Shared Concerns and Shared Responsibilities: An Overview

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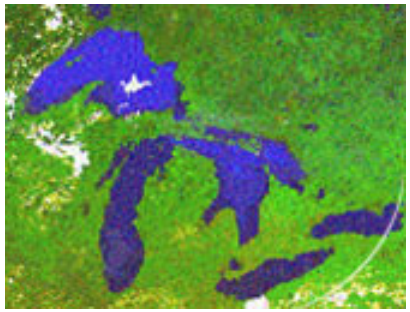
Overview of Presentation

- Great Lakes Water Quality Agreement
- Great Lakes Stressors
- The Science and Policy Regarding:
  - Emerging knowledge on chemicals
  - Land use and health
  - Climate change scenarios
- Q & A



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Historic events

- 19th century cholera epidemics
  - raw sewage crossing boundary waters from coast to coast
- 1909 Boundary Waters Treaty signed
  - to ensure pollution on one side of the border did not adversely effect the other side
- 1909 establishment of the International Joint Commission
  - to oversee the BWT, regulate lake levels

More recent history

- 1940-1960's excessive nutrient loadings particularly from phosphorus
  - high algal growth, results in lack of oxygen when algae die and decompose
- 1960's Lake Erie proclaimed "dead"
  - massive fish kills
- 1972, Great Lakes Water Quality Agreement calls for limits to phosphorus by Canada and the US
  - ban of phosphorus in detergents, increased treatment levels, dramatic improvements

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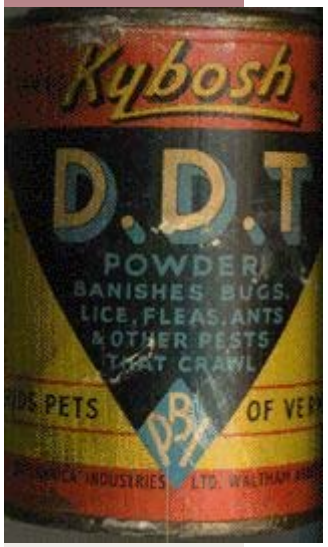
Silent Spring



- Persistent chemicals such as DDT and other pesticides result in gross deformities and reproductive failure
  - e.g. bald eagle disappears from the lower lakes
- GLWQA revised in 1978 to call for virtual elimination of persistent toxic substances
- GLWQA revised in 1987 to call for more aggressive programs,
  - particularly, Remedial Action Plans and Lakewide Management Plans

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- Great Lakes Water Quality Agreement is being reviewed right now.
- Some of the environmental and economic challenges that need renewed attention are:

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Challenges to the Integrity of the Great Lakes Basin Ecosystem

- Eutrophication
- Legacy contaminants
- New chemical discoveries
- Land use and unplanned growth (sprawl)
- Habitat destruction
- Exotic invasive species
- Long range transport
- Climate change

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Challenges to the Integrity of the Great Lakes Basin Ecosystem

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Then and still:

Gross effects:

Tumors and deformities

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In the year 2006
Different substances, different effects

- Now have the ability to detect numerous substances that have been in use for decades with unpredicted ecological and health effects
- Finding different, non-cancerous effects of substances at much lower concentrations
- Should the application of risk assessment and risk management approaches as used in determining probability of carcinomas be challenged in lieu of the precautionary principle?

