



# Water Quality Standard for Natural Conditions

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Water Quality Standards



# Presentation

- Introduction
- EPA Approved Regulation (2003)
- Review of State Approved Reg. and Guidance (2007)
- Statistical Tool
- Questions and Answers



# Natural Condition Definition

Currently Defined in

18 AAC 70.990(41):

any physical, chemical, biological, or radiological condition existing in a waterbody before any human-caused influence on, discharge to, or addition of material to, the waterbody;



# What is the Problem?

- Challenges in permitting discharges to waters with naturally low quality
  - 2003 regulations require site specific criteria that are “better” than the natural condition
  - Not possible for actions where there is no control over pollutant levels via treatment
- No current procedures on how to determine natural levels of pollutants

# Water Quality Standards with natural conditions parameters

## 1) Color

- (not to exceed X color units or Natural conditions)

## 2) Dissolved Oxygen (DO)

## 3) Dissolved Inorganic Substances - fresh (TDS)

- No amounts above natural conditions

## 4) pH

- Ex: “may not vary  $> 0.5$  units from natural conditions

## 5) Sediment

- for water supply – no measurable increase in concentration of settleable solids above natural conditions...

## 6) Turbidity

- May not exceed 5 NTUs above natural conditions

# EPA Approved Regulation (2003)

Water Quality Standards – Pg. 34. Site Specific Criteria AAC  
70.23. (b)

## Main points:

- if natural conditions are of lower quality it constitutes the water quality criterion
- DEC determines if site specific criterion
- public notice required
- highest prevailing quality used
- may require continuing monitoring

# EPA Approved Regulation (2003)

Water Quality Standards – Pg. 34. Site Specific Criteria AAC 70.23. (b)

If the **department finds** that the natural conditions of a waterbody is demonstrated to be of lower quality than a water quality criterion set out in 18 AAC 70.020(b), the natural conditions constitutes the applicable water quality criterion. Upon application or on its own initiative, the department will determine whether a natural condition should be approved as a site-specific water quality criterion. Before making the determination, the department will **issue public notice** of a proposed approval under this subsection and provide opportunity for public comment.

# EPA Approved Regulation (2003)

Water Quality Standards – Pg. 34. Site Specific Criteria AAC  
70.23. (b)

If a natural condition varies with time, the natural condition will be determined to be the **prevailing highest quality** natural condition measured during an annual, seasonal, or shorter time period before discharge or operation, or as a the actual natural condition measured concurrent with discharge or operation. The department will, if necessary to adequately protect water quality

# EPA Approved Regulation (2003)

Water Quality Standards – Pg. 34. Site Specific Criteria AAC  
70.23. (b)

(1) determine a natural condition for one or more seasonal or shorter periods to reflect variable ambient conditions: and

(2) require additional or continuing monitoring of natural conditions as a condition of a permit, certification, or approval.

# Natural Conditions - 2006

- Changed from a site specific criteria to a narrative standard in 18 AAC 70.010(c)
- Implemented through permits, certifications, TMDLs, 303(d) impaired water listing decisions
- *Guidance for the Implementation of Natural Condition-Based Water Quality Standards*
  - Dated November 15, 2006
  - Adopted by reference into regulation
  - Used to set a numeric standard for a waterbody

# State Approved Regulation (2006)

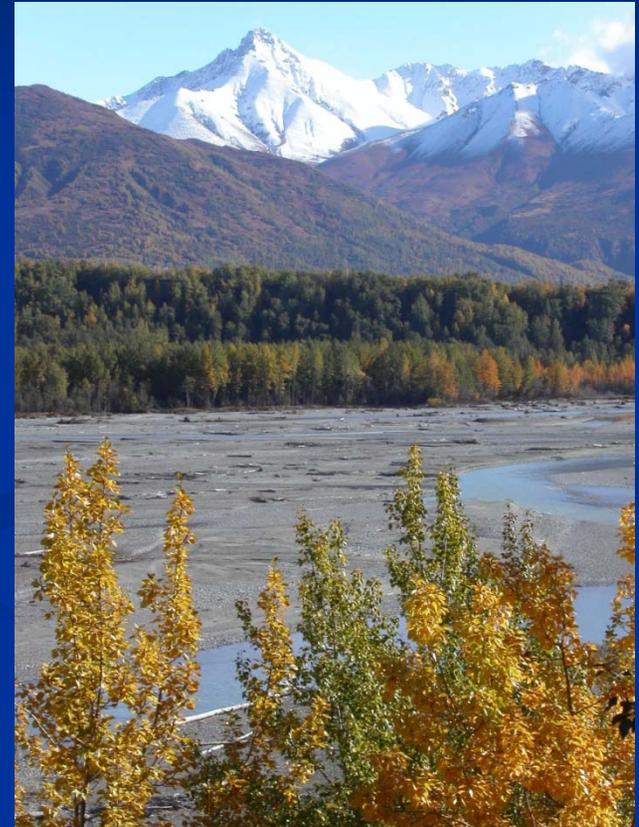
## Water Quality Standards – Pg. 1. General 18 AAC 70.010(d):

