Collaborative Interagency Efforts in Sampling, Analyzing, and Developing Models for Arsenic and Methyl Mercury Detection in Florida

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Overcoming Barriers to Collaborative Interagency Efforts

- **Barriers:**
  - egos or turf wars
  - upper management may have other priorities
  - differences in methods/SOPS
  - difficulties in planning, meeting, organizing, communicating
  - other barriers?

Introduction to Florida Collaborative Interagency Efforts

- Specific agencies or agency sections – areas of expertise that can be coordinated to accomplish critical projects.

- Two examples of Florida developing, planning and completing projects by collaborating with intra-agency sections, other agencies (state, federal, local), or consultants.

- This often involved
  - unofficial partnerships based on interest in the issue
  - collaborative design
  - highly-coordinated planning requiring good communication
  - legal contracts
  - shared QA and data management responsibilities

Methyl Mercury Project - Background

- **1. Statewide Florida freshwater mercury Total Maximum Daily Load** (TMDL) development **required by 2011**

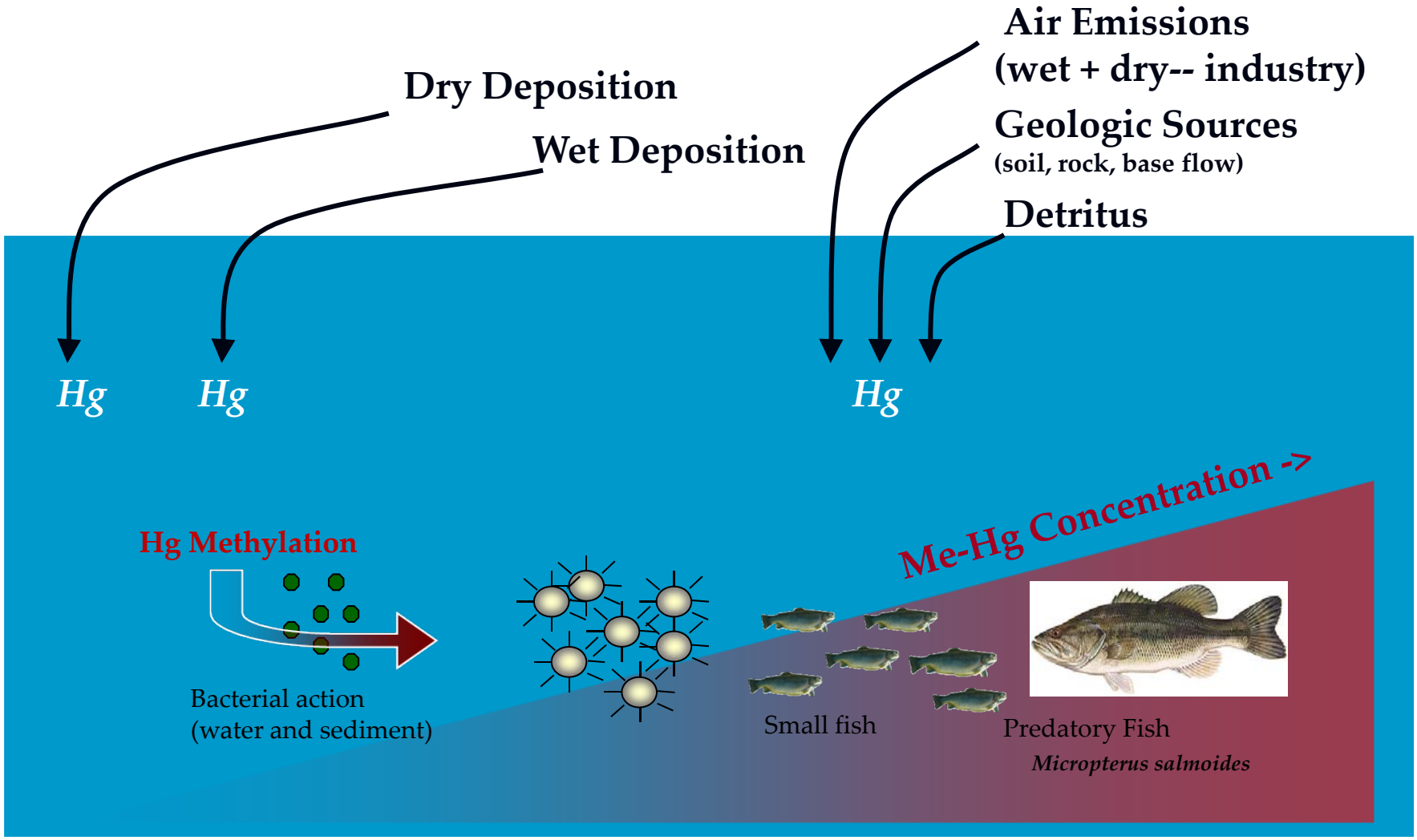
- **Most mercury deposition** in terrestrial and aqueous systems first **confirmed as atmospheric in 1980s**; noted in SE Florida wading bird study from 1990-2003
- (http:web.mit.edu/mitei/lfee/programs/saqass/2004/
- Atkeson-florida-mercury-science-program.pdf)

