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Canada

Development of a Background Soil Chemistry/Toxicology Database for the Atlantic Region

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Federal Contaminated Sites Action Plan (FCSAP)

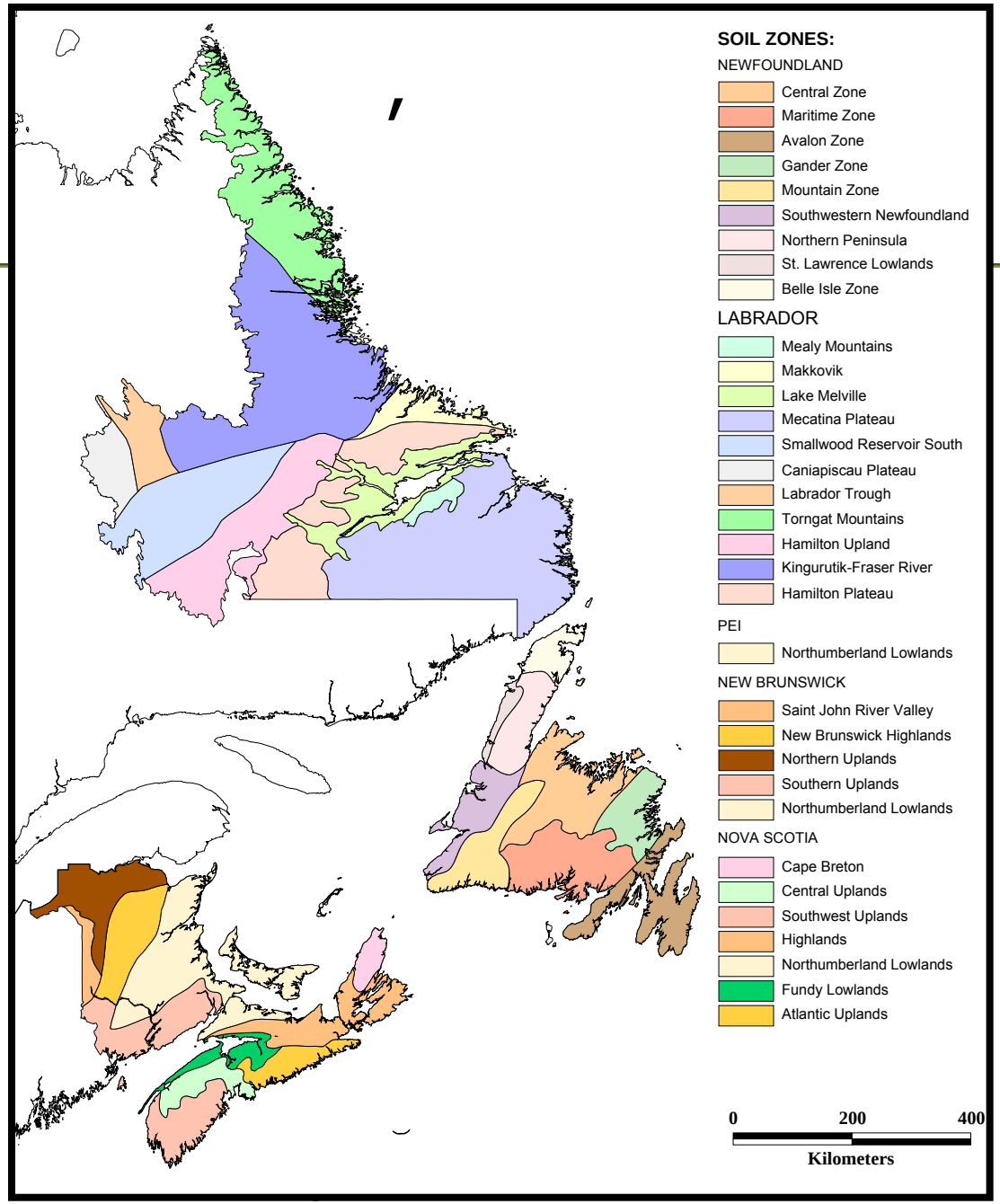
- $3.5 billion over 10 years
- Assess and remediate federal contaminated sites
- Goal: reduce human health and ecological risks, federal financial liability
- Treasury Board initiative
- 4 “Expert Support” departments
  - Environment Canada
  - Department of Fisheries and Oceans
  - Health Canada
  - Public Works and Government Services Canada

Background

- Ecological and human health risk assessment processes are key to FCSAP
- Screening level: compare soil data to established benchmarks (eg. Canadian Council of Environmental Ministers (CCME) Canadian Environmental Quality Guidelines) or background soil quality data
- While other Canadian provincial jurisdictions have initiated databases for background soil chemistry, only sporadic background data exists in the Atlantic region.
- Environment Canada - Atlantic is developing a database of background chemical and toxicological soils data.

