

Monitoring and Assessment

Assessment Methodology

ATTAINS

How's My Waterway



Jesse Boorman-Padgett, USEPA Headquarters

Cristina Mullin, USEPA Headquarters

Selena Medrano, USEPA Region 6

Southwest Tribal Clean Water Act Training

March 2024

Assessment Methodology

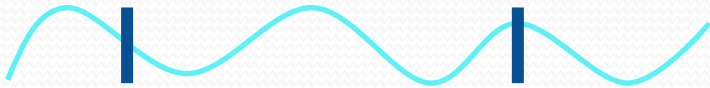
1. Define Assessment Units

What are your Assessment Units?

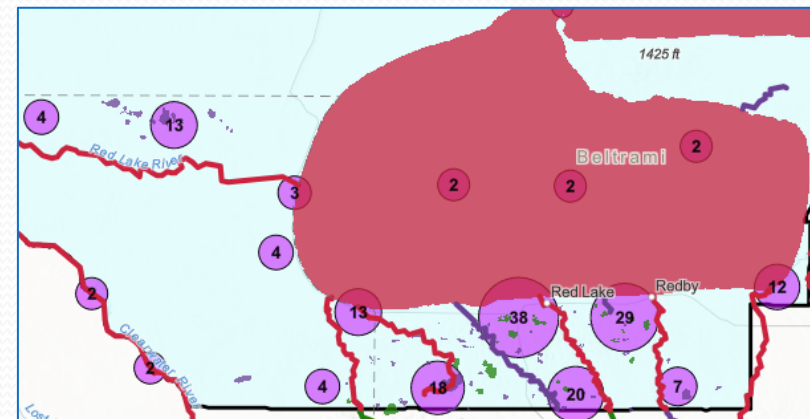
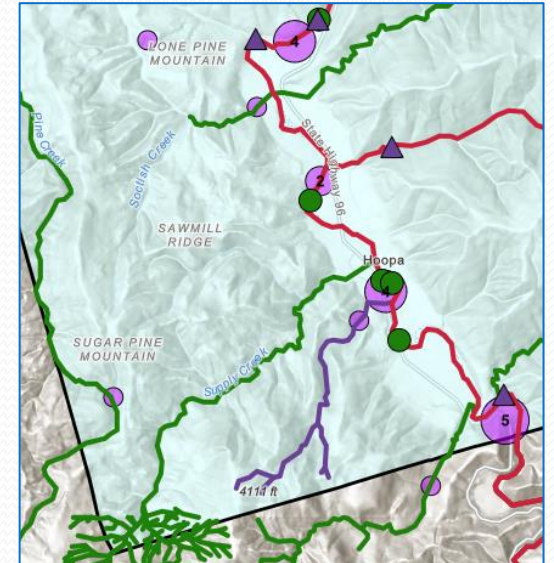
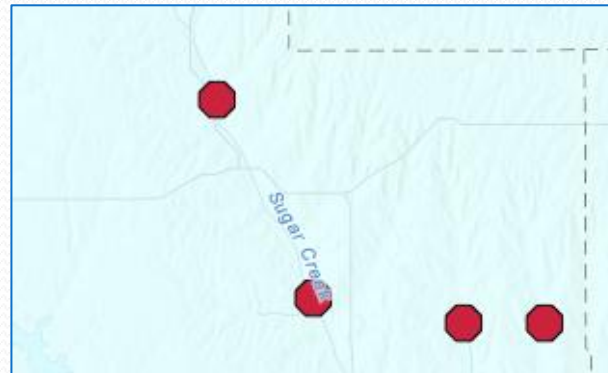
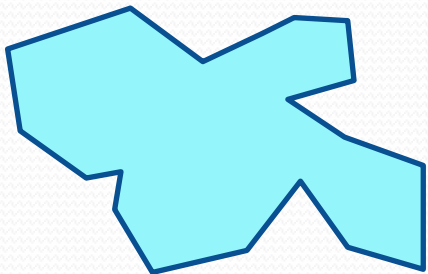
- *Monitoring location only*



- *A segment/length of the stream*



- *An area such as a HUC or Lake*



2. Number of Samples

Parameter	Number of samples for assessment
Dissolved Oxygen	10
<i>Escherichia coli</i>	6

Date	Dissolved Oxygen (mg/L)
7/18/2022	5.29
8/8/2022	3.47
9/12/2022	4.17
10/17/2022	7.09
11/14/2022	6.23

3. Designated Uses, Parameters, and Criteria

Designated Use	Parameter	Criteria
Warm Water Aquatic Life Use	Dissolved Oxygen	6.0 mg/L
Primary Contact Recreation	<i>Escherichia coli</i>	410 cfu/100 mL SSM

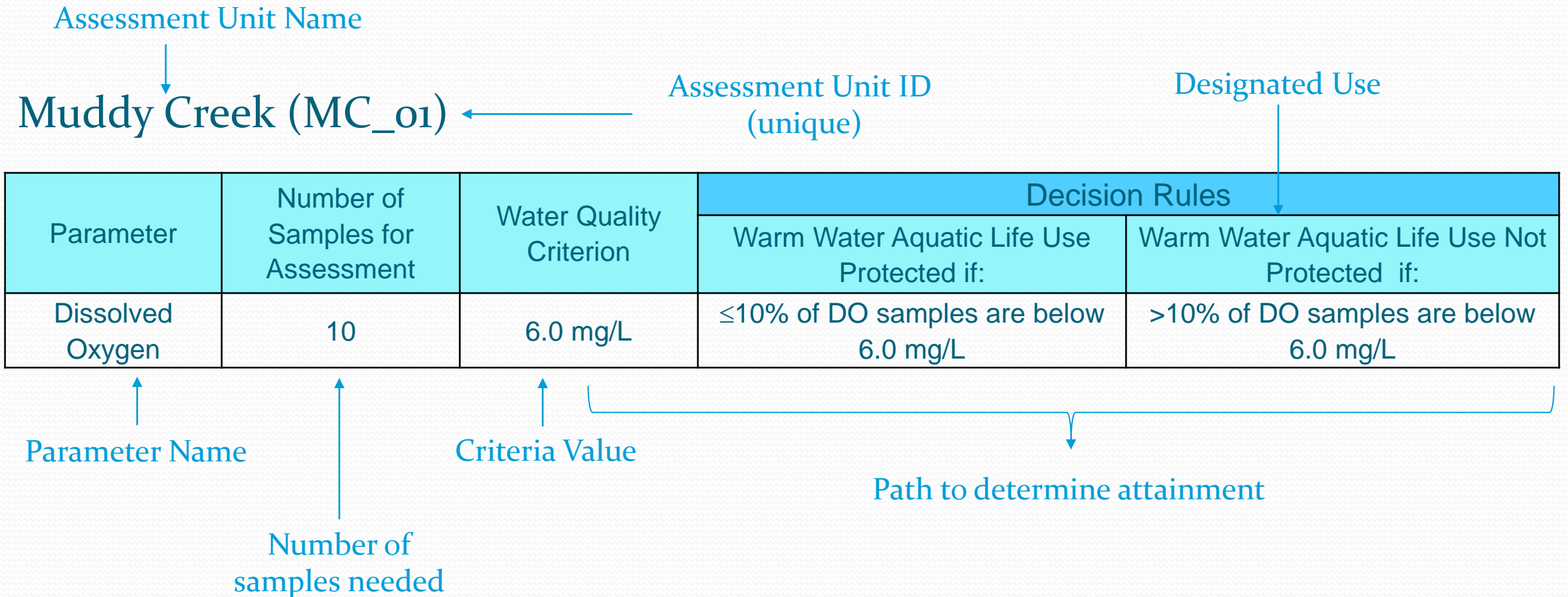
4. Decision Rules

Parameter	Criteria	Supporting Use	Not Supporting Use
Dissolved Oxygen	6.0 mg/L	≤10% of DO samples are below 6.0 mg/L	>10% of DO samples are below 6.0 mg/L
<i>Escherichia coli</i>	410 cfu/100 mL SSM	≤10% of <i>E. coli</i> samples exceed 410 cfu/100 mL	>10% of <i>E. coli</i> samples exceed 410 cfu/100 mL

