Monitoring Technology

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Monitoring

• Design the technology to meet your goals, not the other way around.

• Consistent WHERE and WHEN

• ALWAYS check accuracy, and range.

• Remember Murphy Rules
Hydrologic
  Rainfall / Temp.
  Inflow
  Outflow
  Surface
  Subsurface
  Level
  Soil Moisture
Water Quality
  First Flush
  Grab Samples
  Automated
  Lysimeters

BioInfiltration Monitoring Interests

Note: Brand Names listed are examples – not endorsements
First..... Data Collection

• Considerations
  – Power
  – Communications
  – Accessibility
  – Amount of data (storage)
  – Moisture
  – SDI12
  – 4-20mA
  – 0-5V

Campbell Scientific CR 1000 = ENC 14/16
Texas Rain Gage

Item condition: Used
Time left: 4h 2m 1s (Mar 06, 2012 13:08:00 PST)
Bid history: 3 bids

Current bid: US $0.11
Your max bid: US $ [Enter US $0.16 or more]

Bill Me Later: $10 back on 1st purchase & 6 months to pay
Subject to credit approval. See terms

Shipping: FREE Expedited Shipping See more services ▼ | See all det
Delivery: Estimated between Fri. Mar. 9 and Sat. Mar. 10
Returns: 3 days money back, buyer pays return shipping | Read details

eBay Buyer Protection
Covers your purchase price plus original shipping.
Learn more

http://www3.villanova.edu/VUSP/
Rain Gages

- Tipping Bucket
- Weighing (heated?)
- Volumetric
Depth

- Measure
- Pressure Transducers
- Ultrasonic
- Bubblers

Campbell Scientific
Pressure Transducer

- Depth Range
- Sensitivity
- Minimum Measurement
- Freezing
- Calibration / Drift
  - Slope and Y intercept
  - Frequency
- Cable Length
- Temp. Correction
- Conductivity

Campbell Scientific
Ultrasonic

- Temperature
- Spread
- Bounce Pad
- Vertical
Level Measurement

- Potentiometric
- Measures Depth by electrical contact with probe
Float
Flow

- Orifice / Weir
- Flume
- Area Velocity
- Closed Channel

Moran, Hunt, Jennings 2003
Weir

- Can’t have backwater
- Leaves can get stuck
- Low flows (drips) are problematic
- Measure calm area upstream of weir
- ASTM
Flumes

- Can’t have backwater
- Limited range
  - (higher than weir)
- Leaves can get stuck
- Measure calm area upstream of weir

http://www.usbr.gov/pmts/hydraulics_lab/pubs/wmm/
Area Velocity

- Flow needs to be over sensor
- Low velocities difficult
- Bounces off particles in water.
- Silting is dangerous!
- Move away from exit...

Greyline
Weighing Lysimeters!
How a Mariotte bottle (constant head device) works

- air tube
- water-filled tube
- air
- water
- air bubble
- water drop

Dimensions:
- 5 cm
- 20 cm

Equations:
- \( H_g = +20 \), \( H_p = -20 \), \( H_i = 0 \)
- \( H_g = 0 \), \( H_p = 0 \), \( H_i = 0 \)
Soil Moisture

- Can tell movement of water
- Measures résistance
- Temperature
Field Capacity?

ET?

Wilting Point?

Field Capacity?
Water Sampling

Grab Samples
Automatic First Flush
Vadose Zone
First Flush Samplers

• ICHEM
Automated Samplers

- Versatile Configuration
  - Multiple Bottles
  - Controlled by Data logger
- Peristaltic Pump
- Can add instrumentation
- Power
  - Power

Hach – American Sigma
Soil Lysimeter

- Need to put suction and let draw in for several hours.
- Limited Sample
- Doesn’t Last Forever.
Finally Probes

- Hand held or long term
- Check
  - Detection limits
  - Calibration
  - WHAT it measures
- Easy
  - Temperature
  - Conductivity
  - DO? (optical)
  - Turbidity?

- Ammonia/Ammonium
- Blue-Green Algae
- BOD (Biochemical Oxygen Demand)
- Chloride
- Chlorophyll
- Conductivity
- Dissolved Oxygen
- Free Chlorine
- Nitrate
- Oil / Hydrocarbon
- ORP / Redox
- Photosynthetic Active Radiation (PAR)
- pH
- Resistivity
- Rhodamine
- Salinity
- Specific Conductance
- Temperature
- Total Dissolved Solids (TDS)
- Turbidity
- Photometer Parameters