Environment Canada Environnement Canada

Canada

CARA Mercury Science Program

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ASAI
April 22, 2008

Clean Air Regulatory Agenda

- **Actions** to reduce emissions of SOx, NOx, VOCs, GHGs and hazardous air pollutants including Hg.
- Regulation of **industrial sectors** will be most significant activity under the CARA.
- Implementation requires **research, monitoring, modelling** and **assessment**.

CARA Mercury Science Program

2007 — 2011

Phase 1: Set the Baseline

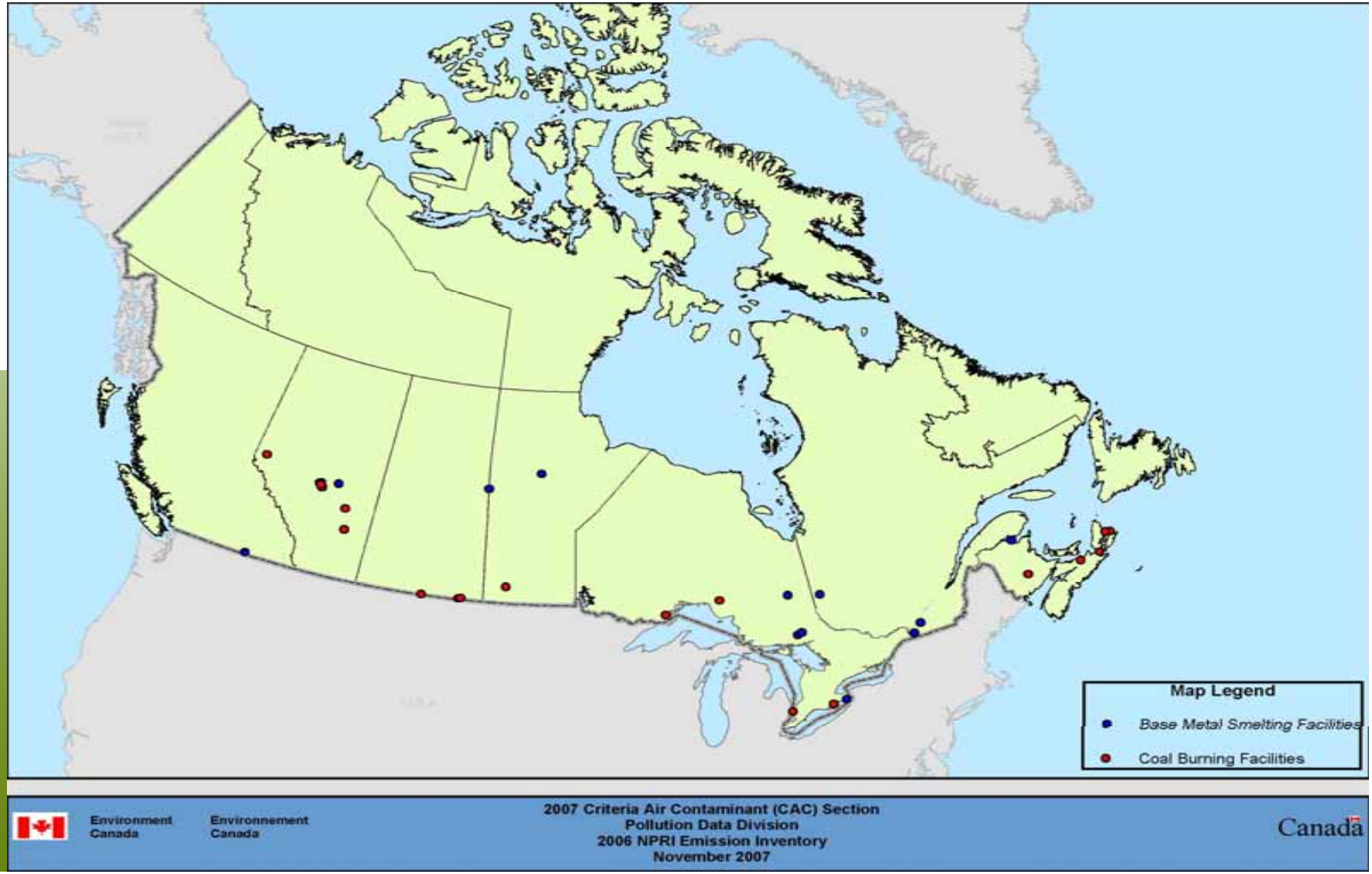
- Define the state-of-the-Canadian environment with respect to the transport, fate and effects of Hg as of 2006.
- Deliverable: Assessment due 2012
- Science Plan: To identify research and monitoring projects that will enable EC to present a cohesive national description of mercury pollution across Canada.

