

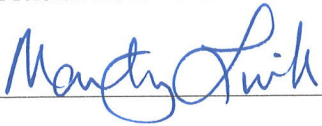
Nebraska's Water Quality Monitoring Strategy 2016-2022



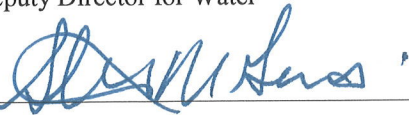
**Water Quality Division
Nebraska Department of Environmental Quality
January 2016**

Review and Approval – Nebraska's Water Quality Monitoring Strategy 2016-2022

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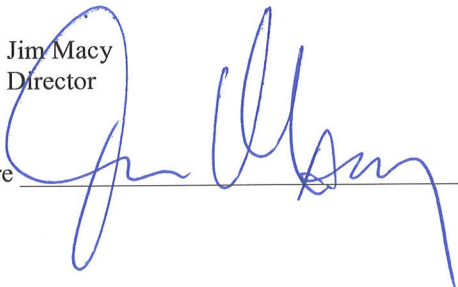
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1.0 Introduction

The Nebraska Environmental Protection Act (NEPA) identifies the water, land, and air of the state are among its most precious resources. Pollution of these resources threatens the health and welfare of each person within the state. Therefore, a state policy is to conserve water and to protect and improve the quality of water for human consumption, wildlife, fish and other aquatic life, industry, recreation, and other productive beneficial uses.

NEPA also empowers the Nebraska Department of Environmental Quality (NDEQ) as the state's water pollution control agency for the federal Clean Water Act and the Safe Drinking Water Act as well as the State of Nebraska Livestock Waste Management Act, Petroleum Release Remedial Action Act, and the Groundwater Management and Protection Act.

The Clean Water Act (CWA) §106 provides funds to carry out the duties of implementing programs to protect and restore water quality, including monitoring and assessing the state's water and reporting the findings. Section 106 (e)(1) also requires that prior to awarding grant funds, EPA determine if the State is monitoring the quality of waters, compiling and analyzing data on water quality, and properly reporting in accordance with (CWA) Section 305(b).

The above requirements of NEPA and the CWA dictate that surface water and groundwater monitoring be carried out to evaluate and report on the biological, chemical, physical, and radiological integrity thereof. The purpose of this document is to summarize Nebraska's current water quality monitoring programs that are primarily carried out by NDEQ. As well, recommendations are provided that will improve the programs.

2.0 Nebraska's Water Resources

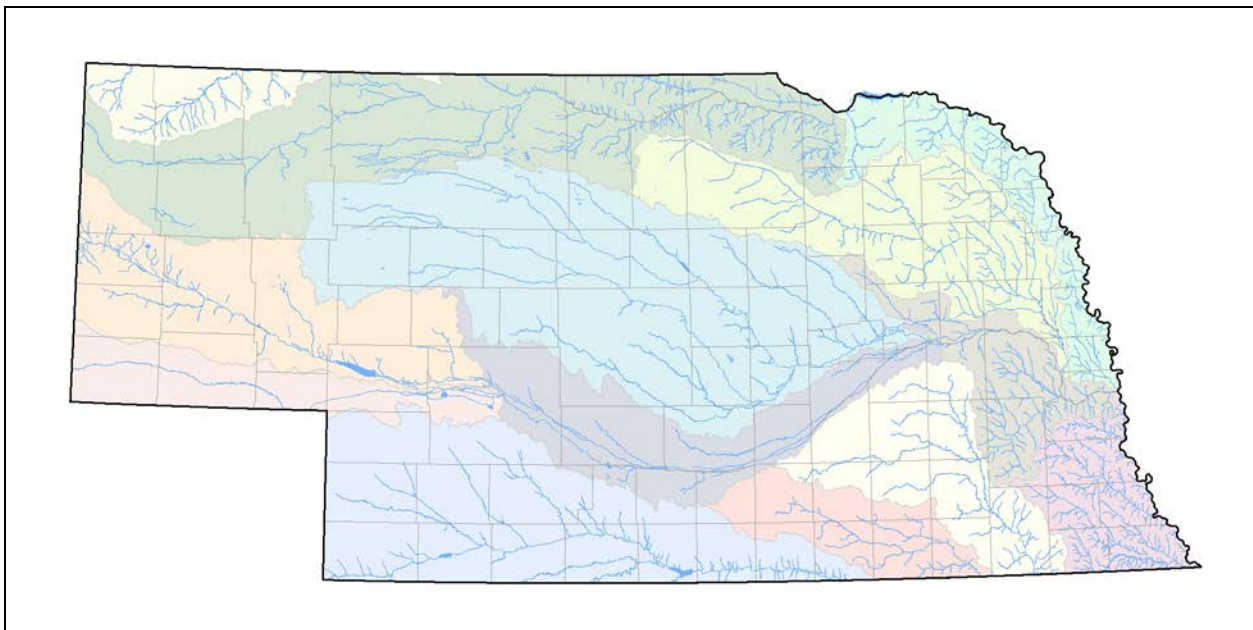
2.1 Surface Water

Surface waters in Nebraska include streams, lakes, and wetlands. Title 117 Nebraska Surface Water Quality Standards (Title 117) defines surface waters to be “all waters within the jurisdiction of this State, including all streams, lakes, ponds, impounding reservoirs, marshes, wetlands, watercourses, waterways, springs, canal systems, drainage systems, and all other bodies or accumulations of water, natural or artificial, public or private, situated wholly or partly within or bordering upon the State. Impounded waters in this definition do not include areas designated by the Department as wastewater treatment or wastewater retention facilities or irrigation reuse pits.”

Title 117 goes on to define a Lake or Impounded Water to mean any waterbody with all of the following characteristics: (1) situated in a topographic depression or a dammed stream channel; (2) 30 percent or less areal coverage of trees, shrubs, persistent emergent aquatic plants, or emergent mosses; and (3) total area exceeds 20 acres. Similar waterbodies totaling less than 20 acres are also included if an active waveformed or bedrock shoreline feature makes up all or part of the boundary, or if the water depth in the deepest part of the basin exceeds 6.6 feet. Finally, wetlands are defined to be those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Surface waters are often categorized into “designated” and “undesignated” whereby designated surface waters are identified specifically in Title 117. The exception to this is wetlands that are not designated. Undesignated streams, lakes, and wetlands are still waters of the state and have uses and protection.

Figure 1. Designated Streams, Lakes, and Reservoirs



Within the boundaries of the state there are 1,558 designated stream segments and 539 designated lakes included in Title 117. These total 16,670 stream miles and 134,389 lake surface acres. Along with the designated waters there are numerous miles and acres of undesignated waterbodies. Although individual wetlands are not designated in Title 117, the surface overflow and isolated wetlands in the State have been estimated at 1,905,000 surface acres.

Surface waters in Nebraska are assigned beneficial uses that include Aquatic Life (four classes), Primary Contact Recreation, Water Supply (three classes), and Aesthetics.

