From Impairment to Implementation Virginia's Water Quality

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May 26, 2015

Water Quality Wheel Overview
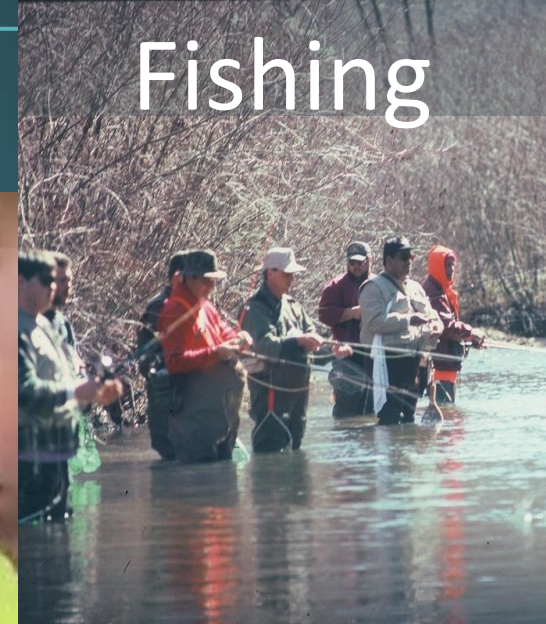
Virginia's Water Uses

Statewide Uses

- **Recreation**
- **Aquatic Life**
- **Wildlife**
- **Fish Consumption**

Localized Uses

- **Industrial water supply**
- **Irrigation**
- **Navigation**
- **Waste Assimilation**
- **Public Drinking Water Supply**

Fishing

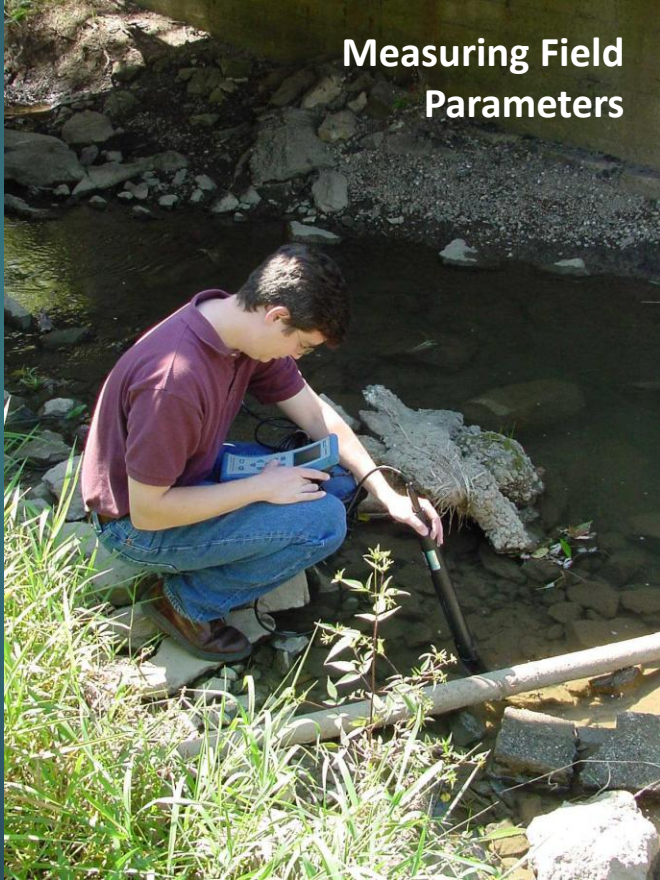Drinking

Aquatic Life

Waste Disposal

Water Quality Process: Monitoring

- Chemical
  - Bacteria
  - Nutrients
  - Dissolved oxygen
  - pH
  - Toxics
- Biological
  - Benthic Macroinvertebrates
- Fish Tissue
  - Mercury
  - PCBs
- Citizen Monitoring

Ambient Water Quality Monitoring Program

Measuring Field Parameters

Sampling from a Bridge

# Water Quality Process: Assessment

- **Required by Clean Water Act**
- **Submitted to EPA every two years**
  - **Status of all waters – 305(b) list**
  - **List of impaired waters – 303(d) list**

EPA Assessment Categories

1. **Fully Supporting all designated uses**
2. **Fully Supporting one or more designated uses, but not all uses**
3. **Indeterminate**
4. **Impaired or threatened, no TMDL necessary**
5. **Impaired or threatened, one or more TMDL(s) are necessary**

What makes a "healthy" aquatic invertebrate community?

- Diversity
- Presence of invertebrates that are intolerant of pollution
  - Stonefly, Mayfly & Caddisfly larvae
- Desirable Habitat

Pteronarcydae / "Salmonflies"
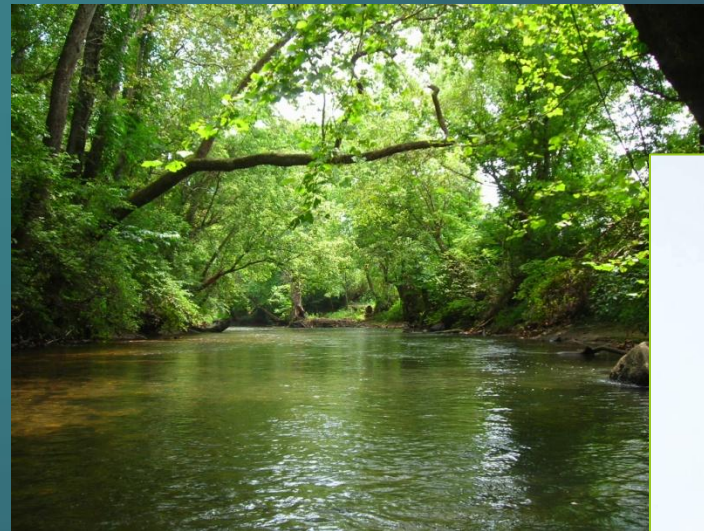
Ephemerellidae / "Hedricksons" or "Pale Morning Dun"

