



**Methodology for Waterbody Assessment and
Developing the 2002 Section 303(d) List of Impaired
Waterbodies for Nebraska**

**Nebraska Department of Environmental Quality
Planning Unit, Water Quality Division**

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1.0 Introduction

1.1 Requirements Under Section 303(d) 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 waterbodies for 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 list of impaired waterbodies and TMDLs to the U.S. Environmental Protection Agency (EPA). The requirements to identify and establish TMDLs for waterbodies exists regardless of whether the waterbody is impaired by point sources, nonpoint sources, or a combination of both. *Pronsolino v. Marcus*, 2000 WL 356305 (N.D. Cal. March 30, 2000.)

EPA issued regulations governing identification of impaired waterbodies and establishment of TMDLs, at § 130.7 in 1985 and revised them in 1992 and again in 2000. However, on October 18, 2001 the effective date of the July 2000 regulations was delayed until April 30, 2003. This action, along with delaying the due date of the 2002 Section 303(d) list was announced in the Federal Register. - Volume 66, Number 202. Therefore, the listing of impaired waters will be conducted under the 1985 TMDL regulations, as amended in 1992.

1.2 State of Nebraska Water Quality Standards

Title 117 – Nebraska Surface Water Quality Standards (Title 117) lists designated waterbodies and the appropriate beneficial use(s) (aquatic life, primary contact recreation, water supply and aesthetics) based upon the monitored or extrapolated 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 tend to be more subjective than numeric values are also assigned to waterbodies for further beneficial use assessment and protection.

When making waterbody assessments to meet the requirements of Section 303(d) and 40 CFR Part 130, the most recently version of Title 117 will be utilized.

The procedures described herein have been developed for use in comparing the applicable water quality criteria to monitoring data and information from a specific waterbody. Waters identified as impaired are then grouped into what is commonly called the Section 303(d) list and at this point, further actions, to address the impairment will be prioritized and scheduled.

1.3 Consistency Between the Section 303(d) List and the Section 305(b) Water Quality Report

The Section 303(d) listing process begins with the same guidance and assessment procedures developed for Section 305(b) reporting purposes. Fundamentally, these processes are consistent, to a point. All waterbodies are assessed and reported in the context of the Section 305(b) report with these assessments allowing greater flexibility in regards to data age and quantity. The Section 303(d) list is used to report known beneficial use impairments based on high quality data of sufficient quantity in order to make confident assessments and decisions. Due to the overlap in these programs, it is imperative that the assessment procedures be consistent and applicable for all assessments. Therefore, the Planning Unit and Surface Water Unit must realize this need when establishing monitoring, assessment and management goals and activities.

1.4 Scope and Format of Nebraska's Section 303(d) List of Impaired Waterbodies

The main scope of the CWA Section 303(d) and 40 CFR Part 130.7 can be centered on two major components, the identification of water quality impairments (Section 303(d) list) and the establishment of strategies to resolve these problems (total maximum daily loads). Statutorily the Department is required to identify the water, describe the data and data assessment methodology and assign a priority for TMDL development. While complying with the statutory requirements, meeting these minimum requirements does little to provide information to regulated communities and general public in regards to future water quality protection and abatement activities.

Also, the data required to meet the needs of the 303(d) list or TMDL development can be similar or be significantly different. For example, often less data is required to identify water quality impairment while extensive data is needed to assemble the components (loading capacity, source identification, etc.) of a TMDL. Finally, the existing and readily available water quality data and information can be of varying quantity and quality.

Another consideration is the procedures chosen to develop the TMDLs, which will generally be completed by one of three methods: simple TMDL, medium/moderately complex TMDLs or very complex TMDL. Similar to the listing, the 3 methods of TMDL development will be a function of the data as well as the manageability of the problem.

Regulations in 40 CFR Part 130.7 (with a delayed effective date of 4/30/03) recommend a four-part Section 303(d) list. As well the 2002 *Integrated Water Quality Monitoring and Assessment Report Guidance* touts the merits of a multi-part Section 305(b) report and Section 303(d) list. The NDEQ has opted to incorporate these concepts and will prepare a five-part list and also create sub-parts for Part 1 with one of the listing goals being to provide a comprehensive overview of the waterbodies and the actions (i.e., additional monitoring, permit issuance, TMDL development) within the Department that will be pursued in the future. Waterbodies included on a segment or part will be a reflection of the data quantity, quality and the confidence associated with the listing decision and to some extent will describe the priority for TMDL completion. The segmented list will also be used by program managers to direct future monitoring plans and priorities. The following are the Section 303(d) list parts.

The Guidelines for Preparation of the Comprehensive State Water Quality Assessments (305(b) Reports) and Electronic Updates – Supplement Section 1.2, establishes four levels of use support: Fully Supporting, Fully Supporting but Threatened, Partially Supporting and Not Supporting and are used to describe the water quality (good, fair or poor). According to the guidance “impairment” means either partially or not supporting a designated use. Based on these definitions those waters partially or not supporting designated uses will be included on the list of waters still needing TMDLs.

Part 1a – Waterbodies identified as partial or not supporting a beneficial use, the source has been identified as “man-induced” and no TMDL has been developed. Program managers have determined that the collection of additional data is not needed to complete the TMDL or validate the listing. These waterbodies will be assigned a high priority for TMDL development. In the event a TMDL is not developed for a Part 1a waterbody prior to the next listing and no additional data is collected, the waterbody will remain on Part 1a.

Part 1b – Waterbodies identified as partial or not supporting a beneficial use, the source has been identified as “man-induced” and no TMDL has been developed. For these waterbodies the existing data may be sufficient to develop a simple or moderately complex TMDL however, the process would benefit from the collection of additional data and information. These waterbodies will be assigned a medium priority for TMDL development and a high priority for additional monitoring. Upon the completion of additional data, the waterbody may be moved to Part 1a. In the event a TMDL is not developed for a Part 1b waterbody prior to the next listing and no additional data is collected, the waterbody will remain on Part 1b.

Part 1c – Waterbodies identified as partial or not supporting a beneficial use, the source may or may not be determined and no TMDL has been developed. Minimal data exists for these waterbodies and the collection of additional data is required. The collection of additional data will be used for TMDL development and/or to validate the listing decision. These waterbodies will not be given a priority for TMDL development but will be given a high priority for additional monitoring. Upon completion of the additional monitoring the waterbody may be moved to Part 1a or Part 2 of the list or delisted.