2.2 Groundwater

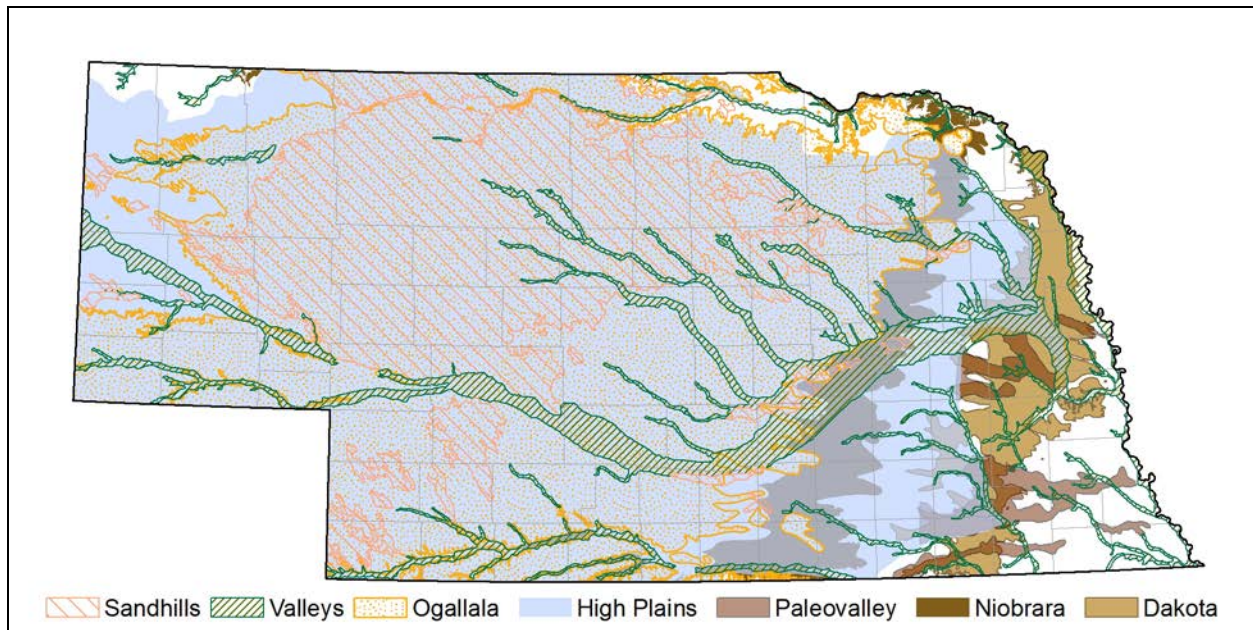
Title 118 Ground Water Quality Standards and Use Classification (Title 118) defines “groundwater” as “water occurring beneath the surface of the ground that fills available openings in rock or soil materials such that they may be considered saturated.”

Groundwater beneficial uses include drinking water, irrigation, livestock watering, industrial and commercial purposes, maintaining assigned surface water uses, and other beneficial uses.

Nebraska is one of the most groundwater rich places in the entire world (NDEQ 2007). Nebraska relies on groundwater for drinking water supplies, irrigation water, industrial water supplies, and other uses. As of November 2015, the Nebraska Department of Natural Resources listed over 96,000 active irrigation wells and 28,000 active domestic wells registered in the state.

Groundwater in Nebraska can be found in various aquifers across the state (Figure 2). The aquifers vary in depositional origin, thickness, and lateral extent. Most of Nebraska is underlain by the Niobrara and Dakota aquifers (both marine deposition) but they are only used for drinking water in the eastern portion of the State. The High Plains aquifer which is the most utilized aquifer and covers most of the State is a combination of the Sandhills (eolian), Valleys (alluvial), Ogallala (alluvial), and portions of the Paleovalleys (alluvial) aquifers. There are areas in eastern and northwestern Nebraska where groundwater is scarce.

Figure 2. Primary Aquifers.



3.0 Allocation of Duties

As the designated agency administering the CWA programs, the Nebraska Department of Environmental Quality – Water Quality Division (WQD) monitors and assesses surface water data and information collected under the auspice of various programs and using partnerships and (contractual) agreements. While the WQD assesses and reports annually on groundwater quality, a majority of the data and information is collected by the State’s 23 Natural Resources Districts (NRDs).

4.0 Overall Monitoring Objectives

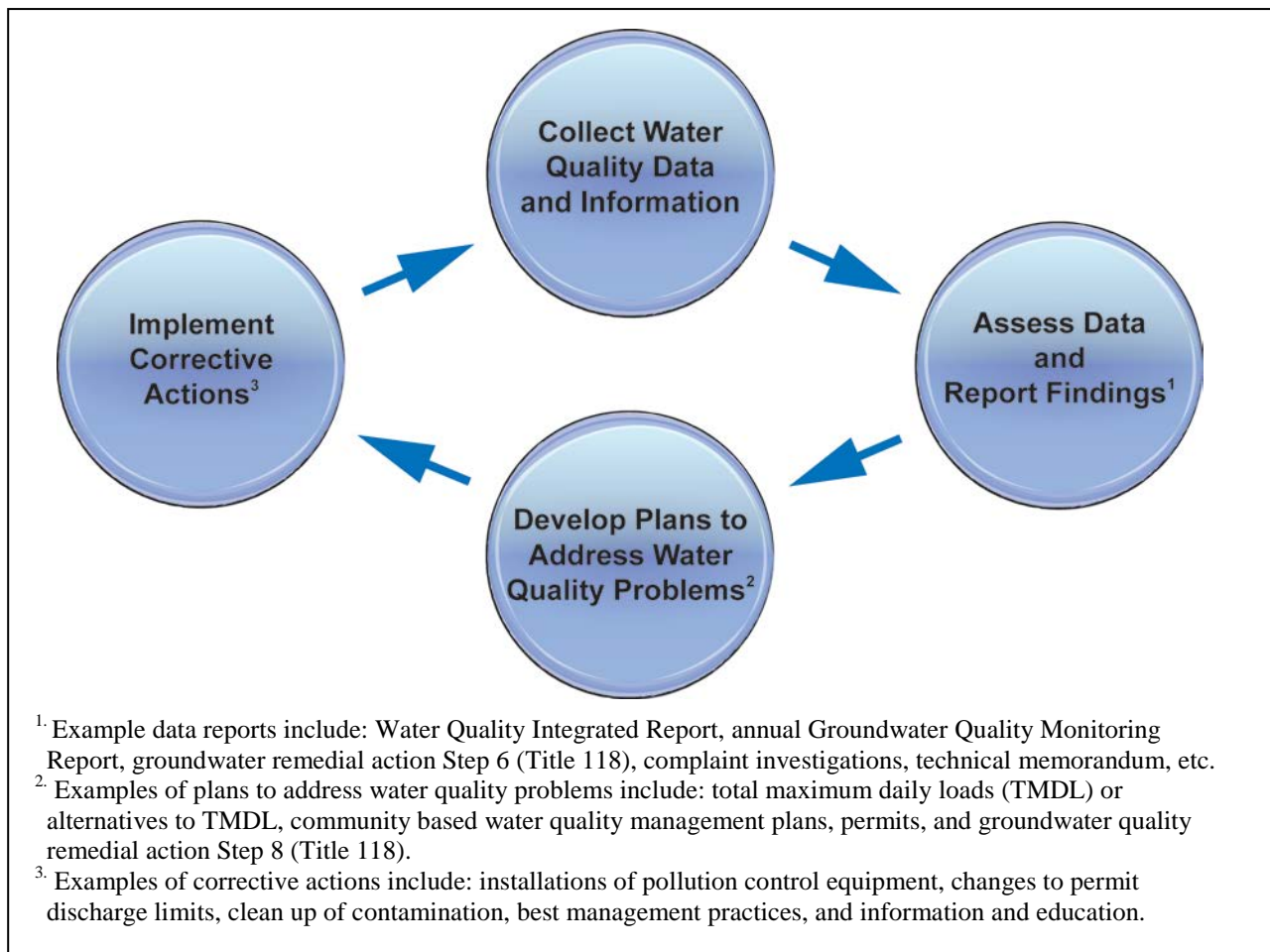
Monitoring programs are needed to aid in managing the State's water resources. When designing monitoring programs, it is important to identify and establish monitoring objectives that will generate data to serve management decisions and provide direction for water quality programs (Figure 3). While each program will have specific objectives related to the type of monitoring and the use of the data, there are four overarching questions that should be answered.

1. What is the current water quality (status) of the State?
2. Is the current water quality safe for consumption, recreation, industrial and agricultural use, the consumption of fish, and aquatic life?
3. Is the water quality improving, getting worse, or not changing?
4. What effect(s) are the programs that are being implemented having on water quality?

Ultimately, all data and information collected should be used to answer one of the above questions. Therefore, the objectives of the WQD monitoring strategy and program are to:

- Collect the data and information needed to define the current water quality status;
- Collect the data and information needed to determine if the water quality is acceptable for consumption, industrial, and agriculture use; and with respect to surface water for recreation, fish, and aquatic life;
- Collect the data and information necessary to characterize and document trends; and/or
- Collect the data and information necessary to determine if water quality management programs are being effective at improving water quality.

