THE ENVIRONMENTAL COUNCIL OF THE STATES

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REPORT OF THE ECOS MERCURY WORKSHOP

Volume II

St. Louis, Missouri
October 20-21, 2000

This document was revised in May 2006 by Ronald Still, N.C. Division of Pollution Prevention and Environmental Assistance and US EPA Region IV WRRC.

The agenda and presentations were replaced with scanned information at 600 pixels from a hard copy provided by ECOS. The speakers' bibliographies were added.

The pages were not renumbered.

ECOS MERCURY WORKSHOP

St. Louis, Missouri
October 18-20, 2000

Volume II

CONTENTS

ECOS Mercury Workshop

October 18-20, 2000

Adam's Mark Hotel

St. Louis, MO

Agenda

Wednesday, October 18:

5:00 – 7:00 PM **Registration** Hotel Lobby – Outside St. Louis B, C

Thursday, October 19:

7:30 AM **Registration** Hotel Lobby – Outside St. Louis B, C

Continental Breakfast St. Louis A

8:00 – 8:30 AM **Welcome and Introduction to Workshop** St. Louis B - C

Stephen M. Mahfood, Director, Missouri Department of Natural Resources

ECOS Mercury Workshop Host
J. Dale Givens, Secretary, Louisiana Department of Environmental Quality

ECOS Co-Chair Water/ Ecosystems Committee

8:30 – 10:00 AM **Why Are We Here?** The purpose of this session is to provide an overview of the science of the mercury problem in the US, its effect on human heath and the sources contributing to these impacts.

Moderated by George Meyer, Secretary, Wisconsin Department of Natural Resources, ECOS President

Panelists:
Kathryn Mahaffey, PhD., Director, Division of Exposure Assessment, OPPTS, US EPA

John Rudd, PhD., Chief Scientist, Freshwater Institute, Department of Fisheries and Oceans, Canada

Gerry Keeler, PhD., Director, Air Quality Laboratory, University of Michigan

10:00 –10:15 AM **Break** – St. Louis Precon W

10:15 – 11:30 AM **US Policy Overview:** Panelists will provide the latest information on what EPA and Congress are doing to address the mercury issue and perspectives from the environmental community.

Moderated by Robert W. Varney, Commissioner, New Hampshire Department of Environmental Services

Panelists:
Joseph C. Stanko, Jr., Majority Counsel, United States House of Representatives

Tim Eder, National Wildlife Federation, Director, Great Lakes Natural Resource Center

Bob Perciasepe, Assistant Administrator for Air, United States Environmental Protection Agency

11:30 – 1:00 PM **Luncheon & Speaker – International Perspective on Mercury and the Policy of Reduction:** St. Louis A

Luke Trip, Director of Heavy Metals, Environment Canada

Introduced by Carl Johnson, Deputy Commissioner, New York Department of Environmental Conservation

1:00 – 2:45 PM **Existing And Emerging Technologies to Reduce Mercury to the Environment:** Panelists will provide an assessment of the state of the art of control technologies, including replacement of mercury in products, and issues dealing with control technology waste streams and the long-term storage of Mercury.

Moderated by Jon Sandoval, Chief of Staff, Idaho Department of Environmental Quality

Panelists:
Dr. Praveen Amar, Director, Science and Policy, NESCAUM

Scott Renninger, Program Manager, Coal Combustion By-products Utilization and Mercury Control Technology, National Energy Technology Laboratory

Art Dungan, Vice President, Safety, Health and Environment, Chlorine Institute

Dan Stickles, Director of Environmental Services, Spectrum Health

Kristina Von Rein, Swedish Environmental Protection Agency

2:45 - 3:45 PM

State Programs to Address Mercury- Part I:
Panelists will describe activities in selected regions of the US presenting information on initiatives and strategies states have in place to address mercury.

Moderated by Tom Skinner, Director, Illinois Environmental Protection Agency

Panelists:
John Wachtler, Mercury Policy Coordinator, Minnesota Pollution Control Agency - ***Great Lakes Region***

Terri Goldberg, Deputy Director, NEWMOA and Mark Smith, Deputy Director, Office of Research and Standards, Massachusetts Department of Environmental Quality - ***New England Region***

Dr. Randy Manning, Georgia Department of Natural Resources – ***Southern States Region***

3:45 PM

Break – St. Louis A

4:00 to 5:15 PM

State Programs to Address Mercury – Part II:
Panelists will describe actual programs they have in place to reduce mercury, its impacts, and research efforts. Presentations will cover progress in emission reductions, scientific investigations of the impact of mining waste on impaired water bodies, the benefits of programs to collect mercury in products and research dealing with the impacts of mercury on wildlife.

Moderated by Lori F. Kaplan, Commissioner, Indiana Department of Environmental Management

Panelists:
Leslie McGeorge, Assistant Commissioner, Environmental Planning and Science, New Jersey Department of Environmental Protection - ***Progress on Reducing Mercury***

Kahlil Abu-Saba, California Water Board - ***San Francisco Bay TMDL***

Tom Atkeson, Phd., Mercury Program Coordinator, Florida Department of Environmental Protection - ***Florida Wild Life Research***

5:15 – 5:45 PM

Wrap- Up and Dialogue: A facilitated discussion of the key points and issues raised during the workshop sessions and a framework for the States-only session on Friday.

Facilitated by: Bill Ross, Ross and Associates

6:30 – 7:30 PM **Reception –** St. Louis Precon W

7:30 – 9:00 PM **Dinner & Speaker - Upcoming Policy Decisions by EPA on the Regulation of Mercury:** St. Louis A

Bob Perciasepe, Assistant Administrator for Air, Unites States Environmental Protection Agency

Introduced by Michael C. Castle, Director, West Virginia Division of Environmental Protection, Chair, ECOS Air Committee

FRIDAY OCTOBER 20:

7:30 – 8:30 AM **Continental Breakfast** – St. Louis A

8:30 – 12:00 Noon **Where Do We Go From Here:** St. Louis B – C
States-only, and invited guests, moderated session to explore future action.

Facilitated by: Bill Ross, Ross and Associates

Discussion Leaders:
George Meyer, Secretary, Wisconsin Department of Natural Resources

J. Dale Givens, Secretary, Louisiana Department of Environmental Quality

Michael C. Castle, Director, West Virginia Division of Environmental Protection

10:00 – 10:15 AM **Break –** St. Louis A

ECOS Mercury Workshop Speakers

Khalil Abu-Saba
CA Regional Water Quality Control Board
1515 Clay St., Suite 1400
Oakland CA 94612
510-622-2382 FAX 501-622-2460
abu@rbs.swrcb.ca.gov

Tom Atkeson, PhD
Florida Department of Environmental Protection
2600 Blairstone Road
Tallahassee FL 32399
850-921-0884
atkeson_t@dep.state.fl.us

Arthur Dungan
Chlorine Institute
2001 L. St. N.W. Ste. 506
Washington DC 20036-4919
202-872-4730 FAX202-223-7225
adungan@cl2.com

Tim Eder
National Wildlife Federation
506 E. Liberty St. 2nd Floor
Ann Arber MI 48104-2210
734-769-3351 FAX734-769-1449
eder@nwf.org

Terri Goldberg
NEWMOA
129 Porland St. 6th Floor
Boston MA 2114
617-367-8558 FAX617-367-0449
fgoldberg@newmoa.org

Gerald Keeler
University of Michigan Air Quality Lab
109 Observation Street
Ann Arbor MI 48108
739-936-1836 FAX734-764-9424
jkeeler@umich.edu

Randall Manning
GA Dept. of Natural Resources/Environmental Protection Divivision
745 Gaines School Road
Athens GA 30605
706-365-6376 FAX706-369-6395
randy_manning@mail.dnr.state.ga.us

Leslie McGeorge
NJ Dept. of Environmental Protection/Environmental Planning & Science
P.O. Box 418, 401 E. State Street, 7th Fl. West Wing
Trenton NJ 86250418
609-292-1254 FAX609-777-1330
1mcgeorge@dep.state.nj.us

C. Mark Smith, PhD, M.S.
MA Department of Environmental Protection & NEG-ECP Mercury Task Force
One Winter Street
Boston MA
617-292-5509 617-292-5858
C.mark.smith@state.ma.us

Joseph Stanko, Jr.
U.S. House Committee on Commerce
2125 Rayburn H.O.B.
Washington DC 20515
202-225-2927 FAX202-225-1919
joseph.stanko@mail.house.gov

Dan Stickles
Spectrum Health
100 Michigan NE MC 079
Grand Rapids MI 49503
616-391-1801 FAX616-391-1419
dan.stickles@spectrum-health.org

Luke Tripp
Environment Canada
351 St. Joseph Blvd.
Hull Quebec Canada
luke.trip@ed-gc-ca

Kristina von Rein
Swedish EPA
S-106 48 Stockholm
Sweden
kristina.von-rein@environ.se

John Wachtler
MN Pollution Control Agency
520 Lafayette Road N.
St. Paul MN 55155-4194
651-297-8333 FAX651-297-8676
John.Wachtler@pca.state.mn.us

ECOS Mercury Workshop
Speaker Biographies

Kathryn R. Mahaffey

Dr. Mahaffey's professional career is in exposure assessment and toxicology of metals. She has worked extensively in the area of food safety. Following graduate training in nutritional biochemistry and physiology at Rutgers University, she completed post-doctoral training in neuro-endocrinology at the University of North Carolina School of Medicine. Her research has been on susceptibility to lead toxicity with greatest focus on age and nutritional factors resulting in more than 100 publications in this area. During her long career with the United States Government she has been influential in lowering lead exposures for the United States population through actions to removal lead from foods and beverages, and from gasoline additives during the 1970s and 1980s.

In recent years, Dr. Mahaffey has been actively involved in risk assessments for mercury. She was the author of the NIH Report to Congress on Mercury, and a primary author of US EPA's *Mercury Study Report to Congress*. These reports emphasized risk of developmental deficits caused by methylmercury exposure during development of the nervous system. Dr. Mahaffey was one of the primary developers of US EPA's *Mercury Research Strategy,* which will be released in late 2000. Currently Dr. Mahaffey is a Division Director with in the Office of Science Coordination and Policy of OPPTS, US EPA. This division runs US EPA's Endocrine Disruptor Screening and Validation Program. Dr. Mahaffey remains active in research and developing US EPA's policies on methylmercury.

John Rudd

Dr. Rudd is presently the Chief Scientist at the Experimental Lakes Area (ELA), which is a government of Canada research facility in northwestern Ontario, Canada. The ELA specializes in whole-ecosystem manipulation experiments that address environmental problems of national and international importance. Dr. Rudd has researched various aspects of mercury pollution during the past 25 years – including point source mercury pollution, the link between lake acidification and mercury contamination of fisheries, the mercury contamination of fisheries in reservoirs, and most recently a whole ecosystem experiment (METAALICUS) which addresses the link between the atmospheric deposition of mercury and mercury contamination of fish. Dr. Rudd has also studied the possible global significance of greenhouse gas evolution from reservoirs, and he has studied microbial processes in acidified lakes that produced alkalinity thereby reducing the impact of acid deposition on lakes.

LESLIE J. MCGEORGE

Leslie J. McGeorge has a Masters of Science in Public Health degree in Environmental Chemistry and Biology from the University of North Carolina. She has worked as a Research Scientist, Bureau Chief, Assistant Director, Deputy Director and Director of the Division of Science, Research and Technology (DSRT), New Jersey Department of Environmental Protection (NJDEP). In July 2000, she was appointed Assistant Commissioner for NJDEP's Environmental Planning and Science program comprised of Air Quality Management; Coastal Planning and Program Coordination; Science, Research and Technology; and Watershed Management. Ms. McGeorge has 19 years experience in environmental research and standard setting for toxic contaminants, and for the last 5 years has co-chaired DEP's participation in the National Environmental Peformance Partnership System (NEPPS) including the development of a system of environmental goals and indicators for New Jersey. She is the DEP representative on NJ's Mercury Task Force.

KHALIL ABU-SABA

Khalil Abu-Saba is an Environmental Specialist for the San Francisco Bay Regional Water Quality Control Board, where he leads development of a Total Maximum Daily Load (TMDL) for mercury in the Bay and its surrounding watershed. He began working with the State of California on watershed planning in 1998, through the San Francisco Estuary Project. In 1999, he joined the Regional Board as one of the first staff in the newly formed TMDL unit. Dr. Abu-Saba received his M.S. in Marine Sciences and his Ph.D. in Chemistry from the University of California, Santa Cruz. He has spent the past decade studying trace metal sources and fate in the environment, focusing on the complex interplay of natural and anthropogenic processes in the San Francisco Bay estuary.

THOMAS D. ATKESON, PH.D.

After nine years with the Florida Department of Health as Chief of the Environmental Epidemiology Program, where he was involved in a wide variety of environmental contaminant issues, Dr. Atkeson joined the Department of Environmental Protection in 1992. His responsibilities are to coordinate Florida's response to the finding of high levels of mercury in fish and wildlife in the Florida Everglades and lakes and rivers statewide. His primary efforts are devoted to planning a long-term monitoring, modeling and research program aimed at defining the causes of mercury contamination in Florida and coordinating the activities of a variety of local, state, federal and private agencies in pursuit of those objectives.

Dr. Atkeson's background is in zoology and wildlife biology. He received a B.S. in Biological Sciences from Auburn University in 1970, and M.S. and Ph.D. in Wildlife Biology from the University of Georgia in 1975 and 1983, respectively.

Dr. Atkeson served as Chair of the Governor's Mercury in Fish and Wildlife Task Force, and it's successor, the multi-agency South Florida Mercury Science Program.

GERALD J. KEELER

Dr. Keeler has been on the faculty at the University of Michigan (UM) in Ann Arbor since 1990. He holds a joint appointment in the Department of Environmental Health Sciences in the school of Public Health and in the Department of Atmospheric, Oceanic, and Space Sciences in the College of Engineering. He serves as the Director of the UM Air Quality Laboratory, an interdisciplinary research group which is internationally recognized as a leader in atmospheric mercury research. Professor Keeler has co-authored more than 40 peer-reviewed publications and numerous reports dealing with mercury measurement technology, sources, chemistry, transport, and deposition over the past decade.

Dr. Keeler's background is in Atmospheric Science and Environmental Health. He received a B.S. in Physics and B.A. in Mathematics from Boston College in 1982, and M.S. and Ph.D. in Atmospheric Sciences from the University of Michigan, College of Engineering in 1985 and 1987, respectively. In addition, he completed a Post-Doc at the Harvard School of Public Health and was a Visiting Scientist at the MIT Nuclear Reactor Laboratory from 1987-1990.

Dr. Keeler served as a Technical Reviewer of the EPA Mercury Report to Congress. Prof. Keeler and his team are currently working on mercury projects in Florida, New England, Michigan, and in other parts of the Great Lakes Region.

JOSEPH C. STANKO, JR.

Since early 1997, Mr. Stanko has been Majority Counsel to the U.S. House of Representatives Committee on Commerce, chaired by Rep. Tom Bliley (R-VA). In that position, Mr. Stanko advises the Committee on environmental matters such as air quality standards, Environmental Justice, EPA's information and data systems, and the role of state agencies in implementing federal environmental statutes. He also takes part in the Committee's congressional oversight of EPA's programs. During his tenure at the Committee, he has been the lead House staffer on a number of Clean Air Act amendments and other environmental legislation.

Prior to joining the staff of the Commerce Committee, Mr. Stanko was in private practice where he specialized in environmental and administrative law. He has represented companies and municipalities in all regions of the United States, in the context of civil, administrative and criminal proceedings.

Mr. Stanko received his undergraduate and law degrees from Boston University. He is a member of numerous legal and environmental professional organizations.

TIM EDER

Tim Eder currently serves as Director of the National Wildlife Federation's Great Lakes office. Located in Ann Arbor, Michigan, NWF's Great Lakes office is the largest of 10 field offices. Tim directs a full time staff of 22. Tim joined NWF in 1988. In prior positions, Tim led NWF's Great Lakes water quality programs, and served as Regional Organizer for Michigan and Ohio.

Tim is the author of several reports and publications, including "A Prescription For Healthy Great Lakes," and "Ohio's Mercury Menace." He has testified before Congress on several Great Lakes pollution issues, including the regulation of power plant pollution and protection and restoration of Great Lakes water quality. Current projects include protecting the Great Lakes from mercury deposited via the atmosphere, and preventing diversions and exports of Great Lakes water.

Prior to joining NWF, Tim worked for the Buffalo-based Great Lakes United and the Michigan United Conservation Clubs. He is a graduate of Michigan State University.

Except for stints in New York and Colorado, Tim has been a life-long resident of Michigan. He currently spends is free time with his wife and two daughters coaching basketball and at their lake camp north of Chelsea.

ROBERT PERCIASEPE

Robert Perciasepe was confirmed by the Senate as an Assistant Administrator for the United States Environmental Protection Agency (EPA) on October 15, 1993.

Mr. Perciasepe currently administers EPA's air and radiation program. In this program, Mr. Perciasepe oversees the development of guidelines and standards for the implementation of the Clean Air Act Amendments of 1990 and the Atomic Energy Act of 1954. The air program assists state and local agencies with monitoring and controlling air pollution, develops regulations to limit and reduce air pollution, establishes standards for disposal of high-level radioactive waste and makes information on these topics available to industry, stakeholders, and the general public.

Previously, Mr. Perciasepe administered EPA's water program. In this role, Mr. Perciasepe was responsible for managing the development of criteria and standards for water quality and drinking water as well as water pollution point source permits. The water program also is actively involved in the State Revolving Fund Program for constructing municipal wastewater treatment plants, and shares responsibility with the U.S. Army Corps of Engineers for regulating wetlands and the disposal of dredged materials.

From January 1991 to August 1993, Mr. Perciasepe was Maryland's Secretary of Environment. In that position, Mr. Perciasepe directed all aspects of pollution control and environmental protection in Maryland, including: air and water pollution control, management of hazardous and solid wastes, control of sediment, erosion and stormwater, as well as activities to protect environmental health and provide financial assistance for environmental restoration. Mr. Perciasepe served as Chairman of Maryland's Asbestos Oversight Committee, Vice-Chairman of the Appalachian Low-Level Radioactive Waste Commission, and as First Chairman of the

(continued)

Northeast Ozone Transport Commission. Mr. Perciasepe also served on the Board of the Chesapeake Bay Trust.

Prior to becoming the Maryland Department of Environment's (MDE) Secretary, Mr. Perciasepe served as MDE's Deputy Secretary and Assistant Secretary for Planning and Capital Programs. Before joining MDE, Mr. Perciasepe worked for Baltimore City as the Assistant Director of Planning, where he was responsible for capital programs, data systems and environmental planning.

Mr. Perciasepe holds a Bachelor of Science degree in environmental sciences from Cornell University and a master's degree in planning from the Maxwell School of Syracuse University.

