Review of General Framework for Identifying Substances to be Considered in the Great Lakes Basin

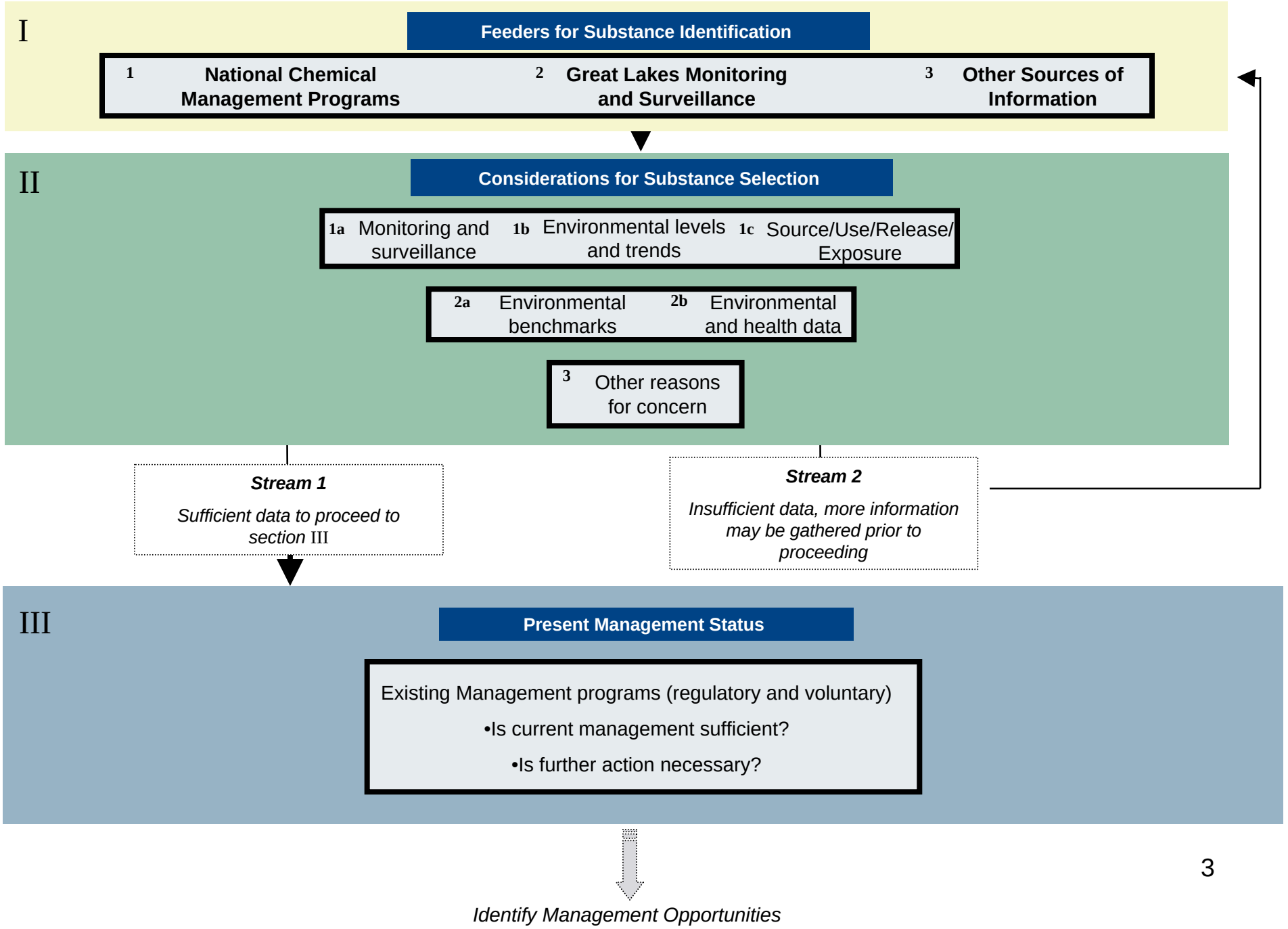
Great Lakes Binational Toxics Strategy (GLBTS)
Substance/Sector Group Meeting