Figure 3. Utilization of Data and Information to Manage Water Quality.



The Department has obligations under the Clean Water Act (CWA) and State statutes, and relies on water quality data and information to meet these obligations. Specifically:

1. Fulfill monitoring and reporting requirements of 40 CFR 130.4 and sections 106, 303(d), 305(b), 314(a) and 319(h) of the Clean Water Act;
2. Fulfill the requirements of Neb. Rev. Stat. §46-1304
3. Document spatial and temporal trends in water quality;
4. Develop scientifically defensible and credible water quality standards;
5. Identify point and nonpoint sources of pollution contributing to water impairments;
6. Collect the data necessary to determine if regulated entities are in compliance with requirements of the applicable regulatory program(s);
7. Develop credible water quality management plans (i.e. total maximum daily loads (TMDLs), alternatives to a TMDL (5-alt), watershed management plans, remedial action plans) and permits (i.e. National Pollutant Discharge Elimination System (NPDES)); and/or
8. Evaluate the effectiveness of water pollution control efforts and restoration efforts implemented by the Department or other entities.

Each monitoring program will establish a unique set of objectives and provide these in a written Quality Assurance Project Plan (QAPP). When developing these objectives for each program, the above overall objectives should be considered.

5.0 Monitoring Programs and Designs

As stated above, each monitoring program will establish a unique set of objectives that when carried out will provide data and information to be used in evaluating and managing Nebraska water resources. Selection of the monitoring design must be based in part on all of the end users needs. Included in the decisions regarding the monitoring design is the need for statistically significant data and information. NDEQ's water monitoring programs employ a variety of designs in carrying out assigned duties.

5.1 *Ambient Stream Monitoring Program*

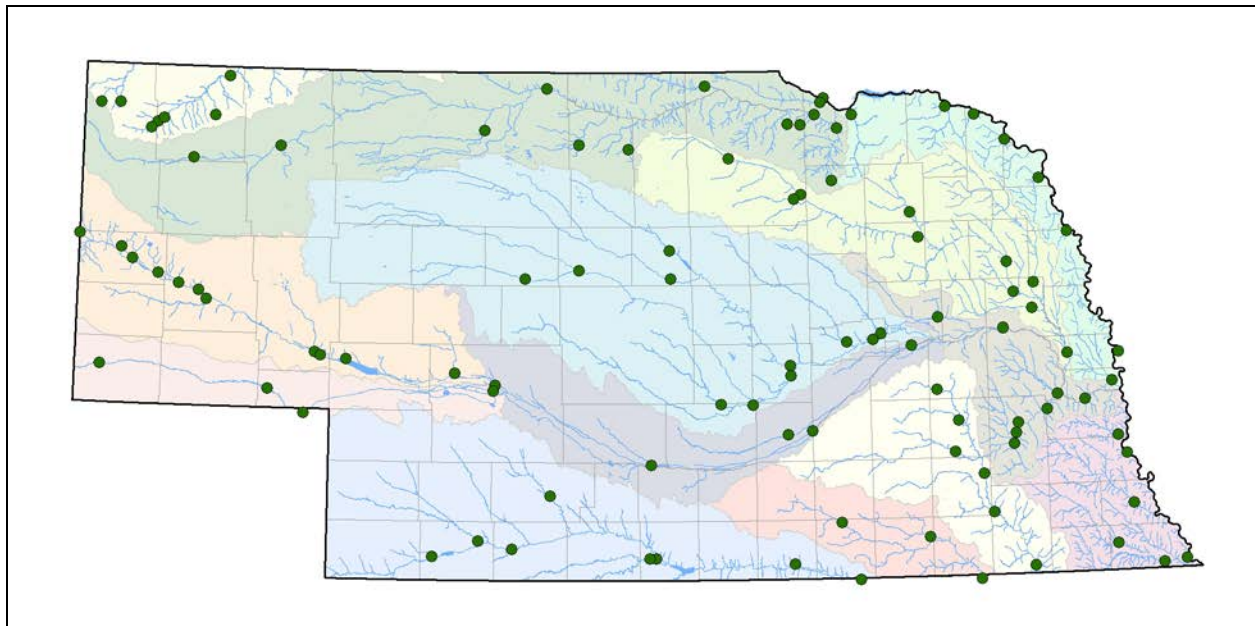
The Ambient Stream Monitoring Program (ASMP) consists of 100 fixed station sites distributed throughout Nebraska's 13 designated river basins. Seventy-one of the eight digit hydrologic unit code or HUCs, accounting for 96% of the land area are monitored by these sites (Figure 4). Typically, the sites are co-located with stream gauging stations. Stream orders covered by the network range from one to six based on the Strahler scale (Strahler, 1957). Data and information collected through this program can be used to document existing water quality (beneficial use assessments) and long-term trends. The data and information may also be used for program (i.e. NPDES) implementation.

Numerous water quality parameters are monitored to establish general water quality trends and to ensure each stream is able to support its designated uses. The following physical and chemical parameters are collected at each site every month:

- water temperature
- dissolved oxygen
- pH
- conductivity
- total suspended solids
- ammonia
- nitrate/nitrite nitrogen
- kjeldahl nitrogen
- total phosphorus
- chloride

Pesticide samples are collected at all sites from May through September. Arsenic and selenium are collected at all sites quarterly, as are a complete suite of metals at bottom of basin sites.

Figure 4. Ambient Stream Monitoring Program Sites



5.2 Ambient Lake Monitoring Program

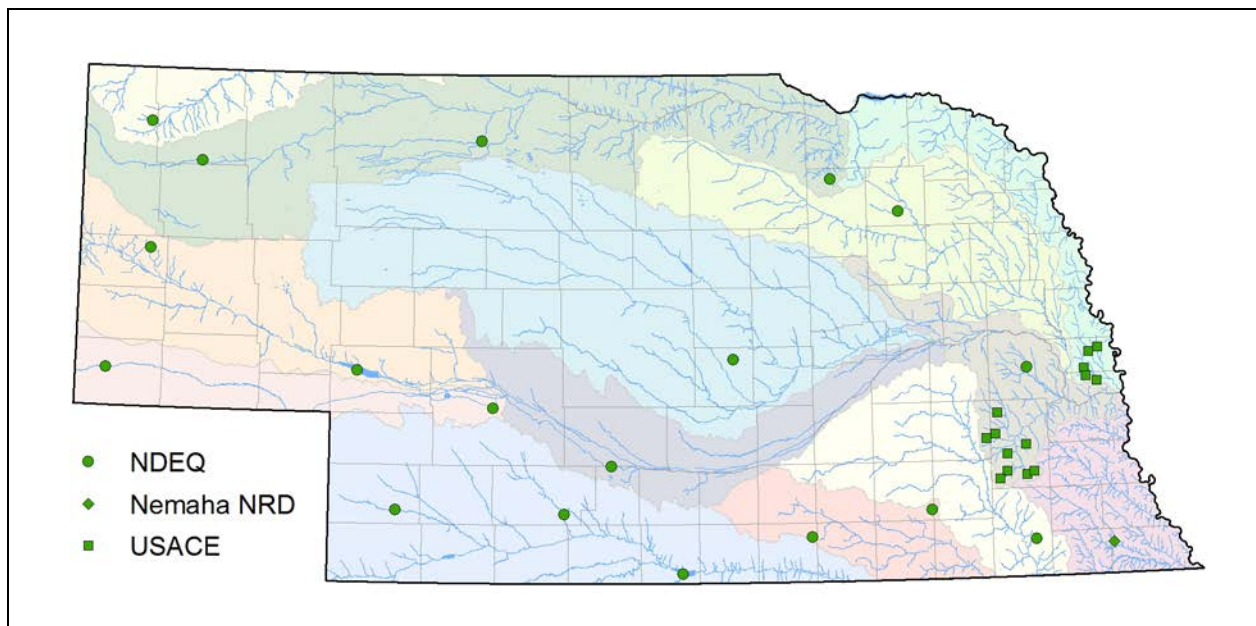
The Ambient Lake Monitoring Program (ALMP) consists of a core of 45 fixed station waterbodies that are monitored by NDEQ (28), United States Army Corps of Engineers (15), and a NRD (2). At least one lake is located in each river basin (Figure 5) and there are several types of impoundments (reservoirs, oxbows, sandpits, etc.) included. Included within the ALMP is the collection of tributary samples. Although both projects fall under the Ambient Lake Monitoring Program, separate QAPPs have been developed for the unique sample types. Data and information collected by this program can be used to assess water quality status, develop long term trends, and evaluate program effectiveness.