LUKE TRIP

Luke Trip has been with Environment Canada for 30 years and currently manages transboundary air pollution issues relating to hazardous air pollutants. He is responsible for developing Canadian domestic and international policy on air pollution matters relating to metals, in particular mercury. He is a negotiator for Canada on the United Nations Long Range Transport of Air Pollution Convention and was instrumental in formulating the Heavy Metals Protocol. He is also an advisor to the Canada-wide Standards for Mercury development committee, the Great Lakes Binational Toxics Strategy Mercury initiative, the Arctic Monitoring and Assessment Program and the New England Governors/Eastern Canadian Premiers Mercury Action Plan.

Mr. Trip graduated from St. Mary's University in Halifax, Nova Scotia, with a degree in chemistry. He is chairman of the Phase II North American Regional Action Plan on Mercury; approved by Canada, the U.S., and Mexico on June 13, 2000 in Dallas, Texas. He is also current chairman of the Implementation Task Force for the Action Plan on Mercury for North America and represents Canada on the Sound Management of Chemicals Working Group of the North American Commission for Environmental Cooperation.

PRAVEEN K. AMAR

Dr. Praveen Amar is Director, Science and Policy, with the Northeast States For Coordinated Air Use Management. His key area of expertise is to "translate" the implications of findings of science and developments in technology into workable and cost-effective policy options for the states in the Northeast. These options in the past have involved evaluation of regional strategies for controlling emissions of mercury and oxides of nitrogen and sulfur, including market-based approaches. The other science-policy interface work has included evaluation of relative roles of regional and local sources, review of new ambient standards for fine particles and ozone, and design of ambient monitoring networks. Current areas of interest are the relationship between environmental regulation and technology innovation (with emphasis on control of mercury emissions from coal-fired boilers), control of NOx from small sources, and regional haze guidelines and policies. *(continued)*

Before joining NESCAUM, Dr. Amar was with the California Air Resources Board for fifteen years where he managed programs on air pollution research, strategic planning, and industrial source pollution control. For over 10 years, he has served as a part-time faculty member at the University of California, Davis, California State University at Sacramento, and Tufts University in Boston, teaching graduate courses in air pollution policy and science, atmospheric chemistry and physics, and mechanical engineering.

He received his Ph.D. in engineering from UCLA in 1977. He is licensed as Professional Mechanical Engineer in the state of California.

SCOTT RENNINGER

Mr. Renninger is the National Energy Technology Laboratory's program manager for Coal Combustion By-product Utilization and Mercury Control Technologies. In addition to these roles, he also manages seven environmental cooperative agreements. Mr. Renninger received his MS in Chemical Engineering from West Virginia University in 1999 and his BS in Chemical Engineering from Penn State University in 1991. He has presented numerous technical papers as well as serving as a conference chairperson at several national and international conferences.

ARTHUR E. DUNGAN

Art has been with the Chlorine Institute since 1988. He is the staffer for the Institute's Plant Operations and Safety Committee, the Environment and Health Committee, the Board Committee on Mercury Issues, and associated sub-groups.

The Chlorine Institute is a trade association of chlor-alkali producers worldwide, as well as packagers, distributors, users, and suppliers. The Institute's mission is the promotion of safety and the protection of human health and the environment in the manufacture, distribution and use of chlorine and related chemicals.

Prior to joining the Institute, Art worked for the former Stauffer Chemical Company for more than twenty years in a variety of assignments in both chemical plants and the corporate headquarters.

Art has a Bachelor of Chemical Engineering Degree from the University of Delaware and a Masters of Business Administration from the University of Louisville.

Art resides in Vienna, VA with his wife and two sons.

DAN STICKLES

Dan is Director of Environmental Services for Spectrum Health, which is a newly formed entity as a result of the merger of Butterworth Hospital and Blodgett Memorial Medical Center, two of Grand Rapid's largest health care systems. With over 25 years experience in hospitals, the last 19 in Grand Rapids, Dan's job has evolved into one of greater responsibility for the management of various hospital waste streams both hazardous and non-hazardous, waste minimization and recycling, and achieving compliance for various regulated waste streams. His most recent project has been the elimination of mercury from all of Spectrum's facilities.

His efforts in this area have led to recognition from a variety of organizations at the state and national level including The National Wildlife Federation, Healthcare Without Harm, and The Ecology Center of Michigan. Dan is also a member of the Leadership Council for Hospitals for a Healthy Environment, which is the partnership formed in 1998 between the American Hospital Association and the EPA. These two entities developed a Memo of Understanding to work towards assisting hospitals in the virtual elimination of Mercury from their facilities by 2005, and a 50% total waste reduction volume by 2010.

Dan is often asked to speak at various seminars and workshops around the country to share his experiences with Mercury elimination at Spectrum Health and he is also a spokesperson for the AHA/EPA partnership. Dan brings a unique and energetic style to every presentation he makes. It's what expected from someone, who likes to say, "my life has been garbage and I've loved every minute of it!"

KRISTINA VON REIN

The Swedish EPA is the national authority coordinating and advancing policies in the environmental field. The agency's terms of reference are set by parliament and the government, which have determined overall environmental goals and more specific environmental objectives for the Agency. The Swedish EPA is active in the fields of environmental protection, conservation, recreational and outdoor leissure issues, research, information, education and training.

Kristina has worked for the Swedish EPA for 10 years - mainly with questions concerning mercury and hazardous waste. She has a Masters of Science in Chemical Engineering and was the project leader for the governmentally assigned Action Programme (1994 - 1999) for the collection of discarded goods and products that contain mercury. The task also included developing a proposal for final storage in Sweden of waste containing mercury.

JOHN N. WACHTLER

John has been Mercury Policy Coordinator at the Minnesota Pollution Control Agency for a little over one year. Prior to this position he worked on utility regulation at another Minnesota agency, focusing primarily on power plant and transmission line projects. Before that John worked for over five years for an engineering consulting firm. John has a Master's degree in Environmental Engineering from the University of Minnesota.

TERRI GOLDBERG

Terri Goldberg is the Deputy Director of the Northeast Waste Management Officials' Association (NEWMOA). She has been managing the Pollution Prevention Program at NEWMOA for over ten years. Ms. Goldberg has been working on issues and projects related to mercury education and reduction for many years. She assisted in the writing and production of the joint NESCAUM/NEWMOA report, Northeast States and Eastern Canadian Provinces, Mercury Study, A Framework for Action. She has been facilitating the development of model state reduction legislation during the past two years. Ms. Goldberg has a masters degree from the Harvard School of Public Health and an undergraduate degree with a focus on environmental science from Hampshire College.

C. MARK SMITH

C. Mark Smith is the Deputy Director of the Office of Research and Standards (ORS) at the Massachusetts Department of Environmental Protection (MADEP). Mark is the Co-chair of the New England Governors and Eastern Canadian Premiers Regional Mercury Task Force and is the Chair of MADEP's Mercury Workgroup. His primary areas of expertise are in toxicology, risk assessment and environmental policy. He holds a Ph.D. in the field of Molecular and Cellular Toxicology and a masters degree in Environmental Management from Harvard University and has published in the areas of genotoxicity, molecular epidemiology, genetic markers of susceptibility and risk assessment.

RANDALL O. MANNING

Dr. Manning is the Coordinator of the Environmental Toxicology Program in the Georgia Department of Natural Resources, Environmental Protection Division. Dr. Manning received his Ph.D. in 1986 from the University of Georgia (UGA), College of Agriculture where he studied the toxicity and metabolism of mycotoxins. Prior to joining the Georgia Environmental Protection Division (GAEPD) in 1990, Dr. Manning was a Postdoctoral Research Associate (1987-88) and an Assistant Research Scientist (1989-90) in the Department of Pharmacology and Toxicology at UGA, studying the toxicity of volatile organic chemicals and the development of physiologically-based pharmacokinetic models for use in risk assessment. As the Coordinator of the Environmental Toxicology Program at GAEPD, Dr. Manning is responsible for providing the Division with support in toxicology and hazard/risk assessment, and ensuring consistency as GAEPD incorporates the use of risk-based evaluations in different programs. Dr. Manning's research interests currently relate to the development of risk-based approaches for evaluation of environmental contamination by regulatory agencies. Dr. Manning is a member of the Society of Toxicology, a Diplomate of the American Board of Toxicology, and holds adjunct faculty positions in the Department of Pharmaceutical and Biomedical Sciences, College of Pharmacy, University of Georgia and the Department of Environmental and Occupational Health, Rollins School of Public Health, Emory University.

ECOS Mercury Workshop
October 18-20, 2000

Presentation Index

Why are we Here? This session provided an overview of the science of the mercury problem in the US, its effect on human heath and the sources contributing to these impacts.

Panelists

Kathryn Mahaffey, PhD., Director, Division of Exposure Assessment, OPPTS, US EPA(Copy of Presentation Is Not Available)

John Rudd, PhD., Chief Scientist, Freshwater Institute, Department of Fisheries and Oceans, Canada (Copy of Presentation Is Not Available)

Gerry Keeler, Phd., Director, Air Quality Laboratory, University of Michigan (Copy of Presentation Is Not Available)

US Policy Overview: This session provided the latest information on what EPA and Congress are doing to address the mercury issue and perspectives from the environmental community

Panelists:

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Tim Eder, National Wildlife Federation, Director, Great Lakes Natural Resource Center (Copy of Presentation Is Not Available)

Ellen Brown, Office of Air and Radiation, United States Environmental Protection Agency (Copy of Presentation Is Not Available)

Luncheon Speaker – International Perspective on Mercury and the Policy of Reduction –Luke Tripp, Director of Heavy Metals, Environment Canada

Existing And Emerging Technologies to Reduce Mercury to the Environment This session provided an assessment of the state of the art of control technologies, including replacement of mercury in products, and issues dealing with control technology waste streams and the long-term storage of Mercury.

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Dr. Praveen Amar, Director, Science and Policy, NESCAUM

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Panelists:

John Wachtler, Mercury Policy Coordinator, Minnesota Pollution Control Agency - Great Lakes Region

Terri Goldberg, Deputy Director, NEWMOA and Mark Smith, Deputy Director, Office of Research and Standards, Massachusetts Department of Environmental Quality - New England Region (Copy of Presentation Is Not Available In Electronic Format)

Dr. Randy Manning, Georgia Department of Natural Resources – Southern States Region

State Programs to Address Mercury – Part II - This session described actual programs they have in place to reduce mercury, its impacts, and research efforts. Presentations will cover progress in emission reductions, scientific investigations of the impact of mining waste on impaired water bodies, the benefits of programs to collect mercury in products and research dealing with the impacts of mercury on wildlife

Panelists:

Leslie McGeorge, Assistant Commissioner, Environmental Planning and Science, New Jersey Department of Environmental Protection - Progress on Reducing Mercury

Kahlil Abu-Saba, California Water Board - San Francisco Bay TMDL

Tom Atkeson, Phd., Mercury Program Coordinator, Florida Department of Environmental Protection - Florida Wild Life Research (Copy of Presentation Is Not Available)

ECOS
Mercury Workshop

Kathryn Mahaffey
National Center For
Environmental Assessment

Why Are We Here?

ECOS
Mercury Workshop

John Rudd
Freshwater Institute

Why Are We Here?

ECOS
Mercury Workshop

Gerald Keeler
Air Quality Laboratory
University of Michigan

Why Are We Here?

ECOS
MERCURY WORKSHOP

JOSEPH STANKO
UNITED STATES HOUSE
OF REPRESENTATIVES

US POLICY OVERVIEW

ECOS
Mercury Workshop

Tim Eder
National Wildlife Federation
Great Lakes Natural Resource Center

US Policy Overview

ECOS
Mercury Workshop

Bob Perciasepe
US Environmental Protection Agency

US Policy Overview

ECOS
MERCURY WORKSHOP

LUNCHEON SPEAKER

LUKE TRIP
ENVIRONMENT CANADA

INTERNATIONAL PERSPECTIVE ON MERCURY AND THE POLICY OF REDUCTION

ECOS
Mercury Workshop

Praveen Amar
Northeast States for Coordinated
Air Use Management

Existing and Emerging Technologies
to Reduce Mercury to the Environment

Environmental Regulation & Technology Innovation:

Controlling Mercury Emissions from Coal-Fired Boilers

Presented by,
Praveen Amar, Ph.D., P.E.
Director, Science and Policy
Northeast States for Coordinated Air Use Management (NESCAUM)
Panel on Existing and Emerging Technologies
to Reduce Mercury Emissions to the Environment

ECOS Mercury Workshop
St. Louis, Missouri
October 19, 2000

NESCAUM
Northeast States for Coordinated Air Use Management

NESCAUM Mercury Technology Study

- An assessment of:
- State of Hg control technology
- Cost of Hg control technology
- Other cases where technology-forcing regulation worked

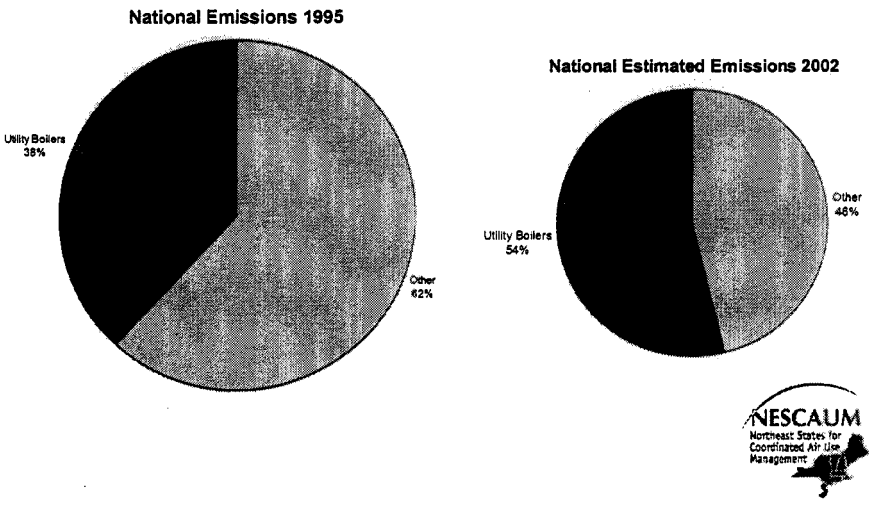
NESCAUM
Northeast States for Coordinated Air Use Management

Mercury: Background

- Most toxic form: Methylmercury
- Primary human exposure: fish consumption
- Total tons of mercury emitted yearly in U.S.: 150
- Emitted by coal-fired power plants: 50 tpy
- Federal science panel: may cause learning disabilities in 60,000 U.S. children each year
- EPA's hazardous pollutant "of greatest potential concern"

NESCAUM
Northeast States for Coordinated Air Use Management

Estimated U.S. Mercury Emissions



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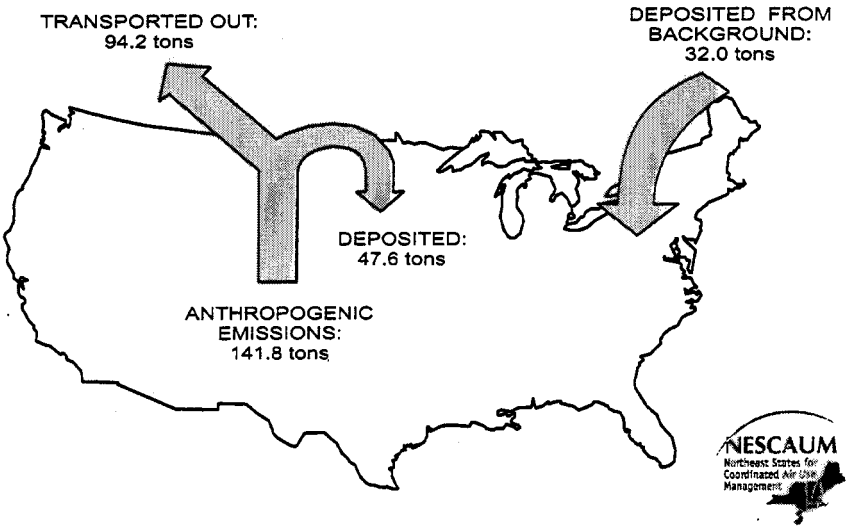
U.S. Transport and Deposition

(Annual Mass Balance)



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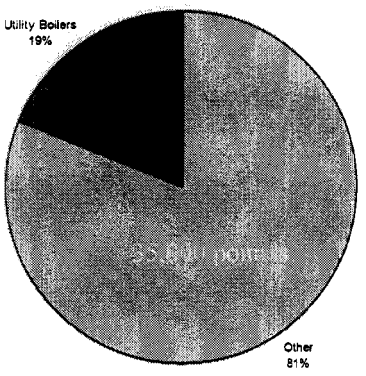
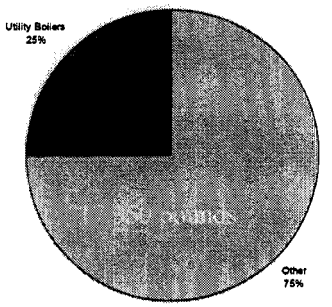
Estimated Mercury Emissions in the Northeast

1995 Northeast Emissions



2005 Estimated Northeast Emissions



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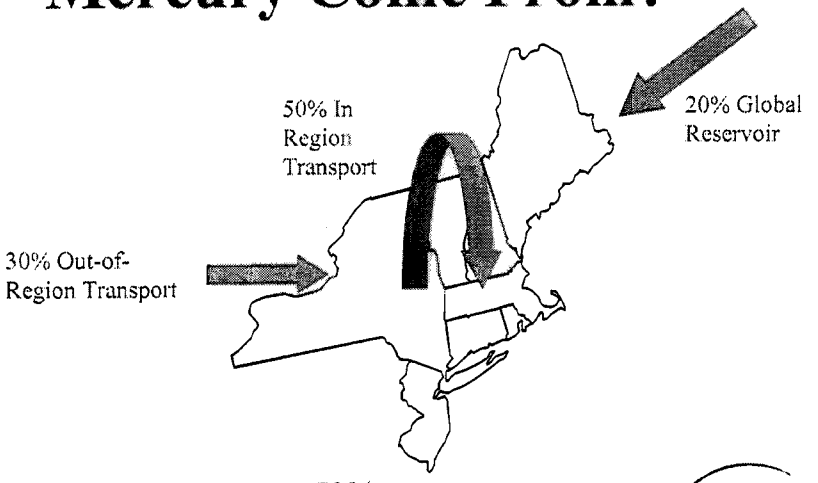
Deposition: Where Does the Mercury Come From?



