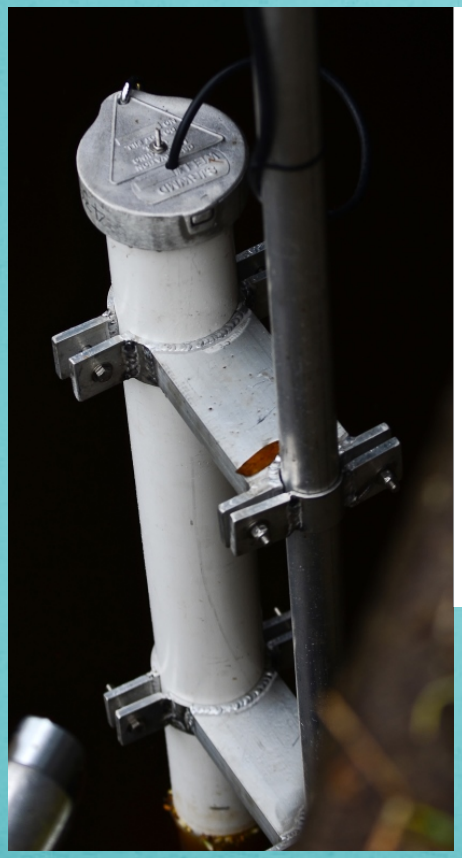
Continuous Monitoring

March 2016 Q-Meeting



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Continuous Monitoring SOP
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Thanks in advance to all the WMDs for letting me borrow their photos

Why is continuous monitoring important?

- **Florida dissolved oxygen water quality standard (**Chap. 62-302.533, F.A.C)

- **Supports state agencies'**
  - Water resource modeling
  - Hydrologic condition reporting (GW)
  - Performance monitoring (restoration & resource management projects)
  - Real-time springs data

DEP Uses of Continuous Monitoring Data

Dissolved oxygen water quality standard (Chap. 62-302.533, F.A.C)

- ***Allows*** for CM instead of grab sampling for Class I, Class II, Class III and Class-III Limited Waters

  - **predominantly freshwaters:**
    - Class I, Class II, Class III and Class-III Limited Waters- a time of day translation is required for lakes and streams

  - **predominantly marine waters:**
    - Class II, Class III and Class-III Limited Waters- at least 3 full days of diel data collected either for a
    - 7-day average DO % saturation
    - 30-day average DO % saturation

- Transitional zone DO assessments

*A full day of diel data shall consist of 24 hours of measurements collected at a regular time interval of no longer than one hour."

DEP Uses of Continuous Monitoring Data (cont'd)

- **Salinity regimes**
  Understand tidal systems

DEP Groundwater Protection Section

- Contracts with WMDs & consulting firms to monitor
  - rain events and agricultural activity near selected springs
  - groundwater seepage into surface waters – tracks septic system effluent

DEP Florida Coastal Office (formerly CAMA)

- Aquatic Preserves and National Estuarine Research Reserves (NERRs) use YSI 6600s and YSI EXO 2 sondes to collect coastal and estuarine data (field measurements)

- Follows NOAA SOPs

What is continuous monitoring?

DEP defines Continuous Monitoring as **"data collected over a time series using a recording device".**

"a methodology that utilizes sensors connected to data loggers and provides multiple results of a given characteristic, spaced at pre-determined time intervals" (NWQMC Aquatic Sensor workgroup).

In-line samplers and meters used for drinking and wastewater may also be referred to as "continuous monitoring".

Most CM systems have 3 functional parts

- main body called a sonde,
- variety of sensors
- data storage mechanism

- internal datalogger as part of the sonde;
- a computer (above water) connected by cable;
- radio transmitter with a receiving station elsewhere.

Continuous Monitoring Data

- Field parameters/measurements
  - Dissolved oxygen, temperature, salinity or conductivity, pH
  - Flow