Part 2 – Waterbodies identified as partial support or not supporting a beneficial use due to the presence of pollution as defined in 40 CFR or due to natural causes/sources. No TMDLs will be prepared for these waters. Additional monitoring in accordance with the rotating river basin monitoring approach may be pursued to verify the assessed status, verify the source determination or to develop site-specific water quality criteria.

Assessments for the placement of waters on Parts 1a-c and Part 2 rely upon the definitions of man-induced and natural causes/source. It is the intent of these procedures to assess waters and water quality data individually and because of this, specific definitions of “man-induced” and “natural causes/sources” are not provided. In general, natural cause/sources shall refer to those pollutants that are contributed to waters by indigenous species, landscape geology and climactic conditions. Man-induced then refers to all sources that are not determined to be natural. It should be noted, these definitions are not inclusive.

Part 3 – Waterbodies identified as partial or not supporting a beneficial use and where the TMDL has been completed by the State and is either approved or pending approval by EPA; and the waterbody has not yet attained the appropriate water quality criteria or beneficial use status. Waters from this portion of the list can be moved to Part 1a, 1b or 1c in the future if significant progress has not been made at implementing the TMDL or monitoring indicates the TMDL is not effective in achieving the water quality criteria. Waters can also be relocated to Part 1a-c if EPA disapproves the submitted TMDL.

Part 3 of the Section 303(d) list will also be used to locate waterbodies assessed to be partial or not supporting a beneficial use but the water-quality standard/criteria will be changed prior to the next listing cycle. These waters can be moved to Part 1a, 1b or 1c at any time prior to the next listing if the NDEQ opts not to modify the criteria, assessment of data using the modified criteria results in partial or not supporting a beneficial use assessment or EPA deems the modification of the criteria inappropriate.

Part 4 – Waterbodies identified as partial or not supporting a beneficial use and where the pollutant source(s) has been identified to be one or more point source(s). In addressing the water quality concerns, a process equivalent to that of TMDLs will be utilized that includes a valid wasteload allocation to be implemented through the issuance of water-quality based permits under the authority of the National Pollutant Discharge Elimination System (NPDES). The water quality impairments and NPDES permits will be scheduled for issuance in a timely manner (usually within 2-3 years) and the schedule will accompany the Section 303(d) list at the time of submittal. Should future monitoring indicate the waterbody is not attaining the applicable criteria after the issuance of a permit and installation of controls, the waterbody will then be moved to Part 1a, 1b or 1c of the 303(d) list.

Water Quality Concerns (Part 5) – Waterbodies where the available data and information is insufficient to make a confident, defensible decision on the beneficial use attainment status. This part may include waterbodies with sample data sets that do not contain the minimum number required but the data does indicate a water quality problem. Another example of a Part 5 waterbody would be a narrative or qualitative data submittal that has not yet been verified. These waterbodies will be assigned a high priority for future monitoring and will be scheduled in accordance with the rotating basin monitoring scheme or other monitoring scheme with the goal being the collection of sufficient data or information to either move the waterbody to Part 1-4 or delist. This portion of the Section 303(d) list is intended to aid in establishing monitoring priorities and will not be part of the official submittal made to EPA as required by the Clean Water Act. This portion of the list will be supplied to EPA in an unofficial manner as a means of notifying the Agency of the Department’s future monitoring intentions and priorities. Although, not part of the Clean Water Act submittal, for informational purposes, part 5 will be supplied to EPA Region 7 with parts 1-4 and may be included in the collective term “303(d) list”.

Figure 1 illustrates the general relationship between the Section 303(d) parts.

1.5 Section 303(d) List Contents

The following information will accompany each waterbody included on Parts 1-5 of the Section 303(d) list.

Waterbody Number:	This is the numerical identification assigned to the waterbody in Title 117, Nebraska Surface Water Quality Standards.
Waterbody Name:	The name of the waterbody.
Size of Affected Area:	The size of the area that is considered impaired using information from the Assessment Database or the maximum allowed by these procedures. Measurement units should be miles for stream segments and acres for lakes/reservoirs.
Impaired Beneficial Use:	The use determined to be impaired must be included (e.g. Aquatic Life, Primary Contact Recreation, etc.).
Parameter of Concern:	The pollutant or stressor that has been indicated to be causing an impairment
Pollutant Source:	A “Y” indicates the impairment is believed to be from point sources, nonpoint sources or both.
TMDL Approval Date:	For Part 3 waterbodies the date EPA approved the TMDL or if approval is pending, the date of submittal.
NPDES Permit Issuance:	For Part 4 waterbodies, the anticipated date the NPDES permit(s) will be issued or public noticed.
Anticipated Monitoring:	If additional monitoring of this waterbody is desired, include the date(s) the monitoring will be initiated and completed.
Assessment Data Source:	The agency, entity, etc. that collected or supplied the data used in the assessment (e.g., NDEQ, USGS, EPA).
Waterbody Summary:	A simple narrative description of the data assessment and/or other information.

Maps of each basin that highlight the identified impaired waters will also accompany the tabular list. Table 1 defines the required information, by part that must accompany waterbodies included on the Section 303(d) list. An example of a Section 303(d) listing is provided in Appendix A.

2.0 General Assessment Methodology

2.1 Waters Covered in Nebraska’s 303(d) List Assessment

All streams, lakes, reservoirs and wetlands will be evaluated for inclusion on the Section 303(d) list if sufficient data exists to assess at least one of the applicable beneficial uses. Each beneficial use deemed to be partial or not supporting per waterbody will be reported. This rule includes all waters identified in Title 117 using the appropriate criteria. Waterbody assessments can be applied to either designated or undesignated waterbodies. The numeric and narrative criteria associated with aesthetics and general criteria for the protection of aquatic life apply to all waterbodies and should be the general basis for the assessment of undesignated waterbodies. As well, Chapters 3 prohibit water quality degradation that adversely affects existing uses and will be considered and applied for Section 303(d) listing purposes.