Where the Department determines that the natural condition of a water of the state is of lower quality than the water quality criteria set out in 18 AAC 70.020(b), the natural condition supersedes the criteria and becomes the standard for that water. In implementing water quality standards based on the natural conditions in a permit, certification or other written decision, the department will follow the procedures set out in the *Guidance for the Implementation of Natural Condition-Based Water Quality Standards*, dated November 15, 2006 adopted by reference.

# State Approved Guidance 2006

The guidance describes  
two methods for implementing  
a natural condition-based water  
quality standard:

- Concurrent Measurement  
(preferred)
- Statistical Characterization



# State Approved Natural Condition Guidance

- The guidance is in the regulation
- Natural Condition-Based Water Quality Standards (Natural Standard)
- Natural Standard
  - Types of parameters that apply
  - Procedures for developing
  - Methods for calculating standard
  - Methods for calculating permit limits

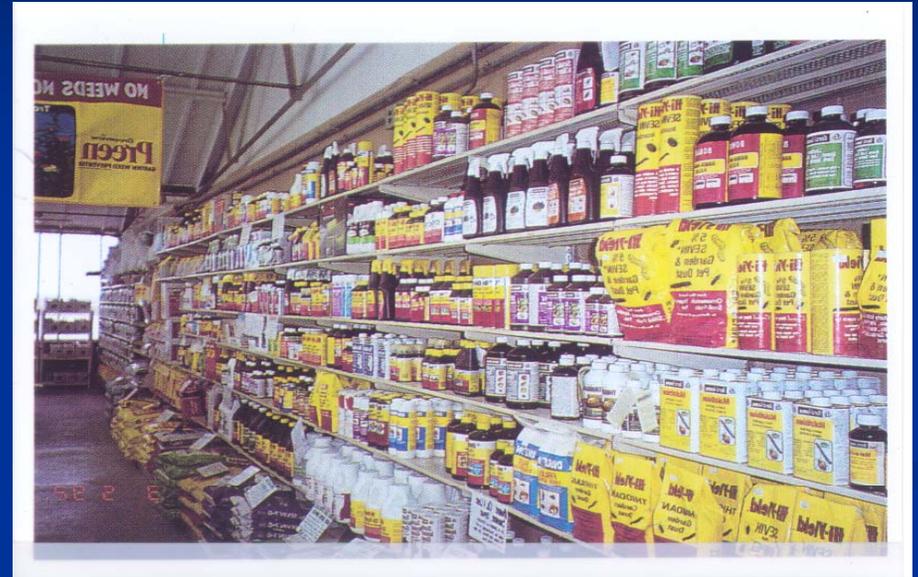
# Applicable Water Quality Parameters

- Potentially applicable to any parameter not attributable to human activities:
  - Bacteria due to wildlife
  - Metals from natural mineral deposits
  - Nutrients from wildlife, vegetation, soils
  - Sediments from natural runoff, geology
  - Temperature, dissolved oxygen from seasonal shifts
  - Other parameters attributed to natural processes

# Natural Standards Do NOT Apply to:

## ■ Human created substances:

- PCBs
- Dioxins
- Synthetic pesticides



## ■ Concentrations of any pollutant attributable to human activities

# Natural Conditions Process Overview



# Exceedance Determination (cont.)

- **Preferred Approach:** Record of natural condition monitoring data from the waterbody of interest
- **Alternate (if preferred approach is unavailable or unreasonable):** Records from nearby site having similar characteristics
  - Data must be collected from the same watershed as the waterbody of interest
  - Applicable when no natural condition monitoring is possible in the waterbody of interest due to human activities