Lake monitoring involves the collection of monthly water samples from May through September from publicly owned lakes and reservoirs across the state. To determine if water quality is sufficient to meet its intended uses in these lakes, samples are taken monthly near the surface at the deep-water site (deepest area) of each lake. These sites are sampled for physical/chemical parameters such:

- water clarity
- total suspended solids
- ammonia
- nitrate/nitrite nitrogen
- kjeldahl nitrogen
- total phosphorus
- dissolved phosphorus
- alkalinity
- chlorophyll a
- select pesticides

In addition, surface to bottom profiles are collected for temperature, dissolved oxygen (DO), pH, and conductivity at both deep-water and mid-lake locations. Profile data are collected every 0.5 meters starting at the water surface and are used to determine at what depth lake stratification may take place.

Figure 5. Ambient Lake Monitoring Program Sites

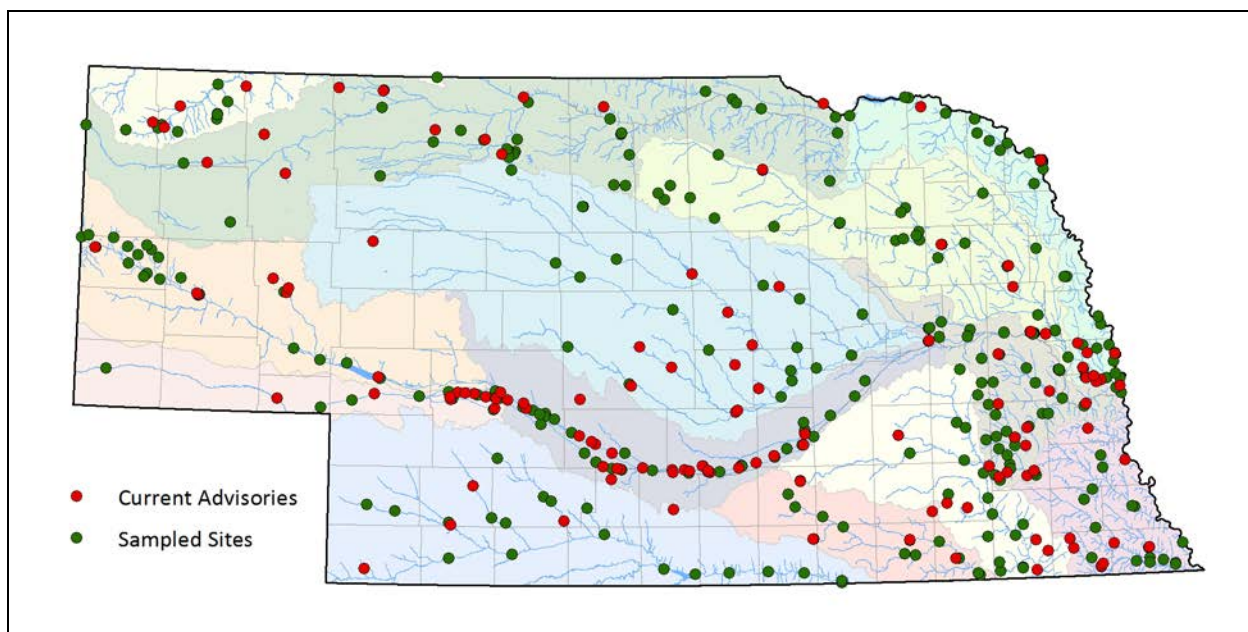


5.3 Fish Tissue (Contaminant) Monitoring Program

The Fish Tissue (Contaminant) Monitoring Program provides information on concentrations of parameters found in fish (tissue) collected from Nebraska's streams and lakes. The program objectives initially were aimed at identifying pollution concerns and determining pollutant loads. Eventually, the program shifted to the protection of public health. Monitoring locations are focused on areas where sport fishing and subsequent consumption are likely to occur. Typically the monitoring design follows the basin rotation scheme and targets approximately 40-50 sites annually. The data and information can be used to assess waterbody status, develop long term trends, provide consumption information (advisories) to anglers, and to a lesser extent evaluate program effectiveness. Historic fish tissue monitoring locations and advisories (as of 2015) are illustrated in Figure 6.

There are two primary types of sites monitored; status site and advisory follow-up. Status sites are monitored to determine the status of the fish tissue in relation to the advisory thresholds. Waterbodies where sampling has revealed exceedances of health risk criteria and subsequent consumption advisories have been issued will be re-sampled following the six-year rotating basin monitoring approach. Re-sampled sites will be removed from the advisory list if their respective samples indicate contaminant levels below health risk criteria.

Figure 6. Historic Fish Contaminant Monitoring Locations



Fish tissue samples prior to 2014 were analyzed for a variety of parameters including heavy metals, pesticides, and other organic compounds. Of the parameters screened, those of primary concern are:

- Polychlorinated biphenyl compounds (PCBs) – prior to 1971, they were used in heat transfer fluids, hydraulic fluids, lubricants, and wax extenders, and later in electrical transformers and capacitors.
- Methyl mercury (organic mercury) – occurs naturally and is released into the environment from mining operations, fossil fuel combustion, refuse incineration, and industrial waste discharges.
- Dieldrin – a breakdown product of the insecticide Aldrin, generally used on corn prior to 1974

Future analysis by the U.S. Environmental Protection Agency (U.S. EPA) Region 7 laboratory will only be for one contaminant, mercury. Like other States across the nation, mercury is responsible for the majority of Nebraska's fish consumption advisories (>95%). Locations where other contaminants are of concern will be given special consideration for additional contaminant analysis.

The primary use of the data is to inform the public of the potential risks associated with eating fish caught in Nebraska waters. The data may also be used to develop trends or identify pollutant sources.

5.4 Public Beach Monitoring Program

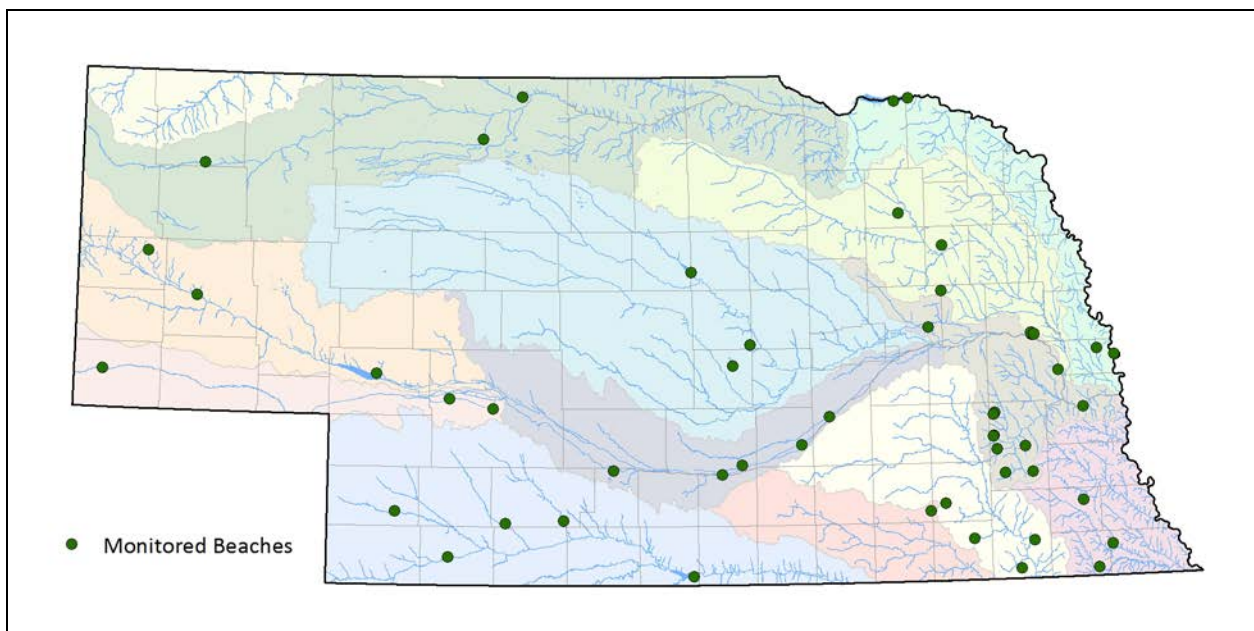
Public lakes with designated swimming beaches and those where power boating is allowed are monitored weekly by NDEQ and its sampling partners (typically local NRDs) from approximately May 1 to September 30 for microcystin and *E. coli* bacteria to determine if unacceptable risks to the public exist. The current monitoring network includes 53 sites from 50 lakes as shown in Figure 7. Samples are analyzed using procedures which provide a quick-turnaround time and allow public health alerts to be issued prior to each upcoming weekend's recreation activities. Weekly, the data are placed on the Department's website.

