



Statewide Cumulative Risk Screening




Toronto - April 2005



Acknowledgements

- ◆ MPCA
- ◆ NERAM
- ◆ Prof. John Shortreed
- ◆ Stephanie Gower



Statewide Risk Screening

Introduction and Overview




Toronto - April 2005



Cumulative Risk Assessment




- ◆ 1 source or facility approved
- ◆ What is the cumulative impact ?
- ◆ "Culpability" Analysis



Statewide Risk Screening

Workshop Objectives & Methods


- ◆ Previous large-scale studies



Statewide Risk Screening

Previous Works


- ◆ New Jersey Environmental Justice
- ◆ RAIME
- ◆ Kuwait 2005



Statewide Risk Screening

MPCA View Advantage


- ◆ Scalable and flexible risk management tool
- ◆ Support monitoring activities
- ◆ Identify risks
- ◆ Focus resources
- ◆ Prioritize corrective actions
- ◆ Track progress toward risk reduction goals



Statewide Risk Screening

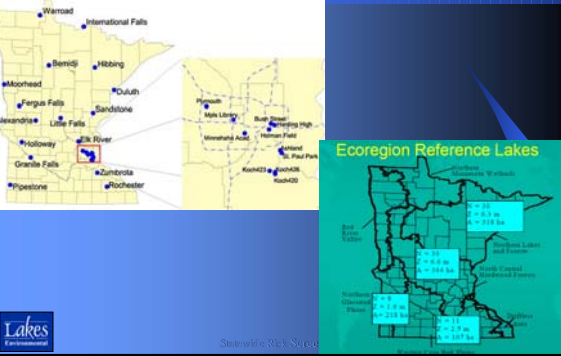
MPCA Risk Advantage

- ◆ Calculate and track risks from literally thousands of sources and contaminants.
- ◆ Easily incorporates better data to improved results.
- ◆ Prioritize and identify solutions, for sources resulting in risks.



Statewide Risk Screening

Overview MN




Statewide Risk Screening

Overview MN



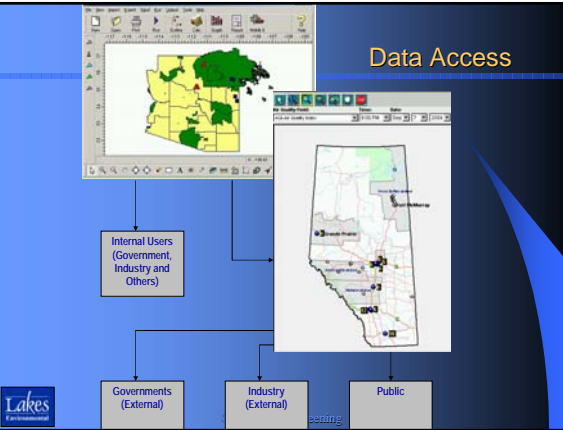


Project Objectives

- ◆ Defensible - relies on approved methods
- ◆ Time efficient
- ◆ Cost efficient
- ◆ Flexible - Analyze variations
- ◆ Supports solution implementation




Statewide Risk Screening

Data Access

Project Summary



Toronto - April 2005

Lakes Environmental

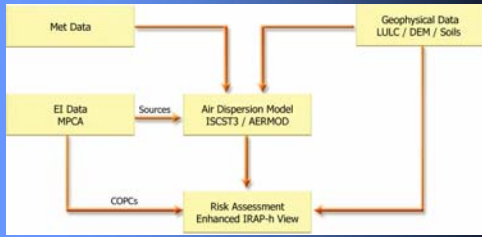
System Modules

- ◆ GIS
- ◆ Calculators
- ◆ MOBILE6
- ◆ NON-ROAD
- ◆ Other Functions



Lakes Environmental

System Architecture



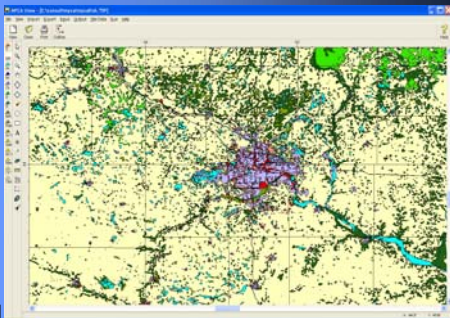
Lakes Environmental

Project

- ◆ EI - Data from MPCA
- ◆ ADM Runs
 - ◆ Over 100Gb of ADM results
 - ◆ ~ 9,000 Point sources
 - ◆ ~ 2,700 Area sources