Common Decision Rules:

- Percentage (>10%)
- Rate of recurrence (no more than once in 3 years)
- Outside of a range (x<y>z)
- Not to exceed (>x)

Putting it all Together



Muddy Creek (MC_01)

Parameter	Number of Samples for Assessment	Water Quality Criteria	Decision Rules	
			Warm Water Aquatic Life Use Protected when:	Warm Water Aquatic Life Use Not Protected when:
Dissolved Oxygen	10	6.0 mg/L	≤10% of DO samples are below 6.0mg/L	>10% of DO samples are below 6.0mg/L
Copper	4	$e^{(0.8545[\ln(\text{hardness})] - 1.386)}$	One sample or less in 3 years exceeds the calculated criterion	More than 1 sample in 3 years exceeds calculated criterion
pH	10	Between 6.0 and 9.0	≤10% of pH samples are below 6.0 or above 9.0	>10% of pH samples are below 6.0 or above 9.0
Sulfates	10	20 mg/L	Median of all samples is ≤20 mg/L	Median of all samples is >20 mg/L
Parameter	Number of Samples for Assessment	Water Quality Criteria	Decision Rules	
			Primary Contact Recreation Protected when:	Primary Contact Recreation Not Protected when:
<i>E. coli</i>	6	Geometric mean of 126 cfu/ 100 mL	GM of <i>E.coli</i> samples is less than 126 cfu/100 mL AND:	GM of <i>E.coli</i> samples is greater than 126 cfu/100 mL OR:
	6	Single sample max of 410 cfu/ 100 mL	≤10% of <i>E. coli</i> samples exceed 410 cfu/100 mL	>10% of <i>E. coli</i> samples exceed 410 cfu/100 mL

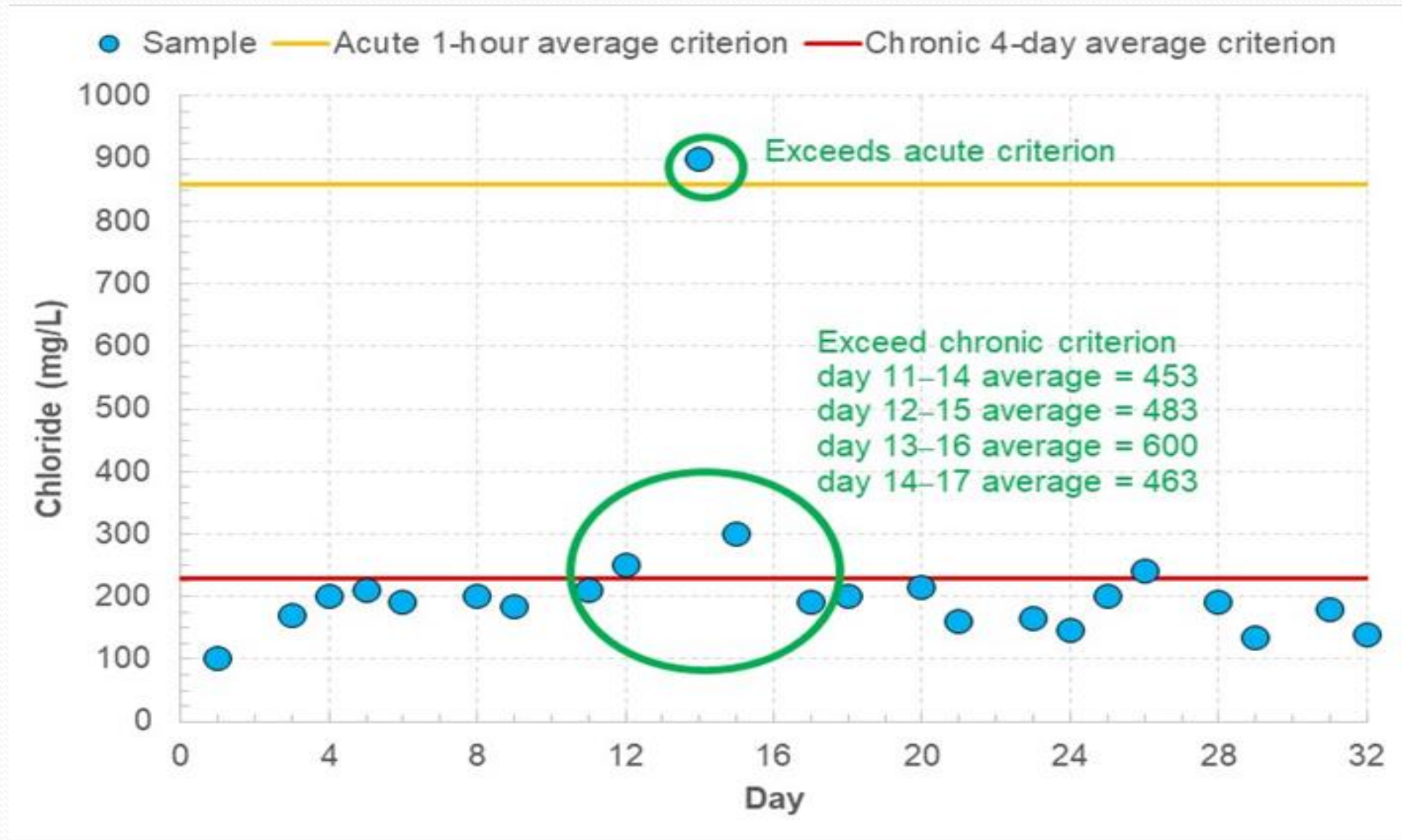
Assessing Data

Considerations for Acute and Chronic Water Quality Criteria – Aquatic Life

- *Acute*: Toxicity at higher concentrations over short time periods
- *Chronic*: Lower concentrations, longer term exposures
- Example: chloride criteria for aquatic life
 - Acute 860 mg/L
 - Chronic 230 mg/L



Lummi Nation Chloride Example



860 mg/L

230 mg/L

Considerations for Sample Size

- **Sample size should target research questions:**

- Types of waterbodies to be assessed
- High/low flow conditions to be considered
- Parameters of interest & seasonality

