

Strategies to Assess Mercury Impacts and Minimize Their Effects in Colorado and Beyond

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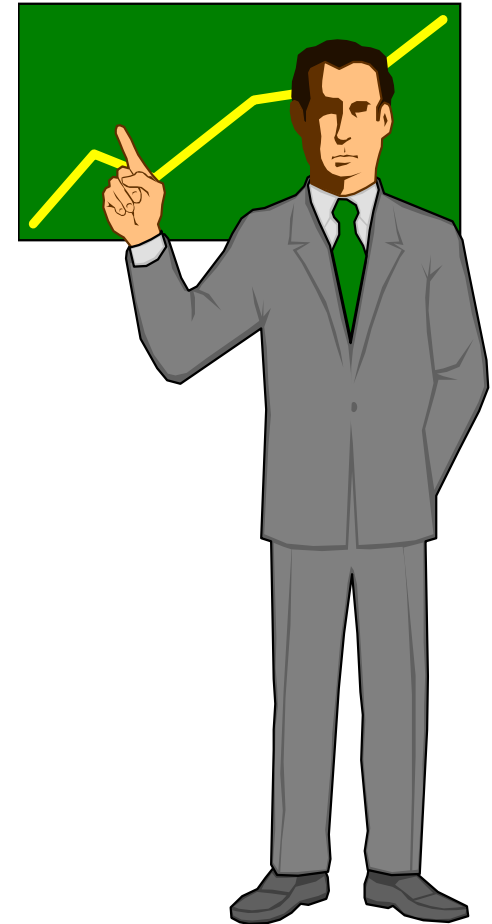
Presented at the NADP Technical Meeting and Scientific Symposium
Boulder, Colorado
September 12, 2007

