SURFACE WATER QUALITY STANDARDS REVISIONS

PRELIMINARY OVERVIEW FOR NPDES PERMITTEES: PROPOSED CHANGES TO ALUMINUM AND COPPER CRITERIA

February 2019

Watershed Planning Program

MassDEP

Bureau of Water Resources

Division of Watershed Management

MassDEP
Commonwealth of Massachusetts
Department of Environmental Protection

Agenda

- Welcome and Introductions
- Workshop Goals
- Overview of Proposed Surface Water Quality Standards (SWQS) Revisions Package
- Overview of Proposed Revisions to Toxic Pollutants
- Monitoring
- Implications for NPDES Permits
- Question and Answer Session

I. Overview of Proposed Regulatory Revisions Package

The Massachusetts Surface Water Quality Standards (SWQS) 314 CMR 4.00

- The SWQS is currently divided into two parts:
  1) A “narrative” or text portion, and
  2) Tables and figures

- MassDEP is proposing to revise both portions of the regulation

Public Process - Schedule

- Public Notice of package is published in Environmental Monitor (30-Day Public Comment Period):

  Target date May/June 2019

- Public Hearings on draft regulatory package:

  Target date June/July 2019

- MassDEP finalizes regulatory package:

  Target date late Summer/Fall 2019

- Final regulatory package is published:

  Target date January/February 2020

- Submit to EPA for Review & Approval Decision (60 days to approve and 90 days to disapprove after receipt)

SWQS Narrative Updates

SWQS Narrative Updates

- Procedures for Sampling and Analyses (314 CMR 4.03(6))
  - Updates to procedures used for the purpose of collecting, preserving and analyzing samples in connection with the SWQS
- Toxic Pollutants (314 CMR 4.05(5)(e))
  - Updates to this section for clarity and to better regulate equation- and model-based criteria
  - Addition of a new Table 29--Generally Applicable Criteria, consistent with EPA recommended ambient water quality criteria (AWQC) discussed in detail later in the presentation
- Bacteria Criteria (314 CMR 4.05(5), and each class of water)
  - Update for consistency with EPA 2012

Tables and Figures (1-27) Update

Updating Tables/Figures 1-27

- **Proposed Changes to enhance clarity:**
  - Modifications to the overall format (including arranging the basins alphabetically)
  - Corrections (spelling, boundary descriptions, missing info)
  - Added definitions as footnotes to the tables
  - Two coastal figures were updated to ensure consistency with our major basin delineations in MassGIS
  - Updated CSO and PWS qualifiers
  - ***Note: No substantive changes to class or use goals***
- **Adding 153 Cold Water Designations:**
  - Better aligns MassDEP's SWQS with MassWildlife's CFR designations

Table 28 Update and New Table 29

Table 28: Updates to Site-Specific (SS) Copper, Zinc, and Nitrogen Criteria

- In 2013, 15 copper and 1 zinc SS criteria were added to Table 28, derived using EPA's Water Effect Ratio (WER) approach
  - EPA recently notified MassDEP that the 15 copper SS criteria are not sufficiently protective. MassDEP proposes to remove these criteria from the table
  - MassDEP proposes to update the zinc SS criteria based on EPA's technical review
- In MassDEP's 2006 SWQS revision,17 Cape Cod nitrogen SS criteria were added based on draft or preliminary TMDLs
  - These SS criteria have been updated based on final TMDLs

Ambient Water Quality Criteria

- Under CWA Section 303(c)(2)(B) *states are required to adopt ambient water quality criteria (AWQC*) for all toxic pollutants for which criteria have been published by EPA under the CWA, where these toxics could reasonably be expected to interfere with the designated uses of the surface water. *If they do not adopt the criteria, they are to provide an explanation*
- In 2006 MassDEP incorporated EPA's 2002 toxic pollutant criteria by reference
- EPA has requested that MassDEP incorporate the AWQC directly into 314 CMR 4.00