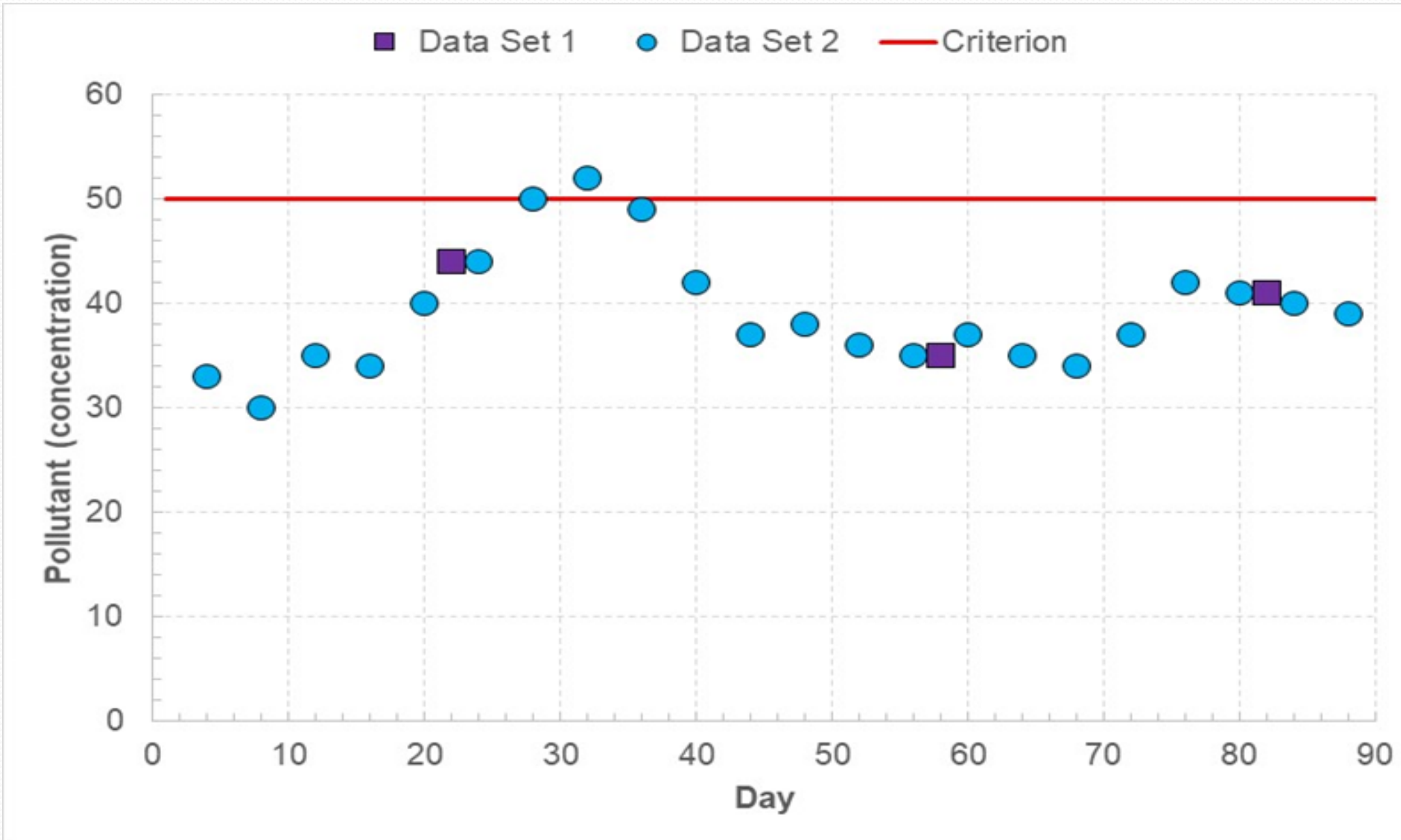
- **Number of samples to be taken**

- Balance cost and completeness of dataset (seasonality coverage, etc)

- Note: Not meeting minimum sample size does not always mean you cannot make a decision

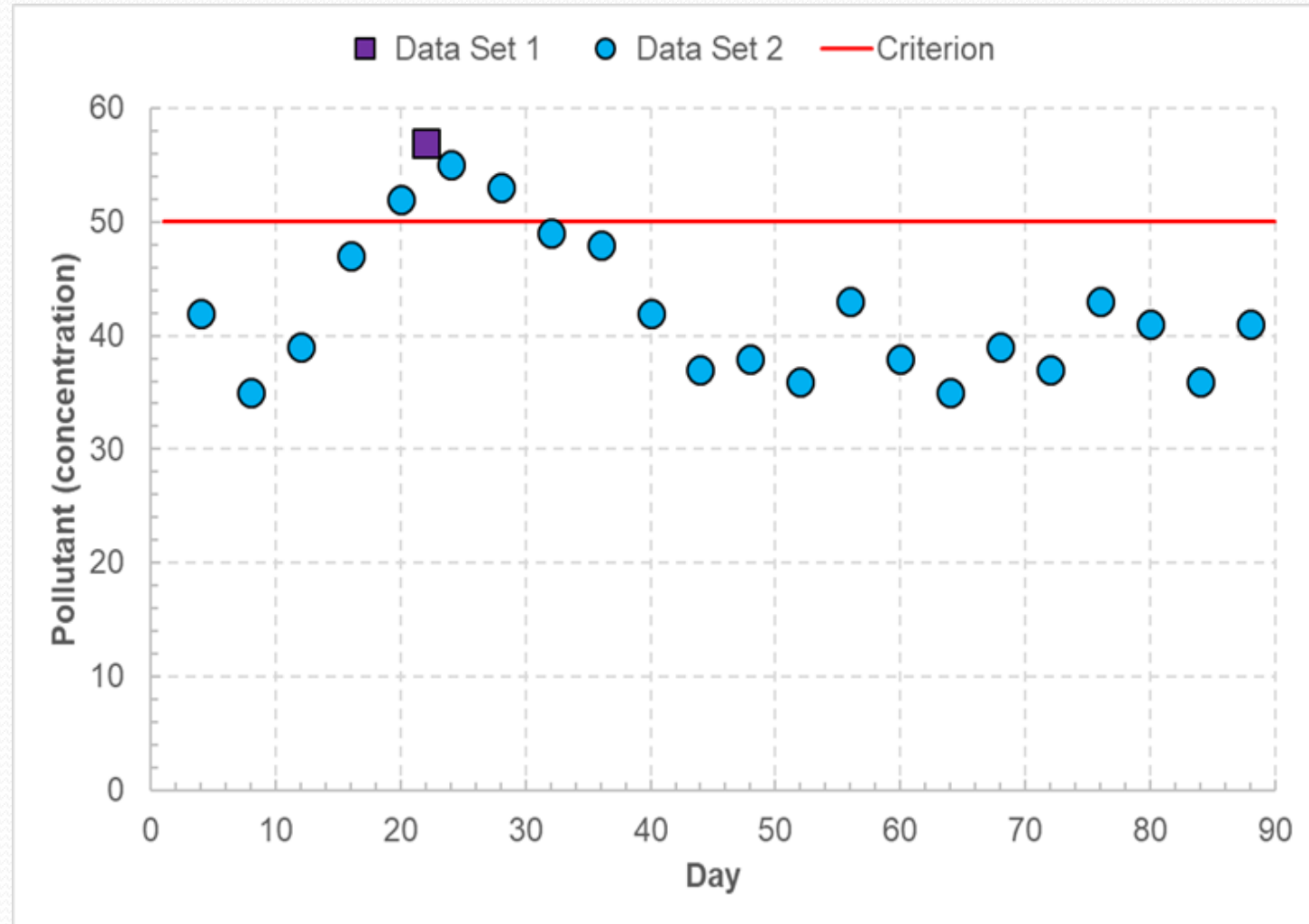


Sample Size Example



Considerations for Sample Size

- Aim to collect enough data to interpret the numeric criterion
- You may need to make decisions with a small dataset
- Numerous factors are considered when developing a sampling frequency, but that is for another module



Examples of Dissolved Oxygen Criteria:

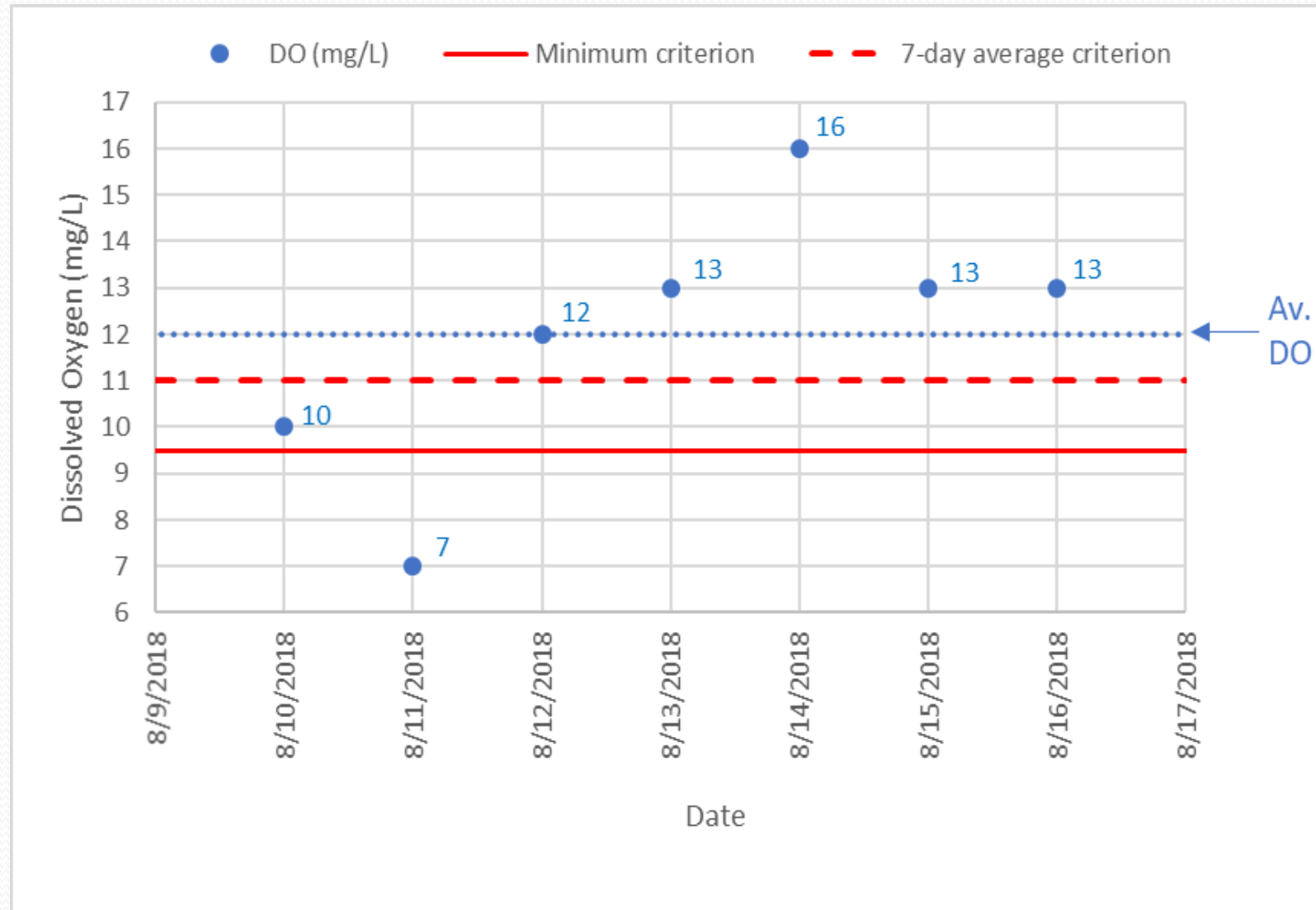
Makah Tribe

- Salmon and trout spawning
 - 7-day average of the daily mean dissolved oxygen: 11 mg/L
 - Minimum: 9.5 mg/L
- Salmon and trout rearing and migration
 - 7-day average of the daily mean dissolved oxygen: 8.5 mg/L
 - Minimum: 6.5 mg/L



Dissolved Oxygen Assessment

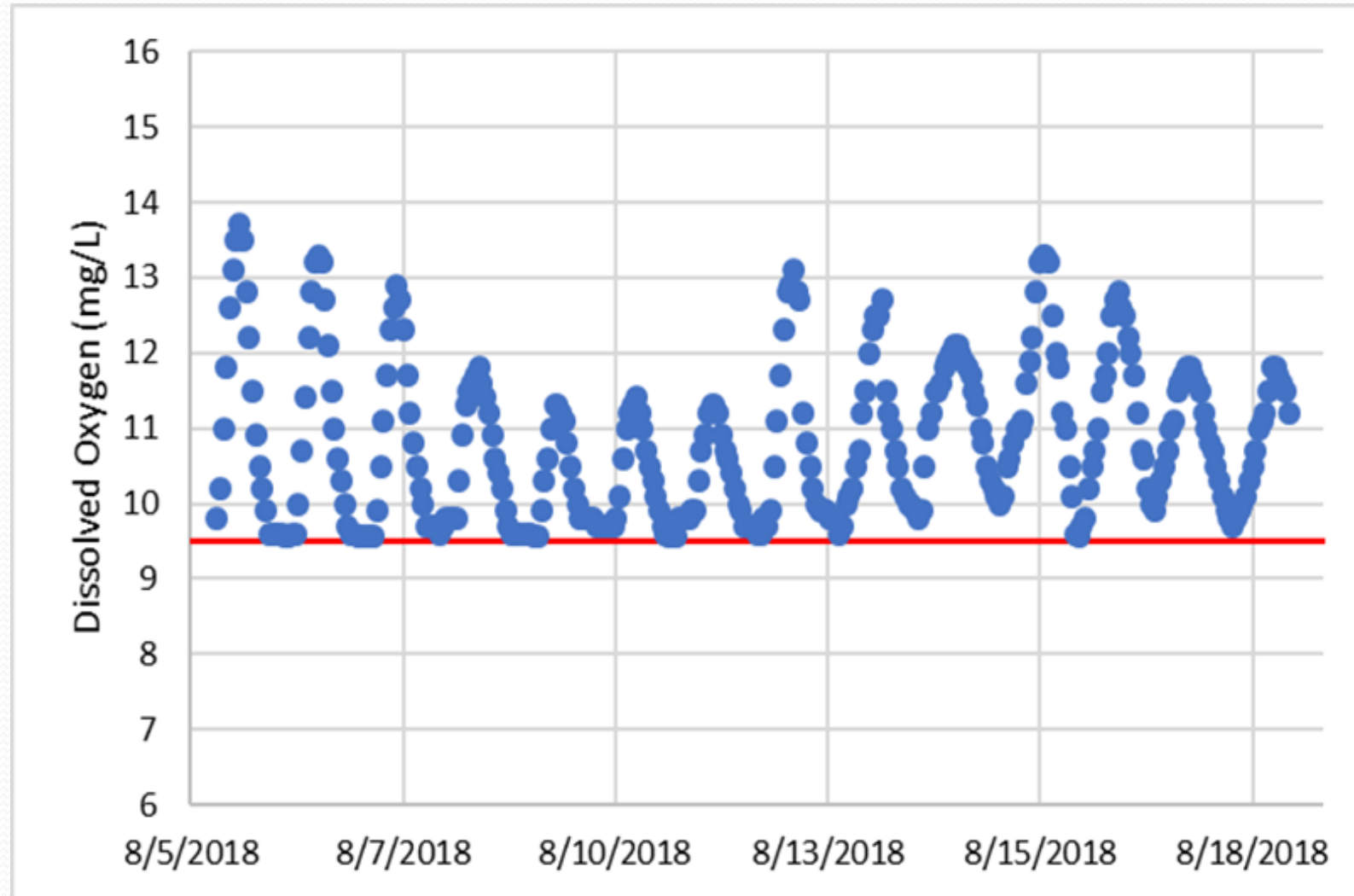
- Salmon and trout spawning water
 - 7-day average of the daily mean dissolved oxygen: 11 mg/L
 - Minimum: 9.5 mg/L
- 7-day average: 12 mg/L
- Range: 7–16 mg/L



