Introduction to Criteria

VIRTUAL WQS ACADEMY

JUNE 2024

Disclaimer

This Presentation does not:

- Impose any binding requirements
- Determine the obligations of the regulated community
- Change or substitute for any statutory provision or regulatory requirement
- Change or substitute for any Agency policy or guidance
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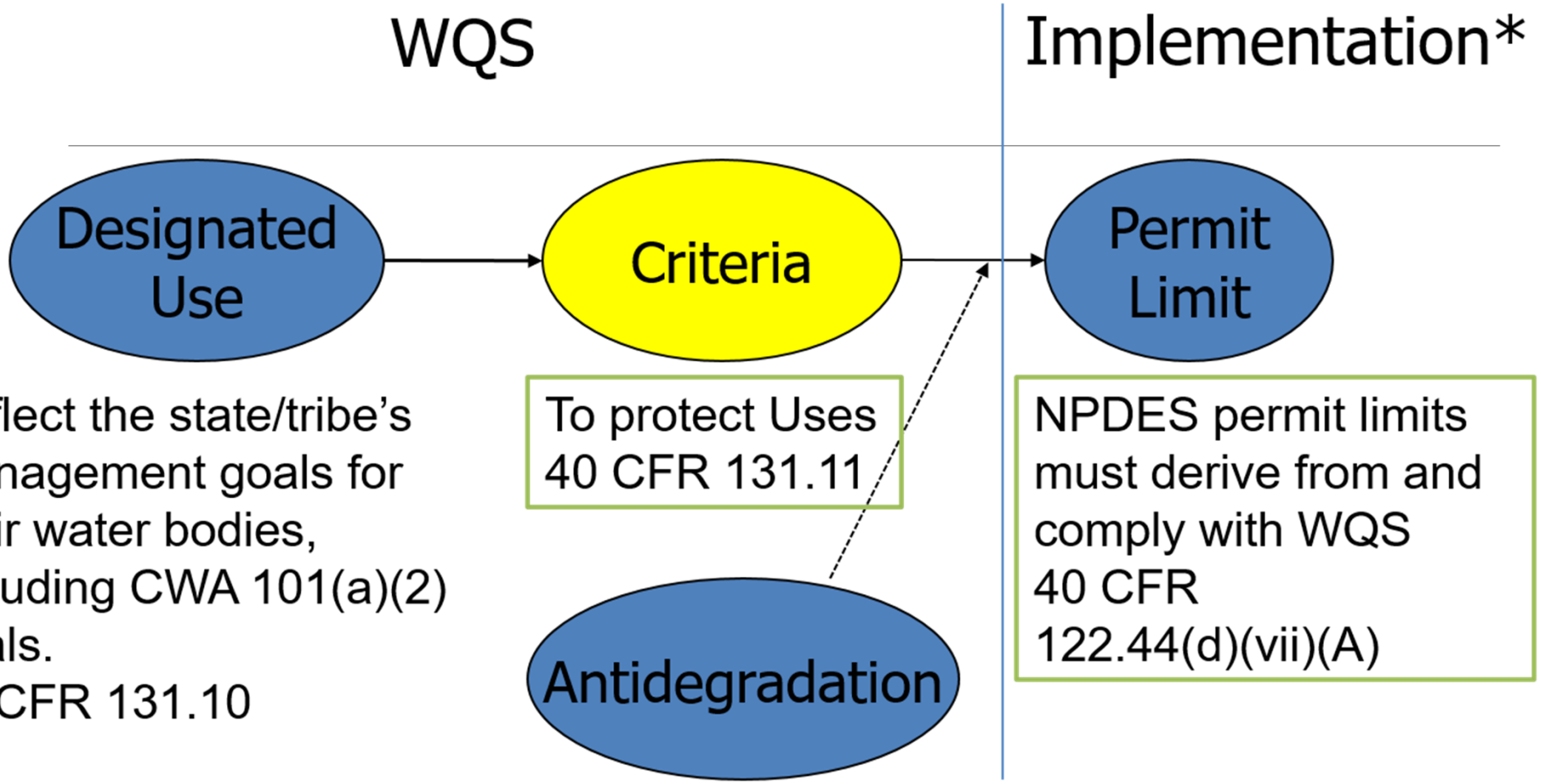
What are Water Quality Criteria?

The term '*criteria'* is defined in regulation at 40 CFR 131.3(b) as:

- Elements of state/tribe WQS, expressed as constituent concentration, levels, or narrative statements, representing a quality of water that supports a particular use. When criteria are met, water quality will generally protect the designated use.

