (permission based / Digital Rights Management)
- Connect to distributed data sources (primary source, secondary source, tertiary source)
- Develop User Input Mechanisms for Reporting and Verification (service oriented)
- Use web processing services for Data Mining and Analysis

Measurable Results

- Objective 1:
 - increase public and industry understanding of the types and quantities of chemicals released into the environment and transferred off-site as waste;
- Proposed Activities:
 - Disseminate maps using the World Wide Web as a platform for **service-oriented applications, data mining and analysis, collaboration, etc**
- Results:
 - increased awareness, understanding, surveillance and use of PRTR data

Measurable Results

- Objective 2:
 - encourage industry to prevent pollution, reduce waste generation, decrease releases and transfers and assume responsibility for chemical use;
- Activities:
 - Visualize Spatio-Temporal Trends of pollution, wastes, chemicals, using Choropleth Maps, Table/Graphs Overlays, and Data Table Outputs
 - Use Point of Interest tools to add facility and pollutant data
 - Use Query tools to monitor compliance, analyze trends, and enable decision-making
 - Publish multi-scalable maps to include in annual Taking Stock reports (online)
 - Contribute to peer-reviewed research / community of practice
- Results
 - industry can manage sector-wide emissions reductions (including credit trading), ensure compliance with regulations for criteria air contaminants, hazardous and toxic substances, and report exceedances
 - Government can monitor compliance with regulations, measure trends in controlled substances, and enable reporting, verification/auditing, and enforcement measures

Measurable Results

- Objective 3:
 - **track** environmental progress and **assist** governments in identifying priorities.
- Activities:
 - Monitor Web Transactions (quantity, type, user)
 - Monitor Key Variables (e.g. quantities, type of pollutant)
 - Data Upload, Visualization, and Analysis Capabilities
 - Collaboration and Communication Forums
 - Export and Publishing



- Phone: (506) 455-8961 ext 113 or 104
- Email: eddie.oldfield@nb.lung.ca
- WEBSITE: www.gishealthportal.ca
- Address:
c/o New Brunswick Lung Association
65 Brunswick Street
Fredericton, NB
E3B 1G5