Project initiation - 2004

- Need to break the region into soil zones
- Need to develop sampling protocol
- Hired Jacques Whitford Environmental Ltd.
- Part 1 – Regional map
- Part 2 – Sampling protocol and pilot study
  - Based on British Columbia method/P. Loro (from New Brunswick)
  - Sampled 2 sites for pilot testing



Source: Soil Landscapes of Canada Working Group. 2005. Soil Landscapes of Canada v3.0. Agriculture and Agri-Food Canada. (digital map and database at 1:1 million scale).

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Soil Zones of the Atlantic Region

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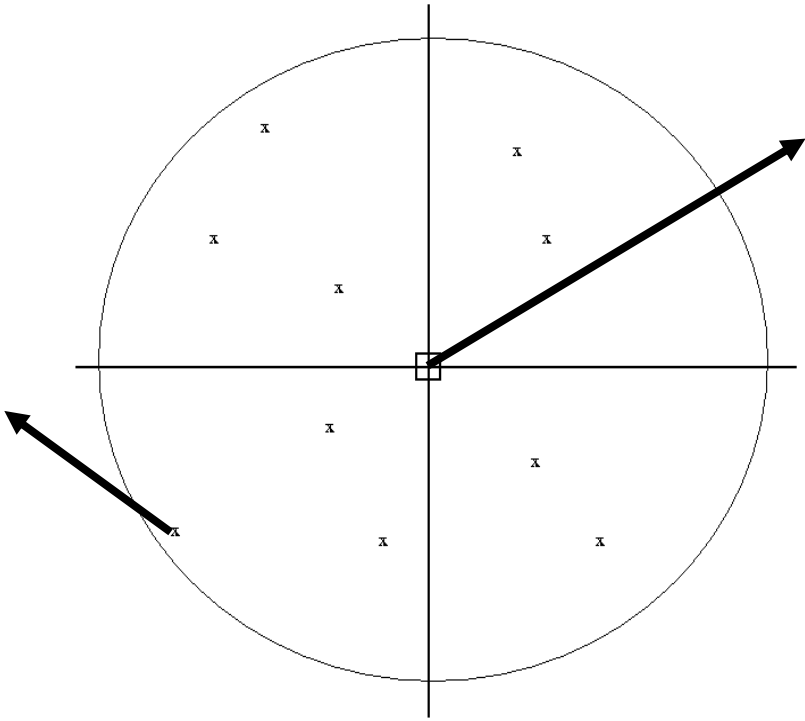
Soil Sampling Protocol

- **At each site, 10 sub-samples randomly collected within one hectare, combined to form one composite sample**
- **0-30cm soil horizon**



Analyses

- Chemical:
  - Metals
  - Polycyclic aromatic hydrocarbons (PAHs)
  - Total organic carbon (TOC)
  - pH
  - grain size

- Toxicological assays (25% of samples):
  - Earthworm, *Eisenia andrei*
  - Collembola, *Folsolmia candida* (springtail)
  - 3 plant assays
    - Lettuce
    - Northern Wheatgrass
    - Alfalfa

- Why were these species selected for assessment???

Invertebrate species

http://cache.eb.com/eb/image?id=24294&rendTypeId=4

http://www.biosci.missouri.edu/carrel/photos/Arthropods/collembola/collembola.jpg

- **Common in Canadian Soils**
  - Widely distributed
  - Found in association with human habitation
- **Relatively short life cycle**
- **Toxicity data are reliable and sensitive**
- **Each represent a different ecological niche within terrestrial environment**

Plant species – Lettuce, Northern Wheatgrass, Alfalfa

http://www.umassvegetable.org/images/soils_crops_pest_mgt/crop/lettuce3.jpg

http://www.agr.gc.ca/pfra/pub/fspg16b.jpg

http://www.noble.org/Press_Release/Collaborations/ForageGenetics/Alfalfa.jpg

- **Lettuce**
  - Annual dicotyledonous species
- **Northern Wheatgrass**
  - Perennial monocotyledonous non-crop species
- **Alfalfa**
  - Perennial dicotyledonous legume species

- **Represent a range in sensitivities**
- **Reliable seed sources**
- **Include a forage crop, a vegetable crop, and a native species**

Earthworm Assay

- 28 day chronic (survival and reproduction)