2011 — 2015

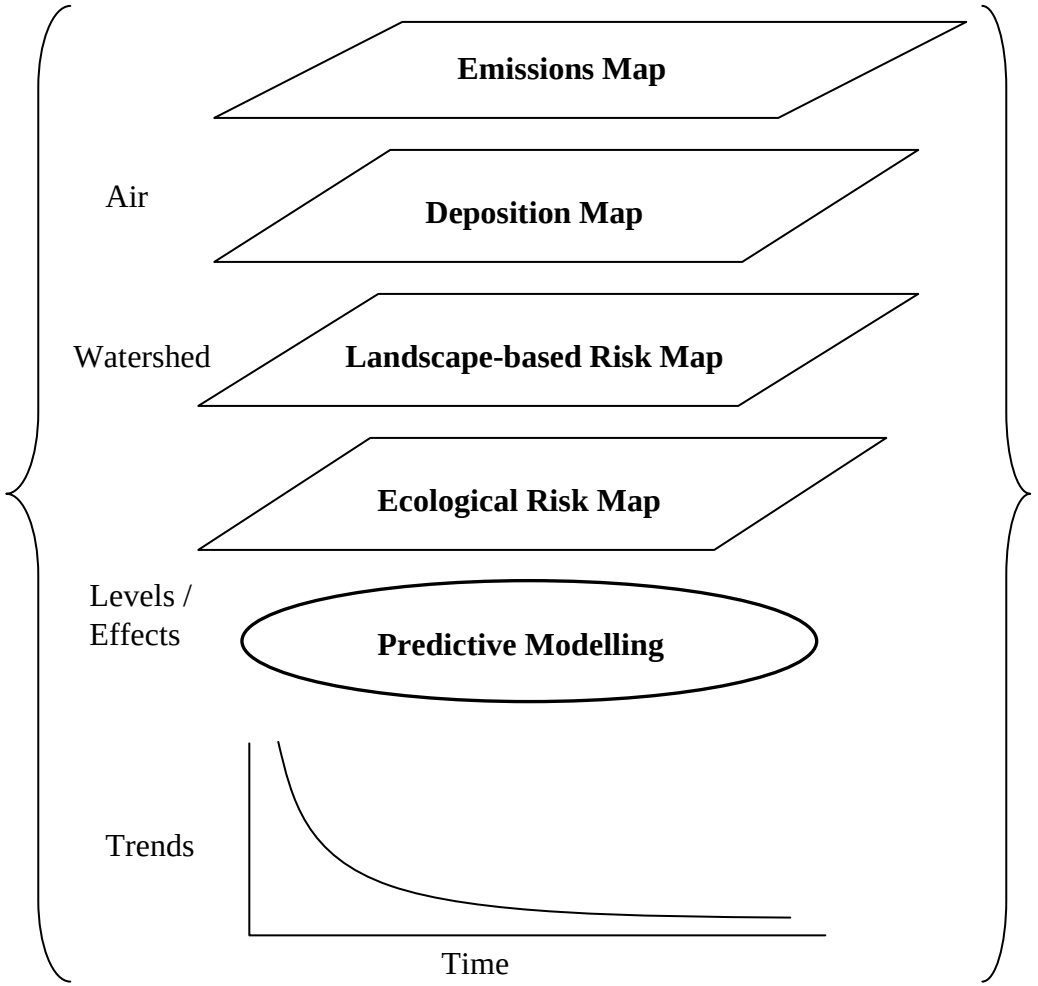
Phase 2: Describe the Benefits

- Describe the benefits of the regulations.
- Deliverable: Assessment due 2017
- Science Plan: Track the efficacy of the regulations

Reductions in mercury emissions from the CARA will come from coal-fired power plants and base-metal smelters.