In region sources: 50%
Out-of-region: 50%
(1998 NESCAUM Regional Mercury Study)

NESCAUM
Northeast States for Coordinated Air Use Management

NESCAUM Report: Key Findings

"All the Pieces Are There; Now All We Have To Do Is Put them Together"

NESCAUM
Northeast States for Coordinated Air Use Management

NESCAUM Report: Key Findings

"We Know More about Mercury and Mercury Control than We Did When We Decided to Regulate Auto Emissions and Pollution from Power Plants"

NESCAUM Report: Key Findings

Lesson of the Recent Past:

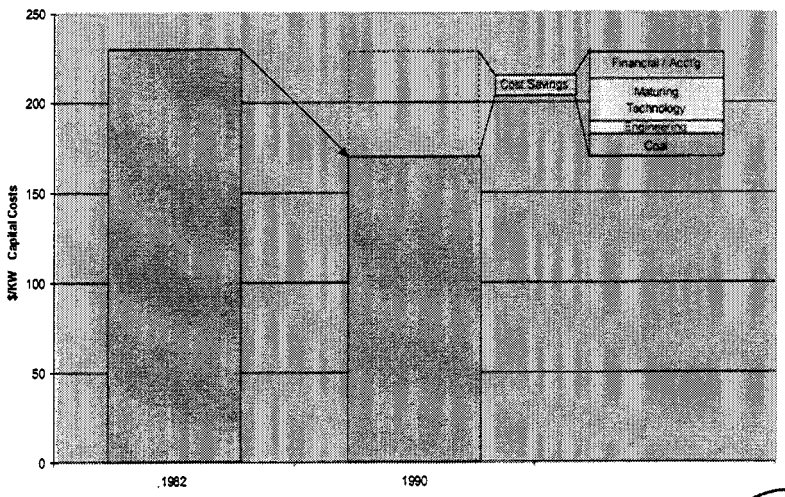
Air Pollution Control Technologies Don't Become Commercially Available at Attractive Prices Until After Regulatory Drivers are Established

Acid Rain

- **1977 CAAA: NSPS for New Units**
  - **Result: Scrubber Cost Dropped**
- **1990 CAAA: Coal Utilities Invest in Scrubbers in Anticipation of Title IV**
  - **Result: Costs Continue To Decline Far**
  - **Below Projections**
- **Late 90s: Threat of Tighter PM/SO_2 Standards**
  - **Result: Move To New Electric Generation Technologies (e.g., gas-fired power plants)**

NESCAUM
Northeast States for Coordinated Air Use Management

Acid Rain Scrubbers: Regulation Drives Cost Down by 25%



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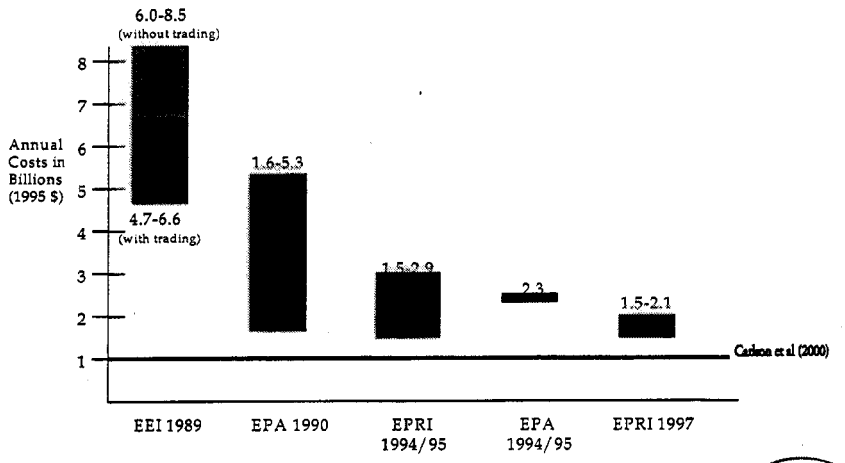
History (1989 - 1997) of Cost Projections:
Federal Acid Rain Program (Phase II)



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Nitrogen Oxides (NO_x)

- **Technologies in Use Outside of US**
- **But: Resistance in this Country**
- **1977 CAAA: Weak Regulatory Driver**
- **Two Key Drivers:**
  - **California Initiatives (NO_x as a Precursor to Ozone)**
  - **1990 Clean Air Act Amendments**
- **Now: Routine Use of Advanced Approaches:**
  - **SCR, SNCR, Gas and Coal Reburn**

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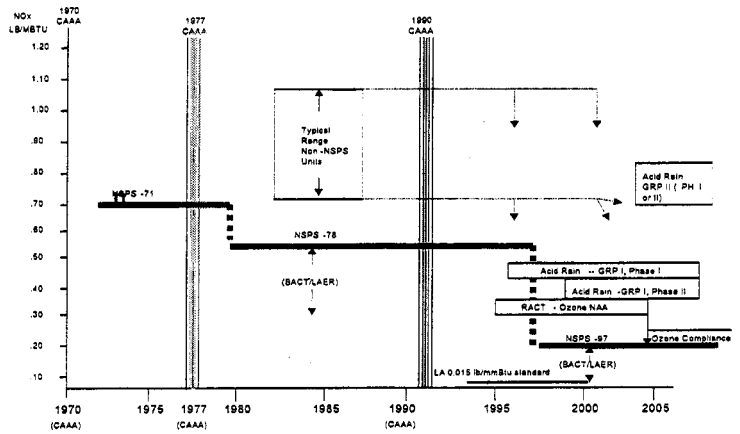
The Relationship Between Regulations and Implementation of NO_x Control



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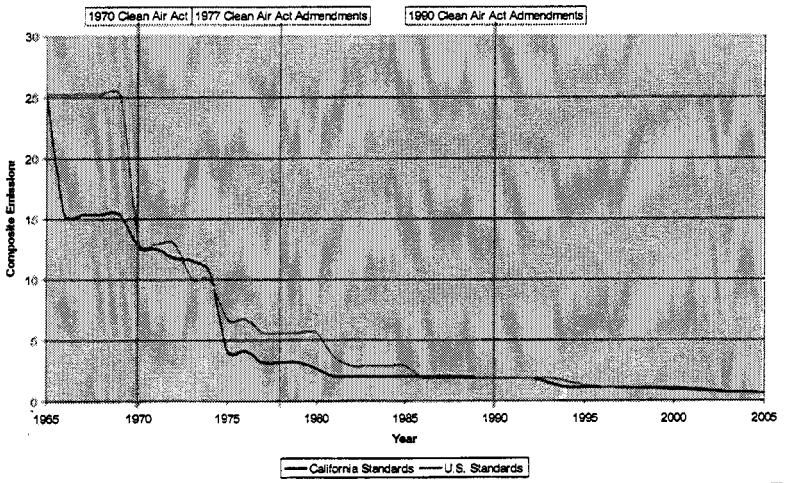
Automobile Emissions

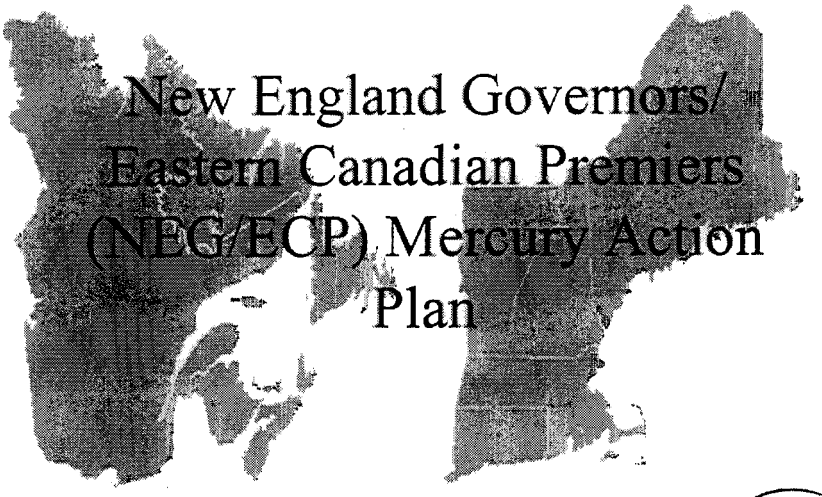
- **1965 --> 2005: Cars 95+% Cleaner**
- **Why?**
  - **California Regulations**
  - **Title II of the CAA**
- **What?**
  - **Catalytic converters**
  - **Tailpipe Standards Ratchet Down**
  - **Cleaner gasoline (no lead; oxygenates)**
  - **LEVs, ZEVs, Hybrids**

NESCAUM
Northeast States for Coordinated Air Use Management

Automobile Emissions Trends: Regulation Sparks Innovation



NESCAUM
Northeast States for Coordinated Air Use Management



New England Governors/ Eastern Canadian Premiers (NEG/ECP) Mercury Action Plan

NESCAUM
Northeast States for Coordinated Air Use Management

NEG/ECP Northeast Regional Mercury Action Plan

- Overall Goals
  - By 2003: implement steps to achieve 50% or greater reduction in mercury emissions in the NE region
  - Long-term: virtual elimination

NEG/ECP Northeast Regional Mercury Action Plan

- Utilities
  - Largest unaddressed combustion source in region
  - In light of progress on other major sources, utility reductions needed for continued progress towards regional goals

NEG/ECP Northeast Regional Mercury Action Plan

- Utilities (continued)
  - Governors and Premiers charged Task Force to:
    - evaluate control options
    - establish emission reduction targets
    - begin to implement reduction strategies by 2003
- NEG/ECP Reduction Targets Established
  (Resolution 25-11, Adopted July 18, 2000)
    - 20-50% Reduction by 2005
    - 60-90% Reduction by 2010
- U.S. EPA decision by December 15, 2000; Proposed MACT Rule by 2003, Final MACT Rule by 2004, Implementation by 2007

Overview of Mercury Control from Coal-Fired Boilers

- No regulations in place for mercury emissions from coal-fired power plants
- No commercially available control technologies for mercury from coal-fired power plants
- Existing control equipment for other pollutants (SO_2, NO_x, particulates) provides some level of mercury removal
- Mercury control technologies in research and R&D stages

Issues with Control of Hg Emissions

- Very low concentrations in flue gas
- Chemical speciation and physical forms present
- Measurement in flue gas difficult

What We Know

- Other experience may speed up implementation of mercury controls:
  - scrubbers and sorbent injection on full-scale power plants for SO_2 control
  - carbon injection for control of mercury from municipal waste combustors
- Pilot and laboratory data on mercury chemistry in flue gas and interactions with existing equipment

What We Don't Know

- Accurate prediction of Hg speciation and removal by control equipment not yet possible
- Effects of
  - Fuel type
  - Boiler configuration
  - Existing Air Pollution Control Devices
- Long term performance of full scale sorbent injection systems
- Stability of Hg in sorbent or scrubber byproducts

Hg Control Options

- Pollution prevention
- Conventional control technologies
- Mercury-specific control technologies

Pollution Prevention

- Fuel switching
- Natural gas co-firing
- Coal cleaning

Existing Control Technologies

- ESPs (electrostatic precipitators)
- Bag houses
- FGDs (SO2 removal)
- SCR
- SNCR
- Most Important: Combinations of Technologies

Mercury-specific control technologies

- Sorbent injection
  - activated carbon
  - non-carbon sorbents
- Enhanced FGD removal
- Emerging technologies

Comparison of Mercury Control Costs with NO_x Control Costs

Control	Capital Costs ($/kW)	Total Annual Cost (mills/kWh)
Mercury Controls	0.43 - 52.21	0.17 - 1.76
Low-NO_x Burners	7.31 - 35.89	0.15 - 0.54
Selective Catalytic Reduction	40.88 - 91.51	1.30 - 2.41

Source: EPA 2000

Conclusions

Lesson of the Recent Past:

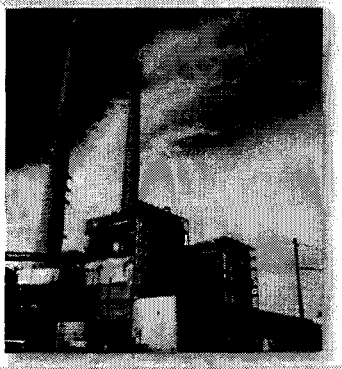
- ***Air Pollution Control Technologies Don't Become Commercially Available at Attractive Prices Until After Regulatory Drivers are Established***
- ***Mercury Control Technologies are no exception***

ECOS
Mercury Workshop

Scott Renninger
National Energy Technology Laboratory

Existing and Emerging Technologies
to Reduce Mercury to the Environment

National Energy Technology Laboratory



Measurement and Control Of Mercury Emissions From Coal-Fired Power Plants

Scott Renninger

Presentation Outline

- Background
- NETL Hg Control Program
- NETL Projects
- Considerations of Various Power Plant & Mercury Control System Configurations
- Conclusions

Will Coal-Fired Power Plants Need Mercury Emission Controls

- A precedent exists in U.S. regulations for mercury removal:
  - municipal waste combustors
  - medical waste incinerators
- Mercury emissions from coal-fired power plants contribute one-third of US anthropogenic emissions
  - Mercury Study Report to Congress
- Court mandated actions on air toxics
  - Determination on need for regulations by Dec. 2000
  - Propose Regulations by Dec. 2003*
  - Promulgate Regulations by Dec. 2004*

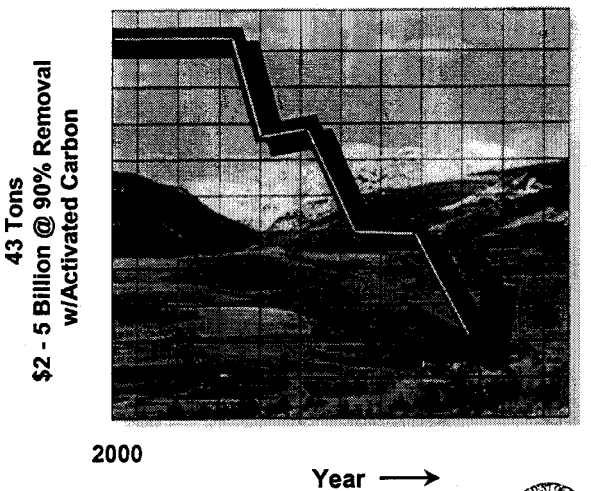
* Actions to be taken if a positive determination is made

Why DOE Is Concerned About Mercury

- **Mercury (Hg) is the coal combustion hazardous air pollutant of greatest concern**
  - Bioaccumulates in food chain
  - Humans exposed to methylmercury through fish consumption
  - Hg is a neurotoxin
- **Regulatory determination due December 15, 2000**
  - Better data needed on Hg transport and deposition
  - Health impacts studies to be completed
  - Control technology cost and performance data needed

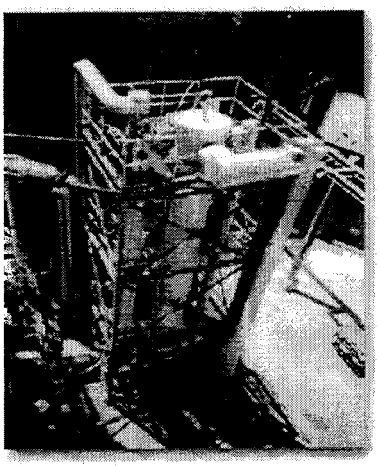
NETL's Mercury Control Goals

- **Develop mercury control options**
  - By 2005, reduce emissions by 50-70%
  - By 2010, reduce emissions by 90%
  - Cost 25-50% less than current estimates



Technology Solutions

NETL represents most comprehensive mercury control development program for coal-fired utility industry



A 10-Year History of Data Collection

(2000 Mercury Emissions Inventory)

After Coal Cleaning

43 Tons

Boiler

Particulate Control

FGD System

Stack

75 Tons

70 Tons

50 Tons

43 Tons

NETL'S Hg Program Portfolio

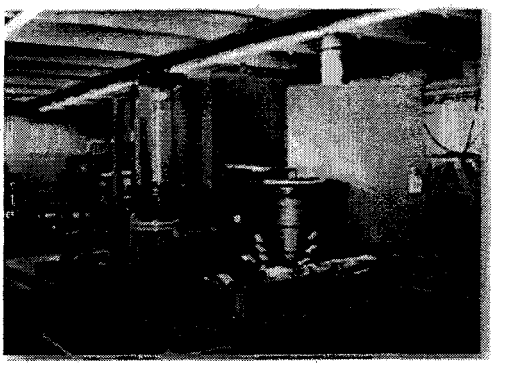
- **Fundamental Studies of Mercury Formation and Partitioning**
- **Development and Evaluation of Measurement Techniques for Different Phases and Oxidation States of Mercury**
- **Development of Mercury Control Technology Utilizing Existing Air Pollution Control Devices**
  - Particulate Control Devices: ESP and FF
  - Flue Gas Desulfurization Scrubbers

NETL'S Hg Program Portfolio- Cont'd

- Development of New Mercury Control Options
- Mercury Cost and Performance Modeling
- Solicitation for Field-Testing and Evaluation of Promising Mercury Control Technologies for Coal Based Power Systems

Key Mercury Projects

- **Fundamental research**
  - Physical Sciences, Inc.
- **Bench scale**
  - ADA Technologies, Inc.
  - Radian International Corporation
- **Operating plant tests**
  - ADA Environmental Solutions, LLC
  - McDermott Technology, Inc.



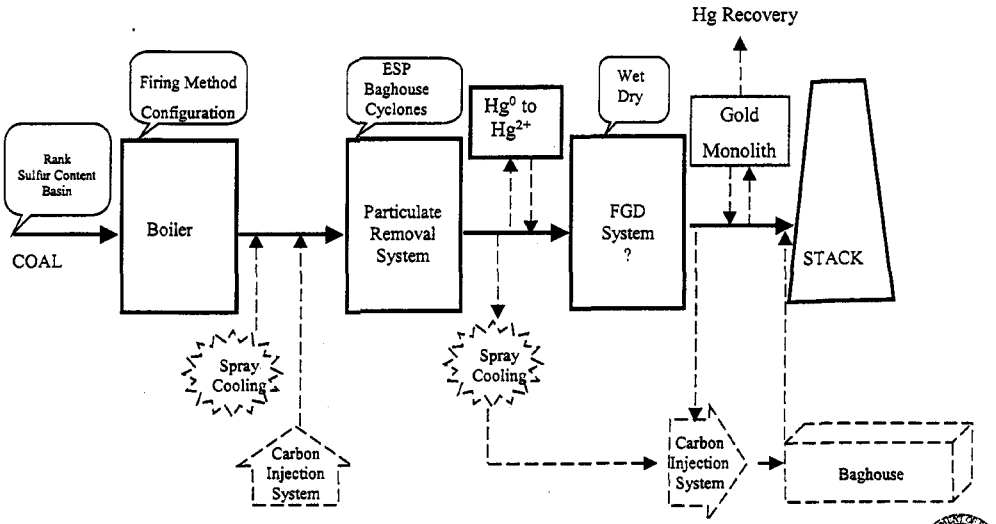
Mercury Control Considerations

- **Important Control Criteria**
  - Mercury Speciation
  - Temperature
  - Residence Time
  - Mass Transfer Limitations
- **Other Considerations**
  - Co-Control of other pollutants
  - CCB Quality
  - Stability of Captured Mercury

Technology Approach

- **Augment existing control technologies**
  - Add sorbent upstream from baghouse or electrostatic precipitator
  - Spray-Cooling
- **Oxidize elemental mercury and capture in a flue gas desulfurization unit**

Power Plant & Mercury Control System Configuration



Power Plant Operations Affecting Mercury Emissions

Power Plant Operations Strategy	Oxidized Mercury	Elemental Mercury
Coal Cleaning	Decrease (coal-specific)	
ESP/Fabric Filter	Decrease	Decrease
Scrubber	Decrease	No Effect
Spray Dryer	Decrease	Decrease
Carbon Adsorption	Decrease (pilot-scale)	

CONCLUSIONS

DOE has various projects and interagency agreements to improve the understanding of mercury emissions & its control:

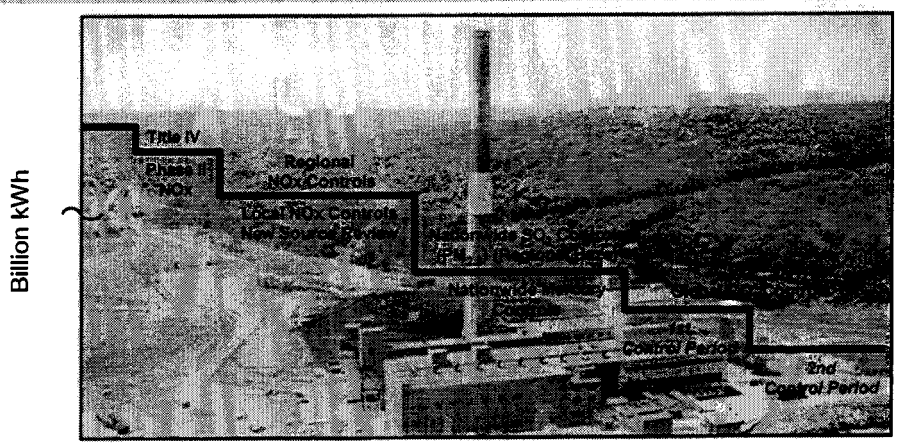
Although we have learned much, more detailed evaluation of mercury control cost and performance is continuing

- **ICR mercury measurements at coal-fired power plants**
- **Improved sorbent R&D**
- **Field-scale testing of promising control options**

CONCLUSIONS

- **Specific mercury emission control recommendations have not been made at this point**
- **NETL mercury modeling and research results will impact regulatory decision**

Coal's Energy Future With Environmental Issues?