Collembola Assay

- 35 day chronic (survival and mean progeny)

Plant Assays – 3 types

- Lettuce (14 d)
- Northern wheatgrass (21 d)
- Alfalfa (21 d)
- Seedling emergence, mean shoot and root lengths and mass

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Progress to date

- # of sites sampled
  - 2004 - 2 sites (NB)
  - 2005 - 33 sites (NB, NF/LAB)
  - 2006 - 66 sites (NB, NF/LAB, PEI)
  - 2007 - 188 sites (NB, NF/LAB, PEI, NS)
  - Total: 264 sites
- **GIS-based database initiated**
- **Collaborative efforts with Tri-National project**

Sample sites

Sampling equipment

Status of Database

- PWGSC contracted to develop database
- “Work in progress”
- Not yet publicly available

EC Background Soils Database - Microsoft Internet Explorer

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Address https://www.agri.ns.ca/ec-soils-secure/frames.asp?ID=31 Go Links

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Canada Background Soils Database

Current Map: Map Function Currently Unused

TOOLS

Zoom All | Back to Main | Logout

Data Management Tools

Analyte Analysis

Average Analyte Analysis

Documents

Site List

What's New

Map Data Disclaimer

Contact: Eugene Peters

Under Development

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- Soil Sites
  - Southwest Uplands Soil Zone - N
  - Southern Uplands Soil Zone - NE
  - Saint John River Valley Soil Zone
  - Northumberland Lowlands Soil Z
  - Northumberland Lowlands Soil Z
  - New Brunswick Highlands Soil Z
  - Highlands Soil Zone - NS
  - Fundy Lowlands Soil Zone - NS
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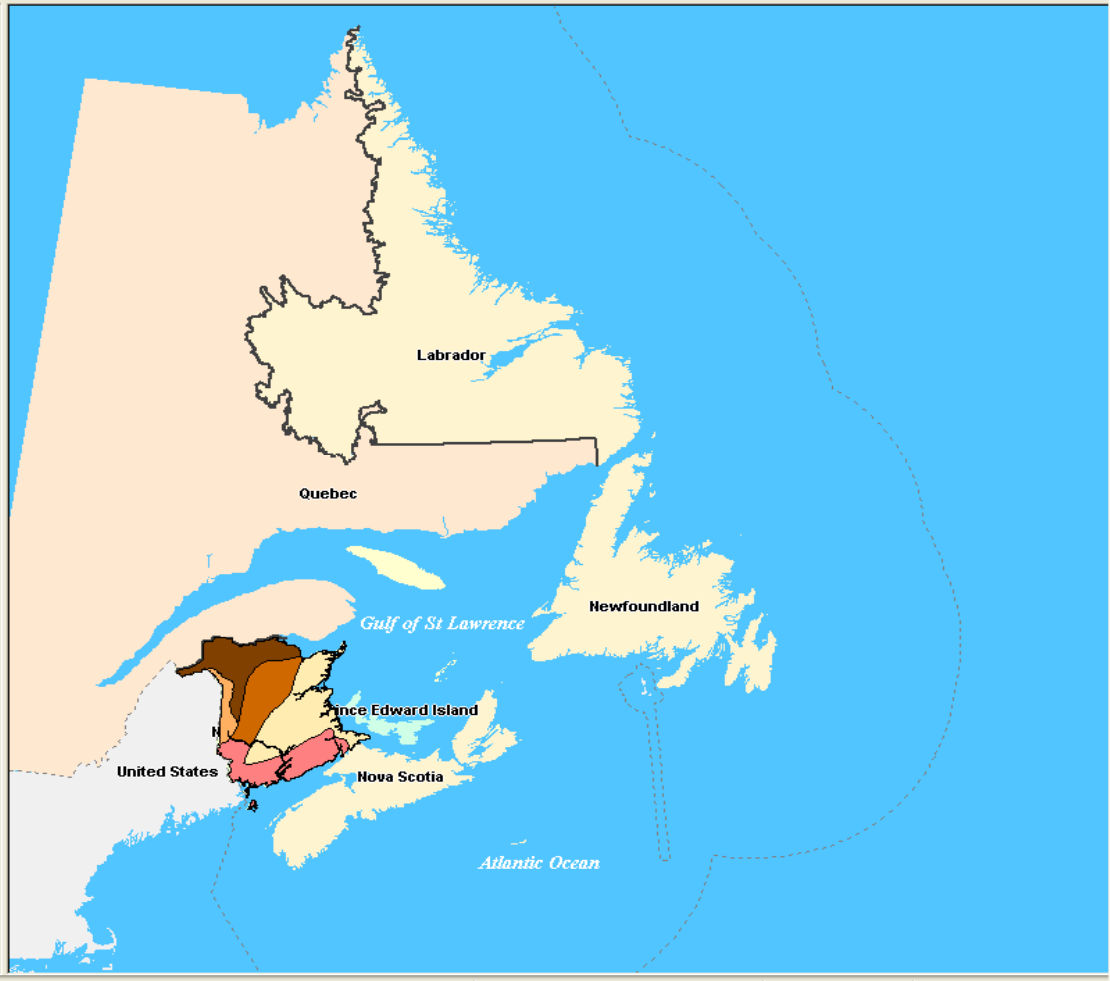