Lakes Environmental

Sample LULC Map



Lakes Environmental


Project Risk

- ◆ Human Health Risk Runs
- ◆ Uses IRAP View Engine
- ◆ Latest HHRAP updates

Lakes Environmental

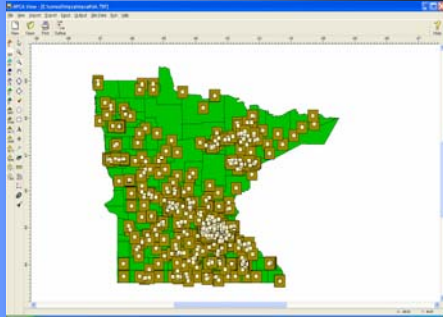

Statewide ADM Runs

- ◆ 9000 Point Sources
 - Vapor - 34 Gbytes
 - Particle - 36 Gbytes
- ◆ 2700 Area Sources
- ◆ Risk Runs ~ 120 Gbytes



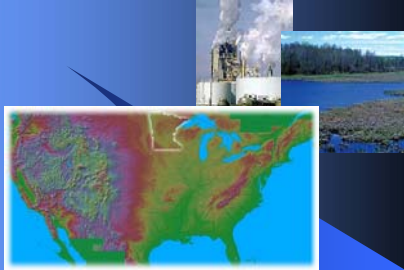
Statewide Risk Screening

Sources Bounded by Grid Box





Statewide Risk Screening

GIS Component

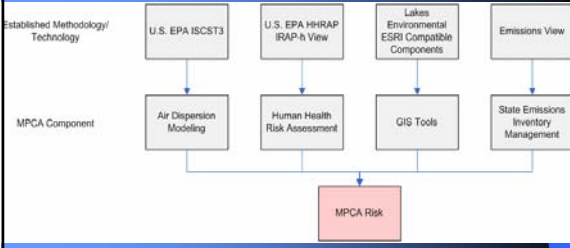



Toronto - April 2005



Statewide Risk Screening


Tool Structure - GIS

Statewide Risk Screening

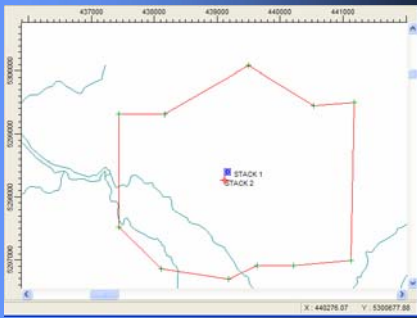

GIS Component

- ◆ **Source Parameters:** Pass-through of other parameters to air model component
- ◆ **Land Use:** Land use classifications and selection of receptor scenarios
- ◆ **Terrain Elevations:** Source base and grid node elevations
- ◆ **Digital Line Graphs:** identifying locations of facilities, sources, railways, and waterbodies



Statewide Risk Screening

Source Location

Statewide Risk Screening

GIS Facility - Outline

#	X	Y
1	-112.976	34.255
2	-112.976	34.105
3	-112.817	34.154
4	-112.817	34.255

Emissions Characterization

Toronto - April 2005

Large Scale EI

Emissions Data

- ◆ Integrate available electronic EI databases
- ◆ Evaluate quality requirements
- ◆ Link emissions data to GIS, air, and risk components

Emissions Data

- ◆ Source-specific parameter values
- ◆ Speciated emission rates

Type of Emissions

What is an Emission Inventory?

Inventory - Listing by sources of air pollutant emissions in a geographic area during a specific time period

The diagram shows a landscape with various emission sources. Labels include: Non-Point Sources (pointing to agricultural fields), On-Road Mobile Sources (pointing to a road with cars), Non-Road Mobile Sources (pointing to a construction site with a bulldozer), and Point Sources (pointing to a factory with a smokestack).

