New Recreational Criteria to Better Protect Public Health

Webcast sponsored by EPA's Watershed Academy and EPA's Office of Science and Technology

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Instructors:

Sara Hisel-McCoy, Director, Standards and Health Protection Division (SHPD), U.S. EPA's Office of Science and Technology

Dr. Sharon Nappier, Microbiologist, Health and Ecological Criteria Division, U.S. EPA's Office of Science and Technology

Tracy Bone, Environmental Scientist, Standards and Health Protection Division, U.S. EPA's Office of Science and Technology

1

Webcast Logistics

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2

Topics for Today's Webcast

- Recreational Water Quality Criteria (RWQC) History
- How 2012 RWQC are More Protective
- The 2012 RWQC
  - Supporting Science
  - Criteria Components
- Supplemental Elements
- Additional Tools
- Developing Alternative Criteria
- Secondary Contact Recreation
- What's Next?

3

2012 Recreational Water Quality Criteria

Sharon Nappier and Tracy Bone
USEPA
January 30, 2013

4 EPA

Overview

- RWQC History
- How 2012 RWQC are More Protective
- The 2012 RWQC
  - Supporting Science
  - Criteria Components
- Supplemental Elements
- Additional Tools
- Developing Alternative Criteria
- Secondary Contact Recreation
- What's Next?

Recreational Water Quality Criteria (RWQC)

- EPA's recommendations intended for use by states in adopting water quality standards to protect the designated use of primary contact recreation (includes swimming, bathing, surfing, or similar water contact activities).
- Recommendations are based on protecting swimmers from exposure to water containing bacteria that indicate fecal contamination.
  - *E. coli* (freshwater), enterococci (freshwater and marine).
- State water quality standards are used to derive National Pollution Discharge Elimination Systems (NPDES) permit limits, make listing decisions, develop Total Maximum Daily Loads (TMDLs) and support beach notification programs.

How are the 2012 RWQC more protective than 1986 criteria? (1)

1. Similar protection for fresh and marine waters: The EPA used an analysis of National Epidemiological and Environmental Assessment of Recreational (NEEAR) Water Study data to refine the illness rate estimate for the recommended marine criterion for enterococci.
   - In the 1986 criteria, illness rates were different in fresh and marine waters.
   - The 2012 RWQC values now protect public health similarly in marine and fresh waters.
2. No "use intensities" – All criteria values apply regardless of beach usage.
   - In the 1986 criteria, four different single sample max (SSM) values were provided based on the beach usage (use intensity) of a waterbody.
   - The 2012 RWQC provide states with optional, precautionary Beach Action Values (BAVs) for beach notification.
3. A new measurement term– Statistical Threshold Value (STV) is recommended to be used in conjunction with the recommended geometric mean (GM).
   - Using both a GM and an STV together provides a more accurate picture of the overall health of the waterbody.

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How are the 2012 RWQC more protective than 1986 criteria? (2)

4. Two sets of recommended criteria. EPA believes both criteria sets are protective of the designated use of primary contact recreation.
   - The criteria that correspond to an illness rate of 36 (NGI) NEEAR gastrointestinal illness per 1,000 primary contact recreators correlate to water quality levels associated with the 1986 criteria. Accordingly, the illness rate has a history of acceptance by the public.
   - The criteria that correspond to an illness rate of 32 NGI per 1,000 primary contact recreators would encourage an incremental improvement in water quality.
5. Duration and frequency. The waterbody GM should not be greater than the selected GM magnitude in any 30-day interval. There should not be greater than a ten percent excursion frequency of the selected STV magnitude in the same 30-day interval. EPA's recommendations do not include a minimum number of samples for the GM or STV. The GM and STV would apply regardless of the number of samples.
   - The duration and frequency of excursion recommendations were not explicit in the 1986 criteria.
   - Many states have water quality standards (WQS) that refer to a minimum sample size.

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RWQC History (1)

- 1968 - EPA published recommendations for fecal coliform at 200 CFU/100 ml.
  - Based on water quality analyses in one Ohio waterbody and Public Health Service's epidemiological studies, conducted 1948-1950.
- 1972 - EPA initiated a series of epidemiological studies at marine and fresh water beaches.
  - Showed *E. coli* and enterococci were better indicators of gastrointestinal illness, compared to fecal coliforms.
- 1986 – EPA published Ambient Water Quality Criteria based on new studies, recommending *E. coli* and enterococci.