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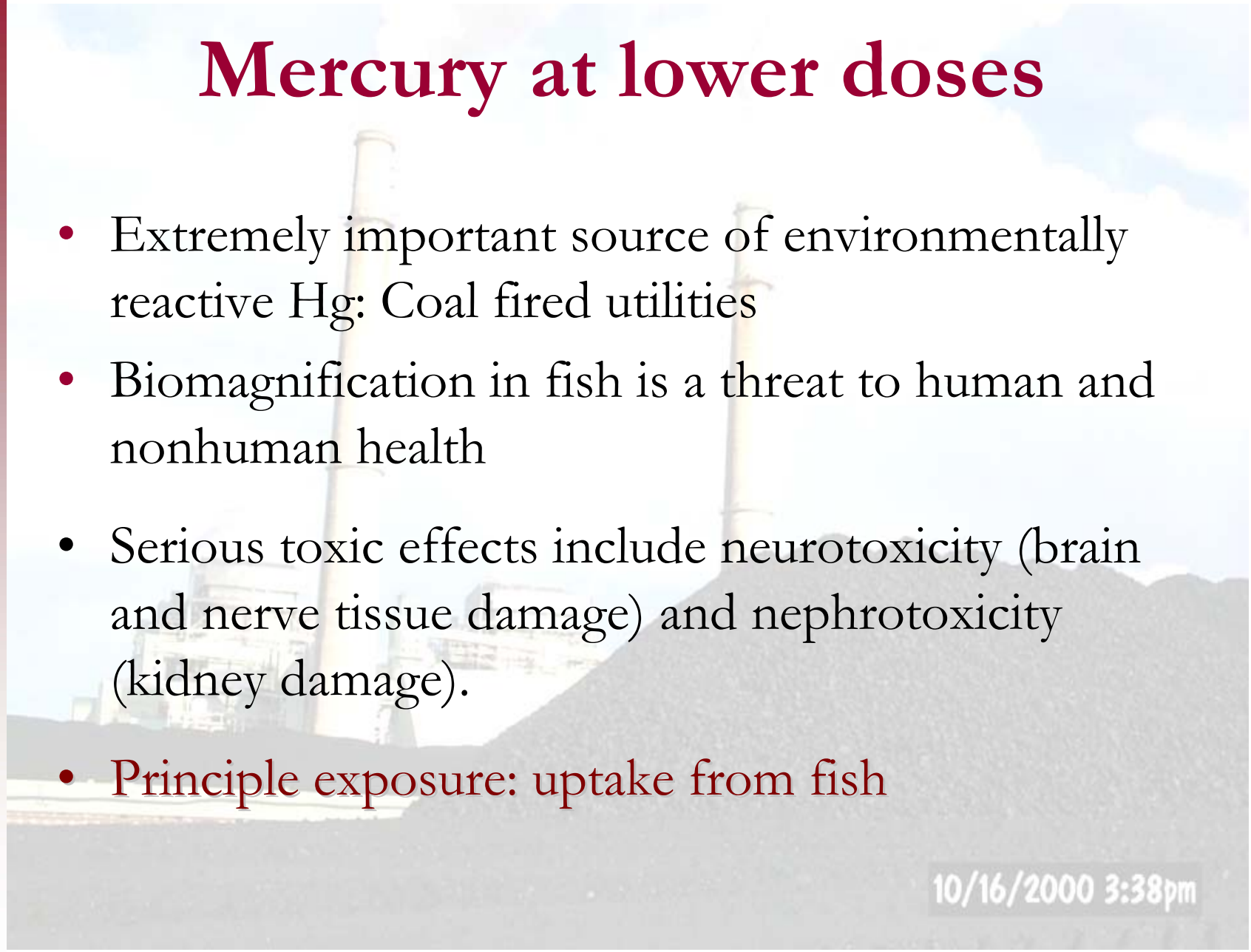
Mercury at lower doses

- Extremely important source of environmentally reactive Hg: Coal fired utilities
- Biomagnification in fish is a threat to human and nonhuman health
- Serious toxic effects include neurotoxicity (brain and nerve tissue damage) and nephrotoxicity (kidney damage).
- Principle exposure: uptake from fish



