2012 Nebraska
Water Monitoring Programs Report

Nebraska Department of Environmental Quality
Water Quality Division
January 2013

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Table of Contents

Acknowledgements

Introduction

2012 drought conditions at Merritt Reservoir, Cherry County.

Acknowledgements:

The following Nebraska Department of Environmental Quality staff have contributed to this report with their photos, maps, numbers, words, and editing. Their efforts are greatly appreciated and gratefully acknowledged here: Mike Archer, Ken Bazata, Dave Bubb, Ryan Chapman, Jason Garber, Patrick Hartman, Tom Heatherly, Dave Ihrie, Dan Inman, Greg Michl, Will Myers, Patrick O'Brien (NARD), Brad Routt, and Dave Schumacher.

Photo on the cover: Geese and ducks on Lake Helen, Gothenburg, Dawson County. Photo by Jenny Swanson.

Individual staff should be contacted with specific questions about specific programs; their contact information is provided at the end of each monitoring program description.

Please direct any general questions related to this report to the editors of this document, Marty Link, NDEQ, at 402/471-4270 or marty.link@nebraska.gov or Mike Archer, NDEQ, at 402/471-4224, mike.archer@nebraska.gov.

NDEQ staff investigating a fish kill at Platte River State Park, Sarpy County.

Introduction

The Nebraska Department of Environmental Quality (NDEQ) is charged with monitoring, assessing, and to the extent possible, managing the state's water resources. The purpose of this work is to protect and maintain good quality water and encourage or execute activities to improve poor water quality. Monitoring is done on the over 18,000 miles of flowing rivers and streams, our greater than 280,000 acres of surface water in lakes and reservoirs, and the vast storage of groundwater in Nebraska's aquifers.

This document brings together a short summary of many of the monitoring programs performed (or required) by the NDEQ. In many cases, recent results are highlighted in the descriptions. There are also examples of how the data that are collected are used. Individual program summaries, in some cases, include descriptions or explanations of water quality trends or observations.

This document is not meant to be a comprehensive or exhaustive scientific report; rather, it is a starting place for describing the numerous monitoring programs carried out by the NDEQ, its contractors, or, in some cases, the regulated community. Other NDEQ reports and documents have more in-depth data and descriptions for many of the programs. The reader will be directed to these in the individual program descriptions, or can contact the author sited at the end of each program description for further information.

Partners

NDEQ gathers much of the data discussed in this document; however, many partners have contributed as well. Without the contractual and voluntary assistance we receive from our many sister agencies and partners, we would not be able to detail the successes that we have accomplished. The state's Natural Resources Districts, Nebraska Public Power District, US Army Corps of Engineers, US Environmental Protection Agency, University of Nebraska-Lincoln, Lincoln-Lancaster County Health, Nebraska Game and Parks Commission, Nebraska Department of Agriculture, and others all contributed time, money, resources, and/or data to our water monitoring programs.

Many thanks.

Pivot irrigation, Buffalo County.

Groundwater Quality Monitoring Report to the Legislature

Why NDEQ Does this Report
The 2001 Nebraska Legislature passed LB329 (Neb. Rev. Stat. §46-1304) which, in part, directed the Nebraska Department of Environmental Quality (NDEQ) to report on groundwater quality monitoring in Nebraska.

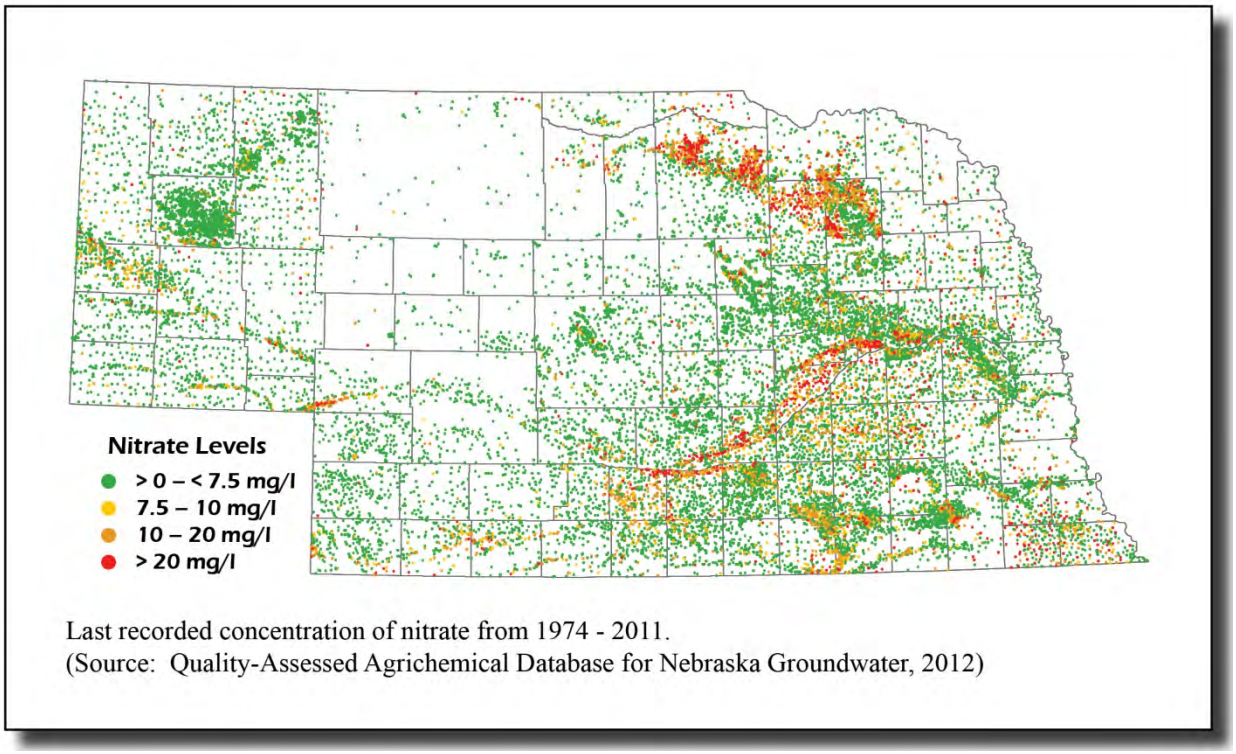
History of this Report:
Beginning in December 2001, the Department has prepared a report annually outlining the extent of ground water quality monitoring conducted primarily by Natural Resources Districts (NRDs) during the preceding calendar year. The Department uses the data submitted by the districts in conjunction with all other readily available and compatible data for the purpose of an annual ground water quality trend analysis.

Where is the Monitoring Conducted?
The State of Nebraska is a large geographic area, over 77,000 square miles. There are approximately 166,000 active registered water wells in Nebraska including irrigation, industrial, municipal, and domestic wells. In 2011, 4,117 wells were sampled. Since 1974, nearly 25,000 wells across the state have been sampled by state agencies, University of Nebraska, federal agencies, and local NRDs. Monitoring is typically conducted in areas of Nebraska with known groundwater problems.

What is Monitored?
There are over 230 compounds monitored for since 1974 and included in this report. Some of the compounds that have been detected a significant number of times since 1974 include nitrate-nitrogen and Atrazine. Nitrate is a form of nitrogen common in human and animal waste, plant residue, and commercial fertilizers. Atrazine is an herbicide used for weed control in a variety of crops such as corn and sorghum.

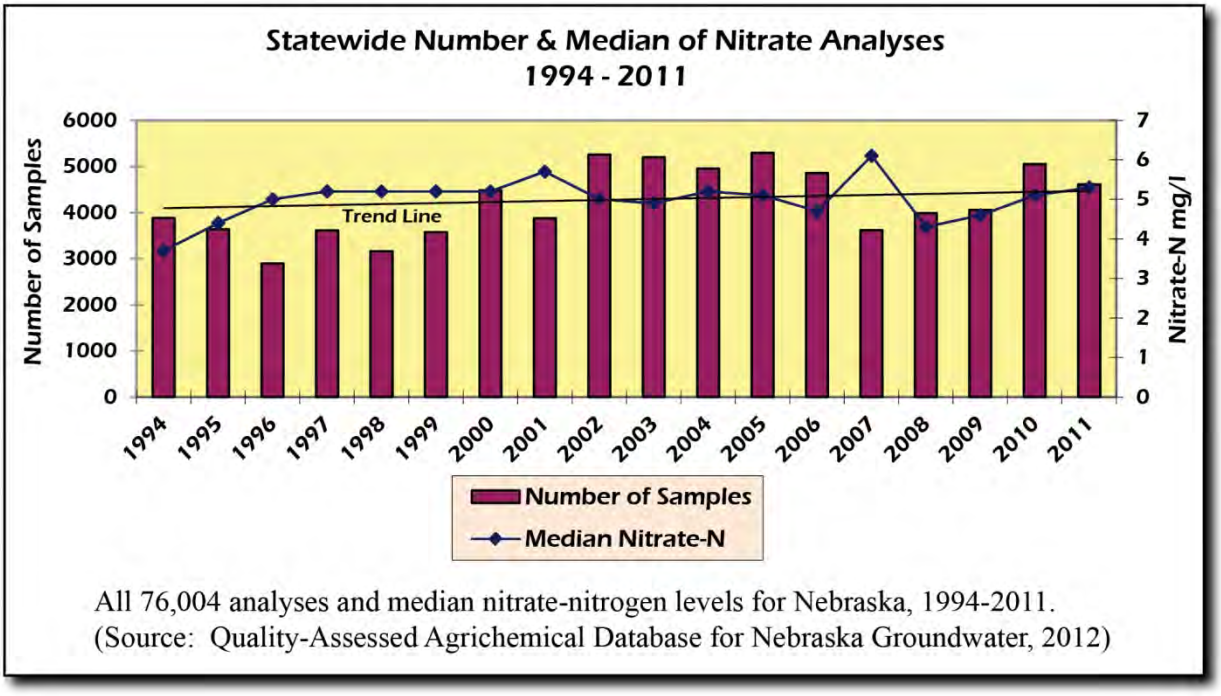
How are the Data Used?
The Department analyzes the data collected for the purpose of determining whether or not ground water quality is degrading or improving and presents the results to the Natural Resources Committee of the Legislature beginning December 1 of each year. The State's 23 NRDs use the data to make decisions on the management of groundwater. To date, 22 NRDs have formed Groundwater Management Areas over part or all of their districts to address groundwater quality problems.

Results as of 2011:
The majority of Nebraska's residents rely on groundwater for drinking water, agriculture, and industry. Most public water supplies that utilize groundwater do not require any form of treatment for drinking water before distributing it to the public. Nitrate is Nebraska's number one groundwater contaminant. In some areas of the state, the nitrate concentration in groundwater is greater than the drinking water standard of 10 mg/L (see figure below).



Last recorded concentration of nitrate from 1974 - 2011.
(Source: Quality-Assessed Agrichemical Database for Nebraska Groundwater, 2012)

The most representative picture of the statewide nitrate concentration is from the time period from 1994 to 2011 due to the number and spatial relationship of the samples collected. The overall trend indicates only a slight increase in nitrate median concentrations statewide (see figure below).



All 76,004 analyses and median nitrate-nitrogen levels for Nebraska, 1994-2011.
(Source: Quality-Assessed Agrichemical Database for Nebraska Groundwater, 2012)

All of the results for agricultural chemicals (including nitrate) can be found on the Nebraska Department of Natural Resources (NDNR) website (http://www.dnr.ne.gov/or http://dnrdata.dnr.ne.gov/clearinghouse/). The entire database can be accessed at NDNR's website, where the database may be searched or 'queried' for numerous subsets of data, such as results by county, type of well, Natural Resources District, etc.

More Information:
For more information about the groundwater monitoring report, contact Dave Miesbach at the Nebraska Department of Environmental Quality, (402) 471-4982 or david.miesbach@nebraska.gov.

Preparing to sample dedicated monitoring wells, southeast of Clearwater, Antelope County.

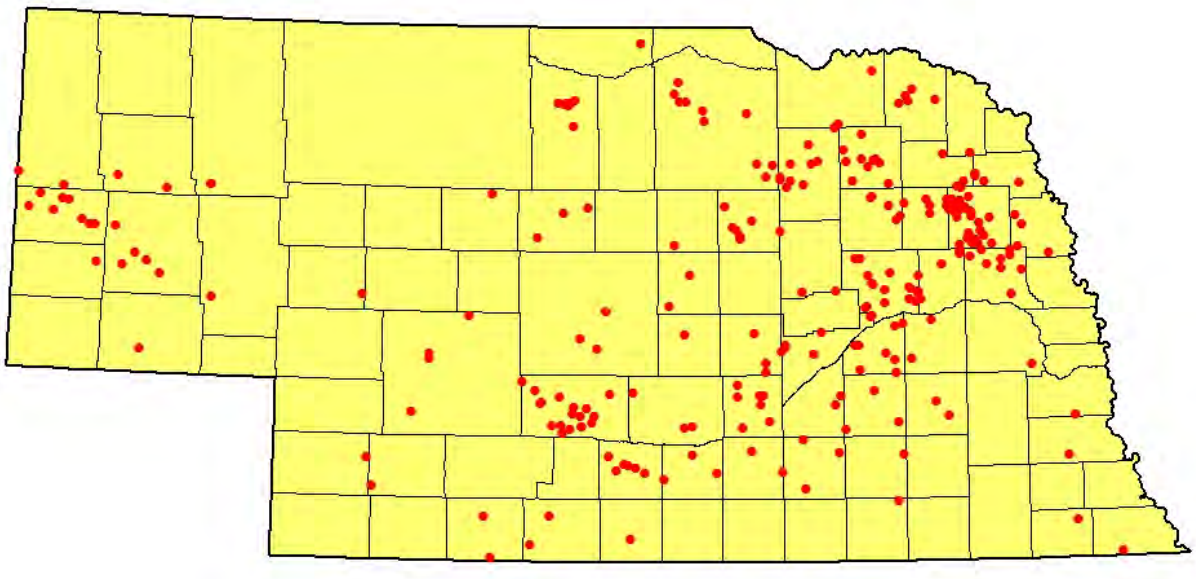
Groundwater Monitoring at Permitted Livestock Facilities

Why require monitoring at livestock facilities?

Nebraska's groundwater may be negatively impacted by leakage from holding ponds at livestock waste control facilities (LWCFs). The liquid waste in the holding ponds has elevated levels of nitrate-nitrogen, ammonia and chloride ions. The NDEQ requires monitoring of these chemical parameters to document any impact to groundwater. The contaminated groundwater may negatively impact public water supply and domestic wells. The NDEQ oversees the investigation and remedial measures conducted by the owners of the facilities if groundwater has been impacted.

History of the monitoring program

The NDEQ's Groundwater Unit began reviewing permitting plans for LWCFs in October 1997. The site-specific hydrogeology, soils, depth to water and use of the groundwater are reviewed to determine the vulnerability of the groundwater. The Groundwater Unit has reviewed 1,108 LWCFs (as of the beginning of November 2012), recommending monitoring at 385 of them. Currently, there are 333 approved groundwater monitoring plans with 272 operations where semi-annual monitoring is conducted. Seven operations conduct annual sampling due to no change in the water quality. The map below shows the locations of the facilities where groundwater monitoring is being conducted.

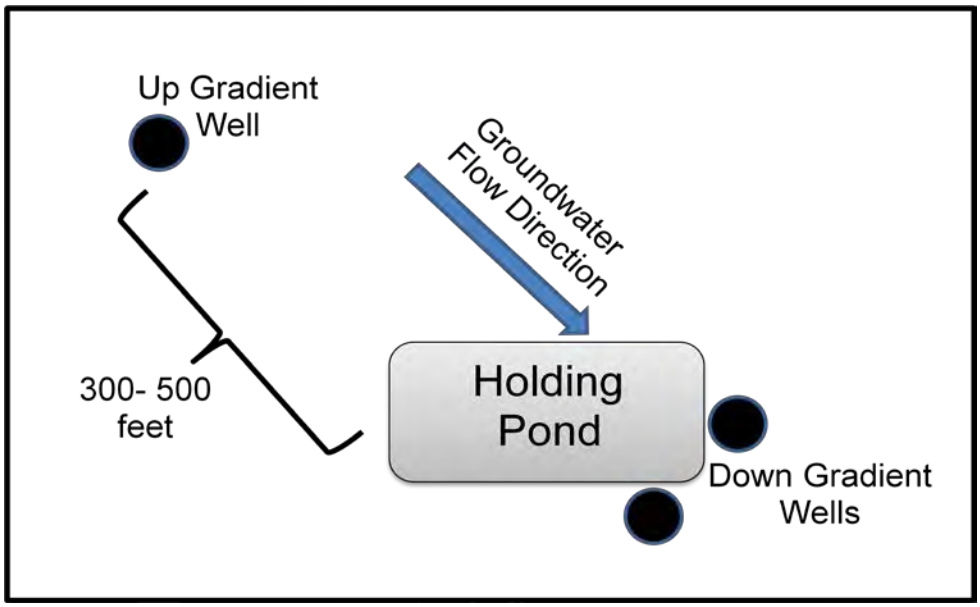


Livestock Operations with Ongoing Ground Water Monitoring

What is monitored?
Groundwater samples are collected from monitoring wells installed around the lagoons or holding ponds and analyzed at a laboratory for

- nitrate-nitrogen,
- ammonia, and
- chloride concentrations.