A Healthy Community

Stoneflies

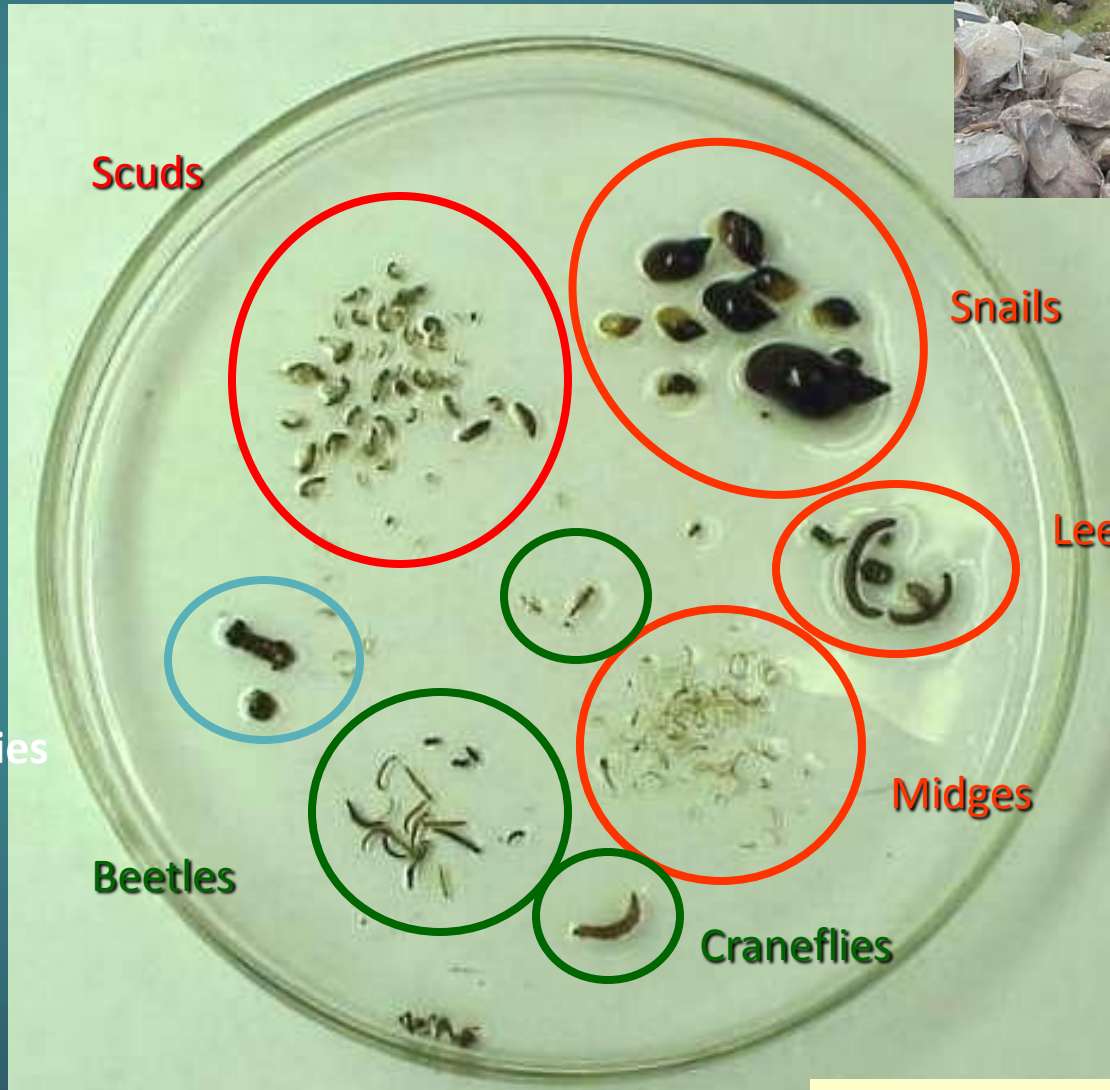Dragonflies, Damselflies

Mayflies

VSCI SCORE ~70-80

Beetles

Midges

Caddisflies

1 inch

S. Davies, ME DEP

A Severely Impacted Community

Scuds, Snails, Leeches, Caddisflies, Beetles, Midges, Craneflies

VSCI SCORE
<40 ☹

1 inch

Water Quality Process: TMDL

The Goal:

Clean Water

TMDL

Implementation Plan

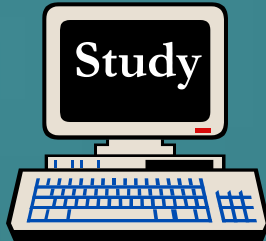Identifies permit controls or best management practices needed to make necessary pollutant reductions

Study

Assessment

Polluted

- Identifies sources of pollution
- Calculates amounts from each source
- Sets maximum pollutant load
- Estimates necessary pollutant reductions to meet water quality standards