When levels of microcystin exceed 20 micrograms per liter ($\mu\text{g/l}$, or ppb, parts per billion), the NDEQ, Nebraska Game and Parks Commission, and Nebraska Department of Health and Human Services jointly issue a Health Alert. During a Health Alert at a public lake, signs are posted advising the public to use caution and avoid full body recreational activities such as swimming, wading, skiing, jet skiing, sailing, and particularly avoid drinking the water. Affected swimming beaches are closed. Camping, picnics, boating, fishing, and other non-contact recreational activities are allowed. The lake remains on Health Alert until levels of microcystin are measured below the 20 $\mu\text{g/l}$ criterion for two consecutive weeks. If the US EPA determines a different microcystin advisory level is warranted, NDEQ and its partners will discuss and act on the new recommendation/information.

In situations where *E. coli* bacteria exceed counts of 235/100ml of water for a single sample, the water is considered at a higher risk for illness when used for full-body contact recreation. Lakes that exceed this level are specifically identified on the NDEQ's website weekly during the recreation season, in the Environmental Alerts section. Unlike with high toxic algae levels, signs are not specifically posted and beaches are not closed for high bacteria levels. This is primarily because bacteria values change quickly while microcystin levels are more persistent and can remain for several weeks. This bacteria information, rather, is provided to allow the public to make their own decision on whether or not to use the lake.

The data have also been used for beneficial use assessment, problem identification, and in some cases project reports. When being used for beneficial use assessment, the microcystin data are applied using narrative (aesthetics) criteria as no numeric water quality criteria for microcystin are currently in Title 117. Investigations/special studies have also been conducted using the data.

Figure 7. Waterbodies Monitored Under the Public Beach Monitoring Program



5.5 Basin Rotation Monitoring Program

The Basin Rotation Monitoring Program (BRMP) targets one to three river basins each year for intensive monitoring. Targeting resources in this manner improves the Department’s efficiency and ability to assess water quality and allows limited resources to be focused where they can produce the greatest environmental results. Samples are obtained weekly from May through September for a variety of physical, chemical, and biological constituents to document existing water quality conditions, identify water quality problems, identify pollutant(s) of concern and their sources, and estimate pollutant loadings. The current basin rotation scheme requires a six year cycle to monitoring each of Nebraska’s 13 major river basins. The 2016- 2021 cycle is illustrated in Figure 8.

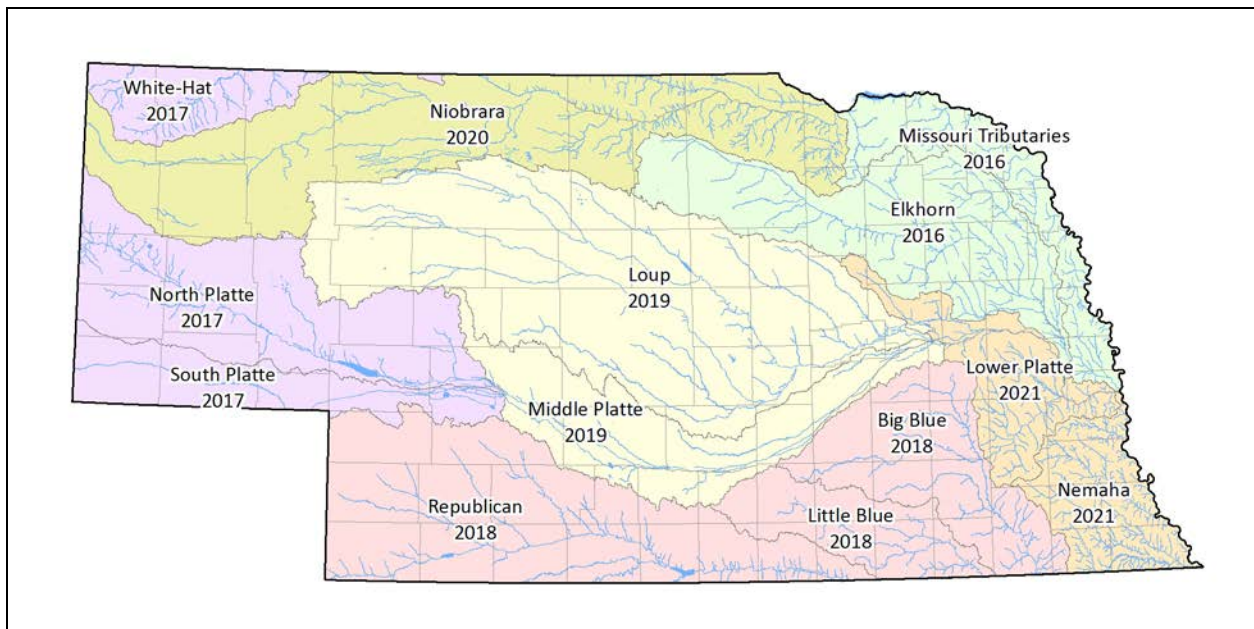
The initial cycle of the BRMP focused on collecting data from all (target basin) waterbodies assigned the primary contact recreation beneficial use. While capturing all of these sites still remains one of the primary objectives, the evolution of the program, as well as the increased number of streams assigned a recreation use has mandated the need to institute a priority ranking system. Approximately 40 sites are monitored annually under the BRMP.

The Department’s main objective for this program is focused on the protection of public health. Section 305(b) of the Clean Water Act has a goal of all stream segments and public lakes being assessed; however, there is no time frame associated with this goal. BRMP management must maintain a balance of assessing all waters and providing current and accurate data to be utilized in furthering water quality management (i.e. TMDLs, permitting, etc.).

NDEQ monitors a suite of water quality parameters to establish general water quality trends, to ensure each stream and lake is able to support its designated uses, and to develop TMDLs. The data can also be used for pollutant/contaminant source identification, program implementation (i.e. NPDES), program effectiveness, and pollutant loading calculation.

The following physical and chemical parameters are collected at each stream site: ammonia, nitrate-nitrite, kjeldahl nitrogen, total phosphorus, chloride, total suspended solids and pesticides. Water temperature, pH, conductivity, dissolved oxygen, and *E. coli* bacteria are collected at both stream and lake sites.