- Atmospheric deposition of mercury constitutes **one of the leading causes of water quality impairment in the US**

- **Watershed loads**
- **wet and dry deposition processes**

must be quantified to determine the total loading of contaminant to ecosystem

How Mercury Enters & Bioaccumulates in the Environment



Compliments of Lori Tilley
City of Jacksonville

Methyl Mercury Project – Basic Design

Major AQUATIC focus

examines relationship between local source emissions and deposition fluxes of mercury to resources.

- **Aquatic monitoring to collect**
  - fish (tissues) from largemouth bass/sunfish
  - water quality
  - sediments and field analytes/indicators

- **Modeling to determine relationship between**
  - mercury concentrations in largemouth bass
  - mercury inputs to freshwater aquatic systems (water & sediments)

Methyl Mercury Project – Basic Design

Major ATMOSPHERIC focus

- identifies local and global source emissions (isotope analysis)
- determine source % of each

➢ **Atmospheric monitoring to collect**

- residue from atmospheric samples (dry deposition)
- residue from precipitation (wet deposition)

➢ **Modeling to determine relationship between**

- mercury concentrations from atmospheric samples
- mercury inputs to freshwater aquatic systems (water & sediments)

How many entities does it take to collaborate on a Mercury TMDL?

Florida Mercury TMDL Project Team comprised of:

- **2 state agencies (1 has 5 sections participating)**
- **1 university**
- **3 consultants/subcontractors (1 international)**
- **2 EPA offices**
- **7 federal, local, municipal, or private entities**

Florida Mercury TMDL Project Team

FDEP Standards & Assessment

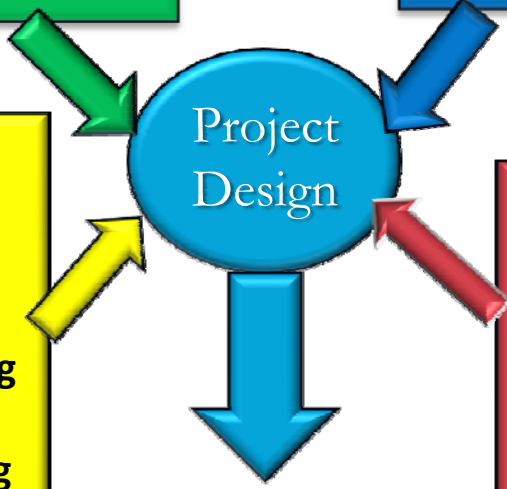
Research, analysis, indicators, metrics, & criteria development

- identified Florida MeHg issues
- forged longstanding partnerships with Hg and MeHg researchers
- developed and manages MeHg contracts

FDEP Watershed Monitoring

Monitoring design: water quality & sediments, QA

- recommended sampling sediments to complete study
- adapted field data and sediment sampling protocol
- developed sediment blanks protocol



University of Michigan

atmospheric monitoring project design, modeling, managing contracts

- designs atmospheric monitoring plans
- develops atmospheric modeling
- manages subcontractors & consultants