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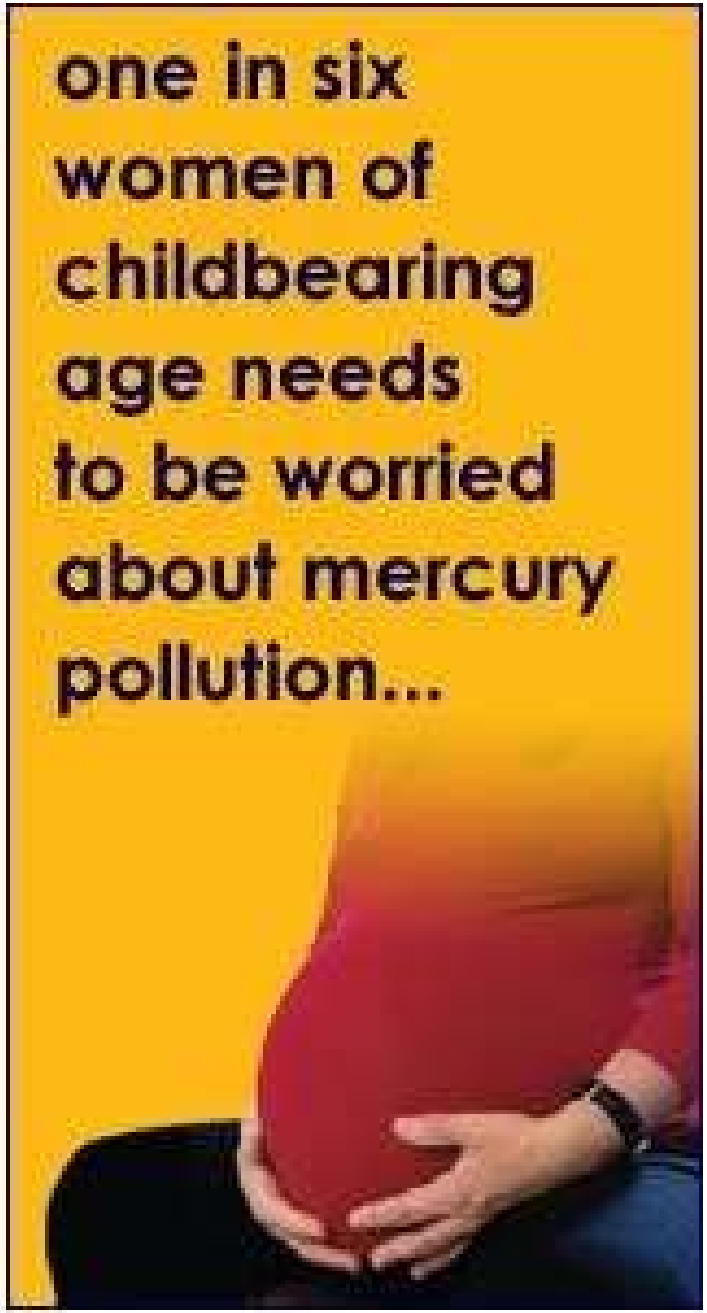
- more than 10% of women of reproductive age in the US have blood mercury levels that may increase the risk of impaired brain development in their children



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What are we doing about stopping ongoing emissions?

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Policy Needs

- Examine and illuminate human health risks and insults associated with mercury, this will continue to be the most effective stimulus for appropriate control initiatives for mercury emissions locally, regionally and globally.

- Policy makers must function in a context of uncertainty arrive at stringent policies that curtail emissions.

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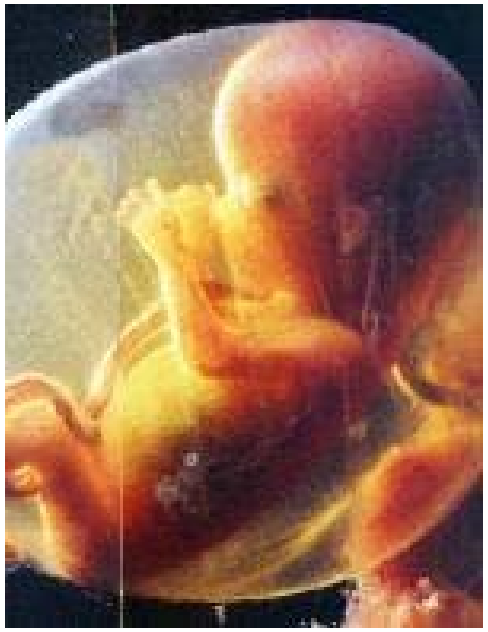
New findings on presence of chemicals in humans



- Exposure to hundreds of toxic chemicals begins in the womb

- Pollutants include mercury, brominated fire retardants, pesticides, polyflourated chemicals such as PFOS (used in the production of Teflon)

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Brominated fire retardants

- can mimic, block, or interfere with hormones such as estrogen, androgen, and the thyroid, resulting in reproductive defects, reduced fertility, and neurological and developmental problems.
- ubiquitous, found in high impact plastics, carpets, foams, textiles, furniture.
- persistent, fat soluble, and have the potential for long-range transport.
- level of PBDEs in North Americans is far higher than levels found in people anywhere else in the world, and increasing.

- While the Canadian government has not pursued a ban of PBDEs, other jurisdictions are taking precautionary action. By 2006 certain types of PBDEs will be banned in the European Union, Maine and California; in Hawaii they will be banned in 2008.