Groundwater naturally has low concentrations of chloride and nitrate-nitrogen while ammonia is not naturally present in groundwater.



Recommended Locations for Groundwater Monitoring Wells

Additionally,

- depth to water,
- pH,
- temperature, and
- specific conductivity

are collected from each monitoring well. The groundwater quality and the flow direction are monitored in the Spring (before irrigation season) and the Fall (after irrigation season).

Where are the wells installed?
A typical livestock facility with groundwater monitoring has three monitoring wells. One well is located 300-500 feet up gradient of the holding pond to record the water quality conditions prior to flowing down gradient under the lagoon. Two monitoring wells are located adjacent to each holding pond in the down gradient flow direction to more quickly identify possible impacts to groundwater. The diagram above shows a generic map of recommended locations for groundwater monitoring wells.

How are the data used?
The LWCF is responsible for conducting the semi-annual monitoring and submitting a report to NDEQ twice a year. Monitoring is conducted either by a hired consulting firm or by the owner of the livestock operation. Groundwater Unit staff review the results from the groundwater sampling. A facility that has had at least three sampling events is evaluated to determine if groundwater has been negatively impacted. In the event a facility has impacted groundwater, the facility is required to address the issues. Currently there are less than 20 LWCFs with more comprehensive groundwater investigations underway. To date, NDEQ does not know of any private or public drinking water wells that have been contaminated from a livestock waste control facility.

More Information:
For more information about groundwater monitoring at livestock waste control facilities, contact Dan Inman at (402) 471-0294, dan.inman@nebraska.gov or Dave Miesbach at (402) 471-4982, david.miesbach@nebraska.gov .

Feedlot in Central Nebraska.

Shallow Groundwater Nitrate Study

Why is this monitoring being conducted?
The statewide groundwater quality monitoring network results reported in the annual NDEQ Groundwater Quality Monitoring Report have shown localized areas across the state that have nitrate concentrations that measure over 20 mg/L (20 ppm). Currently, over 80% of the wells that are sampled for this statewide network are irrigation wells. Interestingly, the results of irrigation well monitoring in several of these areas also have shown nitrate concentrations that are considerably lower (<10 mg/L) when compared to other wells sampled in the same general area.

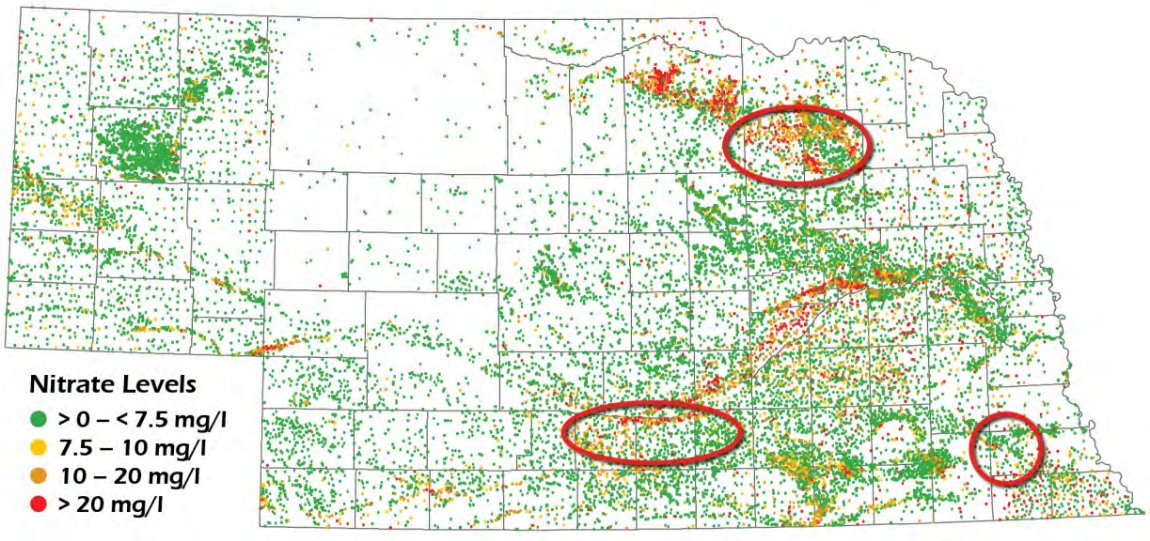
NDEQ staff sampling a monitoring well, Johnson County

The type of well, design, and construction characteristics can influence water quality monitoring results. Thus it is suspected that nitrate concentrations are higher in the shallow groundwater in these areas, but that it is not being detected in these network irrigation wells due to well construction differences. The ability to verify the occurrence of nitrate concentrations in shallow groundwater and the vadose (unsaturated) zone allows for a more accurate assessment of potential problems that may occur in the future. This is very important to human health because domestic drinking water wells often utilize the shallow groundwater and are typically not required to be tested for nitrates or other agricultural related chemicals.

This study will assess the occurrence of agricultural related chemicals in the vadose zone sediments and shallow groundwater. This was done by installing monitoring wells adjacent to monitoring network irrigation wells that have recent low nitrate results. Both the shallow monitoring well and the deeper irrigation well will be sampled at the same time, with the same sampling procedures to minimize the influence of other variables. The vadose zone sediments will also be sampled to document any downward migration of agricultural chemicals.

When a deeper irrigation well shows low nitrate results, is the local shallow groundwater also going to be low in nitrate? Does the current network of mainly irrigation wells properly represent the condition of all groundwater in an area? The two adjacent wells will be sampled at the same time with the same methods to try to answer these questions. More precise groundwater quality information and aquifer characterization in these areas will allow for the development of more effective monitoring strategies that will ultimately better protect domestic groundwater users.

Where is the Monitoring Being Conducted?
The three locations targeted for this study are in areas where concentrations of nitrates over 20 mg/L have been measured in the statewide monitoring network or NRD specific monitored wells. The specific monitoring sites within these areas are adjacent to monitoring network irrigation wells with low (<10 mg/L) nitrate concentrations. These areas have been further identified by NDEQ, UNL, and local NRDs as locations where more detailed water level and water quality information is needed to better characterize the aquifer.



Targeted Study Areas (red circles) with Last Recorded Nitrate Concentrations

What is being monitored?
NDEQ staff is collecting groundwater quality samples from targeted monitoring wells installed specifically for this study. Groundwater samples are also being collected from the statewide network irrigation wells which are located adjacent to these monitoring wells. Vadose zone sediment samples were also collected to characterize the presence of agricultural contaminants above the water table. All samples collected are being analyzed for nitrogen and phosphorus species and select pesticides.

How will the data be used?
NDEQ and UNL will use the data collected in this study to provide information related to the water quality of these areas to the NRDs and the public. Specifically, the data will be used for developing groundwater monitoring strategies, groundwater management plans, and to supplement wellhead protection plans (developed locally to protect public drinking water wells).

NDEQ staff collecting a vadose zone sample, Holt County

NDEQ staff collecting samples, Antelope County

The NRDs will utilize these monitoring wells for both groundwater level and quality information after study completion. The water level information will be reported to the Nebraska Statewide Goundwater Level Program and the water quality information will be reported to the Quality-Assessed Agrichemical Database for Nebraska Groundwater, also known as “the clearinghouse”. UNL will use the drillers log and core sample information for the Nebraska Statewide Test-hole database. A project summary report will be prepared by NDEQ.

Current Progress

The fieldwork for this study began in summer 2011. The work in 2011 consisted of the installation of ten monitoring wells and sampling of the associated vadose zone sediments by UNL and NDEQ staff. Three to four wells were installed in each study area and permanent pressure transducers will be installed at each of the three study sites. Vadose zone sampling was completed and shipped to the lab for analysis. Baseline groundwater sampling was conducted at all wells in each of the three study sites. In 2012, the wells were sampled by NDEQ staff on approximately a monthly frequency during the active irrigation season (June – August). Results of this monitoring should be available for the next annual water monitoring report.

More Information:

For more information on the Shallow Groundwater Nitrate Study, Contact Ryan Chapman at (402) 471-3376 or ryan.chapman@nebraska.gov or Dave Miesbach at (402) 471-4982 or david.miesbach@nebraska.gov. Some of the funding for this project is from the U.S. Environmental Protection Agency’s Clean Water Act supplemental monitoring grant (2010).

NDEQ staff measuring the water level in a test hole, Holt County

Monitoring for Fish Kills and Citizen Complaints

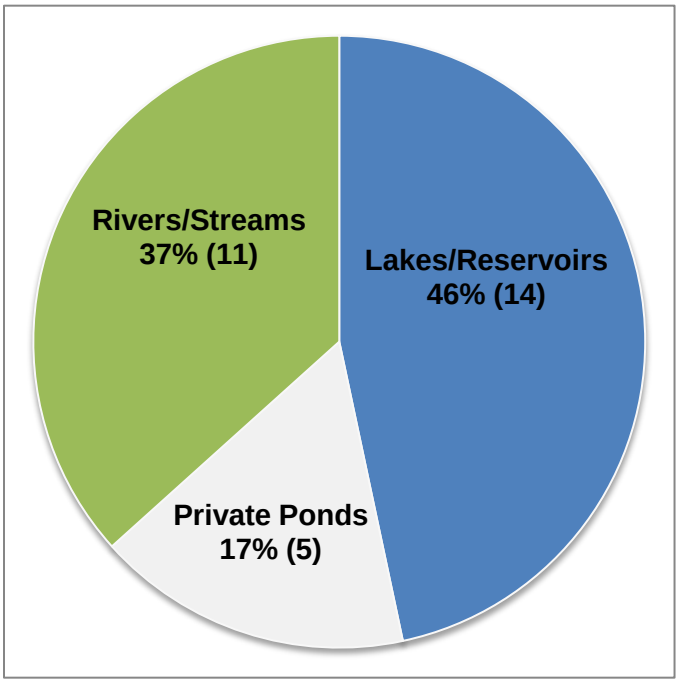
Why do we sample after fish kills and complaints?
The agency responds to numerous fish kills and surface water complaints annually. In many cases, the investigations surrounding a fish kill may require sampling to document the cause of the water quality problem, the magnitude and extent of the water quality problem, a source of pollution, and/or a responsible party. Because a fish kill could result in legal action, sampling requires a relatively high level of quality data.

Fish Kill at Willow Island Lake 2012. Photo courtesy of Jared Lorensen (NGPC).

What types of data are collected?
The types of data collected are determined on a case-by-case basis. Initially, the types of data to be collected will be based on information provided by the person who reports the problem. A final determination of data needed is made by the investigator once an initial site evaluation has been made. In many cases, field measurements of pH, temperature, conductivity, and dissolved oxygen can define the cause of the kill, but further sampling and investigation may be needed to determine the cause of the fish kill.

Fish Kills Reported

From July 1, 2011 through September 30, 2012 a total of thirty fish kills were reported to NDEQ. Of these, fourteen occurred in a lake or reservoir, eleven were in rivers or streams, and five were in private ponds.



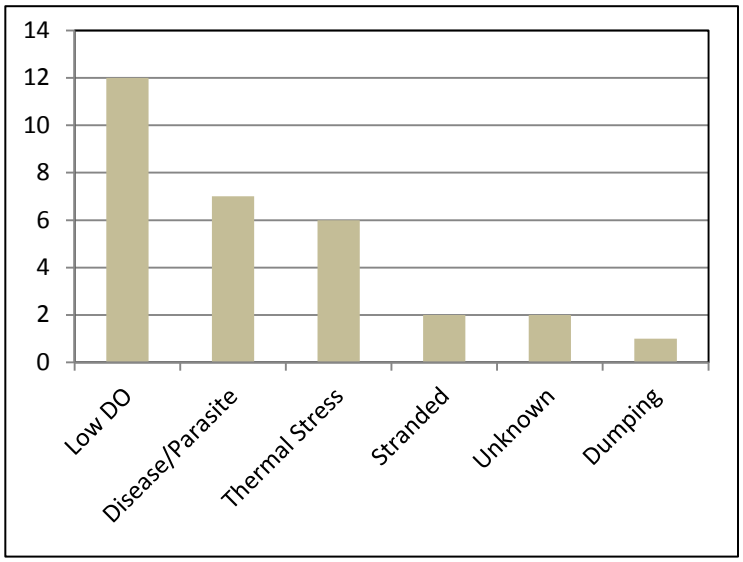
Locations of Reported Fish Kills; July 2011 –Sept 2012

The cause of the fish kills is determined from information collected from the reporting party and/or follow-up investigation and sampling. Twenty Five (83%) of the reported fish kills were due to natural causes; these included twelve due to low oxygen (summer kills), seven from disease or parasites, and six from thermal stress. Two fish kills were the direct result of dam releases that left fish stranded in remnant pools. The cause of two fish kills could not be determined and one fish kill was the result of illegal dumping into a stream.

Summer fish kills are typically caused by low dissolved oxygen concentrations stemming from eutrophic conditions. Eutrophication is a term that describes water quality conditions as a lake or reservoir ages.

Lakes or reservoirs that are "eutrophic" tend to be shallow with high nutrient concentrations and exhibit frequent algae blooms, warmer water temperatures, and lower dissolved oxygen concentrations.

Drought and extended high air temperatures plagued the summer months and caused a number of Nebraska's rivers and stream to be reduced to low flow and in some instances no flow. As a result, a large number of fish kills were caused by thermal stress. These same weather conditions likely caused many of the "low dissolved oxygen" fish kills that were reported



Causes of Reported Fish Kills; July 2011 – Sept 2012.

in our ponds, lakes, and reservoirs. As water warms its ability to retain dissolved oxygen is lessened. If warm water conditions persist eventually the demand for oxygen will surpass the supply and a fish kill will occur.

Winter fish kills are often caused by low dissolved oxygen concentrations which are the result of prolonged ice and snow cover on lakes and ponds. When lakes are frozen-over and have significant snow cover the amount of oxygen slowly decreases due to decreased photosynthetic activity, low light, and no exposure to atmospheric oxygen. 2012 saw very little winter snowfall, consequently there were no reported winter kills reported.

Citizen Complaints

Between July 1, 2011 and September 30, 2012 the surface water unit received 61 notifications of concern regarding surface water issues. While many of these cases were referred to other agency programs that more closely relate to the problem, the surface water unit provides assistance through investigations and/or sample collection to help document conditions.

For More information Contact:

Mike Archer at Mike.Archer@nebraska.gov or (402) 471-4224
Dave Bubb at Dave.Bbubb@nebraska.gov or (402) 471-2810
David Schumacher at David.Schumacher@nebraska.gov or (402) 471-4709

Fish Kill on the Platte River in Platte County 2012. Photo courtesy of Mike Archer.

Fish Tissue Monitoring

Why NDEQ Does this Monitoring

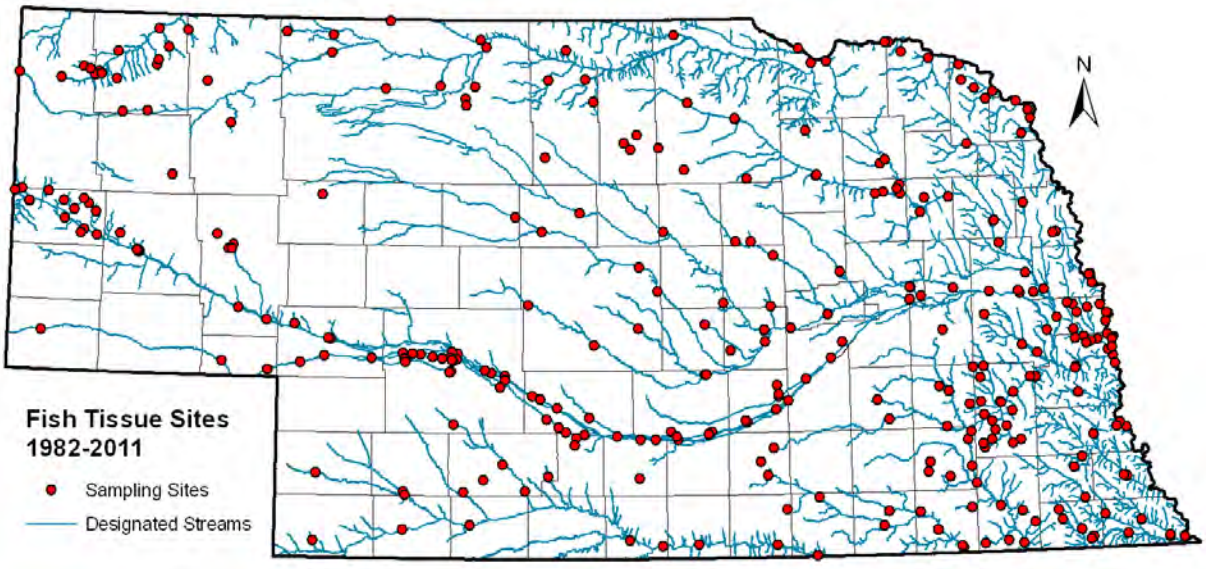
Each year fish samples are collected from numerous streams and lakes across Nebraska to determine their suitability for human consumption. This is important because certain contaminants have a tendency to bio-accumulate in fish tissue and, when eaten, can cause an increased risk for human health problems. In waterbodies where contaminant levels in fish are of concern, "fish consumption advisories" are issued. These advisories do not ban the consumption of fish from a particular waterbody. Rather, advisories are designed to inform the public of how to safely prepare and eat what they catch, and provide suggested guidelines for limiting consumption. As a food source, fish are a high quality protein, low in saturated fat, and high omega-3 fatty acid food source, so anglers should not be discouraged from consuming fish in moderation.