Consultant1

nutrient & trace element cycling (mercury) in aquatic ecosystems

- designs aquatic monitoring programs
- develops aquatic modeling

Developed with statistical analysis in mind

Florida Mercury TMDL Project Team

Florida Fish & Wildlife Conservation Commission

Fish & wildlife monitoring & conservation

- samples 256 waterbodies for water chemistry and largemouth bass/sunfish

FDEP Watershed Monitoring

Water quality sampling, sediment sampling

- samples 128 lakes for field parameters and sediments

Consultant2

Particulate sampling expertise

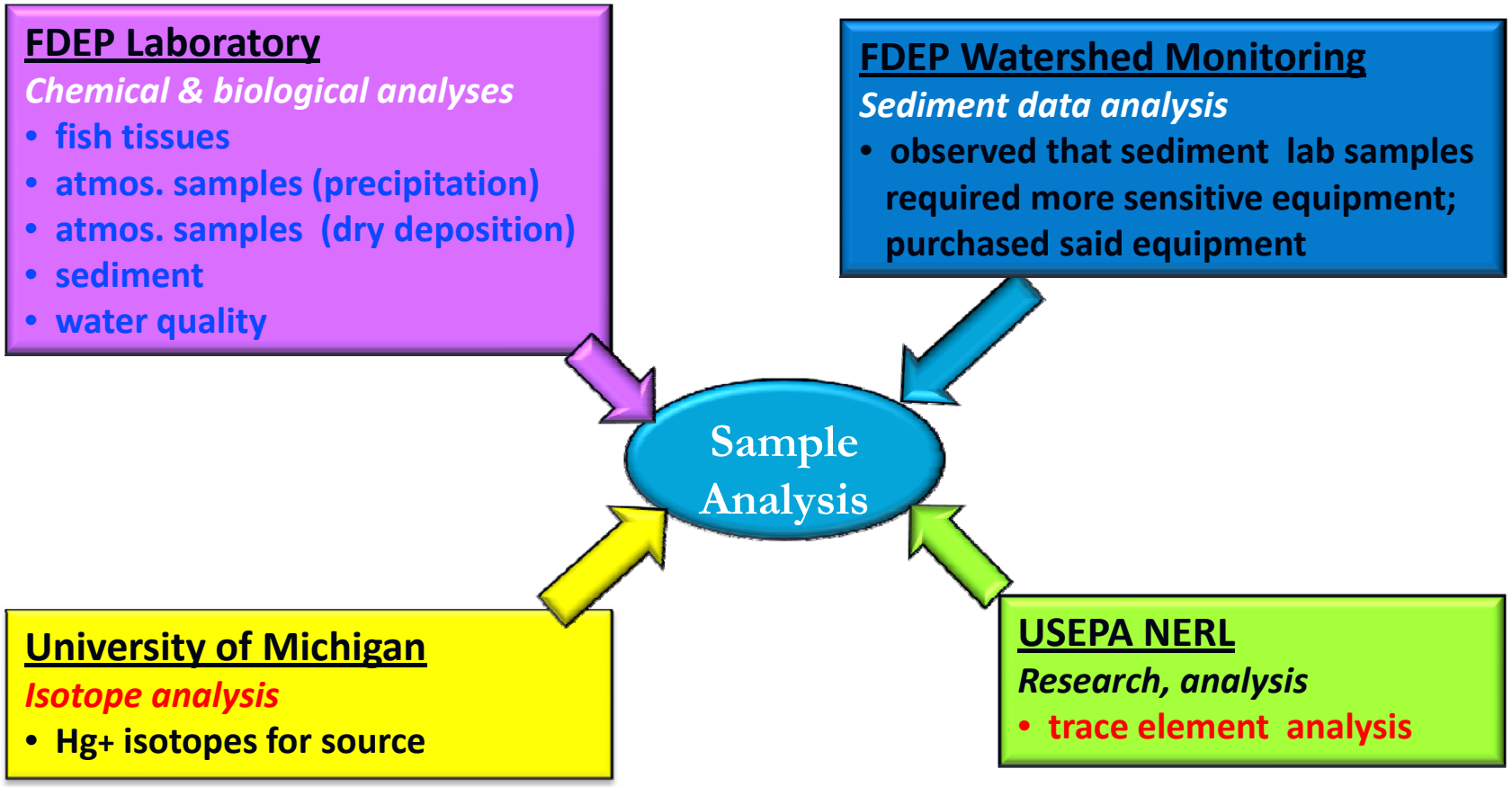
- samples 17 sites around the state for wet & dry deposition
- coordinates sampling with other sampling entities

Local/County environmental Resources depts.

