NEBRASKA

DEPT. OF ENVIRONMENT AND ENERGY

Methodologies for Waterbody Assessments and Development of the 2022 Integrated Report for Nebraska

Nebraska Department of Environment and Energy
June 2022

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1.0 Introduction

1.1 Requirements Under Section 303(d) and Section 305(b) of the Federal Clean Water Act

Section 303(d) of the federal Clean Water Act (CWA), which Congress enacted in 1972, requires states, territories and authorized tribes to identify and establish a priority ranking for all waterbodies in which technology-based effluent limitations required by section 301 are not stringent enough to attain and maintain applicable water quality standards, establish total maximum daily loads (TMDLs) for the pollutants causing impairment in those waterbodies, and submit, from time to time, the (revised) list of impaired waterbodies and TMDLs to the U.S. Environmental Protection Agency (EPA). The requirements to identify and establish TMDLs apply to all waterbodies - regardless of whether a waterbody is impaired by point sources, nonpoint sources, or a combination of both (Pronsolino v. Marcus, N.D. Cal. March 30, 2000).

EPA issued regulations governing identification of impaired waterbodies and establishment of TMDLs at 40 CFR Part 130.7 in 1985 and amended in 1992 and 2000. However, on March 19, 2003, a final rule to formally and completely withdraw the 2000 regulations was published in the *Federal Register*. Therefore, the listing of impaired waters will be conducted under the 1985 TMDL regulations, as amended in 1992.

Section 305(b) of the CWA directs states to prepare a report every two (2) years that describes the status and trends of existing water quality, the extent to which designated uses are supported, pollution problems and sources, and the effectiveness of the water pollution control programs.

Section 314 of the CWA requires that the water quality report (305(b)) report include information on the trophic condition, water quality status and trends, and the methods and procedures to address pollution sources in publicly owned lakes in the state.

The product of these requirements is referred to as an Integrated Report (IR) and EPA's goal for this report is to provide the public with a comprehensive summary of state and national water quality. The Nebraska Department of Environment and Energy (NDEE) has opted to prepare such a report not only for the general public but also for water quality management planning purposes (e.g. future monitoring, TMDL development, best management practice implementation, 319 project prioritization, etc.). On March 31, 2021, EPA provided guidance for the 2022 IR via a memo, "Information Concerning 2022 Clean Water Act Section 303(d), 305(b), and 314 Integrated Reporting and Listing Decisions".

1.2 State of Nebraska Water Quality Standards

Title 117 – Nebraska Surface Water Quality Standards (Title 117) lists designated waterbodies and the assigned beneficial use(s) (e.g. aquatic life, primary contact recreation, water supply and aesthetics) for each waterbody based on chemical, physical and biological attributes. Numeric criteria (concentrations) are set forth in Title 117 to provide a benchmark for protection of an assigned beneficial use and for utilization as a quantitative assessment (maximum or minimum) of the pollutant loadings. Narrative criteria, which are more subjective than numeric values, are also assigned to waterbodies for further protection of beneficial uses.

When making waterbody assessments, the most recently EPA approved version of Title 117 will be utilized. For the 2022 IR, the appropriate version of Title 117 will be that dated June 24, 2019.
With the advent of the Integrated Report, the status of all waterbodies must be included. Reference to the term waterbody shall mean those stream segments and lakes/reservoir identified in Title 117 Chapters 5 and 6. On occasion, data may be obtained from a waterbody not identified in Title 117. In keeping with the goal of an all-encompassing report, the data will be assessed using the most appropriate narrative and numeric criteria. Although not identified individually, wetlands are waters of the state and available data will be assessed using these procedures and the status of the beneficial uses will be included.

1.2.1 Interpretation of Water Quality Standards and Criteria

The following assessment procedures were developed to compare Title 117 water quality criteria against monitoring data collected from specific waterbodies. Future action taken on a waterbody will depend upon the result of the assessment(s) and can range from no action to additional monitoring or TMDL development.

Nebraska's water quality criteria are based heavily upon national recommendations and guidance. As such, many of the numeric criteria include specific duration and frequency (i.e. four day average concentration) requirements. Water quality monitoring is carried out to make the best use of the resources available and to meet the CWA goals of all waters assessed. As such, data and information collected from surface waters may not be directly comparable to the applicable water quality criteria. The procedures have been developed to allow for the assessment of waterbodies using the available data. The NDEE had determined this to be a reasonable and logical approach to assessments.

1.2.2 Conflict of Quality vs. Quantity

Title 117 Chapter 4, Section 001 states:

"These uses are not intended in any way to conflict with the quantitative beneficial uses provided for in Neb. Rev. Stat. Ch. 46, regulating irrigation or the authority of the Nebraska Department of Natural Resources."

For the purpose of water quality assessments, deviations from criteria such as temperature that are due to dewatering of a stream by a granted water right will not be assessed as impaired due to a pollutant. Similarly, deviations from criteria that are the result of drought or other natural phenomena will not be included in the group of waters needing a TMDL.

1.3 Scope and Focus of the Integrated Report

Prior to 2004, waterbody assessments resulted in two products: The Section 303(d) list and the Section 305(b) report. Section 305(b) reporting often allowed for greater flexibility in regards to data age and quantity, whereas, the Section 303(d) lists only reported known beneficial use impairments based on high quality data of sufficient quantity to make confident assessments and decisions. Although the programs overlapped, interpretations and comparisons between the two assessments may have been misleading and not afforded water quality managers the ability to accurately describe the status of a single waterbody or the State's overall water quality.

For these reasons, EPA has encouraged States to adopt the integrated reporting process. The use of a single report will create consistency in the beneficial use assessments and determinations of whether a waterbody is "impaired" or "supported" for assigned beneficial uses.

1.4 Format and Components of Nebraska's Integrated Report

In accordance with the current guidance, Nebraska's Integrated Report will consist of five assessment categories with four sub-categories within category 4 and one sub-category within category 5. Waterbodies will be assigned to a specific assessment category based on the quantity, quality and confidence associated with the water quality data. Program managers will use the Integrated Report to prioritize future monitoring, TMDL development and watershed protection and management plans.

Previous guidance supported an effort to quantify the level of beneficial use attainment using the terminology: "Full Support", "Partial Support", "Threatened" and "Non-Support". Along with this, all waters deemed to be "Partial" or "Non-Support" fell into the category of impaired and were included on the Section 303(d) list. As well, some "threatened" waters were also included on Section 303(d) lists. Use of these more specific categories was not necessary and thus for the Integrated Report, waters and beneficial uses will simply be defined as **Supported**, **Impaired, or Not Assessed**.

According to IR guidance, placement of a waterbody into more than one category is acceptable. NDEE may place a waterbody into two complimentary sub-categories within a Category. Therefore, the Integrated Report format will be as follows with the possibility of multiple sub-category combinations:

Category 1 – Waterbodies where all designated uses are met.

Category 2 – Waterbodies where some of the designated uses are met but there is insufficient information to determine if all uses are being met.

Category 3 – Waterbodies where there is insufficient data to determine if any beneficial uses are being met.

Category 4 – Waterbody is impaired, but a TMDL is not needed. Sub-categories 4A-C and R outline the rationale for the waters not needing a TMDL:

> ***Category 4a*** – Waterbody assessment indicates the waterbody is impaired, but all of the required TMDLs have been completed.
>
> ***Category 4b*** – Waterbody is impaired, but "other pollution control requirements" are expected to address the water quality impairment(s) within a reasonable period of time. Other pollution control requirements include, but are not limited to, National Pollutant Discharge Elimination System (NPDES) permits and best management practices.
>
> ***Category 4c*** – Waterbody is impaired but the impairment is not caused by a pollutant. This category also includes waters where natural causes/sources have been determined to be the cause of the impairment. In general, natural causes/sources shall refer to those pollutants that originate from landscape geology or climatic conditions. It should be noted, this definition is not inclusive.
>
> ***Category 4r*** – Waterbody data exceeds the impairment threshold however a TMDL is not appropriate at this time. The category will only be used for nutrient assessments in new or renovated lakes and reservoirs. Newly filled reservoirs usually go through a period of trophic instability – a trophic upsurge followed by the trophic decline (Holdren, et. al. 2001). Erroneous water quality assessments are likely to occur during this period. To account for this, all new or renovated reservoirs will be placed in this category for a period not to exceed eight years following the fill or re-fill process. After the eighth year monitoring data will be assessed and the waterbody will be appropriately placed into category 1, 2, or 5.

Category 5 – Waterbodies where one or more beneficial uses are determined to be impaired by one or more pollutants and all of the TMDLs have not been developed. ***Category 5 waters constitute the Section 303(d) list subject to EPA approval/disapproval***.

> ***Category 5-Alt*** – Waterbody is impaired, but "other pollution control alternatives besides a TMDL" are expected to address the water quality impairment(s) within a reasonable period of time. Other pollution control alternatives include, but are not limited to, watershed management plan development, best management practice implementation and adaptive management strategies ****Category 5-Alt waters are not approved or disapproved by EPA; however, EPA agrees to accept the alternative.***

1.5 Integrated Report Contents

The following information will accompany each waterbody:

Waterbody Identification Number:	This is the numerical identification assigned to the waterbody in Title 117 - Nebraska Surface Water Quality Standards.
Waterbody Name:	This is the official (Title 117) name of the waterbody.
Beneficial Use Support Status:	This is the status of beneficial use support based on assessment of the readily available data and information. One of the following three beneficial use support categories will be assigned to each waterbody: **S** = Supported Beneficial Use

	I = Impaired Beneficial Use **NA** = Not assessed A blank cell will indicate the beneficial use is not assigned
Overall Waterbody Assessment	This is the waterbody assessment category as discussed in section 1.4 that the waterbody will be placed in.
Comments	Any pertinent information about the waterbody assessment or beneficial use support status will be included here.

An example of the Integrated Report format/contents is provided in Appendix A.

2.0 General Assessment Methodology

2.1 Waters Covered in Nebraska's Integrated Report Assessments

All waterbodies identified in Title 117 will be included in the Integrated Report. Also, non-designated waterbodies, where data exists, will be assessed using the numeric and narrative criteria associated with aesthetics and general criteria for the protection of aquatic life and water supply.