## Step 2. Natural Condition Finding

- DEC must find that Criteria exceedances are the result of natural processes and not human activity
  - The waterbody must be in a predominantly natural state: few roads, light recreational use, limited human activity, although not necessarily pristine
  - Excludes watersheds with major hydrologic or riparian changes

# Natural Condition Finding (cont.)

## ■ Must include:

- Why human activities are not directly or indirectly the cause of the Criteria exceedance for the pollutant of concern
- Evidence that there has been minimal human activity in the watershed that would affect the water quality parameter in question
- How natural processes are adequate to explain the observed exceedances

# Step 3. Areal Extent Determination

To what “waterbody” does the Natural Standard apply?

## ■ May include:

- a single point in a waterbody
- a number of points over an entire waterbody
- some portion of a waterbody

## ■ DEC will consider:

- water quality information
- groundwater and surface water influences
- other natural processes that affect water quality

# Step 4. Expressing Natural Standards: Two Approaches

## ■ Concurrent Measurement Approach

- Compares natural reference site to the waterbody of interest
- Preferred approach

## ■ Statistical Characterization Approach

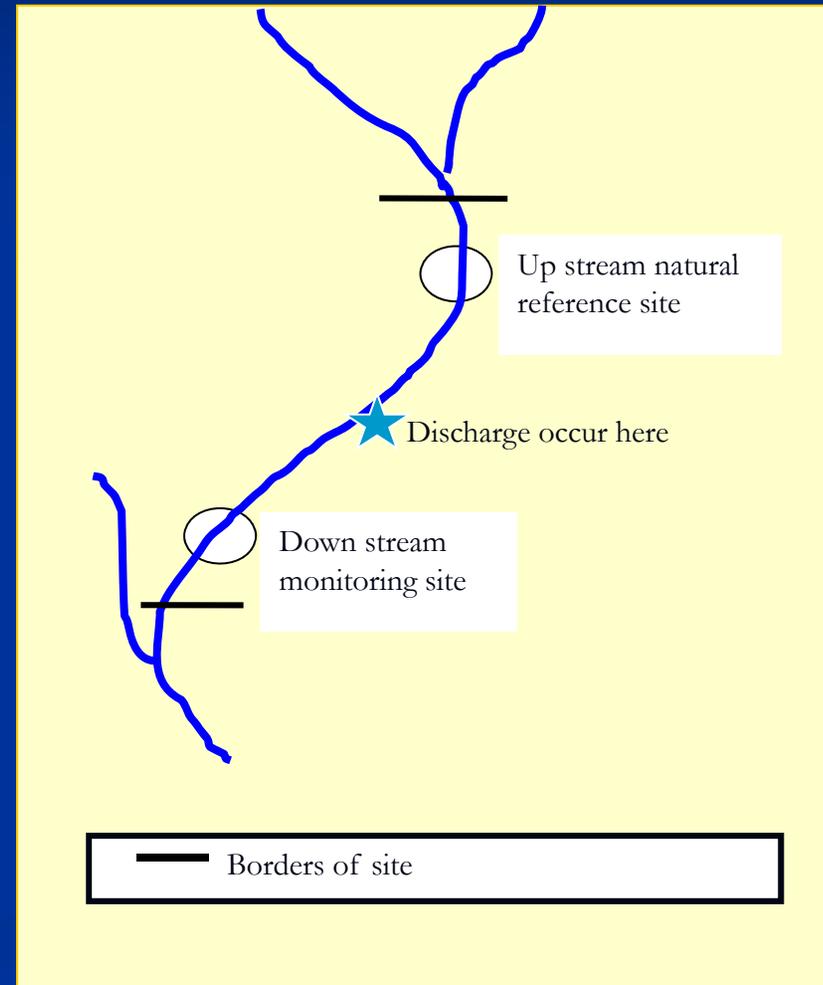
- Used when concurrent approach is not practicable ( e.g., physical limitation) because there is no reference point that can be relied on to reflect continuing natural conditions
- Needs at least two years of data
- Uses statistics to describe the natural condition

# Expressing Natural Standards (cont.)

## Two Approaches: Concurrent Measurement

The preferred approach:

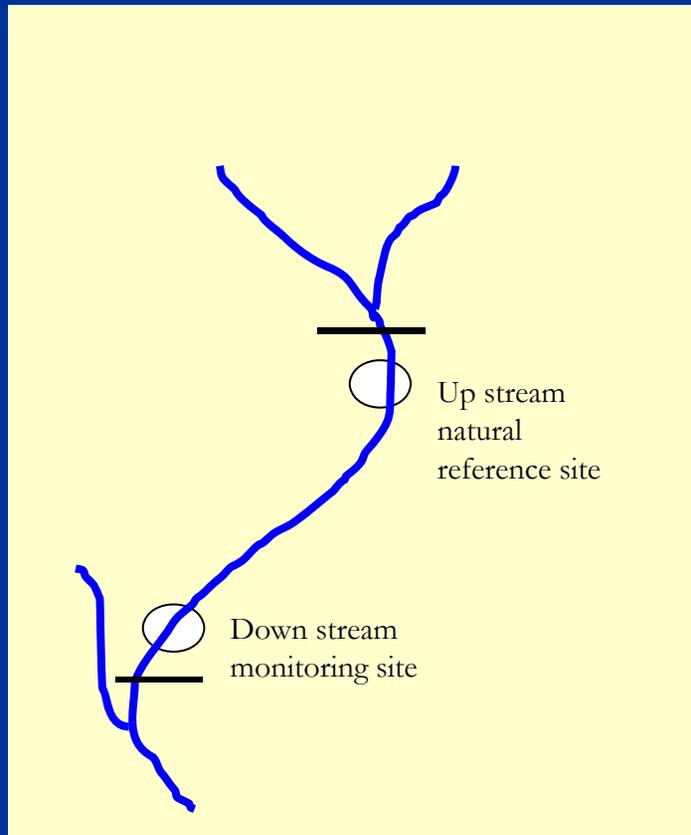
Compares natural reference site to the waterbody of interest.



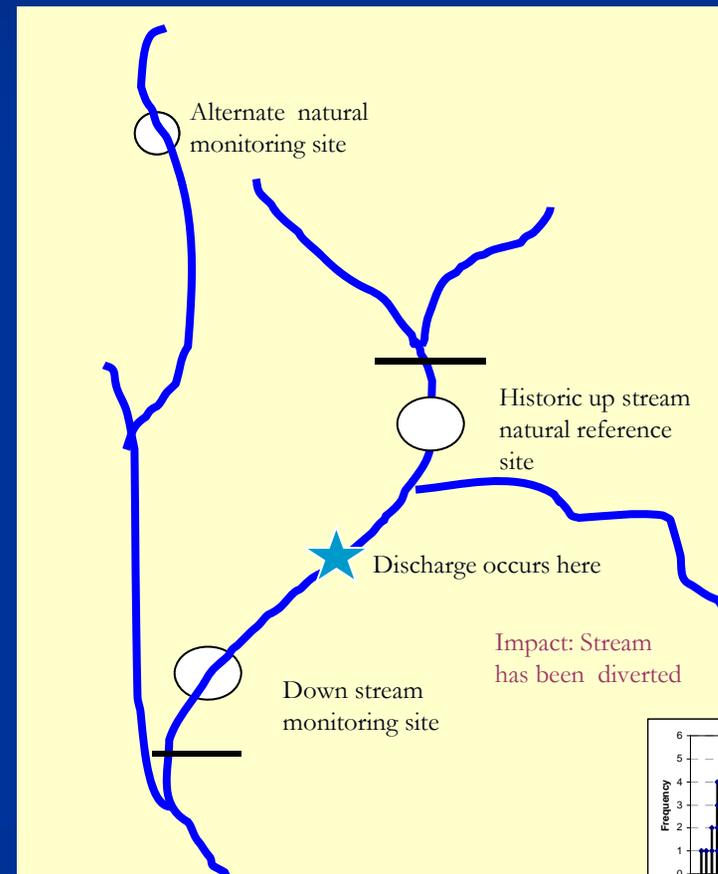
# Expressing Natural Standards (cont.)