Chicago, December 2, 2008

Objectives of the Presentation

- Provide further examples of using the Framework
  - Perfluorooctane Sulfonate (PFOS)
  - Polybrominated Diphenyl Ethers (PBDEs)
  - Nonylphenol and its Ethoxylates (NPEs)
- Consider potential threats to the basin from these candidate substances

Binational Framework for Identifying Substances of Potential Threat to the GLB



Example Using
PFOS,
its Salts and its Precursors

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Feeders for Substance Identification

Example: PFOS

National Chemical Management Programs

Canada

- 'CEPA toxic' under CEPA 1999, added to CEPA 1999 Schedule 1- List of Toxic Substances in 2006.
- Canada proposed to prohibit uses of 50 PFOS substances.

United States

- PFOS has not been produced in the U.S. since 2002.

Great Lakes Monitoring and Surveillance

- PFOS is included in Canada's CMP monitoring plan.
- 18 PFOS substances are included in the Great Lakes Screening Project.
- Perfluorinated compounds (PFCs) are monitored in GLs Fish Monitoring Program.
- PFOS is included in Canadian water & sediment contaminant monitoring programs.
- PFCs under consideration for inclusion in IADN in 2009.

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Feeders for Substance Identification *(Continued)*

Example: PFOS

Other Sources of Information

European Union

- Directive 2006/122/EC restricted PFOS levels in preparations, semi-finished products, products, textiles, and coated materials.
- In June 2008, measures restricting PFOS in Europe became effective.

Organization for Economic Co-operation and Development (OECD)

- PFOS hazard assessment report concluded that its persistence, presence in the environment and in wildlife, and bioaccumulation potential are cause for concern.

Other Countries

- Australia agreed to voluntarily phase out PFOS in 2000. Norway adopted the EU limits on the use of PFOS, and has proposed major reductions of PFOS emissions by 2010. Sweden proposed PFOS and 96 PFOS-related substances as candidates for the Stockholm Convention on POPs.

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Feeders for Substance Identification *(Continued)*

Example: PFOS

Other Sources of Information

UNECE Convention on Long Range Transboundary Air Pollution (LRTAP)

- The UNECE POPs Protocol agreed to consider PFOS as a Persistent Organic Pollutant (POP) and, in 2006, explored management strategies.

UN Stockholm Convention

- A draft risk management evaluation was prepared for discussion at the third meeting of the POPRC (November 2007) recommending listing PFOS under Annex A of the Convention in order to eliminate or restrict production and use. This recommendation is expected to be put forward for decision at the 4th Conference of the Parties in May 2009.

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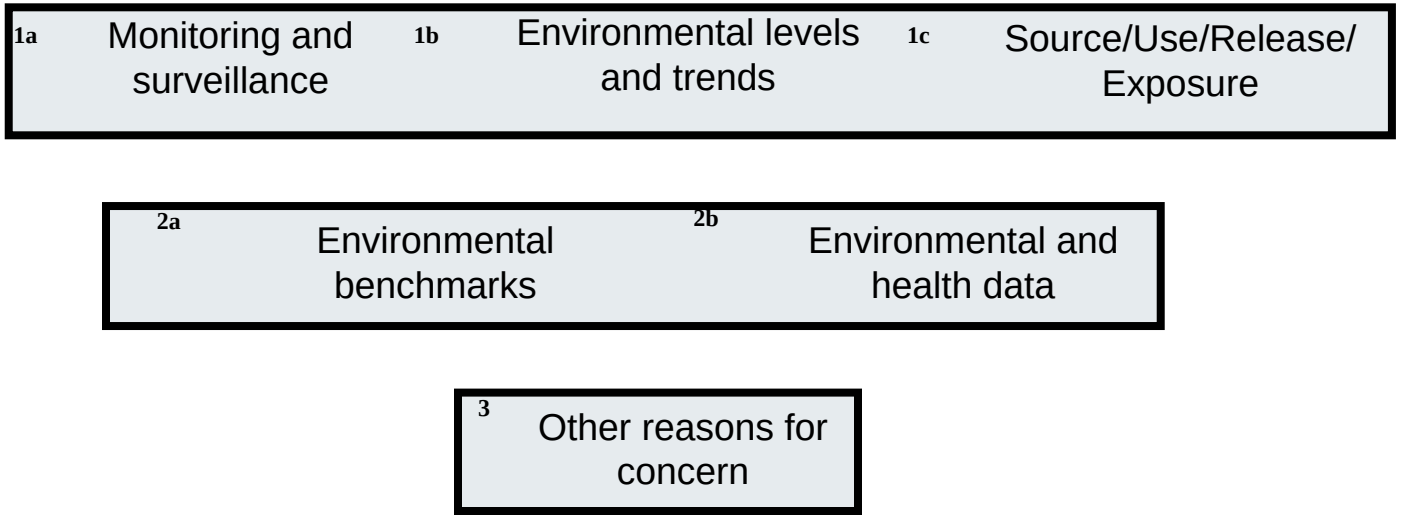
Considerations for Substance Selection