Source: Southern Company

ECOS
MERCURY WORKSHOP

ART DUNGAN
SAFETY, HEALTH AND ENVIRONMENT
CHLORINE INSTITUTE

EXISTING AND EMERGING TECHNOLOGIES
TO REDUCE MERCURY TO THE ENVIRONMENT

The Chlor-Alkali Industry and The Mercury Issue

October 19, 2000

Arthur E. Dungan
Vice President - Safety, Health and Environment
The Chlorine Institute, Inc.

INTRODUCTION

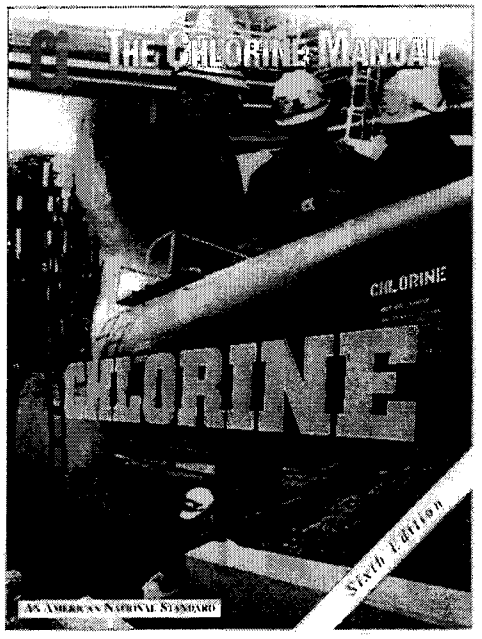
- Industry Overview - Focus on Mercury Cell Technology
- Progress Made - Reducing Releases and Use
- Voluntary Commitment - BNS
- Technological and Economic Issues

2

CHLORINE INSTITUTE

- Trade Association
- Primary Mission
  - Foster Safe Production, Handling, and Use of Chlorine and Related Chemicals
- Primary Work Product
  - 150 Technical Publications, Drawings, and Videos

3



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Industry Overview

- 13 Million Tons Chlorine Produced in 1999
- 38 Production Facilities in 18 States
- 18 Companies Produce Chlorine in the USA
- Chlorine Demand/Uses
  - Current growth is 1/2% - 1% per year
  - Used in Plastics, Electronics, Computers, Water Disinfection, Crop Protection

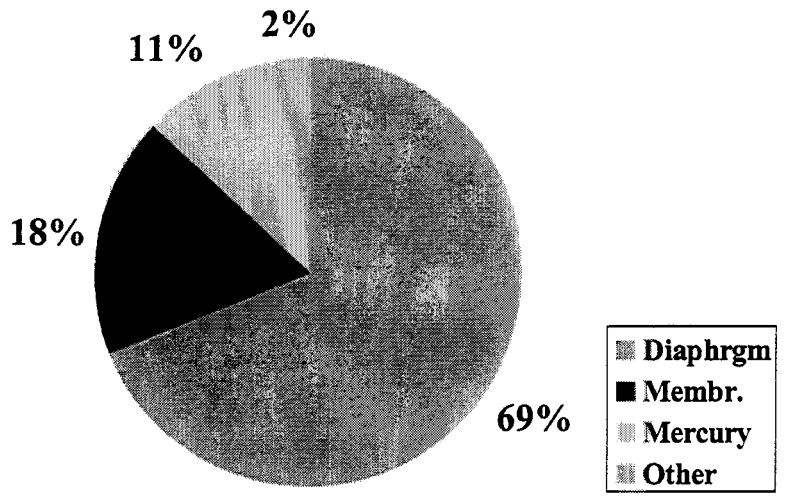
5

Mercury Cell Technology Overview

- 7 Companies Use This Process
- 11 Mercury Cell Facilities in 10 States
  - (AL, DE, GA, KY, LA, OH, TN, TX, WI, and WV)
- Superior Quality of Co-product Sodium Hydroxide

6

Production by Technology



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Improvements in Managing Mercury

- Minimata Disaster - Late 1960s
  - Concerns About Mercury in the Environment
- Industry Initiatives to Reduce Releases
  - Early 1970s
    - Removal from Water Effluents
      - Sulfide Technology
      - Reductions - 99+%

8

Improvements in Managing Mercury

- Mid 1970s
  - Reductions in Air Emissions
    - Carbon Treatment/Ion Exchange Technology
    - Housekeeping Improvements - Cell Room
- Late 1970s
  - Reductions in Solid Wastes - RCRA
- Early 1990s
  - Land Disposal Restrictions
  - Thermal Treatment Technology

9

Current Efforts

- Commitment to Binational Toxics Strategy
- Working with Regulators on a Cooperative Basis to Make Further Reductions
  - MACT Development
- Technology Exchange Among Members to Reduce Mercury Releases and Use

10

Commitment to the Binational Toxics Strategy

- 1996
  - Commitment Made to 50% Reduction in Usage
- 1997
  - Full Understanding of the Commitment with EPA
  - Reduce Mercury Use by 50% or More from the 1990-95 Base Period by 2005
  - Provide EPA with an Annual Report of Progress

11

Commitment to the Binational Toxics Strategy (cont.)

- May 1998
  - First Annual Report
- May 2000
  - Third Annual Report
- May 2001
  - Fourth Annual Report

12

Results to Date

- Mercury use in the base period = 160 tons per year
- Mercury use in the base period = 0.182 pound per ton of chlorine produced
- Mercury use in 1999 = 88 tons - *45% reduction*
- Mercury use in 1999 = 0.105 pound per ton of chlorine produced - *42% reduction*

13

Industry Activities Undertaken to Achieve the Reductions

- Through the Institute, an entirely new structure was developed to address mercury issues from a technical basis
- All Institute technical activities report to a Board level committee of mercury producers - Board Committee on Mercury Issues
- Technical task groups have been established to help companies solve specific issues

14

Industry Activities Undertaken to Achieve the Reductions (cont.)

- Guidance documents are being developed to address key mercury issues
- Members now provide mercury use data to the Institute on an annual basis
- The Institute aggregates these numbers for use in the Annual Report to EPA

15

Technical Issues Being Addressed

- Releases to Air
  - MACT Technology for Point Sources
  - More Stringent Housekeeping Requirements
  - Control Technology Guidance for Housekeeping
- Mercury Use
  - Guidance for Accounting for Mercury Use

16

Technical Issues Being Addressed (cont)

- Mercury in Product - Sodium Hydroxide
  - Guidance for Optimizing Current Technology
  - Technology Options for Further Reductions
- Worker Health Issues
  - Two Publications - Medical Surveillance and Guidance to Physicians
- Handling of Hazardous Wastes

17

Support for Governmental Efforts

In addition to supporting initiatives such as BNS, the Institute and the mercury cell producers have formally supported:

- The United Nations Economic Commission for Europe Heavy Metals Protocol (as it pertains to Mercury)
- The Commission for Environmental Cooperation (North America) Mercury Action Plans (both)

18

Our Commitment

- To Work Cooperatively With All Parties to Address Mercury Issues Pertaining to Chlor-Alkali Manufacture

- To Achieve Further Reductions in Mercury Use and Releases to the Environment

19

ECOS
Mercury Workshop

Dan Stickles
Spectrum Health

Existing and Emerging Technologies
to Reduce Mercury to the Environment

HOSPITALS *for a* HEALTHY ENVIRONMENT

An AHA/EPA Partnership

HOSPITALS *for a* HEALTHY ENVIRONMENT

An AHA/EPA Partnership

Impact of Hospital Waste

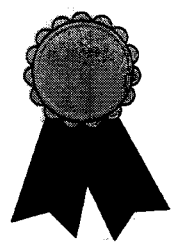
- **Medical waste incinerators 4th largest known source of mercury emissions to the environment**
- **Hospitals generate 2 million tons of solid waste annually - 1% of all municipal solid waste**

HOSPITALS for a HEALTHY ENVIRONMENT
An AHA/EPA Partnership

- **AHA and Region 5 EPA discuss combining mercury and waste reduction efforts - October, 1997**
- **AHA/EPA partnership agreement-- Hospitals for a Healthy Environment (H2E)-- spells out goals for pollution prevention - Signed June, 1998**

HOSPITALS for a HEALTHY ENVIRONMENT
An AHA/EPA Partnership

- **H2E wins the Hammer Award-- Vice Presidential Award for Re-inventing Government- June, 1999**



HOSPITALS for a HEALTHY ENVIRONMENT
An AHA/EPA Partnership

Partnership Goals

- **Virtual elimination of mercury from the waste stream by 2005.**
- **Reduction of total waste volume by 33% in 2005 and 50% by 2010**

HOSPITALS for a HEALTHY ENVIRONMENT
An AHA/EPA Partnership

Other H2E goals...

- **Provide educational seminars**
- **Distribute Mercury in Medical Facilities software**
- **Develop baseline data on hospitals' pollution prevention activities**
  -Monitor progress over time

HOSPITALS for a HEALTHY ENVIRONMENT
An AHA/EPA Partnership

- **Develop a model plan for mercury and waste volume reduction**
- **Explore opportunities to reduce/eliminate EtO and other persistent bio-accumulative toxins**
- **Create an advisory council to oversee H2E activity**
- **Identify national success stories and recognize hospitals for their efforts**

HOSPITALS for a HEALTHY ENVIRONMENT
An AHA/EPA Partnership

- **Environmental Leadership Council**
  - **Recommends educational and outreach activities to hospitals, health systems and health care workers to help reach the waste reduction goal**
  - **Multi-stakeholder representation: AHA, EPA, state and local government, environmental services, facilities and materials management, environmental groups, nurses, physicians, state and metro healthcare associations, and waste management industry.**
  - **Meets quarterly**

HOSPITALS for a HEALTHY ENVIRONMENT
An AHA/EPA Partnership

- **Work Groups**
  - **Multi-stakeholder**
  - **Twelve areas of work: Awards and Recognition, Baseline Data Collection, Best Practices, Chemical Waste Minimization, Communications, Educational Programming, Environmentally-Preferable Products, Environmental Accounting, Ethylene Oxide Minimization, Mercury Virtual Elimination, Resource Directories, and Total Waste Volume Reduction**

HOSPITALS for a HEALTHY ENVIRONMENT
An AHA/EPA Partnership

Accomplishments:

- **Develop work plans**
- **Create name for effort: H2E**
- **Create logo**
- **Communicate effort to state and metro hospital associations and request contact names**
- **Initiate a pledge program**

HOSPITALS for a HEALTHY ENVIRONMENT
An AHA/EPA Partnership

- Increase visibility of effort thru media placements and educational conferences
- Develop baseline waste survey
- Distribute waste survey to a representative sample of AHA member hospitals
- Create an H2E web site
- Establish a listserv to communicate H2E activity

HOSPITALS for a HEALTHY ENVIRONMENT
An AHA/EPA Partnership

- With the University of Vermont, produce and distribute "Our Waste, Our Responsibility" a video on hospitals' responsibility for proper waste management
- Write a "How to" guide for environmentally-preferable purchasing
- Develop a best management practices tool
- Write a model plan for virtual mercury elimination

HOSPITALS for a HEALTHY ENVIRONMENT
An AHA/EPA Partnership

- Develop model plans for chemical waste and total waste volume minimization
- Create an awards and recognition program
- Identify best practices
- Create a comprehensive directory of P2 resources
- Develop a report on environmental accounting for hospitals

HOSPITALS for a HEALTHY ENVIRONMENT
An AHA/EPA Partnership

Future Goals:

- Develop educational opportunities
  - self-directed, computer-based
  - specific to hospital departments
- Create a calendar of national P2 program
- Identify additional strategies for meeting H2E goals

HOSPITALS for a HEALTHY ENVIRONMENT
An AHA/EPA Partnership

Why should I participate in Hospitals for a Healthy Environment???

HOSPITALS for a HEALTHY ENVIRONMENT
An AHA/EPA Partnership

- Supports hospitals' mission to improve community health
- Saves money
- Preserves environmental resources
- Promotes community trust and confidence
- Great PR value

HOSPITALS for a HEALTHY ENVIRONMENT
An AHA/EPA Partnership

Strategies for meeting H2E goals:

- **Obtain top down support**
- **Identify a champion**
- **Implement hospital-wide education - behavior changes**
- **Develop an integrated waste management plan**
- **Improve segregation**
- **Select reusables vs. disposables**
- **Work with vendors on source reduction issues: environmentally-preferable purchasing**

HOSPITALS for a HEALTHY ENVIRONMENT
An AHA/EPA Partnership

Over 600 hospitals and clinics have already signed the mercury pledge to date !

ECOS
MERCURY WORKSHOP

KRISTINA VON REIN
ENVIRONMENTAL PROTECTION AGENCY
SWEDEN

EXISTING AND EMERGING TECHNOLOGIES
TO REDUCE MERCURY TO THE ENVIRONMENT

New proposal

- Stop import and use
- Some exceptions....
- Already existing stop of export with some exceptions

Mercury

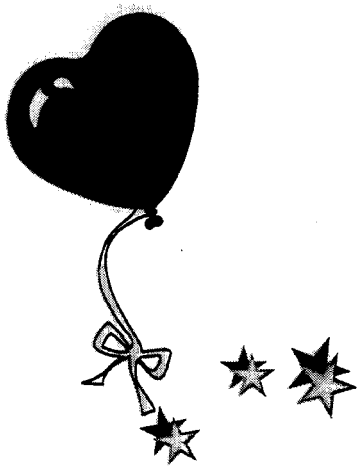
- can not be destroyed
- should not be recycled and exported for use abroad
- = Terminal disposal

Mercury Waste in Sweden

- 270 tonnes stored
- 940 tonnes expected in future
- Total: over 1000 tonnes
- Mostly at SAKAB, chloralkaline ind., metalprod. ind.

A special disposal solution is required

- The waste problem should be solved by todays generation
- The burden on the future generations should be reduced
- Future generations should have the possibility to act



Level of ambition

- Hg emissions should not exceed acceptable load
- The disposal site should be protected against unintended disturbance
- Hg should be disposed of in a stable form in a stable environment
- Security important in a long & short time perspective

Some questions .....

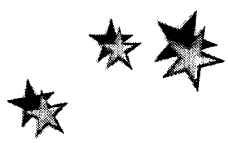
- Wasteproperties and pretreatment?
- Disposaloptions and technics?
- Location and ways of emissions?
- Tolerable emissions and biosphere?
- Capacity and level of ambition?
- Costs and finances?
- Security and responsibilities?
- Riskcommunication?

Locating in a deep rock repository

- Low water permeability
- Absence of bigger crackzones
- Chemical and mechnical stable environment
- Reduced risk for unintended disturbance
- Longest ways of transport to the surface
- Possibilities of dilution

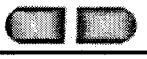
An old mine?

- Low ore potential
- Mechanical stable and beneficial chemical environment
- Low water flow
- Use special parts



Conclusion

- A special disposal solution is required
- A deep rock repository
- An old mine could be used
- Economical feasible
- A solution must be found together with the stakeholders



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Mercury Workshop

John Wachtler
Minnesota Pollution Control Agency

State Programs to Address Mercury
Part I

ECOS
Mercury Workshop

Terry Goldberg
Northeast Waste Management
Officials' Association

State Programs to Address Mercury
Part I

Draft Model Mercury Education & Reduction Act

Terri Goldberg, Deputy Director

Northeast Waste Management Officials' Association

Background

- NESCAUM/NEWMOA/NEIWPCC Workgroup
- Regional Mercury Study
- Mercury Action Plan
- NEGC/ECP Mercury Task Force
- NEWMOA Mercury Workgroup
- Model Legislation

Mercury Action Plan Goal

"Virtual elimination of the discharge of anthropogenic mercury into the environment, which is required to ensure that serious or irreversible damage attributable to these sources is not inflicted upon human health and the environment."

Mercury Action Plan

Recommendations

- "Reduce/eliminate the use of mercury in medical & consumer products to the extent feasible"
- "Identify & implement source reduction programs & develop model legislation"
- "Draft model legislation implementing coordinated labeling & manufacturer take-back programs to help consumers identify products containing mercury & how to properly dispose of them"

Mercury Action Plan (Continued)

- "Eliminate the use of mercury in school science programs through initiation of programs &/or legislation"
- "Adopt measures to curtail the sale of elemental mercury & educate affected populations..."