Goal of Phase 1: To enhance and advance on-going and past research and monitoring efforts to develop a cohesive national description of mercury pollution in Canada.



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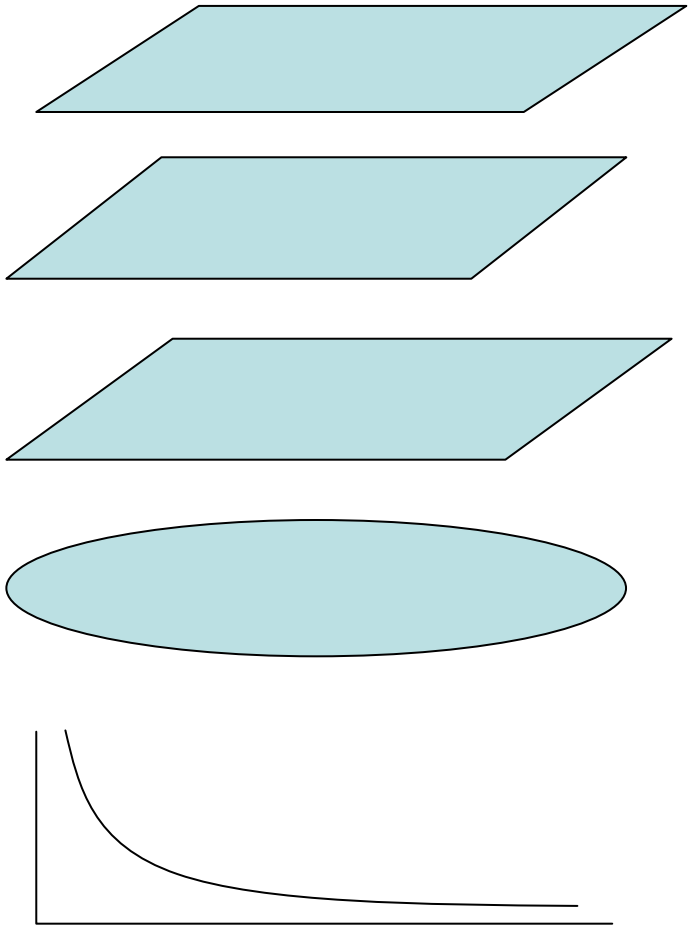
Science Plan:

- Atmospheric Monitoring
- Landscape-based Risk Assessment and Mapping
- Ecological Risk Assessment and Mapping
- Ecosystem Modelling
- Trends



Monitoring Program

- CARA “Supersites” characterized by intensive ecosystem monitoring
  - central Alberta (cluster of coal-fired power plants)
  - central Manitoba (Flin Flon smelter)
  - north western Ontario (Experimental Lakes Area)
  - central Ontario (Dorset)
  - northern Quebec?
  - southern Nova Scotia (Kejimkujik Park)
- Less intensive monitoring of ecosystem components across broad regions of Canada

Atmospheric Monitoring

Objectives:

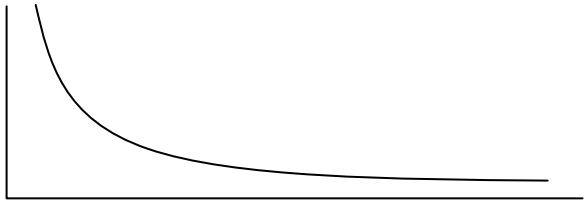
- Describe the changing concentrations of mercury in the air and precipitation across Canada.
- Increase our understanding of the contribution of dry deposition to total deposition of atmospheric mercury at the CARA Hg “supersites”
- Measure atmospheric mercury concentrations downwind of CARA-impacted sites.

Atmospheric Monitoring

Key Outcomes:

- Development and verification of a Hg deposition map

- Trends in ambient concentrations of mercury



Key Activities 2008/09

- Expanding mercury monitoring at CAPMon sites
- Monitoring of GEM, TPM and RGM at CARA Hg "supersites"
- Implement speciation monitoring in Alberta
- QA/QC activities

Landscape-based Risk Assessment and Mapping

Objectives and Key Outcomes:

- Development and verification of a risk map for exposure to mercury based on the nature of the abiotic components of ecosystems (ex. underlying geology).

