Environmental Monitoring Platform - Current Status

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Outline

• Ideas and concept
• Type of equipment
• Designing the trailer
• Putting the equipment together
• Communication with the trailer (Dave)
• Current Status – moving forward
Why not continue with grab sampling programs?

• Limitations inherent with traditional grab sampling
  – Sample collection usually decided by factors not based on water quality – Availability of personnel, summer students, program schedule (once a month, once a quarter, etc)
  – Very few samples collected on week-end or during night-time
  – Few samples collected during storms – most SOPs tell you to avoid going out when weather is bad…

• Limitations with current event-based sampling
  – When an event triggers sampling, it’s chaotic to get samples to the laboratory without the sample being compromised
Design of an Environmental Monitoring Unit

- Easily moveable with typical work truck
- Appropriate size for field work
- Refrigeration capabilities
- Quick deployment and removal
- Flexible floor space for different uses
  - Mobile field laboratory
  - Enforcement support
  - Mobile real-time station
  - General all-purpose trailer
- Secure storage of the equipment
- Advanced communication capabilities
Monitoring Equipment List

• Water Quality Sonde(s)
  – Basic WQ parameters (Hydrolab, YSI)
  – Advanced WQ parameters (s:can)
• Air Temperature and Humidity
• Rain Gauge
• Wind Speed and Direction
• Flow/stage measurement
• Autosampler(s)
• Refrigeration Unit
• …more to come as we start using it
A pilot study…

• Conceived on the back of a Napkin – Cook and Pomeroy (mid-2008)
• Student did preliminary research summer 2008
• Commercial Trailer purchased and modified fall 2008
Final Trailer Version
• Engineered to be safe and durable
Setting up the Trailer

• Plan of attack
  – Use the CR1000 Data Logger as ‘Central Command’
  – Connect the Air Monitoring Equipment
  – Connect the Realtime WQ Sonde
  – Connect the Autosampler(s)
  – Establish Communication with logger
  – Design interface to read the data
  – Design field deployment tubes
  – Deploy in field
Equipment is received...
Logger as Central Command…

» A few simple connections and you're on your way
…Relax, it’s plug and play
Issues we faced

- Air Monitoring Sensors need a cable 30’ long to reach top of the trailer – most did not have required length
- Need way to attach sensors to the top of the pole without climbing on top of trailer – safety issue
- Autosamplers are not ‘accustomed’ to taking external directives – needed special cable and lots of trial and error to get it to work
- Wanted to be able to quickly get the equipment in and out of the trailer for multiple uses within our dept.
- Others on a daily basis…
Attaching Air Quality Sensors

- External square tube
- Manufactured aluminum pole to mount sensor in square tube
- Hole for autosampler, tubes, and real-time probe(s) cables
- Square aluminum pole to attach sensors
- Hole for sensor cables
External Directions to Autosamplers

- Autosamplers usually don’t take directions from external logger
- Custom cable required
- Trial and error eventually achieved success.
Quick Set Up of the Logger Inside the Trailer

• We wanted to be able to quickly remove all equipment from the trailer for other uses.
• Did not want to permanently attach anything to the sides of the trailer.
• We did not want the logger/cables to be on the floor of the trailer when in use.
• Creative thinking caps on and…
Communication with the trailers (Dave)

- Controlling trailers remotely
- Technology used
- Specifics on how it works
- Real life scenarios
Distance Issue

Maintenance Required + Distance to Site = Major Time and Data Loss

- Trailer is multifunctional (many potential changes needed)
- Need to have control over trailer at all times.
- Need to know what’s going on at all times.

- Usually long distances.
- Travel is costly.
Solution: Remote Communication
Virtually There

- View live weather data
- View live water chemistry data
- Visually see weather using a remote camera.
- Get alerts when special event occurs
- Fix problems in real time.
- Make updates to control how system performs.
How It’s Done / What We Can Do

• Data Logger: more than just a “logger”.

• Data Logger has programs that control:
  1. When sensors take and/or store readings
  2. Tell autosamplers to take a sample
  3. Store data on specified time intervals
  4. Send an alert (sample is taken or problem occurs)

• Connect to Data Logger from office using Loggernet.

• Once connected we can:
  1. View live data
  2. Download data (can be automated)
  3. Modify program running on Data Logger.
Scenarios

• Triggering samples on rain events
  - 20mm one day same effect as 7mm over 3 day period.

• Triggering samples based on water chemistry changes.
  - Water Chemistry at different locations may mean different things.
  - Lower fluctuations of different parameters may mean different things at different sites

• Vandalism
  1. Motion sensor triggers series of pictures.
  2. Logger sends alert to office, we check pictures, determine action.

• Temperature inside trailer out of range.
  - We need to preserve samples.
  - If out of whack, travel there to fix.
Potential Deployment of the Trailer (Don)

• Location/Issue will ultimately decide how the trailer is configured to do the monitoring...

• Potential for several events at one location by having several autosamplers in the trailer

• Potential for one event for several locations by having several real-time probes and autosamplers

• Potential for one event for several depths by having several real-time probes and autosamplers

What do you do if you want to sample here??
Need for Floating Dock/Platform

- To deploy at several locations/depth in river/lake, we need some sort of floating dock or platform that we can anchor in place
- Platform needs to be heavy enough to bare weight of real-time probe(s) and potentially solar panel and battery to pump water back to the trailer
- Time to get creative again…
Design of Floating Platform

- Needs to be anchored – different lengths for different locations
- Needs to be stable in the water
- Needs to bear weight of batteries, solar panel, pump etc.
- Deployment of Sonde needs to be stable in water as well
- Quickly became apparent we need professional help…
Other Deployment Possibilities…
Conclusion

- Allows monitoring at targeted locations
- Allows for quick response to events
- Program visibility and profile raised to another level
- Flexible design allows for quick change out of trailer
- Made so that future technologies can be accommodated
Thank you!

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