Dissolved Oxygen Assessment

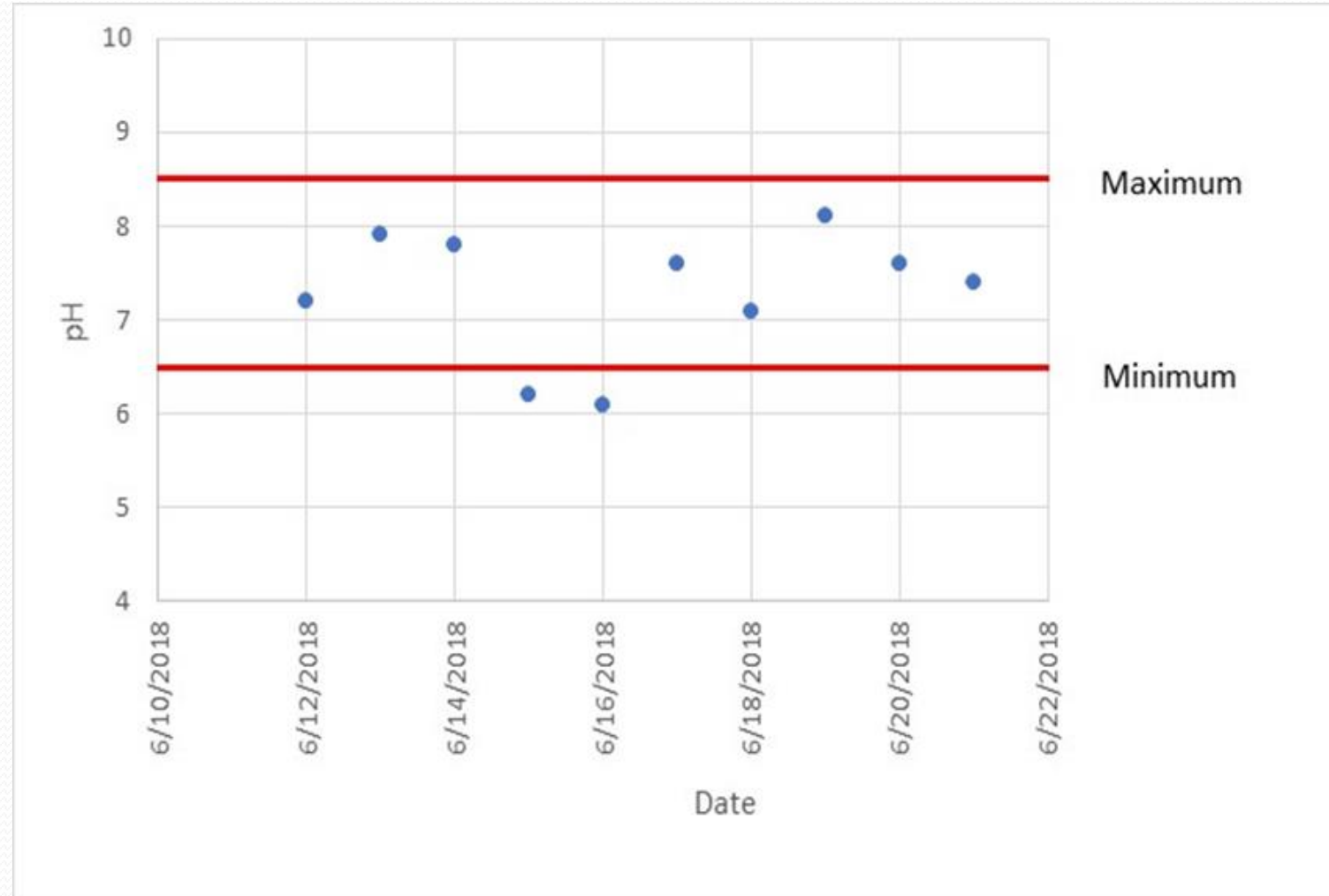
Salmon and trout spawning water criteria:

- 7-day average of the daily mean dissolved oxygen: 11 mg/L
- Minimum: 9.5 mg/L



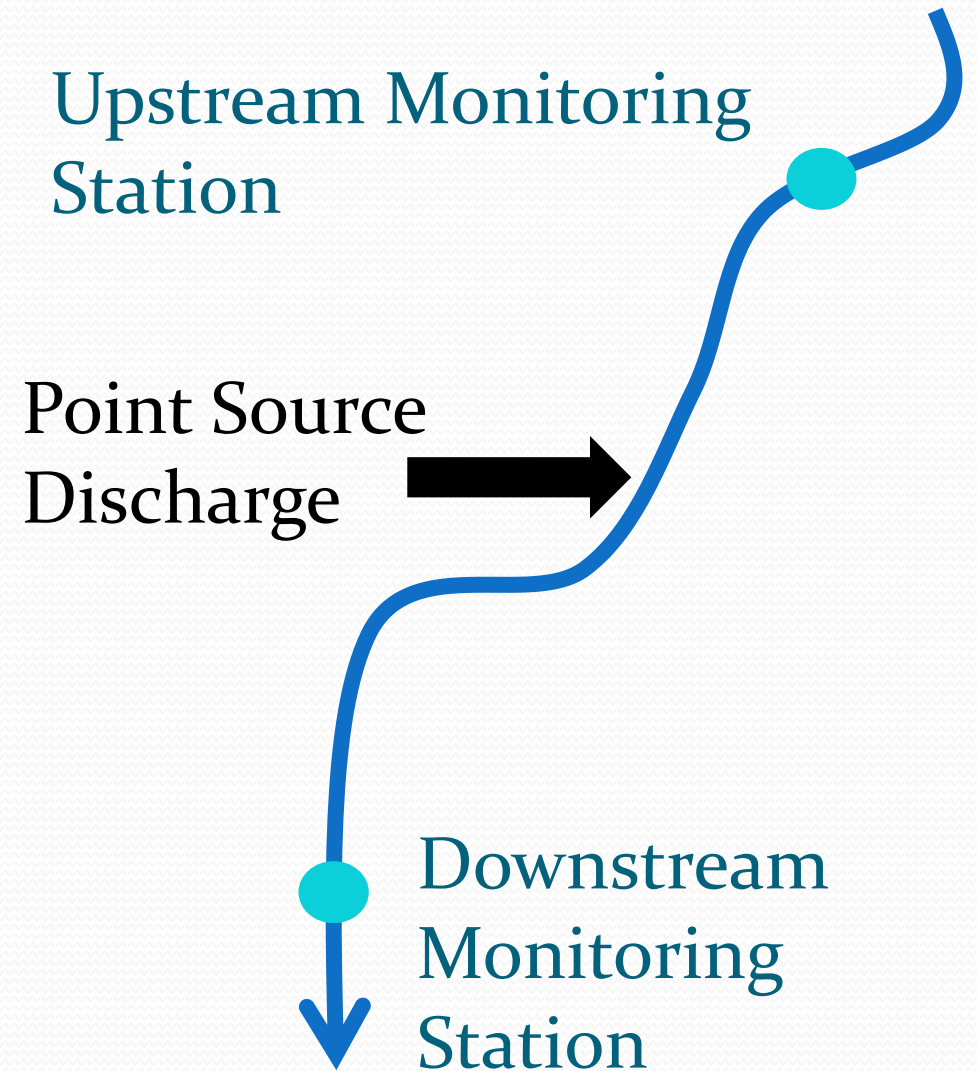
pH Criteria

- A measure of acidity and alkalinity of the water
- Criteria require keeping pH within a specific range
 - To protect human health, the pH must be within the range of 5 to 9
 - To protect aquatic life, the pH must be within the range of 6.5 to 9.0 for freshwater and 6.5 to 8.5 for saltwater