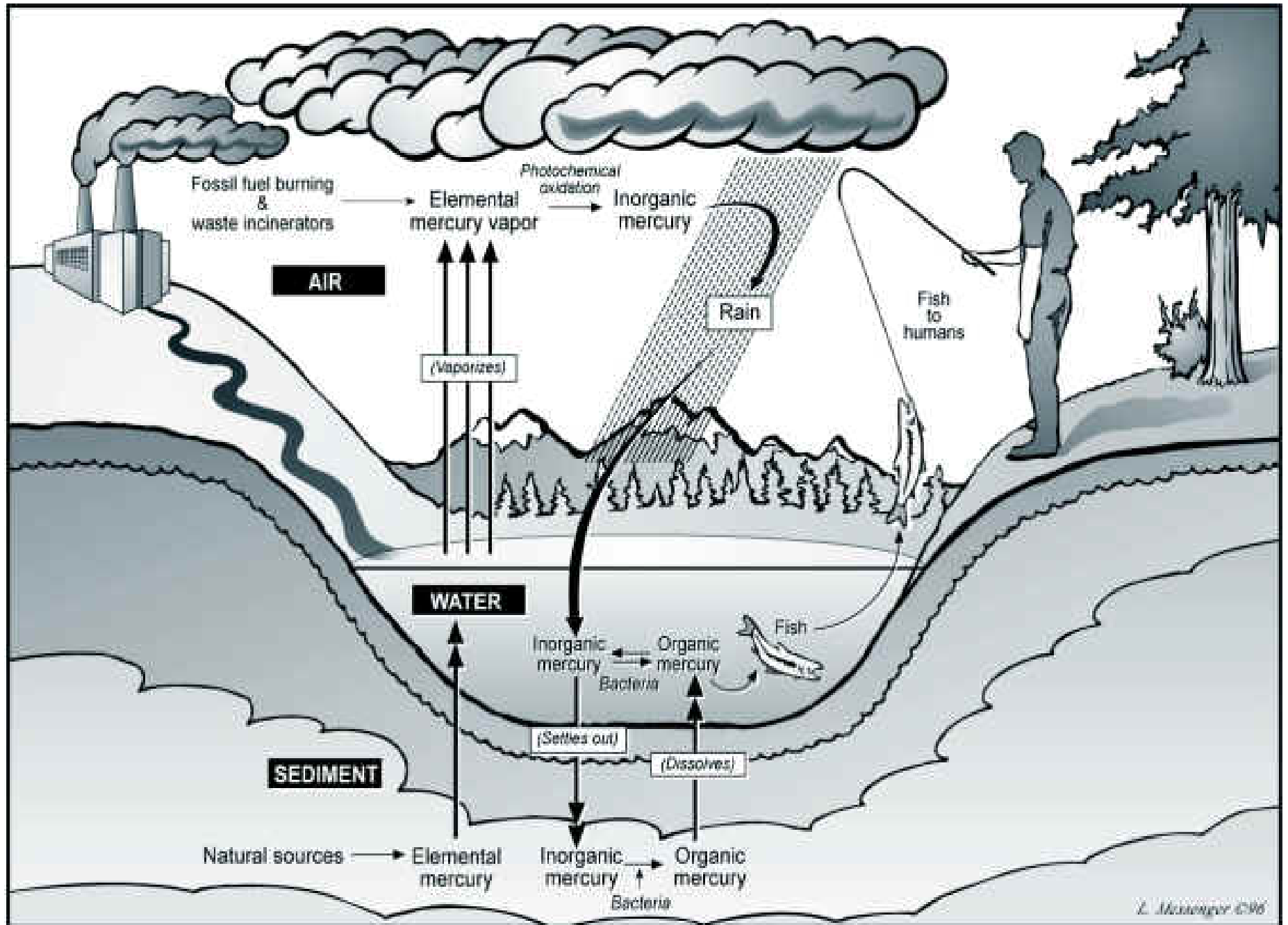


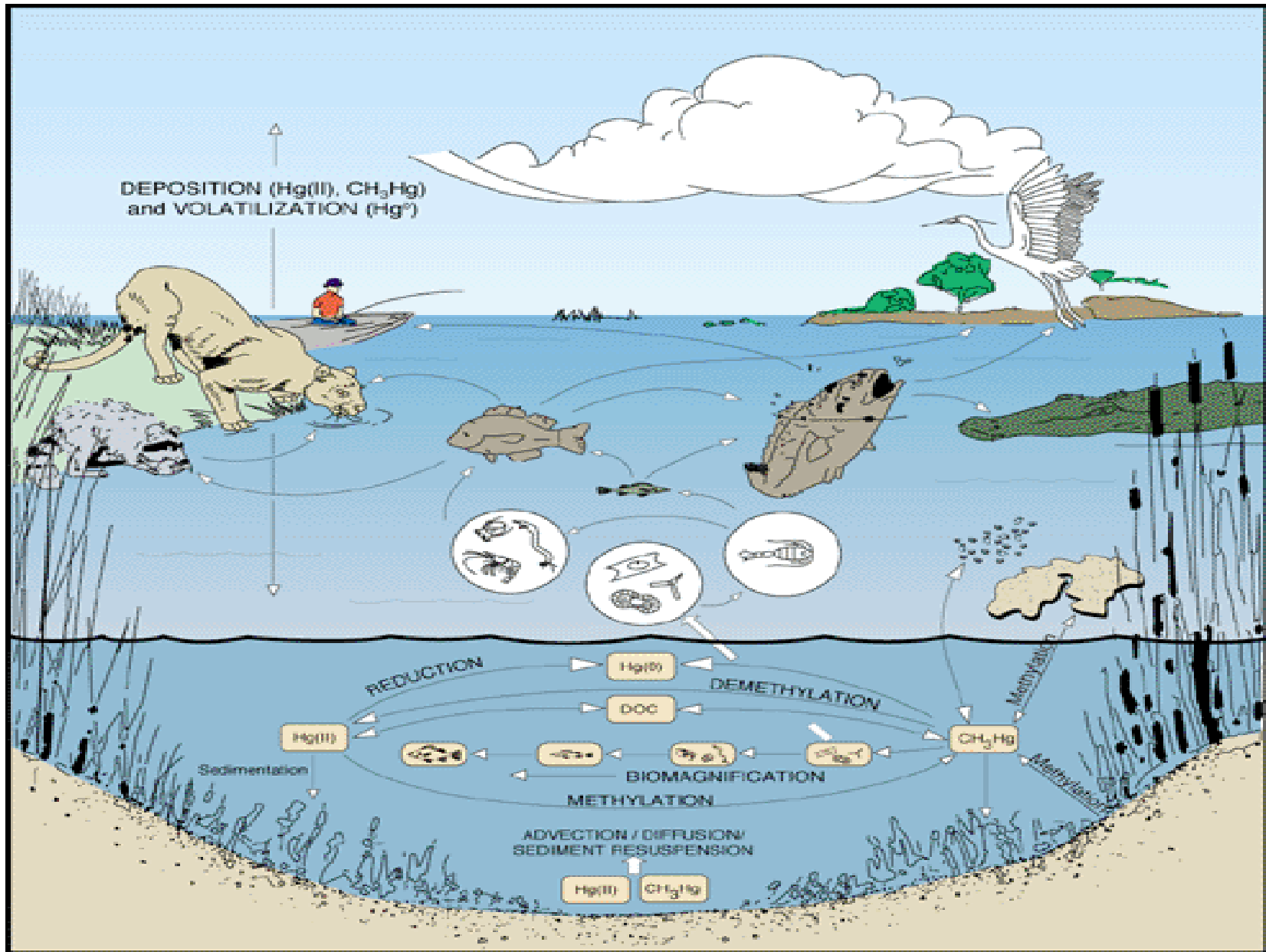
What Is To Be Covered Today

**What's Driving the Issue
for Colorado**

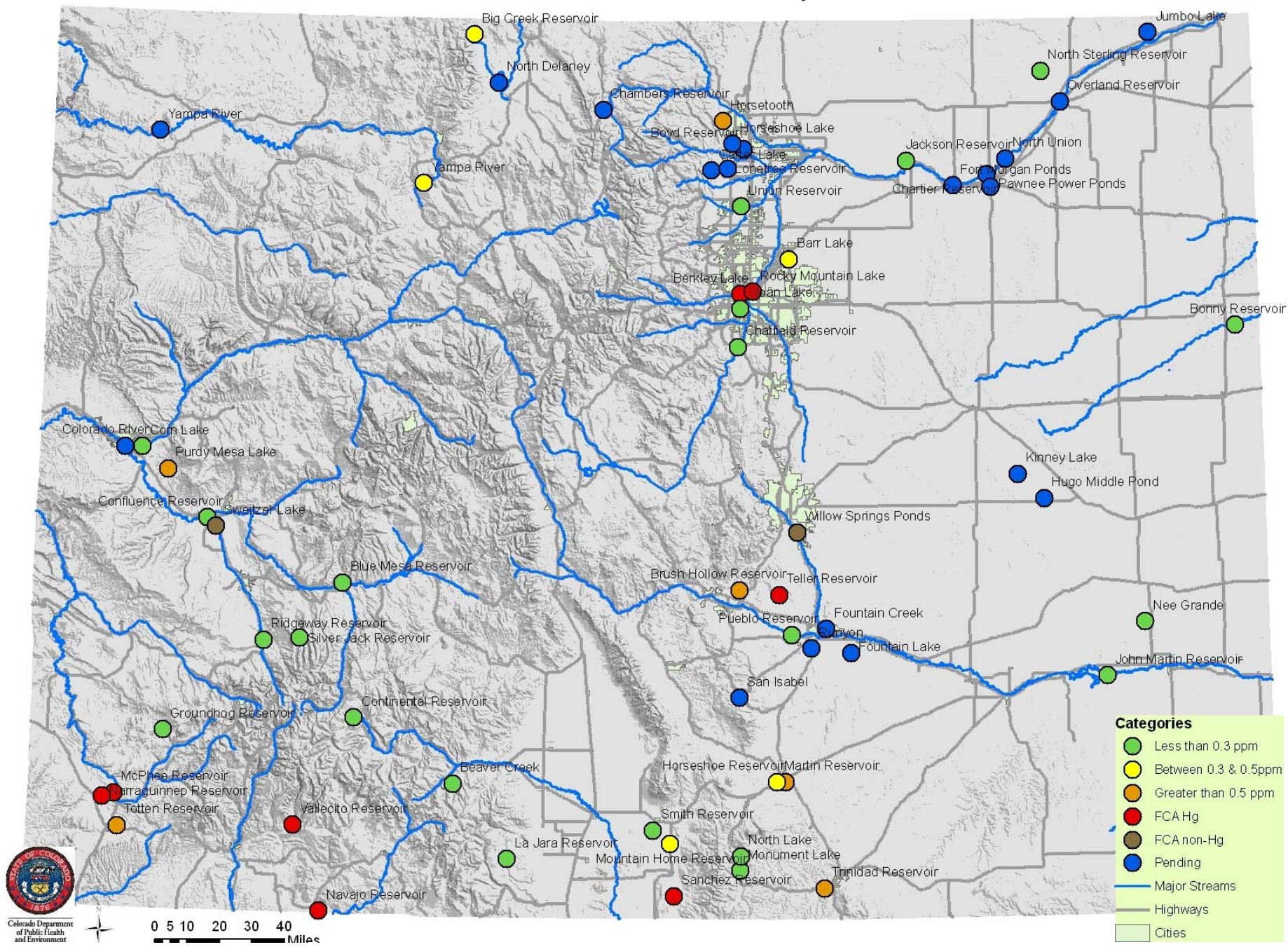
Responses



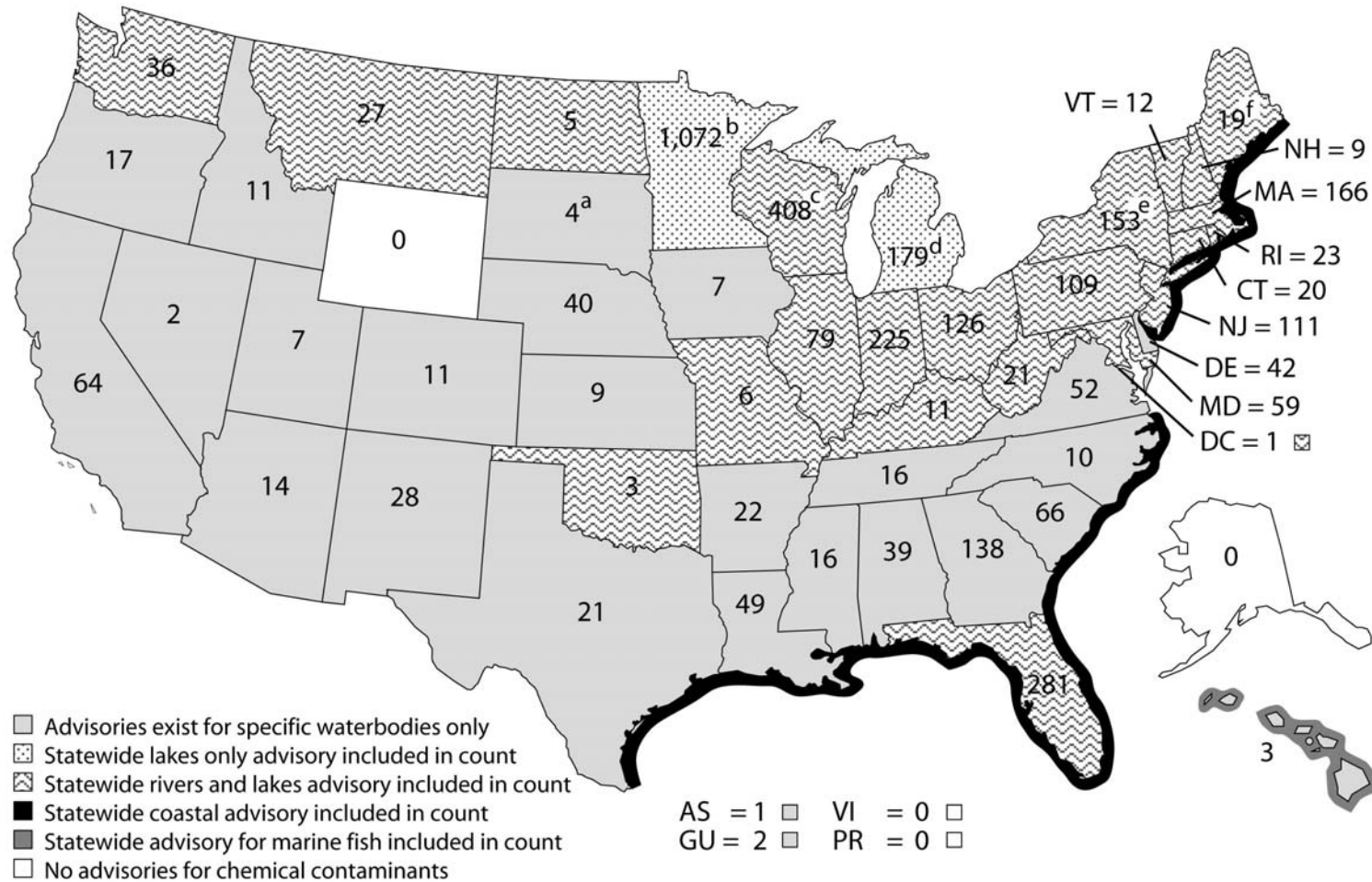




Colorado Fish Tissue Study



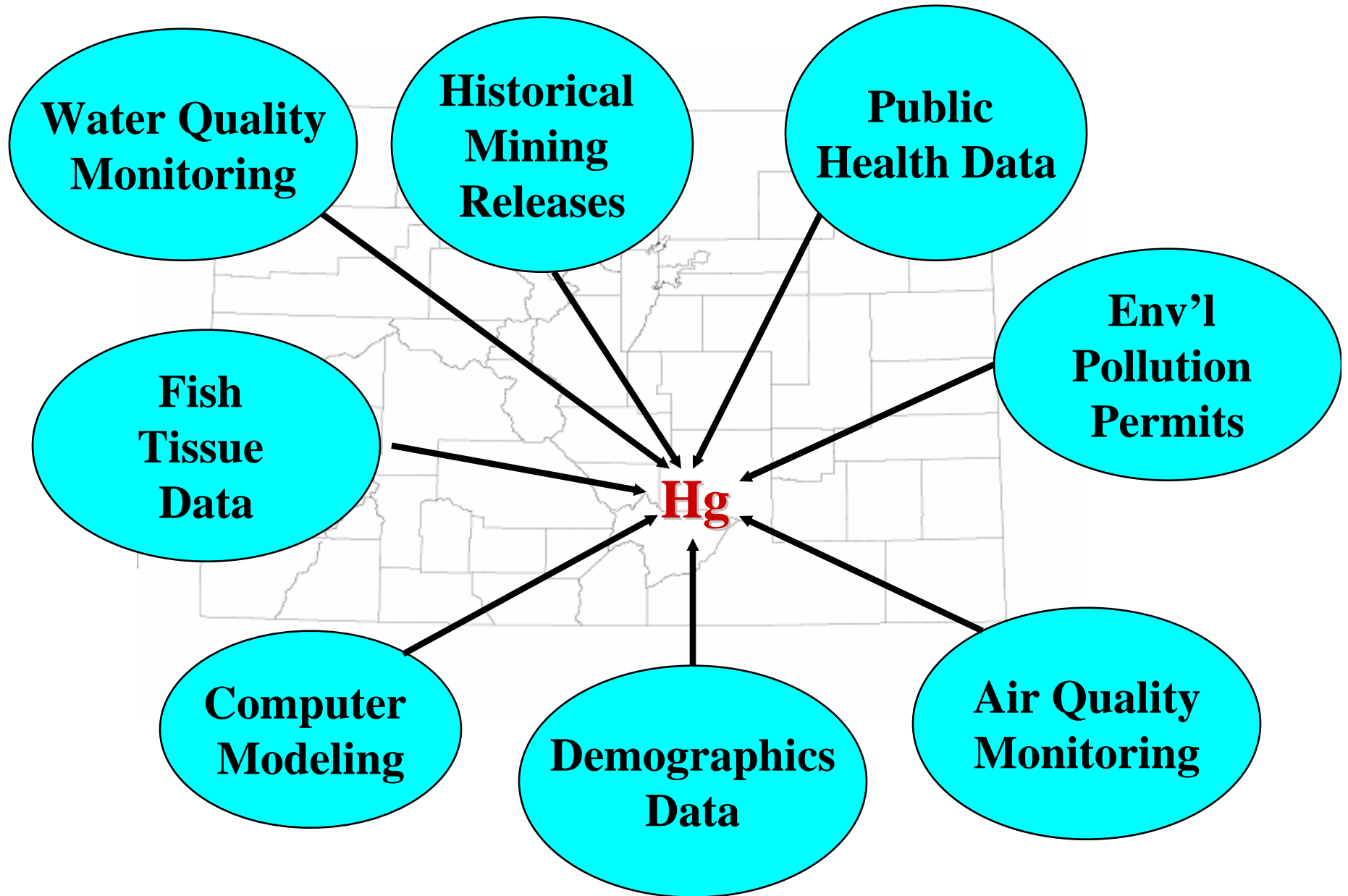
National FCAs 2006



a -Includes (1) advisory from the Cheyenne River Sioux Tribe
 b -Includes (28) advisories from the Great Lakes Indian Fish and Wildlife Commission (GLIFWC) and the Minnesota Chippewa Tribes
 c -Includes (297) advisories from the (GLIFWC)