2.2 Sources of Data - Existing and Readily Available Water Quality Data and Information

In preparing the Integrated Report, 40 CFR Part 130.7 requires that "each state assemble and evaluate all existing and readily available water quality related data and information" to make the listing decisions. Data potentially available to the Department may originate from several sources and be of varying quantity, quality and age. Specific monitoring objectives established by the data collectors can often explain these differences in the data. These procedures have been established in order to assess the data and information and make consistent waterbody assessments.

Chemical, physical, microbiological and biological water quality data and information are collected by various agencies to serve that agency's needs. Because of this, data from one agency may be suitable for beneficial use assessments, while data from a different agency may be inappropriate. Also, data generated by a single agency may vary in its utility to assess beneficial uses, depending on that agency's monitoring objectives within its various monitoring programs. The first step in the Integrated Report development process will be to canvas the agencies and organizations that collect water quality data and information. Sought for consideration in preparing the Integrated Report, but not limited to, are data from:

- Waters included on the most recently approved State Section 303(d) list;
- Waters included in the most recent Section 305(b) report as threatened, partially meeting or not meeting a designated beneficial use;
- Waters for which dilution calculations or predictive models indicate non-attainment of applicable water quality standards;
- Waters where effluent toxicity tests indicate a potential or actual exceedance of the applicable water quality criteria;
- Waters where water quality problems have been reported by local, state or federal agencies, members of the public or academic institutions;
- Nonpoint source assessments submitted to EPA under Section 319 of the CWA or any updates of those assessments;
- Waters monitored within nonpoint source priority watersheds;
- Drinking water source water assessments under Section 1453 of the Safe Drinking Water Act;
- Streams monitored under the NDEE's Basin Rotation Monitoring Program;
- Waters where repeated fish kills have occurred or where abnormalities (lesions, tumors, etc.) have been observed in fish and other aquatic life;
- Waters monitored under the NDEE's Ambient Stream Monitoring Program,
- Waters monitored under the Nebraska Fish Tissue Monitoring Program,
- Lakes monitored under the NDEE's Statewide Lake and Reservoir Monitoring Program, and
- Waters monitored within Nebraska by the United States Geological Survey, Academic Institutions (colleges and universities), U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency, U.S. Army Corps of Engineers, Nebraska Game and Parks Commission, Nebraska

Department of Health and Human Services System, and Nebraska's 23 Natural Resources Districts.

Any data submitted to the Department and used in preparing the Integrated Report will in turn be made available for public viewing and reproduction.

2.3 Data Submittal

To be considered in beneficial use assessments, data from agencies and entities must be received by November 1 of the year prior to the April 1 Integrated Report submittal. It is suggested that entities submitting the data do so well in advance of this date to allow ample time for a review of the data and an opportunity to correct any errors or supply supplemental information that may be needed. Solicitation of data for the 2022 IR will be accomplished via e-mails to data collection agencies and other interested parties. See Appendix D for a list of agencies and interested parties solicited for data.

The Department encourages the submittal of additional data and information from the general public during the publicized period. Data and information can be in the form of analytical results, numeric data or narrative/qualitative submittals. When such information is submitted, the observation date, location(s), quality assurance methods and other pertinent information must also be provided or the Department will not be able to use the data. Other pertinent information may include rationale for the observation being considered outside the normal range of conditions. If not verifiable, narrative and qualitative submittals may not be used in placing a waterbody in a different category however, it will be considered when planning future monitoring activities.

To the extent possible, submitted data (analytical results or measurements) will be stored on either an Excel or Access database. Documents submitted that do not contain "data" will be scanned and stored on the Department's internal computer system. Once the assessments are complete, all data will be available to interested parties for review or reproduction of the data, consistent with the Department's records management policies and procedures.

The IR guidance allows states to establish a "reasonable cut-off" date after which data will not be considered and would be considered during the next listing cycle. Historically, an overwhelming majority of the data is generated by NDEE with very little being submitted by outside sources. To facilitate the timely completion of the draft report, the data submittal cutoff has been established along with a data collection cutoff. That is, only data collected prior to **December 31, 2020** and available prior to November 1, 2021 will be used in preparation of the 2022 IR. The purpose of the guideline is to ensure timely, accurate and complete water quality assessments. Data that falls outside of these dates will be considered on a site-specific basis. Data obtained and submitted after these deadlines will be considered during the next assessment cycle.

2.4 Data Quality Objectives

2.4.1 What Are Data Quality Objectives?

Data Quality Objectives (DQOs) are quantitative and qualitative statements of the quality of data needed to support specific decisions or actions. When a water quality management decision is made based on compiled or collected data, it is important to define the data quality needed to support the decision. The data quality needed will vary depending on the importance of the decision and the amount of uncertainty that can be tolerated in making the decision. Uncertainty in the decision-making process regarding the assignment of use support decisions (e.g., impaired vs. supported) to waterbodies can be addressed through the proper application of statistical procedures to monitoring data. The establishment of DQOs can help insure that data of appropriate quality are compiled and/or collected for statistical assessment. This information can then be used to make decisions with known confidence. Suspect data such as extreme abnormalities will not be utilized in the decision-making process regarding use support decisions.

2.4.2 Review of Statistical Methods

2.4.2.a Target and Sample Populations

When applying statistical methods to make inferences about water quality conditions based on sampling data, it is important that the *environmental units* be defined that make up the target population and the sample population. The target population is the set of population units about which inferences will be made. The sample population is the set of population units directly available for measurement. Population units are the number of objects (environmental units) that make up the target or sample population. These units can be defined in many ways depending on the water quality assessment objectives, the types of measurements to be made, regulatory requirements, costs, and convenience.

The concept of a target population is closely related to that of a representative unit. A representative unit is one selected for measurement from the target population in such a way that it, in combination with other representative units, will give an accurate picture of water quality and beneficial use support. By imposing sampling conditions, one defines the target population. The crucial point is whether the population defined is the one needed to achieve the water quality assessment objectives.

2.4.2.b Sources of Error

The error of estimation is the expression of how close an estimator is to the true population value. It is dependent upon variability in the target population, bias, and random measurement uncertainties. Two factors that influence the size of the error of estimation are sampling and non-sampling error. Sampling error is the name given to natural variability inherent among samples from a population; it is always present when samples are obtained. Sampling error is also referred to as random sampling error. Non-sampling error is the name given to inaccuracies and errors that can and should be avoided by using sound data collection and analysis techniques. Non-sampling error is also referred to as measurement error. Statistical methods can supply an estimate of the amount of the sampling error; it does not imply a mistake on the part of anyone. The accuracy of any estimate depends both on the method used to calculate the estimate from the data (measurement error) and on the sampling plan (sampling error).

2.4.2.c Hypothesis Testing

Decision-making can be approached from the standpoint of hypothesis testing. This approach leads to a very systematic and structured procedure for facilitating the decision-making process. A hypothesis, simply stated, is an assumption or claim. A statistical hypothesis is an assertion about the distribution of one or more random variables.

In hypothesis testing, the formal statement or assertion to be tested is called the null hypothesis (H_o). The null hypothesis is often, but not always, a version of the statement "*Any observed change or difference is due to chance*", and the purpose of the hypothesis test is usually to see whether a change had indeed occurred or a real difference exists. That is why the hypothesis is called a null hypothesis, or hypothesis of no change or difference.

For each null hypothesis to be tested, there is an associated alternative hypothesis (H_a). The alternative hypothesis reflects the change or difference anticipated by the individuals doing the hypothesis test. That is, if the null hypothesis is not true, then what hypothesis is likely to be true? The answer to that question provides the wording used for a specific alternative hypothesis.

There are two types of errors that can be made when hypothesis testing is used. The two types of errors are:

Type I:	Incorrectly concluding that an effect is real when it is not (rejection of the null hypothesis when it is true), and
Type II:	Incorrectly concluding that there is no effect when there is (accepting the null hypothesis when it is false).

Either error, if present, distorts the conclusions. The level of significance, denoted by α, is the maximum probability of making a Type I error. The individual doing the hypothesis testing selects the value for α.

2.4.3 DQOs for Waterbody Assessments and Development of the Integrated Report

2.4.3.a What information is needed, why is it needed, and how will the information be used?

The primary information needed is the physical, chemical, and biological data required by the NDEE to conduct beneficial use assessments for placing waterbodies within one of the 5 categories of the Integrated Report. This information will be used to develop the Integrated Report that will be submitted to EPA pursuant to sections 303(d) and 305(b) of the federal CWA.

2.4.3.b What are the ultimate products or actions anticipated, and what decisions will be made?

The ultimate product and action will be the development of the State's Section 303(d) list of impaired waterbodies (category 5) and the State's Section 305(b) report; and submittal of this information to EPA. The primary decision that needs to be made is determining the proper category to place each waterbody. The decision to include a waterbody in category 5 carries significant ramifications because TMDLs must be developed and implemented to the extent possible for all category 5 waters. The development of TMDLs can require the expenditure of significant resources and take up to two years to complete. Once completed, TMDLs typically enter a 5-year implementation phase. It is therefore of utmost importance that the State's assessment process correctly identifies waters that are impaired. This will allow the state to avoid the expense and effort of developing and implementing an unnecessary TMDL.

2.4.3.c what is the role of the collected and/or compiled data in making the decisions?

The collected and compiled chemical, physical, and biological data will serve as the primary basis for making the assessment decisions, categorizing waterbodies and prioritizing projects.

2.4.3.d What criteria exist for making decisions based on the collected and/or compiled data?

Water quality data assessments and defined impairments are based on the State's surface water quality standards. Where numeric criteria are defined or narrative criteria can be quantified, the NDEE utilizes the "percent of samples exceeding criteria" to define whether a waterbody is supporting its assigned beneficial uses for most pollutants. In line with past EPA guidance, the NDEE utilizes a rate of 10% as an indicator of an impaired waterbody depending on the type of pollutant. The criteria that will be used to determine whether or not a waterbody is impaired are provided in this report under the section entitled "*Methodologies for Assessing Beneficial Use Support Section 3.0".*

2.4.3.e What hypotheses will be tested and/or estimated?

The decision on whether to list a waterbody as impaired has been reduced to the following null and alternative hypotheses:

H_o: The waterbody is not impaired for a designated beneficial use.

H_a: The waterbody is impaired for a designated beneficial use.

2.4.3.f In what ways can the conclusions based on the data be in error and what is the acceptable risk of making incorrect or questionable decisions based on the conclusions?