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Pharmaceuticals

- Wastewater treatment plants are a significant source of pharmaceuticals.
- Commonly detected compounds included antimicrobial disinfectants, antibiotics, musk fragrances, antihistamines , and antiepileptic drugs
- Excreted and intentionally disposed
- Designed to be biologically reactive
- Chemical soup

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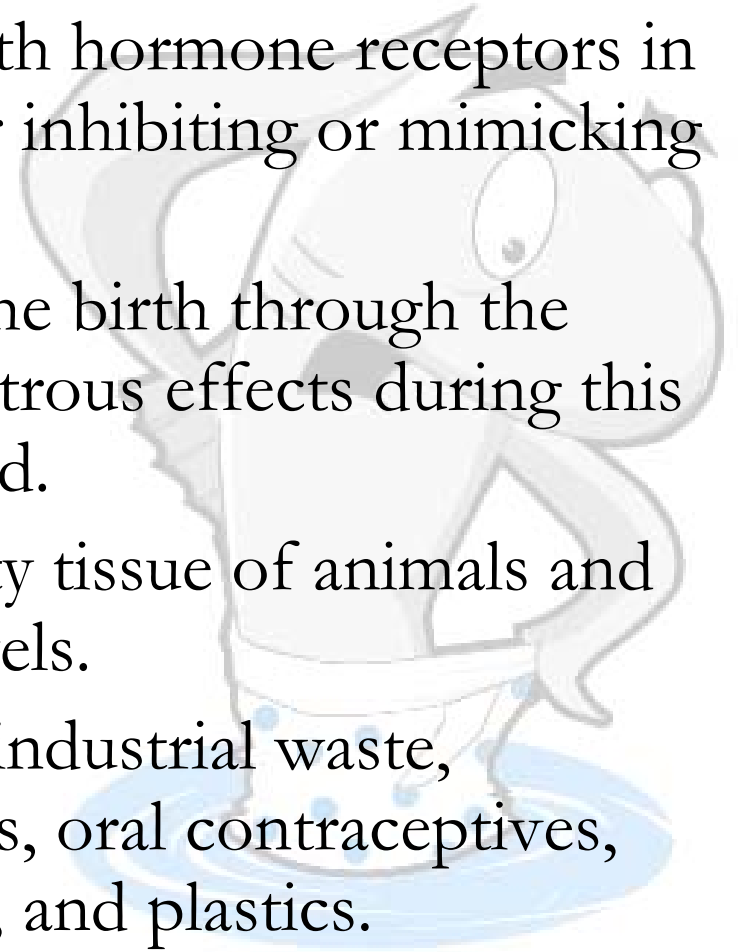
Endocrine Disrupting Substances

- Chemicals that interact with hormone receptors in an organism's body, either inhibiting or mimicking hormone activities.
- Can affect young before the birth through the womb, and can have disastrous effects during this critical development period.
- Can accumulate in the fatty tissue of animals and biomagnify to extreme levels.
- Sources are chemical and industrial waste, pesticides, pharmaceuticals, oral contraceptives, detergents, food additives, and plastics.



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Chlorinated paraffins

- When CP dissolved in a polymer, they can leach into the environment.
- Release can occur anywhere along the life cycle of the product: transport, use, and disposal.
- The public generally does not know that sources could include rubbers, paints, adhesives, caulks and sealants as well as plasticizers or flame retardants.

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Nanotechnology

- Materials and devices on the scale of a billionth of a metre, in virtually all sectors of the economy—from materials sciences to biomedicine to communications and information technology.
- The state of knowledge on toxicity is seriously lacking
- A popular nano materials is a molecule of 60 carbon atoms, which attach themselves together in the shape of a soccer ball. (Fullerenes, or bucky balls)
- Study published in December 2005 finds buckyballs bind to the spirals in DNA molecules in an aqueous environment, causing the DNA to deform, potentially interfering with its biological functions.