Figure 8. 2016-2021 Basin Rotation Cycle



5.6 Stream Biological Monitoring Program

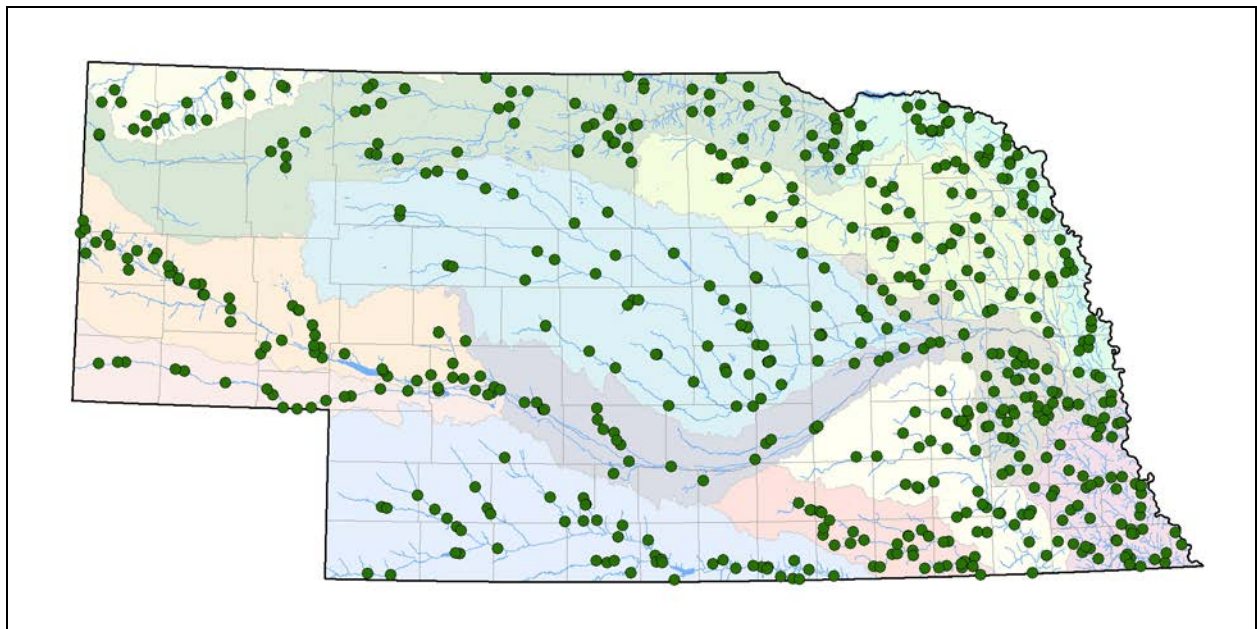
The Stream Biological Monitoring Program is used to determine the health of wadeable streams by evaluating the composition and numbers of resident aquatic macroinvertebrate and fish communities. These biological communities display varying habitat requirements and water quality tolerances making them excellent indicators of stream health. Assessments are made by comparing the biological communities of “reference condition” streams where there are no significant disturbances, to the communities collected from randomly selected stream sites.

The biological data collected through the SBMP are used to inform a variety of management activities, such as:

- Documenting current statewide biological conditions in Nebraska’s streams to track water quality status and trends.
- Identifying streams that do not attain their assigned environmental goals and are in need of restoration or remedial action. Where significant problems were found (i.e. streams were assessed as having poor biological conditions), these stream segments are placed on the 303(d) List of Impaired Water Bodies (as required by the federal Clean Water Act) with regard to aquatic life.
- Identifying exceptional stream segments (reference conditions).
- Providing accurate biological distribution information.

The monitoring design follows the Basin Rotation Monitoring schedule and usually 34 - 40 sites are monitored each year. Historic biological monitoring locations are shown in Figure 9.

Figure 9. Biological Stream Monitoring Program Monitoring Locations (1997-2014)



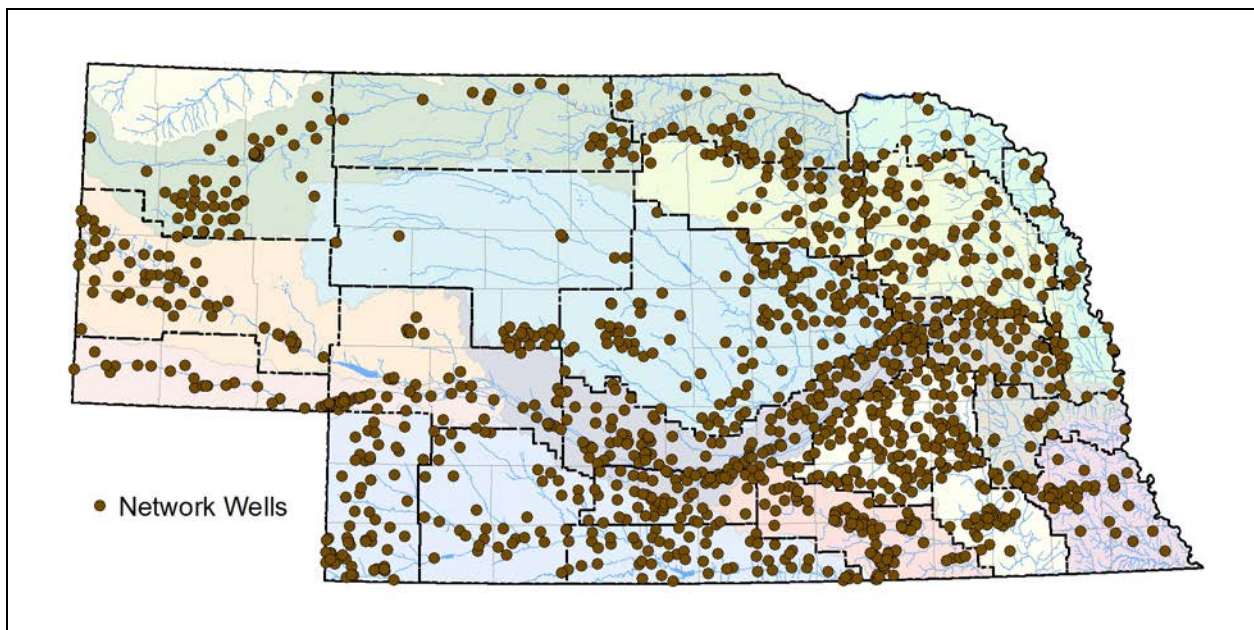
Monitoring begins in late June and concludes in September. Data and information collected at each site include field chemistry (pH, temperature, conductivity, dissolved oxygen and turbidity), stream and riparian habitat surveys, and flow volume. Macroinvertebrates are collected at each site using various techniques (i.e. sweep nets, surber samplers, etc.) suitable for the stream and habitat while fish are collected by electrofishing and seining.

5.7 Groundwater Monitoring Program

The NDEQ does not have a formalized fixed station groundwater quality monitoring network. Groundwater is monitored by several entities to meet a variety of needs. Although no formal network exists, the NDEQ is required by Neb. Rev. Stat. §46-1304 to report on groundwater quality in Nebraska. This task has been completed through the use of data and information collected by other entities, primarily, the state's 23 NRDs who are responsible for groundwater management in the state. Many of the NRDs do have groundwater monitoring networks. In accordance with the same statute, the NRDs are required to submit all groundwater data collected to NDEQ or its designee. Currently, NDEQ and the Department of Agriculture each fund a portion of the Agrichemical Contaminant Database that is maintained by the University of Nebraska-Lincoln as the "designee".

While no formal monitoring network exists, several of the NRDs do sample individual wells on a consistent and at least annual basis. Monitoring has historically focused on nitrates and recently has begun to include pesticides (atrazine, alachlor and metolachlor). Initially >1400 wells were sampled on an annual basis. Funding and landowner issues has recently lowered that to around 1000. The NDEQ and NRDs are working to revise and formalize a groundwater monitoring network. The initial set of wells is shown in Figure 10.

Figure 10. Statewide Groundwater Monitoring Network



The data and information collected in the existing (informal) statewide network has been used for simple trend analysis and status reporting.

The current monitoring scheme is sufficient to report on the status and changes in nitrate levels across the state. There is a need to evaluate other parameters of concern beyond nitrates including but not limited to sulfates, chlorides, selenium, and arsenic. An established fixed network would accomplish this and would be used to evaluate and report on the status and trends accounting for spatial, temporal and geologic variables.