 d -Includes (30) advisories from the (GLIFWC)
 e -Includes (1) advisory from the St. Regis Mohawk Tribe
 f -Includes (2) advisories from the Aroostook Band of Micmacs

2006 Total = 3,852

Holistically Assessing Mercury Impacts





Scientific Evidence/Support

- MDN Sites: Mesa Verde (CO99), Buffalo Creek (CO97)
- USGS Tracer Studies (Dave Krabbenhoft, USGS)
- Snowpack Results (USGS and others)
- CDPHE/Division of Wildlife Findings – Fish Tissue
- Contractor Support (TMDL Efforts)
- Core Sampling in Affected Waterbodies (Gray, 2004)
- Mountain Studies Institute Research (Nydick)
- Four Corners Air Quality Task Force Recommendations
- Mercury Advisory Committee (Regional) – Tentative
- Colorado Mercury Biomonitoring Data
- Data Presented at the Conference



Sample of Current Questions

What is the airborne Hg input at high-elevations?

Are the concentrations and amounts a concern? Should long-term monitoring (MDN) be a priority?

Does high-elevation deposition differ from lower elevation sites?

Has the amount of Hg input changed over time at high elevations?

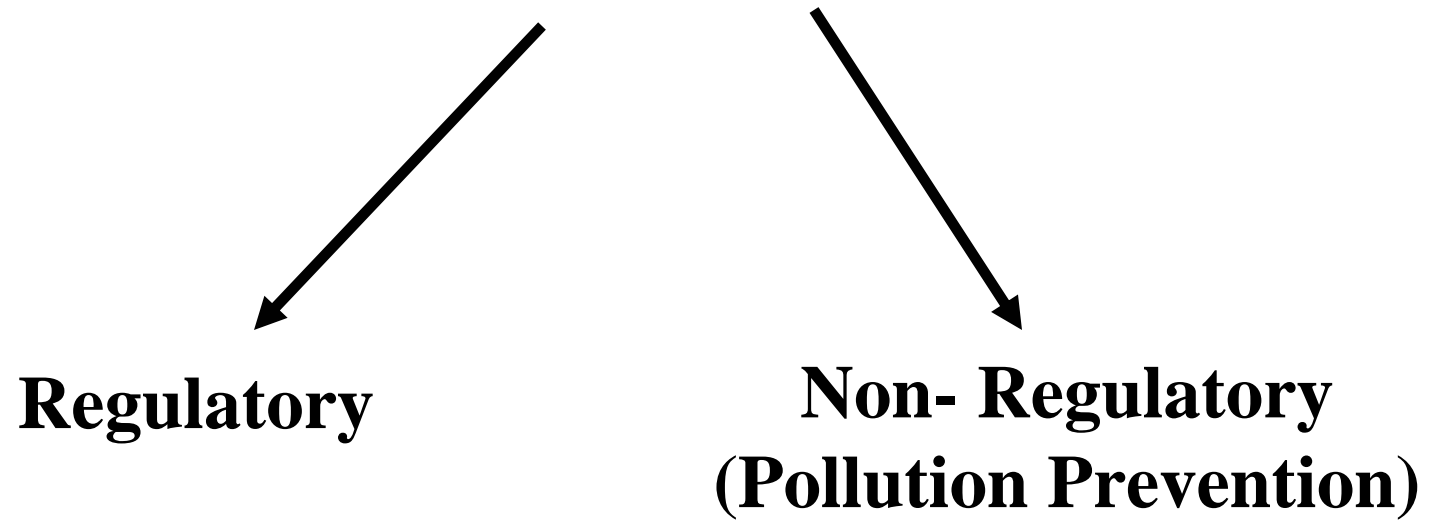
Does the timing of change provide information on the source of input?