Key Activities 2008/09

- Compilation of key geochemical, water and sediment databases for mercury.
- Field collections of water and sediment within the auspices of the tri-national soil study.
- Preliminary mapping of water and sediment Hg concentrations.

Ecological Risk Assessment and Mapping

Objective:

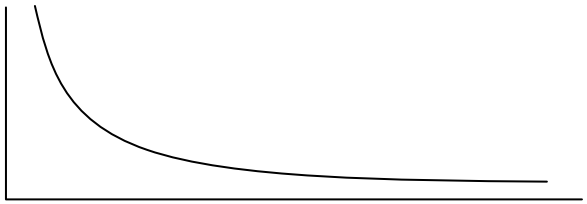
- To conduct a spatial risk assessment of current mercury levels for predatory fish and wildlife across Canada.

Ecological Risk Assessment and Mapping

Key Outcomes:

- Development and verification of a map of levels of mercury in fish and wildlife across Canada and the risk to biota and humans associated with those levels.

- Trends in levels of mercury in fish and wildlife



Key Activities 2008/09

- Compile existing fish mercury data into a national database
- Identify data gaps
- Build on existing efforts to develop a national monitoring program for mercury levels in fish and wildlife

Ecosystem Modelling

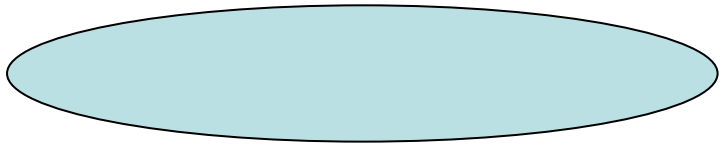
Objectives:

- To develop the capacity to predict the effects of changes in atmospheric emissions of mercury on levels of mercury in fish.
- To help distinguish these effects from two other anthropogenic influences on Hg cycling and bioaccumulation: climate change and sulphur deposition.
- To help identify regional sensitivity and the extent to which the mercury benefits of CARA may vary on a broad national scale.

Ecosystem Modelling

Key Outcome:

- Modelling framework capable of predicting the concentration of mercury in fish based on levels of atmospheric emissions of mercury.



Key Activities 2008/09

- Development of atmospheric model and linkages between this model and the landscape and fish models
- Laboratory studies to define some of the reactions governing the atmospheric transport and fate of mercury.
- Analyses of field data to better define reactions of mercury in terrestrial and aquatic ecosystems.

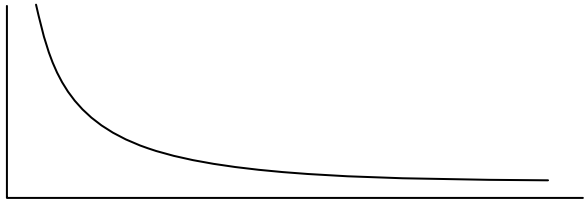
Trends

Objectives:

- To ground-truth deposition modelling and terrain sensitivity mapping and to develop stronger temporal trend records in regions downwind of past and present sources of mercury emissions.

Key Outcomes:

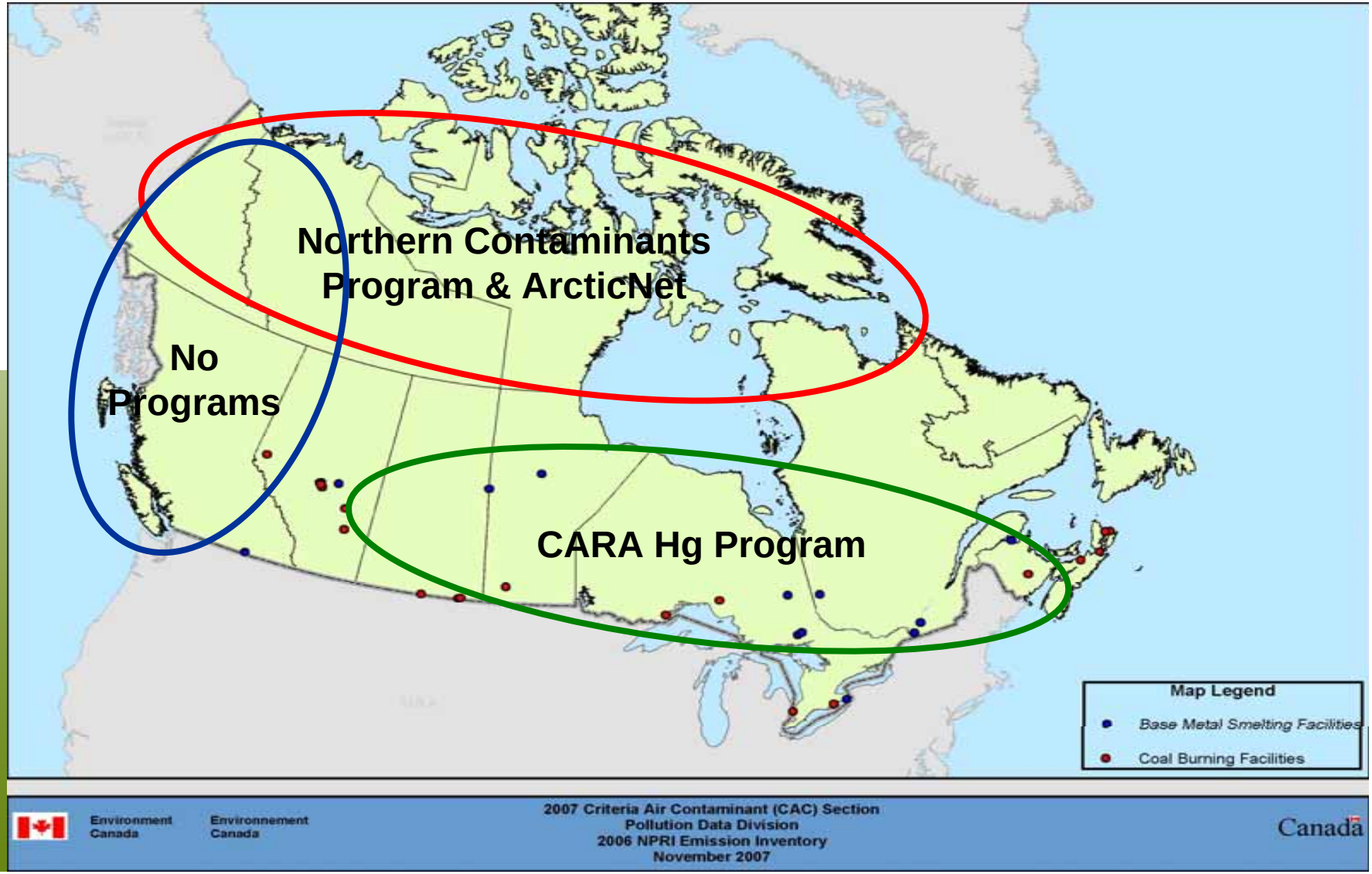
- Temporal and spatial trends in mercury deposition downwind of important source-regions for mercury and sulphate using sediment cores and food webs.