Two significant errors could occur regarding the decisions to be made based on the data assessments. One mistake that could be made is identifying a waterbody as impaired when it truly is not (*Type I Error*). The other mistake that could be made is not identifying a waterbody as impaired when it truly is (*Type II Error*). Although making a Type I or Type II error is bothersome, making a *Type I Error* is considered to be more significant. A *Type I Error* could lead to the scenario of developing a TMDL where it is not needed. The NDEE has determined that an acceptable risk of making a *Type I Error* is 10% (i.e., $\alpha = 0.10$). If this risk level is met, at least 9 of 10 waterbodies listed on the State's 303(d) list should actually be impaired.

2.5 Data Quality Considerations

As required and described previously, all "existing and readily available data and information" will be considered when making waterbody assessments. Within the State, several entities collect water quality data and information for various reasons. To that end, the Department will request and encourage the submittal of this data and information for consideration when developing the Integrated Report.

Data collected by the NDEE, United States Geological Survey, United States Army Corps of Engineers and the United States Environmental Protection Agency are done in accordance with an approved quality assurance monitoring project plan and can be used in the development of the Integrated Report. Data not collected under such a plan must be accompanied by documentation of the quality assurance and/or quality control procedures or it will not be used by NDEE. This documentation should include: the purpose of the data collection, specific sampling location(s) – latitude and longitude preferred, sample type (e.g., grab, composite, depth integrated, waterbody profile, etc.), EPA-approved or Standard Methods analytical lab technique utilized, the entity or persons conducting the analysis, evaluation of duplicate or split samples, sample handling and custody (if applicable), and other pertinent information.

It is suggested that agencies and entities collecting water quality data work closely with the Department to develop quality assurance/quality control programs prior to initiating data and information collection procedures. Through this process, the availability of scientifically defensible and credible data and information should increase.

2.5.1 Temporal Considerations/Data Age

Ambient or other water quality data collected or submitted for use in assessing beneficial use attainment should not be temporally biased. Generally, temporally representative data can be collected using a systematic data collection process, with similar time intervals being scheduled between sampling events (e.g. weekly or monthly samples). Special studies designed at obtaining data during specific conditions (i.e. point source – low flow studies) may be used to define the water quality conditions during the specific event(s) targeted by the study.

Streams, rivers, lakes, reservoirs and wetlands often exhibit temporal changes in water quality. Land use, precipitation, climate, pollution sources and loads, diversions, and impoundments are among the many reasons that water quality conditions change. Although desirable, the application of continuous monitoring stations has not been pursued due to a lack of resources. Aside from a fixed 101-station network, the Department has primarily been using a basin rotation-monitoring plan to collect surface water data. Monitoring activities are focused on two or three river basins each year requiring six years to account for all of the 13 major river basins.

Based upon the implications of being identified as "impaired", the Department will focus assessments on the most recent and representative data that accurately portrays the quality of the waterbody in question. Therefore, data and information collected during the past five year period will be used to initially categorize a waterbody. That is, after a waterbody has been placed in a category, only new or newly acquired data and or information (i.e. TMDLs developed) can be used to relocate the waterbody to another category. Waterbodies **will not** be shifted from category to category solely based upon the age of the data.

The 5-year general practice will be the initial screening for data sets, however; a secondary review will also consider the installation of treatment or controls, hydro-modification, diversion, impoundments or the presence of new or expanded point source discharges. Only data that has been deemed representative should be used in the assessment process.

Exceptions to this requirement include lake/reservoir sedimentation data and continuous data sets. Sedimentation refers to assessment of the overall lake/reservoir volume lost. Once it is determined to be impaired due to sedimentation, no additional measurements are necessary and the data will be accepted - regardless of age. Continuous data sets generally are those where systematic sampling procedures are utilized, for example monthly water quality collections. These data can be used to establish or evaluate trends in water quality. For continuous data sets, the acceptable data age may exceed 10 years.

As a guideline, non-continuous data collected more than 5 years ago, but less than 10 years ago, will not be used to identify a waterbody as impaired. In situations where the data is deemed representative of a waterbody or watershed, the data may be used to relocate a waterbody in Category 3 to Category 1, 2, 4 or 5.

2.5.2 Minimum Number of Samples

Since one goal of the Integrated Report is to accurately depict water quality, it is important to recognize that large data sets have a higher probability of revealing water quality problems compared to small data sets. However, resources often restrict sampling efforts to the minimum amount of data necessary to meet the DQOs.

The Department understands the importance of data quantity in the water quality assessment process. However, resource limitations often restrict the amount of data collected from a single waterbody. Additionally, National guidance suggests states achieve the most practical statewide coverage possible, meaning fewer measurements from a greater number of waterbodies. Given these two points, monitoring programs will target a minimum of 10 chemical (i.e. ammonia, pH, metals) and microbiological (fecal coliform, *E. coli*) samples for assessment purposes.

Exceptions to the 10-sample minimum can be made for:

- Biological measurements (i.e. comparison of metric scores to criteria or reference sites),
- Fish consumption advisories,
- Estimates or measurements of reservoir volume loss or sedimentation rate, and
- Aquatic life observations (i.e. fish kills).

While a sample minimum is targeted, various factors can result in data sets with less than 10 data points. In these situations, assessments for data sets ranging from 3 to 9 should be assessed as though n = 10; and waterbodies with data sets limited to 1 or 2 data points should be included in Category 3 – Insufficient Information.

2.5.3 Estimating the Uncertainty Associated with Criteria Violations in Determining Beneficial Use Impairment

(Note: Much of the following discussion is from: *"A Nonparametric Procedure for Listing and Delisting Impaired Waters Based on Criterion Exceedances"* Lin et.al., 2000; *"Guidance for Assessing Texas Surface and Finished Drinking Water Quality Data, 2002"* TNRCC, 2001; and *"A Modern Approach to Statistics"* Iman and Conover, 1983)

For a given water quality parameter measured in a waterbody, the sample of water quality violations are an estimator of the *true exceedance probability – " p"* for the parameter. Since the estimator varies in a random manner from sample to sample, inferences about the true exceedance probability based on the estimator will be subject to uncertainty. The degree of uncertainty depends on the exceedances and the sample size – the smaller the sample size is, the greater the uncertainty will be. Therefore, the number of water quality violations should not be used for the determination of waterbody impairment without considering the sample size. The reliability of the estimated exceedance probability relating to sample size should be addressed.

The *binomial method* is a useful tool for estimating the probability of committing a *Type I* or *Type II error* for situations when the analysis is based on a single variable that falls into one of two categories; the measurement is either equal to or less than a criterion, or greater than the criterion. A random variable has the binomial distribution if the following conditions exist:

- There are one or more "samples". (The number of "samples" is denoted by n, and is a known number.)
- Each "sample" results in one of two outcomes. (i.e., exceed or not exceed criterion.)
- The outcomes from "sample" to "sample" are independent. That is, the probability of an outcome for any particular "sample" is not influenced by the outcome of the other "samples" (i.e., sample independence).
- The probability of "success", denoted by *p*, is the same from "sample" to "sample".
- The random variable equals the number of "successes" in the n "samples". (Thus the random variable may equal any integer value from 0 to n).

When a random variable satisfies the requirements to be a binomial random variable, it takes one of the possible values: 0, 1, 2, …, *n* (the number of trials). The probability associated with each possible value *x* is denoted by *f(x)*, and is given by the equation:

$$f(x) = \binom{n}{x} p^x q^{n-x} \qquad \text{for } x = 0, 1, 2, \ldots, n.$$

The term $\binom{n}{x}$, called the *binomial coefficient*, is computed using the formula:

$$\binom{n}{x} = n!/[x!(n-x)!]$$

Where $n! = n(n-1)(n-2) \ldots (2)(1)$ for $n \geq 1$ and $n! = 1$ for $n = 0$.

The term p^x in the above equation represents the probability of *x* successes, in *x* trials, the term q^{n-x} represents the probability of $(n - x)$ failures in $n - x$ trials, and they are multiplied together because the trials are independent. The binomial coefficient represents the number of different orders in which the *n* trials can result in *x* successes and $(n - x)$ failures. The function *f(x)* is called the *probability function*.

In general, when the binomial method is used, the proportion of the population that belongs to one of the two categories (in this case the proportion of the population that is greater than the criterion) is denoted as *p*. The proportion of the population that belongs to the second category (in this case the proportion of the population that is equal to or less than the criterion) is denoted as *q*, which is equal to $1 - p$. For example, for a fully supporting waterbody, *p* is equal to or less than 10 percent (0.1), and *q* is greater than or equal to 89.9 percent (0.899). In this case, *p* and *q*, respectively, represent the probabilities, for a single sample event, of collecting a sample that exceeds or a sample that meets the criterion. If one sample/data point were used to determine whether a waterbody is supporting a beneficial use, the probability of committing a *Type I error* would be simple to determine - in this case, 10 percent. However, the assessment of water quality data involves the collection of multiple samples and, in order to estimate the probability of committing *Type I* and *Type II errors*, cumulative probabilities must be determined.

Suppose, for a particular parameter, 2 out of 10 measurements in a waterbody exceed the criterion threshold. *Is the sample exceedance percentage of 20% (i.e., ^p = 0.2) strong evidence to determine the waterbody is impaired using the 10%-exceedance definition of impairment? Or, equivalently, is the sample percentage of 20% significantly larger than an assumed true exceedance percentage of 10% based on only n = 10 measurements?* This question can be put in the framework of hypothesis testing. Here, one wishes to test the null hypothesis

$$H_o: \ p \leq 0.1,$$

that is, the waterbody is not impaired, versus the alternative hypothesis

$$H_a: \ p > 0.1,$$

that is, the waterbody is impaired. The test can be performed by referring the observed number of exceedances, *x*, to a binomial probability table (or apply the probability function equation). When $n = 10$ and $p = 0.1$, the probability of observing two or less exceedances is 0.9298 (and the probability of observing three or more exceedances is 0.0702). If the number of exceedances in the 10 measurements is 2 or less, the sample does not provide sufficient evidence to reject the null hypothesis. Thus, the sample 20% is not significantly larger than the assumed 10% exceedance percentage. But, if three or more exceedances are observed, there is sufficient evidence to conclude that, at the 7% significance level, the true exceedance probability *p* in the waterbody is over 0.1, and the alternative hypothesis $H_a: \ p > 0.1$ is accepted. That is, a 30% sample exceedance percentage is significantly larger than the assumed 10% exceedance percentage at the 7% level of significance. This is equivalent to saying that a 93% confidence interval would exclude $p \leq 0.1$ when 3 of 10 values exceed criteria.