History of Fish Tissue Program

Fish tissue sampling in Nebraska was initiated in the late 1970s, primarily to identify potential pollution concerns throughout the State. Monitoring efforts were focused on whole fish samples collected on large rivers near the bottom of their drainage areas. In the late 1980s, more emphasis was placed on evaluating human health concerns and the Department began analyzing the fillet portions from fish that are most-often consumed. These efforts have continued to the present day.

Where is the Monitoring Conducted?

Monitoring is generally conducted at locations where most fishing occurs; therefore the potential risk to human health is greatest. Fish species targeted for collection included those that are most frequently sought by fisherman, including: catfish, largemouth bass, walleye, crappie, and even carp. From July 1 to September 30 each year, the Department collects fish samples from approximately 40-50 pre-selected streams and publicly owned lakes in two or three of Nebraska's 13 major river basins (see the map below for historic sampling locations). Fish tissue sampling activities are rotated through all 13 basins on a six-year cycle. In addition, fish samples are collected every two years at five locations termed "trend sites." These five trend sites have been monitored for more than 16 years in an effort to identify long-term changes in fish contaminant levels, if present.



What is Monitored?

Fish tissue samples are 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* (i.e., 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* (i.e., organic mercury – occurs naturally and is released into the environment from mining operations, fossil fuel combustion, refuse incineration, and industrial waste discharges); and
- *dieldrin* (i.e., a breakdown product of the insecticide Aldrin, generally used on corn prior to 1974).

How are the Data Used?

Fish tissue data collected are used to assess human health risks utilizing a risk-based assessment procedure. For non-cancer (noncarcinogenic) effects, the assessment procedure results in a *Hazard Quotient* (HQ) value for each contaminant and takes into account an average body weight, ingestion rate, exposure frequency and duration, and percent absorption of contaminants. If more than one contaminant is present in the fish tissue, then the HQs are summed to derive a Hazard Index (HI). If the HI is less than 1.0, then adverse noncarcinogenic effects are not anticipated. If the HI equals or exceeds 1.0 then an advisory is issued.

For a contaminant that may also be associated with a cancer risk, the risk-based assessment procedure results in a *Cancer Risk* (CR) estimate that represents the probability of an individual developing cancer during their lifetime as a result of exposure to the potential carcinogen. If more than one potential carcinogen is present in fish tissue then the risk estimates are summed. Advisories are issued if the estimated CR equals or exceeds 0.0001 (1 in 10,000).

While mercury (methylmercury) is a contaminant accounted for in the HI, Nebraska also utilizes a fish tissue residue criterion (TRC) in place of a water column criterion for the protection of human health. Nebraska's TRC represents the mercury (0.215 mg/kg) concentration in fish tissue that should not be exceeded on the basis of a consumption rate of eight ounces (0.227 kg) per week. Advisories are issued if the mercury concentration in fish tissue equals or exceeds the TRC of 0.215 mg/kg. Exposure to high levels of mercury have been shown to adversely affect the developing nervous system, so women of child-bearing age, pregnant women, and children less than 15 years of age are the most sensitive to the effects of mercury.

Currently the Nebraska Department of Health and Human Services (NDHHS), in cooperation with the NDEQ, the Nebraska Game and Parks Commission (NGPC), and the Nebraska Department of Agriculture (NDA), issues fish consumption advisories for waterbodies where high concentrations of contaminants may indicate a health risk for consumers. Waterbodies where sampling has revealed exceedances of health risk criteria and subsequent consumption advisories have been issued will be re-sampled following the 6-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.

Fish tissue sample preparation.

Fish tissue data are also utilized to assess impairment of Nebraska's waterbodies. Where fish consumption advisories exist, the NDEQ places those waters on the State's Section 303(d) List of Impaired Waterbodies with regard to aquatic life. Nebraska does not have an assigned beneficial use of "fish consumption" in Title 117 Surface Water Quality Standards, therefore the assumption is made that if contaminant loads to fish can affect human health, it is probable that these contaminants can impact aquatic life health.

Current Advisories

As of May 2012, the NDHHS, in cooperation with the NDEQ, the NGPC, and the NDA, has issued fish consumption advisories for 78 waterbodies: 12 stream segments and 66 lakes/reservoirs. These advisories are not bans on eating fish, rather a warning to limit the consumption of specified fish. Please refer to the table and figure below for advisory and location information.

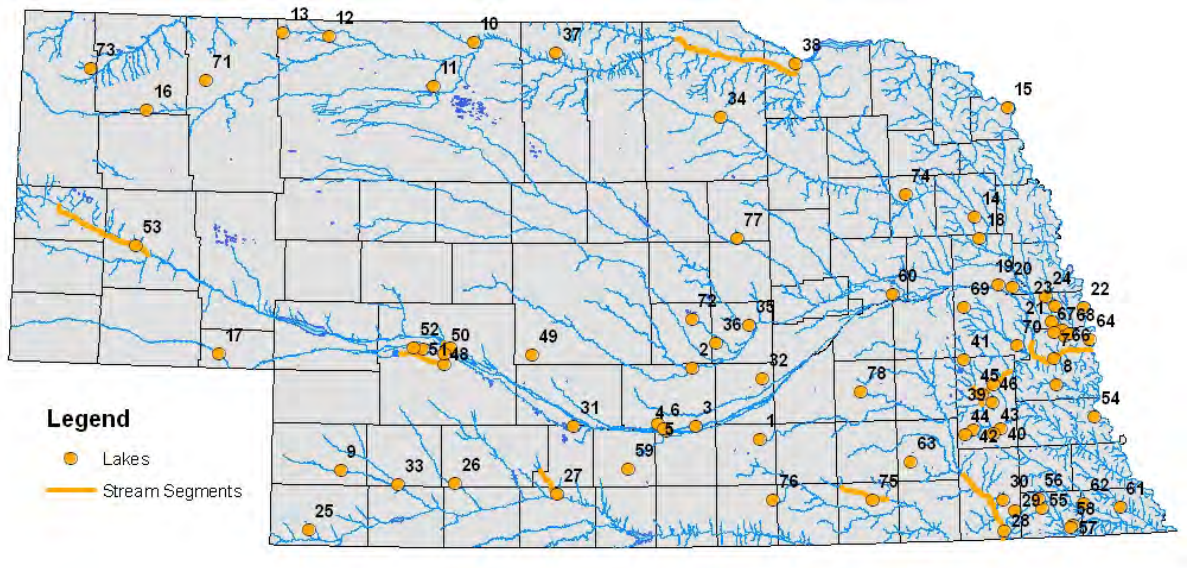
Nebraska Fish Consumption Advisories Through 2010

MAP I.D. #	WATERBODY	COUNTY	FISH SPECIES	PRIMARY POLLUTANT(S) OF CONCERN
1	Lake Hastings	Adams	Carp	PCBs
2	Ravenna Lake	Buffalo	Largemouth Bass	Mercury
3	Bassway Strip Lake No. 5	Buffalo	Largemouth Bass	Mercury
4	Kea Lake	Buffalo	Largemouth Bass	Mercury
5	Cottonmill Lake	Buffalo	Largemouth Bass	Mercury
6	Yanney Park Lake	Bufflalo	Largemouth Bass	Mercury, Selenium
7	Platte River	Cass	Channel Catfish	PCBs, Mercury
8	Weeping Water City Lake	Cass	Largemouth Bass	Mercury, Selenium
9	Enders	Chase	White Bass	Mercury
10	Valentine Mill Pond	Cherry	Largemouth Bass	Mercury
11	Merritt Reservoir	Cherry	Walleye	Mercury
12	Cottonwood Lake	Cherry	Largemouth Bass	Mercury
13	Shell Lake	Cherry	Northern Pike	Mercury
14	West Point City Lake	Cuming	Largemouth Bass	Mercury
15	Crystal Cove Lake	Dakota	Largemouth Bass	Mercury
16	Box Butte Reservoir	Dawes	Northern Pike	Mercury
17	Chappell Interstate Lake	Deuel	Largemouth Bass	Mercury, Selenium
18	Dead Timber Lake	Dodge	Largemouth Bass	Mercury
19	Fremont Lake No. 1	Dodge	Largemouth Bass	Mercury
20	Johnson Lake	Dodge	Largemouth Bass	Mercury
21	Lake Bennington	Douglas	Largemouth Bass	Mercury
22	Zorinsky Lake	Douglas	Largemouth Bass	Mercury
23	Carter Lake	Douglas	Largemouth Bass	PCBs
24	Standing Bear Lake	Douglas	Largemouth Bass	Mercury
25	Rock Creek Lake	Dundy	Largemouth Bass	Mercury
26	Hugh Butler/Red Willow Lake	Frontier	Northern Pike	Mercury
27	Muddy Creek	Furnas	Channel Catfish	Mercury
28	Big Blue River	Gage	Carp	PCBs, Dieldrin
29	Wolf-Wildcat Lake	Gage	Largemouth Bass	Mercury
30	Rockford Lake	Gage	Largemouth Bass	Mercury
31	Phillips Lake	Gosper	Carp	Mercury
32	Eagle Scout Lake	Hall	Largemouth Bass	Mercury
33	Frenchman WMA Lake	Hayes	Largemouth Bass	Mercury
34	O'Neill City Lake	Holt	Largemouth Bass	Mercury
35	North Loup SRA Lake	Howard	Largemouth Bass	Mercury, Selenium
36	Farwell South Reservoir	Howard	Largemouth Bass	Mercury

Table Continued

37	Cub Creek Lake	Keya Paha	Largemouth Bass	Mercury
38	Niobrara River	Knox	Carp	Mercury, Selenium
39	Salt Creek	Lancaster	Carp	PCBs, Mercury
40	Wagon Train Lake	Lancaster	Largemouth Bass	Mercury
41	Wildwood Reservoir	Lancaster	Largemouth Bass	Mercury
42	Bluestem Lake	Lancaster	Channel Catfish	Mercury
43	Stagecoach Lake	Lancaster	Largemouth Bass	Mercury
44	Merganser Lake	Lancaster	Largemouth Bass	Mercury
45	Oak Creek	Lancaster	Channel Catfish	PCBs, Mercury
46	Holmes Lake	Lancaster	Largemouth Bass	Mercury
47	North Platte River	Lincoln	Largemouth Bass	Mercury
48	Maloney Res. Outlet Canal	Lincoln	Carp	Mercury
49	Sutherland Outlet Canal	Lincoln	Carp	PCBs, Mercury
50	Interstate Lake	Lincoln	Largemouth Bass	Mercury
51	East Hershey Lake	Lincoln	Largemouth Bass	Mercury
52	Hershey Lake	Lincoln	Largemouth Bass	Mercury
53	North Platte River	Morrill	Carp	Mercury, Selenium
54	Steinart Park Lake	Otoe	Largemouth Bass	Mercury
55	Burchard Lake	Pawnee	Largemouth Bass	Mercury
56	Mayberry WMA Lake	Pawnee	Largemouth Bass	Mercury
57	Prairie Knoll Lake	Pawnee	Largemouth Bass	Mercury
58	Iron Horse Trial Lake	Pawnee	Largemouth Bass	Mercury
59	Holdredge Park Lake	Phelps	Largemouth Bass	Mercury, Selenium
60	Columbus City Park Pond	Platte	Largemouth Bass	Mercury
61	Verdon Lake	Richardson	Largemouth Bass	Mercury
62	Kirkman's Cove Lake	Richardson	Largemouth Bass, Carp	Mercury
63	Willard L. Meyer/Swan Creek 5A	Saline	Largemouth Bass	Mercury
64	Offutt Lake	Sarpy	Channel Catfish	PCBs
65	West Papillion Creek	Sarpy	Carp	PCBs, Dieldrin
66	Walnut Creek Lake	Sarpy	Largemouth Bass	Mercury
67	Wehrspann Lake	Sarpy	Largemouth Bass	Mercury
68	Halleck Park Lake	Sarpy	Largemouth Bass	Mercury, Selenium
69	Czechland Lake	Saunders	Largemouth Bass	Mercury
70	Memphis Lake	Saunders	Largemouth Bass	Mercury
71	Walgren Lake	Sheridan	Largemouth Bass	Mercury
72	Sherman Reservoir	Sherman	Walleye	Mercury
73	Carter P. Johnson Lake	Sioux	Largemouth Bass	Mercury
74	Maskenthine Lake	Stanton	Largemouth Bass	Mercury
75	Big Sandy Creek	Thayer	Channel Catfish	Mercury
76	Liberty Cove	Webster	Largemouth Bass	Mercury
77	Pibel Lake	Wheeler	Largemouth Bass	Mercury
78	Recharge Lake	York	Largemouth Bass	Mercury

Location of Nebraska Fish Consumption Advisories Through 2010



For More Information Contact:
Nebraska Department of Environmental Quality: (402) 471-4264 or greg.michl@nebraska.gov ,
Nebraska Game and Parks Commission: (402) 471-5553,
Nebraska Health and Human Services System: (402) 471-8880.

For Reports and Other Information Online go to: http://deq.ne.gov
The direct URL link to "Findings of the 2006 to 2008 Regional Ambient Fish Tissue Program in Nebraska":

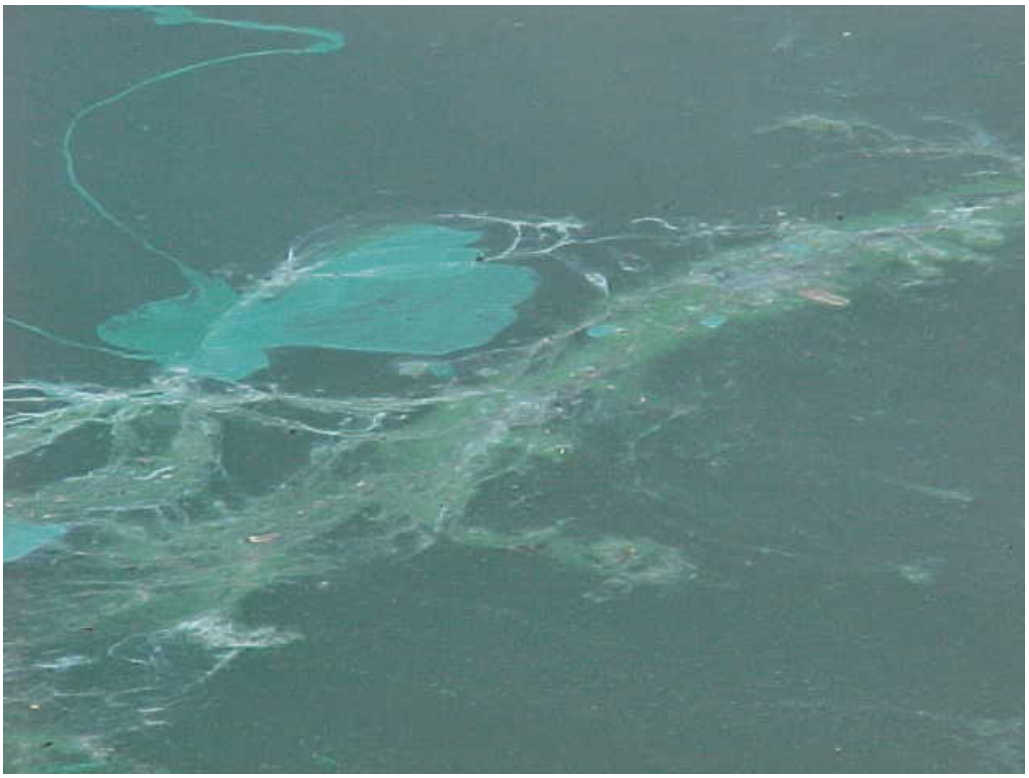
http://deq.ne.gov//Publica.nsf/Pages/WAT155 . To find it on NDEQ's web site, click on the Publications tab, select Water Quality, find it under "Reports."

The direct URL to NDEQ's "Fish Consumption Advisories" page is:

http://deq.ne.gov//SurfaceW.nsf/Pages/FCA To find it on NDEQ's web site, click on the NDEQ News/Topics of Interest tab, then select "Fish Consumption Advisories."