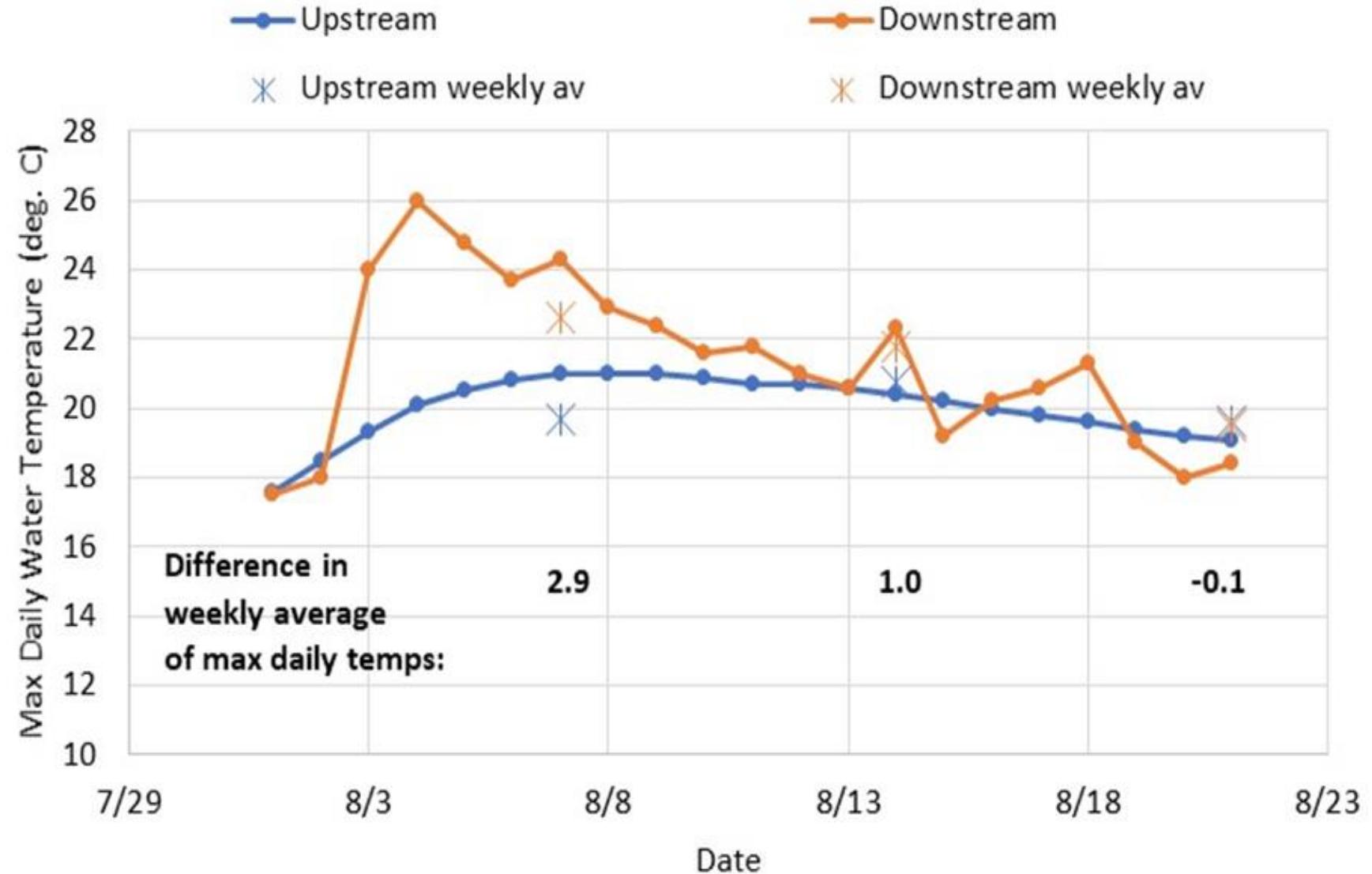
Temperature

- Criteria focused on aquatic life support—warmwater and coldwater
- “In a stream, the introduction of heat by other than natural causes shall not increase the temperature, as measured upstream from the point of introduction, by more than 2.7°C (5°F), based on the weekly average of the maximum daily temperatures measured at mid-depth or three feet, whichever is less.”



Temperature

“No increase in the weekly average of the maximum daily temperature between upstream/downstream locations that is greater than 2.7°C ”



Turbidity

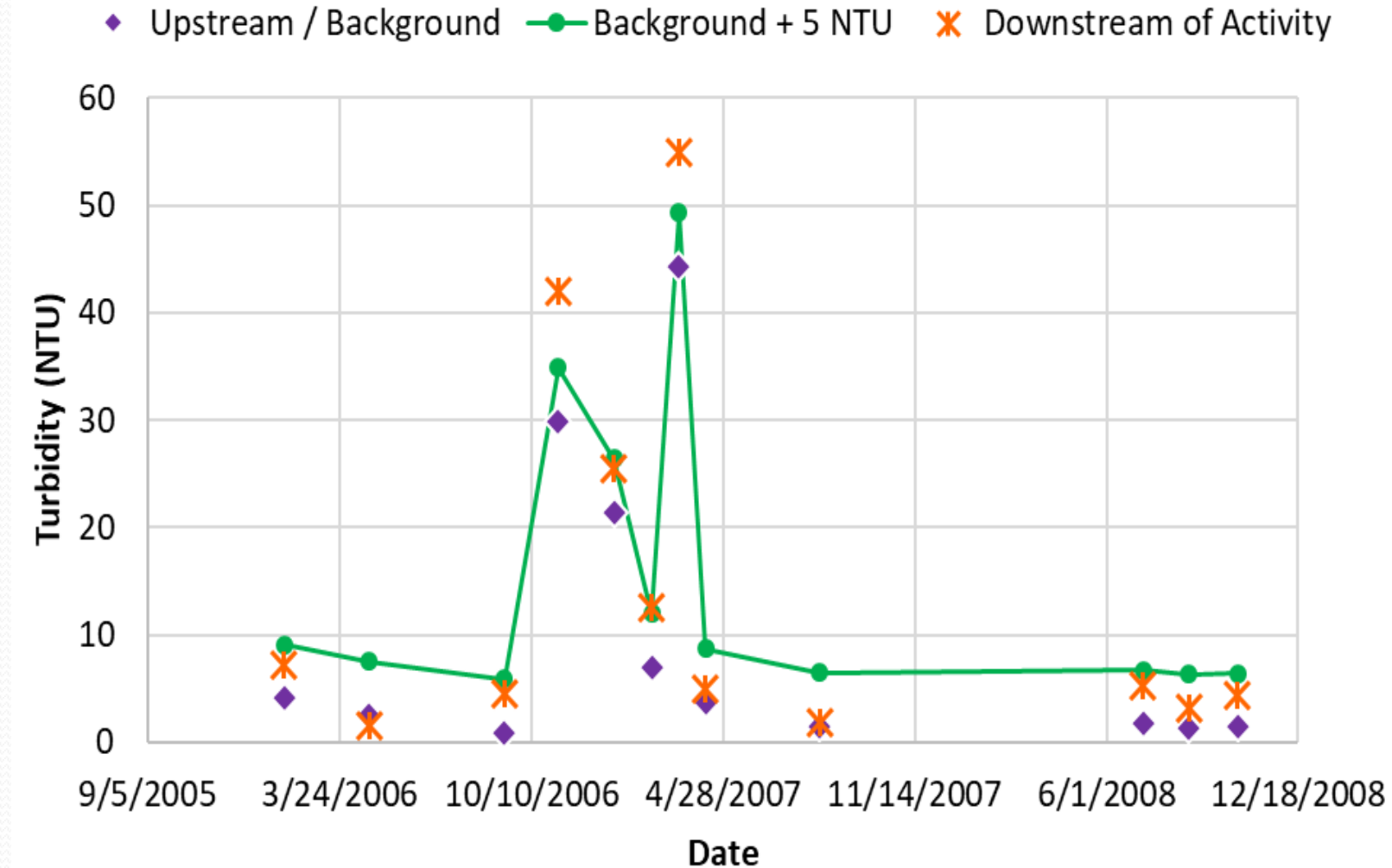
- Measure of cloudiness of water
- Turbidity shall not exceed 5 NTU over background when background turbidity is 50 NTU or less, with no more than a 10 percent increase when background turbidity is more than 50 NTU. Background turbidity shall be measured at a point immediately upstream of the turbidity-causing activity.” (Pueblo of Sandia Tribe 2010)
- “Turbidity shall not exceed 25 NTU.” (Pueblo of Tesuque 2015)



Turbidity: Increase over Background Turbidity

Example

- Pueblo of Sandia: “Turbidity shall not exceed 5 NTU over background when background turbidity is 50 NTU or less, with no more than a 10 percent increase when background turbidity is more than 50 NTU. Background turbidity shall be measured at a point immediately upstream of the turbidity-causing activity.”
- Note conditions when criteria is exceeded



Copper

- Aquatic Life Use
- Relationship with hardness
- Toxic
- Criteria often expressed as an equation:

$$WQC = (e^{(0.8545[\ln(\text{hardness})] - 1.3862)}) * 0.960$$

Where:

WQC = water quality criteria

e = Euler's number (~2.71828)