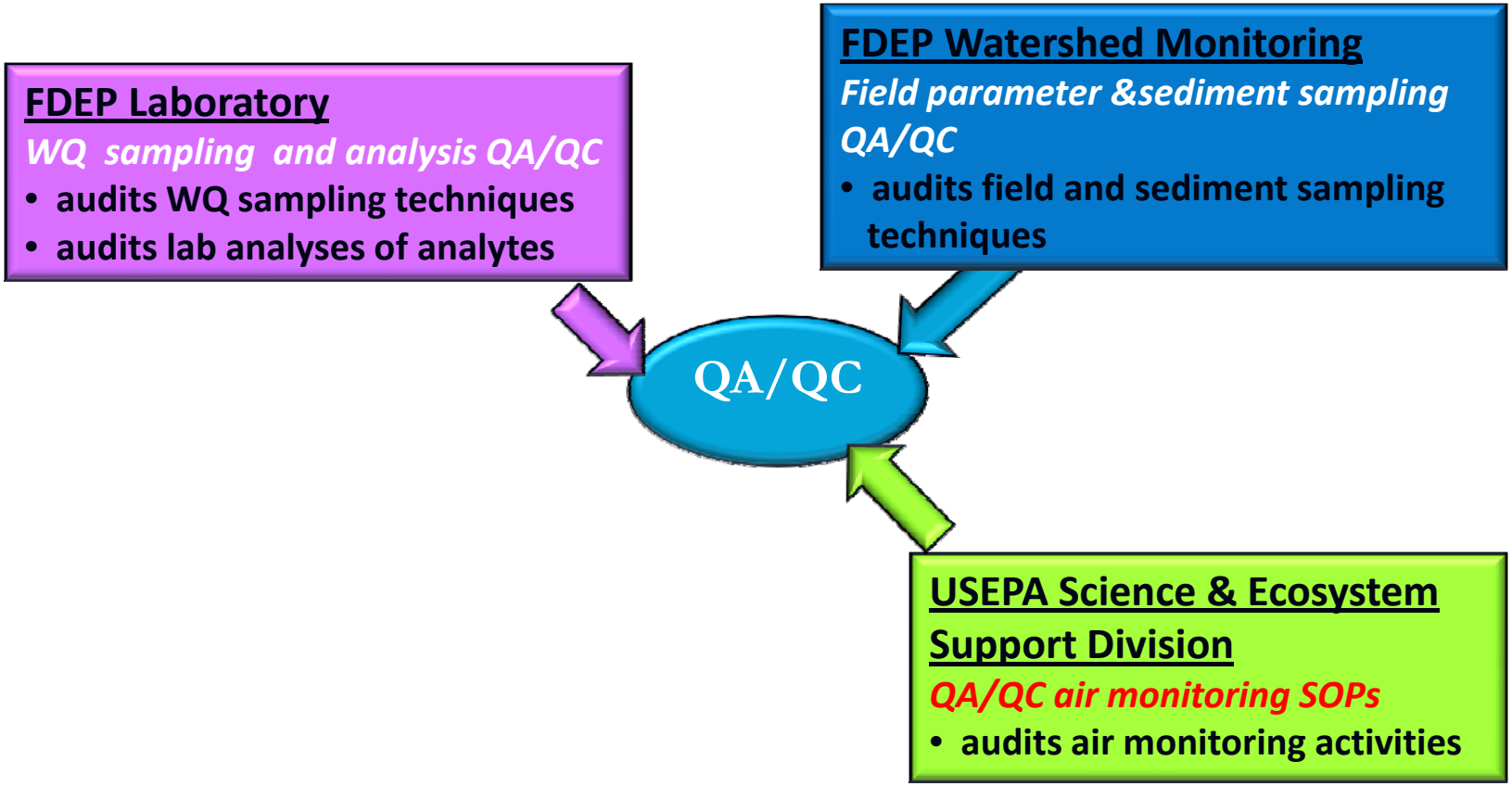
Particulate sampling sites

- provide or operate 17 sites around the state for wet & dry deposition samples

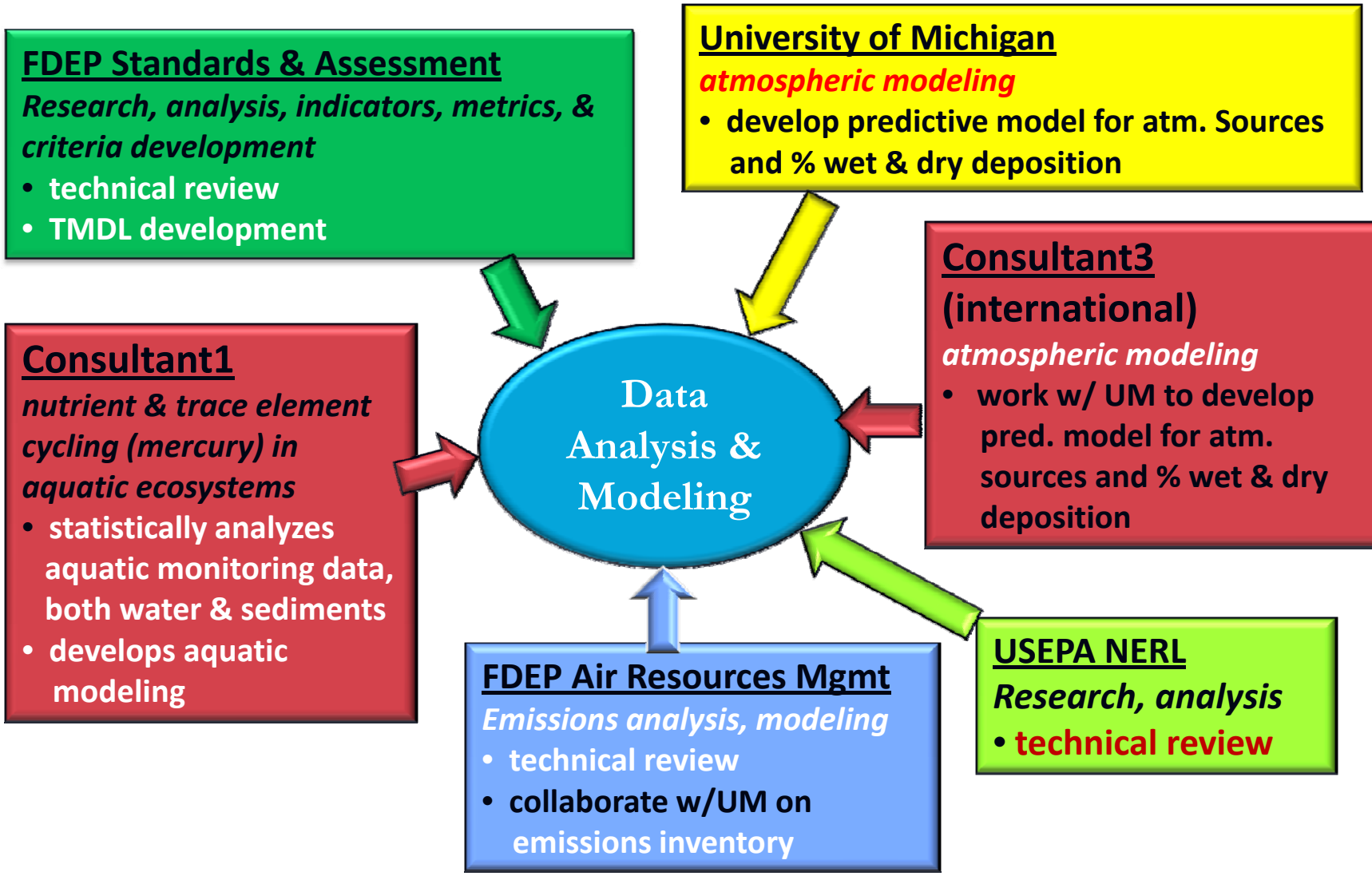
Florida Mercury TMDL Project Team



Florida Mercury TMDL Project Team



Florida Mercury TMDL Project Team

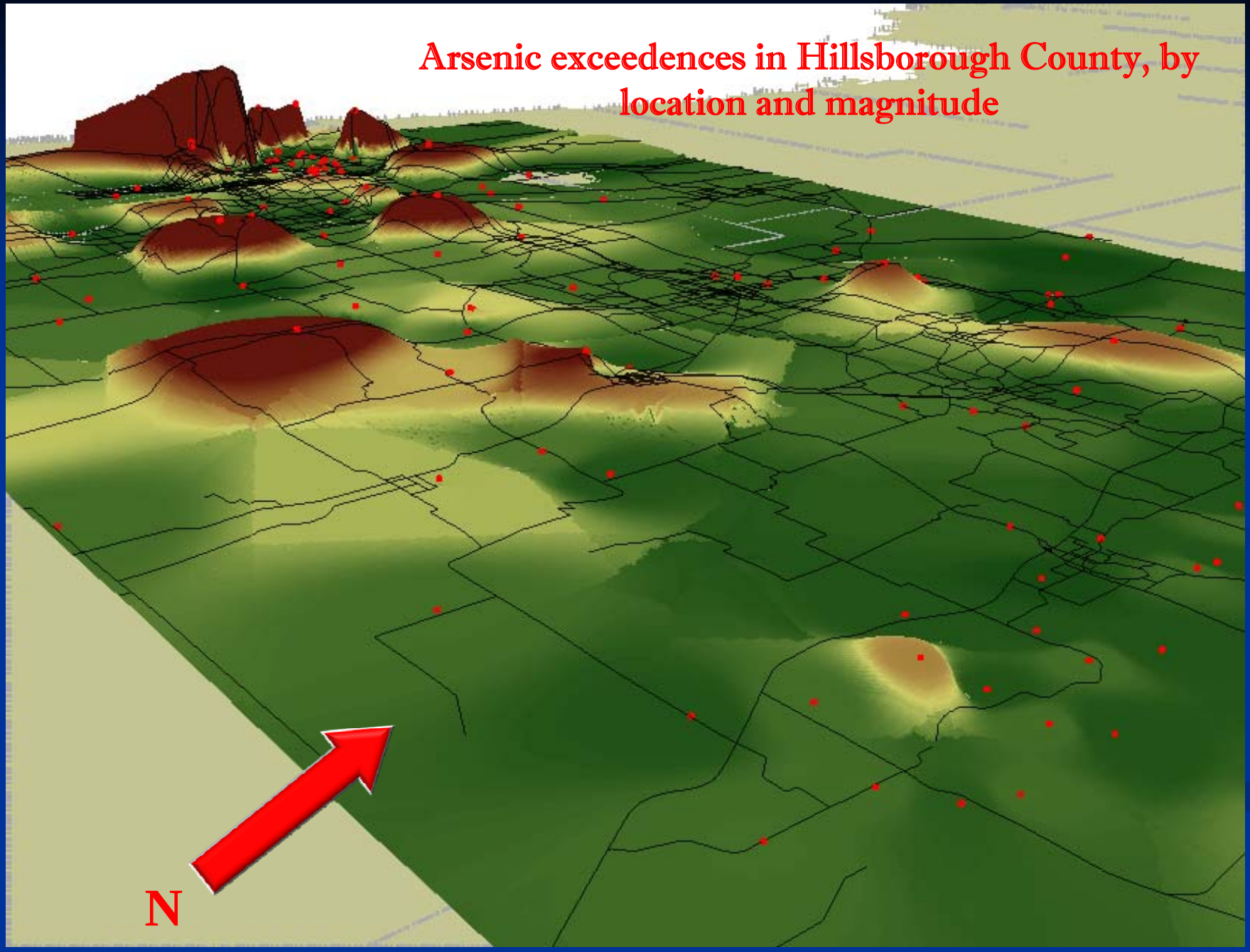


2. Problem: arsenic found in high levels (>10 ug/L) in groundwater NE, SE, SW Florida

- **Potential anthropogenic sources (applied):**
  - citrus groves
  - cotton fields
  - cattle dipping vats
  - golf courses
  - contaminated wells

- **Potential natural sources:**
  - Pyrite
  - Powellite (in SW Florida only)

- **Potential anthropogenic release of naturally-occurring arsenic:**
  - Aquifer Storage and Recovery (ASR)
  - Overpumping of wells
  - Mining


Arsenic exceedences in Hillsborough County, by location and magnitude
N

Arsenic in Groundwater Study: Southwest Florida

Questions to be answered by the study:

- **Do water levels significantly affect arsenic concentrations in groundwater?**
- **Does land use significantly affect arsenic concentrations in groundwater?**
- **Does aquifer lithology significantly affect arsenic concentrations in groundwater?**
- **Do the interactions of the three factors (aquifer lithology, water levels, land use) significantly affect arsenic concentrations in groundwater?**