New Table 29: Generally Applicable Criteria

- MassDEP proposes to incorporate pollutant criteria into a **new Table 29**:
  - 29a for Aquatic Life and
  - 29b for Human Health
  - Most criteria are presented as absolute values
- **Equation-based formulas**: 7 metals (equations and models); ammonia (temperature- and pH-based equation); and pentachloro-phenol (varies according to pH)
- **Water Effect Ratio (WER)**: For certain metals, the WER method may be used to determine aquatic life criteria where adjustments to local conditions are desired *(data collection, toxicity testing and analysis*)

II. Overview of Proposed Regulatory Revisions to Toxic Pollutant Criteria

Updating Toxics Criteria

EPA's updated or new criteria since 2002:

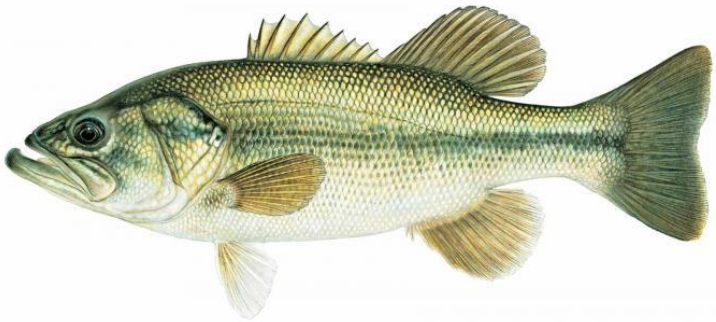
Aquatic Life Criteria	
Pollutant	**Fresh or Marine**
Acrolein (2009)	Fresh
Aluminum (2018, update to 1988 guidance)	Fresh
Ammonia (2013, update to 1999 guidance)	Fresh
Cadmium (2016, update to 2001 guidance)	Fresh and Marine
Carbaryl (2012)	Fresh and Marine
Copper (2007, update to 1996 guidance)	Fresh
Diazinon (2005)	Fresh and Marine
Nonylphenol (2005)	Fresh and Marine
Selenium (2016, update to 1999 guidance)	Fresh
Tributyltin (2004)	Fresh and Marine

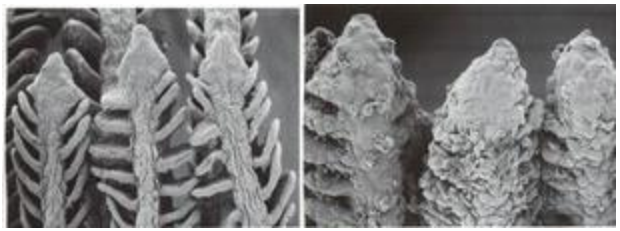
Human Health Criteria
100 updated human health criteria
11 new human health criteria

Freshwater Aluminum Criteria

Why is Excess Aluminum Harmful to Aquatic Life?

- Aluminum is a non-essential metal because fish and other aquatic life do not need it to function
- Elevated levels of aluminum can affect the ability of some species to regulate ions and inhibit respiratory functions, like breathing
- Aluminum can accumulate on the surface of a fish's gill, leading to respiratory dysfunction, and possibly death





Healthy gills (left), Al-impacted (right) of Atlantic Salmon
Source: The Northeast Fisheries Science Center
www.nefsc.noaa.gov/salmon/factsheets/sss_factsheet.pdf

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Freshwater Aluminum Criteria

- **EPA Guidance**:
  - In 2018 EPA published aluminum criteria guidance that recommended the use of Multiple Linear Regression (MLR) models to develop the criteria
  - The use of this approach is encouraged by EPA see https://www.epa.gov/wqc/aquatic-life-criteria-aluminum
  - The MLR-based aluminum criteria will supersede the 1988 chronic (87 µg/L) and acute (750 µg/L) AWQC for Al (pH range: 6.5 to 9.0)