Public Beach Monitoring – Bacteria and Microcystin

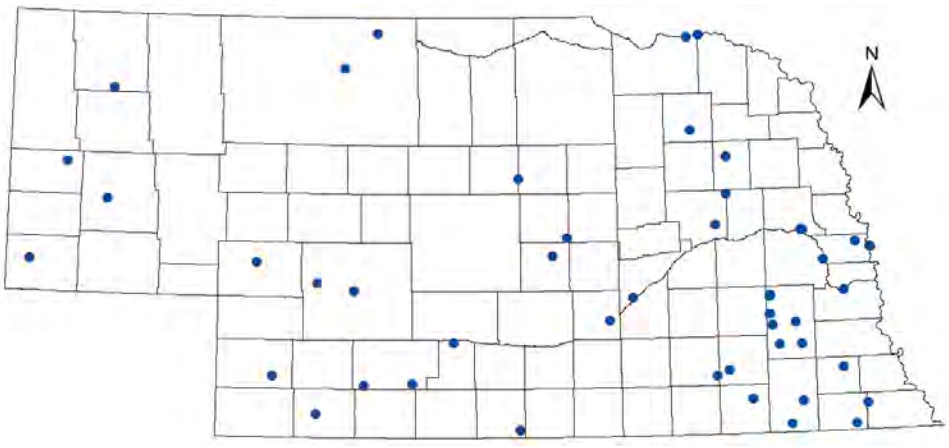
Why Does NDEQ Monitor Public Beaches?
Nebraska's lakes and reservoirs provide a multitude of opportunities for visitors to enjoy the outdoors. Visitors to these areas often times enjoy activities such as swimming, boating, skiing, jet skiing, etc. NDEQ wants to ensure that the users of these waters are informed with the most current water quality information possible.



Blue-Green Algae Bloom. Photo by Greg Michl

When and Where is the Monitoring Conducted?

Sampling for bacteria at Nebraska's beaches has been occurring for many years. Nebraska Game and Parks Commission initiated sampling at a number of

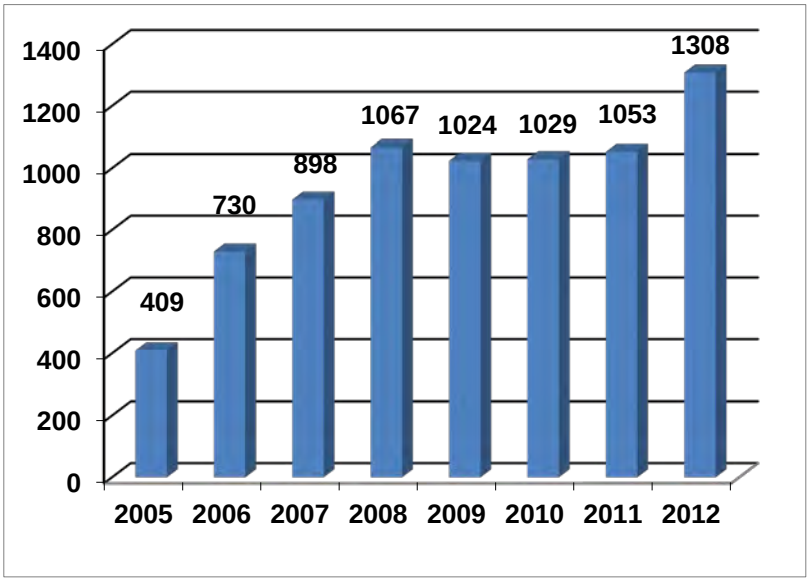


Map of Lakes Sampled for the Beach Monitoring Program in 2012

locations in the 1970s. NDEQ eventually took over the sampling program in the 1990s. In 2004 NDEQ began sampling for the toxin, microcystin; after it was determined that high levels in some Nebraska lakes attributed to the deaths of several dogs that had ingested the water. In 2005, NDEQ and its partners began a more comprehensive plan for collecting samples from publicly owned and operated lakes. Weekly sample collection of 51 sites from 48 lakes coincides with the recreation season (May 1 to September 30). Since the inception of NDEQ's comprehensive beach monitoring program in 2005 more than 7500 samples have been analyzed for microcystin and E.Coli bacteria.

What is Monitored at the Beaches?

E. coli bacteria and blue-green algae toxins, primarily microcystin, are monitored to give an indication of the quality of water at Nebraska swimming beaches. *E. coli* bacteria are monitored to provide an "indirect" indication of potentially harmful (pathogenic) bacteria. While all *E. coli* bacteria are not considered a threat to human health, some bacteria strains are. The larger the population of *E. coli* bacteria measured, the greater are the odds of having harmful pathogenic bacteria. Using this rationale, the value of 235 colonies of *E. coli* bacteria per 100 mL is established as the upper limit for supporting full body contact recreation. When people ingest water with higher levels of *E. coli* bacteria, flu-like symptoms may occur.



Beach Monitoring: Number of samples taken, 2005-2012

E. coli bacteria are primarily associated with animal and human waste. Animal sources of *E. coli* bacteria commonly enter our waters from livestock and wildlife wastes that runoff the landscape during significant rainfall events. Human sources of contamination can include improperly maintained septic systems and wastewater treatment facilities that discharge untreated wastewater.

Toxins, including microcystin, are produced by certain types of blue-green algae. Microcystin in the water can cause skin rashes, lesions, and blisters on people who have been swimming or wading. If toxins are swallowed they can cause headaches, nausea, muscle or stomach pain, diarrhea, or vomiting. Though rare, severe cases can

include seizures, liver or respiratory failure, or even death. The microcystin level of 20 ppb is established as the criterion for full body contact recreational activities.
While all types of blue-green algae are not toxic, the greater the population of blue-green algae, the greater is the chance of having toxic algae problems. In the absence of direct microcystin toxin measurements, one should recognize a severe blue-green algae bloom and treat it with caution. Blue-green algae often have a "John Deere green" or "pea green soup" color, appear as thick green paint or oil floating on the surface of the water (see photo at beginning of this narrative) and usually have a strong septic odor.

How are the Data Used?

NDEQ and its partners (typically local NRDs) collect the lake water sample at the beaches early in each week. Because the sample collectors do their own bacteria analysis and NDEQ analyzes the microcystin samples as opposed to sending them out to a contract lab, the results are quickly available and are posted on the Department's internet site by Thursday of the same week (http://deq.ne.gov). This schedule provides information to the public prior to the weekend, when the majority of lake use occurs.

When levels of microcystin exceed 20 ppb (parts per billion the same as micrograms per liter (µg/l)), the NDEQ and 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 µg/l criterion for two consecutive weeks. If one has prolonged contact with water suspected to have high levels of the microcystin toxin, it is recommended that they shower with fresh water as soon as possible.

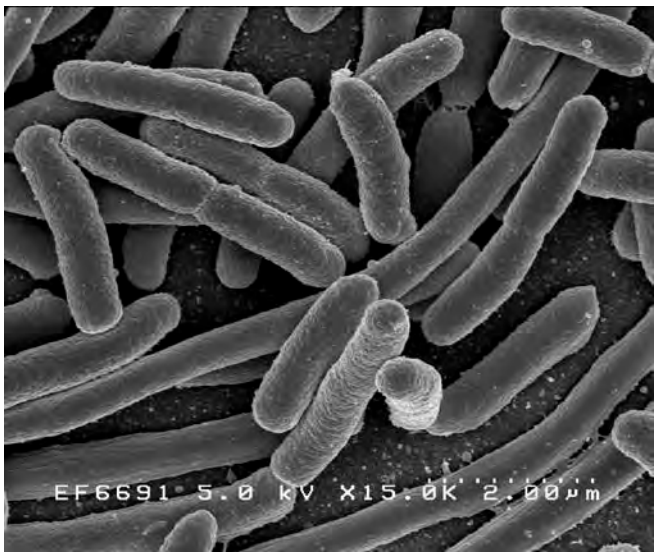
NDEQ staff sampling at Willow Creek Reservoir, near Pierce, Pierce County. The lake was under a "Health Advisory." Photo courtesy of Dave Bubb (NDEQ).

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, 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. Guidance provided to assist the public in the decision making process includes:

- Assess the length of time from heavy rainfall to the time of use;
- Assess the condition of a lake and consider avoiding abnormally turbid waters;
- Consider chronic problems where bacteria levels are consistently high even in the absence of rainfall;
- Avoid situations which could result in a higher potential of swallowing lake water;
- When levels are high, shower after coming in contact with the water; and
- Wash hands before eating after you have been in contact with lake water.

Lakes that repeatedly exceed the *E. coli* and microcystin water quality standard may be put on Nebraska's Clean Water Act 303d list of impaired waters.



Microscopic view of E. coli.

2012 Results

In 2012, the Beach Monitoring program collected and analyzed approximately 1,300 samples for *E. coli* and the microcystin toxin.

Bacteria

Of the bacteria samples taken and analyzed during 2012, 25 samples (2.5%) exceeded the 235 counts/100ml of water standard.

In the table below, the number of samples that exceeded 235/100 ml criterion for bacteria by month for 2005 through 2012 is shown. This table also provides the combined totals per month as well as per year. Note that most high levels occur in the early spring and summer months, in times of higher precipitation (and the associated higher run-off). The extremely low amount of rainfall in 2012 led to a lower than normal number of bacteria readings that exceeded the water standard. Of the 25 high bacteria samples collected during 2012, 15 (60%) occurred during the months of May and June while the remaining 10 samples occurred during July through September.

Beach Samples Exceeding the 235 counts/100 ml E.Coli Bacteria Criterion

Year	May	June	July	August	Sept.	TOTAL
2005	10	8	7	10	2	37
2006	11	14	14	9	7	55
2007	31	14	10	7	12	74
2008	21	30	19	4	15	89
2009	11	17	9	3	4	44
2010	10	27	6	4	6	53
2011	15	23	5	10	3	56
2012	9	6	2	5	3	25
TOTAL	**118**	**139**	**72**	**52**	**52**	**433**

Toxic Algae (Microcystin)

Of the 1000 plus samples collected and analyzed for the microcystin toxin during 2012, only 15 samples exceeded the 20 ppb threshold for closing a beach. This accounts for approximately 1.5% of the total samples collected.

In 2012, five lakes were placed on Health Alert for a total of 25 weeks. The table below shows the lakes that had samples exceed the 20 ppb health standard.

Lakes with Microcystin Toxin Exceeding 20 ppb

Waterbody	County	# of Samples Exceeding 20 ppb	# of Weeks on Health Alert
Big Indian Lake	Gage	3	5
Kirkman's Cove	Richardson	5	7
Maskenthine Lake	Stanton	2	4
Rockford Lake	Gage	1	2
Swan Creek Lake # 5A	Saline	4	7

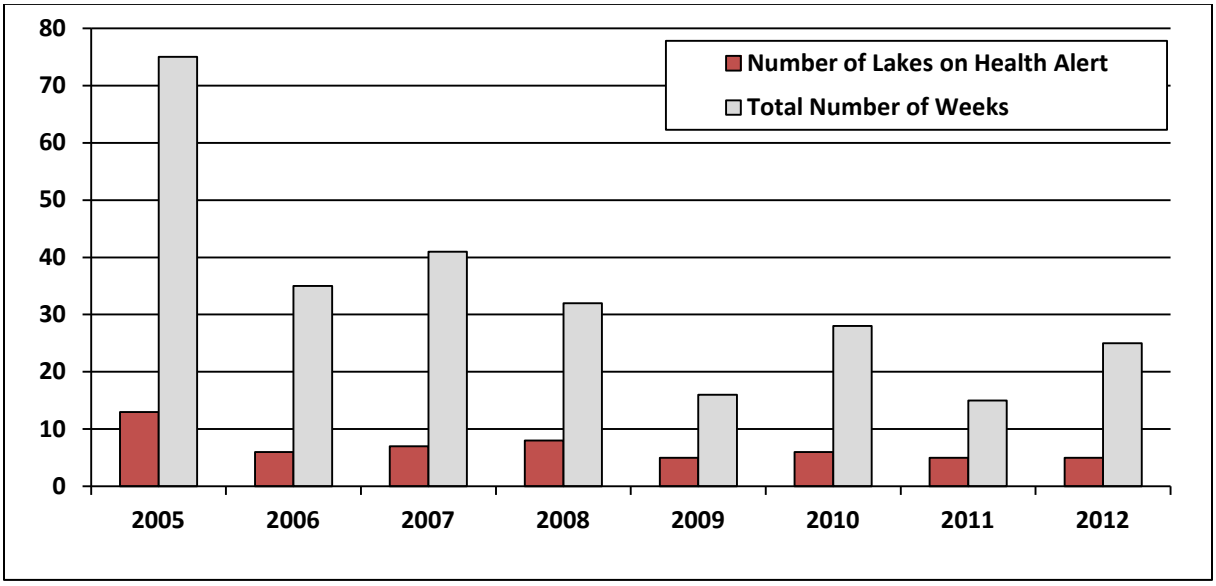
The following table shows the number of samples exceeding the microcystin 20 ppb criterion monthly for 2005 through 2012. It also shows the totals for each year as well as for each month through the years. Unlike with bacteria where high levels are more frequently observed in the springtime, blue-green algae (microcystin) impacts are usually observed later in the summer, after lake water has warmed and algae growth is more significant.

Blue-green algae at Holmes Lake, Lincoln, Lancaster County.

Beach Samples Exceeding the 20 ppb Microcystin Criterion

Year	May	June	July	August	Sept.	TOTAL
2005	8	8	9	20	14	59
2006	5	5	8	8	7	33
2007	14	9	12	7	1	43
2008	0	2	4	7	13	26
2009	1	1	3	3	0	8
2010	0	1	1	8	10	20
2011	0	0	6	0	3	9
2012	0	3	4	7	1	15
TOTAL	**28**	**29**	**47**	**60**	**49**	**198**

The bar graph below shows the number of lakes on health alert and the number of total combined weeks that lakes were on health alert each year from 2005 – 2012.



Number of lakes on Health Alert and the number of combined weeks that lakes were on Health Alert each year from 2005 – 2012.

Why are there problems at some lakes and not others?

Biological communities such as algae are very complex systems and are affected by many variables. The toxic algae issue gets even more complicated as some species of blue-green algae sometimes produce toxins while other times do not. Research is presently being conducted worldwide to answer this question.

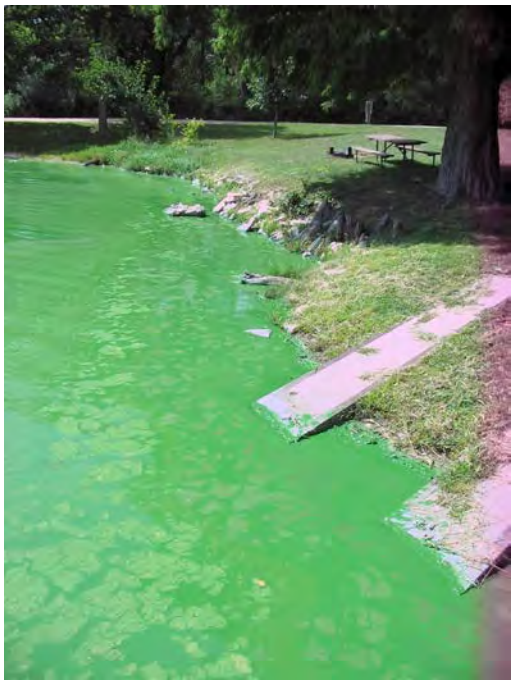
Certain conditions seem to consistently have significant affects. The following conditions are often associated with blue-green algae blooms:

- General weather of each year including the temperature, amount of sunlight and rainfall;
- Nitrogen and phosphorous (nutrients) content in runoff water;
- Low lake water levels. During drought years, problems seem to be more frequent; and
- Increased cloud cover which implies reduced sunlight and lower water temperatures.

In general, algae production is affected by temperature, sunlight and the nutrients of nitrogen and phosphorus.

Toxic algae conditions during 2005 were significantly worse when compared to the other years. 2005 was characterized by lower rainfall, higher temperatures and was toward the end of a major drought. In general, lake levels were significantly lower across the State. In contrast, 2011 was characterized by very heavy spring rainfall and relatively full lakes which led to a low number of lakes that experienced toxic algal blooms.

While the issue of toxic algae and its causes are quite complex, it is easier to understand by reducing the problem to simpler terms. In general, algae production is affected by temperature, sunlight and the nutrients of nitrogen and phosphorus. Higher temperature, sunlight and nutrients result in greater blue-green algae production and therefore, a greater chance for toxic algae problems.



Blue-Green Algae Bloom in Alexandria Lake #3, near Alexandria, Jefferson County. Photo by Dave Bubb.

While temperature and sunlight are beyond our control, we can reduce the amount of nutrients reaching rivers, streams and lakes. Any management practice that can be incorporated in a watershed that reduces these inputs into waters will reduce algae production and therefore the potential for toxic algae problems.

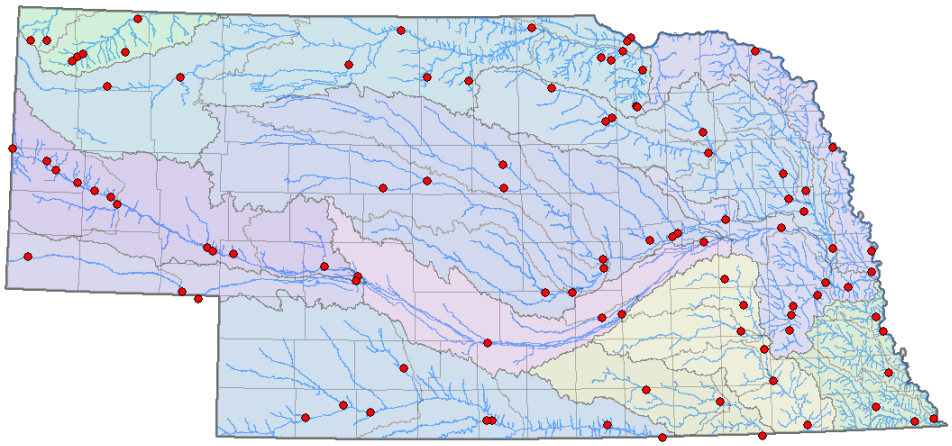
More Information:
Information on NDEQ's Beach Monitoring Program and recreation season weekly sampling results is available at http://deq.ne.gov

Contact: Mike Archer at Mike.Archer@nebraska.gov or (402) 471-4224
Dave Schumacher at David.Schumacher@nebraska.gov or (402)471-4709

Ambient Stream Monitoring

Why Does NDEQ Monitor Streams?
Nebraska's streams and rivers provide essential resources to the residents of our state. These streams supply irrigation and drinking water, support diverse fish and wildlife communities, offer numerous recreational opportunities, and are integral to the state's industrial and electricity production. However, many of these streams also serve as conveyances to dispose of agricultural, industrial, and municipal wastewater and runoff. Assuring that Nebraska's streams can safely support these numerous, and at times, conflicting uses is the responsibility of the NDEQ.