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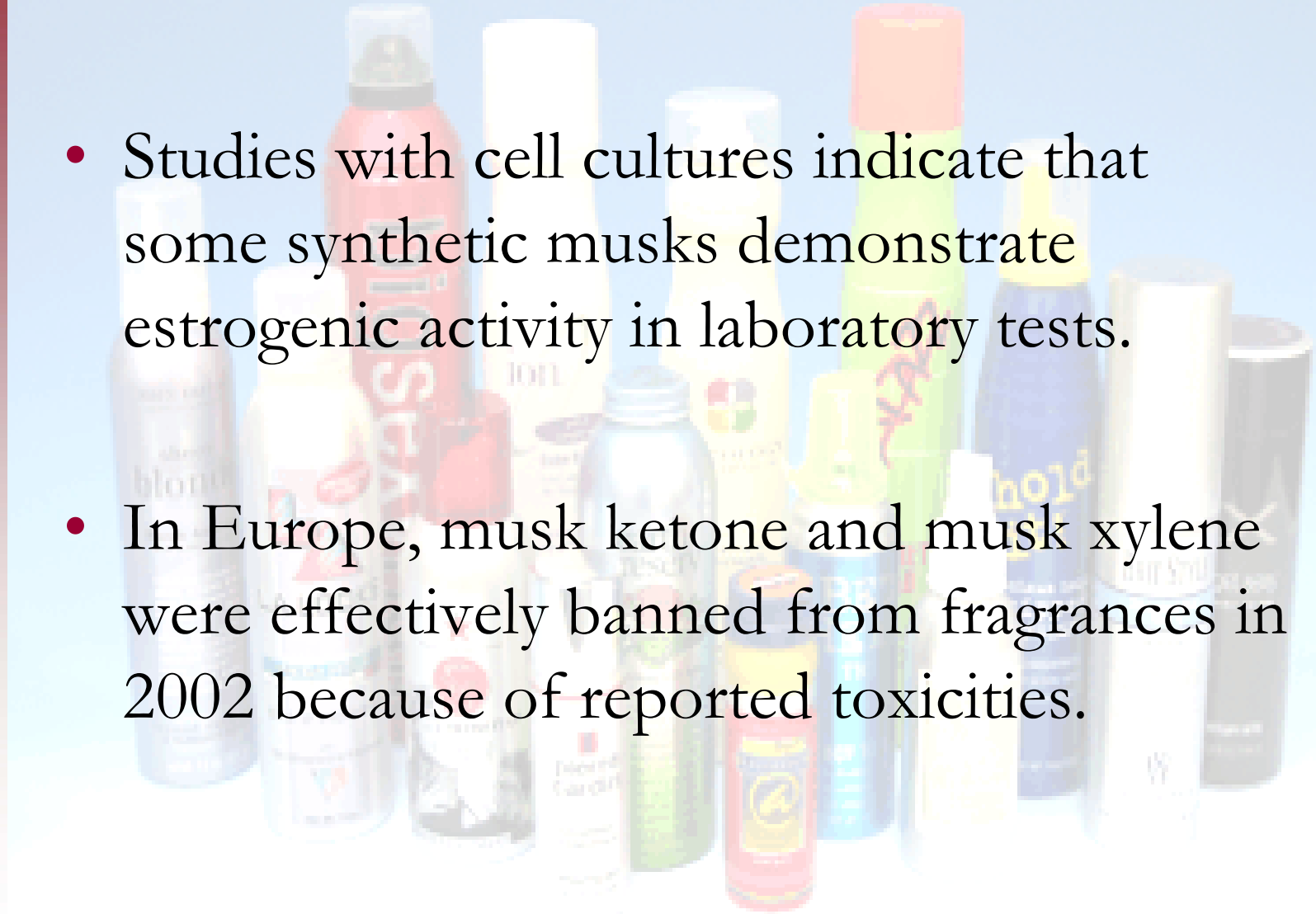
Personal Care Products

- Studies with cell cultures indicate that some synthetic musks demonstrate estrogenic activity in laboratory tests.
- In Europe, musk ketone and musk xylene were effectively banned from fragrances in 2002 because of reported toxicities.



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Needs

- Improved understanding of injury to ecosystems and humans
- Precautionary principle to be invoked?
- Search for product substitution
- Preventative and Green Engineering
- Destructive innovation

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Challenges to the Integrity of the Great Lakes Basin Ecosystem

- Eutrophication
- Toxic chemicals and new discoveries
- **Land Use and unplanned growth (sprawl)**
- Habitat destruction
- Exotic invasive species
- Long range transport
- Climate change

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Demographics

- As of 2004, the combined population of Ontario and 8 U.S. states bordering the Great Lakes stood at 95 million. The region was home to almost 30% of North America's population.

- Between 2000 and 2004, the Great Lakes region grew by over 2 million, or almost 2.2%. Ontario alone grew by over 700,000, representing 35% of the region's growth, much higher than its 13% share of the region's total population.