Is Hg being incorporated in aquatic food webs of high elevation lakes?

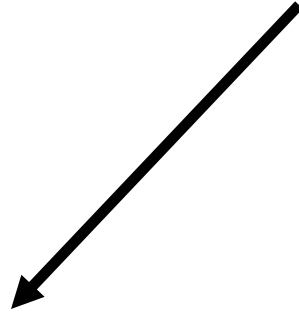
What causes variability of Hg concentrations in biota?



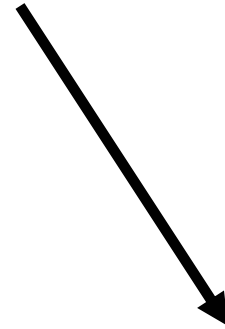
Addressing Mercury



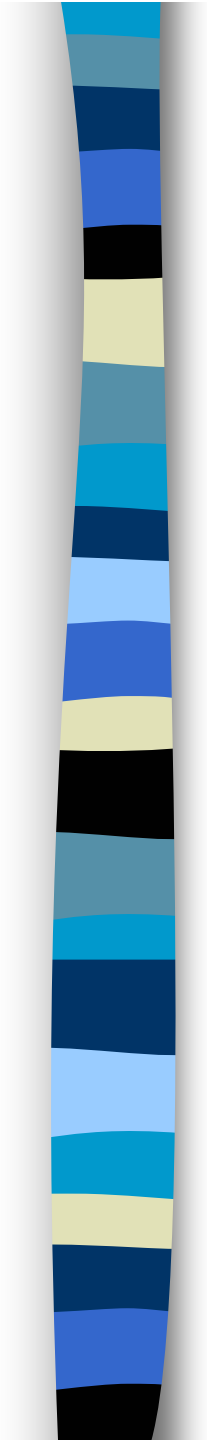
Addressing Mercury



Regulatory



**Non-Regulatory
(Pollution Prevention)**



“Mercury-Free Colorado Campaign” Initiatives

- Problem Characterization
- Dental
- Crematoria
- Consumer (Thermostat/ Thermometer)
- Public Education and Outreach
- Industry (Automotive Switch)



**Environmental
Achievement
Award**

**Pollution Prevention
Champion Award**



2005

Problem Characterization



- TRI Captures *Some* Mercury Releases
 - Significant Amounts not Inventoried Including Computers, Auto Switches, Thermostats, Fluorescent Bulbs, Dental Amalgam, Crematories, Thermometers, and many others
- CDPHE Prepared More Comprehensive Catalogue/Inventory
- Approx. 7800 Pounds Hg Released Annually
- Important Areas for Targeting Identified



Colorado Mercury Inventory

- Initially developed late 2004; revised, by section, as needed
- Point, non-point and natural sources identified
- Uses Toxics Release Inventory and State Generated Data
- Includes dozens of source categories
- Serves mostly as planning tool (State initiatives)

Dental P2 Project

Goal: Reduce mercury releases to wastewater from dental offices by implementing P2 pilot program at Colorado dental offices

Environmental Metrics/ Measurable Results

- Initial Partnership with the City of Pueblo, Pueblo City-County Health Department, and Colorado Mental Health Institute
- Established a baseline of the information, resources, and equipment used by or available to dentists
- Identified barriers to implementing best management practices and best available technologies for mercury recovery
- Conducted trainings with dentists, Implementing BMPs
- Expanding Statewide, as Feasible



Crematory Initiative

- Dental Amalgam Known Mercury Source
- Mercury Released When Dental Fillings Are Volatilized During Cremation
- Mercury Inventory Identifies Crematoria as Significant Source
- Up to 100 Pounds Released Annually from Colorado Sources
- Prefer Pollution Prevention “Carrot” over Regulatory “Stick”
- Effort to Work with Colorado Crematoria, Funeral Homes and Trade Associations to Identify Best Management Practices
- “End of Pipe Controls” or Voluntary Removal?
- Working with Organ Donor Concept



Consumer Mercury Project

- Goal:
- 1) Prevent disposal of mercury-containing thermostats to landfills through promotion of thermostat collection and recycling, and;
 - 2) Raise public awareness to this mercury source

Environmental Metrics/ Measurable Results

- Materials Developed for Heating, Ventilation and Air Conditioning Contractors
- To Date, Nearly 1,300 Thermostats Diverted
- Expanding Program to HHW Facilities (Homeowner Access)





Public Education and Outreach

Goal: Raise Awareness to Mercury Issues and Inform Citizens of Disposal Options Available to Them

Environmental Metrics/ Measurable Results

- Survey Developed for Citizens and Local Agencies Throughout State
- Numerous Presentations Made, Other Outreach Opportunities Sought
- Mercury “Brown Bags”
- Newsletter and Newspaper Articles
- Website Active – Hundred of Website Hits per Month
- Email Service Effective – Many pounds of Mercury Diverted
- Traditional Household Hazardous Waste Program Partnerships
- **Improving the Public Health Message**
 - FCAs
 - Spiderman Toy Example





Industry Mercury Project

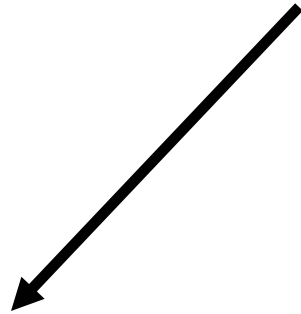
Goal: Reduce mercury pollution via implementation of automotive switch removal program designed to ultimately reduce air emissions at steel mill;