\ln = natural log

hardness = hardness collected concurrent with your sample

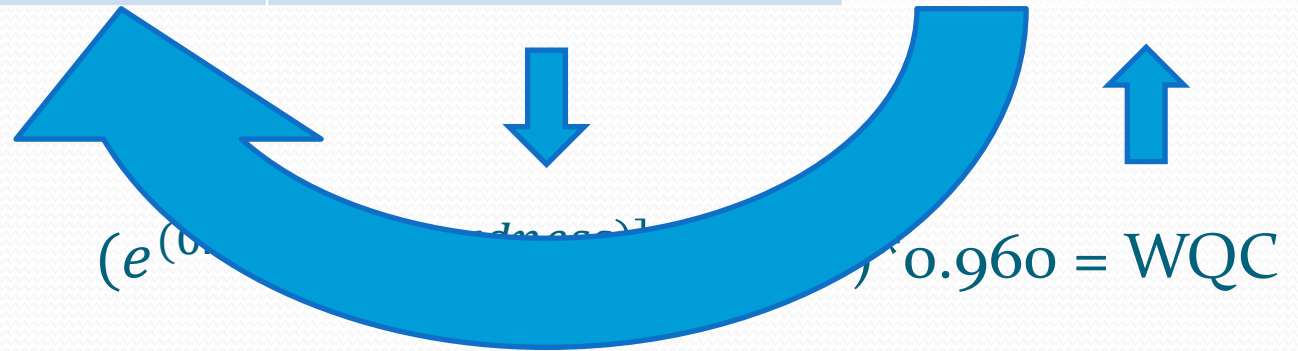
Copper – Example

The Aquatic Life beneficial use designated for a waterbody shall be deemed to be fully supported with respect to any individual toxicant parameter if no more than one of the sample concentrations from the waterbody exceeds the acute or chronic criterion for that toxicant listed in the table within a three year period:

Parameter	Acute (µg/L)	Chronic (µg/L)	Conversion Factor
Copper	$e^{(0.9422[\ln(\text{hardness})] - 1.3844)}$	$e^{(0.8545[\ln(\text{hardness})] - 1.3862)}$	0.960
Lead	$e^{(1.273[\ln(\text{hardness})] - 1.460)}$	$e^{(1.273[\ln(\text{hardness})] - 4.705)}$	$1.46203 - 0.145712$ $*[\ln(\text{hardness})]$
Zinc	$e^{(0.8473[\ln(\text{hardness})] + 0.884)}$	--	0.978

Copper - Assessment

Date	Copper ($\mu\text{g/l}$)	Hardness, Ca, Mg (mg/L)
11/12/2021	0.895	27.3
2/18/2022	4.582	25.9
8/25/2022	1.789	36.4
11/17/2022	6.465	44.4
3/9/2023	0.815	25.2



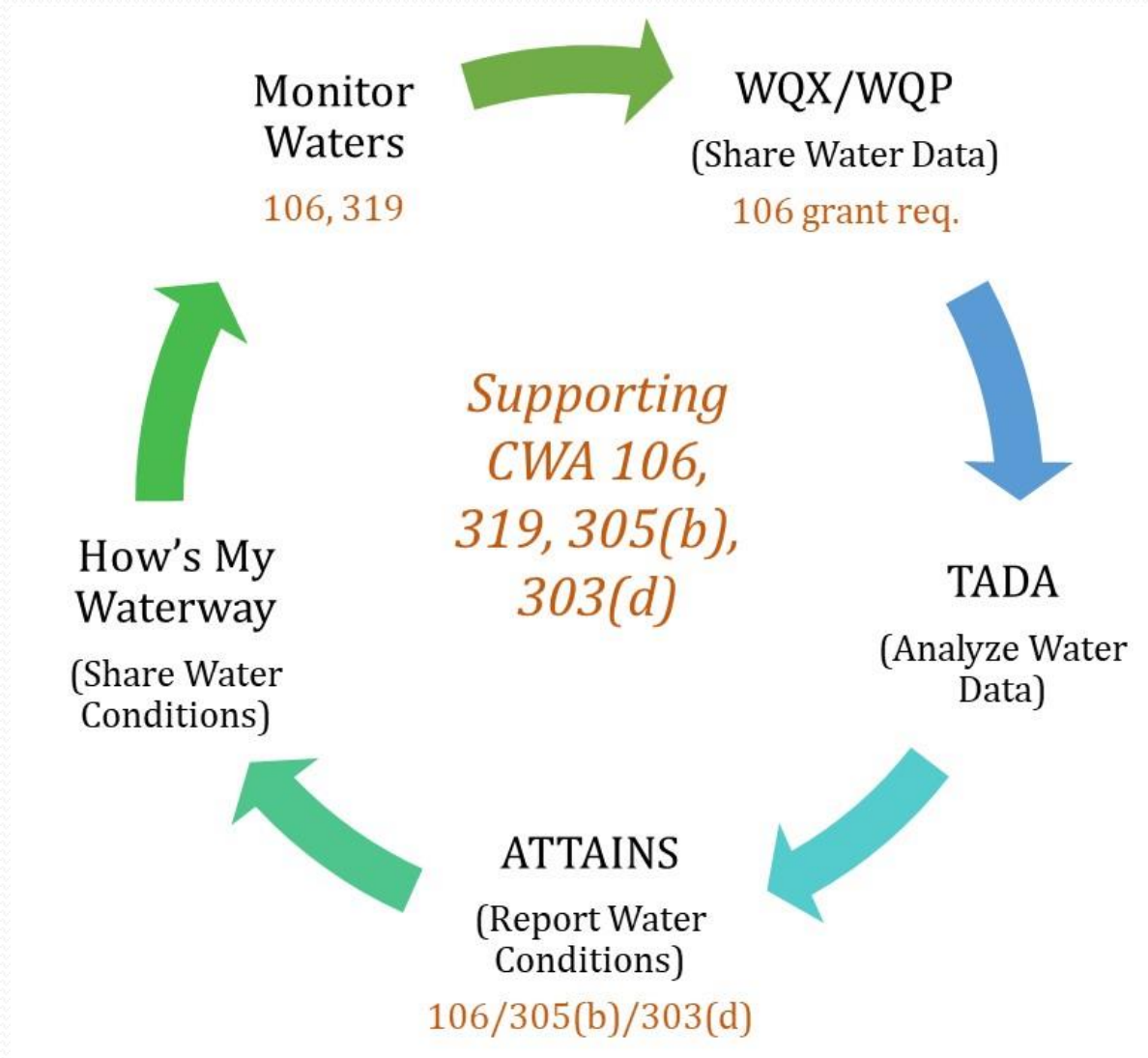
Summary

- Assessment Methodology
 - Assessment Units
 - Number of samples to make an assessment
 - Designated Uses, parameters, and Criteria
 - Decision Rules
- Assess your data

ATTAINS

What is ATTAINS

Assessment and TMDL Tracking and Implementation System



Why share data using ATTAINS?