Arsenic in Groundwater Study: Southwest Florida

Scope and Extent

- 4 counties
- Phase I
  - obtain representative lithologic cores
- Phase II
  - sample different aquifers (surficial, intermediate, Floridan)
  - sample wells with low & high arsenic levels
  - sample wet & dry season groundwater
  - obtain current & historical land use data
- Phase III
  - Compare lithologic & geochemical data
  - Develop predictive models

Arsenic in Groundwater Study: Southwest Florida

Cooperatively-funded and –executed effort of:

- **Florida Dept. of Environmental Protection**
  - **Groundwater Section**
    - **funded collaborative study**
    - **provided well datasets for probabilistic WQ monitoring design**
  - **Florida Geological Survey**
    - **designed 3 phase study to answer questions**
    - **drilled and analyzed lithologic cores**
    - **funded WQ sampling and analysis**
    - **will analyze WQ data and compare with core data to develop model for answering questions**

Arsenic in Groundwater Study: Southwest Florida

Cooperatively-funded and –executed effort of (cont'd)

- **Florida Dept. of Environmental Protection**
  - **Watershed Monitoring Section**
    - organized, coordinated, and conducted sampling of 48 wells in both dry and wet seasons
    - developed protocols and orientation for samplers
    - performed site reconnaissance
    - provided QA/QC
    - reviewed and loaded data
  - **DEP Southwest District**
    - provided backup sampling

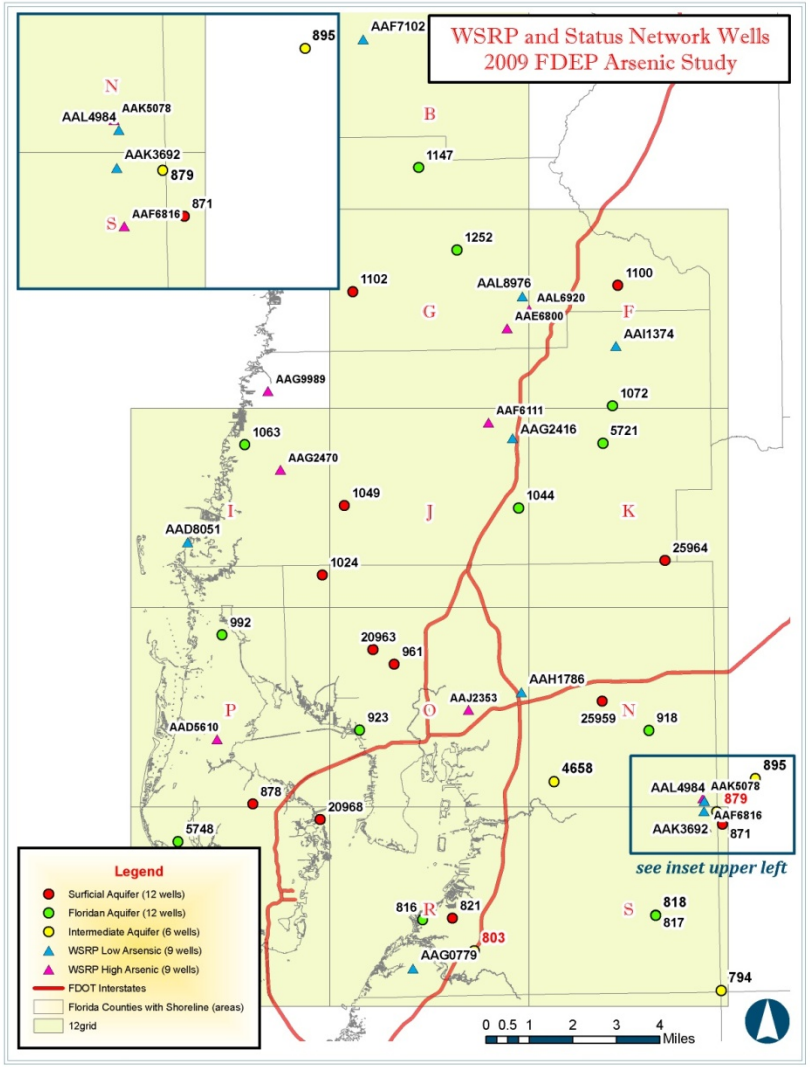
Arsenic in Groundwater Study: Southwest Florida