5.8 *Monitoring for Fish Kills and Surface Water Complaints*

Fish kills and complaints are those incidents that occur or are observed that potentially impact water quality and are reported to the Department. Reporting can be first hand from the complainant/reporters or through another agency (i.e. Nebraska State Patrol). On-site investigations are conducted, as needed, to document existing water quality conditions and violations, identify pollution sources and responsible parties, and determine if any follow-up actions are necessary. Approximately 10 fish kills and/or complaint investigations are conducted annually. Fish kill investigations are coordinated with the Nebraska Game and Parks Commission.

Monitoring may be conducted to identify a pollutant of concern or to document a water quality (standards) criteria violation. The parameters that are analyzed often vary by occurrence. The data and information collected is used to initiate appropriate action(s) ranging from enforcement requests, further investigation, or forwarding the information on to another program.

5.9 *Compliance Monitoring Program*

Several programs require or carry out monitoring to determine compliance status with applicable regulations, issued permits, criteria, or established action levels. Regulatory mechanisms (i.e. permits) may include limitations on the concentration or quantity of a pollutant being released into the environment. Monitoring is also required to document if remediation actions are being effective. Monitoring may be conducted by the regulated entity (self-monitoring) or the Department. The programs that may require monitoring are the National Pollutant Discharge Elimination System, Livestock Waste Control Program, Underground Injection Control Program, Title 118 Groundwater Remediation Program, and the Petroleum Remediation Program. Compliance monitoring may also be required as a result of spills or discharges that require a greater amount of time to remediate the problem.

The potential scope of application for compliance monitoring is any facility in the state regulated under one of the above identified programs.

Data and information collected during compliance monitoring will vary according to the media being sampled and the program and/or permit requirements.

6.0 Water Quality Indicators

Titles 117 and 118 contain a large number of criteria for protection of beneficial uses. It is impractical to monitor for all of these parameters even if the resources were available. Assessments of beneficial uses can be conducted using a subset of the criteria – core indicators. Supplemental indicators may be added during an investigation phase or should the need be identified during the assessment of the core indicators. Supplemental indicators will/should be determined by the program or facility in question. It should also be noted that some parameters can be used to assess multiple beneficial uses. The regularly utilized water quality indicators are provided in Table 1.

Table 1 Water Quality Indicators for Nebraska’s Water Monitoring Program

Waterbody/Beneficial Use	Field Analytes	Laboratory Analytes
<i>Surface Water Core Indicators</i>		
Primary Contact Recreation		<i>E. coli</i> and microcystin
Aquatic Life	Temperature, pH, dissolved oxygen, fish and macroinvertebrate community condition (streams), habitat assessment (streams)	Ammonia, chloride, atrazine, metolachlor, acetochlor, arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, selenium, zinc
Water Supply	Conductivity	Nitrate-nitrite, chloride, atrazine, acetochlor, arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, selenium, zinc
Aesthetics	Secchi depth (Lakes Only)	Chlorophyll <i>a</i> , total suspended solids, suspended sediment
<i>Surface Water Supplemental Indicators</i>		
Aquatic Life		Sodium, calcium, magnesium,
Aesthetics	Turbidity	Alkalinity (lakes), total kjedahl nitrogen, nitrate-nitrite, total phosphorus
<i>Groundwater Core Indicators</i>		
Water Supply	Temperature, conductivity, pH	Ammonia, nitrate-nitrite, chloride, atrazine, simazine,alachlor, metolachlor

7.0 Quality Assurance

It is imperative that all data collected are of acceptable quantity and quality to carry out the monitoring objectives and meet the CWA obligations. Therefore, it is the policy of the Director of NDEQ that all environmental data generated or obtained by or on behalf of NDEQ are of known and acceptable quality. The NDEQ is committed to Quality Assurance (QA) throughout data generating and processing operations. NDEQ undertakes all environmental data gathering and management following an EPA approved Quality Management Plan (QMP). To accomplish this, NDEQ has made the commitment of the time and resources necessary to ensure that environmental data used by the Department are as precise, accurate, and complete as outlined in the Department's appropriate Quality Assurance Project Plans (QAPPs) or Standard Operating Procedures (SOPs).

The umbrella document that dictates quality assurance is the QMP that describes the policies, practices, and procedures of the NDEQ for ensuring environmental data used by the Department are of the type and quality needed for their intended use, and are properly documented. The QMP is the framework for how NDEQ, when required, will conduct Department activities that produce or use environmental data. Written to comply with the "EPA Requirements for Quality Management Plans", EPA QA/R-2 (EPA/240/B-01/002 – March 2001, reissued May 2006), this QMP defines NDEQ's QA-related policies, criteria for and areas of application, and definition of roles, responsibilities, and authorities. The QMP was endorsed/approved by the Director on 12/30/2015 and is anticipated by the EPA Regional Administrator in early 2016. The QMP is available on the agencies intranet.

8.0 Data Management

8.1 *Surface Water Data*

Chemical and physical water quality data and information obtained through the surface water programs will be stored in all four locations:

1. Original bench or field sheets
2. Personal computers
3. NDEQ's Integrated Information System and the Department's "G" drive
4. EPA's Storage and Retrieval (STORET) database

It should be noted that personal computer storage includes utilizing both MS Excel and MS Access (copyright) software. The use of multiple locations provides a security measure to ensure data and information are available in the event of a failure of a single storage location.

8.2 *Groundwater Data*

As described in the program description above, the State's 23 NRDs collect a large quantity of data and information used by the Department. Also stated above, the NRDs are required to submit all groundwater quality data to the Department or its designee, in a timely fashion. The Department has designated UNL as the recipient and curator of the groundwater quality data and information. Data is available through the Quality-assessed Agrichemical Contaminant Database for Nebraska Ground Water on the Nebraska Department of Natural Resources' website (<http://data.dnr.nebraska.gov/Clearinghouse/Clearinghouse.aspx>).

Chemical and physical water quality data and information obtained through the groundwater programs will be stored as:

1. Original bench or field sheets
2. Personal computers
3. NDEQ's Integrated Information System and the Department's "G" drive
4. Agrichemical Contaminant Database

Personal computer storage includes utilizing both MS Excel and MS Access (copyright) software.

8.3 *Compliance Data*

Data and information is either required/requested to meet a regulatory requirement (i.e. NPDES permit) or obtained by the Department to verify the facility compliance status. First and foremost, hard copy reports, etc, are filed and retained in accordance with the Department's records retention policy. At a minimum the complete program database will be compiled and stored in electronic format that is readily accessible. Electronic storage can be via an established database such as EPA's Integrated Compliance Information System (ICIS) or a locally derived Access database. Should a local database be created and utilized, sufficient safety mechanisms for backing up will be created and applied.

9.0 Data Analysis and Assessment

Water quality data and information are analyzed and assessed using various methods to meet the monitoring objectives. While there may be site-specific assessments conducted to answer a specific question, the QAPP will include information on how the data will be analyzed and assessed including the statistical procedure(s) to be applied.

One of the primary uses of water quality data and information is the comparison to a single value or condition such as a criterion, trigger level, permit limit, or action goal. Data collected for or used in this manner will follow established methodologies or standard operating procedures. This includes information obtained as a regulatory requirement (e.g. permit condition).

10.0 Data Reporting

Water quality data and information are utilized and reported in various formal and informal methods. Informal reports are those generated as grant requirements, permitting or other regulatory program documentation. Formal reports include the Water Quality Integrated Report, the Nebraska Water Monitoring Programs Report, the Nebraska Groundwater Quality Monitoring Report, or any others that are readily available for public viewing.

Water Quality Integrated Report

Section 305(b) of the CWA requires the biannual submittal (even numbered years) of a report that describes the water quality of the state and the extent to which the water quality provides for the protection and propagation of a balanced population of shellfish, fish, and wildlife and allows for recreation in and on the water. As well, Section 303(d) of the CWA requires the state from time to time to provide a list of impaired waterbodies.

To meet these requirements and as allowed by EPA, the 303(d) list and 305(b) report are combined into a single document entitled Nebraska's Water Quality Integrated Report. Each report is prepared in accordance with assessment methodologies that are prepared and maintained by NDEQ and reviewed by EPA. Past reports are available from NDEQ as hard copies or online at <http://deq.ne.gov>.