Lakes Environmental
 Statewide Risk Screening

Emissions Data

- ◆ Actual vs. allowable emission rates
- ◆ Process upsets & maintenance
- ◆ Sensitivity of source location

Lakes Environmental
 Statewide Risk Screening

Process

The diagram shows a 3D perspective of a plant. A blue horizontal plane represents the 'Plant Level'. Above it, red lines and arrows represent the 'Point/Stack Level' and 'Process/Segment Level', showing the flow of materials and emissions from various units within the plant.

Lakes Environmental
 Statewide Risk Screening

SCC - Source Classification Codes

- ◆ Approximately 10,300 codes
- ◆ Maintained by the US EPA
- ◆ SCC 1 Description (1): External Combustion Boilers
- ◆ SCC 3 Description (1-01): Electric Generation
- ◆ SCC 6 Description (1-01-002): Bituminous/Subbituminous Coal
- ◆ SCC 8 Description (1-01-002-02): Pulverized Coal: Dry Bottom (Bituminous Coal)

Lakes Environmental
 Statewide Risk Screening

AEIS View – SIC Codes

The screenshot shows a software window titled 'Select Code'. It has a search bar and a list of codes with descriptions. The list includes:

Code	Description
12	Coal mining
1221	Bituminous Coal and Lignite Surface Mining
1222	Bituminous Coal Underground Mining
1231	Anthracite Mining
1241	Coal Mining Services
13	Oil and gas extraction
1311	Crude Petroleum and Natural Gas
1321	Natural Gas Liquids
1381	Drilling Oil and Gas Wells
1392	Oil and Gas Field Exploration Services
1392	Geophysical Mapping and Surveying
1392	Other Oil and Gas Field Exploration Services
1399	Oil and Gas Field Services, NEC
14	Nonmetallic minerals, except fuels


Lakes Environmental

Emissions Data


- ◆ Needs better:
- ◆ 1. Spatial Allocation
- ◆ 2. Temporal Resolution

Lakes Environmental

Air Modeling Component




Toronto - April 2005



ADM Features


- ◆ Automates ADM site-specific data preparation.
- ◆ Auto-generates and processes meteorological files hourly weather data for each source.
- ◆ Automatically executes ISCST3 in batch mode
- ◆ Imports plot files into IRAP-*h* View™ engine.



Statewide Risk Screening

ADM Features


- ◆ Unit emission rates enable any combination of emissions scenarios
- ◆ Phase-specific modeling runs for emissions partitioning:
 - Vapor
 - Particle
 - Particle-bound
 - Mercury



Statewide Risk Screening

Universal Grid

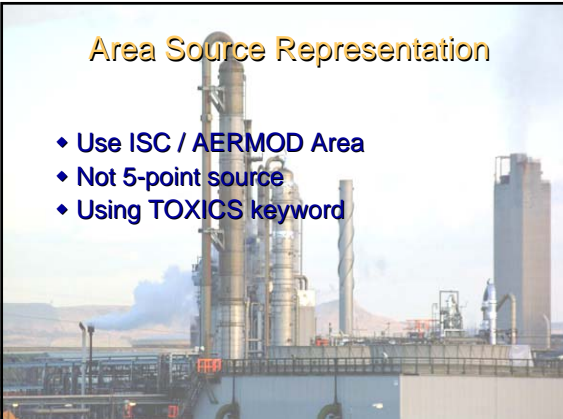
- ◆ Virtually eliminates ADM interpolation
- ◆ Coordinate System:
 - ◆ ISCST3 requires UTM coordinates
 - ◆ Datum = NAD83
 - ◆ Consistent USGS DEM grid data