- (so, more PPCP use…)

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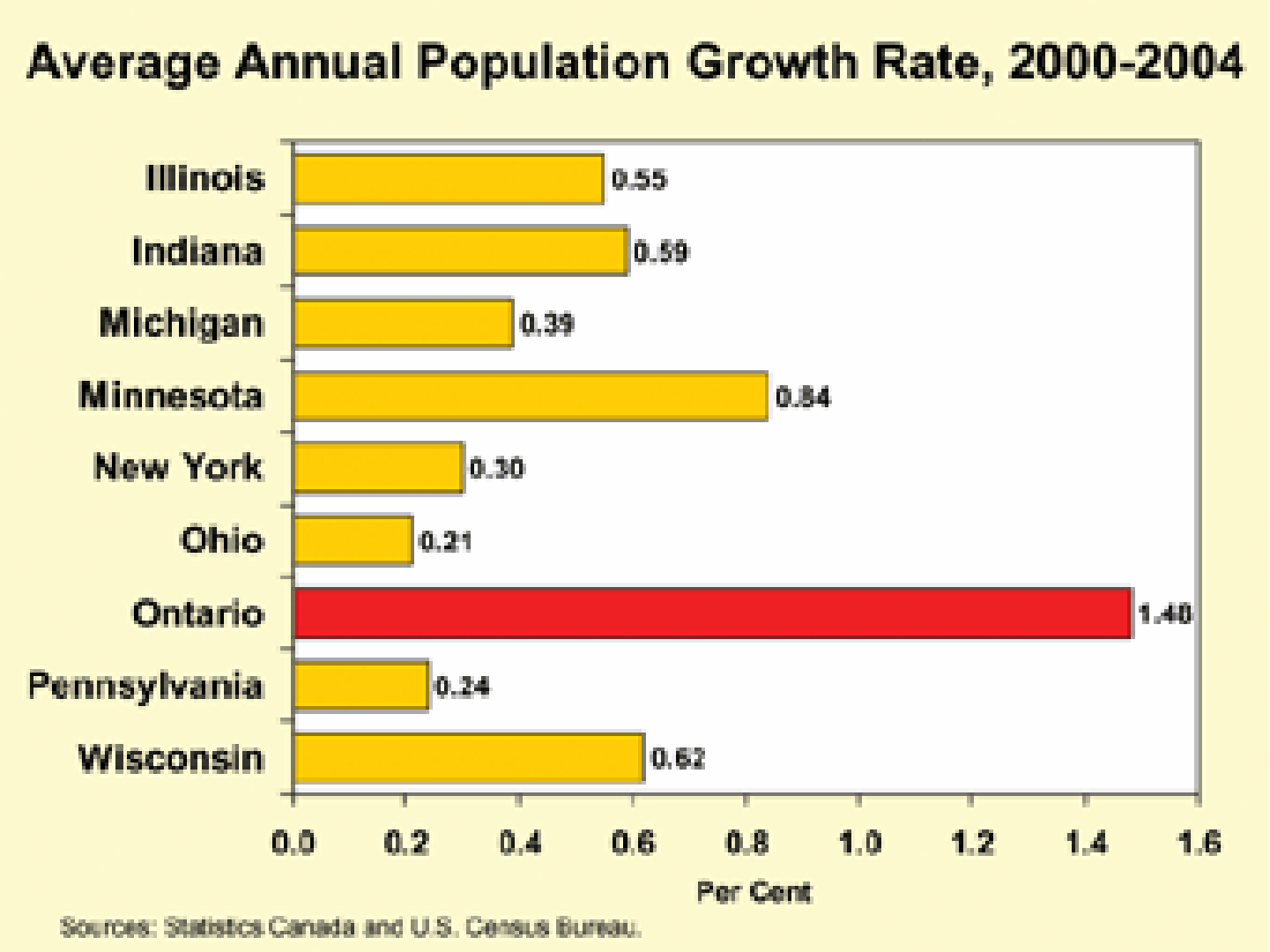
Where are we living?



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Effects of Sprawl

- Housing subdivisions, commercial developments, and the roads that connect them all divide a landscape, which results in habitat fragmentation.
- Fragmentation forces wildlife to either find another place to live or compete with each for a smaller amount of land. Why do we have coyotes in downtown Toronto?
- Threatens wetlands that improve water quality by filtering out sediment and pollutants, that protect the shorelines of rivers and lakes from erosion, and help control and reduce flooding.

Consequence of destroying the nucleus

- Impervious surfaces increases runoff, polluting streams, lakes, and watersheds
- Sprawl results in more cars driving more frequently and for longer periods of time.
- Exacerbates air and noise pollution
- Emissions of PAHs, corrosive chemicals, wash into surface and ground water

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More cars traveling longer distances

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Just a bit of rain?

Where is the water to go?

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The estate lot pitch

This estate development spans over fifty acres of rolling meadows and treed ridges and lies directly across from the ...Conservation Authorities' five hundred acre protected Wetlands. This breathtaking conservation area runs along the... River and offers its own walking trails, and in the winter its own cross-country ski trails. If you are a golfer... is just five minutes away on highway ... There is also a new 18 hole golf course located These two courses offer the best golf in the ...region and they are only minutes away from ...Estates.