Figure 1: General relationship between the Section 303(d) list parts

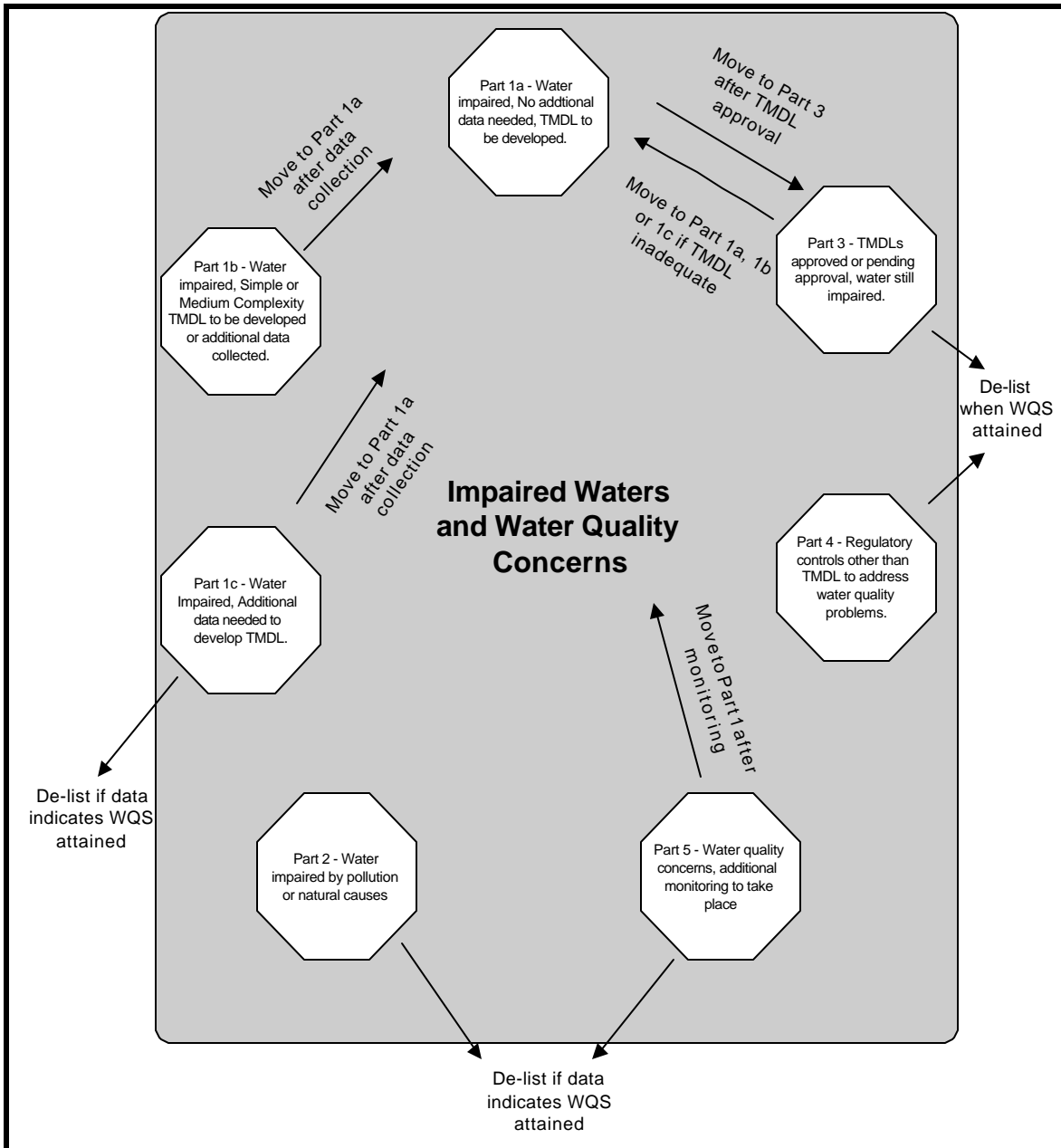


Table 1: Required components for the waterbodies included on the Section 303(d) List.

	<i>Part 1a.</i>	<i>Part 1b.</i>	<i>Part 1c.</i>	<i>Part 2.</i>	<i>Part 3.</i>	<i>Part 4.</i>	<i>Part 5.</i>
Waterbody Number							
Waterbody Name							
Size of Affected Area (miles or acres)							
Impaired Beneficial Use							
Parameter of Concern				(if known) 			
Pollutant Source			(if known) 				(if known)
TMDL Approval Date (or submittal date)							
NPDES Permit Issuance Date (or anticipated public notice date)							
Anticipated Monitoring							
Source of Assessment Data							
Comments/Additional Information							

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

In preparing the Section 303(d) list, 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 303(d) listing decisions consistently.

As stated, chemical, physical, microbiological and biological water quality data and information are collected to serve the varying needs of resource agencies and other entities. Because of this, data from one waterbody may be suitable to make beneficial use assessments and Section 303(d) listing decisions while for a different waterbody it may be inappropriate to attempt to make the same use of a similar data set. Regardless, as the first step in the Section 303(d) list development, the Department will canvas the agencies and entities that regularly or infrequently collect water quality data and information. Data sought for consideration in preparing the Section 303(d) list will include but is not limited to information 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 for which 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 within nonpoint source priority watersheds.

- Drinking water source water assessments under Section 1453 of the Safe Drinking Water Act.
- Waterbodies targeted for monitoring under the River Basin Management Planning process.
- Waters where there have been repeated fish kills or where abnormalities (lesions, tumors, etc.) have been observed in fish and other aquatic life.
- Waters where data has been collected under Nebraska's Ambient Stream Monitoring Program.
- Surface waters monitored during the rotating basin monitoring.

It should be noted, that any data submitted to the Department for use in preparing the Section 303(d) lists will in turn be made available for public viewing and reproduction.

2.3 Data Submittal

(This section is based upon the premise of the Section 303(d) list being submitted to EPA before April 1, as required. Should a deviation from the April 1 date occur, the below dates will also be adjusted accordingly with notification being provided to all potential entities.)

To be considered in the beneficial use assessments, data from agencies and entities must be received by the applicable deadline, based on the data type and described below, of the year prior to the April 1, Section 303(d) list submittal. It is suggested that entities submitting the data do so well in advance of these dates 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.

- *Electronic submissions are preferred (e.g. Excel, Lotus or Access) and must be received by NDEQ on or before December 1.*
- *Non-electronic submissions must be received by NDEQ on or before November 1.*

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 information or narrative/qualitative submittals. When such information is submitted, the observation date, location(s), quality assurance methods and other pertinent information should also be provided. Other pertinent information includes the rationale supporting the observation being considered outside the normal range of conditions. If not verifiable, narrative and qualitative submittals may not be used in the 303(d) process however; the information may be used in completing part 5 – water quality concerns and 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 compact disks. Once the assessments are complete all data will be available to interested parties and review or reproduction of the data will be consistent with the Department's records management policies and procedures.

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 to be 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 implication of the decision and the amount of uncertainty that can be tolerated in the decision that is made. The use of statistical methods to make inferences about existing water quality conditions from sampling data can greatly facilitate the decision making process by accounting for uncertainty concerns. The establishment of DQOs can help insure that data of the appropriate quality is compiled and/or collected for statistical assessment. This information can then be used to make decisions with known uncertainty.