With "impaired" being defined as an exceedance rate of more than 10 percent, the number of water quality violations or "exceedances" required for any given number of samples from 10 to 100 is presented in Table 1. The number of exceedances was selected to maintain a *Type I error* probability below 10 percent (i.e., $\alpha < 0.1$). For samples with an *n* greater than 100, the number of exceedances required will be calculated. All waters assessed to have an impaired beneficial use and meeting the 90% confidence interval shall be included in either Category 4 or 5 of the State of Nebraska Integrated Report.

For data sets with <10 samples the assessments will be as follows

- Assume 10 samples were "targeted" and base the assessment on n=10
- For data sets n=3 to n=9; if 3 data points exceed the applicable water quality standard or goal, the waterbody should be assessed as having an impaired beneficial use.
- For data set n=8 or n=9, if no data points exceed the applicable water quality standard or goal, the waterbody should be assessed as fully supporting the beneficial use.
- For all other situations with data sets n=3 to n=9, the waterbody should be included on Category 3 insufficient information to determine beneficial use status.

2.5.4 Ancillary Information

In order to compare some parameter measurements to water quality criteria, additional (ancillary) information is often required. For example, applicable ammonia criteria are dependent upon the water's pH and temperature; many metals require measures of calcium and magnesium to derive water hardness in order to calculate their criteria. When a water quality parameter requires ancillary information, the guidelines for data assessment (minimum number of samples, quality assurance requirements) also apply to this data. Assessments of water quality information will not be made in the absence of simultaneously collected ancillary information.

2.5.5 Flow Conditions

Water quality information, specifically in lotic waters (streams and rivers) can be collected under variable conditions. For example, in the absence of precipitation, streams are subject to extreme low flows (statistical based flows such as 1q10, 7q10 and 30q5), as opposed to high flow events (floods) that occur in response to significant rain or other precipitation events. Along with variations in precipitation, in some watersheds stream flow volume is regulated by impoundments and diversions to accommodate drinking water supply, irrigation, industrial cooling water or hydroelectric needs.

During periods of low flow, water quality standards (with the exception of narrative and numeric criteria associated with aesthetics; and general criteria and acute toxicity criteria for the protection of aquatic life) do not apply to:

- Streams assigned a Coldwater Class A or B or Warmwater Class A Aquatic Life Use when the stream flow is less than 0.1 cubic feet per second (cfs) or the 7q10, unless a beneficial use still exists
- Streams assigned a Warmwater Class B Aquatic Life Use when the stream flow is less than 1.0 cfs unless an assigned beneficial use still exists (Title 117).

Therefore, in the absence of a verified existing beneficial use, data collected under the above-defined low flows will not be considered when assessing beneficial uses.

More variable and less predictable are the high flow situations that most frequently result from precipitation events. Duration, frequency, magnitude, time of year, land use and applied treatments are all factors that influence the impact of a precipitation event on stream flow volume and water quality. For example, based on the lack of vegetative cover, early spring run-off in a rural setting typically contains larger loads of sediment and organic matter than is observed later in the season. For nonpoint source pollutants, data collected under extreme high flows can skew the data set and force managers to establish unrealistic reduction goals to account for infrequent and often unpredictable events. When reporting beneficial use assessments, impairments due to data collected during extreme high flow events will be noted in the "Comments" section of the IR when that information is available.

Table 1. Sample Size and Number of Exceedances Required to Determine an Impaired Beneficial Use (10% Exceedance).

Minimum number of exceedances required to maintain a >90% confidence that a designated use is impaired (10% exceedance).					
Sample Size (n)	**Number of observations exceeding required to define an impaired use**	**Confidence Level**	**Sample Size (n)**	**Number of observations exceeding required to define an impaired use**	**Confidence Level**
10	3	0.930	56	10	0.951
11	3	0.910	57	10	0.945
12	4	0.974	58	10	0.940
13	4	0.966	59	10	0.933
14	4	0.956	60	10	0.927
15	4	0.944	61	10	0.920
16	4	0.932	62	10	0.913
17	4	0.917	63	10	0.905
18	4	0.911	64	11	0.948
19	5	0.965	65	11	0.943
20	5	0.957	66	11	0.938
21	5	0.948	67	11	0.932
22	5	0.938	68	11	0.926
23	5	0.927	69	11	0.920
24	5	0.915	70	11	0.913
25	5	0.902	71	11	0.906
26	6	0.960	72	12	0.947
27	6	0.953	73	12	0.942
28	6	0.945	74	12	0.937
29	6	0.936	75	12	0.931
30	6	0.927	76	12	0.926
31	6	0.917	77	12	0.920
32	6	0.906	78	12	0.913
33	7	0.958	79	12	0.907
34	7	0.952	80	13	0.946
35	7	0.945	81	13	0.942
36	7	0.937	82	13	0.937
37	7	0.929	83	13	0.931
38	7	0.920	84	13	0.926
39	7	0.911	85	13	0.920
40	7	0.900	86	13	0.914
41	8	0.952	87	13	0.908
42	8	0.946	88	13	0.901
43	8	0.939	89	14	0.941
44	8	0.932	90	14	0.937
45	8	0.924	91	14	0.932
46	8	0.916	92	14	0.927
47	8	0.907	93	14	0.921
48	9	0.954	94	14	0.915
49	9	0.948	95	14	0.910
50	9	0.942	96	14	0.903
51	9	0.936	97	15	0.941
52	9	0.929	98	15	0.937
53	9	0.922	99	15	0.932
54	9	0.914	100	15	0.927
55	9	0.906			

2.5.6 Data Qualifiers

Water quality data and information may be returned with a data qualifier or a "remark code" that denotes a deviation from the acceptable handling, storage or analytical procedures. Common remark codes utilized by the Nebraska Department of Health and Human Service System (HHSS) lab and the associated definitions include:

- A = Value reported is the mean of two or more determinations;
- I = Indicates ice cover where stream flow is unknown;
- J = Estimated Value; Value is not accurate;
- K = Actual value is known to be less than value given;
- L = Actual value is known to be greater than value given;
- Q = Sample held beyond normal holding time;
- U = Indicates material was analyzed for but not detected

Data qualifiers do invoke some question as to the accuracy of the data in representing actual water quality conditions. Therefore, data remarked with a "J", "K", "L", or "Q" should not be used in assessing waterbodies for Categories 1,2,4,5. The exception to this will be bacteria analyses that are solely remarked with a "Q" based on the below explanation. Section 2.5.7 discusses values reported to be "below the detection limit".

40 CFR Part 136 has established a holding time of 6 hours for *E. coli* bacteria samples. Guidance and procedures in Standard Methods – For the Examination of Water and Wastewater: 20th Edition, allows for samples to be held up to 8 hours, as long as they are iced or refrigerated, prior to initiating analysis. Remote sampling locations, sample scheduling, and the availability of laboratory facilities occasionally results in bacteria samples exceeding the 6-hour limitation. In order to assess as much water quality sample data as possible, rather than discarding data based upon the failure to meet the 6-hour holding time, the Department will assess all bacteria data that meets the 8-hour holding time recommended in Standard Methods. Bacteria data that exceeds the 8-hour holding time will not be assessed. Past studies conducted by the Department have shown that there is only a median bacterium die-off rate of 14% after 24 hours and it is likely that change in bacteria densities between 6 and 8 hours is minimal.

The above remark codes are used by the HHSS laboratory, which is the entity currently utilized by the Department for water quality analysis. Data not analyzed by HHSS may be qualified differently. A case-by-case evaluation will be utilized when remarked data is received from another laboratory and those remarks differ significantly from those used by the HHSS. An explanation of the remark code and the decision will accompany the assessment.

2.5.7 Values Below Detection Limits

In the absence of pollutants, or when pollutant concentrations and loadings are minimal, results of water samples may be reported as below the analytical method detection limit (not detected). When a value is reported as not detected (remark code U), it indicates that the value is less than the applied technology can measure and there is no quantifiable way of determining the true value. When making beneficial use assessments, a general rule of thumb is that larger data sets result in a more accurate representation of a waterbody's true water quality. Thus, measurements below detection limits may provide valuable information on situations where pollutants and pollutant loads are not a concern. Finally, elimination of the low-end values may skew a data set. Therefore, rather than eliminating the "non detects" from the assessment data, values measured below detection limits will be calculated as 50% of the method detection limit. This approach may not be appropriate during the analysis of water quality trends.

2.5.8 Spatial Considerations

Waterbody monitoring may occur at single or multiple locations within the designated area. Often program managers seek to optimize resources and gain better waterbody coverage by locating fewer sites along a specific stream segment, lake, reservoir or wetland. Major hydrological features, such as tributary confluences, impoundments, diversions, and returns can limit the spatial representativeness of a monitoring location. As well, drastic changes in land use (e.g., agriculture land being converted to an urban landscape) may also limit a single station's spatial coverage. In large lakes, reservoirs and wetlands minimal sample locations may not provide an accurate representation of the true water quality conditions of the entire waterbody.

A listing of the classified waterbodies is maintained in EPA's Assessment Database (ADB). This software contains assessment information – including the type of monitoring conducted at specific waterbodies, causes and sources of water quality impairment, 303(d) listing information, TMDL development timelines and waterbody name, size, location and assigned beneficial uses. All assessment information is updated annually for all State-identified waters and linked to specific reporting cycles (i.e., assessment year 2008, 2010, 2012, etc). At this time, no wetlands have been included in the ADB but may be added in the future. Stream segment sizes are listed and/or measured in miles and lakes/reservoirs are listed and measured in surface acres (acres). As a rule, the waterbody size listed in the ADB will be used to resolve any disputes about the identity of the waterbody sampled.

For streams, a monitoring site will be considered representative of no more than 25 miles. Significant hydrological influences must be considered when determining the spatial extent of the monitoring site. The exception to this would be in the case of a large river where land use is generally homogeneous and no significant influences exist (i.e. Niobrara River). In these cases, with justification, a single station may be considered representative of up to 75 miles. In Nebraska there are 15 stream segments or 1% of the total stream segments identified in Title 117 that are greater than 75 miles in length yet are sampled at one location. These stream segments are extremely difficult to gain access to and would exceed holding time limitations in analyzing biological samples if NDEE were to sample at multiple monitoring sites.

