

Water Quality Monitoring Training

April 29, 2017



Agenda

- Basics of Monitoring
- Physical Measures
- Chemical Measures
- Biological Measures

- Practice Monitoring

Why Monitor?

- Characterize waters
- Identify trends
- Identify sources
- Determine if cleanup efforts are working

DEQ Data Uses

| Level | Appropriate Data Uses | QA/QC Protocols |
|-------|---|---|
| III | <ul style="list-style-type: none"> List or delist waters on the 303(d) Impaired waters list Assess waters for 305(b) Report Use with DEQ data for TMDL development All uses listed in Levels I and II | <ul style="list-style-type: none"> DEQ-approved Quality Assurance Project Plan (QAPP) and field or lab Standard Operating Procedures (SOP) . Field and/or laboratory audit required. Group provides calibration and quality control associated information to DEQ when submitting data. This information must meet the specific criteria stated in the QAPP. |
| II | <ul style="list-style-type: none"> Identify waters for DEQ follow up monitoring Track performance of TMDL implementation All uses listed in Level I | <ul style="list-style-type: none"> DEQ-approved Quality Assurance Project Plan and approved field or lab SOPs. At this level, there may be deviation from an approved method if it can be demonstrated that the method collects data of similar quality to an approved method. |
| I | <ul style="list-style-type: none"> Education Baseline Conditions Notification of Possible Pollution Events Local Land Use Decisions Special Studies | <ul style="list-style-type: none"> No Quality Assurance Project Plan (QAPP) or SOP required by DEQ. Uniform methodology recommended. QAPP, SOPs and/or lab methods do not meet DEQ quality assurance/quality control requirements or there is no Virginia Water Quality Standard for the parameter. |

How is the Data Used?

- List and delist impaired waters on the 303(d) List – Level III data
- Source identification for TMDL development for waters already listed as impaired – Level III
- Track progress towards the restoration of waters which have an approved TMDL and may also have a TMDL Implementation Plan – Level II or III
- Target waters for future DEQ monitoring – Level II or III
- Educate land owners on the water quality impacts of land use activities – Level I, II, or III

Waterbodies in Fauquier

- Fauquier County:
 - 800 miles of streams
 - 2,800+ acres of ponds/lakes
- JMSWCD monitoring:
 - Bacterial (22 sites in 4 watersheds)
 - Physical Chemical (7 sites in 6 watersheds)
 - Macroinvertebrate (6 sites in 5 watersheds)