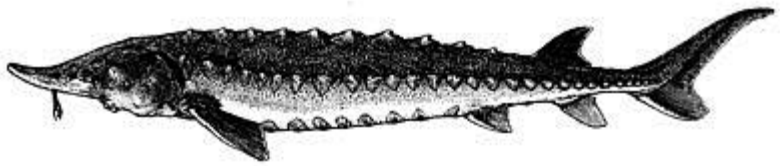
Freshwater Aluminum Criteria

- **The MLR:**
  - Allows the criteria to be derived based on local water chemistry and requires 3 input parameters: pH, hardness, and dissolved organic carbon (DOC)

- **MassDEP's proposed regulation**
  - MassDEP proposes to include the 2018 aluminum MLR criteria in Table 29a
  - MassDEP will post the aluminum MLR criteria calculator on our web page

Default Aluminum Criteria

- MassDEP is proposing default acute and chronic aluminum criteria by watershed or watershed grouping
- In most instances these defaults are derived from the 10th percentile of criteria (protective 90% of the time)
- The 5th percentile acute and chronic criteria values were used where endangered freshwater mussels or Atlantic Sturgeon are known to occur: *the Chicopee, Connecticut, Farmington, Merrimack, and Nashua River Basins.*



Yellow Lampmussel

Dwarf Wedgemussel

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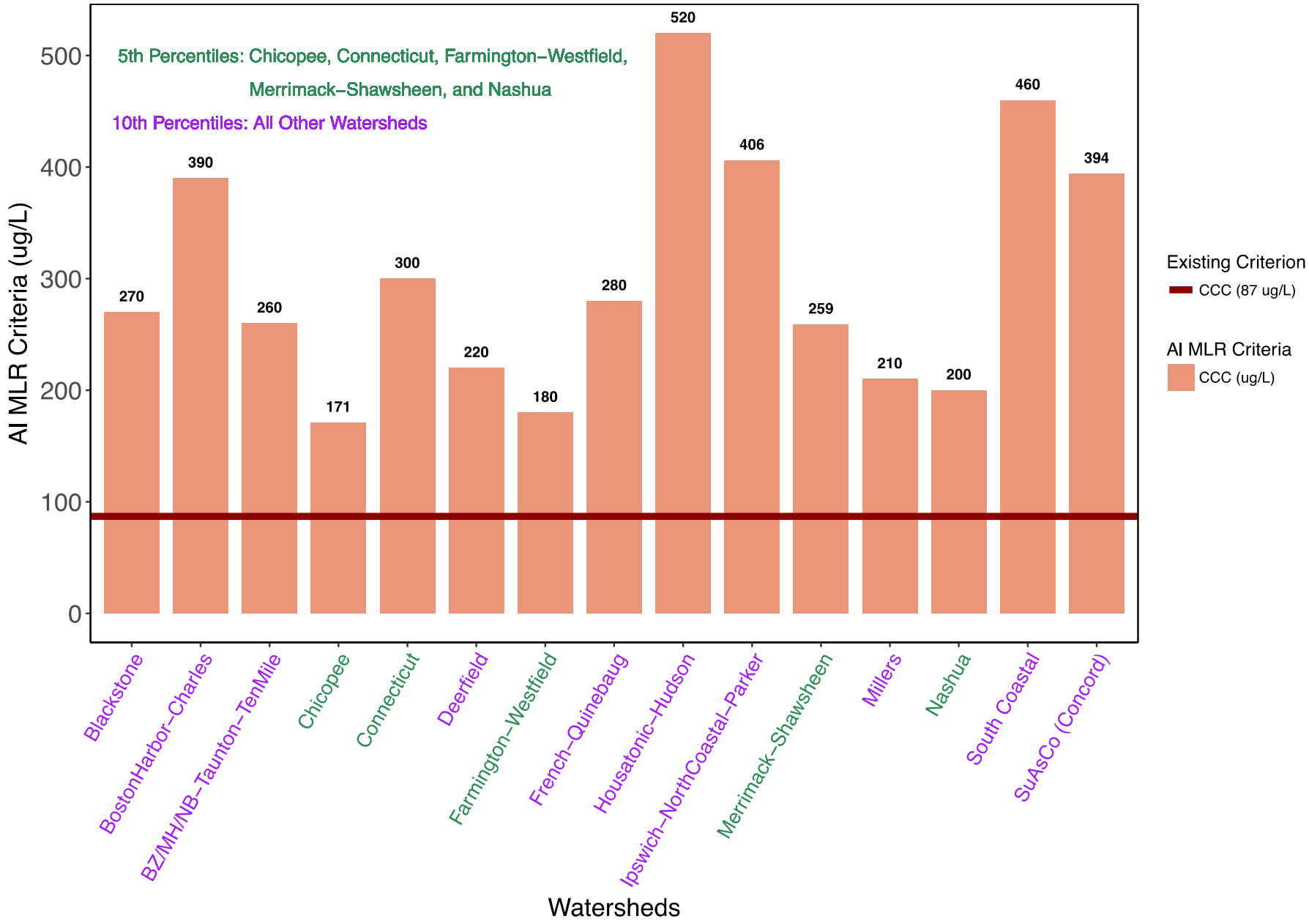
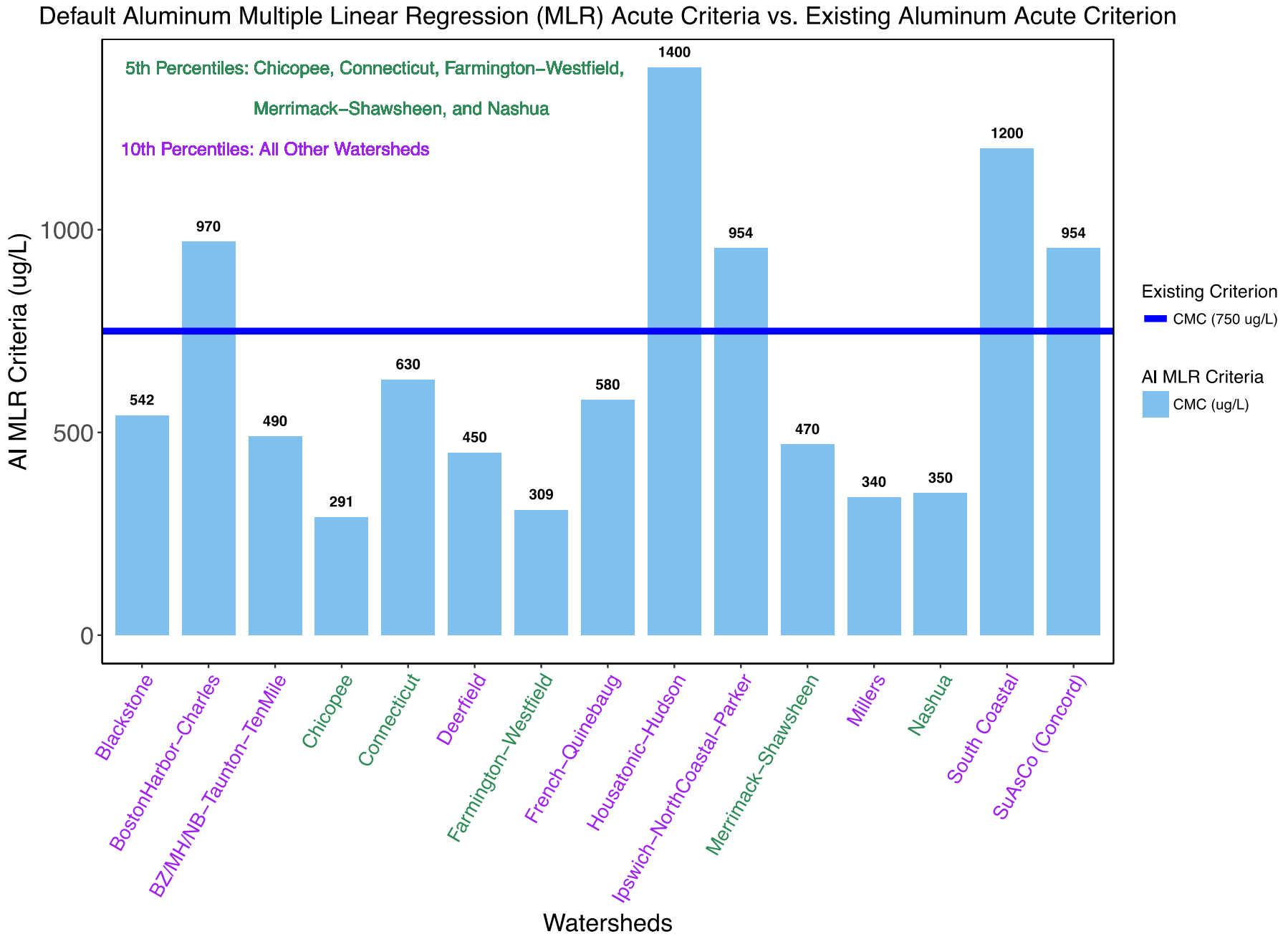
Default Aluminum Criteria