2.4.2 Review of Statistical Methods

2.4.2.a Target and Sampled 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 sampled population. The target population is the set of N population units about which inferences will be made. The sampled population is the set of population units directly available for measurement. Population units are the N objects (environmental units) that make up the target or sampled population. These units can be defined in many ways depending on the water quality assessment objectives, the type 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 the situation being studied. By imposing sampling conditions, one defines the target population. The crucial point is whether the population so 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 the variability in the target population, bias, and random measurement uncertainties. Two factors that influence the size of the error of estimation are sampling and nonsampling 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. Nonsampling error is the name given to inaccuracies and errors that can and should be avoided by using sound data collection and analysis techniques. Nonsampling 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 plan of sampling (sampling error).

2.4.2.c Hypothesis Testing

Decision making can be approached from the standpoint of hypothesis testing based on sample data. This approach leads to a very systematic and structured procedure for aiding 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 conjecture to be tested is called the null hypothesis (H_0). The null hypothesis is often, but not always, a version of the statement "*Any observed change or difference is due to chance variability*", 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).

Type II: Incorrectly concluding that there is no effect when there is (accepting the null hypothesis when it is false).

Both errors, if present, distort one's 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 the 303(d) Listing Methodology

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 NDEQ to conduct beneficial use support assessments for the identification of impaired waterbodies (see *Methodology for Assessing Use Support and Water Quality Concerns* in the following pages of this report). The information will be used to establish the State of Nebraska's list of impaired waterbodies that will be submitted to EPA pursuant to section 303(d) 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 state's section 303(d) list of impaired waterbodies that will be submitted to EPA. The primary decision that needs to be made is determining which waterbodies in the state are impaired and should be placed on the state's section 303(d) list. The decision to put a waterbody on the state's section 303(d) list carries significant ramifications. TMDLs must be developed and implemented for all waterbodies listed under Part 1 of the state's 303(d) list. 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 section 303(d) list correctly identify waters that are impaired. This will allow the state to avoid the expense and effort of developing and implementing a TMDL that is unnecessary.

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 decision of whether or not to list a waterbody as impaired.

2.4.3.d What Criteria Exist for Making Decisions Based on the Collected and/or Compiled Data?

Section 303(d) listing decisions are tied back to the attainment of the state's water quality standards. Where numeric criteria are defined or narrative criteria can be quantified, the NDEQ utilizes exceedance rates of these criteria to define whether or not a waterbody is supportive of its designated beneficial uses. In line with past EPA guidance, the NDEQ utilizes exceedance rates of 10% and 25% as indicators of partial and non-support. The criteria that will be used to determine whether or not a waterbody is impaired are given in this report under the section entitled "*Methodology for Assessing Use Support and Water Quality Concerns*".

2.4.3.e What Hypotheses will be Tested and/or Estimated?

The decision on whether or not to list a waterbody as impaired has been reduced to the following null and alternative hypotheses:

H_0 : 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 decision to be made based on the conclusions of the data assessment. The first mistake that could be made is identifying a waterbody as impaired when it truly isn't (*Type I Error*). The second 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 isn't needed. The NDEQ has determined that an acceptable risk of making a *Type I Error* is 10% (i.e., = 0.10). If this risk level is met, at least 9 out of every 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 Section 303(d) listing decisions. 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 said 303(d) lists. Due to the implications associated with being listed, the Department desires to only consider the highest quality of data feasible. As the quality of data increases so to does the confidence in the final decision.

Data collected by the NDEQ, United States Geological Survey and the United States Environmental Protection Agency are generally done under the auspice of an approved quality assurance monitoring project plan and can be used in the development of the 303(d) list. Data not collected under such a plan must be accompanied by documentation of the quality assurance and/or quality control that will be evaluated by NDEQ. The 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 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.

The establishment of a statewide surface water database/clearing house is under investigation. If developed, it is anticipated that the data and information stored will be accompanied by the quality assurance qualifiers. Usage of data from this source will be dependent upon the assigned quality assurance statements.

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. 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 and watersheds in general are dynamic with many factors contributing to this state of flux. Land use, precipitation, climate, pollution sources and loads, diversions, impoundments are among the many water quality influences. Although desirable, the application of continuous monitoring stations is not pursued as resources are mainly utilized to obtain less data from a greater array of waterbodies. Aside from the fixed 42-station network, the Department has been following a rotating basin monitoring plan whereby monitoring activities are focused in two or three river basins each year. A basin rotation cycle, accounting for the 13 major river basins, requires 5 years to complete.

Based upon the implications of being identified as “impaired” (partially or not supporting a beneficial use), the Department will focus assessments on the most recent data that accurately portrays the quality of the waterbody in question. Therefore, only data and information collected during the past 5 year period will be used to make 303(d) listing decisions.

The 5-year rule will be the initial screen for data sets, however; a secondary review should 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 Section 303(d) assessment process.

Exceptions to this requirement would be for lake sedimentation data and continuous data sets. Sedimentation refers to the assessment of overall lake volume lost. Once a lake has achieved the impairment threshold, 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 month water quality collection. These data are can be used to establish or evaluate trends in water quality. For continuous data sets, the acceptable data age will be 10 years.

Data collected more than 5 years ago but less than 10 years ago will not be used for a Section 303(d) assessment. However, the data can be used to identify a water quality concern and include the waterbody on Part 5, which is reserved for waterbodies where additional monitoring is needed.

2.5.2 Minimum Number of Samples

With a goal of the Section 303(d) list being the identification water quality problems it is important to point out that larger data sets often have a higher probability of detecting water quality standard excursions than smaller data sets. However, resources often restrict sampling efforts to the minimum necessary to fulfill the quality objectives. The Nebraska Section 303(d) list, and subsequent TMDL development, will be prepared to accommodate the varying quantities of data and the associated confidence in the data at defining water quality impairments.

The Department understands the importance of data quantity in the water quality assessment process however; resource limitations and man-hours often restrict the amount of data collected from a single waterbody. As well, national directives suggest states achieve the most practical statewide coverage meaning less measurements from a greater number of waterbodies be obtained. Given these two points, in order to be placed on Parts 1a-c, and Parts 2-3 of the Section 303(d) list, a minimum of 10 samples is required for chemical (i.e., ammonia, pH, metals etc.) and microbiological (fecal coliform) water quality parameters. To assess lake water quality conditions, a minimum of 10 sample sets (dissolved oxygen) must also be used.

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

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

Data sets consisting of only 4-9 samples can be used to identify water quality concerns and placed on Part 5 of the section 303(d) list. Water quality data set containing less than three chemical or microbiological measurements will not be assessed for Section 303(d) purposes.