- The Framework provides categories of considerations to facilitate the evaluation of potential threat to the Great Lakes Basin (GLB):



Monitoring and Surveillance

Example: PFOS

- Monitoring and surveillance data demonstrate the presence of PFOS in the Great Lakes Basin. For example:
  - Furdui et al. 2007 reported PFOS in Great Lakes **lake trout**.
  - Martin et al. 2004 reported PFOS in **various organisms** from Lake Ontario food web.
  - Kannan et.al. 2005 reported PFOS in **aquatic organisms** in a Great Lakes food chain.
  - Boulanger et al. 2004 reported PFOS in **water** from Lakes Erie & Ontario.
  - Environment Canada reported PFOS in **sediments** of Canadian Great Lakes tributaries from 2001 to 2005.
  - Martin et al. 2002 reported PFOS precursors in **air** at Toronto and Long Point, Ontario.
  - Sinclair et al. 2005 reported PFOS levels in **birds** in the Niagara River region.

Environmental Levels and Trends

Example: PFOS

Sediments

- A screening-level survey of recently deposited sediments in Canadian Great Lakes tributaries from 2001 to 2005 indicated relatively low PFOS concentrations that appeared to be indicative of land use (i.e., elevated levels are generally found in more populated watersheds) (see figure on next slide).
- PFOS levels in suspended sediment collected annually at Niagara-on-the-Lake increased from < 400 pg/g in the early 1980s to > 1000 pg/g in 2002 (Furdui et al., 2005).