It should be noted that the Integrated Report is intended to be a composite of all monitoring programs.

Nebraska Groundwater Quality Monitoring Report

As stated above, Neb. Rev. Stat. §46-1304 required NDEQ to prepare a report on groundwater quality in Nebraska and submit this report the legislature by December 1. The report is prepared in with cooperation the State's NRDs to meet the requirements of Neb. Rev. Stat. §46-1305 that requires said NRDs to report on the groundwater quality monitoring programs. Past reports are available from NDEQ as hard copies or online at <http://deq.ne.gov>.

Table 2 below provides a listing of the reports prepared and the monitoring programs that generate the necessary data and information.

11.0 Programmatic Evaluation

An effective and efficient monitoring program will include periodic reviews that determine whether or not the necessary data and information are being collected and utilized in support of the defined objectives. Corrective actions will be undertaken in the event shortfalls are identified.

Ultimately, those carrying out the monitoring and utilizing the data should be continually evaluating the selected parameters, data collection, storage, assessment, and reporting process.

Annually, the monitoring programs will be evaluated and compared back to this strategy. With a few exceptions, a majority of the water quality data are collected from April to October. An evaluation immediately following the monitoring period is preferred for several reasons including:

- Staff has current knowledge of the positive and negative aspects of each program;
- Sufficient time is available to make adjustments prior to the next monitoring season;

Table 2. Water Quality Monitoring Programs (non-regulatory)

Monitoring Program	Water Quality Integrated Report	Groundwater Quality Monitoring Report	Total Maximum Daily Loads	Regulatory Support ¹	Project Reports	Investigation Reports	Web Reporting
Ambient Stream Monitoring Program	✓		✓	✓			
Ambient Lake Monitoring Program	✓		✓	✓	✓		
Fish Tissue (Contaminant) Monitoring Program	✓		✓		✓		
Public Beach Monitoring Program	✓		✓		✓		✓
Basin Rotation Monitoring Program	✓		✓	✓			
Stream Biological Monitoring Program	✓		✓		✓		
Groundwater Monitoring Program	✓	✓		✓			
Fish Kills, Complaints and Special Water Quality Investigation Monitoring Program	✓			✓	✓	✓	
Compliance Monitoring Program	✓		✓	✓		✓	

¹ Regulatory support refers to the usage of water quality data and information in development of permit limitations and requirements, remedial actions plans, criteria development, etc.

The evaluation process will be comprised of the following steps and timeframes:

1. Monitoring staff provide input to unit and section supervisors
 - Completion date: November 1
2. Water quality program managers (those assessing and reporting) provide input to monitoring staff supervisors (i.e. Surface Water Unit, Groundwater Unit)
 - Completion date: November 1
3. Supervisors document concerns and resolutions/recommendations for submittal to Water Quality Division Administrator. This will include and financial implications.
 - Completion date: December 1
4. The Division Administrator will approve or disapprove corrective actions/changes to the monitoring programs.
 - Completion date: January 1

5. Water quality program managers will make the necessary change to the quality assurance project plans, standard operating procedures, or other program documents needed to implement the approved resolutions
 - Completion date: March 1
6. Monitoring staff implement the changes
 - Completion date: April 1

While the evaluation process does include deadlines, it is important that communication continually occurs among the water quality division to allow for potential obstacles to be addressed early in the process, both formally and informally

12.0 General Support and Infrastructure Planning

Staffing

The WQD maintains sufficient staff to manage and conduct the monitoring needed to meet the objectives outlined in this strategy. Along with NDEQ staff, other entities are utilized to assist with data collection. These entities may include: consulting firms, universities, natural resources districts, state agencies and/or federal agencies. As new or expanded projects evolve, staffing needs will be evaluated.

An effective and beneficial means of collecting data and information are the use of temporary employees or student interns that are retained to assist with the seasonal monitoring. The WQD recruits temporary employees that are upperclassmen or recent college graduates. This process is beneficial to both the Division and the employee. The employee gains valuable work experience and employment contacts and the Division does not incur many of the costs associated with additional full time employees (FTEs). A co-benefit is that many temporary employees are later hired by the Agency for full time employment.

Funding

Funding for water quality monitoring activities originates from a variety of sources with the primary and largest sources being the CWA Section 106 and CWA Section 319h Non-Point Source grants with matching funds from the State of Nebraska. Steady funding is anticipated throughout the duration of this strategy from those sources.

Training

Water quality monitoring is conducted using multiple techniques and equipment. A requirement of each QAPP is to include a section on special training requirements and/or certifications. Program managers and supervisory staff will be responsible for ensuring that monitoring staff are properly trained to carry out the various monitoring programs. Standard operating procedures (SOPs) are also utilized to assist in training monitoring staff.

Logistics

As stated above, monitoring is conducted using a variety of techniques and equipment some of which are unique to the program or water type. As part of the QAPP, an equipment list will be provided as an attachment or appendix. The list will be prepared by the program manager and the staff conducting the field work.

Annually, during the evaluation period, equipment will be inventoried and inspected. During this process equipment needs should be identified and forwarded to the project manager, immediate supervisor, and WQD Administrator.

Annually and prior to initiating monitoring, the estimated number of laboratory analysis (samples) should be determined by each program. This includes analysis conducted by the NDEQ, the Nebraska Department of Health and Human Services (DHHS) or other laboratories. Sample totals should be forwarded to the WQD Administrator by March 1.

Monitoring Prioritization

Annually, monitoring priorities must be evaluated and affirmed. This responsibility lies primarily with the Department's senior management (i.e. Director, Deputy Directors, and Division Administrator) with input from the Water Quality Division staff.

Multiple factors must be considered with establishing the prioritization ranking including: the protection of human health, aquatic resources, assigned beneficial uses, financial capabilities, staffing needs, data gaps and needs, and reporting requirements.

13.0 Strategy Timeline

This strategy will be effective for the period of 2016-2022. The six year period has been selected based on matching up with two triennial WQ standards reviews, three integrated reports, one basin rotation cycle and at least one permit term.

14.0 Proposed Improvements to Nebraska Water Quality Monitoring Programs

General Recommendation #1: Maintain or expand surface water monitoring programs to ensure statewide coverage. The planning process should be evaluated and modified annually to better characterize watershed health. Individual programs should be evaluated annually to ensure resources are allocated appropriately. Data users including the NPDES program, Section 319 program, 303(d) program, livestock, and others should be consulted.

General Recommendation #2: Establish a framework to maintain, refine, and potentially extend the statewide groundwater monitoring network. Currently, the WQD relies upon NRDs and other entities to collect a bulk of the ambient groundwater data and information centered around an informal network of (mostly irrigation) wells. These data are valuable and necessary in accomplishing part of the monitoring objectives and satisfying statutory requirements. An emphasis should be placed on coordinating with groundwater data collection entities and developing a framework and plans for the collection and analysis of defensible data, valuable in statistical trend analysis within all economically important aquifers.

General Recommendation #3: Enhance and formalize standardized training for both groundwater and surface water monitoring activities conducted by NDEQ staff. As stated above, monitoring is conducted by numerous entities using various methods and equipment. SOPs have been developed that detail most of these methods and equipment. From these, formalized training should be developed to ensure and maintain the quality of the data. Minimum core training (i.e. electro-fishing, groundwater well sampling) should also be implemented for identified monitoring personnel.

General Recommendation #4: Volunteer monitoring. As requested or as needs arises, NDEQ will train voluntary monitoring groups to perform monitoring activities that meets QA requirements for the Clean Water Act.

Specific Recommendations

1. Continue to evaluate fish tissue contaminant monitoring to include selenium.
2. Involve NPDES staff in surface water monitoring site selections.
3. Continue to evaluate the SNAP pilot program and evaluate its applicability to become permanent.
4. Evaluate environmental DNA analysis methods for potential future parameters.
5. Develop a Water Quality Index for ambient sites to better communicate watershed health to citizens.
6. Develop, encourage, and/or participate in groundwater monitoring training at NARD sponsored events.

15.0 References

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