2.5.3 Screening Waters for Potential Inclusion on the Section 303(d) list

As explained in section 2.3.4 two types of errors are possible when making Section 303(d) listing decisions. The first is the identification of water as impaired when it actually isn't (Type I) and the second is the failure to identify a water as impaired when it actually is (Type II). Ideally, established procedures balance the occurrences of making Type I and Type II errors however, in doing this, confidence in the outcomes may be questionable especially when considering smaller data sets. A means of balancing the errors is through the collection of additional monitoring data but this too comes with some difficulties, as it will increase the competition for monitoring resources.

In an effort to balance errors, meet the Department's confidence limits, make use of the existing data and to facilitate future monitoring these procedures will incorporate a 2-step assessment process. The initial assessment step will be based upon a straight percent criteria exceedance while the second step will account for the uncertainty and base the Section 303(d) listing decision on a 90% confidence level.

The screening procedures are tailored after those suggested in EPA's *Guidelines for the Preparation of the Comprehensive State Water Quality Assessments and (305(b) Reports and Updates: Supplement*. For partial support and nonsupport – defined as exceedance rates of greater than 10 and 25 percent, respectively – the number of exceedances required for any given number of is presented in Table 2. Waters identified as partial or nonsupport using these procedures will then be assessed using the procedures described in section 2.5.4.

Table 2. Sample size and number of exceedances required to screen waters for partial or nonsupport of a designated use (based on 2 significant digits).

Sample Size (n)	Number of Exceedances Needed to Meet 10% Rate	Sample Size (n)	Number of Exceedances Needed to Meet 25% Rate
4 -9	1	4 -7	2
10-19	2	8-11	3
20-28	3	12-15	4
29-38	4	16-19	5
39-47	5	20-23	6
48-57	6	24-27	7
58-66	7	28-31	8
67-76	8	32-35	9
77-85	9	36-39	10
86-95	10	40-43	11
96-100	11	44-47	12
		48-50	13

2.5.4 Accounting for Uncertainty Associated with Using Criteria Exceedances to Determine Impairment of Designated Uses

(Note: Much of the following discussion is taken from the following: “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 in a waterbody, the sample proportion of exceedances is a point 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 sample proportion of exceedances 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 *Type I* and/or *Type II errors* for situations when the analysis is based on a given variable that falls into one of two categories. Placing measurements of water quality variables in two categories – either equal to or less than a criterion, or greater than the criterion – is an example of such a situation. 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, up to n , the number of trials. The probability associated with each possible value x is denoted by $f(x)$, and is given by the equation:

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

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

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

Where $n! = n(n-1)(n-2) \dots (2)(1)$ 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 is used to determine whether a waterbody is supporting or not, the probability of committing a *Type I error* would be simple to determine in this case – that is, 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 that, 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., $\hat{p} = 0.2$) strong evidence to determine the waterbody as partially 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

$$H_0: p = 0.1,$$

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 $p = 0.1$ when there are 3 exceedances in a sample of 10.

For partial support and nonsupport – defined as exceedance rates of more than 10 and 25 percent, respectively – the number of exceedances required for any given number of samples from 4 to 100 is presented in Tables 3 and 4. 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 be partially or not supporting a beneficial use and meeting the 90 % confidence interval shall be included on the State of Nebraska Section 303(d) list.

Waters assessed as partial or nonsupport using the initial screen but the exceedance rate does not meet the 90% confidence interval required to be “listed” will be placed on the water quality concern list – Part 5 and these waterbodies will be given the highest priority for future monitoring. As a rule, these waters will be scheduled for monitoring prior to the next listing cycle.

In the event a waterbody is screened as being partial or nonsupport but does not meet the confidence interval after the collection of additional data, the water body will be placed on Part 1c of the Section 303(d) list. The listing will be based upon the failure of the waterbody to show a long-term compliance with applicable water quality criteria. Failure to collect additional data in a timely manner (maximum of 4 years from the original assessment/screen) will result in the waterbody automatically being placed on Part 1c of the Section 303(d) list.

2.5.5 Ancillary Information

In order to compare some waterbody measurements with water quality standards and criteria, additional or ancillary information is required. For example, applicable ammonia criteria are dependent upon the water’s pH and temperature. When a water quality parameter requires such information, the guidelines for data assessment (minimum number of samples, quality assurance requirements) also apply to this data. As well, assessments of water quality information will not be made in the absence of simultaneously collected ancillary information.

2.5.6 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 (1q10, 7q10 and 30q5), opposed to high flow events (floods) that occur in response to significant rain or other precipitation events. Along with precipitation or the lack thereof, in some systems, stream flow volume is regulated by impoundments and diversions to accommodate 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 cfs or the 7q10, unless a beneficial use still exists, and
- 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 use attainment status.

More variable and less predictable are the high flow situations that are most frequently the result of precipitation events. Duration, frequency, magnitude, time of year, land use and applied treatments are all factors that influence the impact a precipitation event may have on the stream flow volume and corresponding water quality. For example, based on the lack of vegetative cover, early spring run-off in a rural setting typically contains greater amounts of sediment and organic matter than 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 including a waterbody on the Section 303(d) list, impairments due to data collected during extreme high flow events will be noted in the comment section.

Table 3. Sample size and number of exceedances required to determine partial or nonsupport of a designated use (10% exceedance).

Minimum number of exceedances required to maintain a >90% confidence that a waterbody is partially or not supporting a designated use (10% exceedance).					
Sample Size (n)	Number of Observations exceeding required to “list”	Confidence Level	Sample Size (n)	Number of Observations exceeding required to “list”	Confidence Level
4	2	0.948	53	9	0.922
5	2	0.919	54	9	0.914
6	3	0.984	55	9	0.906
7	3	0.974	56	10	0.951
8	3	0.962	57	10	0.945
9	3	0.947	58	10	0.940
10	3	0.930	59	10	0.933
11	3	0.910	60	10	0.927
12	4	0.974	61	10	0.920
13	4	0.966	62	10	0.913
14	4	0.956	63	10	0.905
15	4	0.944	64	11	0.948
16	4	0.932	65	11	0.943
17	4	0.917	66	11	0.938
18	4	0.911	67	11	0.932
19	5	0.965	68	11	0.926
20	5	0.957	69	11	0.920
21	5	0.948	70	11	0.913
22	5	0.938	71	11	0.906
23	5	0.927	72	12	0.947
24	5	0.915	73	12	0.942
25	5	0.902	74	12	0.937
26	6	0.960	75	12	0.931
27	6	0.953	76	12	0.926
28	6	0.945	77	12	0.920
29	6	0.936	78	12	0.913
30	6	0.927	79	12	0.907
31	6	0.917	80	13	0.946
32	6	0.906	81	13	0.942
33	7	0.958	82	13	0.937
34	7	0.952	83	13	0.931
35	7	0.945	84	13	0.926
36	7	0.937	85	13	0.920
37	7	0.929	86	13	0.914
38	7	0.920	87	13	0.908
39	7	0.911	88	13	0.901
40	7	0.900	89	14	0.941
41	8	0.952	90	14	0.937
42	8	0.946	91	14	0.932
43	8	0.939	92	14	0.927
44	8	0.932	93	14	0.921
45	8	0.924	94	14	0.915
46	8	0.916	95	14	0.910
47	8	0.907	96	14	0.903
48	9	0.954	97	15	0.941
49	9	0.948	98	15	0.937
50	9	0.942	99	15	0.932
51	9	0.936	100	15	0.927
52	9	0.929			