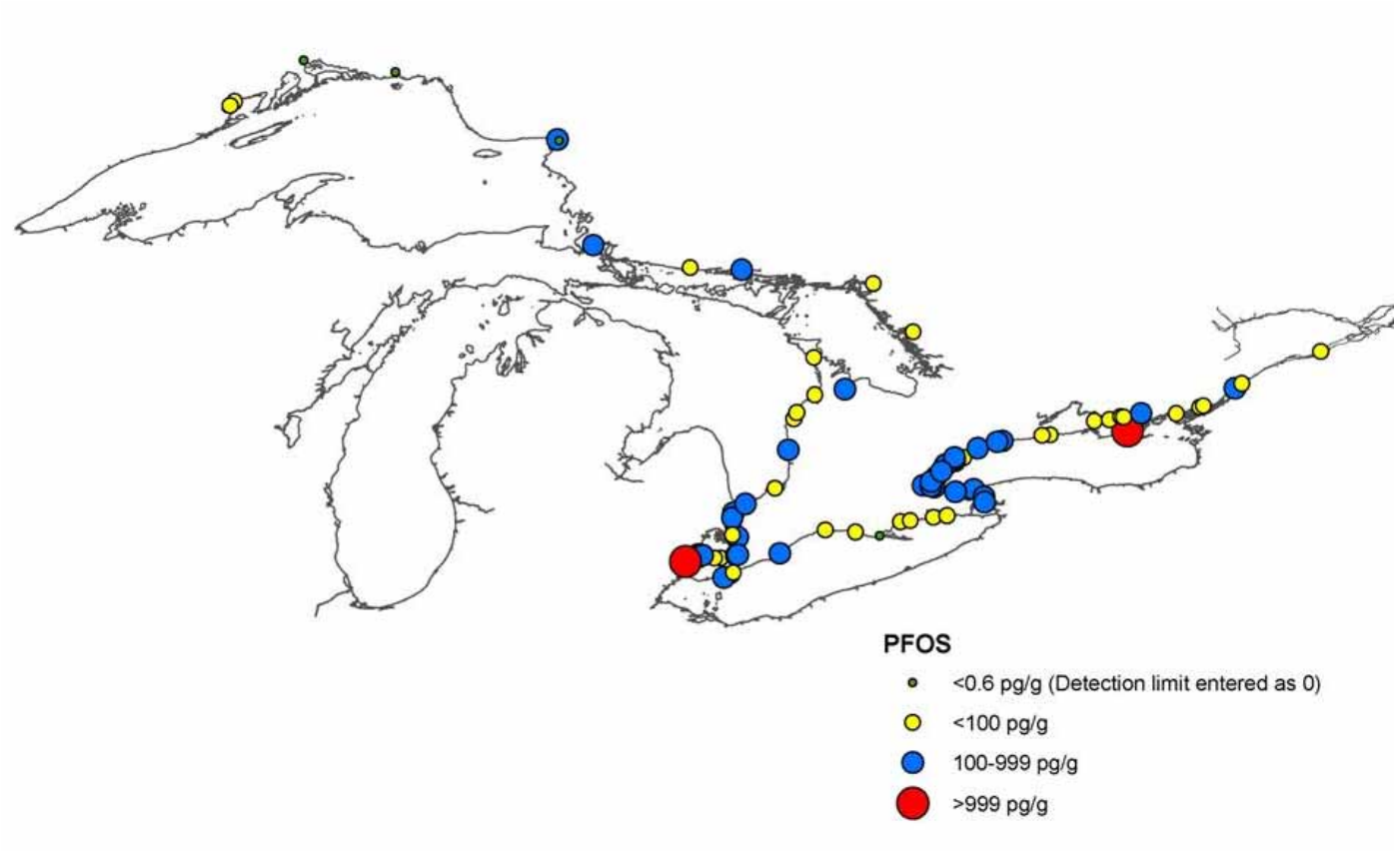
Air

- Average levels of PFOS precursors were 101 pg/m^3 in Toronto and 35 pg/m^3 at Long Point for N-MeFOSE alcohol, and 205 pg/m^3 in Toronto and 76 pg/m^3 in Long Point for N-EtFOSE alcohol (Martin et al., 2002) .

Fish and Biota

- PFOS has been identified in whole lake trout samples from all the Great Lakes at concentrations from 3 ng to 139 ng (wet weight) (Stock et al., 2003).
- PFOS levels in lake trout are highest in Lake Erie and lowest in Lake Superior.
- Retrospective analyses of archived lake trout samples from Lake Ontario have identified a 4.25-fold increase (from 43 to 180 ng/g wet weight, whole fish) from 1980 to 2001 (Martin et al., 2004).

Levels of PFOS in Surficial Sediments of Canadian Tributaries to the Great Lakes, 2001-2005



Source: GLBTS 2006 Annual Progress Report

Environmental Levels and Trends *(cont'd)*

Example: PFOS

Surface Water

- In 2004, Boulanger et al. reported PFOS levels in Lakes Erie & Ontario ranging from 21-70 ng/L. The arithmetic mean was 31 ng/L for Lake Erie and 54 ng/L for Lake Ontario, with a maximum value of 121 ng/L.

Wildlife

- PFOS levels in polar bears from South Hudson Bay: max 3770 µg/kg liver; range 2000-3770 µg/kg liver; mean 2730 µg/kg liver (Smithwick et al., 2005).
- PFOS has been found in eagles in the Great Lakes, mallards in the Niagara River, and in Canadian migratory species from the U.S.
- Piscivorous birds (common merganser, bufflehead) in the Niagara River region were found to have significantly greater PFOS concentrations than non-piscivorous birds (Sinclair et al., 2005).