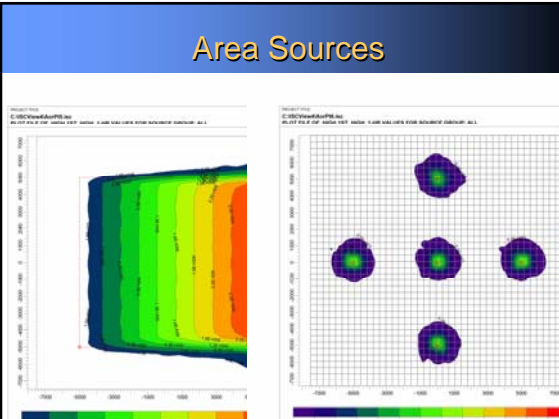
Statewide Risk Screening

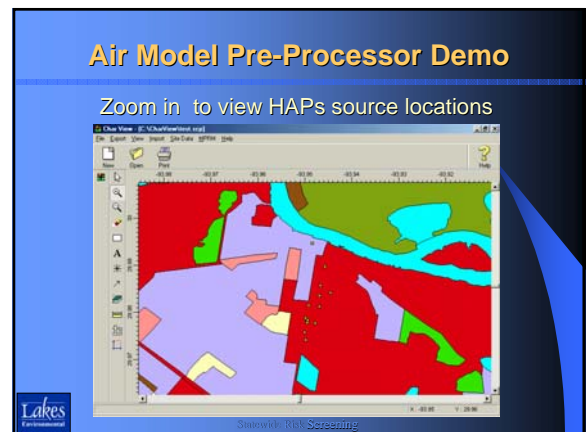
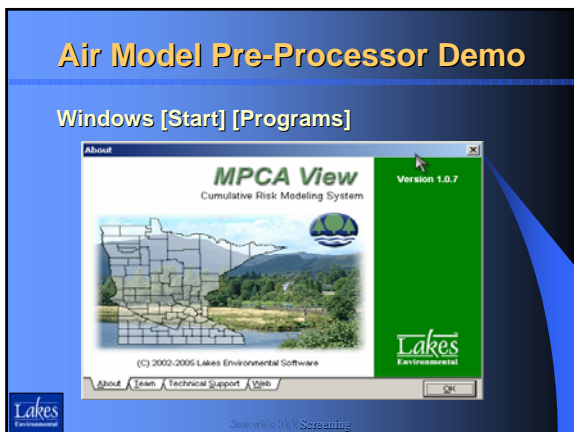
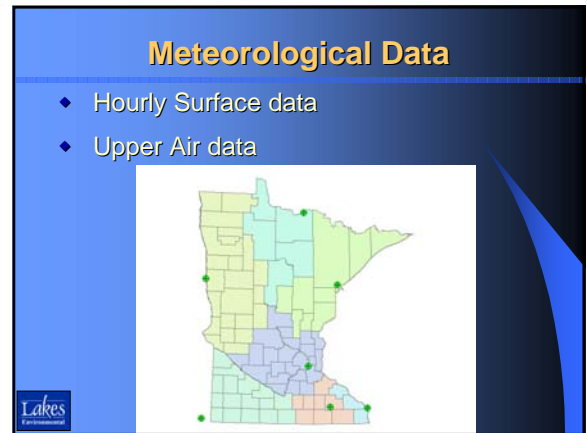
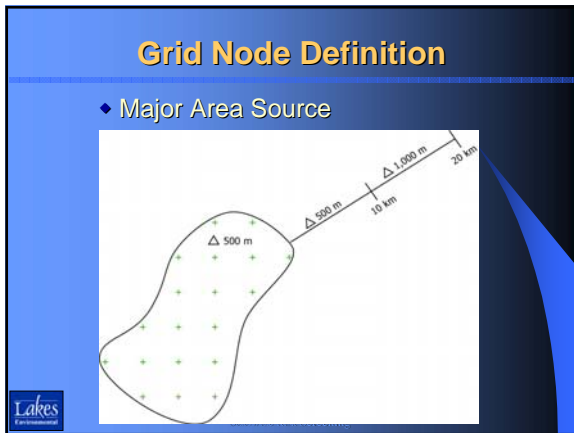
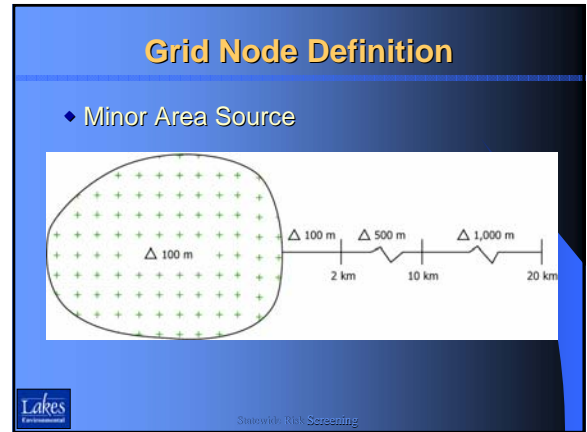
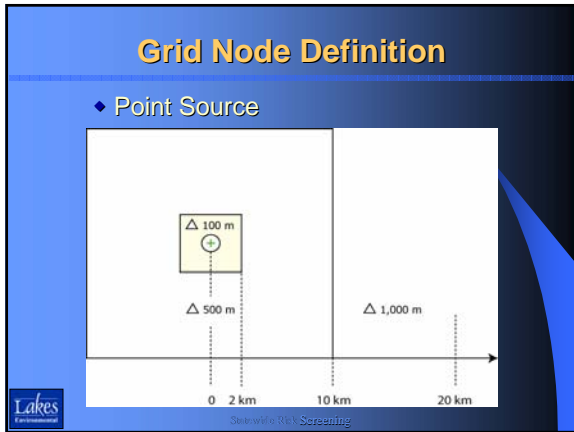
Area Source Representation