Table 4. Sample sizes and number of exceedances required to determine nonsupport of a designated use.

Minimum number of exceedances required to maintain a >90% confidence that a waterbody is not supporting a designated use (25% exceedance).					
Sample Size (n)	Number of Observations exceeding required to “list”	Confidence Level	Sample Size (n)	Number of Observations exceeding required to “list”	Confidence Level
4	3	0.949	53	18	0.908
5	4	0.984	54	19	0.938
6	4	0.962	55	19	0.927
7	4	0.929	56	19	0.915
8	5	0.973	57	19	0.901
9	5	0.951	58	20	0.932
10	5	0.922	59	20	0.920
11	6	0.966	60	20	0.908
12	6	0.946	61	21	0.936
13	6	0.920	62	21	0.926
14	7	0.962	63	21	0.914
15	7	0.943	64	21	0.901
16	7	0.920	65	22	0.930
17	8	0.960	66	22	0.919
18	8	0.943	67	22	0.907
19	8	0.923	68	23	0.935
20	9	0.959	69	23	0.925
21	9	0.944	70	23	0.914
22	9	0.925	71	23	0.901
23	9	0.904	72	24	0.930
24	10	0.945	73	24	0.919
25	10	0.929	74	24	0.908
26	10	0.909	75	25	0.934
27	11	0.947	76	25	0.925
28	11	0.932	77	25	0.914
29	11	0.914	78	25	0.902
30	12	0.949	79	26	0.929
31	12	0.936	80	26	0.920
32	12	0.920	81	26	0.909
33	12	0.901	82	27	0.934
34	13	0.939	83	27	0.925
35	13	0.924	84	27	0.915
36	13	0.908	85	27	0.904
37	14	0.942	86	28	0.930
38	14	0.929	87	28	0.920
39	14	0.914	88	28	0.910
40	15	0.946	89	29	0.934
41	15	0.933	90	29	0.925
42	15	0.919	91	29	0.916
43	15	0.904	92	29	0.905
44	16	0.937	93	30	0.930
45	16	0.925	94	30	0.921
46	16	0.910	95	30	0.911
47	17	0.941	96	30	0.901
48	17	0.930	97	31	0.926
49	17	0.916	98	31	0.917
50	17	0.902	99	31	0.907
51	18	0.934	100	32	0.931
52	18	0.922			

2.5.7 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 Health and Human Service System (HHSS) and the associated definitions include:

- A = Value reported is the mean of two or more determinations
- J = Estimated Value; Value is not accurate
- K = Actual value is known to be less than 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 the actual water quality conditions. Therefore, data remarked with a “J”, “K”, “L”, or “Q” should not be used in assessing waterbodies for Parts 1-4 of the Section 303(d) list. The data may be suitable for identifying water quality concerns and for listing on Part 5. The following section discusses values reported to be “below the detection limit”.

The above represent remark codes used by the HHSS laboratory, which is the entity 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 in the event remarked data is received from another laboratory and those remarks differ significantly from those used by HHSS. An explanation of the remark code and the decision will accompany the assessment.

2.5.8 Values Below Detection Limit

In the absence of pollutants or when pollutant concentrations and loadings are minimal, the results of a water sample analysis may be reported to be below the analytical method detection limit (not detected). When a value is reported as not detected, the only known is that the value is less than the applied technology can measure and there is no generalized way of determining the true value. When making beneficial use and Section 303(d) assessments, the larger the data set, the greater the potential that a waterbody is accurately represented. As well, these measurements may provide significant 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, the assessed value should be calculated as 50% of the method detection limit.

A situation may arise where the 50% detection limit value exceeds the criteria being considered. In these cases, the data will not be used to make an assessment for Section 303(d) purposes.

2.5.9 Spatial Considerations

Waterbody monitoring may occur at a single or multiple locations within the designated area. Often program managers seek to optimize resources and gain better coverage by locating fewer sites along a specific stream segment, lake or wetland. While in some cases this may be appropriate; major hydrological features, such as tributary confluences, impoundments, diversions, and returns can limit the spatial extent of a monitoring location. As well, drastic changes in land use (e.g., agriculture land being converted to suburban housing) may too limit a single station’s spatial coverage. Finally, in large lakes, reservoirs and wetlands, due in part to the slow dose-response time, minimal sample locations may not provide an accurate representation of the true water quality conditions of the waterbody as a whole.

A listing of the classified waterbodies is maintained in EPA's Assessment Database and the waterbody size is an included field. (At this time no wetlands have been included in this database but will likely be added in the future.) Stream segment sizes are listed and/or measured in miles and lakes/reservoirs are listed and measures in surface acres (acres). As a rule, the waterbody size listed in the Assessment Database will be used to resolve any disputes.

For streams, a monitoring site can 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. The application of these spatial restrictions for streams is recommended in EPA's *Guidelines for the Preparation of the Comprehensive State Water Quality Assessments and (305(b) Reports and Updates: Supplement* and have been utilized by several states.

Multiple samples collected under static stream conditions, from the same segment and within a relatively short period of time (e.g. the same day), shall be combined and the mean of the data used to represent the water quality conditions. Exceptions to this will be when the sampling event is evaluating the impacts of a specific source.

For lakes and reservoirs, a single sampling station will only be considered representative of 25% of the total lake or reservoir volume. Some lakes/reservoirs (e.g., shallow, few surface acres) can exhibit the potential to mix readily and thoroughly and thus fewer monitoring sites may be needed to characterize the water quality. For these waterbodies, provided the appropriate justification is included, the 25% rule may be suspended. Similar to stream segments; significant influences (inflows) must be considered when determining the spatial extent of a monitoring location.