Human Exposure

- Widespread exposure in the general US population (>98% detection in NHANES 2003-2004), but serum PFOS levels declined ~32% from 1999-2000 to 2003-2004.

Source/Use/Release/Exposure Information

Example: PFOS

Source/Use

- PFOS is not manufactured in Canada or the U.S.
- PFOS was used as a repellent on rugs, carpets, fabric and upholstery (e.g., Scotchguard®); in food packaging; fire-fighting foams; hydraulic fluids; carpet spot removers; mining and oil well surfactants; and other formulations.
- From 1997 to 2000, an estimated 318 tonnes of PFOS substances were used in Canada.
- In 2007, approx. 3 tonnes of PFOS remained in Canadian stockpiles of aqueous foam used for firefighting; most other supplies of PFOS are believed to have been depleted.

Release

- PFOS may enter the environment through municipal/industrial wastewater discharges to surface water and through leachates from landfills when products containing these substances are sent for final disposal. PFOS may also be released directly to air, land, and surface water when products containing PFOS are used.
- Inflow from Lake Erie and wastewater treatment plants are the two major sources of PFOS into Lake Ontario.

Exposure:

- Potential human exposure occurs through contaminated air, surface and ground water, contaminated foods, and the use of PFOS-containing products.

Environmental Benchmarks

Example: PFOS

- There are no benchmarks available for Canada.
- Minnesota has issued Health Risk Limits for PFOS (0.3 ug/L) and PFOA (0.5 ug/L) in drinking water, and fish contaminant advisories for several highly impacted bodies of water. Minnesota is also considering effluent limits for PFCs in wastewater.
- Two other states, New Jersey and North Carolina, also regulate PFCs in drinking water.
- Drinking water criteria are available from the United Kingdom (maximum acceptable concentration of 0.3 µg/L for PFOS in drinking water).

Environmental and Health Data

Example: PFOS

- Studies suggest that perfluorinated surfactants persist and bioaccumulate following release into the aquatic environment.
- Bioaccumulation factor of 1000 in benthic invertebrates, and biomagnification factors in larger predators like bald eagles and minks are 10 to 20 times that of their prey.
- Health Canada concluded that adequate margins of exposure existed between the amount of PFOS in human blood compared to levels at which effects occurred in animals, including consideration of age differences and differences within and between species.
- Research shows no adverse human health effects resulting from exposure to PFOS.

Other Reasons for Concern

Example: PFOS

- Evidence suggests that PFOS has endocrine disrupting properties in rats.

Summary of Environmental Considerations

- Monitoring and surveillance data indicate the presence of PFOS in the GLB.
  - PFOS detected throughout the Great Lakes environment (air, fish, sediment, water, wildlife)
  - Demonstrated capacity for biomagnification in food webs.
  - PFOS levels have increased in sediment and fish from 1980s to 2002.
  - Widespread exposure in US population, with declining serum PFOS levels since 1999-2000.