- ◆ Use ISC / AERMOD Area
- ◆ Not 5-point source
- ◆ Using TOXICS keyword



Area Sources





Air Model Pre-Processor Demo

[Site Data] >> [Process Site Parameters]

Status

Processed 11 of 3909 sources at 00.04 per source.

Time: Elapsed - 00:00:51, Remaining - 05:02:42

Cancel

Lakes Environmental
 Statewide Risk Screening

Risk Modeling Component

Toronto - April 2005

Lakes Environmental
 Statewide Risk Screening

Risk Modeling Objectives

- ◆ **Fast** - Permitting, planning, and enforcement
- ◆ **Traceable** - Evaluate and implement solutions
- ◆ **Multi-Pathway** - Prioritization of multiple emissions sources of multiple COPCs

Lakes Environmental
 Statewide Risk Screening

Features

- ◆ Imports air parameter values from air model
- ◆ Implements multi-pathway exposure scenarios
- ◆ Identification of max. per air parameter values
- ◆ Simultaneously calculates and tracks risks from:
 - Multiple sources
 - Multiple contaminants
 - Multi-pathway

Lakes Environmental
 Statewide Risk Screening

Data Requirements

- ◆ Exposure and site-specific parameters
- ◆ HHRAP defaults
 - Inhalation and consumption rates
 - Exposure duration
 - Direct and indirect exposure pathways
 - Amount and type of food ingested (percent contaminated)
- ◆ No HHRAP defaults
 - Average annual evapotranspiration, irrigation, rainfall, runoff, and wind speed
 - Depth of the water body
 - USLE watershed

Lakes Environmental
 Statewide Risk Screening


Data Requirements

- ◆ Fate and transport Parameters
 - ◆ Implementation of HHRAP defaults
 - ◆ Data available for 205 chemicals
 - ◆ Flexibility to incorporate site-specific data
 - ◆ Flexibility to add additional contaminants

Lakes Environmental
 Statewide Risk Screening

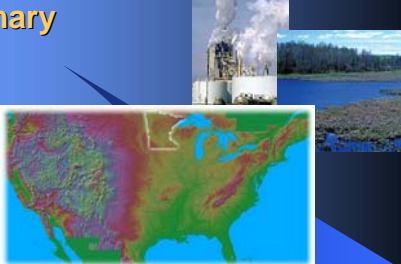
Data Requirements

- ◆ Toxicity Parameters
 - Incorporation of IRIS, HEAST, MPCA values
 - Flexibility to add new or updated values
 - Inhalation Pathway - Inhalation toxicity factors (RfC or URF) combined to estimate HQ and cancer risks.



Statewide Risk Screening

Results Summary



Toronto - April 2005