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

3.0 Methodology for Assessing Use Support and Water Quality Concerns

3.1 Primary Contact Recreation

Waters designated with the primary contact recreation beneficial use have been determined to be used or have a potential to be used for primary contact recreation activities that include: swimming, water skiing, etc. Fecal coliform bacteria have been accepted as an indicator of disease causing pathogens, viruses and bacteria and are included in Title 117 as the sole water quality criterion for evaluating the recreation beneficial use. The established criteria are a geometric mean of 200/100ml and no greater than 10% of the samples can exceed 400/100ml. Title 117 also designates the recreation season to be May 1– September 30 outside of which, the criteria does not apply. The assessment of fecal coliform bacteria information is provided in Table 5.

Table 5: Assessment of the Primary Contact Recreation Beneficial Use using Fecal coliform bacteria data.

Minimum Samples	Full Support	Partially Supporting	Not Supporting	Water Quality Concern
10	Season geometric mean \leq 200/100 ml and \leq 10% of samples exceed 400/100 ml	Season geometric mean \leq 200/100 ml but $>$ 10% of samples exceed 400/100ml	Season Geometric mean $>$ 200/100 ml	
4 –9	Not assessed for full support with $<$ 10 samples	Not assessed for partially supporting with $<$ 10 samples	Not assessed for not supporting with $<$ 10 samples	Season Geometric mean $>$ 200/100 ml and/or $>$ 10% exceedance 400/100 ml

3.2 Aquatic Life

3.2.1 Chemical Parameters

Title 117, Chapter 4 contains a suite of parameters aimed at the protection of aquatic life. Some parameters remain constant regardless of the biota of the receiving stream while others like ammonia, metals and total residual chlorine vary according to the aquatic life use designations or developed site specific criteria. Also, many parameters are assigned both acute and chronic criterion for the protection against both short term and long term exposures. When making aquatic life beneficial use assessments, the monitoring information should be evaluating using all applicable criteria for the parameters regardless of reporting units.

The assessment of the aquatic life beneficial use using chemical water quality data and information can be found in Table 6.

Table 6: Assessment of the Aquatic Life Beneficial Use using chemical water quality data.

Minimum Samples	Full Support	Partially Supporting	Not Supporting	Water Quality Concern
10	\leq 10% exceedance of acute or chronic water quality criteria	11-25% exceedance of chronic criteria	$>$ 10% exceedance of acute criteria or $>$ 25% exceedance of chronic criteria	
4 -9	Not assessed for full support with $<$ 10 samples	Not assessed for partially supporting with $<$ 10 samples	Not assessed for not supporting with $<$ 10 samples	$>$ 10% exceedance of acute or chronic criteria

3.2.2 Fish Kills

Fish kills can be the result of natural phenomena or due to the presences of pollutants above the threshold of a portion of or the entire aquatic community. The pollutants 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, not anticipated to be repeated and because of this will not be included on the Section 303(d) list. Repeated fish kills from the same waterbody/location should be considered for Section 303(d) listing purposes. Table 7 provides the assessment of the aquatic life beneficial use using fish kill information.

Table 7: Assessment of the Aquatic Life Beneficial Use using Fish Kill data and information.

Minimum Events/occurrences	Full Support	Partially Supporting	Not Supporting	Water Quality Concern
>2	No fish kills occurring	Not assessed for partially supporting using fish kill information	>2 fish kills occur at a similar waterbody location. Source is determined to be not natural.	>2 fish kills occur at a similar waterbody location. Source is determined to be natural.
2	No fish kills occurring	Not assessed for partially supporting with 2 or less observations	Not assessed for not supporting with 2 or less observations	2 fish kills occurring on the waterbody and the source is either known or unknown

It should be noted, fish kills resulting from the dewatering of streams, lakes and wetlands or the related problems (e.g. extreme temperatures) will not be considered in the Section 303(d) assessment process.

3.3 Water Supply

3.3.1 Public Drinking Water

Due to the availability of ground water in Nebraska the number of systems utilizing surface water as the sole potable water source are few compared to other regions. Water from surface waterbodies is treated prior to distribution and the finished water is monitored on a regular basis. Table 8 provides the public water supply beneficial use assessment procedures using chemical information.

Table 8: Assessment of the Water Supply – Public Drinking Water Beneficial Use using chemical water quality data.

Minimum Samples	Full Support	Partially Supporting	Not Supporting	Water Quality Concern
10	Running annual average of the finished water and source do not exceed maximum contaminant levels.	Not assessed for partially supporting	Running annual average of the finished water exceeds applicable maximum contaminant levels.	Running annual average of the source water exceeds applicable maximum contaminant levels.
4 –9	Not assessed for full support using <10 samples	Not assessed for partially supporting using <10 samples	Not assessed for not supporting using <10 samples	Running annual average (source or finished) exceeds applicable maximum contaminant levels.

3.3.2 Agriculture Water Supply

Waters designated with the agriculture water supply beneficial use have been deemed acceptable or to exhibit the acceptable characteristics of being suitable for irrigation and livestock watering without treatment. While four specific parameters (conductivity, nitrite and nitrate as nitrogen and selenium) have been promulgated for the protection beneficial use, any substance that degrades the use shall not be allowed. The assessment of the agriculture water supply beneficial use using chemical water quality data and information can be found in Table 9.

Table 9: Assessment of the Agriculture Water Supply Beneficial Use using chemical water quality data.

Minimum Samples	Full Support	Partially Supporting	Not Supporting	Water Quality Concern
10	≤10% exceedance of water quality criteria	Not assessed for partially supporting	>10% exceedance of water quality criteria	
4 -9	Not assessed for full support with <10 samples	Not assessed for partially supporting	Not assessed for not supporting with <10 samples	>10% exceedance water quality criteria.

3.4 Aesthetics

The aesthetics beneficial use applies to all surface waters of the state. Title 117 requires that waterbodies be free from human induced pollution which causes: noxious odors; floating, suspended, colloidal or settleable materials that produce objectionable films, colors, turbidity or deposits; and the occurrence of undesirable or nuisance aquatic life to be deemed “aesthetically acceptable”.

These criteria are intended to cover water quality impacts where no numeric criteria exist. Generally, the application are two fold and include 1) NPDES permit prohibitions and 2) the criteria are applied on a complaint basis that requires validation by the Department. Once verified/validated, if a human induced source can be determined, the waterbody can be placed on the Section 303(d) list Parts 1 or 4. If no source can be determined, the waterbody should be identified as a water quality concern (Part 5) and further investigations should ensue.

In the event the cause/source of the problem is natural the waterbody can either be included on Part 2 of the 303(d) list or not included at all.