## Two Approaches: Statistical Analysis

### Historical Data Collection

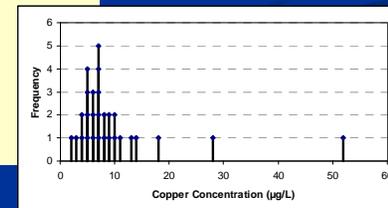


### Discharge Monitoring



Impact: Stream has been diverted

Compare data with historical reference



## Step 5. Public Participation

- Any time DEC finds that the natural standard comprises the water quality standard, the public will be notified and afforded an opportunity to comment
- Public notification, review, and opportunity for comment may be conducted independently or as part of an associated action, such as a permitting decision

## Step 6. Recordkeeping

- DEC will establish a record of every finding that includes supporting documentation and technical analyses
- DEC will maintain an official list of the waterbodies where Natural Standards have been found to apply



# Expressing Natural Standards

- Regardless of approach used, the applicant must have:
  - Approved natural reference sites
  - Proper Quality Assurance and Quality Control (QA/QC)
  - Appropriate statistics, data management and metadata.

# Selection of Natural Reference Sites

A natural reference site must:

- Be free of significant upstream human disturbance; and
- Have conditions comparable to the waterbody of interest.
- When using historic data, the applicant must demonstrate that the site **did** meet natural reference site criteria during the time data collection took place.

# Quality Assurance and Quality Control

- QA/QC procedures must be identified and used.
  - Data collection in accordance with DEC generic Quality Assurance Project Plan and Quality Management Plan
  - Analytical methods must be able to detect pollutant concentrations at the applicable DEC water quality standard

# Concurrent Measurement Approach

- Timing
- Duplicate required
- Specified in permit monitoring requirements
- If the effluent or downstream concentration is less than or equal to the concurrent natural reference site measurement, then discharge is in compliance with the Natural Standard

# Concurrent Measurement Approach

- Objective: Ensure that water quality standards are met with a reasonable degree of assurance
- Noncompliance evaluated in two ways:
  - Any single measurement exceeds the concurrent reference condition by a statistically significant margin
  - Effluent concentrations *persistently* exceed reference conditions by any amount
- Permits must specify what is considered a single or persistent exceedance

# Statistical Characterization Approach

- The statistical methodology similar to EPA's Technical Support Document (TSD) approach for setting permit limits

## Statistical characterization must

- (1) Meet minimum data requirements including any necessary seasonal determination
- (2) Complete the required statistical analysis

# Statistical Characterization Approach

## Minimum Data Requirements

- Must include at least 20 valid data points
- A minimum of two years of data must be collected, preferably three years
- Should have  $\leq 20\%$  frequency of non-detects
- Must measure seasonal variability

# Statistical Characterization Approach

## Seasonal Determinations

- If seasonal water quality is significantly different, then seasonal Natural Standards will be necessary.
- 20 valid data points will be required for each season.
- If data are insufficient for a season, statewide Criteria apply.

# Statistical Characterization Approach

## Seasonal Determinations

- Conditions that may require seasonal Natural Standards include:
  - High and low flows
  - Seasonal variations in gaining or losing flow
  - Seasonal variation in current patterns
  - Seasonal thermal stratification in lakes and estuaries
  - Winter and summer conditions
  - Ice coverage
  - Storm events

# Statistical Characterization Approach

## Statistical Analysis

- Statistical terms used:
  - Mean – the average of all data points
  - 90<sup>th</sup> percentile – 90% of the natural conditions data will be at or below this concentration

# Statistical Characterization Approach

## Statistical Analysis

- Natural conditions vary over time, so the Natural Standard must describe a distribution of concentrations, not just one value
- The natural distribution is described by:
  - the mean of natural conditions data describes the Natural Standard for long-term or chronic exposure.
  - the 90<sup>th</sup> percentile of natural conditions data describes the Natural Standard for occasional or acute exposure.

# Statistical Characterization Approach

## Calculating Permit Limits

- Calculating permit limits is described in the EPA's permit manual for toxics.
- Permits require calculation of wasteload allocation, long term average, average monthly load, and maximum daily load.
- The values calculated for the Natural Standards statistics are used to calculate these types of permit limits.

# Statistical Characterization Approach

## Other Water Actions

- Natural Standards calculated by statistical characterization can also be used for :
  - Determining if a waterbody is impaired or meeting standards under the Clean Water Act Section 303(d); or
  - Determining waterbody recovery goals in a Total Maximum Daily Load plans for impaired waterbodies.

# Natural Conditions Statistical tool