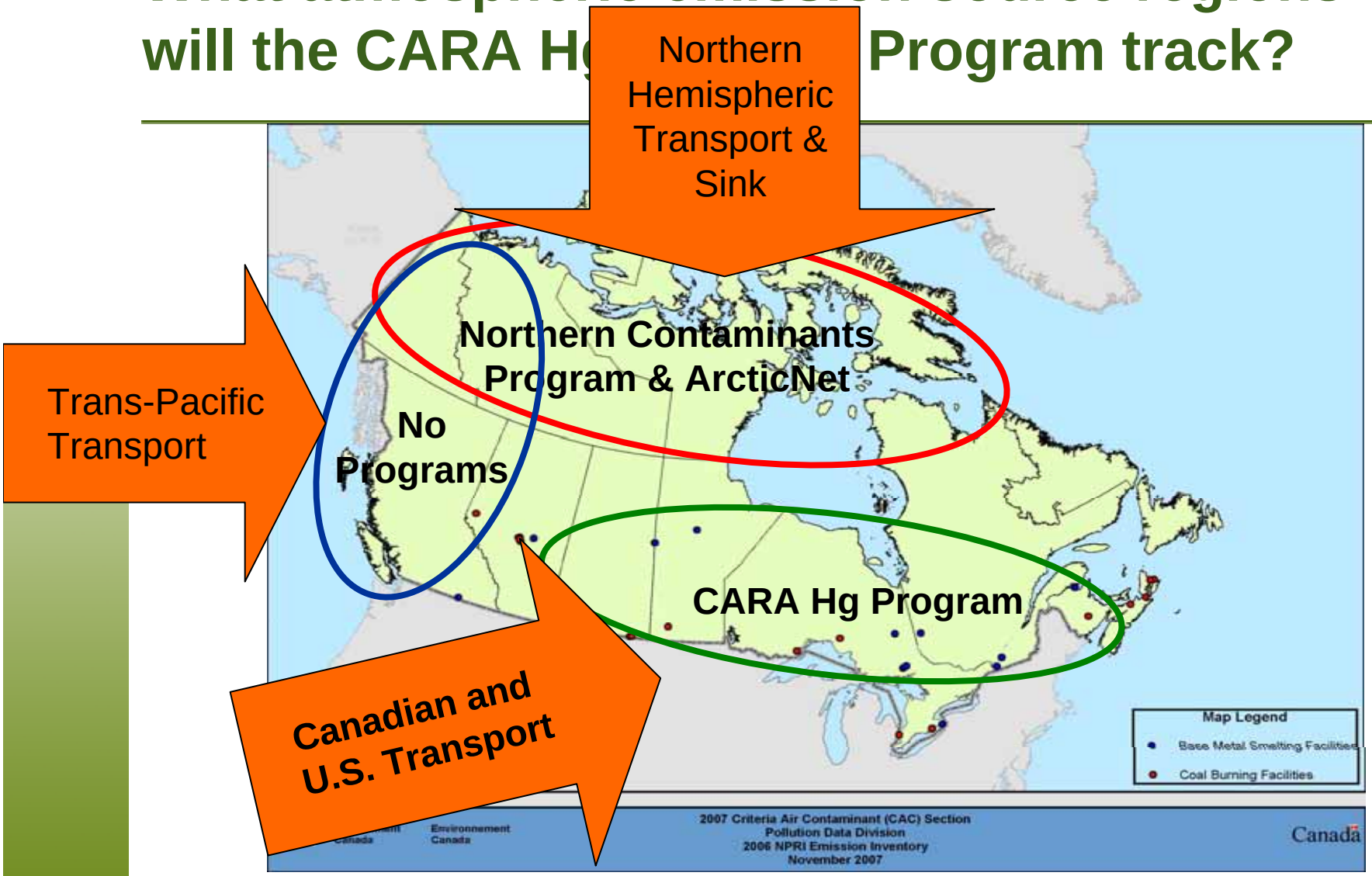
Key Activities 2008/09

- Field collections at CARA Hg “supersites”
- Laboratory analysis
- Preliminary data analysis

Spatial focus of CARA research and monitoring



What atmospheric emission source regions will the CARA Hg Program track?



UNEP Global Hg Program

UNECE Heavy Metals Protocol

Arctic Council Action Plan Hg Project

North American Regional Action Plan

Great Lakes Canada-U.S. Bi-national Toxics Strategy

New England Governors/Eastern Canadian Premiers' Hg Action Plan

CARA

CEPA

CWS

National Hg Science Blueprint

HC

NRCan

EC

DFO

AAFC

Academia

INAC – NCP

Private Sector

Provinces

Environment Canada

Environnement Canada

Canada

National Hg Science Blueprint

OGDs, Provinces, Academia Hg Science Program + Environment Canada Hg Science Program

Other EC Hg Science Activities + CARA Hg Science Plan

Delivery of Science Plan

- This EC led program is being delivered by our department in conjunction with NRCan, DFO, academia and, through co-sponsorship of projects, the provinces, industry and other federal government departments.