Environmental Metrics/ Measurable Results

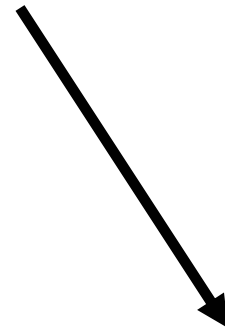
- Cooperative effort between CDPHE and the Colorado Automotive Recyclers
- Identification of four dozen participating automotive recycling entities
- Implementation of switch removal program at numerous automotive sites
- Contractor handles pick up and disposal of collected switches
- 78,000 switches removed to date
- Over 170 pounds of mercury diverted from area steel mill
- Colorado recently joined national collection program (based on our program)



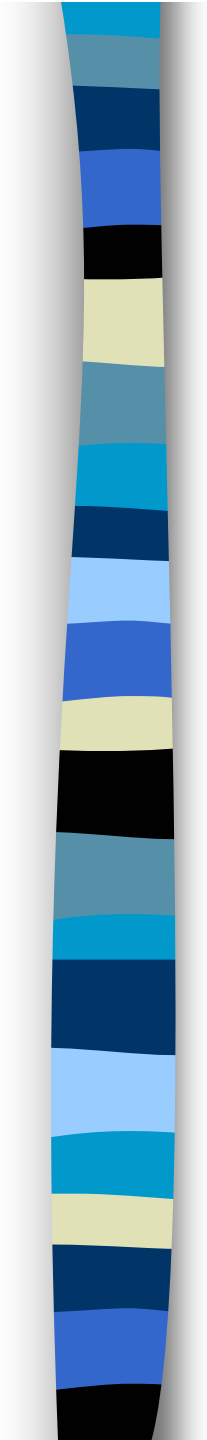
Addressing Mercury



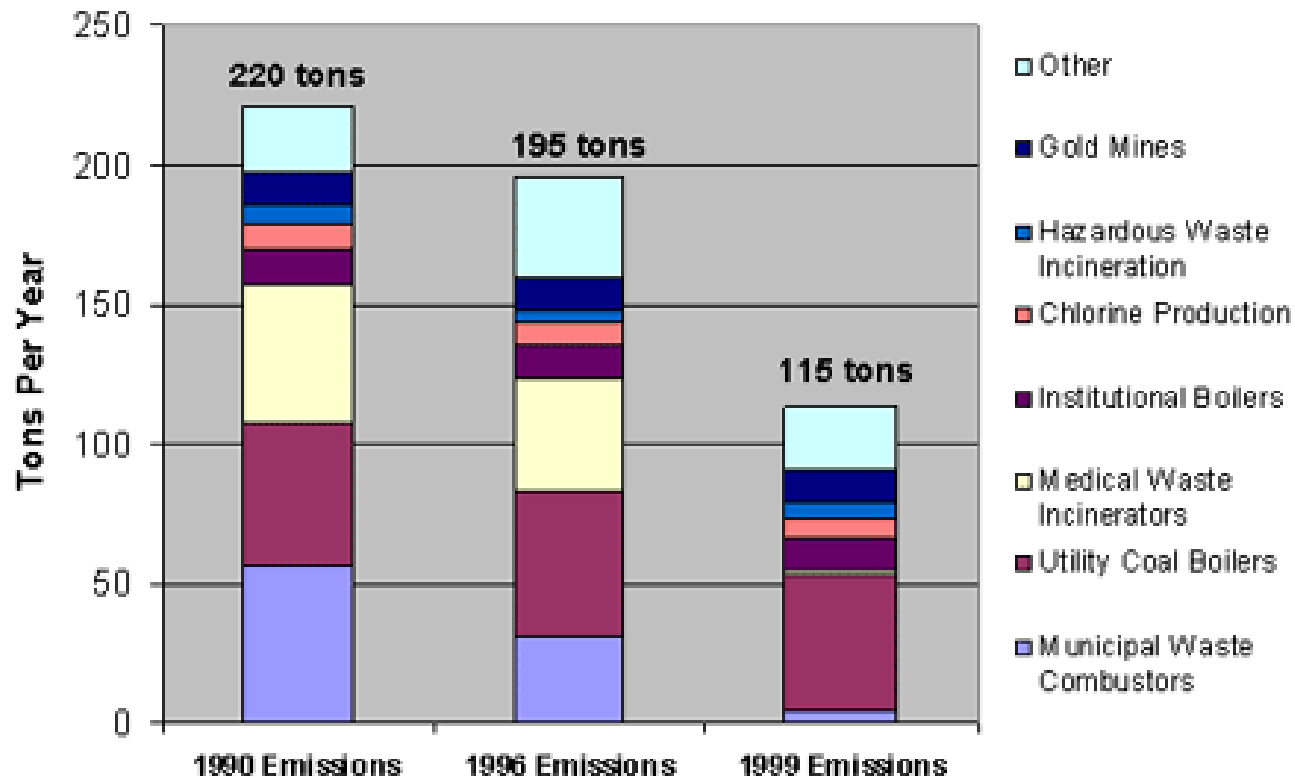
Regulatory



**Non-Regulatory
(Pollution Prevention)**



U.S. Emissions of Human-Caused Mercury



Mercury Emissions from Power Plants

- Power Plants are Largest Man-Made Air Source in U.S.
- Mercury is Natural Component of Coal
- For Fate and Transport, Chemistry is Key
 - Hg^0 versus Hg^2
 - Chloride Content
 - Not All Coal Created Equally
- Emissions Contribute to “Global Pool” But...
Are Likely Local Contributors as Well
- Emissions From Plants Being Addressed by
Clean Air Mercury Rule