USA : United States of America | 1 : 10,792,079 | 1,434 x 1,341 (mi)

Discussions | Discussions not available on https://www.agri.ns.ca/

United States of America | Internet

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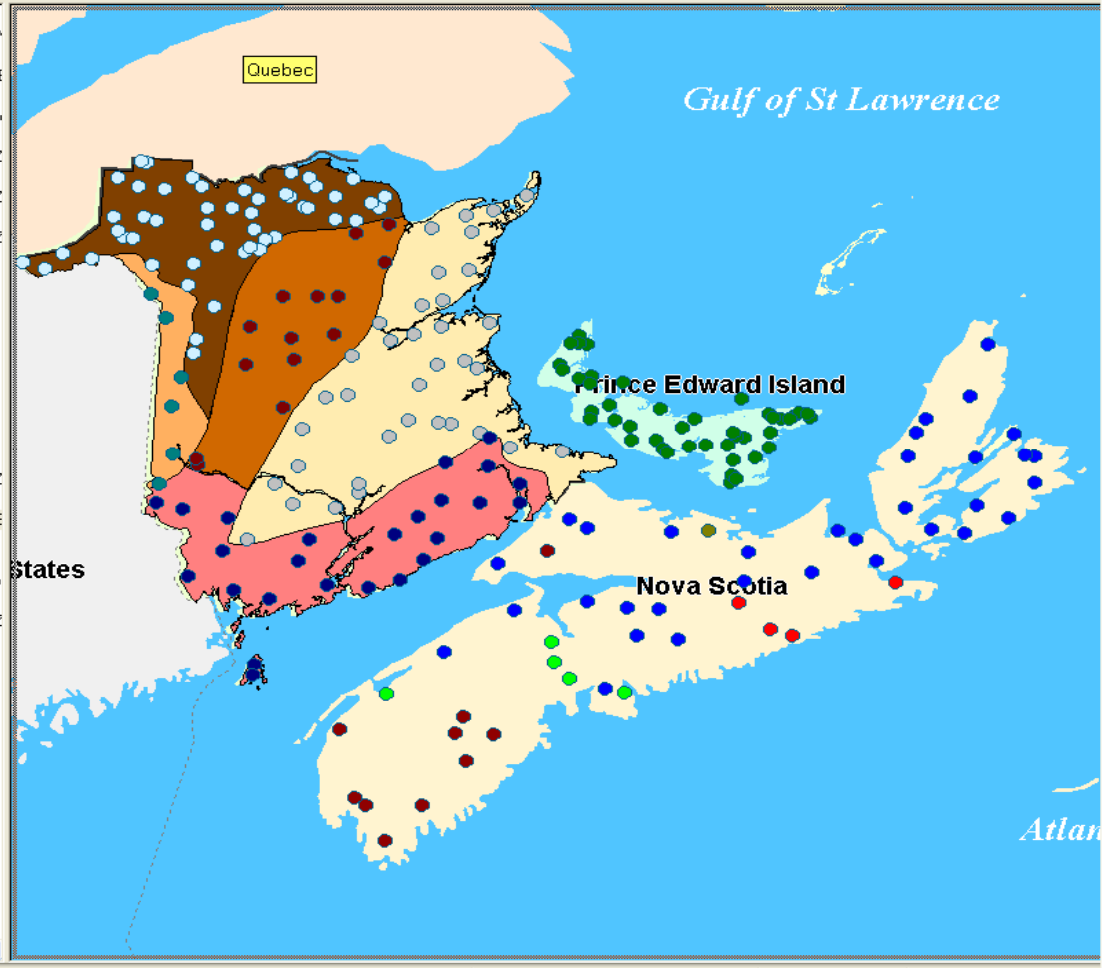

Canadian Provinces : Quebec | 1 : 3,473,730 | 461 x 432 (mi)

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Questions?