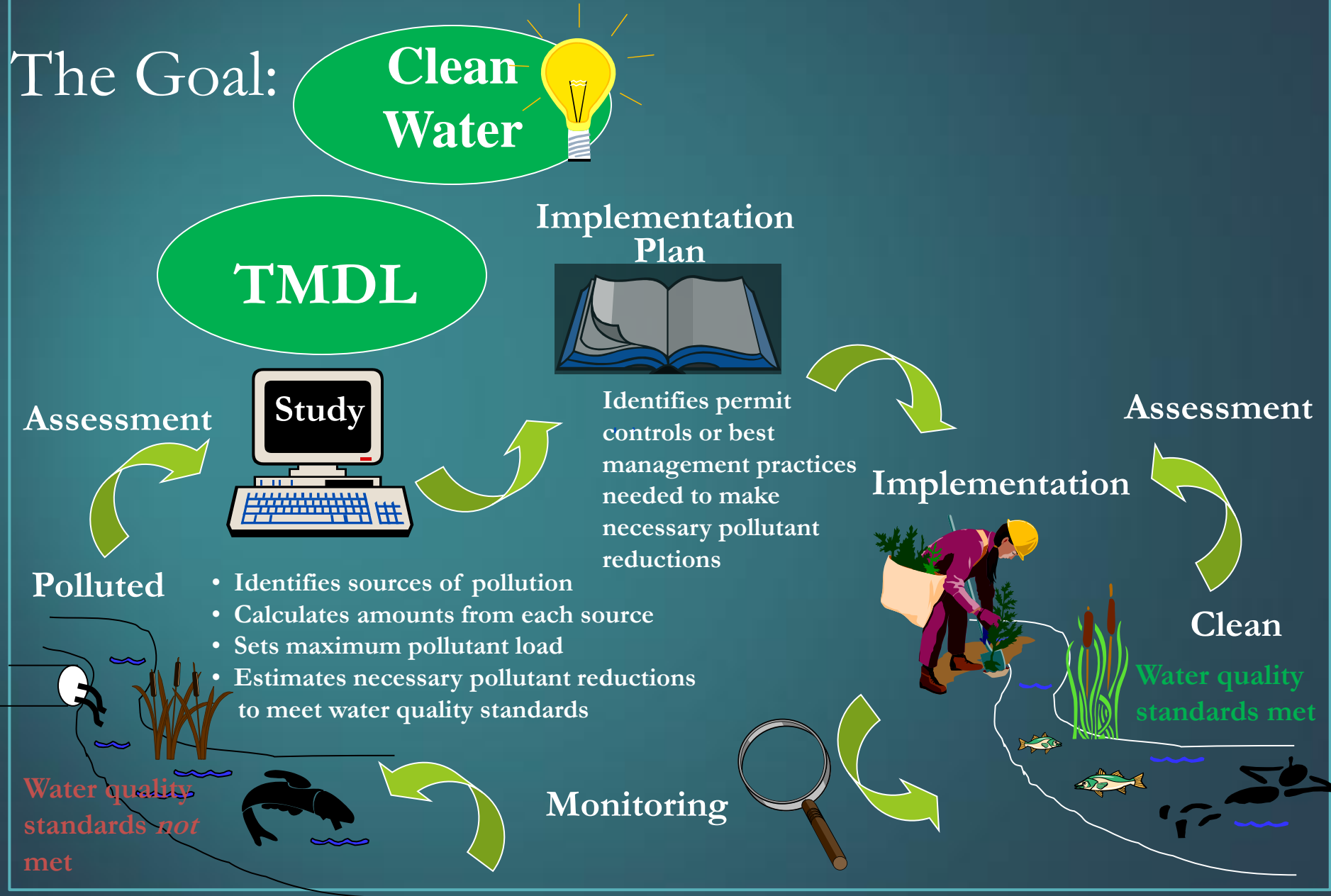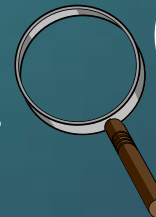Water quality standards *not* met

Implementation

Assessment

Clean

Water quality standards met

Monitoring

Actions on the land impact local streams!

Cropland

Livestock

Wildlife

Industry

Roads, Homes, Septics, etc

Pets

Wetlands and Flood Plain Changes

Pasture

ALL POOP IS NOT EQUAL
(E. Coli counts per gram of fecal matter)

Source	The Equivalent Number of Sources to One Beef Cow
Human	16.92
Pet	73.33
Horse	78.57
Beef Cattle	1.00
Dairy-Milked or dry Cow	1.31
Dairy-Heifer	2.85
Deer	95.10
Raccoon	292.04
Muskrat	1,320.00
Beaver	165,000.00
Goose	41.30
Duck	13.58
Hog	3.06
Chicken (Layer)	242.65

Elements of Successful TMDLs

- Making reductions meaningful
- Involving the Community
- Building Foundations
  - And what role do Virginia Master Naturalist Chapters play?

Elements of Successful TMDLs

Where Virginia Master Naturalists can help!!!

- Making reductions meaningful
  - Wildlife load vs. cattle load
  - Efficiency in action
  - Equitable and community-driven
  - Best Management Practices
  - Good Planning
  - Good Stewardship
  - Ask questions like, What is a healthy watershed?

Huggies
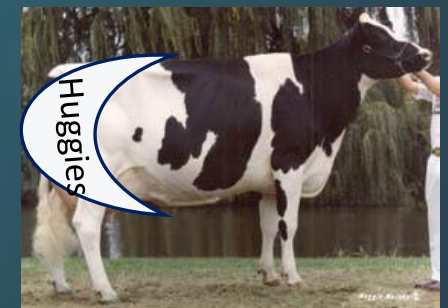
Making Meaningful Reductions

Table 1. Relative Contributions of Various Bacteria Sources by source under Existing Conditions (in-stream loads) for Tye River.

Source	Annual Average Fecal Coliform Loads (cfu/yr)	Relative Contribution by Source
Human	1.82E+15	1.84%
Livestock	9.30E+16	94.47%
Pets	1.18E+15	1.20%
Wildlife	2.44E+15	2.48%
Total	**9.84E+16**	

Table 2. Estimated Relative Contributions of Different E. coli sources to the overall E. coli concentration for the Tye River.