Clean Air Mercury Rule

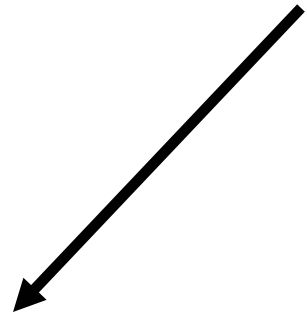
- EPA Rule to Control Mercury Emissions from Coal-Fired Electric Utilities
- New Source Performance Standard (CAA Sec. 111)
- National Cap on Emissions, Phased Reductions
- States or EPA Distribute Mercury Allowances to Facilities
- Allows for Mercury Emissions Trading (“Hot Spots”)
- States to Develop Plan of Action for Allowances by November 2006



Colorado CAMR

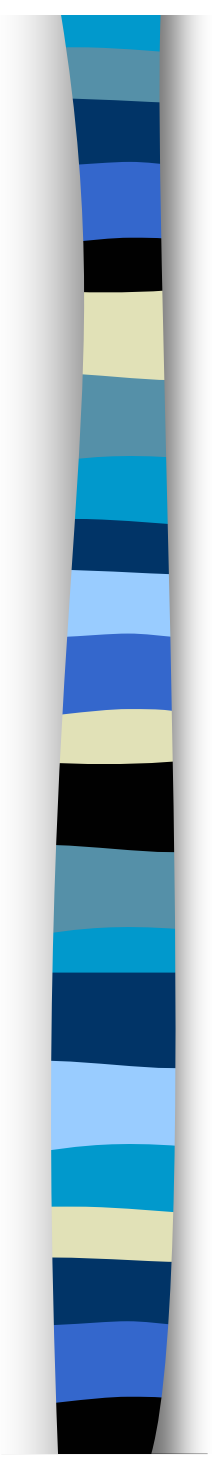
- One of the more aggressive reduction programs in the U.S.
- All mercury allowances come to State for distribution
- State distributes only what are needed
- Power plants cut emissions beginning in 2012 (80%); all facilities reduce by 2018 (90%);
- Extensive mercury monitoring requirements of facilities
- Creates “Colorado Citizens’ Hg Reduction Trust”
- Plan is currently with EPA for review and approval

Addressing Mercury



Regulatory

**Non-Regulatory
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Fish Tissue Sampling Activities

- Fish Consumption Most Significant Pathway of Exposure
- CDPHE with 5-Year Game Plan to Monitor Waterbodies
- To Date, Sixteen Waterbodies Contain Fish with Mercury Concs. Above Levels of Concern (1 in 3)
- CDPHE Water Quality Working with Div. Of Wildlife and DCEED to Post Consumption Advisories
- CDPHE also Working to Identify Sources of Mercury and Eventually Secure Reductions, As Feasible
- **First Phase TMDL Developed for Several Waterbodies**
REGULATORY DRIVER





TMDL Development

- Process to apportion mercury from various source categories
- Estimates reductions needed from each category to meet WQ standards- $[\text{Hg}]_{\text{fish}}$
- Has significant implications for regulatory development
- To date, only two TMDLs prepared for Colo.
- Third under development



Estimated Loading of Phase 1: McPhee

- Natural Background (soils)
- Legacy Mining (Rico/Silver Creek, Dunton, and La Plata)
- Air Deposition (local power plants and global pool)



Other Colorado Strategies and Considerations

Colorado Biomonitoring Activities

- Developing Hg Biomonitoring Program
- Over 6000 public health records (blood and urine samples)
- Deidentifying data (HIPPA), enter in database
- Analyze through GIS for patterns (space and time)
- Outreach strategies: sensitive populations, geographical areas
- Control strategies?

Lessons Learned with Mercury

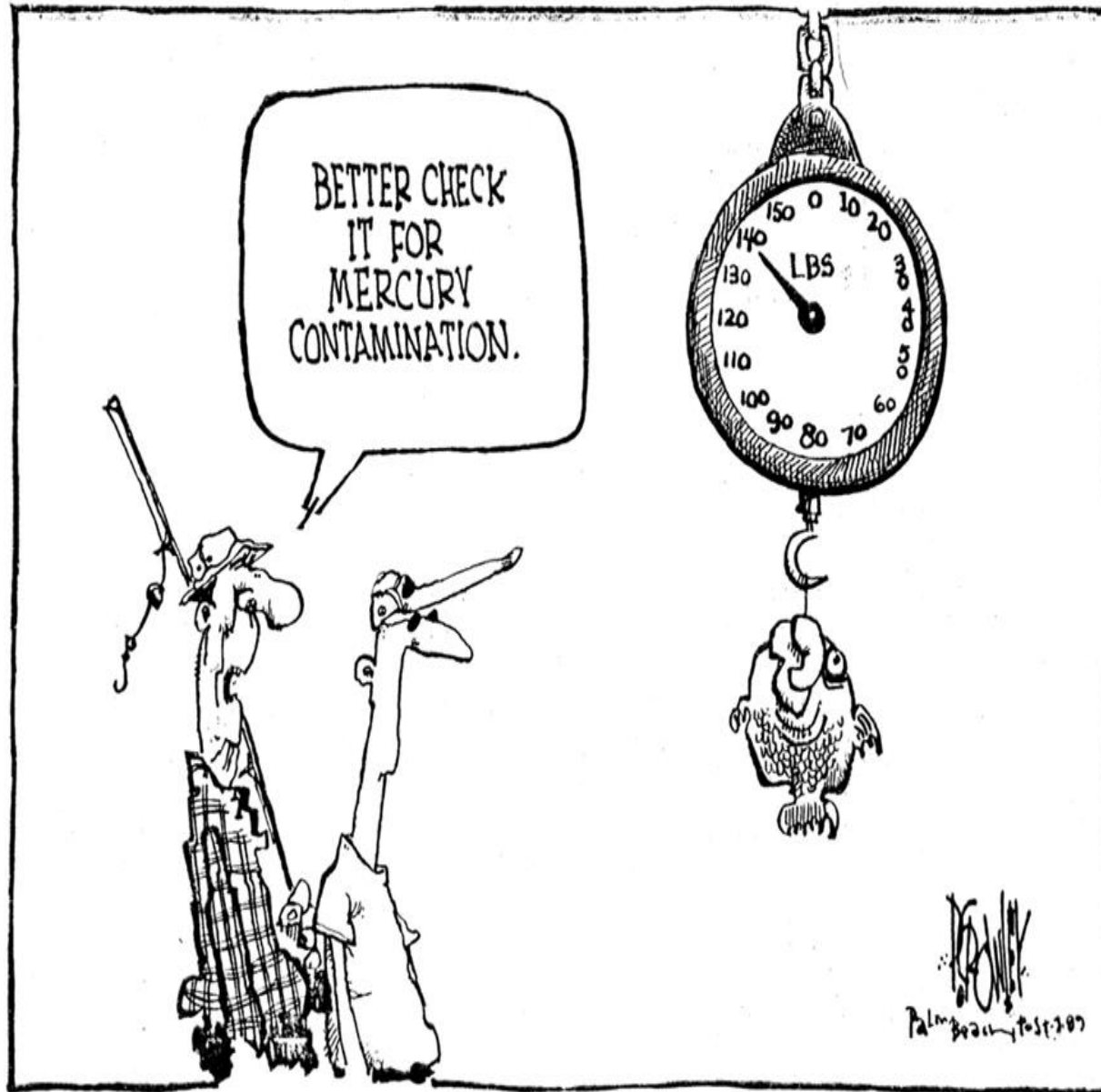
- Protection of Public Health First Priority (FCAs)
- Data Continue to Come In, Drive Decisions and Next Steps
“Scientific Evidence/Support”
- Fate and Transport of Emissions Are Challenging
- Improved/ Expanded Monitoring (Air and Water) May Be Necessary, e.g., Dry Deposition
- Solutions Can be Multi-Faceted and Cross Media in Nature