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 eliminates spawning, rearing or other aquatic habitats. As well, the recreation area of a lake or reservoir can be reduced or rendered undesirable. Sedimentation will be assessed using two measurements, impoundment volume loss and sedimentation rate. The assessment of the aesthetics beneficial use, using sedimentation data, information and measurements can be found in table 10.

Table 10: Assessment of Lakes/Reservoirs Using Sedimentation Data and Information.

Minimum Samples	Full Support	Partially Supporting	Not Supporting	Water Quality Concern
See below	Volume loss <25%	Volume loss ≥25%	Not assessed for not supporting.	Long term annual sedimentation rate >0.75% per year

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

4.0 Methodology for Assignment of Causes and Sources of Pollution

Wherever possible, the cause of a waterbody impairment (low dissolved oxygen, ammonia) should be linked to a single source, multiple or combination of sources. Identification of sources can take the form of best professional judgment, utilization of Arcview or other software, special studies nonpoint source assessments, field observations or simple statistical approaches.

Sources will fall into one of two major categories 1) nonpoint sources and 2) point sources. *Nonpoint sources* are diffuse sources that most often result from a precipitation event and the movement of water across a surface with pollutants, both natural and human induced being carried by the runoff. *Point sources* are any discernible, confined and discrete conveyance including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock or vessel or other floating craft from which pollutants may be discharged. Confined animal feeding operations fall into the category of point sources. Point sources are regulated under the National Pollutant Discharge Elimination System permit program and the Nebraska State Operating Permits.

5.0 303(d) Listing Considerations

5.1 Adding and Deleting Waterbodies, Pollutants, and Pollutant Sources to the 303(d) List

From time to time but prior to the next required submission, the Department may find it advantageous or prudent to take one of the following actions:

- Add a waterbody to the 303(d) list
- Expanding the scope of impairment to an existing listed waterbody (i.e., adding a parameter, increasing size of impacted area)
- Relocate a waterbody on the 303(d) list
- Remove a waterbody from the 303(d) list, or
- Decrease the scope of impairment to an existing listed waterbody (i.e., removal of a single parameter, reduction in size of impacted area)

The modification of the Section 303(d) list can be the result of:

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

When making a decision to add, remove or modify a waterbody's location on a Section 303(d) list, 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 describe above.

5.2 Placement of Waterbodies on the Appropriate 303(d) List Parts

The segmented Section 303(d) list format is intended to provide program managers, EPA, affected entities and the general public a general idea as to the direction of the TMDL program as well as future monitoring. Overall, waters should be placed based upon the level (quantity and quality) of available data; intentions to conduct future monitoring or gather information, anticipated TMDL "type" (simple, complex, etc.), pollutant source (point vs. nonpoint source) or other pertinent decision making information. The description of each part should be used as the guideline for waterbody placement and proper justification must be provided when a deviation occurs.

5.3 Prioritization/TMDL Development Schedule

The CWA and 40 CFR require that the State establish a priority ranking for each waterbody on a Section 303(d) list. Overall, the priority ranking will consider:

- The severity of the impairment in relation to the designated use.
- 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.
- Waters where endangered or threatened species exist and the pollutant(s) threatens said species.
- The presence of sensitive aquatic species.
- Any other pertinent factor (economic or aesthetic importance, degree of public interest, etc.).

Via the listing process and by location on the Section 303(d) list the available data for a particular waterbody should be evident (Part 1a waterbodies have complete data sets). 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 be coordinated with the rotating basin management/monitoring scheme.

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

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

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

5.4 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. As well, 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 Section 303(d) list and the data used to make the assessment decision to the participating entities and request comments on the draft list. Comments received will be evaluated, additional discussion possibly will 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 Section 303(d) list submittal.

5.5 Public Participation

Aside from being required by 40 CFR Part 130, meaningful public participation is a key component of the Section 303(d) listing process. In order to ensure the public is made aware of the proposed list 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 Section 303(d) list 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.
- ◆ On or about September 1 of the year just prior to 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 Section 303(d) list 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 of December 1 for electronic submittals and November 1 for non-electronic submittals.
- ◆ In the event several entities express an interest in assisting with the Section 303(d) list 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 January 1, the draft list will be completed and notification of the availability of the list and the listing methodologies will be conducted using newspapers from major cities (i.e. Omaha, Lincoln, Norfolk, and North Platte) and the list will be made available for viewing and reproduction at various library facilities across the state. As well, copies of the draft list will be sent to the appropriate state and federal agencies (including EPA Region 7), and any other interested party for review and comment.
- ◆ In as much as possible, the NDEQ’s Internet web site will be used to make notice of the intention to develop the 303(d) list and to publicize the availability of the draft list.

- ♦ 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 NDEQ date stamp. Comments may be written, sent by FAX or via e-mail to the Section 303(d) list administrator. 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 a Section 303(d) listing additions or deletions.
- ♦ All appropriate comments received on the assessment methodologies or the waterbodies included or not included on the draft list will be considered when making the final 303(d) listing 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, it may be prudent to summarize the comment and respond accordingly. This action will be noted when incorporated into the responses.

5.6 Submittal to EPA Region 7

Prior to the established deadline the Nebraska Section 303(d) list will be submitted to EPA Region 7 under the signature of the Director or the authorized designee. 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 Section 303(d) list,
- A copy of the current listing methodologies,
- Final draft Section 303(d) list 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, and
- Proposed waters to be delisted and the supporting documentation/information.
- Proposed water quality monitoring.

Following the submittal, the Department will provide annual updates to the Section 303(d) list that too will be submitted to EPA. These updates will be completed using all of the procedures (data submittal, public participation, etc.) that will be used in preparing the 2002 list as well, the information accompany this update will be consistent with the above procedures.

6.0 References

40 Code of Federal Regulations, Part 130.

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, 2000. Title 117 – Nebraska Surface Water Quality Standards, Nebraska Department of Environmental Quality, Lincoln Nebraska, August 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 – Example of information provided for Section 303(d) listed waters

Waterbody ID	Waterbody Name	Size of Affected Area	Impaired Use	Parameter Of Concern	Pollutant Source	TMDL Approved	NPDES Permit Issues	Future Monitoring Scheduled	Source of Assessment Data	Comments
BB3-10000	West Fork Big Blue River	41 miles	Primary Contact Recreation	Fecal coliform bacteria	Point and Nonpoint	Yes (3/01)	NA	Rotating Basin Monitoring	NDEQ	1997 recreation season sampling results are: season geometric mean = 1,567 #/100 ml and 72% of the values exceed 400/100 ml