Default Freshwater Aluminum Criteria by Watershed (River Basin or Coastal Drainage Area)*		
River Basin or Coastal Drainage Area	CMC† (Acute) ug/L	CCC† (Chronic) ug/L
Blackstone	542	270
Boston Harbor/Charles	970	390
Buzzards Bay/Mt Hope Bay/Narragansett Bay/Taunton/Ten-Mile	490	260
Cape Cod Coastal	**	**
Chicopee (5th percentile)	291	171
Connecticut (5th percentile)	630	300
Deerfield	450	220
Farmington/Westfield (5th percentile)	309	180
French/Quinebaug	580	280
Housatonic/Hudson	1400	520
Ipswich/North Coastal/Parker	954	406
Islands Coastal	**	**
Merrimack/Shawsheen (5th percentile)	470	259
Millers	340	210
Nashua (5th percentile)	350	200
South Coastal	1200	460
Sudbury, Assabet, and Concord (SuAsCo)	954	394

***Defaults are based on 10th percentile criteria calculated from concurrent pH, DOC, and hardness data, except watersheds marked as 5th percentile to protect state and federal endangered species.**
**** Insufficient data are available to calculate watershed-based default criteria.**
†The CMC = Criterion Maximum Concentration and the CCC = Criterion Continuous Concentration

Default Aluminum Multiple Linear Regression (MLR) Chronic Criteria vs. Existing Aluminum Chronic Criterion




Default Aluminum Multiple Linear Regression (MLR) Acute Criteria vs. Existing Aluminum Acute Criterion
5th Percentiles: Chicopee, Connecticut, Farmington–Westfield,
Merrimack–Shawsheen, and Nashua
10th Percentiles: All Other Watersheds
Al MLR Criteria (ug/L)
0
500
1000
542
970
490
291
630
450
309
580
1400
954
470
340
350
1200
954
Blackstone
BostonHarbor–Charles
BZ/MH/NB–Taunton–TenMile
Chicopee
Connecticut
Deerfield
Farmington–Westfield
French–Quinebaug
Housatonic–Hudson
Ipswich–NorthCoastal–Parker
Merrimack–Shawsheen
Millers
Nashua
South Coastal
SuAsCo (Concord)
Watersheds
Existing Criterion
CMC (750 ug/L)
Al MLR Criteria
CMC (ug/L)