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RWQC History (2)

- 2000 – Beaches Environmental Assessment and Coastal Health (BEACH) Act required EPA to conduct new studies by October 2003, and to publish new or revised criteria for coastal and Great Lakes waters by October 2005 based on these studies.
  - EPA failed to meet these deadlines and was sued.
- 2004 - EPA's BEACH Act Rule:
  - EPA promulgated criteria for states that did not have criteria in their standards as protective of human health as EPA's 1986 criteria recommendations for their coastal marine and Great Lakes waters designated for primary contact recreation.
- 2007 - EPA convened an Experts Workshop to discuss the state of the science and to obtain input on research needed for the next 2-3 years to develop the scientific foundation for the new criteria.
  - *Critical Path Science Plan* identified research studies.

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RWQC History (3)

- 2008 - EPA entered into a Settlement Agreement and Consent Decree to conduct studies in support of criteria development.
  - Many of the studies were from the *Critical Path Science Plan* : Epidemiology Studies, Quantitative Microbial Risk Assessment (QMRA), Predictive Modeling, New Indicators and Methods.
- 2010 - EPA completed research studies in accordance with Consent Decree and Settlement Agreement.
- Published **Final 2012 RWQC on November 29th, 2012**.

Expert and Stakeholder Input

- March 2007 (Warrenton, VA) – Experts workshop
- February 2008 (Washington, D.C.)
  - Purpose, content & status of *Critical Path Science Plan*
- February 2009 Inland Waters Workshop
- October 2009 (Chicago, IL) – Status update on research
- March 2010 (Webinar) – Recap of October 2009 meeting
- October 2010 (Webinar)
  - Framing main issues associated with the new criteria
- June 2011 (New Orleans, LA)
  - Input on evaluation and synthesis of research and development of options for structure of the new criteria
- September 2011 (Webinar) - Recap of the June meeting
- September 2011 (Washington) – Scientific Peer Review
- November 2011 (Atlanta, GA) Expert Workshop on wildlife (non-human) sources of fecal contamination

NEEAR Epi Studies (1)

- EPA conducted 9 epidemiological studies between 2003 and 2010.
- National Epidemiologic and Environmental Assessment of Recreational Water (NEEAR) studies.
  - 4 fresh water (wastewater treatment plant (WWTP) impacted)
  - 3 marine water (WWTP impacted)
  - 1 tropical water (WWTP impacted)
  - 1 marine water (not WWTP impacted0
- Goals of the studies were to evaluate new rapid methods and to collect health and water quality data to support the 2012 RWQC.

NEEAR Epi Studies (2)

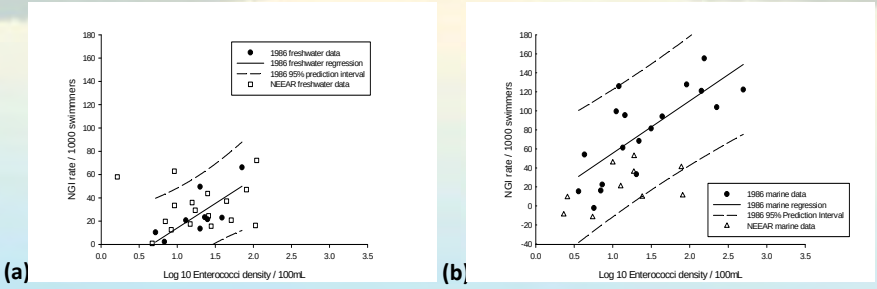
NEEAR studies:

- Supported the historical criteria values and provided a basis for recommending marginally lower culturable criteria values.
- Illustrated that illness-water quality relationships were similar across marine and freshwaters.
- Provided basis for rapid method (quantitative polymerase chain reaction – qPCR) site-specific criteria values.