Drafting Process

- ✏ Formed NEWMOA Mercury Workgroup – Summer 1998
- ✏ Held Stakeholder Summit – Jan.1999
- ✏ Drafted Model – Feb. 1999 - Nov. 1999
- ✏ Released Draft Model – Nov.1999
- ✏ Held 2 Public Meetings – Dec.1999
- ✏ Reviewed Verbal & Written Comments – Jan. - Spring 2000
- ✏ Endorsed by Governors – Summer & Fall 2000

Introduction to the Draft Model

- Comprehensive: Designed to achieve virtual elimination goal & respond to recommendations
- Synthesis: Based on best available approaches
- Regional: Promotes consistency across the states
- Menu: Enables states to select provisions that are best suited to their jurisdictional/political interests

Outline of Major Sections

Section 3 – Definitions
Section 4 – Interstate Clearinghouse
Section 5 – Notification
Section 6 – Restrictions on Sales
Section 7 – Phase-out & Exemptions
Section 8 – Labeling of Mercury-Added Products
Section 9 – Disposal Ban
Section 10 – Collection System Plans
Section 12 – Disclosure
Section 13 – Elemental Hg Limits

Proposed Interstate Clearinghouse

- Establishes regional multi-state clearinghouse
- Functions: coordinate notification; facilitate reviews of applications for exemptions, collection system plans, applications for alternative labeling/notification, and disclosure of mercury content; coordinate education/outreach

Proposed Notification

- Manufacturers/wholesalers submit product description and amount of mercury in the product

Proposed Restrictions on the Sale of Mercury-Added Products

- No mercury-added novelties sold
- No mercury fever thermometers sold, except by prescription; must have instructions on clean-up
- No K-12 school may use or purchase Hg chemicals for use in classroom
- No mercury-added dairy manometers sold

Proposed Phase-Out & Exemptions

- Phases out mercury-added products starting with those that contain >1 gram mercury down to 10 mg
- Exemption criteria: Mandatory health & safety; beneficial to environment; protective of public health & safety; no feasible alternative; no comparable non-mercury alternative
- Exemption requests must include collection system plan
- Regional coordination

Proposed Labeling Program

- No mercury-added products sold unless the product, component, & packaging are labeled; some exemptions & product specific provisions
- Must inform user that mercury is present & how to dispose properly
- Responsibility of manufacturer
- Allows for applications for alternative labeling/notification
- Regional coordination

Proposed Disposal Ban

- Mercury-added products can only be disposed in hazardous waste recycling and disposal facilities
- Allows discharge of mercury to WWT with a permit
- Specifies actions to be taken by solid waste facilities

Proposed Collection System Plan

- Manufacturer/s must submit a plan for collection system subject to state approval
- Plan components: public education; targeted capture rate; program for implementation & financing
- Encouraged to use existing infrastructure
- Manufacturers must submit reports on effectiveness of collection system
- Cost of collection borne by manufacturer
- Exempts products consumed in use

Proposed Disclosure Provision

- Manufacturer/s submit Certificate of Analysis for mercury content to health care facilities & state agency
- Applies to specified list of formulated products that contain incidental or intentional mercury >1 ppb.
- Includes acids, alkalies, bleaches, cleaners, pharmaceutical products, stains, reagants, preservatives, fixatives, buffers, & dyes

Proposed Limits on Elemental Hg

- No elemental mercury sold, except for medical, dental amalgam dispose-caps, research, or manufacturing purposes
- All sales must include a MSDS

Proposed Education & Outreach

- Implement public education & outreach program for affected parties
- Cooperate with manufacturers, other affected business, institutions, and others
- Regional cooperation

Proposed Universal Waste Rule

- Requires states to adopt or modify Universal Waste Rule for mercury-added products where feasible
- Regional cooperation

Proposed State Procurement

- Gives priority to low or non-mercury-added products, unless there is no feasible alternative, in state purchases and purchases made with state funds
- Gives priority to energy efficient lighting
- Requires state contracts for dental insurance for state employees to reimburse equally non-mercury & mercury amalgam

Status of Legislative Efforts

- Connecticut
- Maine
- Massachusetts
- New Hampshire
- New York
- Rhode Island
- Vermont

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Mercury Workshop

Mark Smith
Massachusetts Department of
Environmental Quality

State Programs to Address Mercury
Part I

ECOS
Mercury Workshop

Randall Manning
Georgia Department of Natural Resources

State Programs to Address Mercury
Part I

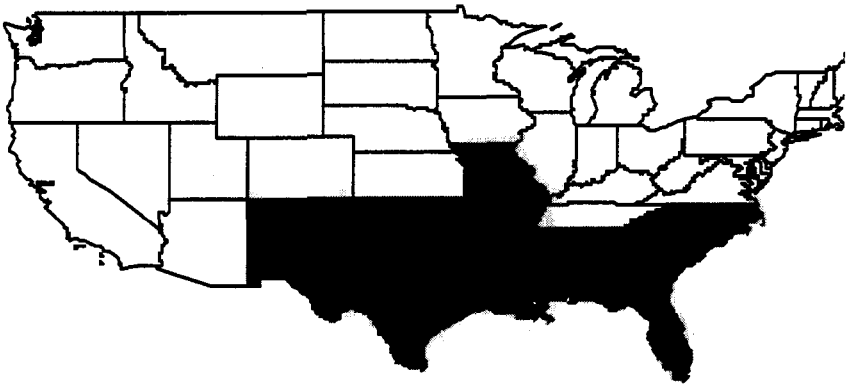
Southern States Mercury Task Force (SSMTF)

Randall O. Manning

SSMTF

- Began in '93 by AR, LA, & MI
- To foster communication between states on issues related to Hg
- Focus on southern (regional) concerns

Participating States



Agencies

- Environmental Protection/ Natural Resources
- Pollution Control
- Health

Focus

- Fish contamination & advisories (human health)
- Risk communication
- Ecological issues (critters)
- Sources, Transport, Deposition
- Remedial approaches

Fish Advisories

- Early '90s – FDA Action Level (1 ppm)
- Present – Moving to "Risk-Based"

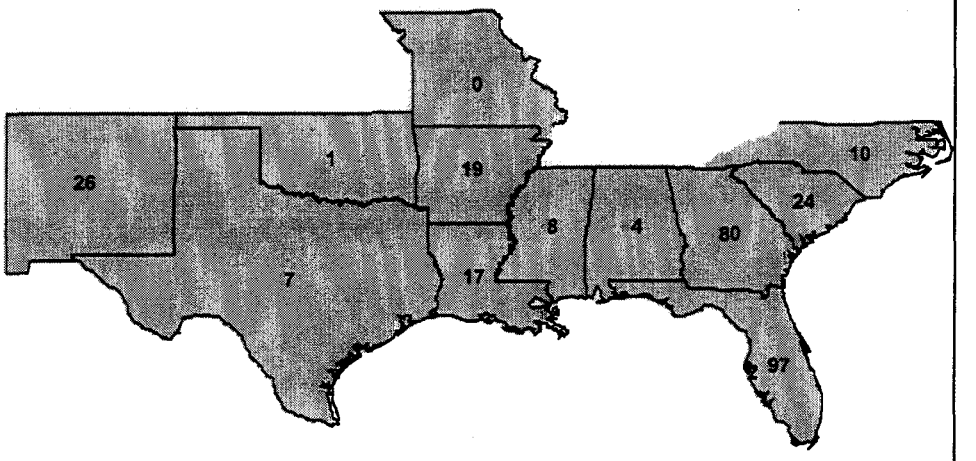
State Approaches

- AL – FDA based – tiered – 1 ppm
- AR – FDA based – tiered – 1 ppm
- FL – Risk based – tiered - 0.5, 1.5 ppm
- GA - Risk based - tiered - 0.23, 0.7, 2.3 ppm
- LA – Risk based – tiered – 0.5 ppm
- MS – FDA based – tiered – 1 ppm

State Approaches (cont.)

- MO – FDA based – (?) – 1 ppm
- NC – FDA > Risk based – tiered -- (?)
- NM – Risk based – tiered – (?)
- OK – Risk based – tiered – 0.7, 1.0 ppm
- SC – Risk based – tiered – 0.1(0.25), 0.6, 3.0 ppm
- TX – Risk based – tiered – 0.7 ppm

SSMTF Hg Fish Advisories



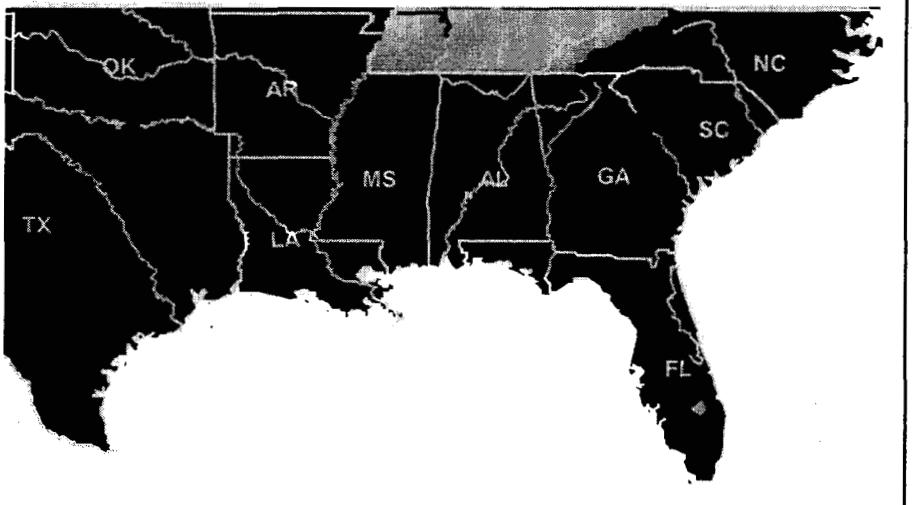
Fresh vs. Marine Waters

- Fresh – differ greatly
- Marine – similar

Marine Hg Advisories

- **Gulf of Mexico states**
  - King Mackerel
  - Consistent approach achieved over several years
- **South Atlantic Coast states**
  - King Mackerel
  - 4 states issued same advisory simultaneously

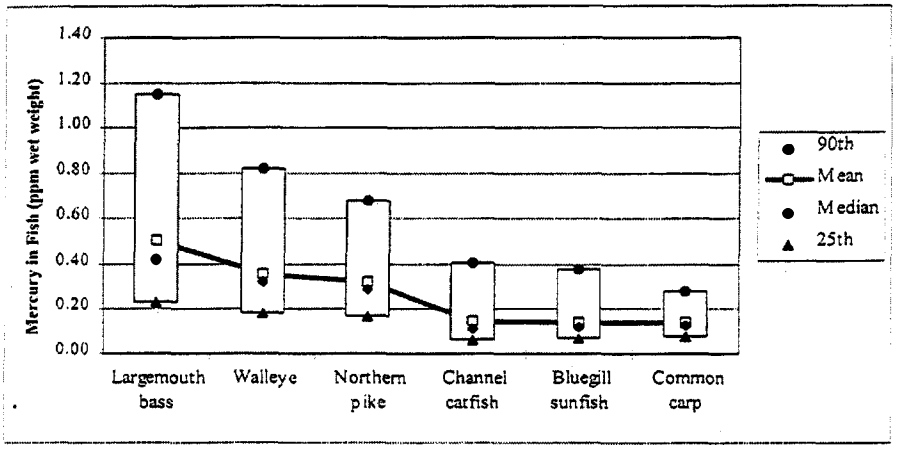
Marine Hg Advisories



Up & Coming Issues

- TMDL's
- Apples vs Oranges
- Voluntary vs Regulatory

Concentration Ranges of Mercury in Tissues of Selected Fish Species



Hg Concentrations ('90-'95)

State	LMB Hg conc. (ppm) wt. mean	# of Hg adv. ('99)
AL	0.39	4
GA	0.27	80
SC	0.99	24
National	0.46	NA

U.S. EPA National Survey of Mercury Concentrations in Fish, 1999

ECOS
Mercury Workshop

Leslie McGeorge
Environmental Planning and Science
New Jersey Department of Environmental Protection

State Programs to Address Mercury
Part II

MERCURY REDUCTION APPROACHES FOR NEW JERSEY

The State of New Jersey has been active in efforts to monitor, research and reduce the environmental and public health impacts of mercury pollution for over 10 years. In 1993, NJ's Mercury Emissions Standard Setting Task Force recommended the establishment of a stringent standard for mercury emissions from municipal solid waste (MSW) incinerators. This standard was subsequently promulgated in 1994 by the NJDEP, leading to a greater than 10-fold reduction in mercury emissions from solid waste incineration in 1995, five years ahead of subsequent federal EPA requirements. Additionally, a greater than 10-fold reduction in medical waste incinerator emissions has also been achieved since 1993 primarily from source reduction. Emission reductions from MSW incinerators were achieved with a combination of source reduction and emission controls.

Partially in response to NJDEP data on statewide contamination of selected freshwater fish with mercury, a second Mercury Task Force was initiated in 1998. The charge of this Task Force is to develop an overall mercury reduction plan for New Jersey. To develop this plan, the Task Force is inventorying and assessing sources, reviewing current policies, and determining the impacts on New Jersey's ecosystems and on public health. Recommendations are being developed in the areas of source reduction, stack emission controls, energy efficiency, outreach/communication, research, and environmental indicators of progress. These draft recommendations will be discussed.

ECOS
Mercury Workshop

Khalil Abu-Saba
California Water Board

State Programs to Address Mercury
Part II

The Mercury TMDL for the San Francisco Bay Estuary

Overview and lessons learned

October 19, 2000

Dr. Khalil E. Abu-Saba, TMDL Team
California Environmental Protection Agency
State Water Resources Control Board
California Regional Water Quality Control Board,
San Francisco Bay Region

1

The usual caveats...

- **This discussion is about:**
- Published historic accounts
- Public information (hearings, staff reports, peer-reviewed science)
- The perspectives of a civil servant and an informed audience

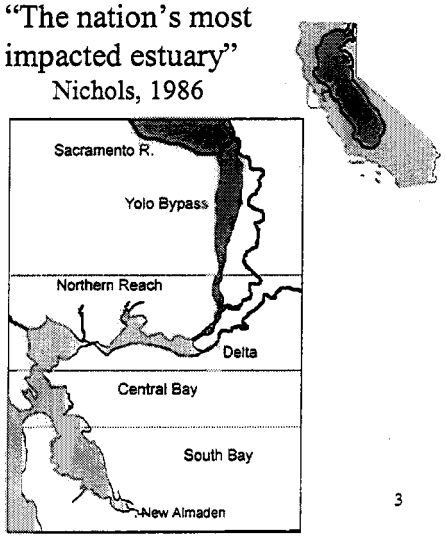
- **This discussion is <u>not</u> about:**
- The will or intent of the Regional Board, the State Board, or the State of California
- The anticipated outcome of any public process

2

The terrain we live in...

- Over 90% of tidal wetlands filled
- Drains 40% of California watershed
- Heavily managed freshwater inflows
- Significant Gold Rush Impacts
- Two distinct reaches
  - Well-flushed northern reach
  - Poorly-flushed South Bay

"The nation's most impacted estuary"
Nichols, 1986



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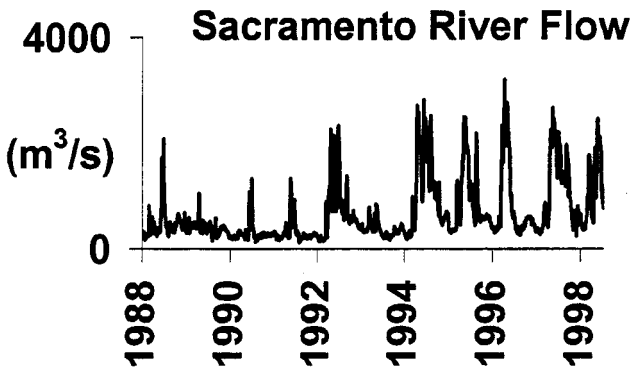
… and its climate



4

Demographic Terrain of the San Francisco Bay Region

- Booming economy and high cost of living
- 6.5 million + residents
- Sophisticated stakeholder base
- Strong environmental advocacy
- 109 municipal governments
- 36 municipal sewage treatment plants
- 18 industrial treatment plants
- 5 urban runoff programs

5

The San Francisco Bay Regional Monitoring Program

- Ordered by Regional Water Quality Control Board in 1992
  - State Water Code authority (Sec. 13267)
- Funded by regulated parties
  - Municipal, industrial, urban runoff, dredgers
  - Current annual budget ~ $2.5 million
- Monitors toxics and trace substances in Bay
  - 25,000+ data points
  - 20 + peer-reviewed publications
- Managed by San Francisco Estuary Institute
  - www.sfei.org

6

Key Pieces of S.F. Bay Mercury TMDL

- Reduce watershed loadings from New Almaden mining district
  - Once the largest producers of mercury in North America
  - Ongoing inputs of polluted sediments into lower South S.F. Bay
- Hold wastewater to 50 kg per year
  - Based on technological performance standards
  - Allocated according to vulnerability of receiving waters
  - Reasonable room for growth
- Build Pollution Prevention Programs
  - Fluorescent light recycling
  - POTW initiated take-back programs
  - Strengthen pre-treatment requirements
- Regulate using adaptive management
  - Phased TMDL approach
  - Ongoing monitoring, ten-year review

7

Elements of a TMDL

Status in SF Bay

Proposed in June 30, 2000 report to U.S. EPA

Received substantial stakeholder input

Needs scientific peer review

- Problem Statement
- Numeric Targets
- Source Assessment
- Linkage Analysis
- TMDL, Load and Waste Load Allocations
- Margin of Safety, Seasonal Variations, Critical Conditions

Needs stakeholder process to develop

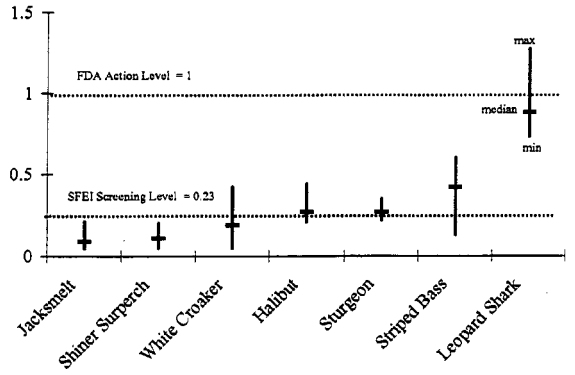
Needs formal public process to adopt

- Implementation Plan

8

Problem statement: mercury in fish

- Bioaccumulates in food chain
- Developmental neurotoxin
- Potential human health threat
- Probable wildlife threat

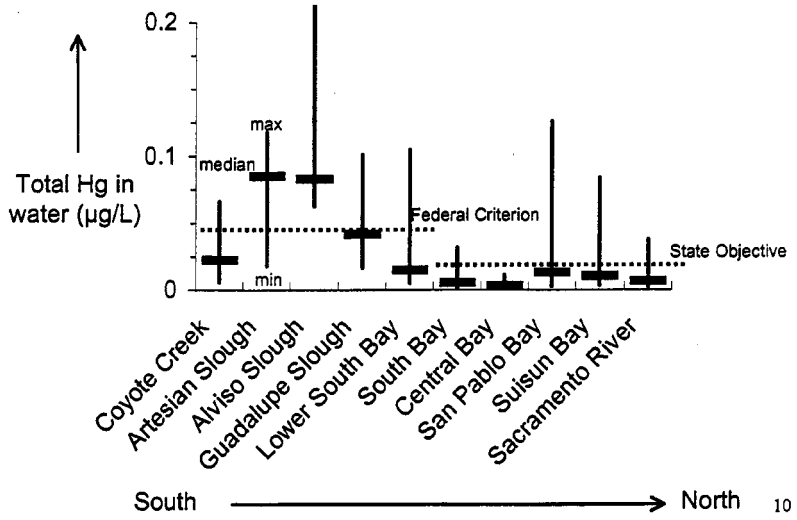


Data from the San Francisco Estuary Regional Monitoring Program for Trace Substances. http://www.sfei.org

9

Problem statement: Numeric objectives

Data from the San Francisco Estuary Regional Monitoring Program for Trace Substances. http://www.sfei.org



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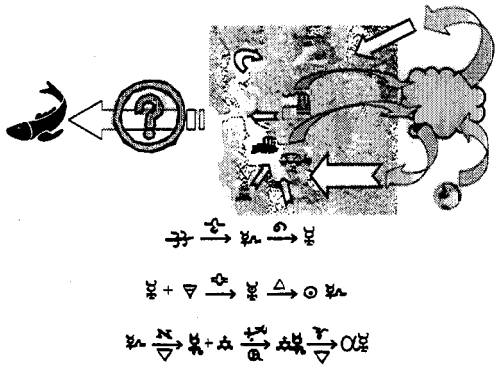
Why?