Multiple samples collected on the same day from the same segment under static stream conditions shall be combined and the parameter's mean value will be used to represent the segment's water quality condition. The data will be accompanied by an "A" remark code to denote the value reported is the mean of two or more determinations. Exceptions to this will be when monitoring efforts are designed to evaluate diurnal or temporal impacts related to a specific pollutant source.

For lake and reservoirs, a deepwater and mid-lake sampling station typically represents the entire waterbody. Chemical data such as nutrients, chlorophyll α and pesticides will be gathered from the surface at the deepwater location by boat. A depth profile determines stratification and is developed using a multi-parameter meter at both sampling stations. The multi-parameter meter gathers field data at 0.5 meter intervals from the surface to the bottom of the lake/reservoir and includes field parameters such as dissolved oxygen, pH, water temperature and specific conductivity. Some small lakes/reservoirs (e.g. shallow, few surface acres) may not have boat access; thus field and chemical data is gathered near shore usually by wading out into the waterbody. Sampling sites have been determined for all lakes and reservoirs within the Department's Statewide Lake and Reservoir Monitoring QAPP (NDEQ 2010).

Consistent with Title 117, Chapter 2, samples obtained within any regulatory mixing zone shall not be used for assessing the waterbody. This guideline does not prohibit the assessment of acute water quality criteria within a chronic mixing zone or the assessment of water quality criteria within a mixing zone applied for the protection of public water supplies.

2.5.9 Seasonality Considerations

All data will be initially assessed for seasonal variability in concentration or occurrence. This process will be accomplished by creating charts of time-series plots for each parameter of interest. These charts will be created from data gathered within the most recent 5-year monitoring period, or where continuous datasets exist (i.e., no more than a 2-year gap in data availability) over longer periods of time. If review of these charts indicates that seasonal differences or patterns occur, the NDEE will focus its assessment efforts within the season(s) or period of time where parameter concentrations/occurrence is evident. By examining only the timeframe (seasons) where parameters appear in detectable levels, or at or near levels of concern, a waterbody can be more accurately assessed for use support/impairment. In contrast, when seasonal differences are present, but a long-term database is used to assess beneficial use support, the impacts to beneficial uses are underestimated and waters where real seasonal concerns exist may be overlooked.

3.0 Methodologies for Assessing Beneficial Use Support

3.1 Primary Contact Recreation

3.1.1 E. coli Bacteria

Waters designated for primary contact recreation beneficial use have an existing use or an attainable use for primary contact recreation activities that may include: swimming, water skiing, tubing, canoeing, etc. *Escherichia coli (E. coli)* bacteria have been accepted as indicators of disease causing pathogens, viruses and bacteria. E. coli bacteria are included in Title 117 as the water quality criterion for evaluating the recreation beneficial use (Title 117 Chapter 4, Section 002). Title 117 also designates the recreation season to be May 1– September 30, outside of which the criteria does not apply. Recreation season data will be pooled independently for each stream segment, lake, and recreation season over the most recent 5-year monitoring period.

Title 117 includes criteria for both a recreation season geometric mean and a single sample maximum. The November 16, 2004 Federal Register (Volume 69, No. 220) contained information regarding the final rule for "Water Quality Standards for Coastal and Great Lakes Recreational Waters". This rule includes a discussion on the use of the single sample maximum (SSM). Specifically:

"EPA expects that the single sample maximum values would be used for making beach notification and closure decisions. EPA recognizes however that States and Territories also use criteria in their water quality standards for other purposes under the Clean Water Act in order to protect and improve water quality. Other than in the beach notification and closure decision context, the geometric mean is the more relevant value for ensuring that appropriate actions are taken to protect and improve water quality because it is a more reliable measure, being less subject to random variation and more directly linked to the underlying studies on which the 1986 bacteria criteria were based."

To more fully protect public health, NDEE will determine recreational beneficial use support with both a seasonal geometric mean, which considers the magnitude of pollution, and a seasonal binomial distribution, which considers the frequency of water quality criteria violations. The established criteria and the assessment of *E. coli* bacteria information are provided in Table 2.

Table 2: Assessment of the Primary Contact Recreation Beneficial Use Using *E. coli* Bacteria Data.

Methods	Supported	Impaired
Geometric Mean (Streams & Lakes)	All seasonal geometric means with in the last 5 seasons ≤126cfu/100 ml	1 or more of the last 5 seasonal geometric means >126cfu/100 ml
Binomial Distribution (Lakes)	≤10% of samples exceed 235cfu/100ml	>10% of samples exceed 235cfu/100ml

3.1.2 Cyanobacteria Toxins

Cyanobacteria, or blue-green algae as it is commonly known, naturally occur in lakes and reservoirs throughout Nebraska. A few species of cyanobacteria found in Nebraska produce toxins that can be dangerous to humans and animals in high enough concentrations. On rare occasions, large scale cyanobacteria blooms occur in a lake or reservoir can produce enough toxins to make full contact recreation unsafe. Toxic substances are included in Title 117 as a water quality criterion for evaluating the recreation beneficial use (Title 117 Chapter 4, Section 002.02). Title 117 also designates the recreation season to be May 1– September 30, outside of which the criteria does not apply. NDEE's cyanobacteria toxin limit was set at 20 ug/l, to correspond with the World Health Organization's recommendation. Recreation season data will be pooled independently for each stream segment, lake, and recreation season over the most recent 5-year monitoring period.

The established criteria and the assessment of toxin information are provided in Table 3.

Table 3: Assessment of Primary Contact Recreation Beneficial Use Using Toxin Data

Method	Supported	Impaired
Binomial Distribution	≤10% of samples exceed 20ug/l	>10% of samples exceed 20ug/l

3.2 Aquatic Life

3.2.1 Chemical Parameters

Title 117 Chapter 4, Section 003 contains the water quality criteria assigned to protect aquatic life. Some parameters apply to all waters regardless of the biota of the receiving stream, while others like ammonia and metals vary according to the aquatic life use designations or where site-specific criteria have been developed. Also, many parameters have both acute and chronic criteria for the protection against short-term and long-term exposures. When making aquatic life beneficial use assessments, the monitoring information should be evaluated using all applicable numeric criteria for the parameters, regardless of reporting units.

The assessment procedures for the aquatic life beneficial use using chemical water quality data and information can be found in Table 4.

Table 4: Assessment of the Aquatic Life Beneficial Use Using Chemical Water Quality Data.

Method	Supported	Impaired
Binomial Distribution	≤10% of samples exceed acute or chronic water quality criteria	>10% of samples exceed acute or chronic water quality criteria

The Selenium criteria shown in Table 5 are for the protection of aquatic life. These criteria are expressed preferentially as fish tissue concentrations (mg/kg fish), followed by water column concentrations (mg/L) in the absence of fish tissue information.

Table 5: Fish Tissue and Water Column Selenium Criteria for Assessment of the Aquatic Life Beneficial Use

POLLUTANT				CAS No.*
Selenium				7782-49-2
	FISH TISSUE[1] CRITERIA		WATER COLUMN[4] CRITERIA	
Criterion Element	Egg/Ovary[2]	Fish Whole Body or Muscle[3]	Thirty-day average	Intermittent Exposure[5]
Magnitude	15.1 mg/kg	8.5 mg/kg whole body or 11.3 mg/kg muscle	1.5 µg/L in lakes and reservoirs 3.1 µg/L in streams and rivers	$WOC_{int} = \frac{WQC_{30\text{-}day} - C_{bkgrnd}(1-f_{int})}{f_{int}}$
Duration	Instantaneous measurement[6]	Instantaneous measurement[6]	30 days	Number of days/month with an elevated concentration
Frequency	Not to be exceeded	Not to be exceeded	Not more than once in three years on average	Not more than once in three years on average

1. Fish tissue elements are expressed as steady-state.
2. Egg/Ovary supersedes any whole-body, muscle, or water column element when fish egg/ovary concentrations are measured.
3. Fish whole-body or muscle tissue supersedes water column element when both fish tissue and water column concentrations are measured.
4. Water column values are based on dissolved total selenium in water and are derived from fish tissue values via bioaccumulation modeling. Water column values are the applicable criterion element in the absence of steady-state condition fish tissue data.
5. Where $WQC_{30\text{-}day}$ is the water column monthly element, for either a lake or stream; C_{bkgrnd} is the average background selenium concentration, and f_{int} is the fraction of any 30-day period during which elevated selenium concentrations occur, with f_{int} assigned a value ≥ 0.033 (corresponding to 1 day).
6. Fish tissue data provide instantaneous point measurements that reflect integrative accumulation of selenium over time and space in fish populations at a given site.

* Chemical Abstract Services Registry Number

3.2.1.1 Priority Pollutants

The 2006 IR Guidance states: *For toxic ("priority" pollutants) and protection of freshwater aquatic life, EPA guidance recommends use of a once in three year maximum allowable excursion frequency."* Consistent with this guidance, the assessment of toxic ("priority" pollutants) will consider a waterbody impaired if an acute criteria for a toxic pollutant is exceeded more than once every three years on average. This assessment procedure, shown in Table 6, will apply to the priority pollutants listed in Appendix B.

Table 6: Assessment of the Aquatic Life Beneficial Use for EPA Identified Priority Pollutants

Method	Supported	Impaired
Maximum allowable excursion frequency	≤1 chronic water quality criteria violation in the last 3 years	>2 chronic water quality criteria violations in the last 3 years

3.2.2 Lakes and Reservoirs – Nutrients

Excessive nutrient concentrations, specifically nitrogen and phosphorus, adversely affect water quality and biological populations within lakes and all other impounded waters including reservoirs, sandpits, and oxbows. Unlike other pollutants, the presence of nitrogen and phosphorus do not always directly lead to impairments. Rather, nutrients spur algal or other vegetative growth that then creates impairments in the form of algal toxins, diurnal pH shifts, increased biological oxygen demand and hypoxia. Reductions in dissolved oxygen levels, water clarity, biodiversity, and aquatic habitat have all been attributed to excessive nutrient loads. Additionally, increases in bacteria concentrations, toxin mobility, ammonia toxicity, and algal blooms have been shown to correspond with increasing nutrient loads.

Title 117 Chapter 4, Section 003.05 Nutrient Criteria for Lakes and Impounded Waters specifically states, *"Chlorophyll a represents the desired biological condition (response) and is generally influenced by the amount of phosphorus and nitrogen (cause). Thus, if the chlorophyll a criterion is met, total phosphorus or total nitrogen values above the listed values will not be considered to violate their respective criteria."* However, in Nebraska's approval letter for the 2012 Tri-Annual Review of Water Quality Standards dated June 22, 2012 from EPA, this language was disapproved.