Regular stream monitoring allows NDEQ to determine if water quality conditions meet state and federal standards to safely support the assigned designated uses. If the monitoring data indicates a water quality problem, NDEQ uses this data to locate potential pollutant sources and develop point and non-point source pollution control plans. Regular monitoring also allows NDEQ to recognize trends in stream water quality that may lead to more efficient and effective pollution controls. Finally, NDEQ uses stream monitoring data to generate a portion of the Water Quality Integrated Report to submit to the United States Environmental Protection Agency, as required by the Federal Clean Water Act. This report is submitted in April of even numbered years and is used by NDEQ as part of the prioritization process for the development of pollution control or watershed management plans.



Locations of NDEQ ambient monitoring sites

Where and When is the Monitoring Done?
The ambient stream monitoring program consists of 97 fixed monitoring sites designed to collect data from all 13 of Nebraska's major river basins. Samples are collected from each site on the first week of each month, year-round. The map below shows the locations of the 97 monitoring sites.

How were the Monitoring Sites Selected?
Nebraska's ambient stream monitoring program was designed to evaluate surface water quality in each of the State's 13 major river basins. To achieve this goal, the 13 major basins were subdivided by geology, land-use, soil type, and topography. Three types of monitoring sites were then established in each basin: indicator sites, stream integrator sites, and basin integrator sites. Indicator sites are located on streams that drain areas

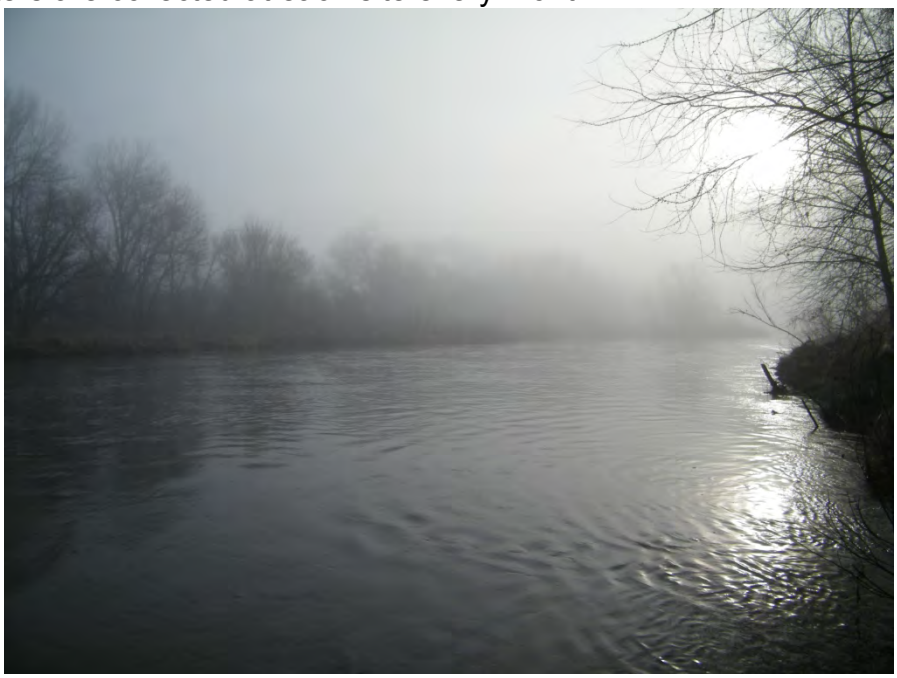
of homogenous land-use, soil type, and geology, and provide background water quality information for the predominate regions of each basin. Stream integrator sites are located at key intersections in the drainage network so that the most significant tributaries or contaminant sources in a basin are sampled by at least one integrator site. Basin integrator sites are located at the bottom of each major basin and provide insight into the water quality of the entire river basin.

What is Monitored?

NDEQ monitors numerous water quality parameters 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
- total nitrogen
- total phosphorus
- total chlorides

Pesticide samples are collected at all sites from April though September. Arsenic and selenium are collected at all sites quarterly, as are a complete suite of metals at each basin integrator site.



Republican River, south of Hardy, Nuckolls County/Kansas boundary.

History of the Ambient Stream Monitoring Program

NDEQ has maintained a network of stream monitoring sites since the inception of the agency in 1971. In the early 1970s, 365 sites were monitored on a quarterly basis to gather baseline data on streams where there was limited information. In 1978, the program was reorganized to consist of 90 sites that were monitored monthly. The program was again restructured in 2001 to its current configuration and sampling has been conducted monthly at each of the 97 sites ever since, resulting in ~1164 water quality samples being collected annually.

Impairments and Sources

The most recent assessment of the ambient stream monitoring network found that 77 of the 97 monitored stream segments were impaired (some segments had multiple impairments). An impairment means the stream water quality does not meet state requirements for at least one of its designated uses (either recreation, drinking water, irrigation water, or the support of aquatic life).

The most common water quality impairment from the 2012 assessment was E. coli which violates the recreational beneficial use. E. coli samples are collected from water bodies used for recreational uses such as swimming and boating. E. coli in the lake water can cause gastrointestinal problems if swallowed. E. coli exists naturally in the environment. It gets into lakes and rivers via wildlife, human sources, and from runoff after a rainfall event. A few sources of E.coli include wildlife and livestock feces and failing septic systems.

More information about all surface water impairments is available in the 2012 Integrated Report. This report combines the Clean Water Act 303(d) impaired waters list with the 305(b) summary of the health of Nebraska's surface waters. This report is available on NDEQ's website.

Trends

The design of the ambient monitoring program also allows the NDEQ to recognize trends in stream water quality and determine the efficacy of current pollution control strategies.

The table shows the trend results from one parameter (the pesticide, Atrazine). The results of the analysis can be: increasing trend observed, decreasing trend observed, and stable water quality (not increasing or decreasing). The Department considers a trend to be significant when the p-value is ≤0.05 (the probability of the observed trend being due to random chance is less than 5%)

Waterbody Name	Atrazine Trend Status	P-value
W. Fork Big Blue River	Decrease	0.137
North Platte River	Decrease	0.001
South Platte River	Decrease	0.089
Papillion Creek	Decrease	0.131
Plum Creek	Decrease	0.109
Lodgepole Creek	Decrease	0.077
Elkhorn River	Stable	0.207
Pebble Creek	Stable	0.206
Salt Creek	Stable	0.378
Missouri River	Stable	0.41
Loup River Power Canal	Stable	0.257
Big Blue River	Stable	0.622
Little Blue River	Stable	0.639
Big Sandy Creek	Stable	0.203
Platte River	Stable	0.405
Big Nemaha River	Stable	0.367
Little Nemaha River	Stable	0.506
Republican River	Stable	0.552
Chadron Creek	Stable	0.407
South Loup River	Stable	0.411
Platte River	Stable	0.448
Niobrara River	Stable	0.557
Winters Creek	Stable	0.435
White River	Stable	0.861
Platte River	Increase	0.12
Medicine Creek	Increase	0.01

Trend analysis results for the pesticide Atrazine from NDEQ's ambient stream monitoring program.

More Information:

For more information on the quality of Nebraska's streams, the most recent *Surface Water Quality Integrated Report* and the *Annual Report to the Legislature* are available on the Department's website at http://deq.ne.gov

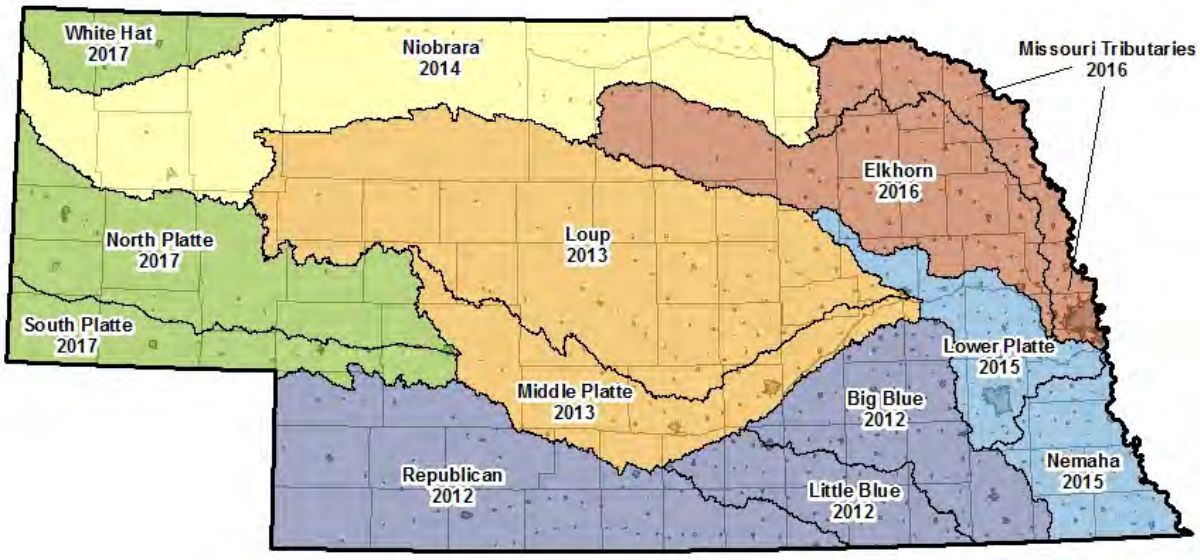
Contact:

David Schumacher at David.Schumacher@nebraska.gov or (402) 471-4709
Michael Archer at mike.archer@nebraska.gov or (402) 471-4224

Basin Rotation Monitoring

Why Does NDEQ Conduct Basin Rotation Monitoring?

A goal of the Federal Clean Water Act is that each state assess the water quality of "all navigable waters of the State". In Nebraska, this means assessing over 16,000 miles of streams and rivers, and more than 148,000 acres of lakes and reservoirs. These water quality assessments are used to determine if the sampled waterbodies are safe for recreation and if they can support aquatic life and industrial or agricultural uses. If the data shows that a waterbody cannot support all of its designated uses due to pollution, NDEQ begins a process to determine the source of the pollution and develop a pollution control strategy. This process can be both time consuming and costly, so it is imperative that NDEQ has sufficient data on a waterbody before it makes a determination on the water quality. The basin rotation program was developed so that NDEQ can work towards the goal of assessing all waterbodies within the state, while at the same time, insuring sufficient data is collected to determine if a waterbody is impaired by pollution. By focusing sampling efforts to a few adjacent river basins each year, NDEQ can collect enough water quality samples to perform accurate assessments, while at the same time, collect data from many waterbodies because of the reduced size of the sampling area.



NDEQ six-year basin rotation monitoring schedule

Where and When is the Monitoring Done?

Monitoring is done on a six-year rotation in the 13 major river basins in the state. Monitoring in each basin, during its rotation year, is done on a weekly basis between May 1 through September 30. In 2012, a total of 28 streams and 11 lakes were sampled in the, Big Blue, Little Blue, and Republican River Basins. This sampling resulted in ~820 water quality samples being collected. The map above shows the basins and their rotation schedule.

How are the Monitoring Sites Chosen?
One of the primary objectives for the Basin Rotation Program is the protection of public health. To meet this objective NDEQ, aims to assess 100% of the stream segments and public lakes that support primary contact recreation (swimming and wading). For this reason, the majority of monitoring sites in this program have been designated for recreation.

What is Monitored?
NDEQ monitors a suite of water quality parameters 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: ammonia, nitrate-nitrite, total nitrogen, total phosphorus, total chlorides, total suspended solids, turbidity, pH, temperature, conductivity, dissolved oxygen, *E. coli* bacteria, and pesticides.

Impairments and Sources
The most common impairment detected by NDEQ's basin rotation monitoring program is the bacteria *E. coli*. Potential sources of bacterial pollution are improperly functioning waste water treatment facilities, septic tanks, and lagoons, as well as urban and agricultural runoff.

Merritt Reservoir, Cherry County. Drought conditions made some sampling difficult to accomplish.

The herbicide atrazine is the second most common impairment detected. Atrazine is a widely used herbicide that is commonly applied in the spring when rain events can cause cropland runoff to enter nearby streams and rivers.

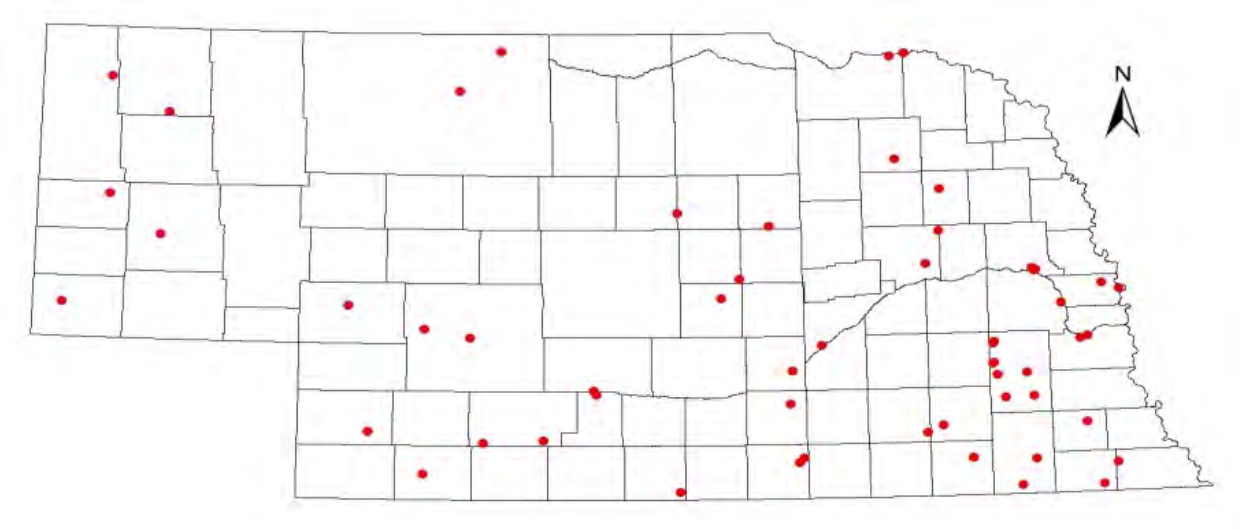
Data from the basin rotation monitoring are combined with the ambient and other surface water monitoring programs to make up the data package used for all assessments of the status of Nebraska's waters.

More Information
For more information on the quality of Nebraska's streams, the most recent *2012 Integrated Report* are available on the Department's website at http://deq.ne.gov . Additional questions can be directed to Patrick Hartman (patrick.hartman@nebraska.gov) or Dave Schumacher (david.schumacher@nebraska.gov)

Nebraska Lake Monitoring

Why Monitor Lakes and Reservoirs?
Nebraska's natural lakes and man-made reservoirs have different public usage throughout the year. NDEQ monitors these resources to determine if water quality is good enough for recreational activities such as swimming and water skiing, and suitable for fish and other aquatic organisms to survive and reproduce.

From May 1 to September 30, the Department and its partners obtain monthly samples from publicly owned lakes and reservoirs across the state. In some cases, the streams that flow into reservoirs are also monitored. Since reservoirs are a reflection of their watersheds, data on streams that flow into reservoirs can provide useful information in evaluating water quality problems. In 2012, 53 lakes were monitored for chemical and biological parameters while fish tissue monitoring was conducted at 26 lakes. Stream monitoring was conducted above eight reservoirs.



Lake sampling locations 2012

What is monitored?
To determine if water quality is good enough to meet its intended uses in these lakes, samples are taken monthly for the following:

- dissolved oxygen
- temperature
- conductivity
- pH
- water clarity
- nutrients
- bacteria
- pesticides
- microcystin

May through September is considered to be the “growing season” of a lake or reservoir and are the months of the year when water quality tends to be the worst. Streams above reservoirs are typically monitored during and after rain events for nutrients, sediment, and pesticides.

How are the Data Used?