- Watershed and air sources
- Historic sources
- Complex cycling in the environment



11

Three proposed numeric targets

Basin Plan Numeric Objective:
0.025 µg/L
mercury in water

Federal Numeric Criterion:
0.051 µg/L
mercury in water

Basin Plan Narrative Objective for Bioaccumulation

Sediment Target:
0.4 µg/g
in fine sediments

Dissolved Methylmercury Target:
0.05 ng/L in water

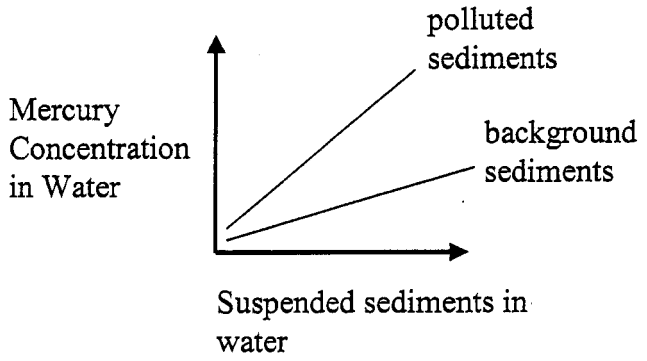
Total mercury in fish: in progress, based on NAS 2000 findings.

Phase 1 | Phase 2 | Phase 2

12

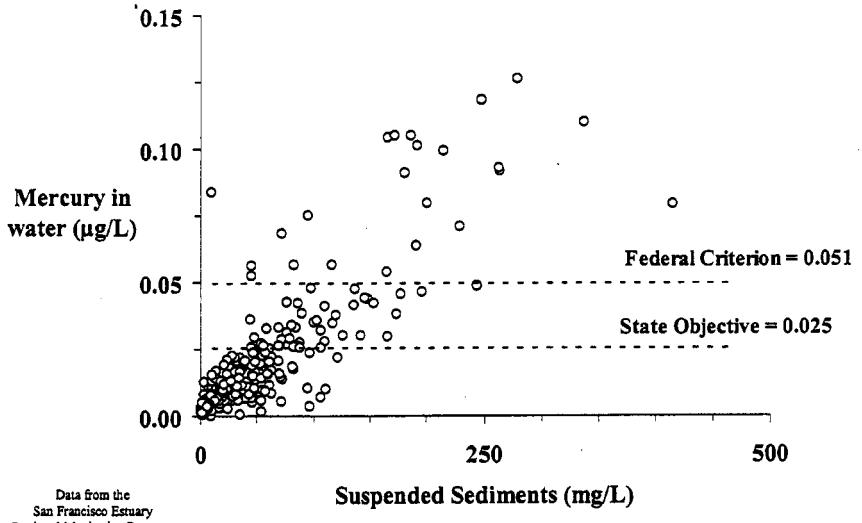
What increases mercury in water?

- Increasing amounts of sediment in the water
  - mercury sticks to dirt
- Increasing amount of mercury in sediment



13

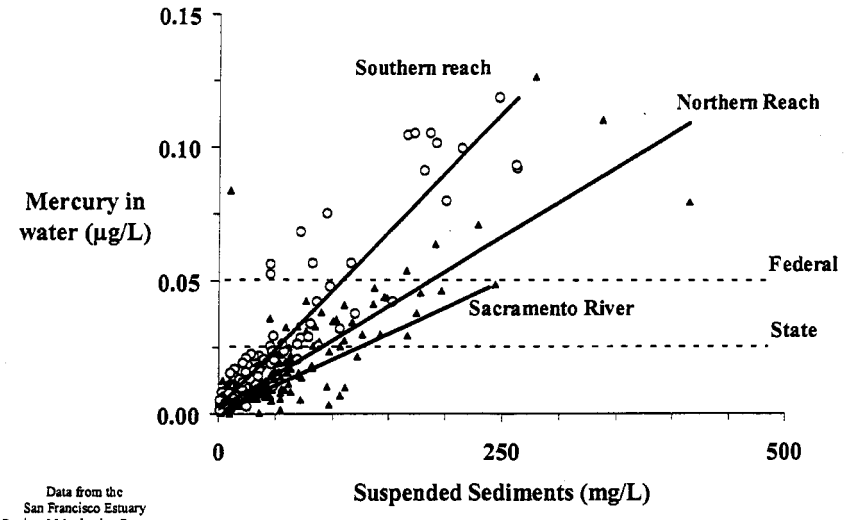
What increases mercury in SF Bay water?



Data from the San Francisco Estuary Regional Monitoring Program for Trace Substances. http://www.sfei.org

14

Polluted Sediments

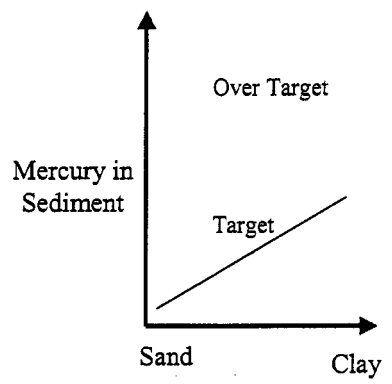


Data from the San Francisco Estuary Regional Monitoring Program for Trace Substances. http://www.sfei.org

15

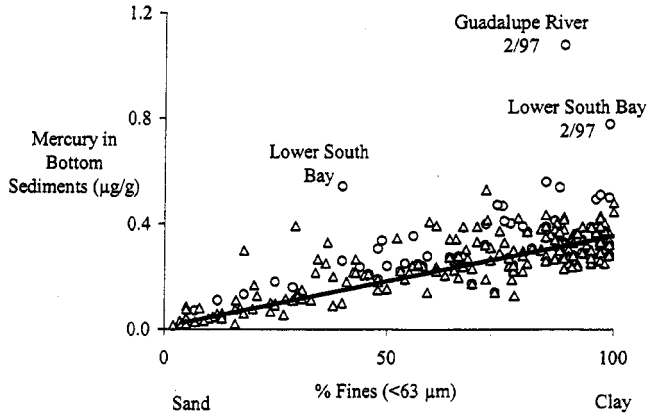
Phase 1 Target: Mercury in Sediments

- Most of the sediment in SF Bay comes from the Central Valley
- Our sediment should resemble that of Central Valley Source
- There is usually more mercury in fine clay than in coarse sand



16

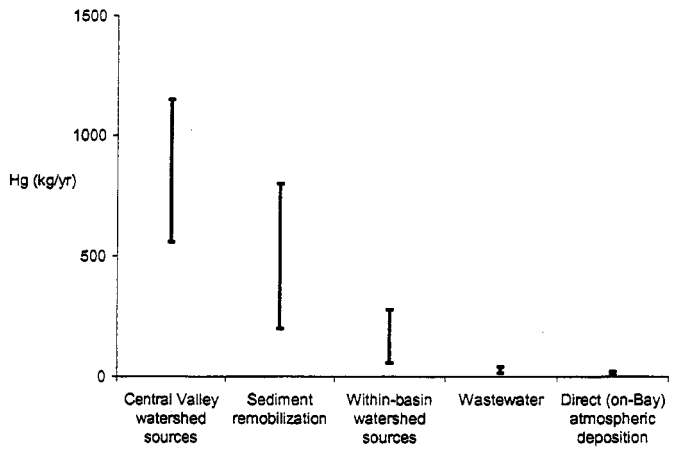
Evaluation of Sediment Target



Data from the San Francisco Estuary Regional Monitoring Program for Trace Substances. http://www.sfei.org

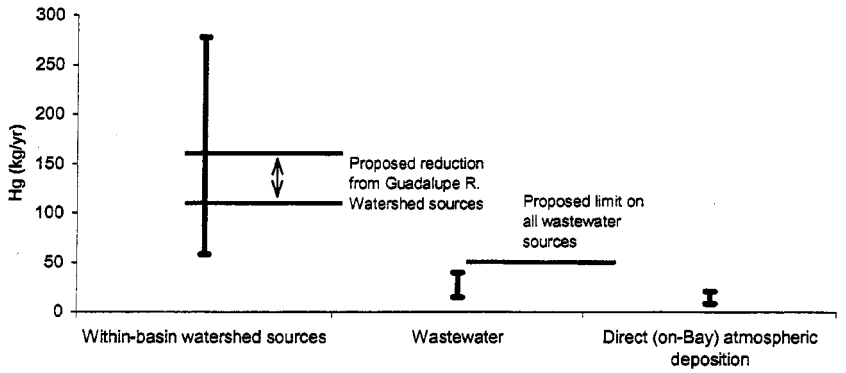
17

Source Assessment



18

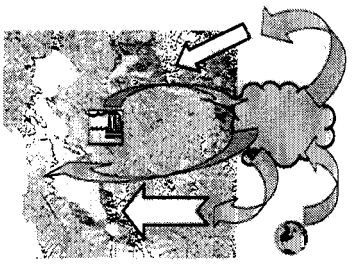
Phase 1: Proposed Allocations



19

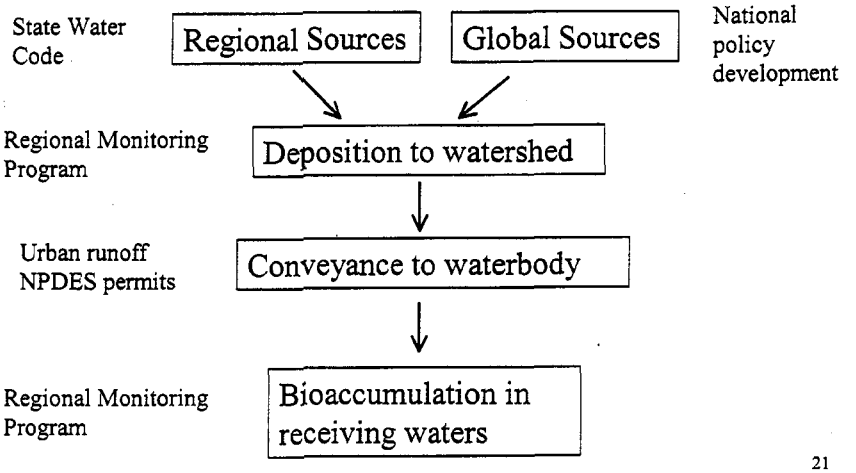
What About Air Sources?

- Two types of sources:
  - Regional
    - Point
    - Diffuse
  - Global
- Two pathways
  - Direct, on-Bay
  - Watershed load



20

Monitoring and Regulating Air Sources



21

Proposed Watershed Management Strategy

First Phase

- Load reductions from Guadalupe River
  - Stabilize sediments in upper watershed
  - Design and maintenance opportunities in lower watershed
  - Partnership with Guadalupe River TMDL
- Monitoring and assessment in other watersheds, urban runoff
- Limit wastewater loads to 50 kg baywide
- Reduction of air sources by 70 kg - primarily via fluorescent light recycling

Second Phase

- Implement additional targets (tissue, methylmercury)
- Review load reductions attained
- Review response of environmental indicators
- Revise TMDL
- Implement additional control measures as needed
- Formally incorporate with wetland management goals

22

Lessons Learned

- Knowledge is power
  - Regional monitoring
  - Non-partisan peer review
- Build partnerships
  - Environmental advocates
  - Regulated community
  - Other regulatory agencies
- Airborne deposition is a global problem
  - We will do our part to reduce air emissions
    - Fluorescent light recycling
    - BACWA / BASMAA fuels study
  - But our emissions land in <u>your</u> watersheds
- Newly mined mercury is way too cheap
  - Cost of mercury from recycled fluorescent lights = $4000 / lb.
  - Cost of imported quicksilver = $1 - $2 / lb.
  - Finding published in a report written by Sustainable Conservation, funded by the Bay Area Clean Water Association

23

Supplemental Slides

- The rest of the slides are presented in poster format, and have been included in the handout for your convenience.

24

Some useful links

- The S.F. Bay Mercury TMDL:
  - http://www.swrcb.ca.gov/rwqcb2/Downloadable_Files
- June 21 Board item, report, and stakeholder comments
  - http://www.swrcb.ca.gov/rwqcb2/Agenda/June_21_2000/6-21-00-11/6-21-00-11.html
- The S.F. Bay Regional Water Board
  - http://www.swrcb.ca.gov/rwqcb2
- The S.F. Bay Regional Monitoring Program
  - http://www.sfei.org
- The California State Water Resources Control Board
  - http://www.swrcb.ca.gov
- California Environmental Protection Agency
  - http://www.calepa.ca.gov

25

California Environmental Protection Agency

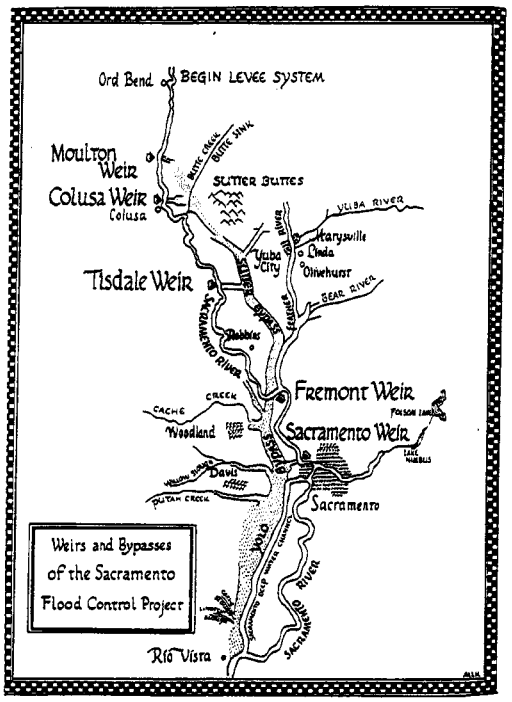
Mission: to restore, protect, and enhance the environment, to ensure public health, environmental quality, and economic vitality.

- •State Water Resources Control Board
  - – Nine Regional Water Quality Control Boards
- •Air Resources Board
- •Department of Toxic Substances Control
  - – Cleanup sites, Universal Waste Regulations
- •Integrated Waste Management Board
  - – Landfills, recycling programs
- •Office of Environmental Health Hazard Assessment
  - – Fish consumption advisories
- •Department of Pesticide Registration

26

No man ever steps into the same river twice, for its not the same river, and he's not the same man.

- Heraclitus



Map from R. Kelley, *Battling the Inland Sea;* UC Press, 1989

The Evolution of Water Quality Regulations in California

- Physical Disturbances (1850's-1950's)
  - sedimentation, flooding
- Observable Effects (1972, Clean Water Act)
  - eutrophication
- Toxic Effects (1987 Water Quality Act)
  - numeric criteria to prevent mortality
- Sublethal effects (1980's - present)
  - contaminated fish, diminished habitat

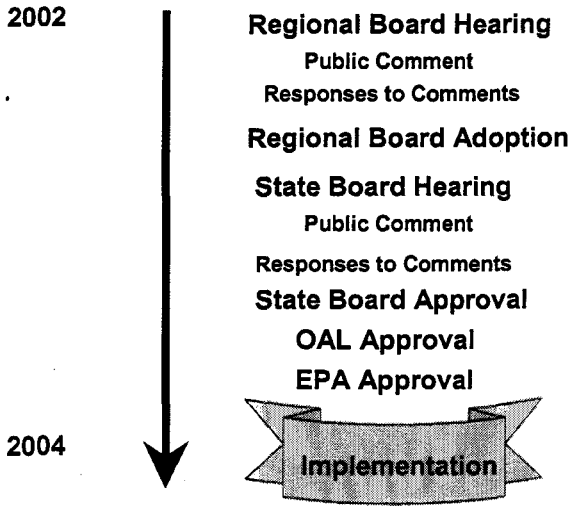
28

The Gold Rush

- Hydraulic Mining
  - Deposited over a billion cubic yards of sediment in San Pablo Bay
  - Flooded farms, impeded navigation
- Gold Mining
  - Mobilized over seventy thousand tons of mercury
  - Historic mercury impacts still present
    - contaminated sediments
    - inoperative mines

29

Basin Planning Process



30

Mercury TMDL Timeline

Year	Action
2000	• Define Targets • Develop conceptual model • Assess sources and loads including uncertainties • Propose control measures and information needed to reduce uncertainty
2000 - 2002	• Conduct monitoring and assessment to reduce uncertainties • Revise proposed control measures
2002 - 2004	• Adopt control measures in Basin Plan • Implement initial controls
2004 +	• Continue monitoring and assessment • Implement additional controls as needed

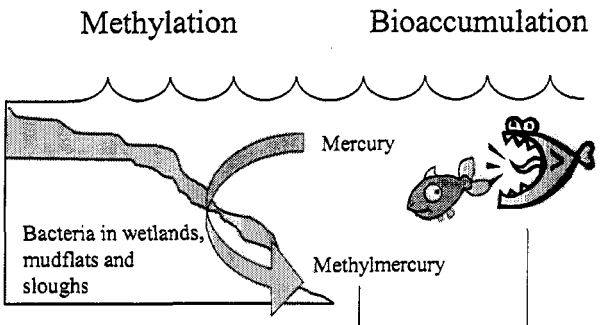
31

Basin Plan Narrative Objective for Bioaccumulation

- "Controllable water quality factors shall not cause a detrimental increase in the concentrations of toxic substances found in bottom sediments or aquatic life. Effects on aquatic organisms, wildlife, and human health will be considered."