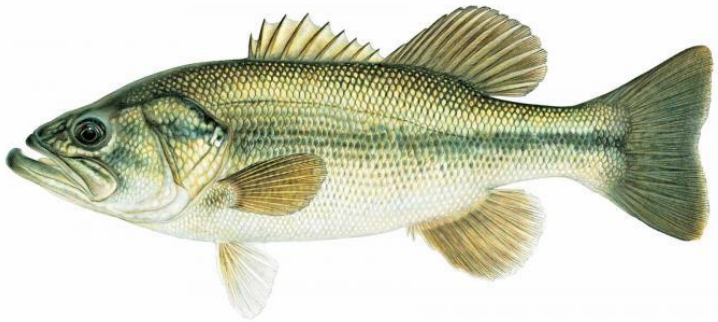
Aluminum Criteria

- Entities will have the option of using the default criteria for their watershed, or collecting data at the relevant location to use as inputs to the aluminum criteria calculator
- Criteria derived for use in establishing effluent limits in NPDES permits require approval by MassDEP/EPA
- These criteria would then be subject to public notice in connection with the NPDES permitting process

Freshwater Copper Criteria

Why is Excess Copper Harmful to Aquatic Life?

- Cu is a trace metal in the earth's crust; it is an essential element for all living organisms
- Cu enters surface water through multiple pathways: weathering, copper pipe corrosion, effluent discharges, watershed runoff, etc.
- Toxic Cu concentrations impair neurological, metabolic, and reproductive processes



Freshwater Copper Criteria

- **EPA Guidance**:
  - In 2007 EPA published a recommended bioavailability model (Biotic Ligand Model; BLM) to calculate freshwater criteria for copper
  - The use of this approach is encouraged by EPA see https://www.epa.gov/wqs-tech/copper-biotic-ligand-model
- **MassDEP's proposed regulation**:
  - MassDEP proposes to continue using the hardness-based equation for copper criteria in Table 29a
  - MassDEP will also allow the use of the 2007 copper BLM in Table 29a
  - MassDEP will post the current version of the 2007 BLM criteria calculator on our web page

Freshwater Copper Criteria

- **MassDEP's proposed regulation (Cont.)**:
  - The BLM allows the criteria to be derived based on local water chemistry
  - This approach requires 10 water chemistry parameters as inputs *(e.g., pH, dissolved organic carbon (DOC), major cations (Ca, Mg, Na, & K), major anions (SO_4 & Cl), temperature, and alkalinity)*
  - Will likely require additional sampling to develop discharge-specific criteria

Monitoring

Method Development: Discharge-Specific Aluminum Criteria

- MassDEP partnered with USGS
- The project includes water quality data collection at 11 freshwater sites in Massachusetts over 12 months
- Values for pH, DOC, and hardness will be used to calculate discharge-specific aluminum criteria (EPA's MLR)
- The project will inform the development of MassDEP guidelines on discharge-specific data collection and analysis