Source	Mean Daily *E. coli* Concentration by Source (cfu/100mL)	Relative Contribution by Source
Direct loading to streams		
Livestock in stream	56	37%
Wildlife in stream	34	22%
Straight pipes	2	1%
Point Sources	<1	<1%
Interflow and Groundwater	<1	<1%
Storm Runoff	60	39%
Total	153	

Water Quality Process: Implementation

Source Controls to improve water quality
Planned locally with various stakeholders
Example: Recreation Use impaired due to bacteria

Residential Controls

- Repair/replace faulty septics
- Remove straight pipes
- Stormwater controls
- Control pet waste
- Riparian Buffer Establishment/maintenance
- Raingarden Development/maintenance
- Rain Barrel installation/maintenance
- LID encouragement
- Rainleader disconnects
- Stormwater management at the source
- Residential or Homeowner Association BMP development/maintenance
- Citizens Monitoring
- Trash Pickup Events
- Education Events
- Good Housekeeping/Yardkeeping

Agricultural Controls

- Stream fencing
- Stream crossings
- Rotational grazing
- Vegetated stream buffers
- No or Low Till Crops
- Streamside Riparian Buffer Conservation Easements
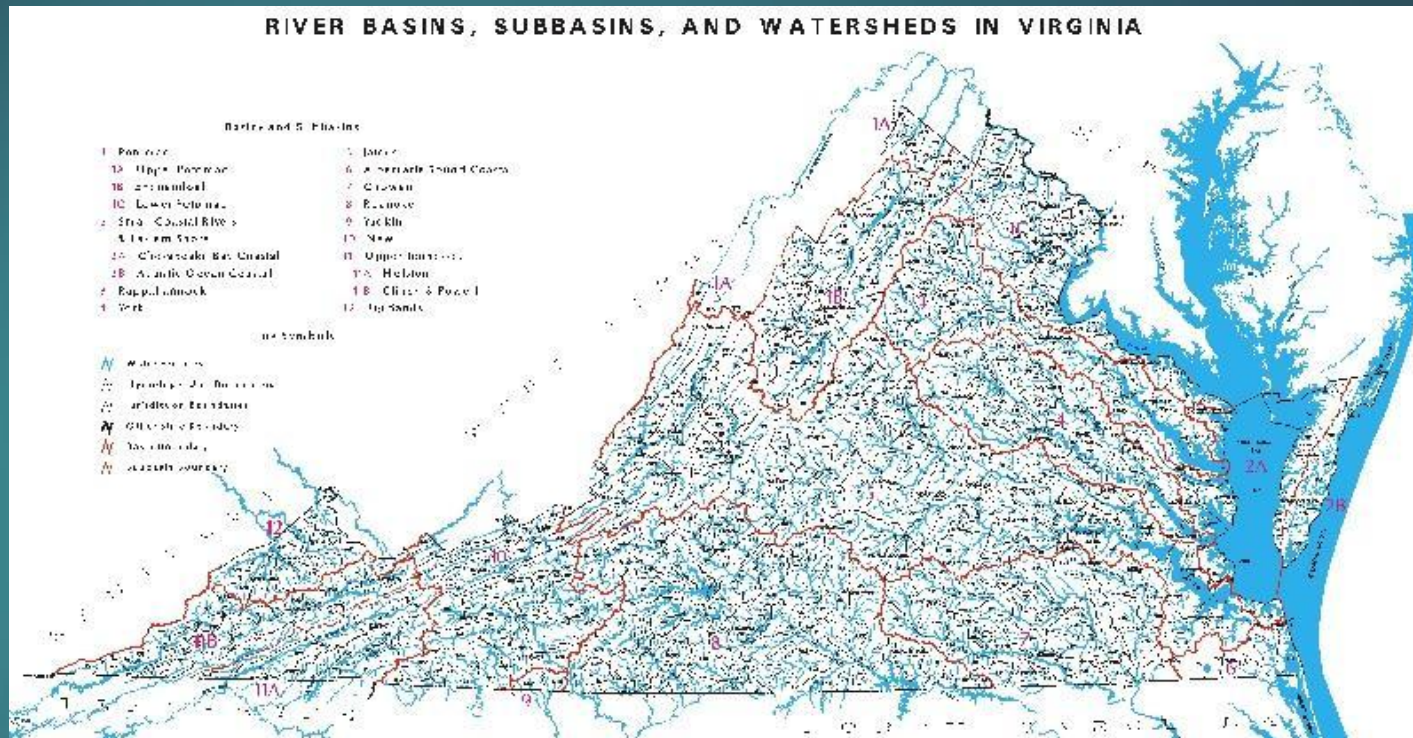- Soil Nutrient Management Plans and Monitoring

Photo by USDA NRCS

DEQ Support and Use of Volunteer Data

James Beckley

Virginia and DEQ

RIVER BASINS, SUBBASINS, AND WATERSHEDS IN VIRGINIA

- Virginia has >100,923 miles of rivers and streams
  - 117,158 acres of significant lakes and reservoirs
  - 2,836 square miles of estuaries
- On average, DEQ monitors ~2,000 stations each year with an analytical monitoring budget of $880,000

- Since 1998 DEQ has actively partnered with citizen volunteer and other non-agency water monitors
- In 2003 DEQ developed a QA/QC program to allow the agency to incorporate non-agency data to assess water quality
- Continued support by DEQ is resulting in an unprecedented amount of quality data submitted to the agency

How DEQ Uses Submitted Data

- Stream Assessment

- Tracking

- Rapid Response

- Outreach

- Education

- 305(b) assessment of stream health and 303(d) listing

- Water quality improvement such as during TMDL implementation

- Early detection of pollution events to help alert DEQ

- Work with local communities in a positive way

- Show the importance of water quality to the public

Ways DEQ Does Not Use Submitted Data

- Submitted data is not used by DEQ for enforcement or similar "regulatory" actions

- Data is not assessed if it was collected in permitted mixing zones or at discharge pipes

- Submitted data not used by itself to develop TMDL Implementation Plans

How DEQ Reviews Submitted Data

- QA all submitted data
- Groups encouraged to use DEQ approved protocols and Quality Assurance Project Plan (QAPP)
- Laboratories must pass inspection
- Data falls into one of three categories