32

Methylmercury target based on <u>aquatic life</u> component of narrative objective



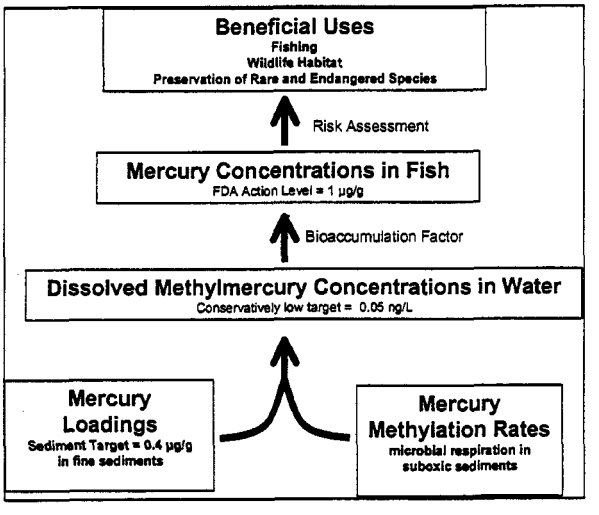
- Methylmercury is the form that bioaccumulates
- Methylmercury magnified ten-million times up the food chain

Target 0.05 ng/L in water

To maintain < 0.5 µg/g in fish

33

Linkage Analysis

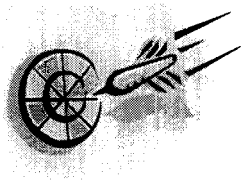


34

Calculation of loading capacity from a sediment target

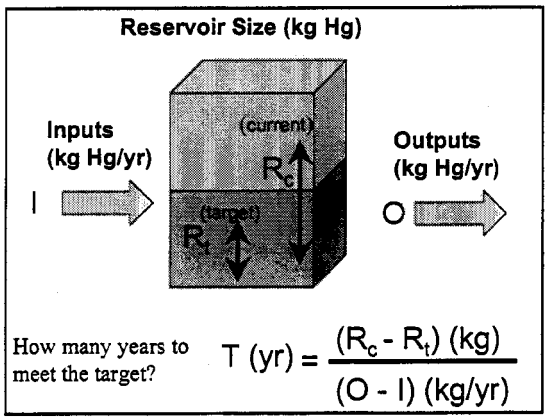
CWA Requirement | Beneficial Uses | Regional Monitoring | Watershed Assessment

Loading Capacity = (Target - Current) x Sediment Load



35

Assimilative Capacity

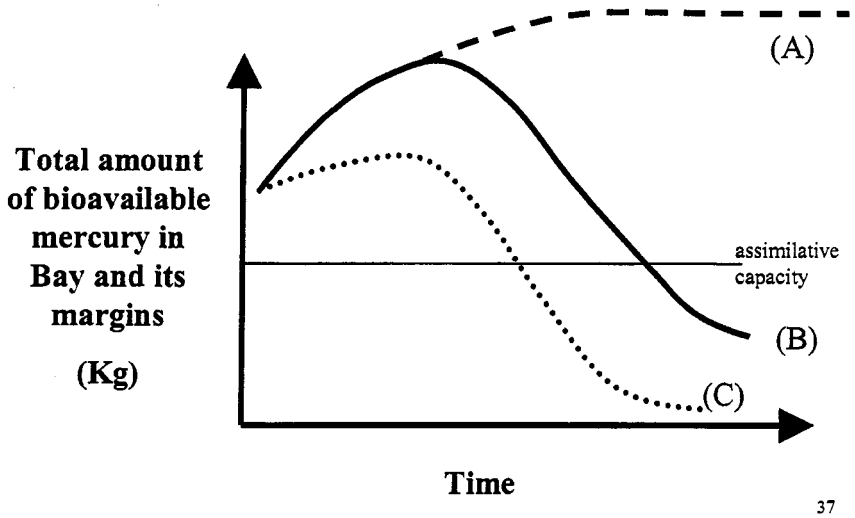


How many years to meet the target?

$$T\ (yr) = \frac{(R_c - R_t)\ (kg)}{(O - I)\ (kg/yr)}$$

36

The Big Picture



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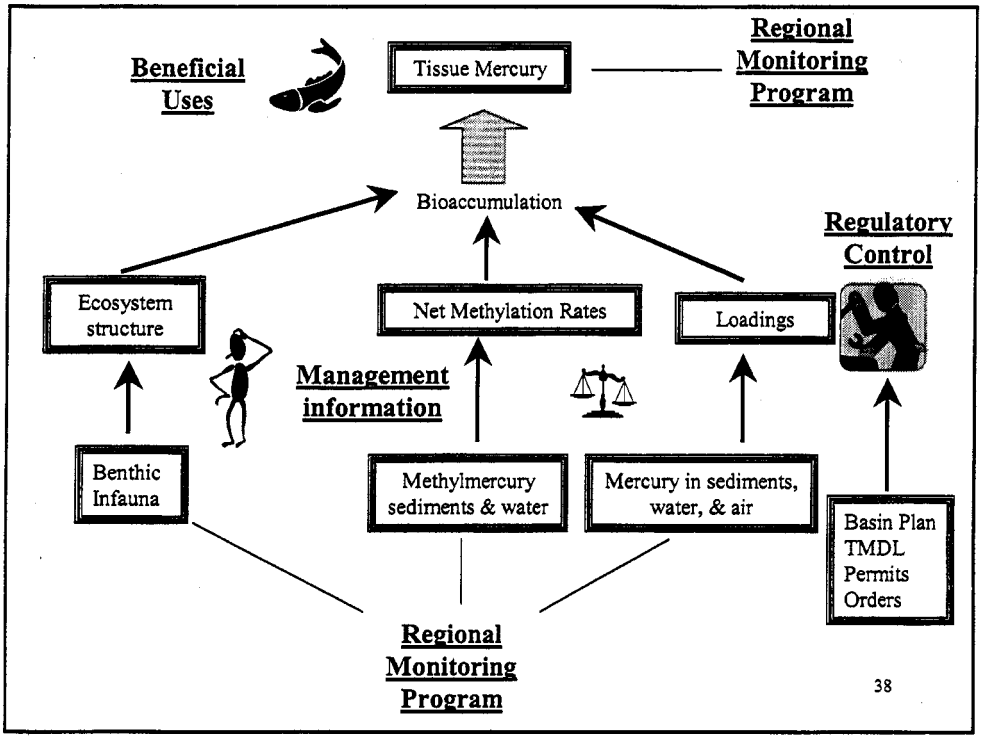
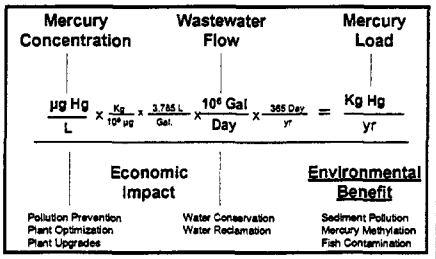


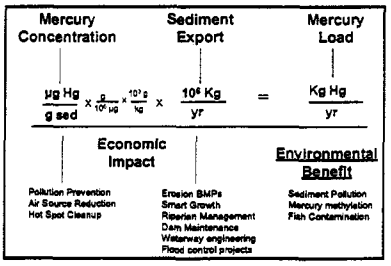
38

Implementation Plan

Effluent loads



Watershed loads



39

ECOS
Mercury Workshop

Tom Atkeson
Florida Department of
Environmental Protection

State Programs to Address Mercury
Part II

ECOS MERCURY WORKSHOP
REGISTRANTS - 2000

ALABAMA

Tom Parrott
Director - EH & S
Vulcan Chemicals
P.O. Box 385015
Birmingham, AL 35238
PHONE: (205) 298-3851
FAX: (205) 298-2967
EMAIL: tom.parrott@vul.com

Robert W. Cooner
Chief, Montgomery Branch
AL Department of Environmental Mgmt
1890A Cong. W.L. Dickinson Drive
P.O. Box 301463
Montgomery, AL 36109
PHONE: (334) 260-2700
FAX: (334) 272-8031
EMAIL: rc@adem.state.al.us

ARKANSAS

Tony Davis
Planning Branch Manager
Arkansas Dept. of Environmental Quality
8001 National Drive
Little Rock, AR 72209
PHONE: (501) 682-0959
FAX: (501) 682-0798
EMAIL: DavisA@adeq.state.ar.us

CALIFORNIA

James Downing
Biologist
City of San Jose
4245 Zanker Road
San Jose, CA 95134
PHONE: (408) 945-3719
FAX: (408) 934-0491
EMAIL: james.downing@ci.sj.ca.us

Dr. Leonard Levin
Program Manager, Air Toxic
EPRI
3412 Hillview Avenue
Palo Alto, CA 94303
PHONE: (650) 855-7929
FAX: (650) 855-1069
EMAIL: llevin@epri.com

CALIFORNIA (continued)

Khalil Abu-Saba
Environmental Specialist
CA Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612
PHONE: (510) 622-2382
FAX: (501) 622-2460
EMAIL: abu@rbs.swrcb.ca.gov

CANADA

Luke Trip
Manager, Heavy Metals
Environment Canada
351 St. Joseph Boulevard
Hull
Quebec KIA 0H3, Canada
EMAIL: luke.trip@ed-gc-ca

Dr. J. Rudd
Chief Scientist, Experimental Lakes Area
Fresh Water Institute, DFO
501 University Crescent
Winnipeg, Manitoba R3T 0K5, Canada
PHONE: (204) 983-5240
FAX: (204) 984-2404
EMAIL: ruddj@dfo

CONNECTICUT

Thomas Metzner
CT Department of Environmental Protection
79 Elm Street
Hartford, CT 06106
PHONE: (860) 424-3001

DISTRICT OF COLUMBIA

Joseph Stanko, Jr.
Counsel/Environmental Policy
U.S. House Committee on Commerce
2125 Rayburn House Office Building
Washington, DC 20515
PHONE: (202) 225-2927
FAX: (202) 225-1919
EMAIL: joseph.stanko@mail.house.gov

DISTRICT OF COLUMBIA (continued)

Michael Petruska
Associate Div. Director, US EPA
1200 Pennsylvania Ave. N.W. (5302W)
Washington, DC 20460
PHONE: (703) 308-8414
FAX: (703) 308-8433
EMAIL: petruska.mike@epa.gov

Rita Schoeny
Associate Director
HECD/OST/OW - U.S. EPA
1200 Pennsylvania Ave. NW (MC 4304)
Washington, DC 20460
PHONE: (202) 260-3445
FAX: (202) 260-1036
EMAIL: schoeny.rita@epa.gov

Mary Blakeslee
Deputy Director, Information Management
Environmental Council of the States
444 N. Capitol St. NW, Suite 445
Washington, DC 20001
PHONE: (202) 624-3660 FAX: (202) 624-3666
EMAIL: maryb@sso.org

Ellen Brown
Policy Analyst
Environmental Protection Agency/AIR
1200 Pennsylvania Ave. NW
Washington, DC 20460
PHONE: (202) 564-1669
FAX: (202) 564-1557
EMAIL: braun.ellen@epa.gov

Carol Leftwich
Project Manager
Environmental Council of the States
444 N. Capitol St. NW, Suite 445
Washington, DC 20001
PHONE: (202) 624-3660 FAX: (202) 624-3666
EMAIL: leftwich@sso.org

Arnold Kuzmack
Senior Science Advisor
Office of Water/Office of Science & Technology
401 M. St. S.W.
Washington, DC 20460
PHONE: (202) 260-5821
FAX: (202) 260-5394
EMAIL: kuzmack.arnold@epa.gov

DISTRICT OF COLUMBIA (continued)

Robert Perciasepe
Assistant Administration for Air
U.S. Environmental Protection Agency
1200 Pennsylvania Ave. NW, MC#6101A
Washington, DC 20004

Patricio Silva
Natural Resources Defense Council
1200 New York Ave. N.W., Ste. 400
Washington, DC 20005
PHONE: (202) 289-6868
FAX: (202) 289-1060
EMAIL: psilva@nrdc.org

Arthur E. Dungan
VP, Safety, Health & Environment
Chlorine Institute
2001 L. Street N.W., Suite 506
Washington, DC 20036
PHONE: (202) 872-4730
FAX: (202) 223-7225
EMAIL: adungan@cl2.com

Kathryn Mahaffey, PhD.
Director, Division of Exposure Assessment
OPPTS, US Environmental Protection Agency
401 M Street SW, MC#7201
Waterside Mall
Washington, DC 20460
PHONE: (202) 260-3573

Dennis Griesing
Vice President, Government Affairs
The Soap and Detergent Association
1500 K. Street NW, Suite 300
Washington, DC 20005
PHONE: (202) 662-2518
FAX: (202) 347-4110
EMAIL: dgriesing@sdahq.org

Jeff Bigler
Senior Fisheries Biologist
US EPA Office of Science and Technology
401 M Street, SW
Washington, DC 20460
PHONE: (202) 260-1305

DELAWARE
John Dege
Director - Air Program
EI DuPont de Nemours Inc
1007 Market St. D6078
Wilmington, DE 19707
PHONE: (302) 773-0900
FAX: (302) 774-1361
EMAIL: john.a.dege@usa.dupont.com

Nicholas A. DiPasquale
Secretary
DE Dept. of Natural Resources
& Environmental Control
89 Kings Highway
Dover, DE 19901
PHONE: (302) 739-4403
FAX: (302) 739-6242
EMAIL: ndipasquale@state.de.us

FLORIDA
Tom Atkeson, PhD
Mercury Coordinator
FL Department of Environmental Protection
2600 Blairstone Road
Tallahassee, FL 32399
PHONE: (850) 921-0884
EMAIL: atkeson_T@dep.state.fl.us

GEORGIA
Randall O. Manning
Toxicologist
GA Dept. of Natural Resources/
Environmental Protection Division
745 Gaines School Road
Athens, GA 30605
PHONE: (706) 365-6376
FAX: (706) 369-6395
EMAIL: randy_manning@mail.dnr.state.ga.us

Ron Methier
Air Branch Division
GA Environmental Protection Division
4244 International Parkway, Suite 120
Atlanta, GA 30354
PHONE: (404) 363-7016
FAX: (404) 363-7100
EMAIL: ron_methier@mail.dnr.state.ga.us

IOWA
Monica Wnuk
Env. Specialist Senior
Iowa Dept. of Natural Resources
7900 Hickman Road, Suite 1
Urbandale, IA 50332
PHONE: (515) 281-7212
FAX: (515) 242-5094
EMAIL: monica.wnuk@dnr.state.ia.us

IDAHO
Jon Sandoval
Chief of Staff
Idaho Dept. of Environmental Quality
1410 North Hilton Street
Boise, ID 83706
PHONE: (208) 373-0240
FAX: (208) 373-0417
EMAIL: jsandova@deq.state.id.us

ILLINOIS
Thomas V. Skinner
Director
IL Environmental Protection Agency
1021 North Grand Ave. East, P.O. Box 19276
Springfield, IL 62794
PHONE: (217) 782-9540
FAX: (217) 782-9039
EMAIL: tskinner@epa.state.il.us

Kathleen C. Bassi
Assistant for Policy & Program Coordination
IL Environmental Protection Agency
1021 North Grand Avenue East
Springfield, IL 62794
PHONE: (217) 785-4140
FAX: (217) 728-2465
EMAIL: epa2344@epa.state.il.us

Toby Frevert
Great Lakes Coordinator
IL Environmental Protection Agency
1021 North Grand Avenue East
Springfield, IL 62702
PHONE: (217) 782-1654

ILLINOIS (continued)
Hank G. Naour
Manager, Air Toxic Unit
IL Environmental Protection Agency
1021 North Grand Avenue East
P.O. Box 10506
Springfield, IL 62794
PHONE: (217) 782-2113
FAX: (217) 524-5023
EMAIL: epa2211@epa.state.il.us

INDIANA
Lori F. Kaplan
Commissioner
IN Department of Environmental Management
100 N. Senate Avenue
Indianapolis, IN 46204
PHONE: (317) 232-8611
FAX: (317) 233-6647

Paula Smith
Director Planning & Assessment
IN Department of Environmental Management
100 N. Senate Avenue
Indianapolis, IN 46204
PHONE: (317) 233-1210
FAX: (317) 233-6647

KANSAS
Jan O. Sides
Director, Bureau of Air & Radiation
KS Dept. of Health & Environment
Forbes Field, Building 283
Topeka, KS 66620
PHONE: (785) 296-1551
FAX: (785) 296-1545
EMAIL: jsides@kdhe.state.ks.us

LOUISIANA
Jimmy Guidry, M.D.
State Health Officer
LA Department of Environmental Quality
P.O. Box 132, 1201 Capitol Access Road, Bin #2
Baton Rouge, LA 70821
PHONE: (225) 342-3417
FAX: (225) 342-0080
EMAIL: jguidry@dhhmail.dhh.state.la.us

LOUISIANA (continued)
J. Dale Givens
Secretary
LA Department of Environmental Quality
P.O. Box 82263
Baton Rouge, LA 70884
PHONE: (225) 765-0639 FAX: (225) 765-0641
EMAIL: daleg@deq.state.la.us

Chris Roberie
Surveillance Div. Administrator
LA Department of Environmental Quality
PO Box 82215
Baton Rouge, LA 70884
PHONE: (225) 765-2953 FAX: (225) 765-0635
EMAIL: C_roberie@deq.state.la.us

Dana S. Oliver
Environmental Manager
Pioneer Americas, Inc.
P.O. Box 23
St. Gabriel, LA 70776
PHONE: (225) 642-1863 FAX: (225) 642-1882
EMAIL: DSOLIVER@PIONA.COM

Linda Korn Levy
Asst. Secretary
LA Department of Environmental Quality
P.O. Box 82215
Baton Rouge, LA 70884
PHONE: (225) 765-0491 FAX: (225) 765-2725

MASSACHUSETTS
C. Mark Smith, PhD, M.S.
Deputy Director
MA Department of Environmental Protection
& NEG-ECP Mercury Task Force
One Winter Street
Boston, MA 02108
PHONE: (617) 292-5509 FAX: (617) 292-5858
EMAIL: C.mark.smith@state.ma.us

Terri Goldberg
Deputy Director
NEWMOA
129 Porland Street, 6th Floor
Boston, MA 02114
PHONE: (617) 367-8558 FAX: (617) 367-0449
EMAIL: fgoldberg@newmoa.org

MASSACHUSETTS (continued)

Praveen Amar
Director, Science and Policy
NESCAUM
129 Portland Street
Barton, MA 02114
PHONE: (617) 367-8540
FAX: (617) 742-9162
EMAIL: pamar@mescaum.org

MARYLAND

Paul Jiapizian
MD Department of the Environment
2500 Broening Highway
Baltimore, MD 21224
PHONE: (410) 631-3906
FAX: (410) 631-3998
EMAIL: pjlapizian@mde.state.md.us

MAINE

David J. Lennett
Director, Bureau of Remediation &
Waste Management
ME Department of Environmental Protection
17 State House Station
Augusta, ME 04333
PHONE: (207) 287-7890
FAX: (207) 287-7826
EMAIL: david.lennett@state.me.us

MICHIGAN

Steven J. Kratzer
Toxics Reduction Program Manager
Michigan Dept. of Environmental Quality
P.O. Box 30457
Lansing, MI 48909
PHONE: (517) 373-0939
FAX: (517) 335-4729
EMAIL: kratzers@state.mi.us

G. Tracy Mehan
Director, Office of the Great Lakes
Michigan Dept. of Environmental Quality
P.O. Box 20473
Lansing, MI 48909
PHONE: (517) 335-4056
FAX: (517) 335-4053
EMAIL: mehang@state.mi.us

MICHIGAN (continued)

Dan Stickles
Director of Environmental Services
Spectrum Health
100 Michigan NE, (MC 079)
Grand Rapids, MI 49503
PHONE: (616) 391-1801
FAX: (616) 391-1419
EMAIL: dan.stickles@specrum-health.org