Lakes and impounded waters according to codes listed in Title 117 Chapter 6 designated for Aquatic Life Use will be analyzed by the following nutrient criteria based on seasonal averages from April 1 to September 30 (Table 8). If the lake or impoundment is exhibiting thermal stratification, the standards apply only to the epilimnion; otherwise the standards apply at all depths (section 002). Total phosphorus (TP), total nitrogen (TN) and chlorophyll *a* (Chl a) standards have been identified for the Eastern and Western regions of the state (Table 7). Additionally, due to a lack of anthropogenic impairments, natural lakes found in the Sandhills region of the state will not be subjected to nutrient or chlorophyll assessments (Appendix C).

Table 7: Nutrient standards for Eastern and Western Lakes and Impounded Waters

Lakes or Impounded Waters Classification	Region Codes	Total Phosphorus (ug/l)	Total Nitrogen (ug/l)	Chlorophyll *a* (ug/l)
Eastern Lakes and Impounded Waters	E	50	1000	10
Western Lakes and Impounded Waters	W	40	800	8
Natural Sandhill Lakes	SH	---	---	---

Table 8: Assessment of Aquatic Life Use Using Total Phosphorus, Total Nitrogen, and Chlorophyll *a* Data.

Method	Assessment Period	Supported	Impaired
Binomial Distribution	A minimum of 10 samples over 2 growing seasons	Chl a, TP, and TN ≤ growing season mean concentrations	Chl a, TP, or TN ≥ growing season mean concentrations

3.2.3 Fish Kills

Fish kills can be the result of natural phenomena or due to anthropogenic activities where pollutants are introduced at levels that impact a portion of, or the entire aquatic community. The pollutant(s) in question may be delivered to the waterbody as the result of a catastrophic event (e.g., spill) or an ongoing pollution problem. Typically, spills are one-time events that are not likely to be repeated. Thus, spills will not be used as the sole justification to identify the aquatic life beneficial use as impaired. However, repeated fish kills from the same waterbody provide the justification necessary to assess a waterbody as impaired. Table 9 provides the assessment procedures for the aquatic life beneficial use using fish kill information.

Table 9: Assessment of the Aquatic Life Beneficial Use Using Fish Kill Data and Information.

Method	Minimum Events/occurrences	Supported	Impaired
Maximum allowable excursion frequency	1 Fish Kill triggers an assessment	≤2 fish kills occurring in a waterbody within a 5- year period	>2 fish kills occur within a 5-year period at a similar waterbody location. Source is determined to be not natural.

It should be noted, fish kills resulting from the dewatering of streams, lakes and wetlands - or the conditions resulting from such activities (e.g. extreme water temperatures alone or in concert with low dissolved oxygen levels related to low water rather than a spill or release) - will not be considered in identifying an impaired situation.

3.2.4 Fish Consumption Advisories

Title 117, Chapter 4, Section 003.01C includes parameters that may not be easily measured in the water column or benthic environment. Difficulty in quantifying pollutants may be attributed to natural small quantities, monitoring difficulty, analytical inadequacies (i.e., method detection limitations) and variable source contributions. A surrogate to direct waterbody measurement is to analyze the flesh or tissue of representative aquatic (fish) species and assess the potential for bioaccumulation of a pollutant. Assessment of this data and information can lead to the issuance of fish consumption advisories. The July 21, 2003 *Guidance* states:

> *"EPA considers a fish consumption advisory…and the supporting data to be existing and readily available data and information that demonstrates non-attainment of (CWA) Section 101(a) "fishable" use…"*

Table 10 provides the assessment procedures that should be applied to fish tissue data and information.

Table 10: Assessment of the Aquatic Life Beneficial Use Using Fish Tissue Data and Information.

Minimum Events/occurrences	Supported	Impaired
Screening and Follow-up Samples	No fish consumption advisory	Fish consumption advisory issued for a waterbody.

Nebraska's fish tissue methylmercury criterion of 0.215 mg/kg became effective in Title 117- Nebraska Surface Water Quality Standards on July 31, 2006. This criterion was established with the risk-based equation that used the standard assumptions of 70 kg adult and a reference dose of 0.0001 mg. Nebraska opted to utilize a more realistic consumption rate of 8 oz. per week (0.0324 kg/day) opposed to the standard assumption of 6 oz. per week. The higher consumption rate resulted in a more stringent criterion of 0.215 mg/kg as compared to EPA's recommended value of 0.3 mg/kg.

3.2.5 Biological Data and Information

Title 117, Chapter 4, Section 003.01J Biological Criteria states:

"Any human activity causing water pollution which would significantly degrade the biological integrity of a body of water or significantly impact or displace an identified "key species" shall not be allowed except as specified in Chapter 2."

The report titled "*Bioassessment of the Wadeable Streams and Rivers of Nebraska Using a posteriori Classifications*" (Heatherly II, 2013) outlines the process by which streams are assigned an excellent, good, fair or poor rating. This report found the least-disturbed (reference) streams of Nebraska could be classified into five groups, each having unique physical templates based on temperature, discharge, and

percentage of riffle habitat (R.H.). Sites of unknown quality are compared to reference streams with similar physical templates using multimetric indices based on macroinvertebrates and fish (Table 11). These metrics are capable of discriminating between streams of known good and poor quality. The threshold values for determining the status of a river or stream are customized for each reference group (Table 12).

For the aquatic life standard, full support stream ratings will include everything with a fair, good, or excellent rating for fish and invertebrates (Table 13). Streams that receive a poor rating for fish or invertebrate multimetric index scores will receive an impaired use designation for the aquatic life standard. During assessments, when a poor rating is returned, a review of the data will be conducted to ensure the assessment was accurate and not due to extreme weather events or natural lack of habitat. When such factors are not associated with the assessment, the waterbody will be deemed impaired and scheduled for additional monitoring or a TMDL. When such extraneous factors are associated with a poor rating, the waterbody will not be considered impaired. An example of this would be in the Niobrara River Basin where the streams are rolling sand bottoms and the invertebrate habitat is not present. Should the Department encounter other exceptional circumstances; a detailed explanation will be included in the IR.

Table 11: Invertebrate and Fish Core Metric

Invertebrates			**Fish**	
Metric	**Code**		**Metric**	**Code**
Taxon richness	Richness		Family-level richness	Numfamly
Intolerant taxon metric	Inttaxa		% pollution tolerant fish	Ptole
Shannon diversity index	Swdi		# benthic species	Nsbenth
Pollution tolerance index	Tolindex		# lithophilic species	Nsla2
Family-level Hilsenhoff biotic index (HBI)	Hilbifam		% nest-associated species	pnass
% scraping taxa	Pct.scrap			

Table 12: Group thresholds for Multimetric Index Scores

Group	Rating	Invertebrates	Fish
Group 1	**Excellent**	21.5	16.5
Site has < 25% riffle habitat	**Good**	18.5	13
Temperature < 21.6° C	**Fair**	12.33	8.67
Flow < 3.0 l/s	**Poor**	6.17	4.33
Group 2	**Excellent**	22	15
Site has < 25% riffle habitat	**Good**	19	12
Temperature < 21.6° C	**Fair**	12.67	8
Flow ≥ 3.0 l/s	**Poor**	6.33	4
Group 3	**Excellent**	24	16
Site has ≥ 25% riffle habitat	**Good**	22	10
	Fair	14.67	6.67
	Poor	7.33	3.33
Group 4	**Excellent**	22	18
Site has < 25% riffle habitat	**Good**	19	11
Temperature ≥ 21.6° C	**Fair**	12.67	7.33
Flow ≥ 3.0 l/s	**Poor**	6.33	3.67
Group 5	**Excellent**	24	15
Site has < 25% riffle habitat	**Good**	20.5	11
Temperature ≥ 21.6° C	**Fair**	13.67	7.33

Flow < 3.0 l/s	**Poor**	6.83	3.67

Table 13: Assessment of Aquatic Life Beneficial Use Using *a posteriori* Classifications

Minimum Events/ Occurrences	Supported	Impaired
1 Fish and 1 Macroinvertebrates Sample	Excellent, good, or fair index rating for fish and invertebrates	Poor index rating for fish or invertebrates

3.3 Water Supply

3.3.1 Public Drinking Water Supply

Due to the abundance and availability of high quality ground water in Nebraska, the numbers of public drinking water systems utilizing surface water as the sole potable water source are few compared to other States.

Title 117 Chapter 4, Section 004.01 Public Drinking Water specifically states that surface waters assigned the use serve as public drinking water supplies and must be treated (e.g. coagulation, sedimentation, filtration, chlorination) before the water is suitable for human consumption. As such, surface waters used by public drinking water systems are treated prior to distribution and the finished water is monitored on a regular basis. The assessment procedures for assessment of public drinking water are shown in Table 14.

Table 14: Assessment of the Public Drinking Supply Water Beneficial Use Using Chemical Water Quality Data.

Method	Supported	Impaired
Binomial Distribution	≤10% exceeding water quality criteria	>10% exceeding water quality criteria

3.3.2 Agricultural Water Supply

Waters designated with the Class A agriculture water supply beneficial use have been deemed acceptable or exhibit the acceptable characteristics of being suitable for irrigation and livestock watering without treatment. While three specific parameters (conductivity, nitrite plus nitrate as nitrogen, and selenium) have been promulgated for protecting this use, any substance that degrades the use shall not be allowed. The assessment procedures for the agriculture water supply beneficial use using chemical water quality data can be found in Table 15.

Table 15: Assessment of the Class A Agricultural Water Supply Beneficial Use Using Chemical Water Quality Data.

Method	Supported	Impaired
Binomial Distribution	≤10% exceeding water quality criteria	>10% exceeding water quality criteria

3.4 Aesthetics

The aesthetics beneficial use applies to all surface waters of the state. Title 117 Chapter 4, Section 005 states that waters of the State may be deemed "aesthetically acceptable" if they are free from human-induced pollution that causes noxious odors, floating, suspended, colloidal or settleable materials that produce objectionable films, colors, turbidity or deposits, or undesirable or nuisance aquatic life.