In addition to the NEEAR data, EPA considered:

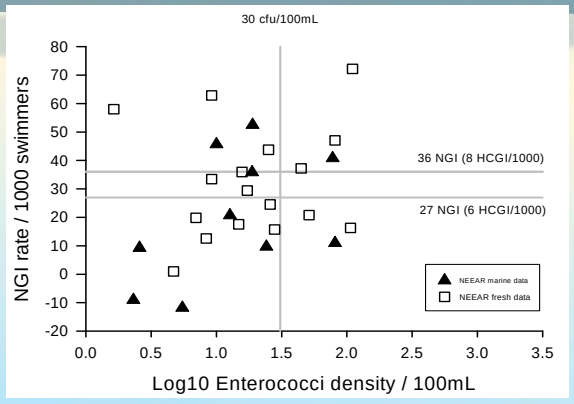
- Other non-EPA epidemiological studies.
- External peer-review comments (September 2011).
- Public comments received on the December 2011 draft RWQC.

Determining Culture Criteria Values (1)



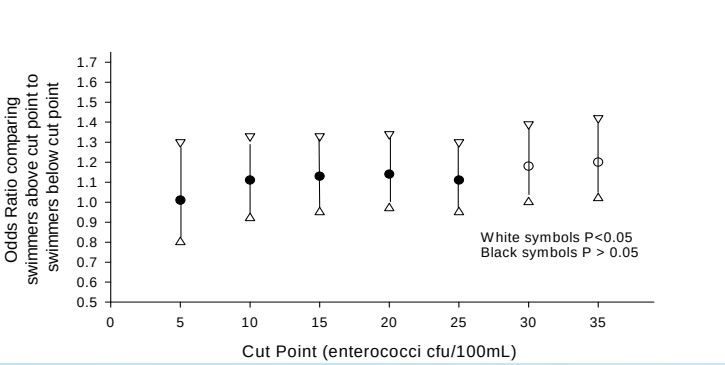
NEEAR study culture data aggregated by similar water quality and 1986 criteria data for (a) fresh water beaches and (b) marine water beaches.

Determining Culture Criteria Values (2)



NEEAR marine and fresh water culture-based enterococci and illness rate data aggregated by days of similar water quality.

Determining Culture Criteria Values (3)



Adjusted odds ratios of GI illness for swimming above specific cut-points in NEEAR marine and fresh water study sites.

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2012 RWQC (1)

- RWQC are 304(a) national recommendations for all waters.
  - All states (coastal and non-coastal), territories, and tribes.
- All waterbody types designated for the primary contact recreational use.
  - States designate the majority of waters for primary contact.
  - RWQC does not address secondary contact recreational uses.

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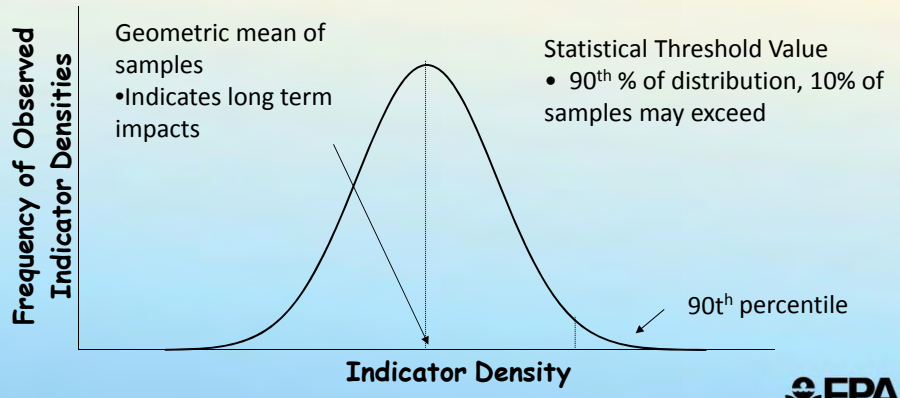
2012 RWQC (2)

- RWQC recommendations consist of **magnitude, duration, and frequency of exceedance** of the pollutant; in this case fecal contamination as measured by fecal indicator bacteria.
- 2012 RWQC provides **two sets** of recommended criteria, each of which corresponds to a different illness rate.