Gerald J. Keeler
Professor
University of Michigan Air Quality Lab
109 Observation Street
Ann Arbor, MI 48108
PHONE: (739) 936-1836
FAX: (734) 764-9424
EMAIL: jkeeler@umich.edu

Michael Murray, Ph.D.
Staff Scientist, National Wildlife Federation
Great Lakes Natural Resource Center
506 E. Liberty Street, 2nd Floor
Ann Arbor, MI 48104

Tim Eder
Director,National Wildlife Federation
506 E. Liberty St. 2nd Floor
Ann Arber, MI 48104
PHONE: (734) 769-3351
FAX: (734) 769-1449
EMAIL: eder@nwf.org

Joy Taylor
Environmental Quality Specialist
MDEQ - Air Quality Division - Toxic Unit
106 W. Allegan
Lansing, MI 48933
PHONE: (517) 335-6974
FAX: (517) 241-7499
EMAIL: taylorj1@state.mi.us

MINNESOTA

Kristen Applegate
Assistant Commissioner
MN Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155
PHONE: (651) 296-7354
FAX: (651) 296-7923
EMAIL: kristen.applegate2pca.state.mn.us

Amy Hennen
Izaak Walton League
1619 Dayton Ave. Suite 202
St. Paul, MN 55104
PHONE: (507) 285-1560
FAX: (507) 281-0455
EMAIL: ahennen@iwla.org

John Wachtler
Mercury Policy Coordinator
MN Pollution Control Agency
520 Lafayette Road N.
St. Paul, MN 55155
PHONE: (651) 297-8333
FAX: (651) 297-8676
EMAIL: John.Wachtler@pca.state.mn.us

MISSOURI

Scott Totten
Deputy Director
MO Dept. of Natural Resources -
Division of Environmental Quality
P.O. Box 176
Jefferson City, MO 65102
PHONE: (573) 751-5998
FAX: (573) 751-9277
EMAIL: nrjanob@mail.dnr.state.mo.us

Randy Raymond
Permitting Chief
MO Department of Natural Resources
P.O. Box 176
Jefferson City, MO 65102
PHONE: (573) 526-3835
FAX: (573) 751-2706
EMAIL: nrraymr@mail.dnr.state.mo.us

MISSOURI (continued)

John Young
nrcrawb@mail.dnr.state.mo.us
Division Director
MO Department of Natural Resources
P.O. Box 176
Jefferson City, MO 65102
PHONE: (573) 751-0763
FAX: (573) 751-9277
EMAIL: nryounj@mail.dnr.state.mo.us or

Kip Betz
Missouri Staff Reporter
The Bureau of National Affairs, Inc.
8110 Roxburgh #7
Clayton, MO 63105
PHONE: (314) 862-9844
FAX: (314) 862-9854
EMAIL: jbetz@bna.com

John Madras
MO Department of Natural Resources
P.O. Box 176
Jefferson City, MO 65102
PHONE: (573) 751-7428
FAX: (573) 526-5797
EMAIL: nrmadj@mail.dnr.state.mo.us

Karen Bataille
MO Dept. of Conservation
1110 So. College Avenue
Columbia, MO 65201
PHONE: (573) 882-9880
FAX: (573) 882-4517
EMAIL: bataik@mail.conservation.state.mo.us

Earl Pabst
Environmental Policy Director
MO Department of Natural Resources
P.O. Box 176
Jefferson City, MO 65102
PHONE: (573) 751-4533 FAX: (573) 751-9277
EMAIL: nrpabst@mail.dnr.state.mo.us
or nrschut@mail.dnr.state.mo.us

Steven Mahfood
Director
MO Department of Natural Resources
P.O. Box 176
Jefferson City, MO 65102
PHONE: (573) 751-4732

MISSOURI (continued)

Rosemary Wilson
Vice President - Midwest
Center for Energy & Economic Development
301 N. Memorial Drive
St. Louis, MO 63102
PHONE: (314) 342-3477
FAX: (314) 342-3479
EMAIL: rwilson@ceednet.org

Gale Carlson
MO Department of Health
930 Wildwood Drive
Jefferson City, MO 65102
PHONE: (573) 751-6090
FAX: (573) 526-6946
EMAIL: carlsg@mail.health.state.mo.us

Teresa Schubert
MO Department of Natural Resources
PO Box 176
Jefferson City, MO 65101
PHONE: (573) 751-4533
FAX: (573) 751-9277
EMAIL: nrschut@mail.dnr.state.mo.us

Phil Bass
MS Dept. of Environmental Quality -
Office of Pollution Control
PO Box 10385
Jackson, MS 39289
PHONE: (601) 961-5101
FAX: (601) 961-5741
EMAIL: Phil_Bass@deq.state.ms.us

Greg Jackson
TMDL Section Chief
MS Department of Environmental Quality
2380 Highway 80 West
Jackson, MS 39289
PHONE: (601) 961-5098
FAX: (601) 961-5357
EMAIL: greg_jackson@deq.state.ms.us

MISSISSIPPI (continued)

Jerry W. Cain
Chief Environmental Permits Division
MS Dept. of Environmental Quality,
Office of Pollution Control
P.O. Box 10385
Jackson, MS 39289
PHONE: (601) 961-5073
FAX: (601) 961-5703
EMAIL: JERRY_CAIN@deq.state.ms.us

Kim Caviness
EIT
MS Department of Environmental Quality
P.O. Box 10385
Jackson, MS 39289
PHONE: (601) 961-5390
FAX: (601) 961-5357
EMAIL: kim_caviness@deq.state.ms.us

NEBRASKA

Mike Linder
Director
Nebraska Dept. of Environmental Quality
1200 “N” Street, Suite 400
PO Box 98922
Lincoln, NE 68509
PHONE: (402) 471-4231
FAX: (402) 471-2909
EMAIL: mike.Linder@ndeq.state.ne.us

NEW HAMPSHIRE

Robert W. Varney
Commissioner
NH Department of Environmental Services
Six Hazen Drive, P.O. Box 95
Concord, NH 03302
PHONE: (603) 271-3503
FAX: (603) 271-2867
EMAIL: rvarney@des.state.nh.us

NEW JERSEY
Sue Shannon
Government Relations Specialist
New Jersey Dept. of Environmental Protection
Division of Science, Research & Technology
P.O. Box 409 401 E. State St.
Trenton, NJ 08625
PHONE: (609) 292-1156
FAX: (609) 777-2852
EMAIL: Sshannon@dep.nj.state.us

Leslie McGeorge
Assistant Commissioner
NJ Dept. of Environmental Protection/
Env. Planning & Science
P.O. Box 418, 401 E. State Street,
7th Fl. West Wing
Trenton, NJ 08625
PHONE: (609) 292-1254
FAX: (609) 777-1330
EMAIL: 1mcgeorge@dep.state.nj.us

William O'Sullivan
Administrator
New Jersey Dept. of Environmental Protection
401 East State Street
Trenton, NJ 08625
PHONE: (601) 984-1484
FAX: (609) 984-6369
EMAIL: wosulliv@dep.state.nj.us

NEW YORK
Carl Johnson
Deputy Commissioner
New York State Dept. of
Environmental Conservation
50 Wolf Road
Albany, NY 12233
PHONE: (518) 457-1415
FAX: (518) 457-9629
EMAIL: cxjohnso@gw.dec.state.ny.us

NORTH CAROLINA
William H. Maxwell
Environmental Engineer
US Environmental Protection Agency
MD - 13
Research Triangle Park, NC 27711
PHONE: (919) 541-5430
FAX: (919) 541-5450
EMAIL: maxwell.bill@epa.gov

OHIO
Robert Hodanbosi
Chief, Div. Of Air Pollution Control
Ohio EPA
122 South Front Street
Columbus, OH 43215
PHONE: (614) 644-2270
FAX: (614) 644-3681
EMAIL: bob.hodanbosi@epa.state.oh.us

Lisa J. Morris
Environmental Program Administrator
Ohio EPA - Division of Surface Water
122 South Front Street, PO Box 1049
Columbus, OH 43216-1049
PHONE: (614) 644-2001
FAX: (614) 644-2745
EMAIL: lisa.morris@epa.state.oh.us

Jenny Leshnock
Environmental Supervisor
Ohio Environmental Protection Agency
P.O. Box 1049
Columbus, OH 43216
PHONE: (614) 644-2022
FAX: (614) 644-2745
EMAIL: jennifer.leshnock@epa.state.oh.us

OREGON
Richard Gates
Administrator Lab Division
Oregon Dept. of Environmental Quality
1712 SW Eleventh
Portland, OR 97201
PHONE: (503) 229-5983
FAX: (503) 229-6924
EMAIL: gates.rick@deq.state.or.us

Mary Abrams
Snake River Basin Coordinator
Oregon Dept. of Environmental Quality
115 Elm St.
LaGrande, OR 97850
PHONE: (541) 975-1320
FAX: (541) 975-1700
EMAIL: abrams.mary@deq.state.or.us

SOUTH CAROLINA
Robin Stephens
Asst. to the Deputy Commissioner
South Carolina DHEC
2600 Bull Street
Columbia, SC 29201
PHONE: (803) 898-4383
FAX: (803) 898-3942
EMAIL: stephers@columb30.dhec.state.sc.us

Robert W. King, Jr.
Assistant Deputy Commissioner
South Carolina DHEC
2600 Bull Street
Columbia, SC 29201
PHONE: (803) 898-3900
FAX: (803) 898-3942
EMAIL: kingrw@columb30.dhec.state.sc.us

SOUTH DAKOTA
Patrick Snyder
Environmental Project Scientist
SD Dept. of Environment and Natural Resources
Joe Foss Building, 523 East Capitol
Pierre, SD 57501
PHONE: (605) 773-3351
FAX: (605) 773-6035
EMAIL: patrick.snyder@state.sd.us

SWEDEN
Kristina Von Rein
Swedish EPA
S-106 48 Stockholm
Sweden
PHONE: (468) 698-1127
EMAIL: kristina.von-rein@enriron.se

TENNESSEE
Elaine Patterson
Manager, Governmental Affairs
Olin Corporation
7708 Ashley Oaks Dr.
Chattanooga, TN 37421
PHONE: (423) 954-2721
FAX: (423) 954-2720

TENNESSEE(continued)
Karen Risse
Environmental Project Manager
International Paper
6400 Poplar Ave.
Memphis, TN 38197
PHONE: (901) 763-6483
FAX: (901) 763-6939
EMAIL: krisse@ipaper.com

TEXAS
David Parmer
TX Natural Resource Conservation Commission
PO Box 13087 (MC 100)
Austin, TX 78711

John Westendorf
Manager-Water Quality
Occidential Chemical Corporation
5005 LBJ Freeway
Dallas, TX 75244
PHONE: (972) 404-3229
FAX: (972) 404-3287
EMAIL: john_westendorf@oxy.com

VIRGINIA
Greg Merrill
Director State Affairs
American Chemistry Council -
Chlorine Chemistry Council
1300 Wilson Boulevard
Arlington, VA 22209
PHONE: (703) 741-5417
FAX: (703) 741-6084
EMAIL: greg_Merrill@americanchemistry.com

Mark Anderson
Senior Vice President
Stateside Associates
2300 Clarendon Boulevard
Arlington, VA 22201
PHONE: (703) 525-7466
FAX: (703) 525-7057

VERMONT

Michael T. Bender
Executive Director
Mercury Policy Project
1420 North St.
Montpelier, VT 05602
PHONE: (802) 223-9000
FAX: (802) 223-7914
EMAIL: mtbendervt@aol.com

WASHINGTON

Bill Ross
Ross and Associates Environmental
Consulting, Ltd.
1218 Third Avenue, Suite 1207
Seattle, WA 98101
PHONE: (206) 447-1805
FAX: (206) 447-0956
EMAIL: bill.ross@ross-assoc.com

Kristyn Ideker
Ross and Associates Environmental
Consulting, Ltd.
1218 Third Avenue, Suite 1207
Seattle, WA 98101
PHONE: (206) 447-1805
FAX: (206) 447-0956
EMAIL: kristyn.ideker@ross-assoc.com

WISCONSIN

John Gozdialski
Regional Waters Leader
WI Department of Natural Resources
810 W. Maple Street
Spooner, WI 54801
PHONE: (715) 635-4002
FAX: (715) 635-4105
EMAIL: gozdzj@dnr.state.wi.us

Lakshmi Sridharan
Air & Waste Regional Leader, Southeast Region
WI Department of Natural Resources
Box 7921
Madison, WI 53707
PHONE: (608) 266-5207
FAX: (608) 266-2768
EMAIL: kesslk@dnr.state.us

WISCONSIN (continued)

Mary Jo Kopecky
Deputy Administrator, Div. Of Water
WI Department of Natural Resources
P.O. Box 7921
Madison, WI 53707
PHONE: (608) 261-8448
FAX: (608) 266-6983
EMAIL: kopecm@dnr.state.wi.us

George E. Meyer
Secretary
WI Department of Natural Resources
P.O. Box 7921
Madison, WI 53707
PHONE: (608) 266-2121
FAX: (608) 266-6983
EMAIL: Meyer@dnr.state.wi.us

Eric R. Uram
Midwest Associate Representative
Sierra Club
214 North Henry Street
Madison, WI 53703
PHONE: (608) 257-4994
FAX: (608) 257-3513
EMAIL: eric.uram@sierraclub.org

Charles Case
Community Mercury Specialist
WI Dept. of Natural Resources
101 S. Webster Street, P.O. Box 7921
Madison, WI 53707
PHONE: (608) 267-7639
sFAX: (608) 267-0496
EMAIL: case@dnr.state.wi.us

WEST VIRGINIA

Earl Billingsley
Supervisor
WV Dept. Office of Air Quality
7012 Mac Corkle Ave. SE
Charleston, WV 25304
PHONE: (304) 926-3624
FAX: (304) 926-3739
EMAIL: ebillingsley@mail.dep.state.mv.us

Scott Renninger
Project Manager
National Energy Technology Laboratory
3610 Collins Ferry Road
Morgantown, WV 26507
PHONE: (304) 285-4790
FAX: (304) 285-4403
EMAIL: srenni@netl.doe.gov

Michael C. Castle
Director
WV Division of Environmental Protection
10 McJunkin Road
Nitro, WV 25143
PHONE: (304) 759-0575
FAX: (304) 759-0526

Paul Koval

ECOS Mercury Workshop
Planning Committee

First Name	Last Name/ (Affilitation)	Phone Number	Fax Number	Email Address
Tom	Atkeson (FL)	850-921-0884	850-414-1390	Thomas.Atkeson@dep.state.fl.us
Mike	*Aucott (NJ)*	*609-292-7530*	*609-292-7340*	*maucott@dep.state.nj.us*
Bill	Becker (STAPPA/ALAPCO)		202-624-7864	202-624-7863 bbecker@sso.org
Dana	Bisbee (NH)	603-271-4974	603-271-2867	dbisbee@des.state.nh.us
Mary	**Blakeslee (ECOS)**	**202-624-3660**	**202-624-3666**	**maryb@sso.org**
Ellen	*Brown(USEPA)*	*202-564-1669*	*202)564-1557*	*brown.ellen@epa.gov*
Mary	Douglas (STAPPA/ALAPCO)		202-624-7864	202-624-7863 mdouglas@sso.org
Randy	England (NJ)	609-984-7927	609-292-7340	rengland@dep.state.nj.us
Caroline	Garber (WI)	608-264-9218	608-267-0560	garbeC@mail01.dnr.wi.us
David	Hawkins (NRDC)	202-289-6868	202-289-1060	dhawkins@nrdc.org
Kristyn	Ideker (ross-assoc)	206-447-1805	206-447-0956	kristyn.ideker@ross-assoc.com
Ted	Johnson (EPA)	202-260-8142		johnson.theodore@epa.gov
Aaron	*Keatley (KY)*	*502-564-2150*	*502-564-4245-*	*aaron.keatley@mail.state.ky.us*
Becky	Keogh(AR)	501-682-0959		keogh@adeq.state.ar.us
Bob	King (SC)	803-898-3900	803-898-3942	kingrw@columb30.dhec.state.sc.us
Mary Jo	**Kopecky (WI)**	**608-261-8448**	**608-266-6983**	**kopecm@dnr.state.wi.us**
Paul	*Koziar (WI)*	*608-267-9388*	*608-267-2768*	*koziap@dnr.state.wi.us*
Winslow	Ladue (VT)	802 241-3404	802 241-3273	Winslow.Ladue@state.vt.us
Leahann	Lamb (UT)	801-536-4476	801-536-4405	llamb@deq.state.ut.us
Carol	Leftwich (ECOS)	202-624-3677	202-624-3666	leftwich@sso.org
Linda	Levy (LA)	225-765-0491	225-765-0635	linda_l@deq.state.la.us
Leslie	*Mc George (NJ)*	*609-984-6070*	*609-777-2852*	*lmcgeorg@dep.state.nj.us*
Tracy	*Mehan, III (MI)*	*517-335-4056*	*517-335-4053*	*mehang@state.mi.us*
Hank	Nauor (IL)	217-785-1716	217-524-5023	epa2211@epa.state.il.us
Thomas	Niejadlik (NH)	603-271-6865	603-271-1381	t_niejadlik@des.state.nh.us
Earl	Pabst (MO)	573-751-4533	573-751-9277	nrpabse@mail.dnr.state.mo.us
Allan	Price (AR)	501-682-0942	501-682-0936	adp@adeq.state.ar.us
Rick	Rhumba (NH)	603-271-1987	603-271-7053	rrumba@des.state.nh.us
Bill	Ross (ross-assoc)	206-447-1805	206-447-0956	bill.ross@ross-assoc.com
John	Sandavol (ID)	208-3730240	208-373-0417	jsandova@deq.state.id.us
Teresa	Schubert (MO)	573-751-4533	573-751-9277	nrschut@mail.dnr.state.mo.us
Sue	*Shannon (NJ)*	*609-292-1156*	*609-292-7340*	*sshannon@dep.state.nj.us*
Mark	Smith (MA)	617-292-5509	617-556-1006	C.Mark.Smith@state.ma.us
Felice	*Stadler (NWF)*	*202-797-6800*		*Stadler@nwf.org*
Joy	Taylor (MI)	517-335-6974	517- 41-7499	taylorj1@state.mi.us
David	Thornton (MN)	651-296-7265	651-297-8676	david.thornton@pca.state.mn.us
David	Word (GA)	404-656-4713	404-651-5778	david_word@mail.dnr.state.ga.us
Lynda	Wynn (EPA)	202-260-0021	202-401-3372	Wynn.lynda@epa.gov
Butch	Younginer (SC)	803-898-4399	803-898-4200	Youngiem@columb32.dhec.state.sc.us

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THE ENVIRONMENTAL COUNCIL OF THE STATES
444 North Capitol Street, N.W. Suite 445
Washington, DC 2001
http://www.ecos.org
Tel: (202) 624-3660
Fax: (202) 624-3666
E-mail: ecos@sso.org

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