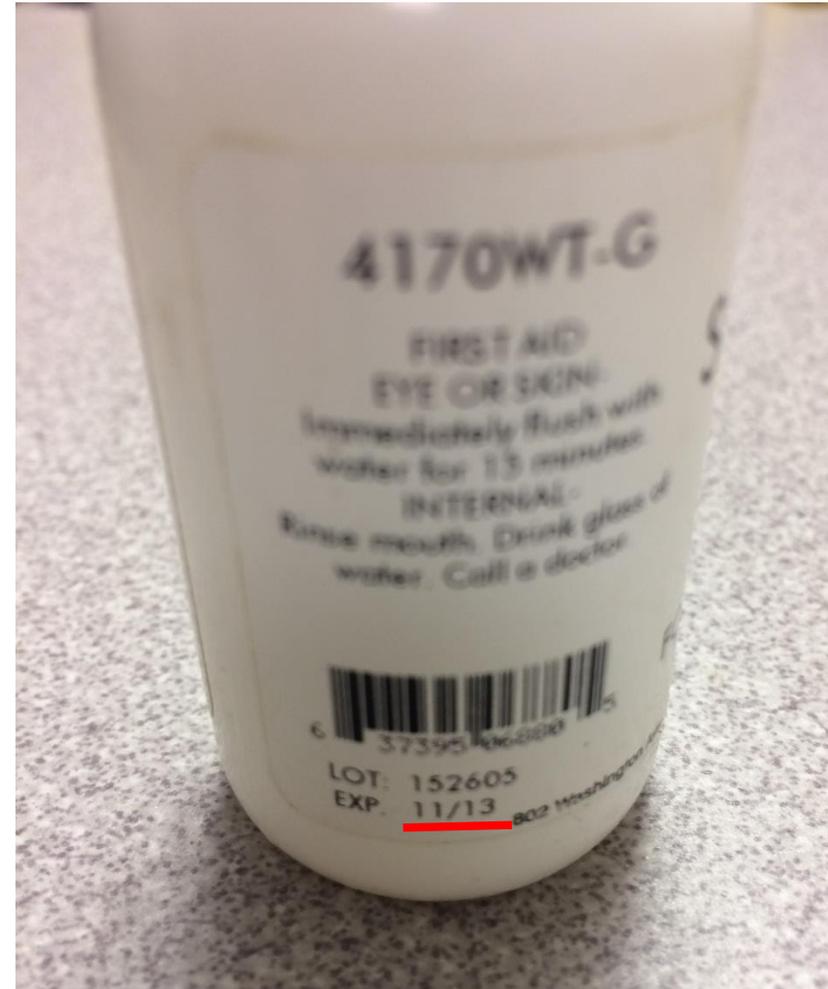
| Parameter | Importance |
|-----------------------------------|---|
| Dissolved Oxygen | Essential for aquatic organisms. |
| pH | Affects chemical and biological processes; organisms can only survive in specific range. |
| Nitrogen | Essential for plant growth; necessary for metabolism and growth of aquatic organisms. |
| Phosphorus | Essential for plant growth; necessary for metabolism and growth of aquatic organisms. |
| Benthic Macroinvertebrates | Good indicators of water quality. |
| Bacteria | Indicator of fecal contamination; can cause illness. |
| Chlorophyll <i>a</i> | Estimates the abundance of algae. |
| Submerged Aq. Veg. | Food and habitat for aquatic organisms. |
| Temperature | Affects chemical and biological processes. |
| Turbidity/Total Solids | Indicators of runoff effects; affect sunlight reaching SAV. |
| Salinity | Affect the distribution of plants and animals in estuarine environments. |
| Conductivity | Useful measure of general water quality. Significant changes may indicate a discharge of pollution. |

Quality Assurance/Quality Control

- Details your procedures, methods, monitoring sites, and quality control measures
- Quality Assurance Project Plan (QAPP)
 - Needed for Level II Data
 - District's on file with DEQ
 - Volunteers can work under the District's plan
 - Need to know information about your site to update plan

Prior to Sampling

- Check equipment for damage
- Check equipment for cleanliness
- Check chemicals
 - Expiration date
 - Floating particles
 - Change in color
- Prepare data sheets



Safety

- Safety is more important than data!
- Urgent problems (fish kill, oil spill) should NOT be sampled and reported to DEQ (Alan Lacy: 703-583-3864)
 - Nights, holidays, weekends: Dept. of Emergency Mgmt. (800-468-8892)
- Sample in teams
- Take special care in high water events
- Carry a first-aid kit and water
- Blaze orange during hunting season
- Be aware of steep banks

Safety

- Be aware of PI and ticks
- Do not cross private property without permission
- Wash your hands after monitoring. Keep hands away from mouth/nose until then. Do not eat.
- If you feel uncomfortable at a site, leave!
- Avoid contact between chemicals and skin, eyes, or mouth. Gloves are recommended.
- Properly dispose of waste.

Collecting Samples

- General Guidelines:
 - Sample in main flow of stream (usually mid-channel)
 - Do not sample in stagnant water or next to the stream bank
 - Do not sample at a discharge (must be representative of the stream)
 - If wading, approach from downstream and be careful not to disturb sediment
 - If sampling from bridge, collect from upstream side if safely possible
 - If using a bucket, rinse with stream water and discard downstream



Physical Measures

Temperature

- Air before water
- Field Thermometer (\$20-\$80; Level I, II, III)
- Thermister Probe (\$200; Level I, II, III)