Collected data are compared to a Water Quality Standard or benchmark that will indicate if there is a concern. For most parameters, a minimum number of violations or excursions will be allowed before the waterbody is considered to be impaired or not to have good enough quality. If a waterbody is considered to be impaired, it will be placed on Nebraska’s Section 303(d) List of Impaired Waters. Once on this list, more information is collected to develop water quality targets and pollutant reduction goals. These targets and reductions are incorporated into a document called a Total Maximum Daily Load (TMDL). The TMDL then provides the basis for water quality improvement projects sponsored by various resource management and funding agencies such as Natural Resources Districts, cities, Nebraska Game and Parks Commission, and USDA-Natural Resources Conservation Service to name a few. While the Section 303(d) list is revised every two years, assessments on each lake or reservoir are conducted on an annual basis. Results of the assessments are presented in the Surface Water Quality Integrated Report that is prepared by NDEQ on even numbered years. This report is available on-line at http://deq.ne.gov .

Merritt Reservoir, Cherry County August 2012,
Photo - Dave Bubb, NDEQ

Statewide Concerns

Nebraska Surface Water Quality Standards identifies 528 public lakes totaling 148,920 surface acres. Since 1991, the NDEQ and its partners have monitored 229 public lakes totaling 138,837 surface acres. This represents 43 percent of the total lakes and 93 percent of the total lake surface acres in the state.

Nutrients and algae related issues are the most common lake impairments. Excessive algae growth can increase the pH of the water which can make some things, like ammonia, more toxic to aquatic organisms. Excessive nutrients can also lead to blooms of blue green algae and high concentrations of microcystin, which is a toxin produced by this algae.

The accumulation of contaminants in the tissue of fish is a growing concern across the country. Approximately 35 percent of the lakes assessed had unacceptable concentrations of contaminants in fish tissue (see "Fish Tissue Monitoring" section of this report). In most cases, the impairments were due to mercury which is believed to be entering lakes through atmospheric deposition.

Lake Improvement Programs

When water quality programs were first initiated at NDEQ, most efforts were aimed at reducing the impacts of point source discharges. From the early 1970s through the present, lake and reservoir management has evolved to include nonpoint sources. Several programs administered by NDEQ as well as other local, state, and federal programs work to protect impounded waters. Some of the programs administered by NDEQ that are protective of the quality of impounded waters include Livestock Waste, Wastewater, Storm Water, and Nonpoint Source.

NDEQ staff filtering a water sample at Rockford Lake, Gage County, photo-Dave Bubb, NDEQ

Numerous agencies, including local, state, and federal, are involved in different aspects of lake and reservoir management whether it be the collection and/or assessment of data, water quality planning, or implementing projects to address water quality problems. The coordination of efforts among these entities has allowed for a more comprehensive and cost effective approach to lake and reservoir management.

Pesticide Trends in Lakes and Reservoirs

In 2012, the NDEQ assessed the results of our pesticide analysis data collected in all state lakes and reservoirs. The assessment was conducted using lake monitoring data collected from 1993-2008 on five of the major pesticides used in the state. This information is summarized in a report titled, "Occurrence and Trends of Pesticides in Nebraska Lakes and Reservoirs 1993-2008". The report contains information on the trends observed in the pesticide data collectively and by each of the 13 major river basins. The report is available on-line at http://deq.ne.gov .

More Information

NDEQ's Lake and Reservoir Monitoring Program is managed and conducted out of the main office in Lincoln. For more information, contact Mike Archer at (402-471-4224) or at mike.archer@nebraska.gov .

Stream Biological Monitoring Program

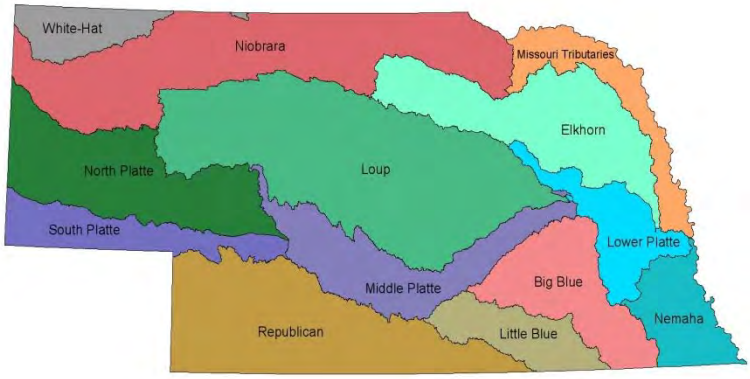
Why Biological Monitoring?

Medicine Creek, near Stockville, Frontier County, above Harry Strunk Reservoir.

Nebraska has over 81,000 miles of streams of which over 16,000 miles flow continuously. Streams in Nebraska are capable of containing a rich diversity of aquatic life including aquatic macroinvertebrates (i.e. small animals living in water that can be seen with a naked eye), fish, amphibians, and mammals. Nitrogen, phosphorus, pesticides, sediment, and other pollutants are stressors that can degrade stream conditions for aquatic life, and can be potentially harmful to people. The aim of the Stream Biological Monitoring Program (SBMP) is to provide accurate statewide assessments of the biological conditions of Nebraska's streams so that sound decisions in management, planning, and regulation can be made.

History of the Stream Biological Monitoring Program:

The Department began biological monitoring in 1983 with a targeted approach for classifying stream segments for Title 117 (Nebraska Surface Water Quality Standards). These sites were typically located at bridges. Over 900 stream sites were sampled for fish and macroinvertebrates over a 14 year period. In 1997, the Department added a probabilistic monitoring design that involved the sampling of randomly selected sites to it's SBMP in order to address statewide and regional questions about water quality. Data to answer such questions as "How good is the water quality in Nebraska?" are best obtained such that all streams have an equal chance of being sampled. These monitoring sites are generated by a computer program that randomly chooses sites on streams throughout Nebraska. From 1997-2011, the biological communities of 512 randomly selected stream sites were sampled.



Where is the Monitoring Conducted?
Each year 34-40 randomly selected wadeable stream sites (i.e. streams that are shallow enough to sample without boats) are chosen for study in two or three river basins throughout Nebraska. During a six-year cycle, all 13 major river basins in the state are intensively monitored (see map for basin divisions).

What is Monitored?
Routine chemical analyses of water samples provide water quality information for a snapshot in time meaning short-term pollution events may never be detected. Chemical analyses also provide no indication of the stream's physical nature or habitat. The "health" of a stream depends on not only the contaminants present or absent, but the quality of the habitat and the creatures living there. NDEQ's SBMP assesses the health of streams by evaluating the composition and numbers of resident aquatic macroinvertebrate and fish communities. Assessments are made by comparing the macroinvertebrate and fish communities at "reference condition" streams where there are no significant disturbances, to the communities collected from the randomly selected stream sites.

Aquatic Macroinvertebrates

Mayfly larvae

Aquatic macroinvertebrates are small creatures that live in streams attached to rocks, vegetation, or woody debris, or burrowed into the stream bottom. They include aquatic larval stages of insects such as mayflies and dragonflies; crustaceans such as crayfish and clams; and worms and snails. Because they are extremely sensitive to pollutants, macroinvertebrate populations often respond to changes in water quality caused by the introduction of various contaminants into the stream. Department personnel have collected nearly 600 different species of macroinvertebrates since 1997 through the sampling effort associated with the SBMP. In addition, numerous new species not previously found in Nebraska have been recorded.

Fish

Brown Trout from Nine Mile Creek in Scotts Bluff County

From small coldwater trout streams to large warm rivers, Nebraska streams support about 50 species of fish. As with macroinvertebrates, fish display varying habitat requirements and water quality tolerances making them excellent indicators of stream health. The majority of Nebraska's species are small, with adults generally less than 5 inches long. The Department's fish surveys have also provided information on changing abundances and ranges of fish in the state. Some species have been found to occur in many more places than previously thought, while others have shown dramatic declines over the last 30 years.

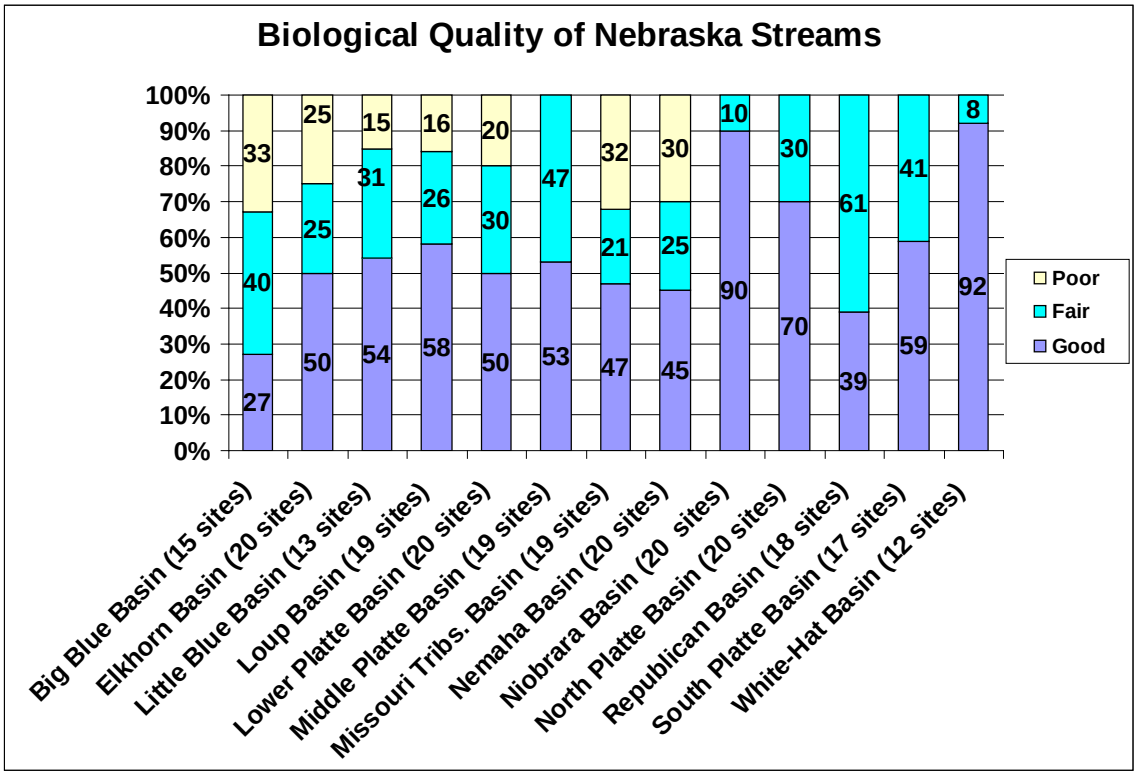
How are the Data Used?
The biological data collected through the SBMP are used to inform a variety of management activities, such as:

- 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.

Under the federal Clean Water Act, states are required to develop programs to evaluate the physical, chemical, and biological integrity of the Nation's waters and to adopt water quality standards to restore and maintain that integrity. States must report to Congress on the condition of all waters within their boundaries every two years (see the chapter in this report about the Integrated Report). The information collected by the Department's SBMP satisfies these requirements for assessing the biological integrity of Nebraska's streams.

NDEQ staff sampling on the Big Blue River

Results
For the purposes of this report, biological data from 232 random sites were used to characterize the condition of wadeable streams in the 13 major river basins in Nebraska (see bar graph below). Data from the latest completed round of surveys (2004-2008) were used to assess the water quality of streams in the Big Blue, Elkhorn, Little Blue, Loup, Lower Platte, Missouri Tributary, Nemaha, Niobrara, North Platte, and Republican Basins.



The Middle Platte, South Platte, and White-Hat Basins were assessed using two seasons of data because fewer random sites were selected in these basins. Additional findings from the next round of sampling that began in 2009 will be forth coming over the next several years and will be used to continue the assessment of the biological condition of wadeable streams in Nebraska.

The results of the survey show the White-Hat and Niobrara Basins are in the best condition of the basins evaluated with 92% and 90% of the streams in good condition, respectively. The streams in the remaining basins are considerably lower in quality. The Big Blue Basin presents the most concerns with only 27% of the streams in good condition and 33% of streams in poor condition.

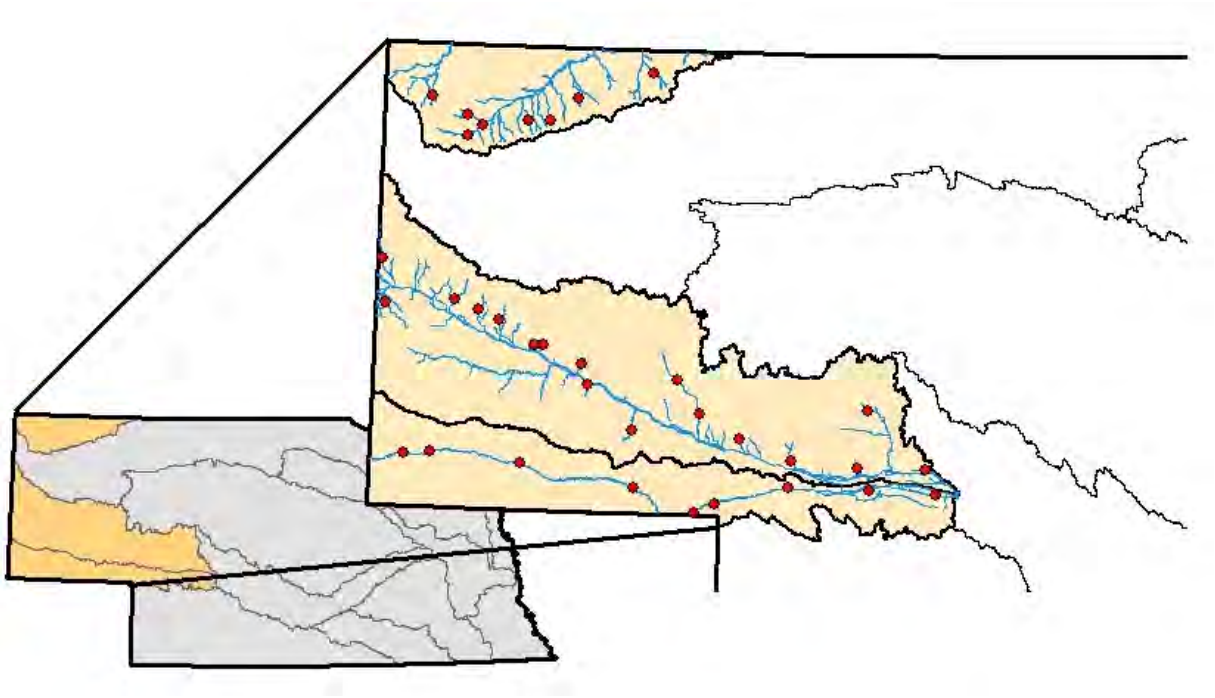
The recent Wadeable Streams Assessment done by EPA reported that increases in nutrients (e.g., nitrogen and phosphorus) and streambed sediments have the highest negative impact on biological condition. These contaminants are commonly introduced into the streams by non-point source pollution from agricultural practices such as crop production (see photo below) and livestock operations and by point source pollution such as discharge from sewage treatment facilities. In order to protect and improve the condition of the streams in Nebraska, it is important that proper management measures are implemented to reduce the impacts of these pollutants.

Agricultural run-off

NDEQ Staff sampling in the Little Blue River, near Oak, Nuckolls County.

2011 Update

Thirty-four stream locations were sampled as part of the 2011 SBMN (see figure below).

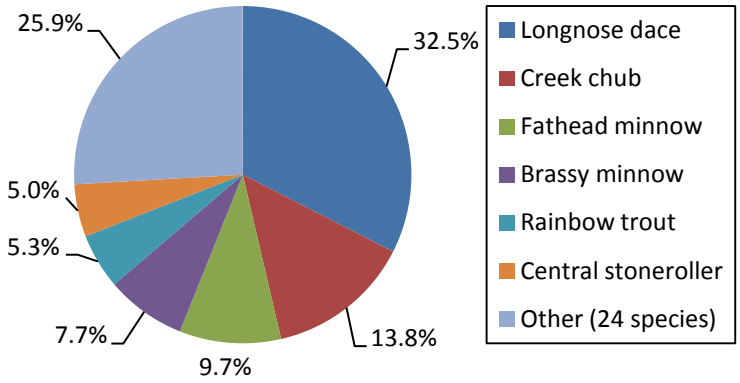


Sampling Locations in the North Platte River, South Platte River, and White River Hat Creek Basins, 2011

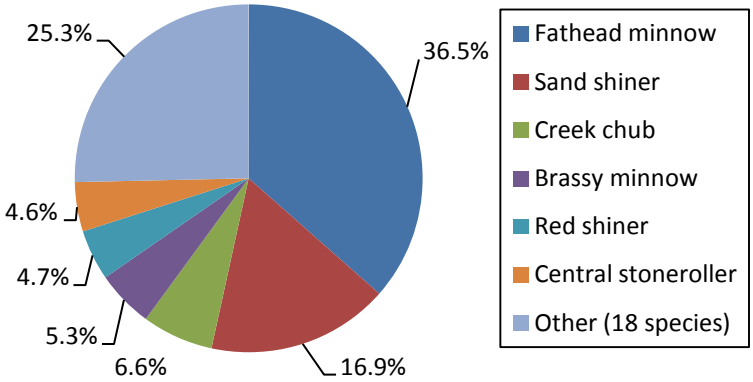
Preliminary assessments of the biological collections made in 2011 are provided in the following charts. Relative species abundance and species richness describe key elements of biodiversity which the Department uses to determine stream health. Relative species abundance refers to how common or rare a species is relative to other species in a given stream location while species richness simply refers to the number of species collected.