Alliance for the Chesapeake Bay
Member Recertification Event

Ways DEQ Supports Citizen Monitoring

- Data use authorization form
- Citizen Monitoring Grant Program
- Agency technical support
- Non-Agency online database
- 3,000 mile goal

Citizen Monitoring Grant Program

- Since 1998, DEQ has provided grant money to monitoring groups

- Awards cover monitoring costs and training

- When available, grants are typically around $4,000

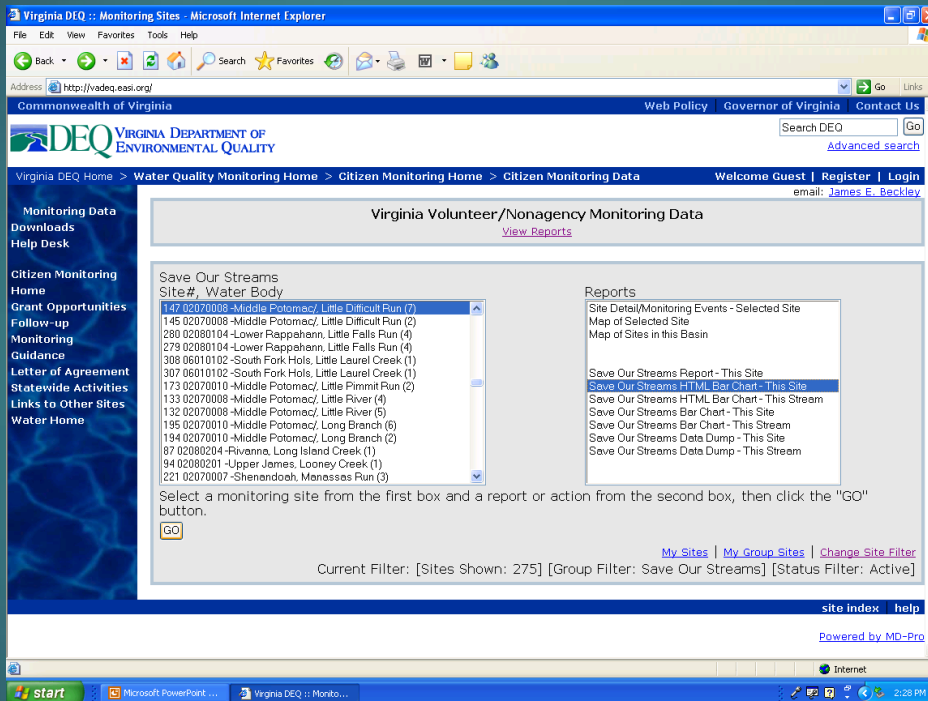- Data is submitted to DEQ and meet QA requirements

DEQ Technical Support

- Assist with training of monitoring groups
- Technical review of methods and QA/QC procedures
- Citizen Monitoring Methods Manual
- Online resources relating to water quality