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Present Management Status

Example: PFOS

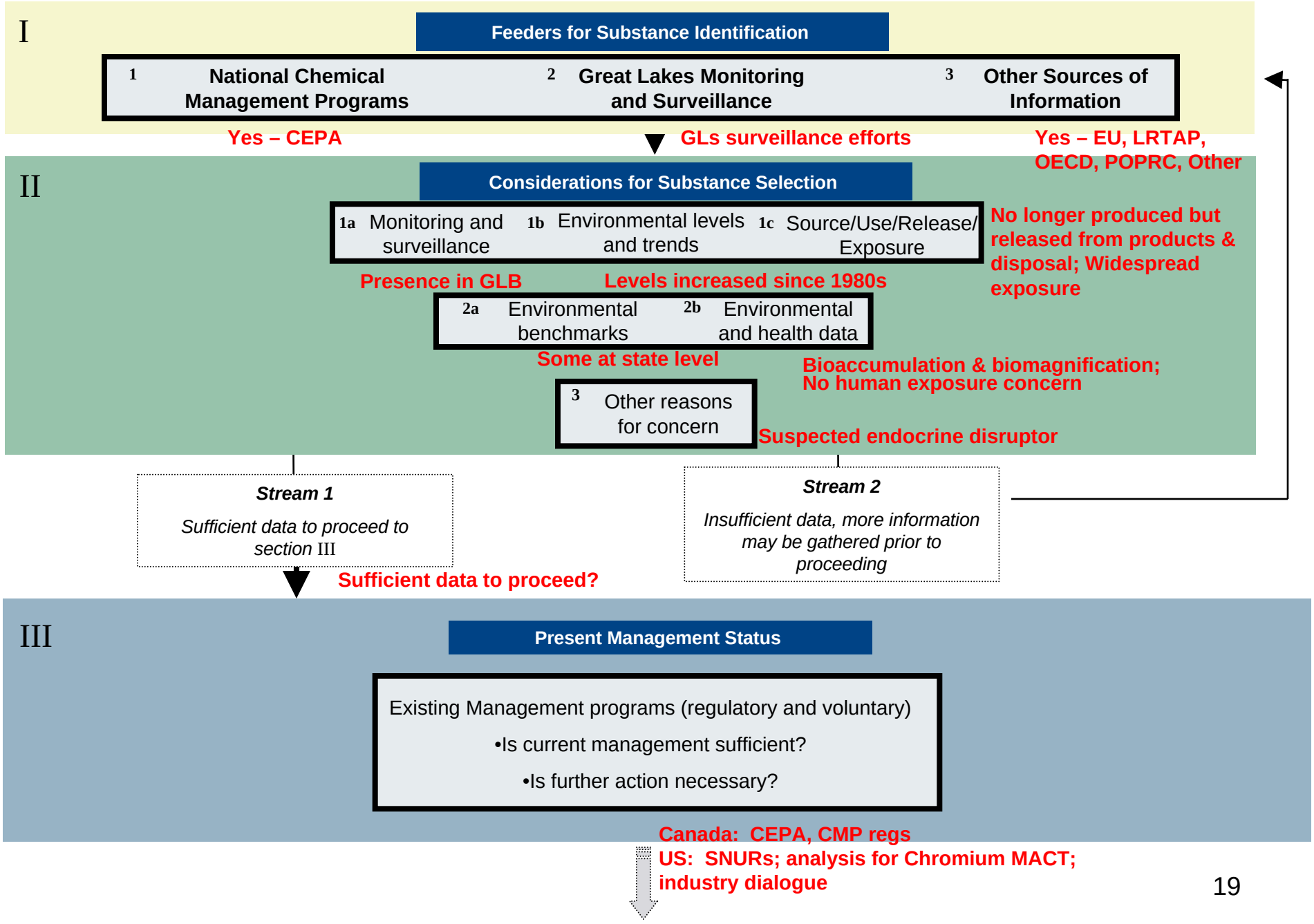
Canada

- Final regulations published in June 2008 prohibit the manufacture, use, sale, offer for sale or import of PFOS and its salts and certain other compounds; with some exceptions (http://gazetteducanada.gc.ca/partII/2008/20080611/html/sor178-e.html).

US

- In 2002, EPA published two SNURs to limit future manufacture or importation of 88 PFAS chemicals. In 2007, EPA published another SNUR on 183 additional PFAS chemicals.
- These SNURs recognized the continuation of a few limited, highly technical uses for which alternatives were not available, and which were characterized by very low volume, low exposure, and low releases. EPA allowed PFOS use in chromium plating, noting concern about wastewater releases.
- A recently completed survey of wastewater releases at chromium plating facilities will inform the Clean Air Act residual risk analysis for the Chromium MACT.
- EPA has engaged the National Association of Surface Finishers in dialogue on alternatives and best management practices to minimize/prevent PFOS releases.
- MPCA and MN Department of Health have undertaken significant work with respect to PFC contamination in Minnesota.

Binational Framework for Identifying Substances of Potential Threat to the GLB - PFOS



Discussion

- Is PFOS a threat to the basin?
  - Present in all Great Lakes media.
  - Potential risk to wildlife through bioaccumulation and biomagnification.
- Is current management sufficient?
- Is further action necessary?