Thirty fish species were collected in the North Platte River Basin, 24 species in the South Platte River Basin, and 11 species in the White River-Hat Creek River Basin. Fathead minnows, longnose dace, sand shiner, creek chub, and brassy minnow were the most abundant fish species in the three basins. The most abundant of the major macroinvertebrate taxa included the larvae life stages of the aquatic flies (e.g., midges, black flies, mosquitoes), mayflies, caddisflies and aquatic beetles.

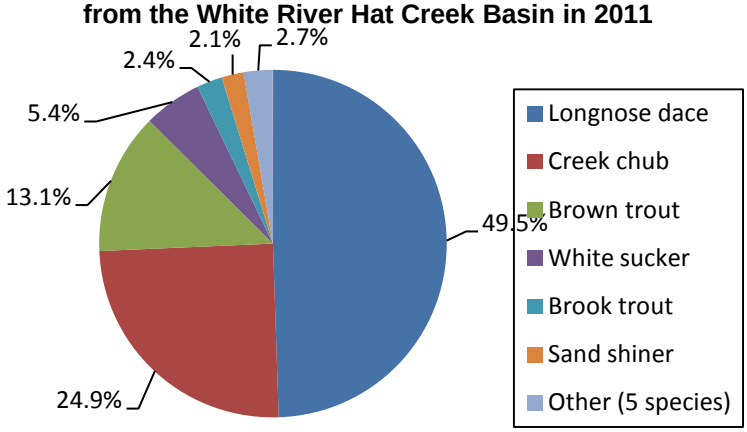
Relative species abundance of fish collected from the North Platte River Basin in 2011



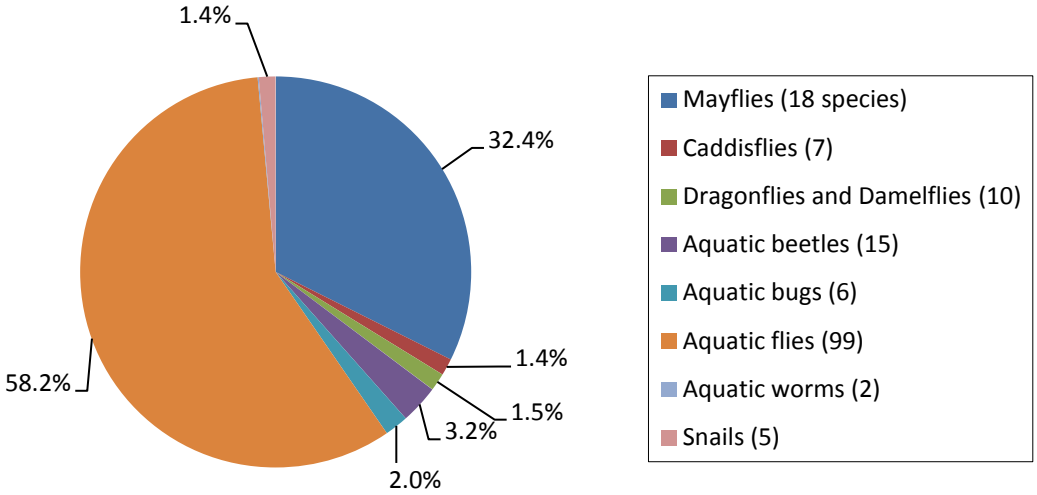
Relative species abundance of fish collected from the South Platte River Basin in 2011



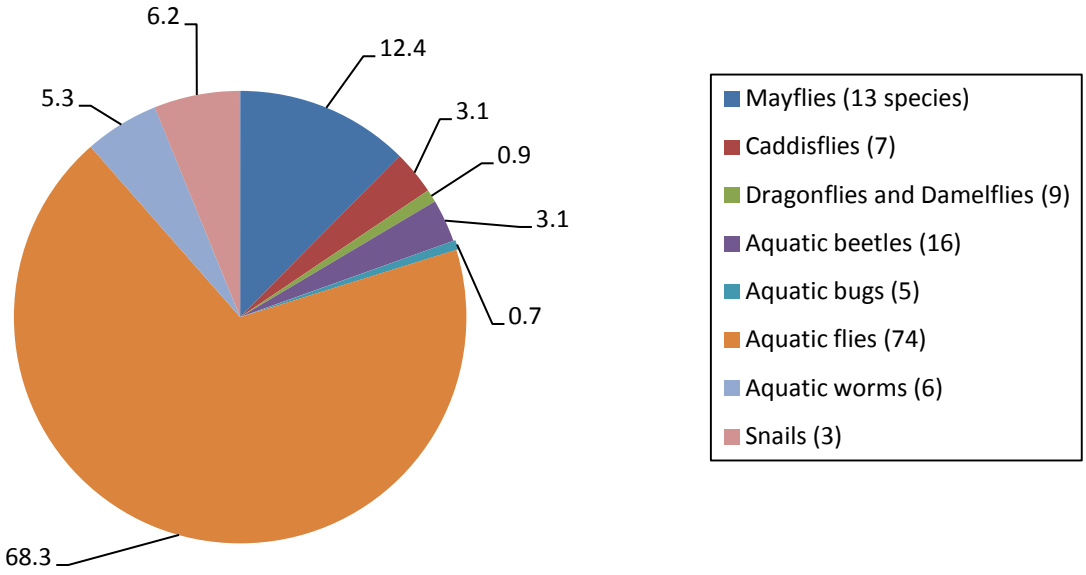
Relative Species abundance of fish collected from the White River Hat Creek Basin in 2011



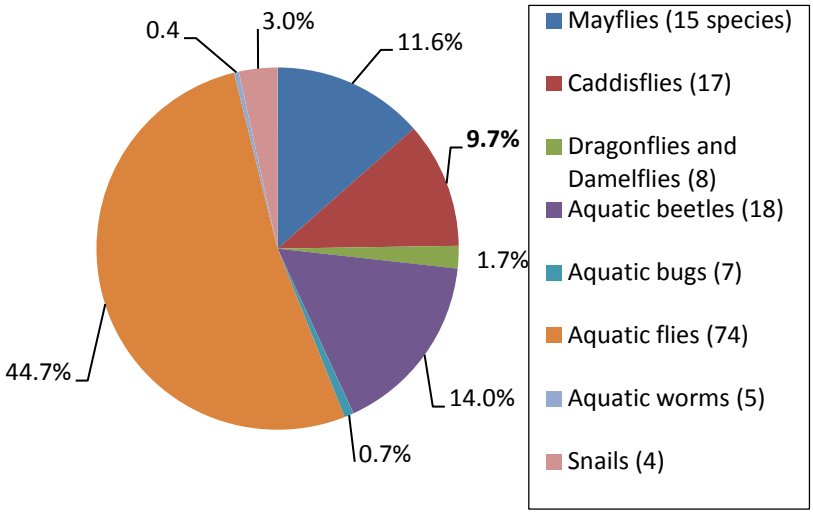
Relative species abundance among the 8 major aquatic macroinvertebdrate groups collected from the North Platte River Basin in 2011 and the species richness within each group



Relative species abundance among the 8 major aquatic macroinvertebrate groups collected from the South Platte River Basin in 2011 and the species richness within each group



Relative species abundance among the 8 major aquatic macroinvertebrate groups collected from the White River Hat Creek Basin in 2011 and the species richness within each group



More Information

The Department's Stream Biological Monitoring Program is conducted and managed out of the main office located in Lincoln. Contact Ken Bazata at 402/471-2192 or ken.bazata@nebraska.gov or Dave Schumacher at 402/471-4709 or david.schumacher@nebraska.gov for further data or information.

Stone Fly caught in Stinking Water Creek, near Palisades, Hayes County

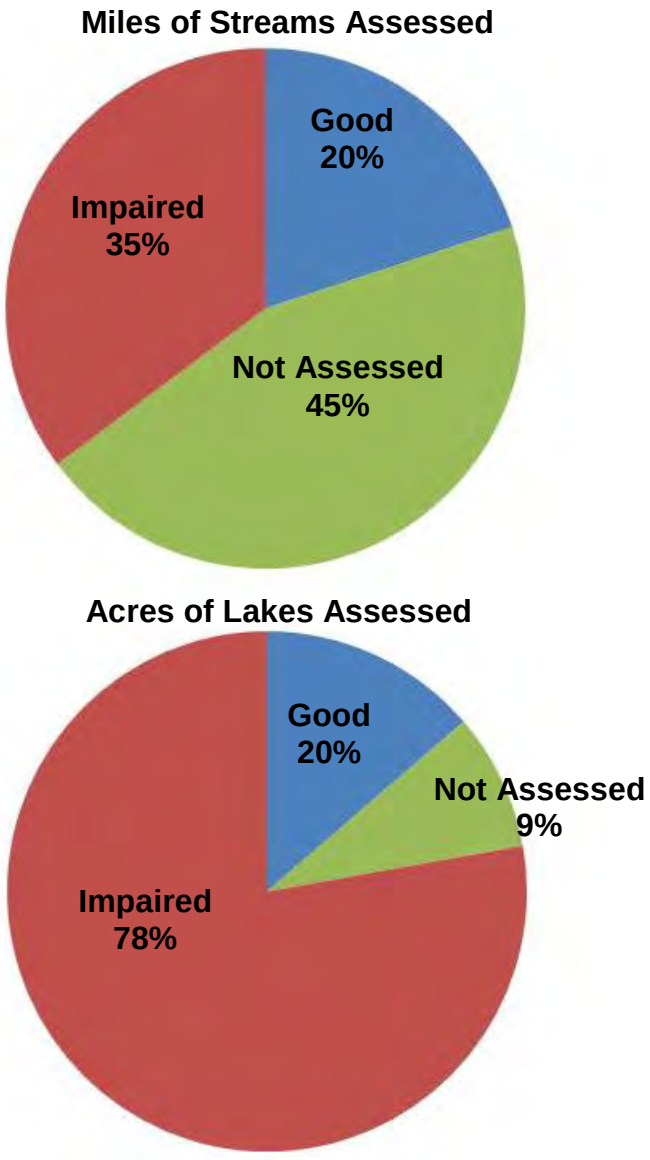
2012 Surface Water Quality Report Card

Nebraska's Assessment of Lakes and Rivers

The federal Clean Water Act (CWA) requires states to assess the water quality of their lakes and rivers to determine if they meet state and federal water quality objectives. Nebraska's water quality objectives are defined in *Title 117- Nebraska Surface Water Quality Standards* (NDEQ, 2012). Title 117 defines the beneficial uses that are to be supported by each of Nebraska's lakes and streams. Examples of beneficial uses for Nebraska's waterbodies include:

- recreation (swimming, wading);
- aquatic life (health of water insects, fish, and wildlife);
- drinking water (public drinking water supply); and
- agricultural supply (livestock water supply).

Title 117 also specifies the numeric levels of pollutants such as *E. coli* bacteria and nitrate that can be present in a waterbody without impairing the assigned beneficial uses. When determining the water quality for a specific waterbody, NDEQ determines the assigned beneficial uses for that waterbody and assesses the water quality data against the pollutant criteria defined in Title 117.



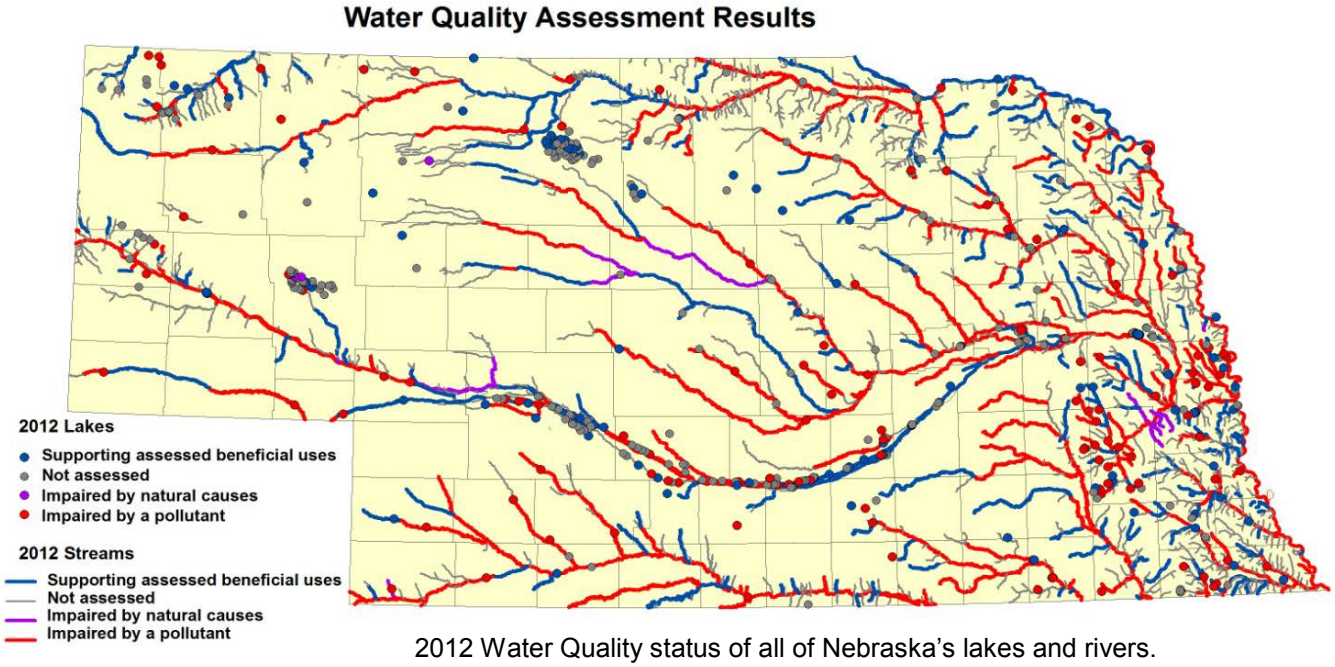
Proportion of streams and lakes assessed and the impairment status of the assessed waterbodies

Reporting Water Quality Conditions

Every two years the CWA requires that states develop an "Integrated Report" (NDEQ, 2012) that summarizes the water quality condition of all surface waterbodies in the state. For this report, states evaluate all available water quality data and determine which waterbodies are or are not supporting their designated beneficial uses. Waters that do not fully support all of their assigned beneficial uses are considered "impaired" and place on an impaired waterbodies list (303(d) list), waters that support all assigned uses are considered "supporting" or good quality waters.

Summary of Nebraska's 2012 Integrated Report

Nebraska has 1558 stream segments flowing over 18,000 miles and 528 lakes and reservoirs that cover more than 148,000 acres. For the 2012 Integrated Report, NDEQ staff conducted assessments on 490 stream segments and 275 lakes equating to more than 8,941 miles of streams and 140,000 lake acres being assessed (see figure above). While numerous waterbodies still need assessment, NDEQ has made a concerted effort to focus sampling and assessments on the waterbodies used more widely by the public. This has resulted in assessments on all lakes over 50 surface acres in size and all mainstem rivers (see map, below).



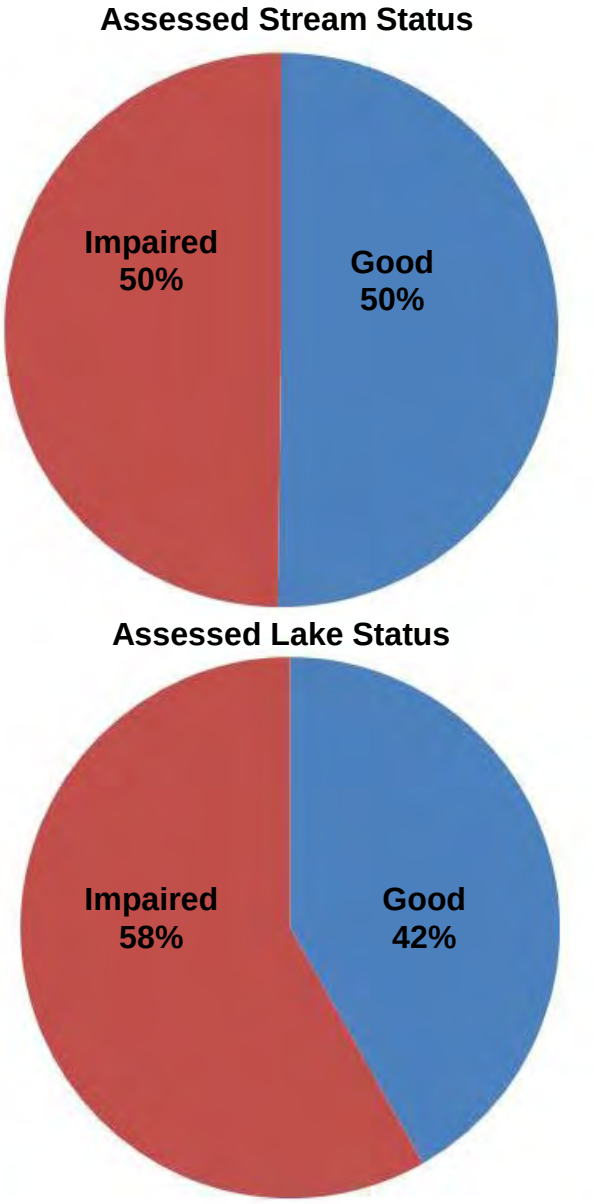
2012 Water Quality status of all of Nebraska's lakes and rivers.