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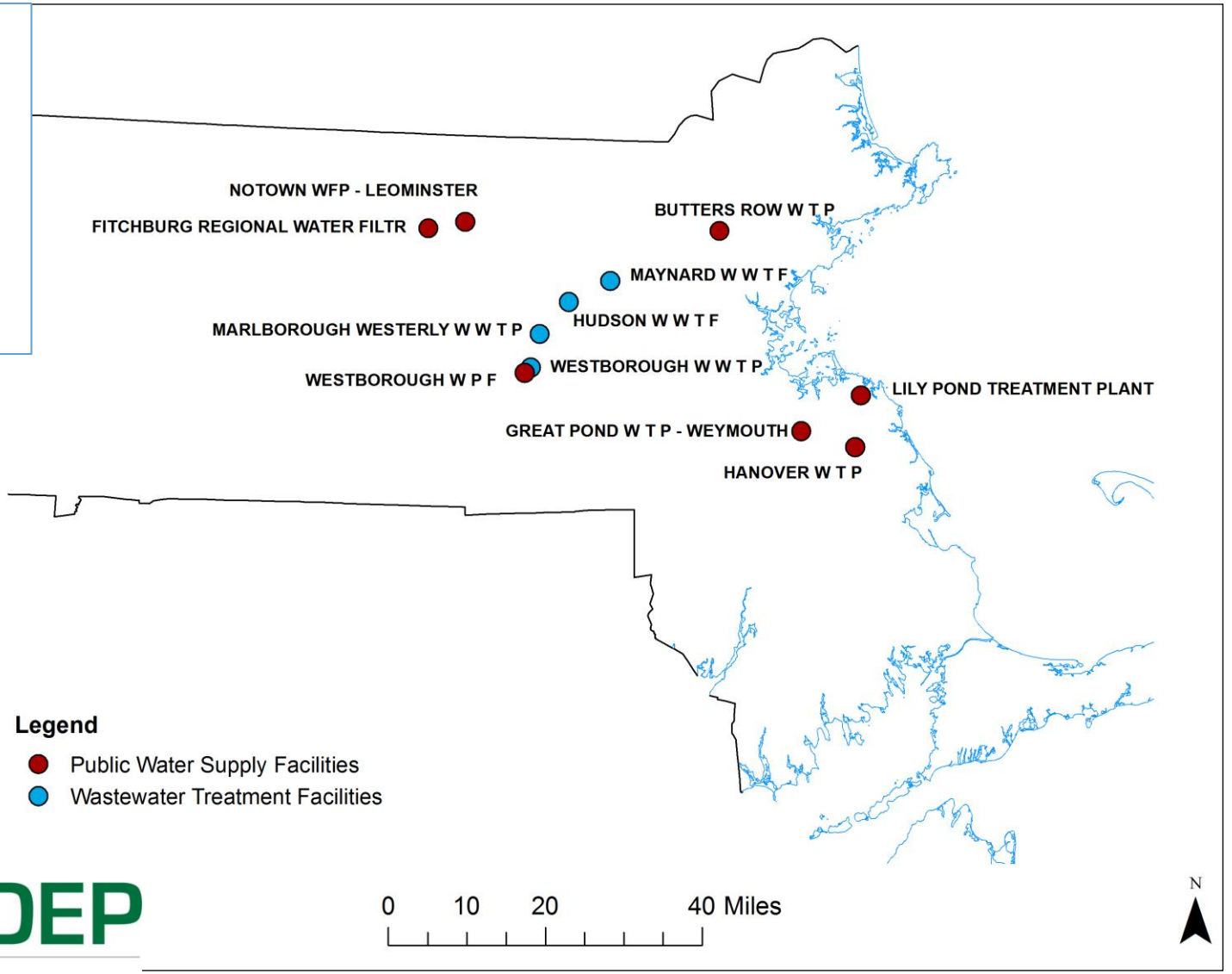
Discharge-Specific Study Locations

4 wastewater treatment facilities (WWTF)
7 public water supply (PWS) facilities



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Continuous data collection

4 sondes installed along Assabet Upstream of WWTF's

Facilities Interested in Data Collection

- Start early
- Consult with MassDEP
- Develop a Quality Assurance Project Plan
- Collect data for 12 months: pH, hardness and dissolved organic carbon (DOC)

IV. Implications for NPDES Permits

NPDES Permit Terminology

- **Reasonable Potential Analysis (RPA) –** used to determine whether a discharge (alone or in combination with other sources of pollutants) to a waterbody, could cause an exceedance of an applicable water quality standard.
- **Anti-backsliding –** Refers to Clean Water Act statutory requirement that prohibits permits with less stringent limits than the previous permit (with some exceptions).
- **Anti-degradation –** A provision that prevents waters of high quality (quality exceeds water quality standards) from being degraded (314 CMR 4.04 and MassDEP Anti-degradation Implementation Procedures).