Turbidity/Total Solids

- Transparency Tube (\$50; Level I)
- Turbidity Probe (\$200-\$800; Level I)
- Laboratory (\$10/sample; Level I)

Stream Flow

- Flow Meter (\$150-\$1500; Level I)
- Measuring Tape, Meter Stick, Float (orange) (<\$10; Level I)
 - Cross-Sectional Area: Stake out a line across the stream, measure depth every 2', Calculate average depth, multiply by width
 - Velocity: Measure a 20-50' length of stream, drop float and record time to cross distance, calculate velocity ($r=d/t$)
 - Discharge: $CSA * V$

Visual Stream Assessments

- Obtain information about:
 - Habitat
 - Sedimentation
 - Erosion
 - Riparian Zone
- 100m section of stream



Chemical Measures

Dissolved Oxygen

- Meters (\$400 - \$1,000; Level I, II, III)
- Test kits
 - LaMotte Test Tabs (\$12; 50 tests; Level I)
 - Hach #1469-00 (\$86; 100 tests; Level I)
 - LaMotte - 5860-01 (\$55; 50 tests; Level I, II, III)
 - CHEMetrics – K-7512 (\$55; 30 tests; Level I)

pH

- Meters (\$100-\$1000; Level I, II, III)
- Test kits
 - LaMotte Test Tabs (\$15; 50 tests; Level I)
 - LaMotte – 5858-01 (\$42; 50 tests; Level I, II)

Nutrients (Nitrogen/Phosphorus)

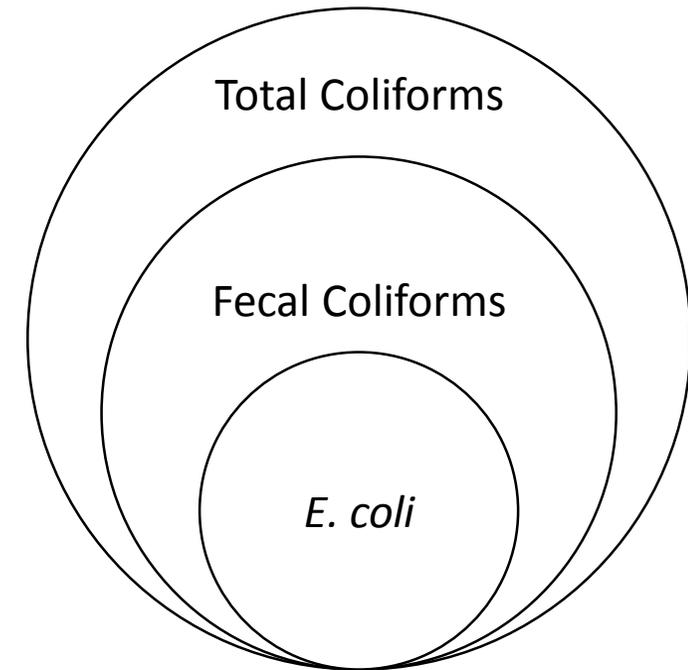
- Laboratory (\$30/sample; Level I, II, III)
- Test kits
 - LaMotte Test Tabs (\$11; 50 tests; Level I)
 - LaMotte – 3119-01 (\$100; 50 tests; Level I)
 - CHEMetrics – K-8510 (\$65; 30 tests; Level I)
 - CHEMetrics – K-6904 (\$77; 30 tests; Level I)



Biological Measures

Bacteria

- Pathogenic bacteria found in fecal waste.
- Coliscan Easygel (\$3/sample; Level I, II)
- Laboratory (\$25/sample; Level I, II, III)



Coliscan Method

- [Introduction](#)
- [Part 1: Preparing Coliscan](#)
- [Part 2: Sampling with Coliscan](#)
- [Part 3: Plating with Coliscan](#)
- [Part 4: Incubating and Counting with Coliscan](#)
- [Part 5: Disposal of Coliscan Materials](#)

Benthic Macroinvertebrates

- Stream Insects/Bugs
- Virginia Save Our Streams Rocky Bottom Method
- Equipment cost: \$100 (Level I, II)



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