Gathering field data, Turkey Creek, southeast of DeWitt, Gage County.

Of the 490 stream segments assessed, 244 were supporting their assigned uses, while 246 were impaired. Lake assessments found 160 of the lakes assessed to be impaired and 115 to be supporting their uses (see figure at right).

Common Stream Impairments
The most common impairments for Nebraska streams were *E. coli* bacteria, impaired stream biology, high levels of atrazine, and fish consumption advisories. The most common lake impairments were high levels of nutrients, fish consumption advisories, elevated pH, and low dissolved oxygen (see graphs on following page).

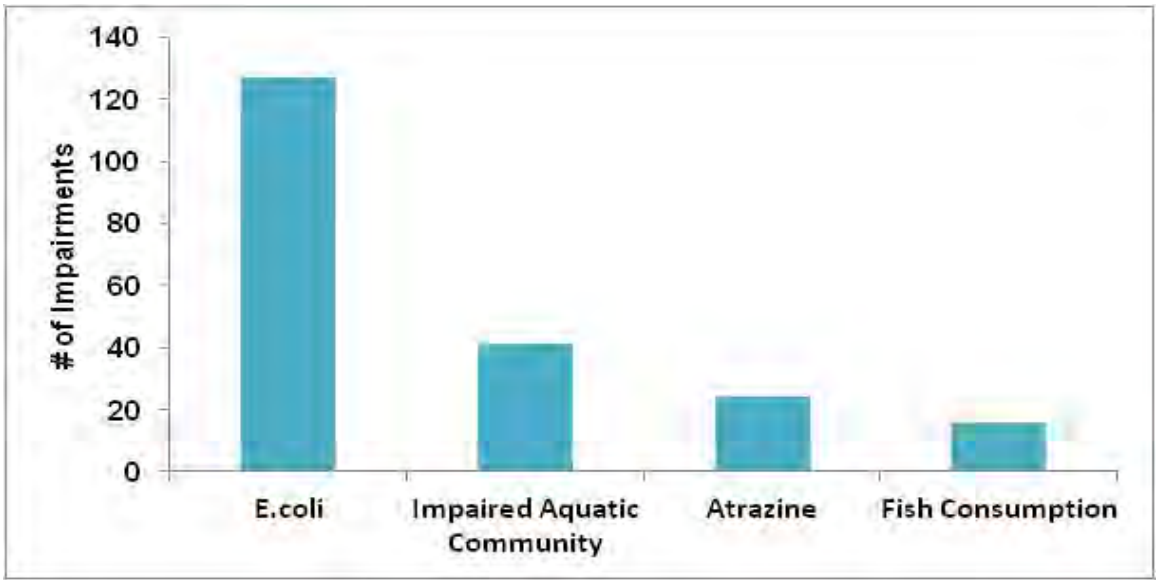
Summarizing the assessment information as simple percentages of impaired waterbodies does not tell the entire story, however. Because Nebraska's water quality criteria are designed to be fully protective, impairment of one beneficial use does not mean the waterbody is not supporting other beneficial uses.



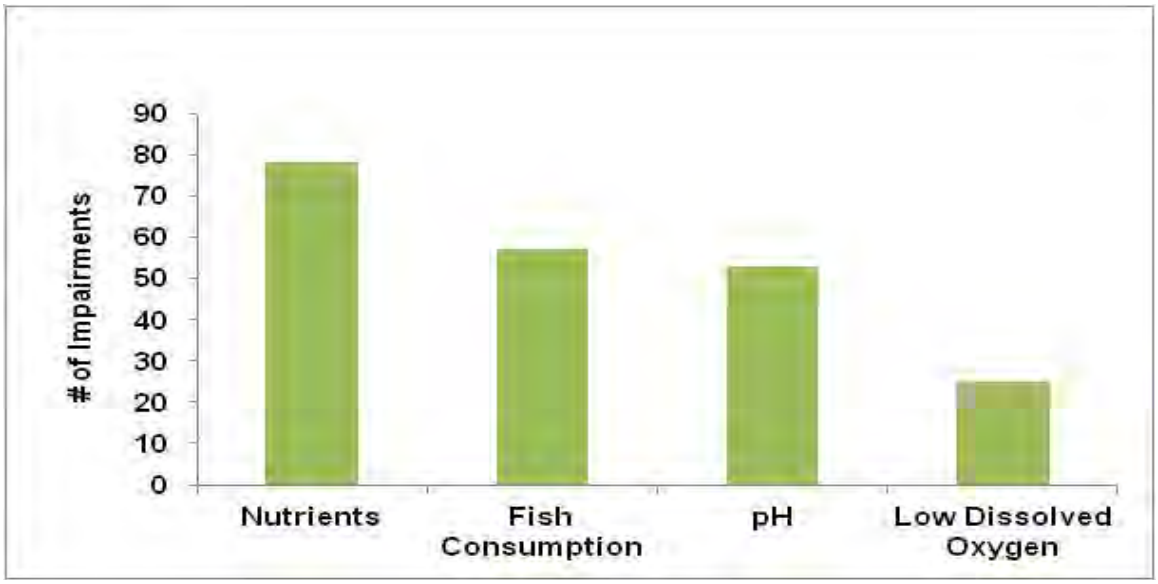
Proportion of assessed streams and lakes that were impaired or good quality.

Big Blue River near DeWitt, Gage County.

Common Stream Impairments



Common Lake Impairments



Strategies to Resolve Water Quality Impairments

Once a waterbody is determined to be impaired, the state is responsible for developing a plan or method to reduce pollutant levels so that waterbody is no longer deemed impaired. Three types of pollution control plans are commonly implemented: Point source pollution is managed via the National Pollutant Discharge and Elimination System (NPDES) permitting program and nonpoint source pollution is managed via Total Maximum Daily Loads (TMDLs) and Watershed Management Plans. Both of these nonpoint source pollution plans involve determining the cause and sources of the water quality impairment, working with the stakeholders to develop and implement pollution control strategies, and continuing to monitor water quality to determine if the plan is working or if modifications are required.

Preparing a sample for nutrient analysis at Rockford Lake, Gage County.
Photo by Dave Bubb, NDEQ

References:

NDEQ, 2012. Title 117 – Nebraska Surface Water Quality Standards. Nebraska Department of Environmental Quality. Water Quality Planning Unit. Lincoln, NE

NDEQ, 2012. 2012 Water Quality Integrated Report. Nebraska Department of Environmental Quality. Water Quality Planning Unit. Lincoln, NE

More Information

For more information on the quality of Nebraska's streams and lakes, the most recent *Surface Water Quality Integrated Report* is available on the Department's website at http://deq.ne.gov . Or contact Jason Garber at (402) 471-2875; jason.garber@nebraska.gov.

Surface Water Sampling Summary

As discussed in the previous short reports, the NDEQ performs surface water monitoring throughout the state. This section summarizes the planned number of samples and parameters analyzed for each monitoring program. Because of the uncertainties of weather, schedules, or equipment problems, not all planned samples are taken or analyzed. The State's 23 Natural Resources Districts (NRDs) (among other partners) provide monitoring support; the NRD abbreviations and headquarter cities are listed at the end of this section.

Davis Creek Reservoir, Valley County, looking toward dam. 2012 drought impact: water level down ~ 25 feet.

AMBIENT STREAM MONITORING

2012 Ambient Stream Monitoring Summary

Network: 97 sites statewide
Frequency: once per month (first full week), 12 months per year
Parameters:

- **Traditional:** total suspended solids (TSS), chloride, ammonia, nitrate-nitrite, kjeldahl nitrogen, total phosphorus
- **Field Measurements:** temperature, oxygen, pH, conductivity, turbidity, stream discharge.
- **Pesticides:** once per month, April – Sept; atrazine, acetochlor, metolachlor
- **Quarterly Metals:** 4 times per year (Jan., Apr., July, Oct.)

- **Bottom of Basin:** all metals, 17 sites (11 NDEQ + 6 USACE) Total – selenium, mercury and; Dissolved - sodium, magnesium, calcium, arsenic, cadmium, chromium, copper, lead, nickel, silver, zinc
- **All other Sites** "partial metals list": Total – selenium; Dissolved: sodium, magnesium, calcium, arsenic

2012 Ambient Stream Sample Totals by Parameter

- **Traditional & Field** (97 Sites X 12 Events) = 1164
- **Pesticides:** (97 Sites X 6 Events) = 582
- **Metals (all metals)** (17 Sites X 4 Events) = 68
- **Metals (partial metals list)** (80 Sites X 4 Events) = 320
- **QC Samples/Year** (NDEQ 14 and USACE 2 X 12 Events) = 192

Assistance: MNNRD, SPNRD, US Army Corps of Engineers (USACE)

BASIN ROTATION MONITORING

As explained in a previous section (Basin Rotation Monitoring), the state is covered by more intensive sampling on a six year rotating schedule, shown below.

Year	River Basins
2011	North Platte, South Platte & White-Hat
2012	Big Blue, Little Blue & Republican
2013	Loup & Middle Platte
2014	Niobrara
2015	Lower Platte & Nemaha
2016	Elkhorn & Missouri Tributaries

2012 Basin Rotation Monitoring Summary

Network: 39 sites**:** 28 streams (including 17 shared ambient) and 11 lakes in the Big Blue, Little Blue, and Republican River Basins.
Frequency: weekly, May 1 - September 30 (21 weeks)
Parameters:

- **Traditional:** (rivers/streams only) TSS, chloride, ammonia, nitrate-nitrite, kjeldahl nitrogen, total phosphorus
- **Field Measurements: (**rivers/streams & lakes) temperature, oxygen, pH, conductivity, turbidity, discharge.
- **Pesticides:** (rivers/streams only) atrazine, metolachlor, acetochlor
- **Bacteria:** (rivers/streams and lakes) *E. coli*

2012 Basin Rotation Sample Totals

- Total Stream Samples (traditional, bacteria and field measurements) = 588
- Total Lake Samples (bacteria and field measurements) = 231
- Total Bacteria Samples (Basin Rotation Only) = **819**

Assistance: LBBNRD

PUBLIC BEACH MONITORING

2012 Public Beach Monitoring Summary

Network: 49 sites statewide
Frequency: weekly, May 1 - September 30 (21 weeks)
Parameters: bacteria, toxic algae (microcystin)

2012 Bacteria & Toxic Algae Routine Weekly Samples

49 Sites X 21 Weeks = 1,029

Additional Toxic Algae Samples

- Routine Quality Control Samples
  - duplicates (102) and blanks (102)
  - accuracy and verification checks (26) = 222
- Special Concern Samples
  - Cub Creek Reservoir NPS Study = 57
  - Carter Lake NPS Study = 63
  - Lake Helen Pre-Project Study = 13
- Fish Kill/Complaint Samples = 7

2012 Total Toxic Algae Samples (including QC and special samples) = **1,391**

Assistance: MNNRD, NNRD, URNRD, LRNRD, LLNRD, LENRD, SPNRD, City of Carter Lake, Nebraska Public Power District (NPPD), USACE

Blue-green algae bloom at Merritt Reservoir, Cherry County

LAKE MONITORING

2012 Lake Monitoring Summary

Network: Deep Water Sites (38 lakes)

- **NDEQ:** 22 lakes X 5 months = 110
- **USACE:** 15 lakes X 5 months = 75
- **NNRD:** 1 lake X m Months = 5
- **QC Samples:** 10 NDEQ, 10 USACE = 20

2012 Total Deep Water Samples: = 210

Frequency: monthly from May through September

Parameters:

- **Traditional:** TSS, total phosphorus, dissolved orthophosphorus, nitrate/nitrite nitrogen, kjeldahl nitrogen or total nitrogen, % alkalinity.
- **Pesticides:** atrazine, metolachlor, acetochlor
- **UNL Lab:** chlorophyll-a
- **Field Measurements:** depth profiles (pH, conductivity, temperature, oxygen, turbidity), water transparency

Network: Mid-Lake Sites (37 lakes)

Frequency: monthly from May through September

Parameters: mid-lake depth profile (pH, conductivity, temperature, oxygen, turbidity)

2012 Mid-Lake Network Samples:

NDEQ: 22 Lakes x 5 months = 110

USACE: 15 lakes x 5 months = 75

Total Mid-Lake Profiles: = 185

Additional Lake Monitoring Projects (Nonpoint Source Programs)

Study/Lake	Parameter
Fremont State Lakes Pre-Project Renovation Study	nutrients, biological
Lake Helen Pre-Project Renovation Study	nutrients, bacteria, & toxic algae
Carter Lake Post-Project Evaluation Study	bacteria & toxic algae
Willow Creek Pre-Project Evaluation Study	nutrients, bacteria, & toxic algae
Jenny Newman Lake Pre-Project Renovation Study	nutrients & alum treatment
Cub Creek Reservoir Pre-Project Evaluation Study	nutrients, bacteria, & toxic algae

Assistance: USACE, City of Carter Lake, UNL, NGPC, LENRD, USGS

FISH TISSUE MONITORING

2012 Fish Tissue Network

- 66 fish samples collected from 46 sites (23 rivers/streams and 23 lakes)

Assistance: NGPC, Nebraska Health & Human Services (NHHS), Nebraska Dept. of Agriculture (NDA), EPA

NDEQ staff preparing a fish tissue sample collected from a Sandhills lake

STREAM BIOLOGICAL MONITORING PROGRAM

Network: 35 stream sites in the Big Blue, Little Blue, and Republican River Basins

Field measurements: temperature, pH, oxygen, conductivity, turbidity and stream discharge, fish and aquatic insect communities, and habitat assessments

NDEQ staff electrofishing Rose Creek, Jefferson County

FISH KILLS AND CITIZEN COMPLAINTS

Timeframe: July 1, 2011 to September 30, 2012

Fish Kills Attributed to:	Number
Low dissolved oxygen levels (flooding, season change)	12
Disease or parasites	7
Dumping	1
Stranded	2
Thermal stress (receding water levels)	6
Unknown causes	2
TOTAL	**30**

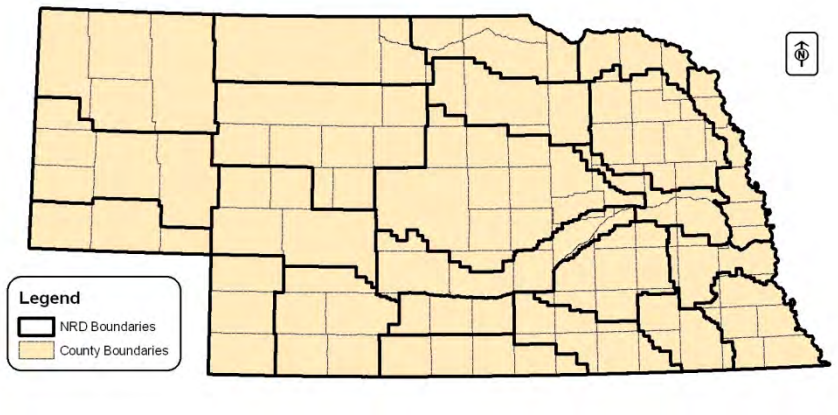
Between July 1, 2011 and September 30, 2012, the Department received 61 notifications of complaints concerning surface water issues. Many of these were referred to other agency programs that more closely related to the problem and five complaints were investigated with on-site visits by the surface water staff.

Assistance: NGPC, U.S. Fish & Wildlife (USFW), University of Nebraska Lincoln (UNL), NRDs, NDA, Lincoln Lancaster County Health Department (LLCHD)

NDEQ staff investigating a fish kill in the Platte River, Platte County

Natural Resources Districts, Abbreviations and Headquarter Cities

Central Platte NRD	CPNRD	Grand Island
Lewis and Clark NRD	LCNRD	Hartington
Little Blue NRD	LBNRD	Davenport
Lower Big Blue NRD	LBBNRD	Beatrice
Lower Elkhorn NRD	LENRD	Norfolk
Lower Loup NRD	LLNRD	Ord
Lower Niobrara NRD	LNNRD	Butte
Lower Platte North NRD	LPNNRD	Wahoo
Lower Platte South NRD	LPSNRD	Lincoln
Lower Republican NRD	LRNRD	Alma
Middle Niobrara NRD	MNNRD	Valentine
Middle Republican NRD	MRNRD	Curtis
Nemaha NRD	NNRD	Tecumseh
North Platte NRD	NPNRD	Scottsbluff
Papio-Missouri River NRD	PMRNRD	Omaha
South Platte NRD	SPNRD	Sidney
Tri-Basin NRD	TBNRD	Holdrege
Twin Platte NRD	TPNRD	North Platte
Upper Big Blue NRD	UBBNRD	York
Upper Elkhorn NRD	UENRD	O'Neil
Upper Loup NRD	ULNRD	Thedford
Upper Niobrara-White NRD	UNWNRD	Chadron
Upper Republican NRD	URNRD	Imperial



More Information:
More information about the State's 23 Natural Resources Districts can be found at www.nrdnet.org. For more information about any of the specific programs summarized in this section go to the section which has more detail and use the contact information there, or contact Dave Schumacher, NDEQ, at 402/471-4709 (david.schumacher@nebraska.gov).