DEQ Non-agency Database

- Online database to store and display non-agency data

- Anyone can view, or query water quality data

- Registered users can upload data for their group

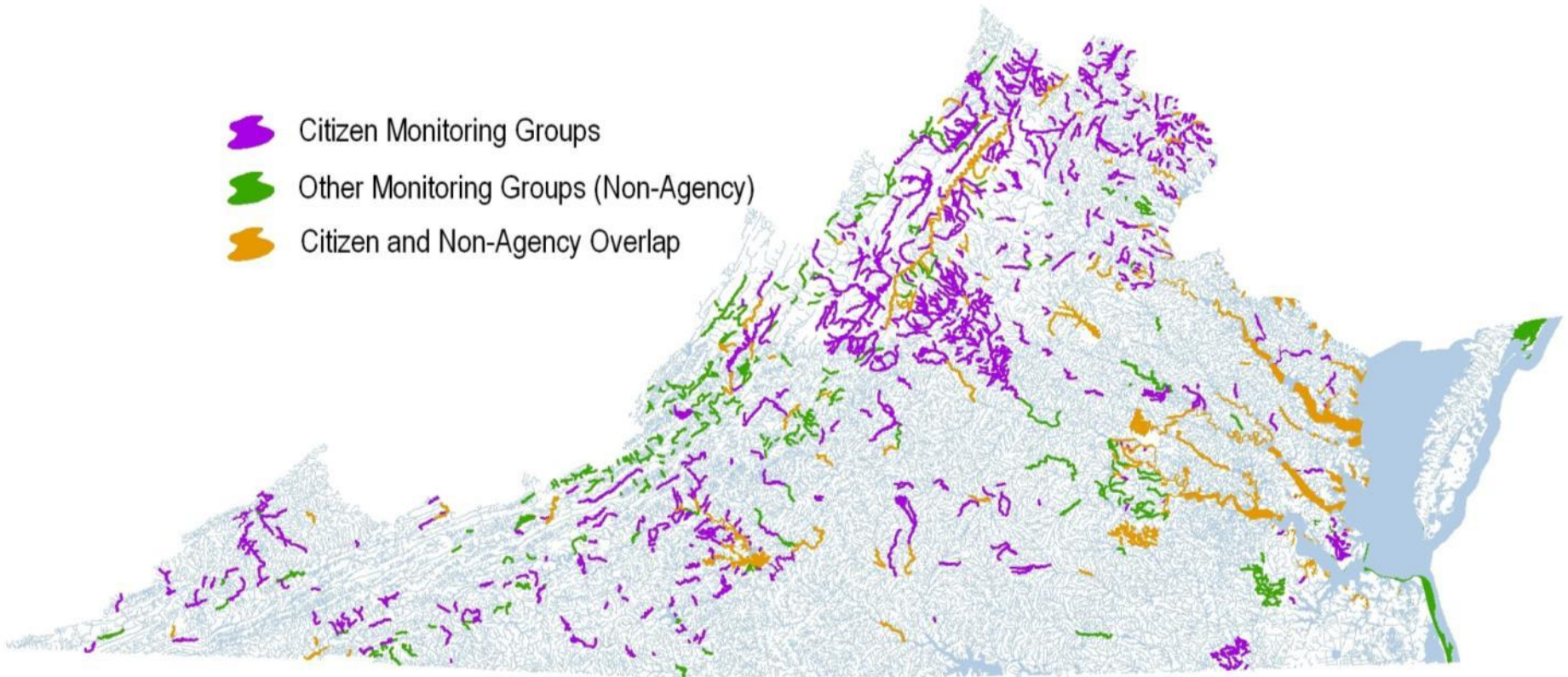- Accessed at www.deq.virginia.gov/easi/

Mileage Tracking

Assessment Cycle	Monitoring Year	Citizen Stations Submitted	Sample Events	Stream Miles	Estuary Mi^2	Lake Ac^2
2008	2001-2006	1,002	15,605	2,371.61	73.74	9,726.15
2010	2003-2008	1,485	23,420	3,499.45	37.48	30,052.98
2012	2005-2010	1,774	30,829	4,124.44	40.15	27,975.46
2014	2007-2012	1,494	31,871	3,559.96	34.48	24,860.47

- DEQ conservatively estimates citizen volunteers provide at least $750,000 a year in analytical and in-kind (volunteer) time

Waters Monitored By Citizen or other Non-DEQ Data

Citizen Data Available Online

- DEQ developed an online database for citizens to upload their data- www.deq.virginia.gov/easi/

- Google map allows users to click on a station of interest to download data and information.

- Map link
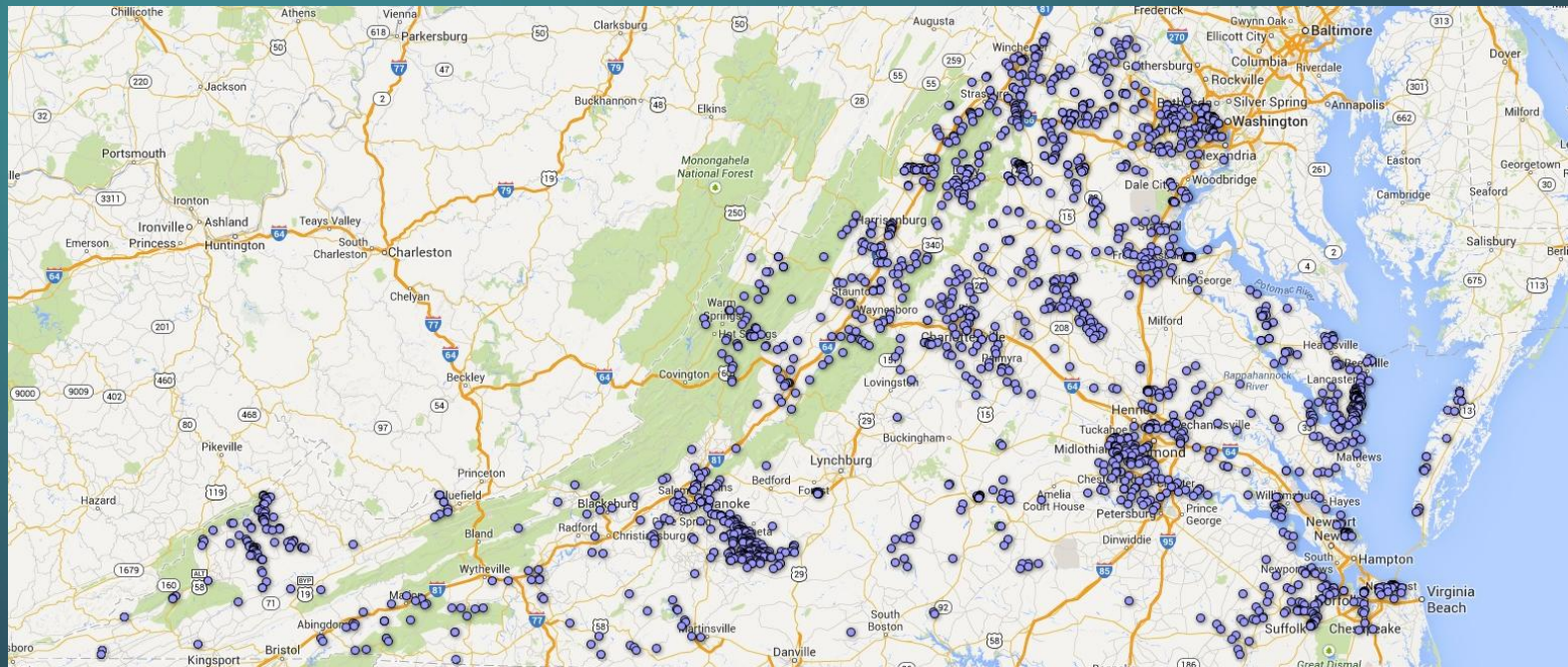
Sources and Resources

- DEQ Monitoring Page: http://www.deq.state.va.us/Programs/Water/WaterQualityInformationTMDLs/WaterQualityMonitoring.aspx

- DEQ Citizen Monitoring Page: http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/WaterQualityMonitoring/CitizenMonitoring.aspx

- DEQ Water Quality Assessment Page: http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/WaterQualityAssessments.aspx

- DEQ TMDL Page: http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/TMDL.aspx

- DEQ TMDL Implementation Page: http://www.deq.virginia.gov/programs/water/waterqualityinformationtmdls/tmdl/tmdlimplementation.aspx

- DEQ VEGIS application and mapping tool: http://www.deq.virginia.gov/connectwithdeq/vegis.aspx

- Integration and Application Network: UMD Center for Environmental Science watershed tool:

  http://ian.umces.edu/

Questions?