Key point: water quality criteria cannot be used for establishing permit limits until they have been promulgated into regulation by MassDEP **AND** approved by EPA

Aluminum Limits in Massachusetts Permits—most based on chronic criteria – 87 µg/L

Al Limit (Average Monthly)	47
Al Monitoring Report Only	44
Al Limits = 87 µg/L	19
Al Limits 88 – 100 µg/L	8
Al Limits 101 - 200 µg/L	12
Al Limits > 200 µg/L	8

Some facilities are under enforcement orders and subject to interim limits due to inability to meet permit limits.

Permits Issued Prior to Finalization of New Aluminum Criteria

- RPA conducted using current criteria (87 µg/l chronic, 750 µg/l acute)
- If RP found, limit established based on current criteria, but limit does not go into effect until 3 years after effective date
- If MassDEP adopts new criteria during 3-year period, permittee can request modification to extend compliance schedule
- If MassDEP adopts new criteria and EPA approves the criteria during 3-year period, permittee can request modification to either extend the compliance schedule or revise the limit based on new criteria

Permits Issued Prior to Finalization of New Aluminum Criteria

- For permits with existing limit, existing limit will be interim
- For permits with no existing limit, monitor only
- Anti-backsliding does not apply if limit has not gone into effect
- See draft permit for Maynard for compliance schedule language

https://www.epa.gov/sites/production/files/2018-10/documents/draftma0101001permit.pdf

Permits Issued After New Aluminum Criteria Finalized (Approved by EPA)

- If no prior Al limit, or Al limit has compliance schedule and limit has not yet gone into effect:
  - Conduct RPA using applicable watershed default Al criteria OR discharge-specific criteria if sufficient data available
  - If RP, limit established based on new criteria
  - If limit not immediately achievable, possibility of compliance schedule
  - If no RP, no limit

Permits Issued After New Criteria Finalized - Existing Aluminum Limit

- Determine limit based on new criteria (watershed default criteria or discharge-specific criteria)
- Compare to existing limit
  - If limit based on new criteria < existing limit, new limit applies
    - Example: existing limit is 150, limit based on new criteria is 100; new limit would be 100
  - If limit based on new criteria > existing limit and facility is in compliance with existing limit, existing limit remains due to anti-backsliding
    - Example: existing limit is 100 and facility is in compliance; limit based on new criteria is 150; limit remains at 100
  - If limit based on new criteria > existing limit and facility is not in compliance with existing limit, possibility of modifying limit, but could not be greater than current performance
    - Example: existing limit is 100 and facility is currently achieving 150; limit based on new criteria is 200; possibility limit may be modified to 150

Limits can only be modified if consistent with anti-backsliding and anti-degradation provisions.

Copper Limits in Massachusetts Permits

Cu Limit (Avg Monthly or Max Daily)	76
Cu Monitoring Report Only	51
Cu Limit <10 µg/l (Avg Monthly)	19
Cu Limit 10-20 µg/l (Avg Monthly)	23
Cu Limit 21-30 µg/l (Avg Monthly)	13
Cu Limit >30 µg/l (Avg Monthly)	12

Some facilities are under enforcement orders and subject to interim limits due to inability to meet permit limits.

Permits Issued Prior to Finalization of New Copper Criteria

- No change from current practice
- Applicable criteria calculated using hardness data
- RPA conducted using applicable criteria
- If RP, limit established based on applicable criteria
- If limit not achievable immediately, possibility of compliance schedule
- If no RP, no limit

Permits Issued After New Criteria Finalized (Approved by EPA)

- In most cases, no change from current practice (use hardness-based criteria)
- Where sufficient data available, BLM will be used
  - Must follow procedures in regulations for data collection, QAPP approval, etc.
- Ideal if data collected prior to permit renewal
  - If not, talk with EPA and MassDEP about possibility of compliance schedule to allow time to collect data for BLM
- Same rules for anti-backsliding and anti-degradation apply for modifying limits

Questions

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