Magnitude of the 2012 Criteria

- *E. coli* and enterococci magnitude values are expressed by both:
  - Geometric mean (GM), and
  - Statistical Threshold Value (STV).



Duration and Frequency

- Duration and Frequency:
  - GM concentration should not be greater than the selected GM magnitude in any 30-day interval (zero excursion).
  - STV no more than 10% excursion frequency of the selected STV magnitude in the same 30-day interval.
- EPA's recommendations do not include a minimum number of samples for the GM or STV. Regardless of number of samples in 30-days, both the GM and STV would apply in a state with standards based on the 2012 RWQC.
  - For more information regarding EPA policy regarding sample sizes in making WQS attainment status determinations, see the EPA 2006 Integrated 303(d)/305(b) Report Guidance.
- Duration can be either static or rolling.
- The 30-day duration coupled with limited excursions above the STV, allows for the detection of transient fluctuations in water quality in a timely manner.

2012 RWQC

Table 4. Recommended 2012 RWQC.

Criteria Elements	Estimated Illness Rate (NGI): 36 per 1,000 primary contact recreators			Estimated Illness Rate (NGI): 32 per 1,000 primary contact recreators	
	Magnitude			Magnitude	
Indicator	GM (cfu/100 mL)[a]	STV (cfu/100 mL)[a]	OR	GM (cfu/100 mL)[a]	STV (cfu/100 mL)[a]
Enterococci – marine and fresh	35	130		30	110
OR					
E. coli – fresh	126	410		100	320
Duration and Frequency: The waterbody GM should not be greater than the selected GM magnitude in any 30-day interval. There should not be greater than a ten percent excursion frequency of the selected STV magnitude in the same 30-day interval.					

[a] EPA recommends using EPA Method 1600 (U.S. EPA, 2002a) to measure culturable enterococci, or another equivalent method that measures culturable enterococci and using EPA Method 1603 (U.S. EPA, 2002b) to measure culturable *E. coli*, or any other equivalent method that measures culturable *E. coli*.

Questions on the Science?

23

Supplemental Elements that Could Increase Protection

Optional Beach Action Values (BAVs) that are precautionary.

- Providing additional information for beachgoers, including families with children.

Rapid test method: *Enterococcus* qPCR Method 1611 can detect and quantify enterococci more rapidly than the culture method.

- EPA is encouraging the use of this new indicator-method combination on a site-specific basis, particularly for heavily used beaches.
- Can be used to provide an early alert to beach goers, including families with children.

Supplemental Elements (1)

- BAV for making beach notification decisions.
  - BAVs correspond to the 75th percentile of the recommended RWQC water quality distribution, thus providing an early warning to beachgoers before the WQS is exceeded.
- Rapid method – quantitative polymerase chain reaction (qPCR).
  - EPA *Enterococcus* Method 1611 (qPCR) results are available in less than 4 hours for increased public health protection by facilitating same day beach notification.
  - EPA encourages a site-specific analysis of the method's performance prior to use.

Supplemental Elements - BAV (2)

Table 5. Beach Action Values (BAVs).

Indicator	Estimated Illness Rate (NGI): 36 per 1,000 primary contact recreators BAV (Units per 100 mL)		Estimated Illness Rate (NGI): 32 per 1,000 primary contact recreators BAV (Units per 100 mL)
Enterococci – culturable (fresh and marine)[a]	70 cfu		60 cfu
E. coli – culturable (fresh)[b]	235 cfu	OR	190 cfu
Enterococcus spp. – qPCR (fresh and marine)[c]	1,000 cce		640 cce

[a] Enterococci measured using EPA Method 1600 (U.S. EPA, 2002a), or another equivalent method that measures culturable enterococci.

[b] *E. coli* measured using EPA Method 1603 (U.S. EPA, 2002b), or any other equivalent method that measures culturable *E. coli*.

[c] EPA *Enterococcus* spp. Method 1611 for qPCR (U.S. EPA, 2012b). See section 5.2.

Supplemental Elements - qPCR (3)

- RWQC provides GM and STV values for states interested in adopting *Enterococcus* qPCR Method 1611 into their WQS.

Table 6. Values for qPCR in marine and fresh waters.