Contact:

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Acknowledgements and Answers:
DEQ Regional Offices
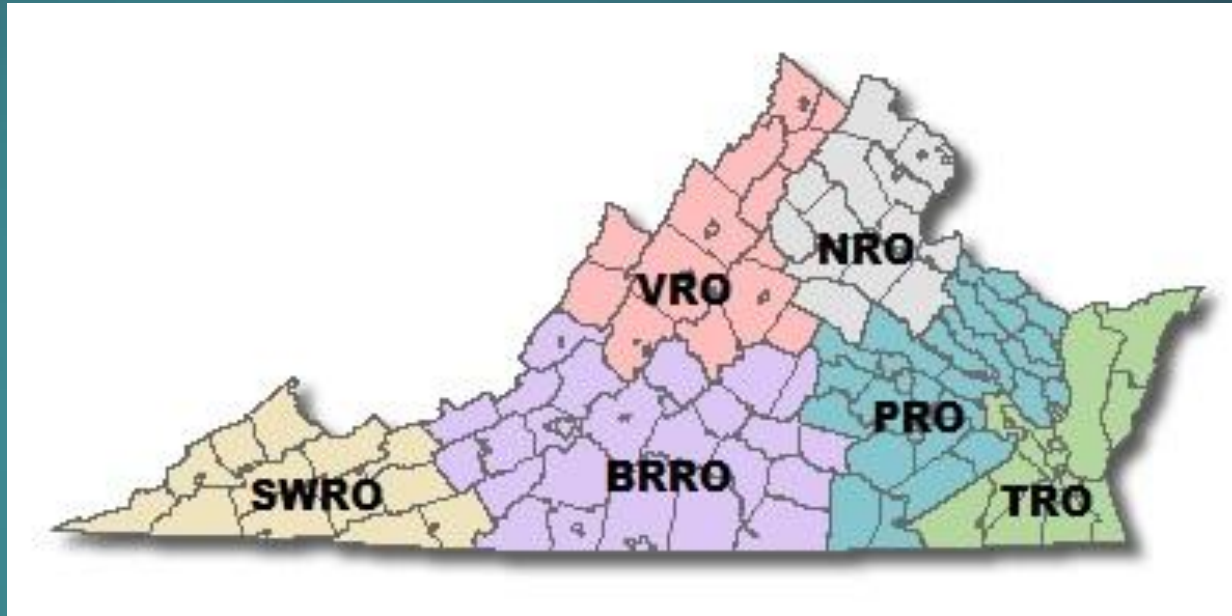
Valley Regional Office (VRO) - Harrisonburg
Northern Regional Office (NRO) - Woodbridge
Piedmont Regional Office (PRO) – Glen Allen
Tidewater Regional Office (TRO) - Virginia Beach
Blue Ridge Regional Office (BRRO) – Lynchburg & Roanoke
Southwest Regional Office (SWRO) - Abingdon

Regional Staff Contacts

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DEQ TMDL Implementation Planning Staff looking for a few good VMN Volunteers!

- To participate in TMDL and TMDL Implementation Plan development;
- Develop, design, build, and/or maintain watershed water quality projects (many of which are or can be Naturalizing, by design) ;
- Apply for grants;
- Citizen's Monitoring;
- Pick up trash;
- Design Best Management Plans for pollutant reduction;
- Design Best Management Plans for stormwater management;
- Design Green Infrastructure ideas;
- Participate in local and regional planning for stormwater management and land use change; and
- Enjoy Virginia's Water Resources by using them.

Funding TMDL Implementation

- DEQ receives funding from the EPA 319(h) grant program
- Funding limited to project areas with approved Implementation Plans (IPs)
- Funding for best management practices included in IPs
- Competitive application process every 2-3 years
- Support 10-20 projects at one time dependent on size and BMP installation rates
- Qualifying organizations: local governments, county health departments, soil and water conservation districts, regional commissions, Virginia institutes of higher education, and Virginia State Agencies

Examples of Additional Funding Sources

DEQ :

- Water Quality Improvement Fund
- Stormwater Local Assistance Fund
- State Revolving Loan Fund

DCR:

- Virginia Agricultural Cost-Share Program

Other sources:

- National Fish and Wildlife Service (NFWF)
- Trout Unlimited
- National Oceanic & Atmospheric Administration (NOAA)

Shout Out:

- Riverine Chapter (Richmond area)- monitoring program since 2008 focusing around Upham Brook. Monitor for DO, pH, temp, bacteria (Coliscan test)

- James River Chapter (Goochland area)- New group started up in 2013. Sampling for DO, pH, temp, bacteria (Coliscan test)

- Peninsula Chapter (Newport News)- Monitoring since 2014 for E. coli bacteria (Coliscan). Expanded to now sample for water clarity and temperature and working with JRA's River Watch program.

- New River Valley Chapter (Blacksburg)- Began monitoring in 2014 for E. coli (laboratory based), pH, DO, benthic macroinvertebrates.

- Southwest Piedmont Chapter (Martinsville)- Interest in E. coli sampling (Coliscan). Members are working in partnership with the Dan River Basin Association on a watershed wide monitoring project.

- Most of the groups listed above have either received funding through the citizen grant program and were trained by DEQ. Training time from DEQ was counted towards their training hour requirements.

Shout Out:

Northern Virginia Non Point Source Coordinator, May, has worked with Virginia Master Naturalists in various TMDL / Watershed related projects including:

- provides educational programming for underserved kids in Mathews County (kayak camp);

- Co-leading watershed/wetland educational activities with the districts (MWEE – Meaningful Watershed Educational Experience);

- Getting advice on information provided on signs for raingardens and other LID (Low Impact Development) stormwater features, and getting their assistance to help maintain those features;

- Evaluating estimated wildlife numbers for 16 watersheds in the Piankatank IP (Implementation Plan);

- Assisting with the production on a video of the "muddy bottom technique" for identification of macroinvertebrates (York Roundtable event); and

- Assisting the VMN state coordinator with ideas on how to involve VMNs in projects reducing stormwater(LID) at a state university.