What was living there before? What will the new occupants do to the resource?

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Behavioural shifts burdened with inertia

- Freedom of choice
- Perceive quality of life
- Perceived safety
- Easier access to recreation
- Laden with environmental and economic consequence

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Urban Development
Best Management Practices

- Redesign grading, ditches, detention ponds
- Modify existing and design new infrastructure to accommodate extreme events
- Reduce the urban heat island effect through building design, green space, roof-top gardens
- Increase infiltration capacity
- Integrate source water protection planning into urban planning realm
- Build sustainable transportation corridors

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Porous Pavers

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Porous Pavers

Get the water back in the ground where it belongs

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Green Roofs

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Compact cities

- population densities high enough to support public transport and make it feasible to operate.
- people can live near to their work place, schools and leisure facilities.
- greenfields are preserved, brownfields redeveloped
- compactness and mixed uses are associated with diversity, social cohesion and cultural development.
- infrastructure can be provided cost-effectively per capita, population densities are sufficient to support local services and businesses.

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- **Climate change**

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FOR SALE!
SNOWSHOES & WINTER
COAT (WHITE). Hare

Increased severity of storms

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More sheet runoff

More
combined sewer
overflows

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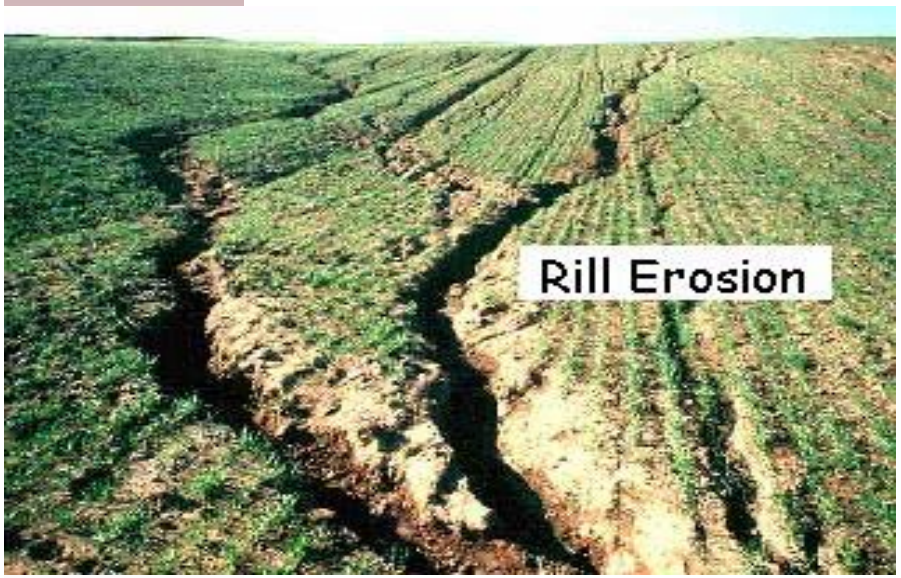
Increased intensity of storm events

-greater erosion and entrainment of sediment, nutrients, pesticides



More prolonged periods of drought

Dropping Lake levels

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Loss of boat habitat

Wetland losses

Observed Changes in the Great Lakes Region

- Warmer conditions
- More intense rainfall events
- Evaporation offsets precipitation increases
- Less snowfall
- Reduced Lake levels
- Longer growing seasons
- Need to anticipate
  - changes in fish community composition
  - threat of exotic, invasive species
  - expanded storm sewer infrastructure

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Great Lakes Levels –Model

- Total range of 11 models' projections for changes in lake levels:
  - **less than a 1 foot increase to more than a 5 foot decrease**

- Implications:
  - 5 foot reduction = 20-40% reduction in outflow to Seaway
  - Reductions in hydropower generation up to 15% by 2050
  - Increased costs of navigation of 5 to 40% ($13M dredging to increase)
  - For each inch of carrying capacity lost to lower water levels, a thousand-foot-long ship can carry 270 fewer tons. The ship owners are paid on the basis of the tonnage they carry, but their operating costs are fixed, so they face decreased revenues if they have to off-load freight.