1. WE USE IT!!!! Availability increases utility
2. Eliminates paper reporting
3. Reduces reporting time and burden
4. Aligns tribal and state assessment reporting
5. Prepares tribes interested in CWA 303(d) authority to make and report listing decisions



Tribal Pilot

- 2016-ATTAINS Tribal Pilot started
- October 2017-ATTAINS training for pilot tribes
- December 31, 2017-First ATTAINS submissions due from 13 pilot tribes
- Pilot tribes have continued to submit through ATTAINS

Objectives

Test whether ATTAINS can serve as an alternate reporting mechanism for tribal water quality assessment reporting

Capture programs as they exist, can be used regardless of whether tribe has WQS or TAS for 303(d)

Understand the water quality on tribal lands





Considerations and Lessons Learned

Make sure you are still meeting all of your grant obligations and make sure data are loaded in WQX

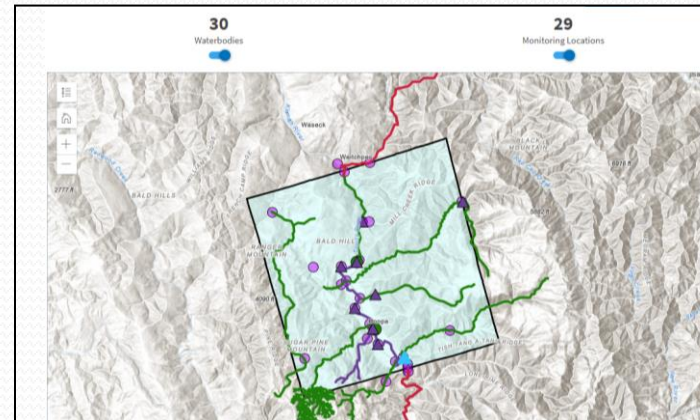
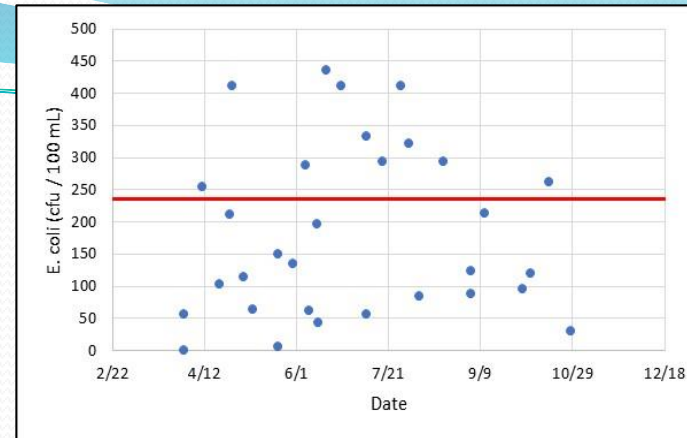
ATTAINS does not make the attainment decision for you, it holds the attainment decision you make

Creating the Assessment
Methodology is the longest part

Very beneficial to tribes

Where We Are Now

- 20 pilot and phase 1 tribes currently have data in ATTAINS
- Training phase 2 tribes
- ATTAINS is an accepted reporting mechanism in upcoming revised 106 guidance
- Created assessment trainings, parameter factsheets, & assessment methodologies
- Tribal data is How's My Waterway!



FACTSHEET ON WATER QUALITY PARAMETERS

Dissolved Oxygen

Dissolved oxygen (DO) is the amount of oxygen in water that is available to aquatic organisms. DO is necessary to support fish spawning, growth, and activity.

Why do we measure dissolved oxygen?

DO is an important indicator of the overall biological health of a waterbody and is required for a waterbody to support aquatic life. It is generally measured in the field along with water temperature, turbidity (clarity), specific conductance, and pH. This information is then assessed against water quality standards to determine whether the water is fit for aquatic life.

while other species such as aquatic worms and snails can tolerate lower DO concentrations. Hypoxic (low DO concentration) or anoxic (virtually no DO) conditions do not support fish or macroinvertebrate populations.

Figure 1 is a generalized illustration of how DO affects fish health – sensitivities vary by species. In the range labeled as "too low", DO is too low to support fish. In the "stressful" range, DO conditions impede spawning and reproduction, and limit growth and activity. A higher DO is needed to be "supportive" of fish spawning, growth, and activity. Different levels of DO are required to support aquatic life depending on the species present and their stages of life (spawning, larvae, etc.). Trout, for example, require higher DO, while carp can survive in lower DO conditions. Among the macroinvertebrates, many immature insects require a high DO content.

RANGE OF TOLERANCE FOR DISSOLVED OXYGEN IN FISH

mg/L Dissolved Oxygen

0 10 20 30 40 50 60 70 80 90 100

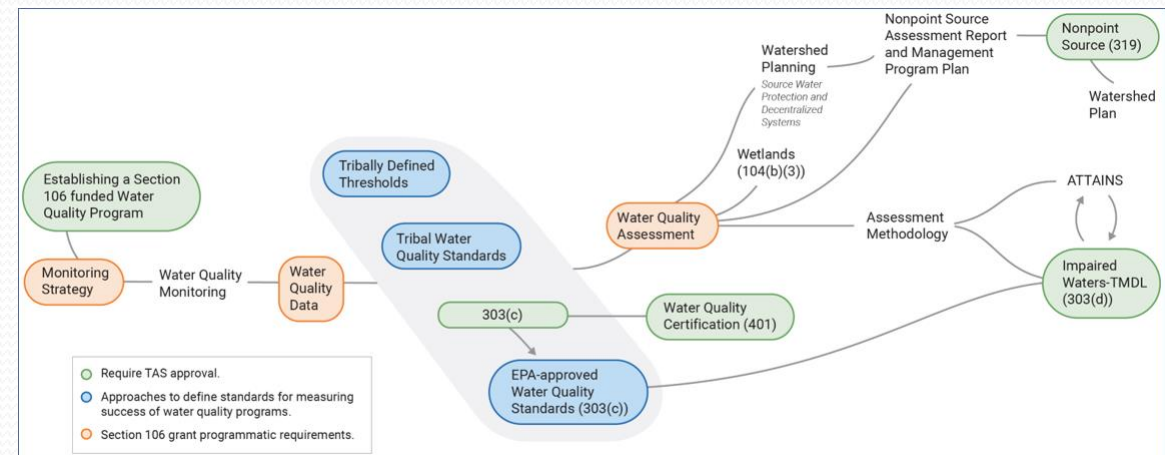
Too Low Stressful Supportive

Figure 1. General freshwater fish tolerance for dissolved oxygen concentrations – tolerances vary by species.

What affects dissolved oxygen?

The primary sources of oxygen in surface waters are transfer of oxygen from the air and by plants and algae in the water due to photosynthesis. When the water is in equilibrium with the atmosphere and is holding as much DO as expected for the temperature, barometric pressure, and salinity conditions, it is said to be saturated. Aeration or photosynthesis can cause DO concentrations to become even higher and exceed saturation (the water becomes supersaturated).

For factsheets on other water quality parameters, visit www.cwa.gov/tribes/water-quality-parameters.
For more information about the CWA Section 106 Grants Program, visit www.cwa.gov/tribes/water-quality-parameters/106-grants.



What is How's My Waterway

- EPA's tool to provide the general public with information about the condition of their local waters
- Brings data in from a number of data systems including WQP and ATTAINS
- Displays information on 3 scales: Community (HUC12), State/Tribe, and National

United States
Environmental Protection
Agency

Environmental Topics Laws & Regulations About EPA

Search EPA.gov

Glossary Data About Educators

How's My Waterway?

Informing the conversation about your waters.

code, or place... >> Go OR

Learn about your waters:

Community State & Tribal National

Eating Fish Aquatic Life Drinking Water

Tribal ATTAINS Data in How's My Waterway

- New How's My Waterway launched in June 2020
- Tribal assessment data was added to Community page in December 2020
- A cultural use group was added in April 2022
- Displays tribal and state data side-by-side
- Tribal pages launched in November 2022

The screenshot shows the ATTAINS web application interface. At the top, there are three navigation tabs: "Community", "State & Tribal", and "National". Below the tabs is a dropdown menu with "New Mexico" selected. The main heading is "Tesuque, New Mexico by the Numbers". Below this, there are three summary statistics: "8 Monitoring Stations", "3 Rivers Monitored", and "2 Monitoring Stations with Perennial Flow". A "show up in summaries below." link is present. Below the statistics is a text block describing Tesuque as one of the Eight Northern Pueblos in New Mexico, located about 9 miles north of Santa Fe, and its own tribal Water Quality Standards. The Department of Environment and Natural Resources is responsible for surface water quality monitoring and water quality assessment. The Pueblo of Tesuque is in the ATTAINS (Tribal) Pilot Program and has been using ATTAINS successfully. A "Show more" link is provided. Below the text block are two toggle switches: "8 Waterbodies" and "11 Monitoring Locations". At the bottom, there is a map showing the location of Tesuque, with labels for "W. Fontage Rd", "En Medio Chupadero", and "Rio Nambé".



Demo