Element	Estimated Illness Rate (NGI): 36/1,000 primary contact recreators		OR	Estimated Illness Rate (NGI): 32/1,000 primary contact recreators	
	Magnitude			Magnitude	
	GM (cce per 100 mL)	STV (cce per 100 mL)		GM (cce per 100 mL)	STV (cce per 100 mL)
qPCR[a]	470	2,000		300	1,280
Duration and Frequency: The waterbody GM should not be greater than the selected GM magnitude in any 30-day interval. There should not be greater than a 10 percent excursion frequency of the selected STV magnitude in the same 30-day interval.					

[a] EPA *Enterococcus* spp. Method 1611 for qPCR (U.S. EPA, 2012b).

27

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Additional Tools (1)

- Tools for site-specific evaluation and management of waters:
  - Tools will be described in detail in the revised Beach Guidance Manual planned for Fall 2013
    - Sanitary surveys
    - Predictive modeling
- Tools for developing alternative criteria values:
  - Epidemiological studies
  - Quantitative Microbial Risk Assessment (QMRA)
  - Novel indicators or new analytical methods

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Additional Tools (2)
Evaluating and Managing Waters

- **Sanitary surveys**: Used by water quality managers to evaluate waters for fecal contamination potential and prioritize clean-up and remediation efforts.
  - Involve collecting information about the beach and surrounding watershed for purpose of cataloging physical conditions that may influence water quality in a watershed or at a beach.
    - February 2013: Marine sanitary survey.
- **Predictive models**: Draw on existing culture-based monitoring data, may be inexpensive, and allow for rapid water quality management decisions.
  - Currently used in the Great Lakes and other areas.
    - How-to Manual: September 2013 (draft). Based on interviews with groups who have implemented beach models, manual will allow the process to be replicated in other locations.
    - Field Projects: Initiated in 2014. EPA will work with 2-3 beach communities interested in incorporating predictive models to field test the manual.

Developing Alternative Criteria (1)

- EPA's regulations at 131.11(b) allow states to develop alternative (or site-specific) criteria that are scientifically defensible and protective of the use.

- In establishing revised criteria, states should establish numerical values based on:
  - §304(a) guidance (i.e., 2012 RWQC), or
  - §304(a) guidance modified for site-specific conditions, or
  - Other scientifically defensible methods.

Developing Alternative Criteria (2)

- **Quantitative Microbial Risk Assessment (QMRA)**: A formal process, analogous to chemical risk assessment, of estimating human health risks due to exposures to selected infectious pathogens.
  - Useful where sources are characterized predominantly as nonhuman or nonfecal.
    - How-to Manual for States (Volume A): October 2013 (final).
- **Epidemiological Studies:** with or without QMRA.
    - Alternative health relationships: October 2013 (final).

Developing Alternative Criteria (3)

- **Alternative Indicators and Methods**: As new or alternative indicator and/or enumeration method combinations are developed, states may want to consider using them to develop alternative criteria.
  - States may decide to gather water quality data over one or more recreational seasons for the alternative indicator/method combination.
  - Important to show that a consistent and predictable relationship exists between the enumeration methods and an established indicator-health relationship in the illness and water quality range of the 2012 RWQC.
    - Protocol for incorporation of alternative indicators/methods: October 2013 (final).

Secondary Contact Recreation (1)

- 2012 RWQC does not address Secondary Contact Recreation (SCR)
  - EPA's NEEAR studies collected epidemiological data on swimmers and the results were designed for primary contact recreation.
  - EPA's regulations allow for subcategories of uses.
    - Secondary contact recreation is a subcategory of primary contact use.
    - States must submit a Use Attainability Analysis (UAA) that meets the requirements in 40 CFR 131.10.
    - UAA must show protection of the use and be scientifically defensible.

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Secondary Contact Recreation (2)

EPA is working to better understand the difference in risk between primary and secondary contact activities.

- Conducting a systematic review to evaluate illness risk associated with primary and secondary contact activities.
  - A special type of literature review designed to objectively and transparently synthesize scientific evidence from many different studies.
  - Minimizes bias by establishing methods and procedures before the review is performed.
  - Uses meta-analysis to combine data from different epidemiological studies.
- Will peer review and publish in a scientific journal.
- Expect completion by end of the year.