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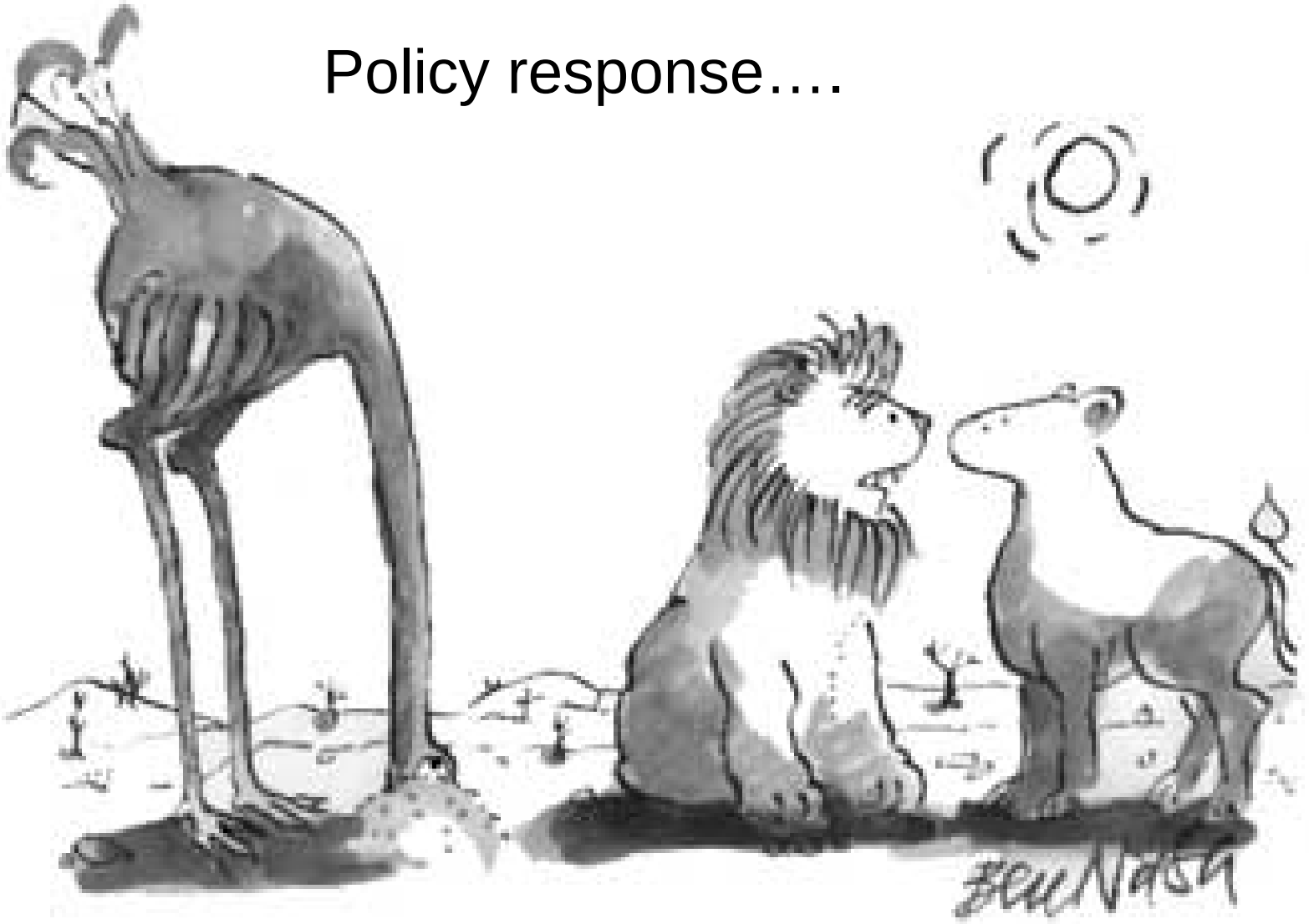
Policy response….



"Ostrich?? What Ostrich?!?"

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If climate change is, then what

- Mitigation will have to be a long term effort with unknown ability to reverse the course
- Adaptation will be a necessity
- Are we preparing programs and policy under the current scenarios painted by climate change?

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Continuing the discourse

- Review and revitalization of the Great Lakes Water Quality Agreement can put programs and policies in place to coordinate regional and binational action to address these ecosystem, economic and social threats
- Keep the topics on the nation's agenda
- The Great Lakes need people passion

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Aiming for Excellence

- In order to succeed you must fail, so that you know what not to do the next time.
  Anthony J. D'Angelo

- All who have achieved great things have been great dreamers.
  Orison Swett Marden

Questions?

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Thanks for making the Lakes Great