Shout Out:

- Annually, Piedmont DEQ Staff Biologists (Warren and Bill) do a presentation for the Pocahontas Master Naturalist chapter that covers aquatic ecology, ichthyology, and water quality. Bill also does a presentation for the Riverine Master Naturalist chapter (mainly residents from Hanover, Henrico, and Richmond) that covers aquatic ecology, benthic macroinvertebrates, and water quality.

- Northern Virginia TMDL Coordinator, Rebecca, has recently completed VMN training in the Merrimac Farm Chapter.

- Tidewater Virginia TMDL Coordinator, Jennifer, has presented on different occasions to VMN chapters. One of her best success stories has been community engagement with the Lynnhaven River TMDLs, including Virginia Master Naturalists.

Shout Out:

- Southwest Regional DEQ Staff Non Point Source Coordinator Chris, has done presentations for the Holston Master Naturalist chapter that covers aquatic ecology at VHCC (before he worked for DEQ).

- Blue Ridge TMDL Coordinator in the Roanoke Office, Mary, works with a variety of different stakeholders to develop clean-up plans and TMDLs. Mary looks forward to collaboration with Master Naturalist chapters in the Roanoke and New River Valleys.

Announcement(s):

Registration for the **2015 Mid-Atlantic Volunteer Monitoring Conference** in Winchester, VA on August 7 and 8 is now open!

- To register please go to https://www.elleevance.com/beventLive.aspx?EventID=NBI39336680.   Friday registration is $55 and Saturday is $30. Registration includes lunch and snacks, and dinner (Friday only). Payment is made by credit card or by mailing a check to the listed address (C/O Alliance for the Chesapeake Bay).
- The optional Thursday canoe expedition is $35 (limit 25) and Saturday Build Your Own Rain Barrel workshop is $45. Payment for these optional activities is due at the event.
- **Register before July 23 to guarantee a spot at the conference!**

If planning to stay overnight, we have received discounted rates for three hotels in the Winchester, VA area.

- Holiday Inn Express- Winchester North: 540-667-7050 or www.hiexpress.com/winchester: $72/night
- Hampton Inn- Winchester North: 540-678-4000 or www.hamptoninn.com/hi/winchester-north.com: $75/night
- Holiday Inn Winchester Historic Gateway: 540-667-3300 or http://www.holidayinn.com/winchesterva $80/night
- When registering use the group code **Mid-Atlantic Monitoring Conference** to get the discount. Register by July 23 to guarantee a discounted group rate!

We are still accepting submissions for short videos and films involving water quality and volunteer monitoring to be screened at the conference. Details about the film festival and other conference related items are available at https://www.facebook.com/pages/Mid-Atlantic-Volunteer-Monitoring-Conference/433737196786906

Announcement(s):

State Fair of Virginia is coming! We are revamping our educational area down near the river! Below is a draft list of things you , your family, or your students can do:

- *Experience the Chesapeake Bay, its lands and water:*

  Journey around "the Bay" to see some unique features that make this estuary a national treasure of great, historical, environmental and economic importance. Students will walk through different displays and understand better how people have reaped benefits from this amazing natural resource. They'll get a glimpse how scientists and natural resource managers are working to restore the Bay to its original environmental condition. A wide variety historical and natural history artifacts and live animals are depicted in scenes, as well as interactive displays are available for hands-on learning.

- Check out a **Bay watershed map** and see which river basin you traveled from and to. Are you traveling within the Chesapeake Bay watershed or entering it? (Geography, Science) Dominion Classroom

- **Discover** what **natural resources** can be found within and outside the Bay watershed? (Science) in the Land & Water pavilions

- Act like a waterman, and try to **tong oysters**. See how oysters "clean" water. (Social studies, Physical education) Water pavilion

- Discover **how a crab pot works**. (Engineering, Technology) Water

- Guess how many critters call the Chesapeake Bay home. Count the different species of fish, shellfish and animals in the natural resource area. (Math, Science) Land & Water pavilions (make this part of the **pledge—improve habitat**)

- Move sand around and see how the **force of water** moves a stream channel. (Science) Dominion Classroom

- **Touch a wild snake**, a beaver pelt, or deer antlers and describe how it feels and looks. (Science and English) Land

- **Vote for your favorite archeological** site to preserve. (History) Water

- Before coming to the fair, read about Captain John Smith's journey into the Chesapeake Bay (History, Science).

- Take pictures of native plantings, rain barrels and a rain garden that could help reduce run off and "green" your school. (Science, Technology) Land pavilion (outside)

- See what happens to rivers when it rains; can trees prevent erosion? (Science) Water

- Measure your Bay "footprint" and take a pledge to reduce pollution. See how your actions add up! (Math, Science, Technology)

- For more *resources* (before and after visiting the State Fair), visit www.Virginia.gov/Bay

- Lessons from the Bay
  The purpose of Lessons from the Bay is to help Virginia school teachers of grades 3 through 6 incorporate into their classrooms a variety of activities and projects related to protecting and restoring the Chesapeake Bay watershed (from the Virginia Department of Education).

- Chesapeake Bay: An Introduction to An Ecosystem Guide, a primer on Bay ecology.

- Rain Gardens : A rain garden is a shallow, constructed depression that is planted with deep-rooted native plants and grasses.

- Build Your Own Rain Barrel : A rain barrel is a container that collects rain water from rooftops (this is called stormwater runoff).

- How to Take Action, conserve resources, prevent pollution and keep the Bay healthy.
  http://www.chesapeakebay.net/takeaction/howtotips

Thanks and Acknowledgements:

DEQ Watersheds staff, almost all of whom provided slides and experiences to include.

Megan Sommers-Bascone

James Beckley

Ann Regn