YSI EXO2


Cycle PO4

- Water quality analytes
  - Chlorophyll-a
  - nitrate+nitrite
  - turbidity

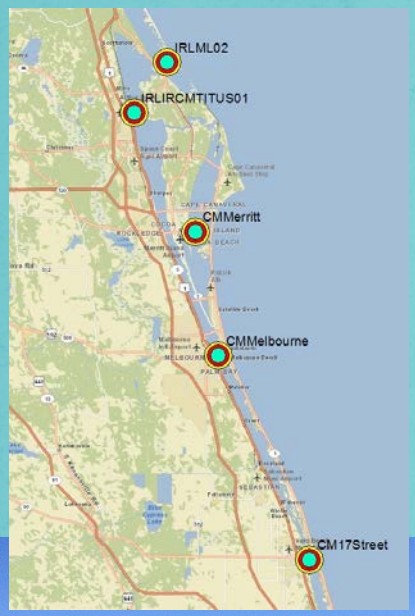

SUNA V2

Continuous Monitoring: Challenges

(from January 2015 Florida Water Resources Monitoring Council meeting)

1. Appropriate deployment
2. Lack of formal protocols
3. Operation & maintenance requirements/costs
4. Data management and sharing

Appropriate Deployment



- useful for learning about ecological & hydrological systems;
- "provide the foundation for a more comprehensive evaluation of the variability in loading characteristics and water-quality degradation than provided by discrete water-quality samples" (Rasmussen et al, USGS, 2003);
- Useful for obtaining "deep" data over a short period of time;
- verifies whether conditions are static or cyclical over time, or change during/after an event.

Lack of formal protocols

- No current state SOPS; QA/QC and SOPs are at various stages of development and approval;
- These vary by instrument and monitoring entity;
- Most methods used for measuring analytes not approved by EPA or DEP
- For QA/QC, agencies in Florida currently use :
  - monthly grab sampling
  - telemetry to allow near real-time data checking for outliers, or anamolous data
- NOAA and USGS have time-tested, formalized SOPs, training, audits, and annual evaluations;

Operation & Maintenance Costs

algae

- Tend to be expensive; cost from $5,000 - $14,000/unit;
- Require at least 1-2 FTE to install, service, and maintain, depending upon the numbers of sites.
- Most devices must be retrieved or serviced every 2-3 weeks

corrosion

Operation & Maintenance Costs

- Most are susceptible to biofouling or vandalism, depending on device placement;
- On their own, agencies have developed "jackets" or enclosures to minimize biofouling

barnacles

Data Storage & Sharing

- Lack of approved SOPs and QA/QC protocols can inhibit data comparability between programs;
- CM collects more data points over time than other sampling methods; data require additional resources for storage, management, and analyses.
- SJRWMD: uses Hydstra to both evaluate and manage CM data. Has real-time data available at http://webapub.sjrwmd.com/agws10/hdswq/
- SWFWMD: uses internal db for CM data. Real-time springs data at http://www.swfwmd.state.fl.us/springs/
- NOAA: uses CDMO

DEAR CM initiatives

- DEAR CM workgroup;
- AEQA conducting analyses of grab sample/CM data from around the state;
- Funding additional CM evaluations of appropriate deployment uses;
- Funding Aquarius software to store/analyze CM data until the Watershed Information Network (WIN) is ready to accept CM data

DEAR CM Workgroup

- Jessica Mostyn, Ben Russell, Michael Blizzard, Jon Turner, Cheryl Swanson, Lisa Van Houdt, Gary Payne, Brian Katz, John Kaba, Chrissy Rakowski, Kate Muldoon.

- Compiling & reviewing SOPs, papers, methods and information from other sources that use CM devices:
  - NOAA
  - USGS
  - Washington state
  - British Columbia
  - NWQMC Sensor Group http://www.watersensors.org/

- Over last 6 months, developed draft general CM SOP
  - Recording-keeping & documentation;
  - Minimum calibration requirements;
  - Optional comparison with grab sample measurements;
  - Preventative maintenance

Information Exchange on Concurrent Efforts

- Florida Water Resources Monitoring Council CM workgroup
  - Composed of WMDs, DEP, Ocean Research & Conservation Association, FCO reps;
  - Held first meeting in January 2016;
  - Collecting additional information on deployment, QA/QC, operations & maintenance, models, and data storage among monitoring entities in Florida;

- DEP Florida Coastal Office currently uses NOAA procedures & SOPs; has proposal to develop learning module for CM use.

CM: Next Steps

DEAR CM workgroup

- meeting with Division for draft SOP review
- potential inclusion in QA rule (2017)
- focusing next on
    - data management
    - pros/cons of different models for different purposes

Florida Water Resources Monitoring Council CM workgroup

- plans to post CM use information on common site to inform Floridians

Questions???

Convict Springs, Lafayette County
--courtesy of Suwannee River WMD