Cooperatively-funded and –executed effort (cont'd)

- **Southwest Florida Water Management District**
  - funded collaborative study
  - conducted sampling
- **Activation Labs (NELAC certified)**
  - analyzed all water quality samples for
    - Major cations (Ca, Mg, Na, K)
    - Major anions plus (Alkalinity, Cl, SO4, PO4, TDS, Temp, pH, DO, Sp. Cond.
    - Trace metals (50 metals - research grade)

Arsenic in Groundwater Study: Southwest Florida

- **Update**



In summary . . .

Solutions to collaboration/cooperation barriers

- understand that collaboration
  - ensures best use of resources
  - allows "expert" entities to contribute what they do best
  - increases standing and profile in monitoring community
- keep upper management in loop
- provide training and QA, which can overcome differences in methods and SOPs
- use current technologies to overcome communication barrier - webinars, remote netmeeting software, teleconferences, e-mail, ftp sites, cell phones
- solutions to other barriers?

Take Home Message

Pros of coordinating and collaborating on critical programs:

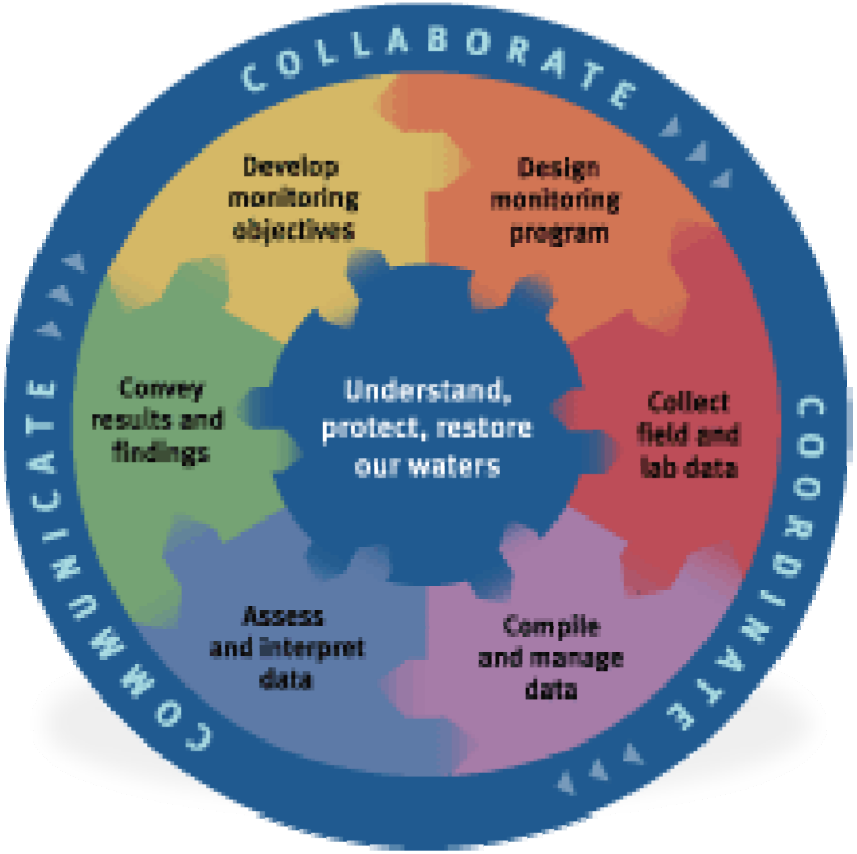
- **Uses each entity's knowledge, skills, and abilities**
- **Maximizes resources**
- **Enriches the project or study**
- **Can help meet short deadlines**

Cons:

- **Many participants –more opportunity for misunderstandings and miscommunication**
- **Each participating entity must know exactly what's expected and when it's expected**

Take Home Message

- Recommend dedicated position for oversight/management
- Requires timeline and good organization
- Requires constant communication
- Document via written communication (e-mails, spreadsheets, maps, text messages, web pages, reports) to complement spoken agreements
- Check progress on a regular basis
- Address details up front. . . .(Lab MDL? mg/L or ug/L? Whose QA?)



Questions?

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