These criteria are intended to address water quality impacts not identified by numeric criteria exceedance. Generally, the applications are two-fold and include: 1) NPDES permit prohibitions and 2) criteria are applied on a complaint basis and require validation by the Department. Once verified as a human-induced source, the waterbody can be placed in Category 5. If no source can be determined, the waterbody will be placed in Category 3 and further investigations should ensue. If the cause or source of the problem is determined to be natural, the waterbody will be placed within Category 4C.

These assessment procedures will expand the scope of the aesthetics beneficial use to utilize data collected by the Department and other sources that may not include numeric criteria found in Title 117 or approved by EPA.

3.4.1 Lakes and Reservoirs – Sedimentation

Excess sediment delivered to an impoundment can cause several problems including "objectionable colors, turbidity and deposits". Deposition of sediment can displace or eliminate critical aquatic habitat, as well as reduce the recreational area within a lake or reservoir. Sedimentation will be assessed using two measurements - impoundment volume loss and sedimentation rate. Table 16 provides the description of how to assess the aesthetics use with sedimentation data.

Table 16: Assessment of Lakes/Reservoirs Using Sedimentation Data and Information.

Minimum Assessment Period	Supported	Impaired
≥ 5 years	Volume loss < 25% and annual sedimentation rate ≤ 0.75%	Volume loss ≥ 25% or annual sedimentation rate > 0.75% per year

A sample minimum in not needed when assessing lake sedimentation information based on overall volume loss or bathymetric evaluations. Sedimentation rate can be determined using empirical data, the Revised Universal Soil Loss Equation or other methodology.

3.5 Trend Analysis

In accordance with the IR Guidance, the NDEE will conduct trend analysis where sufficient data exists. Typically the trend analysis will be conducted on waterbodies monitored as part of the fixed station ambient stream monitoring network. While several parameters are monitored from these sites, resource limitations may limit the scope of the analyses. At a minimum two sites per basin will be considered with additional sites being evaluated as resources allow.

The Department considers a trend statistically significant when the p-value is ≤0.05. The results of the trend analysis will be one of three outcomes: Increasing trend observed, Decreasing trend observed or Not Significant trend observed (there was not 95% or greater certainty to determine a trend).

In situations where the water quality data and information used in the trend analysis show declining water quality and the significance level is met, these will be considered waters of concern and identified as such. Waters deemed waters of concern may not exhibit a standards violation, however monitoring should continue to track the support or impairment status.

4.0 Reporting Considerations

4.1 Reassigning Waterbodies to Categories within the Integrated Report

From time to time but prior to the next required submission, the Department may find it advantageous or prudent to reassign waterbodies to another category within the Integrated Report. These modifications may be made for the following reasons:

- Additional, new or expanded water quality data or information
- Errors detected in the original assessment decision
- New or modified water quality criteria
- New assessment procedures
- Approval of a TMDL

When making a decision to reassign a waterbody, the level (quality, quantity, time consideration, etc.) of data and the required exceedance of the water quality criteria must be consistent with the listing procedures described above.

4.2 Prioritization/TMDL Development Schedule

The CWA and 40 CFR require that the State establish a priority ranking for each waterbody that is impaired and requires a TMDL (Category 5). In 2011 EPA and the States began working on the development of a new Long-Term Vision for the CWA Section 303(d) Program that focuses on implementable TMDLs in high priority areas (NDEQ, 2015).

Overall, the priority ranking will follow NDEE's Basin Rotation Approach in conjunction with the Social Impact and Implementation Matrix which considers:

- The likelihood of the TMDL being implemented.
- The social impact where waters that are designated as public water supplies or are a source of drinking water and are impaired by a pollutant that is contributing to a violation of a primary drinking water standard. Recreation and Aquatic life designated uses will also be prioritized due to their human health, economic, and ecological importance.
- Waters where sensitive aquatic species, or endangered or threatened species exist and the pollutant(s) threaten said species.
- Any other pertinent factor (severity of the impairment, aesthetic importance, degree of public interest, etc.).

Waterbodies with complete data sets will be given a higher priority for TMDL completion and TMDL development will be scheduled based upon the complexity of the problem, sources involved, and any other relevant factors. To some extent, TMDL prioritization and scheduling will consider the severity of the impairment in relation to the designated use.

TMDLs for waters within the "data lacking" categories will be prioritized based upon:

1. Basin rotation management/monitoring programs,
2. Section 319 priorities and the development of comprehensive watershed management plans, and
3. NPDES permit issuance needs/priorities.

Regardless of the priority assigned, TMDL development will be completed as expeditiously as resources allow.

4.3 Resolution of Disagreements with Other Jurisdictions

On occasion, a waterbody may be subject to more than one jurisdiction or flow into an area controlled by another State or Tribe. Waters may also flow from an area controlled by another State or Tribe into the Department's jurisdiction. For these waters, the Department will forward a copy of the draft Integrated Report and the data used to make the assessment decision(s) to the participating entities and request comments prior to or during the public notice period. Comments received will be evaluated, additional discussions may ensue, and modifications to the list may or may not occur. Should a conflict remain when the final list is prepared, USEPA Region 7 will be notified as part of the final Integrated Report submittal.

4.4 Public Participation

Public Participation is required by 40 CFR Part 130, and has been a key component of the Section 303(d) listing process in the past. One of the goals of the Integrated Report is to provide the general public with information on the status of all waters of the State. With this in mind, public input on the entire Integrated Report will be sought. To ensure the public is made aware of the proposed Report and given ample opportunity to respond, the procedures described below will be utilized. It should be noted, the procedures are based upon an April 1 submittal deadline. All dates will be adjusted accordingly should there be any deviation from the April 1 requirement.

- During the period between Integrated Report submittals, the Department will correspond with other government and public entities during the course of regularly scheduled or attended meetings, task forces, work groups and discussions regarding the data collection and listing process.
- By June of the year preceding the submittal deadline, a letter of request will be sent to all state and federal agencies responsible for the collection, receipt or management of surface water (as defined by Title 117) data and/or information (i.e. NE Game and Parks Commission, United States Geological Survey, etc.). The same letter of request will be sent to all parties who had provided comments on previous Section 303(d) lists and those entities that may collect water quality data and information. The letter will explain the Department is in the process of developing the Integrated (Water Quality) Report and offer an opportunity for the entities to submit data or information to be reviewed and considered. The letter will also note the data submittal deadline is September 30.
- In the event that several parties express an interest in assisting with the Integrated Report development, a work group may be formed. The work group will meet on one to three occasions to address the concerns raised.
- On or about February 1, the draft report will be completed and notification of the availability of the report and the assessment methodologies will be e-mailed to all federal, state, and local agencies as well as to all parties who had provided comments on previous Section 303(d) lists and those entities that may collect and/or utilize water quality data or information (Appendix D). A PDF version of the draft Integrated Report will be placed on the NDEE website (http://deq.ne.gov) for public viewing and reproduction. The NDEE's website will be used to make notice of the intention to develop the Integrated Report and to publicize the availability of the draft report.

- A 30 day review period will be established and enforced and **comments received after the deadline will not be considered**. To resolve any potential conflicts, the "date received" will be indicated by a NDEE date stamp. Comments may be written, sent by fax or via e-mail to the designated contact. Verbal comments or statements will not be accepted. At the discretion of the Director, the comment period may be extended by 30 days. (Due to the April 1 deadline this will represent the maximum comment period.)
- If a sufficient number of comments are received, one or more public meetings/hearings may be held to allow stakeholders an opportunity to further justify or propose changes to the Integrated Report.
- All appropriate comments received on the assessment methodologies or the categorization of waterbodies within the Integrated Report will be considered when making the final assessment decisions. A written response addressing the applicable comments will be provided to the person, persons, and organization or government agency making such comments. If several comments are received making similar statements, NDEE may summarize the comments and respond accordingly. This action will be noted when incorporated into the responses.

4.5 Submittal to EPA Region 7

Prior to the established deadline, the Nebraska Integrated Report will be submitted to EPA Region 7 under the signature of the Director or the authorized designate. If applicable, this deadline may be postponed by mutual agreement by EPA and the Department.

To be considered complete, the submittal package should include:

- Cover letter
- The final Integrated Report (Section 303(d) list and Section 305(b) report)
- A copy of the current assessment and reporting methodologies
- Final draft Integrated Report available for public notice
- Proof of public notification/opportunity for comment
- Copies of comments received on the draft
- Copies of the Department's responses to applicable comments
- Proposed waters to be delisted and the supporting documentation/information.

Following the submittal, the Department may make annual updates to the Integrated Report. Submittal of these to EPA is not required, but may be conducted as a means of notifying EPA of beneficial use support status changes and monitoring priorities. These updates will be completed using all of the procedures (e.g. data submittal, public participation) that will be used in preparing future Integrated Reports. The information accompanying this update will be consistent with the above procedures.

5.0 References

40 Code of Federal Regulations, Part 130.

APHA 1998. Standard Methods for the Examination of Water and Wastewater – 20th Edition.. American Public Heath Association. Washington, D.C.

EPA 1997. Guidelines for the Preparation of the Comprehensive State Water Quality Assessments (305(b) Reports and Electronic Updates: Supplements. United States Environmental Protection Agency, Office of Waters. Washington, D.C.

EPA 2005. Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant Sections 303(d), 305(b) and 314 of the Clean Water Act.

Heatherly II, T. 2013. Bioassessment of the Wadeable Streams and Rivers of Nebraska Using a posteriori Classifications. Nebraska Department of Environmental Quality, Water Quality Division. Lincoln, 2013.

Holdren, C., W. Jones, and J. Taggart. 2001. Managing Lakes and Reservoirs. North American Lake Management Society and Terrene Institute, in cooperation with Office of Water, Assessment, and Watershed Protection Division, U.S. Environmental Protection Agency, Madison, WI.

Iman, R.L., Conover, W.J. 1983. A Modern Approach to Statistics, New York.

Lin, P., Meeter D., Niu X., 2000. A Nonparametric Procedure for Listing and Delisting Impaired Waters based on Criterion Exceedances, Technical Report, Department of Statistics, Florida State University, Tallahassee, FL

NDEQ, 2010. Quality Assurance Project Plan For Statewide Lake and Reservoir Monitoring, Nebraska Department of Environmental Quality, Lincoln, Nebraska, February 2010

NDEQ, 2014. Title 117 – Nebraska Surface Water Quality Standards, Nebraska Department of Environmental Quality, Lincoln, Nebraska, December 13, 2014.