The Purpose of Criteria



**NPDES is just one example of implementation*

What does the CWA say about Criteria?

- *CWA 303(c)(1):* States/Tribes shall adopt criteria to protect designated uses into their WQS.

- *CWA 303(c)(2)(b):* States/Tribes shall adopt criteria for "priority pollutants" (a list of 'toxic pollutants' from a Congressional committee report referenced in *CWA **307(a)***).

What do the WQS Regulations Require for Criteria? (40 CFR 131.11)

States/Tribes must adopt those water quality criteria to protect the designated use.

- Criteria must be based on sound scientific rationale.
- Criteria must contain sufficient parameters or constituents to protect the designated use.
- For waters with multiple use designations, the criteria shall support the *most sensitive use*.

Federal Recommendations for Criteria

- *CWA Section 304(a) Criteria*: Recommendations developed by EPA based on the latest scientific knowledge, issued periodically as guidance to states/tribes for use in developing their own criteria.

- Basis for Federal promulgation if necessary (i.e., if a state/tribe fails to adopt adequately protective criteria on their own).

Pyramid Lake

Forms of Criteria: Numeric and Narrative

- 40 CFR 131.11(b) states that in establishing criteria states/tribes should establish numerical values based on:
  1) CWA 304(a) guidance.
  2) CWA 304(a) guidance modified to reflect site-specific conditions.
  3) Other scientifically defensible methods.

- State/Tribes should establish narrative criteria or criteria based upon biomonitoring methods where numerical criteria cannot be established or to supplement numerical criteria.

- Both numeric and narrative forms of criteria provide a regulatory basis for implementation and management actions like NPDES permit limits.

Numeric Criteria

- Example:

  "To protect the Aquatic Life Use, dissolved Zinc *shall not exceed* 90 micrograms per liter as a one hour average more than once every three years."

Lake Tahoe

Narrative Criteria

Example:

"Surface waters *shall be free from* substances attributable to wastewater discharges or other pollutant sources that cause injury to, or are toxic to, or produce adverse physiological responses in humans, animals, or plants."

Note: For CWA 307(a) toxics, a state/tribe must provide a method of translating a narrative criterion into something numeric from which a permit writer can derive effluent limits (40 CFR 131.11(a)(2)).

Types of Water Quality Criteria

Most common types…

To protect aquatic life uses

- **Aquatic life criteria** (focus on pollutants)
- **Biological criteria** (focus on aquatic community)

To protect human uses

- **Human health criteria** (focus on effects over a lifetime)
- **Recreational criteria** (focus on preventing illness from recreation)

Other types of criteria:

- Nutrient criteria
- Sediment criteria
- Etc.

Aquatic Life Criteria: Components

- Aquatic life criteria protect aquatic life from specific pollutants in the water column.

- In addition to typical surface waters, EPA recommendations are largely applicable to wetlands, but some may need adjustments, for example because of natural factors such as pH.

- An aquatic life criterion typically contains three components:
  - **Magnitude** (or concentration) – how much of a parameter
  - **Duration** – period of time over which the instream concentration is averaged
  - **Frequency** – how often the average concentration can be exceeded

Example: "To protect the Aquatic Life Use from acute toxicity in saltwater, dissolved Zinc *shall not* exceed 90 micrograms per liter as a one hour average more than once every three years."

Aquatic Life Criteria

Usually include:

- An acute value to protect against short exposure periods.
- A chronic value to protect against long term exposure.
- Separate saltwater values and freshwater values to account for different effects depending on salinity.

Example: Dissolved Zinc Aquatic Life Criteria
For all of the below, concentrations shall not exceed the specified number as a 1-hour average (for acute) or a 4 day average (chronic) more than once every 3 years.

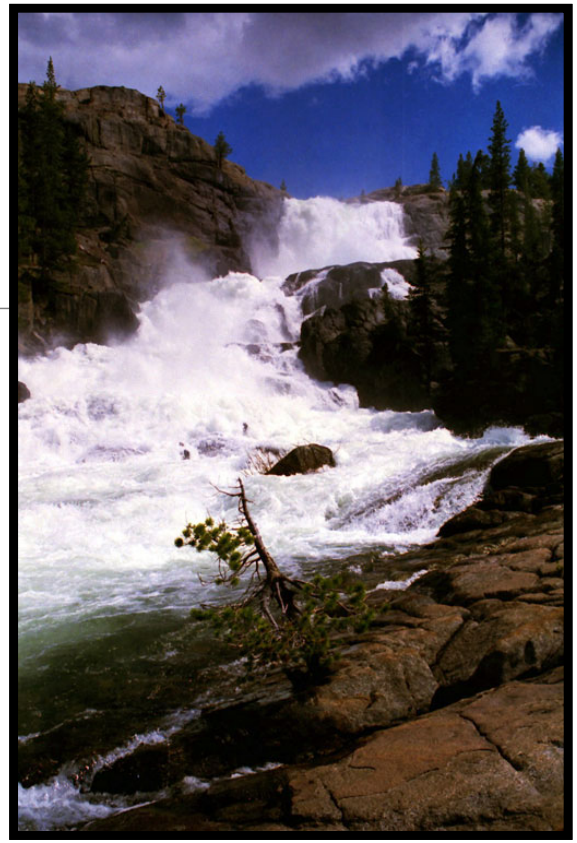
Saltwater acute: 90 ug/L as a 1-hour average
Saltwater chronic: 81 ug/L as a 4 day average