Closing Comments

- Mercury Challenge to be Here for Long Time
e.g., *CDC Report on Environmental Exposures*,
Expanding Human Activities
- Many Areas of Opportunity (P2 and Regulatory)
- Mercury Program Reductions With Some Success
- May Need to Do Much More in Reducing Mercury to Meet
Public Health Mandates





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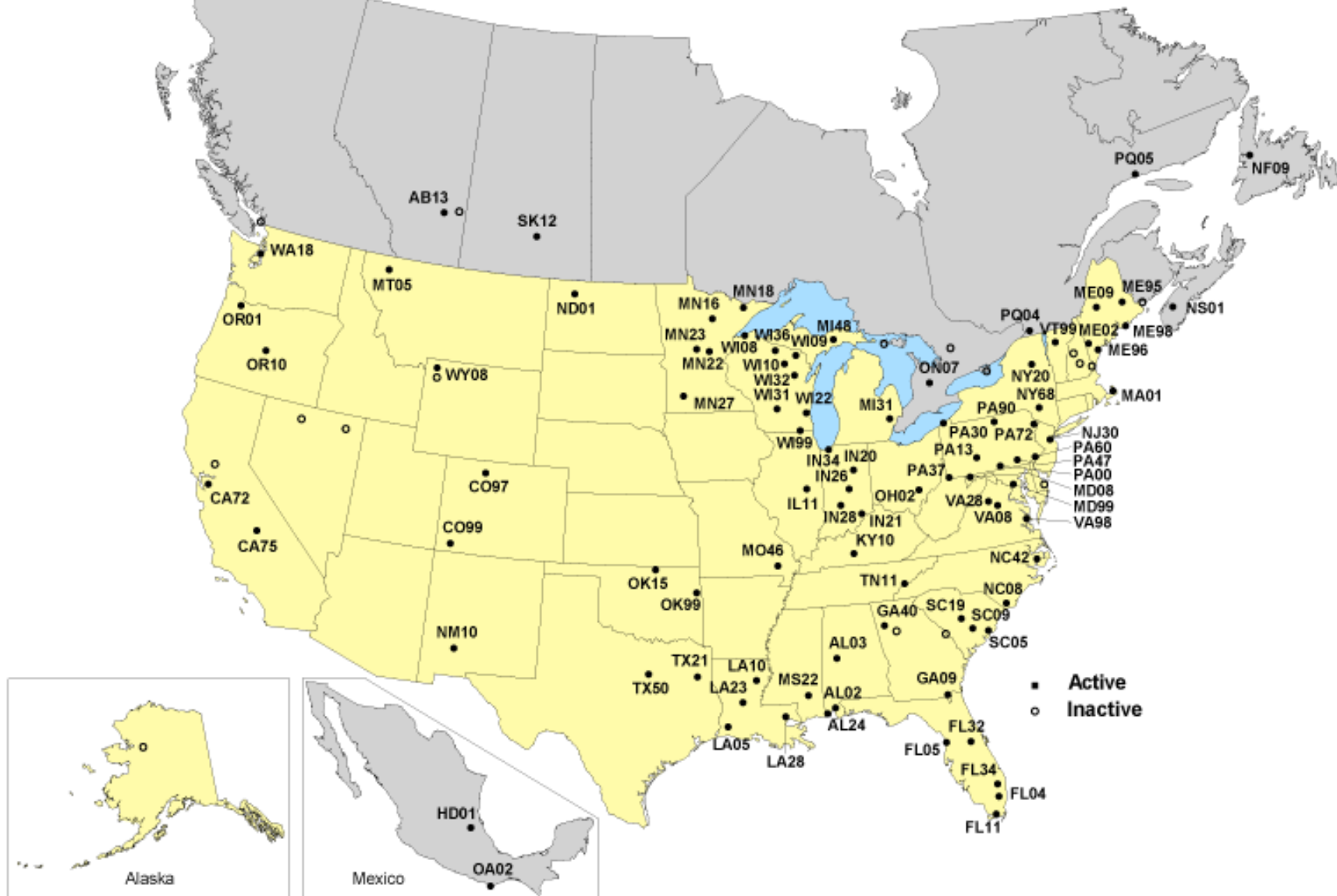
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Supplemental Slides

National Atmospheric Deposition Program Mercury Deposition Network





General Mercury Deposition Observations

- Mesa Verde Site with Some of the Highest Air Deposition Rates in U.S.
- Deposition Values Are Highly Variable
- Variability May Imply Importance of Local and Regional Mercury Sources
- “Hot Spots” for Mercury Are a Real Possibility (Local Waterbodies With High Mercury in Fish)
- Dry Deposition of Mercury Is An Issue
 - Needs Further Understanding