NDEQ, 2015. Long-Term Vision for Assessment, Restoration, and Protection under the Clean Water Act Section 303(d) Program, Nebraska Department of Environmental Quality, Lincoln Nebraska, July 2015.

Pronsolino v. Marcus, 91 F. Supp. 2d 1337, 1349-51 (N.D. Cal. 2000).

Texas Natural Resource Conservation Commission, 2001, Guidance for Assessing Texas Surface and Finished Drinking Water Quality Data 2002, TNRCC Office of Compliance and Enforcement, Monitoring Operations Division, Surface Water Quality Monitoring Program, Austin, TX.

Appendix A – Potential Example of Information Provided in the Integrated Report

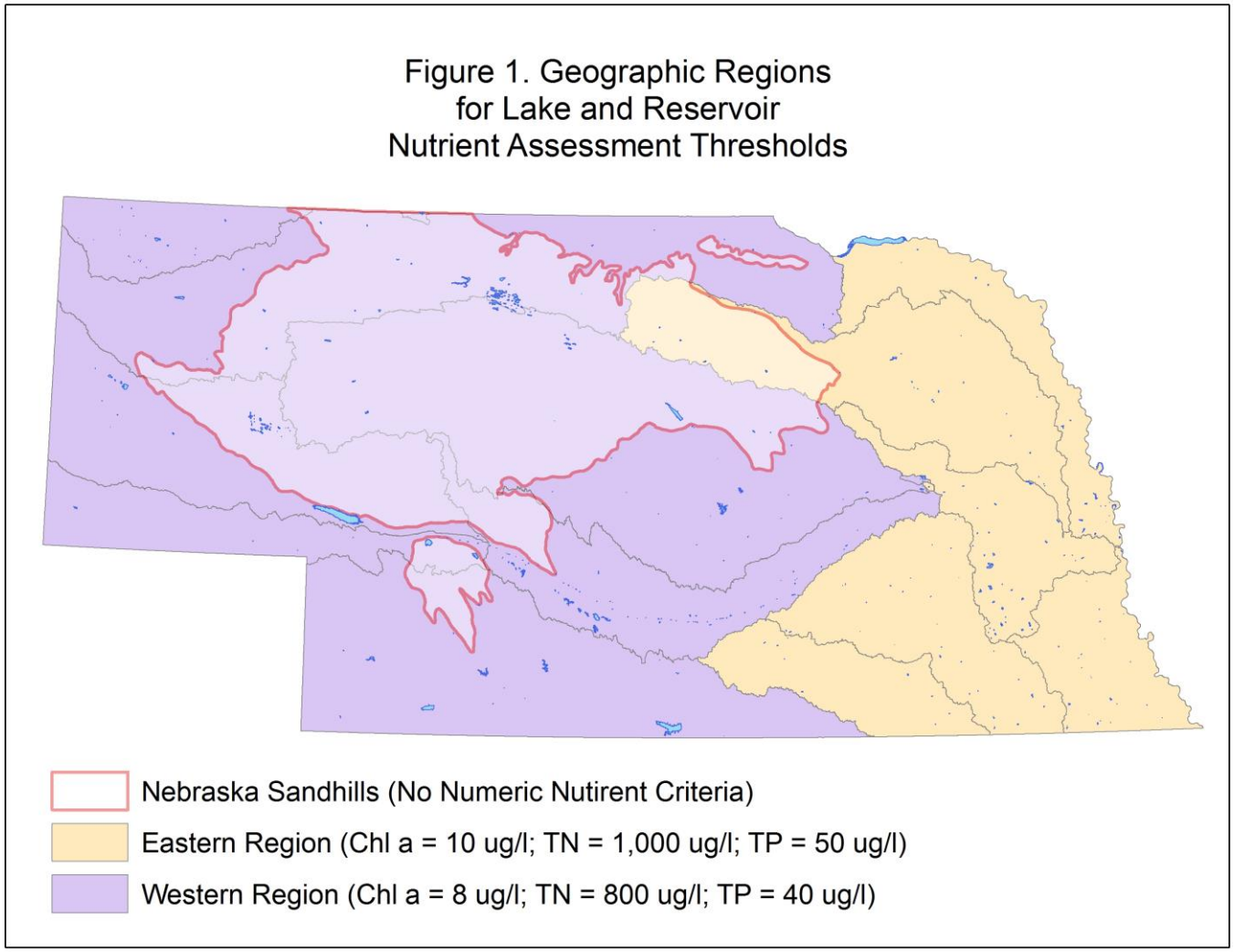
Waterbody ID	Waterbody Name	Recreation	Aquatic Life	Public Drinking Water	Agricultural Water Supply	Industrial Water Supply	Aesthetics	Overall Assessment	2016 IR	Impairments (Causes)	Comments/Actions
Lakes											
BB1-L0010	Donald Whitney Memorial Lake	I	I		S		S	I	5	Recreation (*E.coli*), Aquatic Life - DO (Total Nitrogen), (Total Phosphorus)	
BB1-L0020	Diamond Lake South	I	I		S		S	I	5	Recreation (*E.coli*), Aquatic Life - DO (Total Nitrogen), (Total Phosphorus)	
BB1-L0030	Big Indian Lake (11A)	S	I		S		I	I	4R	Aquatic Life (Total Nitrogen), (Total Phosphorus)	Lake Renovated 2011, Nutrient and Sediment TMDL approved 09/09, Fish consumption assessment

Appendix B – EPA Identified Priority Toxic Pollutants[1]

Parameter	Acute Criteria (µg/l)	Parameter	Acute Criteria (µg/l)	Parameter	Acute Criteria (µg/l)
Antimony	88	1,2-Trans-Dichloroethylene	None	Di-n-Butyl Phthalate	None
Arsenic	340	1,1,1-Trichloroethane	None	2,4-Dinitrotoluene	None
Beryllium	130	1,1,2-Trichloroethane	None	2,6-Dinitrotoluene	None
Cadmium	Hardness[2]	Trichloroethylene	45,000	Di-n-Octyl Phthalate	None
Chromium (III)	Hardness[2]	Vinyl Chloride	None	1,2-Diphenylhydrazine	270
Chromium (VI)	Hardness[2]	2-Chlorophenol	4,380	Fluoranthene	3,980
Copper	Hardness[2]	2,4-Dichlorophenol	2,020	Fluorene	None
Lead	Hardness[2]	2,4-Dimethylphenol	2,120	Hexachlorobenzene	6
Mercury	1.4	2-Methyl-4,6-Dinitrophenol	None	Hexachlorobutadiene	90
Methylmercury	None	2,4-Dinitrophenol	None	Hexachlorocyclopentadiene	7
Nickel	Hardness[2]	2-Nitrophenol	230	Hexachloroethane	980
Selenium	20	4-Nitrophenol	230	Ideno(1,2,3-cd)Pyrene	None
Silver	Hardness[2]	3-Methyl-4-Chlorophenol	30	Isophorone	117,000
Thallium	1,400	Pentachlorophenol	pH[3]	Naphthalene	2,300
Zinc	Hardness[2]	Phenol	10,200	Nitrobenzene	27,00
Cyanide	Hardness[2]	2,4,6-Trichlorophenol	None	N-Nitrosodimethylamine	None
Asbestos	None	Acenaphthene	1,700	N-Nitrosodi-n-Propylamine	None
2,3,7,8-TCDD (Dioxin)	<0.01	Acenaphthylene	None	N-Nitrosodiphenylamine	None
Acrolein	68	Anthracence	None	Phenanthrene	30
Acrylonitrile	68	Benzidine	2,500	Pyrene	None
Benzene	5,300	Benzo(a)Anthracene	None	1,2,4-Trichlorobenzene	None
Bromoform	None	Benzo(a)Pyrene	None	Aldrin	3
Carbon Tetrachloride	35,200	Benzo(b)Fluoranthene	None	alpha-BHC	None
Chlorobenzene	250	Benzo(ghi)Perylene	None	beta-BHC	None
Chlorodibromomethane	None	Benzo(k)Fluoranthene	None	gamma-BHC (Lindane)	0.95
Chloroethane	None	Bis(2-Chloroethoxy)Methane	None	delta-BHC	None
2-Chloroethylvinyl Ether	None	Bis(2-Chloroethyl)Ether	None	Chlorodane	2.4
Chloroform	28,900	Bis(2-Chloroisopropyl)Ether	None	4,4'-DDT	1.1
Dichlorobromomethane	None	Bis(2-Ethylhexyl)Phthalate	2,000	4,4'-DDE	1,050
1,1-Dichloroethane	None	4-Bromophenyl Phenyl Ether	None	4,4'-DDD	0.6
1,2-Dichloroethane	118,000	Butylbenzyl Phthalate	None	Dieldrin	0.24
1,1-Dichloroethylene	None	2-Chloronaphthalene	1,600	alpha-Endosulfan	0.22
1,2-Dichloropropane	None	4-Chlorophenyl Phenyl Ether	None	beta-Endosulfan	0.22
1,3-Dichloropropene	None	Chrysene	None	Endosulfan Sulfate	None
Ethylbenzene	32,000	Dibenzo(a,h)Anthracene	None	Endrin	0.086
Methyl Bromide	None	1,2-Dichlorobenzene	None	Endrin Aldehyde	None
Methyl Chloride	None	1,3-Dichlorobenzene	None	Heptachlor	0.52
Methylene Chloride	None	1,4-Dichlorobenzene	None	Heptachlor Epoxide	0.52
1,1,2,2-Tetrachloroethane	None	3,3'-Dichlorobenzidine	None	Polychlorinated Biphenyls PCBs:	2
Tetrachloroethylene	5,280	Diethyl Phthalate	None	Toxaphene	0.73
Toluene	17,500				

[1] The listing of priority toxic pollutants are those listed in the document "National Recommended Water Quality Criteria", USEPA, Office of Water, Office of Science and Technology. 2006.
[2] Title 117 – Nebraska Surface Water Quality Standards has established site specific and/or aquatic life use class criteria based upon the hardness of the waterbody.
[3] Title 117 – Nebraska Surface Water Quality Standards has established site specific and/or aquatic life use class criteria based upon the pHf the waterbody.

Appendix C - Figure 1: Geographic Regions for Lake and Reservoir Nutrient Assessment Thresholds



Appendix D – NDEE's Data Submittal Request List

Distribution List Name:	IR Data Request Public Notice:
Central Platte NRD	vogt@cpnrd.org
Central Platte NRD	luke@cpnrd.org
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