Water Chemistry Sampling at Trust Fund Sites

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Standard Monitoring Requirements

- Water chemistry data collection protocols
  - Representative and comparable samples
- Required parameters for analysis
  - Trust Fund project data are comparable
- Minimum detection limits
  - Changes in concentration data can be distinguished
  - Assure that detection limits are lower than reference values for MD streams
Standard Collection Protocols

- Sampling of rising, peak, and falling limbs
  - All parts of storm sampled
  - Water chemistry changes over the course of a storm
  - More data are better
  - Calculation of load is more accurate when all parts of storm represented

<table>
<thead>
<tr>
<th>Limb</th>
<th>Discharge Volume (CF)</th>
<th>Concentration (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>TKN</td>
</tr>
<tr>
<td>Rising</td>
<td>57,330</td>
<td>0.7</td>
</tr>
<tr>
<td>Peak</td>
<td>151,311</td>
<td>0.8</td>
</tr>
<tr>
<td>Falling</td>
<td>87,353</td>
<td>&lt; 0.5</td>
</tr>
</tbody>
</table>
Storm Hydrograph

Example Hydrograph

- Rising
- Peak
- Falling

Stage (ft) vs Date/Time
## Trust Fund Standard Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Target MDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Dissolved Nitrogen</td>
<td>mg/L</td>
<td>0.034</td>
</tr>
<tr>
<td>Ammonia as N</td>
<td>mg/L</td>
<td>0.0016</td>
</tr>
<tr>
<td>Nitrite-N</td>
<td>mg/L</td>
<td>0.002</td>
</tr>
<tr>
<td>Nitrite &amp; Nitrate-N</td>
<td>mg/L</td>
<td>0.003</td>
</tr>
<tr>
<td>Particulate Nitrogen as N</td>
<td>mg/L</td>
<td>0.003</td>
</tr>
<tr>
<td>Phosphate (PO₄)</td>
<td>mg/L</td>
<td>0.002</td>
</tr>
<tr>
<td>Total Dissolved Phosphorus</td>
<td>mg/L</td>
<td>0.006</td>
</tr>
<tr>
<td>Particulate Phosphorus as P</td>
<td>mg/L</td>
<td>0.0003</td>
</tr>
<tr>
<td>Total Suspended Solids</td>
<td>mg/L</td>
<td>0.8</td>
</tr>
<tr>
<td>Turbidity</td>
<td>NTU</td>
<td>1</td>
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</tbody>
</table>
Eligible Storm Criteria

- 48 hours of antecedent dry time (< 0.05” of rain)
- > 0.1 inches of rain in 24 hours
How to Sample?

- **Portable automated sampler**
  - increases flexibility for capturing storms
  - sample more of the storm
  - up-front equipment cost
  - risk of equipment failure or programming error
  - post storm processing

- **Manual (grab) sampling**
  - low equipment cost
  - need to staff station for storm entirety
  - sample less of the storm
  - sample and done
Storm Hydrograph

Example Hydrograph

- **Stage (ft)**
  - 0.2
  - 0.4
  - 0.6
  - 0.8
  - 1.0
  - 1.2

- **Date/Time**
  - 4/22/2012 4:48
  - 4/22/2012 9:36
  - 4/22/2012 14:24
  - 4/22/2012 19:12
  - 4/23/2012 0:00
  - 4/23/2012 4:48
  - 4/23/2012 9:36

- **Key Points**
  - Rising
  - Peak
  - Falling
Storm Hydrograph

Automated Sampling ~ 1-hour interval
Storm Hydrograph

Automated Sampling ~ 30-minute interval (better)
Storm Monitoring 101

- Supplies list

<table>
<thead>
<tr>
<th></th>
<th>manual</th>
<th>auto</th>
</tr>
</thead>
<tbody>
<tr>
<td>project field notebook</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>flow loggers</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>bags of ice</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>chain of custody forms</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>sample bottles</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>automated samplers</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>roll of suction tubing</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>spare bubbler line</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>sampler batteries</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>1-liter sampler bottles</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>sampler bottle caps</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>cable ties</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>spare strainers</td>
<td>•</td>
<td></td>
</tr>
</tbody>
</table>
Storm Monitoring 101

- Deployment Procedure
  - Consult analytical lab for pickup schedule
  - Consult meteorological services
  - Use time-paced autosampler program*
  - Allow sufficient time for falling limb*
  - Check sampler battery charge*
  - Ice in sampler*
  - Connect suction tubing and level sensor*

* (automated)
Storm Monitoring 101

- Retrieval Procedure
  - Check to be sure minimum rainfall criterion is satisfied
  - Check for filling of bottles
  - Use spreadsheet or proprietary software to examine hydrograph
  - Select discrete samples to represent rising, peak, and falling limbs of hydrograph
  - Composite discrete samples
  - Measure pH of composites
  - Filter sample as necessary
  - Submit samples to laboratory

* (automated)
Sample Handling and Preservation

- Stock sampler with ice
- Keep samples refrigerated or on ice
- Transfer samples to the laboratory within 24 hours of sampling cessation (falling limb captured)
- Chain of custody
Equipment Maintenance

- Check:
  - Tightness of connections (suction tubing to anchor point)
  - Suction and pump tubing integrity (holes? splits?)
  - Distributor arm (firmly attached, pump tubing not wobbly)
  - Accurate level measurement on logger
  - Volume delivery calibration
Quality Control Samples

- Make up 20% of samples submitted to laboratory

<table>
<thead>
<tr>
<th>Flow Type</th>
<th>Blank</th>
<th>Duplicate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseflow, all stations</td>
<td>Distilled water</td>
<td>Duplicate sample</td>
</tr>
<tr>
<td>Stormflow, all stations</td>
<td>Distilled water run through automated sampler tubing using sampler pump</td>
<td>Not applicable*</td>
</tr>
</tbody>
</table>
Baseflow Monitoring Guidance

- 72 hours of antecedent dry time (< 0.05” of rain)
- Fixed sampling schedule
  - first week of the quarter
  - second week of the second month of the quarter
- Measure instream water quality parameters
  - temperature
  - pH
  - specific conductivity
  - dissolved oxygen
- Collect grab sample
Questions and Comments