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Other CWA Uses

Water quality-based effluent limitations (WQBELS)for NPDES permits, identification of impaired and threatened waters and TMDLs are based on State WQS (i.e., recreational water quality standards (RWQSs).

- NPDES permitting for RWQS
  - Permitting for continuous dischargers should consider both the GM and STV in the limit calculations.
  - Approaches and information available winter 2013.
- Identification of impaired and threatened waters for RWQS.
  - States would consider both the GM and the STV as part of a revised WQS and recommend as part of the water quality attainment determination.

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What Should States and Tribes Do Next?

- The BEACH Act directs coastal states to adopt and submit to EPA revised RWQS for BEACH Act waters by December 2015.
  - CWA section 303(i)(1)(B) (coastal and Great Lakes states).
  - States subject to the 2004 BEACH rule are also expected to revise their WQS.
  - EPA is updating the 2002 National Beach Guidance (fall 2013).
- States with non-BEACH Act waters are encouraged to review and to revise as appropriate their RWQS during their next triennial reviews.
  - Triennial reviews described in EPA regulations at 40 CFR 131.20.

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Revising State/Tribe/Territory RWQS

- RWQC are § 304(a) national recommendations for all waters.
  - All states (coastal and non-coastal), territories, and tribes.
  - All waters designated by States for primary contact recreational uses.
- Waters designated for primary contact recreation would be **protected by either set of criteria** adopted into state WQS and approved by EPA.
- Should not **mix the magnitude values from different illness rates** since the STV is derived from the GM.
- Risk management decision regarding illness rate are recommended to be applied **statewide**.

Take Home Messages

- EPA's 2012 §304(a) bacteria criteria are for culturable *E. coli* and enterococci which indicate fecal contamination.
- When using the 2012 RWQC, states and tribes have flexibility to:
  - Make appropriate risk management decisions regarding illness rate.
  - Develop alternative criteria using scientifically defensible methods.
  - Use rapid methods (predictive modeling or qPCR) on a site-specific basis
- The designated use of primary contact recreation is protected if either set of criteria recommendations is adopted into state WQS and approved by EPA.
- States/Tribes/Territories should work with their EPA Regional offices very early in their process to revise their state RWQS.

For More Information

- 2012 RWQC
  - **http://water.epa.gov/scitech/swguidance/standards/criteria/health/recreation/index.cfm**
  - List of implementation documents **http://water.epa.gov/scitech/swguidance/standards/criteria/health/recreation/upload/2012-RWQC-Implementation-Materials.pdf**
- EPA's Beach Web Pages
  - **http://water.epa.gov/type/oceb/beaches/index.cfm**
- Fecal Indicator Methods

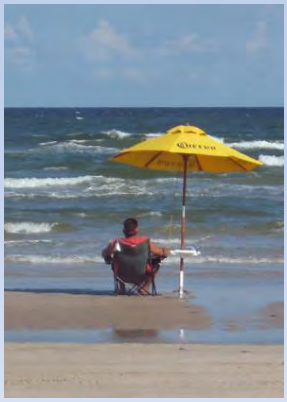
  http://water.epa.gov/scitech/methods/cwa/index.cfm
- Sharon Nappier at (202)566-0740 or **nappier.sharon@epa.gov**; or Tracy Bone (202)564-5257 or **bone.tracy@epa.gov**.

39 EPA

Speaker Contact Information

Dr. Sharon Nappier
Microbiologist
Health and Ecological Criteria Division
U.S. EPA's Office of Science and Technology
nappier.sharon@epa.gov

Tracy Bone
Environmental Scientist
Standards and Health Protection Division
U.S. EPA's Office of Science and Technology
bone.tracy@epa.gov



Next Watershed Academy Webcast

Check back in February for the next Webcast:

Water Quality Exchange Part 2 of 4 –
Making it Easy to Share Water Quality Data

Information will be posted at
www.epa.gov/watershedwebcasts

41

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http://water.epa.gov/learn/training/wacademy/upload/2013-01-30-certificate.pdf

You can type each of the attendees names into the PDF and print the certificates.

Questions?