Freshwater acute: 120 ug/L as a 1-hour average
Freshwater chronic: 120 ug/L as a 4 day average

Biological Criteria (or 'biocriteria')

- Protect aquatic life uses by describing the desired biological condition of surface waters for a specific aquatic life designated use.
- Based on the premise that the structure and function of an aquatic biological community within a specific type of waterbody provide critical information about the quality of surface waters.
- Usually developed based on an appropriate reference condition.
- Expressed as narrative or numeric (numeric preferred).

Biocriteria forms



Narrative:

- "Waters shall be free from substances in concentrations or combinations that would adversely alter the structure and function of aquatic communities, as defined by the reference condition."

Numeric:

- Class I: Cool Water Aquatic Life
  - Taxa Richness: 5
  - EPT Index: 3

Human Health Criteria

- Human health criteria are developed to protect humans from specific pollutants in both water and fish tissue that humans might ingest.
- Calculated to protect from effects of pollutants from ingestion of aquatic organisms in the water ("org only") and for ingestion of water and organisms ("water + org").
- Expressed as a pollutant concentration based on:
  - Toxicological Assessment
  - Exposure Scenario

Recreational Criteria

- Recreational criteria protect recreational designated uses (for activities including swimming, bathing, surfing, etc.).
- Designed to protect people from illnesses (including gastrointestinal, skin, eye, ear, etc. effects) due to exposure to fecal contamination in water, and kidney and liver damage due to exposure to certain cyanotoxins.
- For fecal contamination, EPA has published criteria recommendations based on epidemiological studies involving swimmers, looking at an association between water quality and illness.

Nutrient Criteria

- Nutrient criteria are numeric limits of total nitrogen and total phosphorus that protect designated uses (aquatic life, recreational, and public water supply) from the effects of eutrophication.
- Nutrient criteria are developed for different waterbody types using field data of nutrient concentrations (the *stressors*) and different ecological effects symptomatic of eutrophication (the *responses*).

Little Fall Creek

Example: EPA's 304(a) recommendation tables on the internet

Pollutant (P = Priority Pollutant)	CAS Number	Freshwater CMC[1] (acute) (µg/L)	Freshwater CCC[2] (chronic) (µg/L)	Saltwater CMC[1] (acute) (µg/L)	Saltwater CCC[2] (chronic) (µg/L)	Publication Year	Notes
Cadmium (P)	7440439	1.8	0.72	33	7.9	2016	Freshwater acute and chronic criteria are hardness-dependent and were normalized to a hardness of 100 mg/L as CaCO3 to allow the presentation of representative criteria values…expressed in terms of the dissolved metal in the water column…

Our Goal for You

- This week you will see (and practice) how EPA derives its "national recommended CWA 304(a) criteria" that are intended to be generally protective. However, national recommendations are not tailored to any regional concerns or site-specific conditions.

- States and authorized tribes need not derive their own criteria if they choose to incorporate EPA's recommendations directly as their own criteria.
  - However, if you work for a state or tribe, and that entity does want to derive its own criteria (statewide, or site-specific)…after today you will have some experience with how you could go about this.

Review Questions

1) What's the primary purpose of criteria?
2) What are 304(a) criteria?
3) What are the two forms of criteria?
4) When a water has multiple designated uses, what must the criteria protect?
5) How are criteria implemented?

BONUS: Where were most of the photos in this presentation from?

Review Questions (Answers)

1) What's the primary purpose of criteria?

Protect designated uses

2) What are 304(a) criteria?

EPA's published recommendations

3) What are the two forms of criteria?

Numeric and narrative

4) When a water has multiple designated uses, what must the criteria protect?

The most sensitive use

5) How are criteria implemented?

NPDES permits, TMDLs, etc.

BONUS: Where were most of the photos in this presentation from? *Nevada*