July 29, 2016

WATER

Protecting Our Natural Resource

Upper Big Sioux River Watershed Project

UBSRWP What do all of those letters mean, anyway?

Nearly everybody probably has heard of the Upper Big Sioux River Watershed Project, but not everyone knows exactly what it is or what it does.

UBSRWP is a locally led project that aims to keep our water clean. The project gets its funding from a U.S. Environmental Protection Agency Clean Water Act (Section 319) grant provided through the South Dakota Department of Environment and Natural Resources and sponsored by the City of Watertown.

The project is a continuation of the original Lake Kampeska Watershed Project that resulted from a 1992 diagnostic/feasibility study implemented by volunteers from the Kampeska Chapter of the Izaak Walton League of America. The name was changed to the Upper Big Sioux River Watershed Project when the Lake Pelican Water Project District joined the participating partners following completion of the Lake Pelican Diagnostic/Feasibility Study in 1995.

The Upper Big Sioux watershed is located in the Prairie Coteau region of eastern South Dakota. This unusual land formation was caused by glacial action some 2,000 to 15,000 years ago. Lake Kampeska is a 5,075-acre lake with an average depth of 11 feet. Lake Pelican covers 2,796 acres and has an average depth of 6.5 feet. The Big Sioux River delivers 90 percent of the nutrient and sediment loads entering the lakes. Shoreline erosion also contributes to sediment and nutrient loading. Steadily increasing loads come from urban development in the immediate lake area.

A combined total of four state parks, one county park, four city parks, two private parks, and nine other lake access areas are located on the lakes' shorelines. The remaining shoreline consists of residential, agricultural and business properties. The Regional Economic Development value is estimated to be $29.74 per user day for all recreation forms. Recreational use collected from creel surveys conducted by the South Dakota Game, Fish and Parks Department and visitation records from the city, county and state parks around the lakes indicates 133,157 user days per year. The annual impact of recreation to Watertown and the surrounding region is estimated to be $3,960,089. (PL-566 Study, USDA, May 2000)

Studies conducted from 1989 through the spring of 1993 on Lake Kampeska and from 1993 to 1995 were used to evaluate nutrient and sediment contributions from cropland and animal feeding operations (AFOs).

Grants (EPA Section 319 and state, local match)

Grants	EPA	Other fed.	State	Local match	Total
Total	**$3,902,800**	**$956,022**	**$280,785**	**$5,713,484**	**$10,853,091**

This project was produced by the Upper Big Sioux River Watershed Project.

UBSRWP Project Coordinators

- July 1994 — **Kim Schneider**
- January 1996 — **Mike Williams**
- March 2010 — **Roger Foote**

Coordinator looks toward future as work continues

By Roger Foote
UBSRWP Coordinator

It is impossible on these pages to list and thank all of the groups, individuals and visionaries who dedicated a large portion of their careers, lives and fortunes to the betterment of this watershed in the pursuit of water quality.

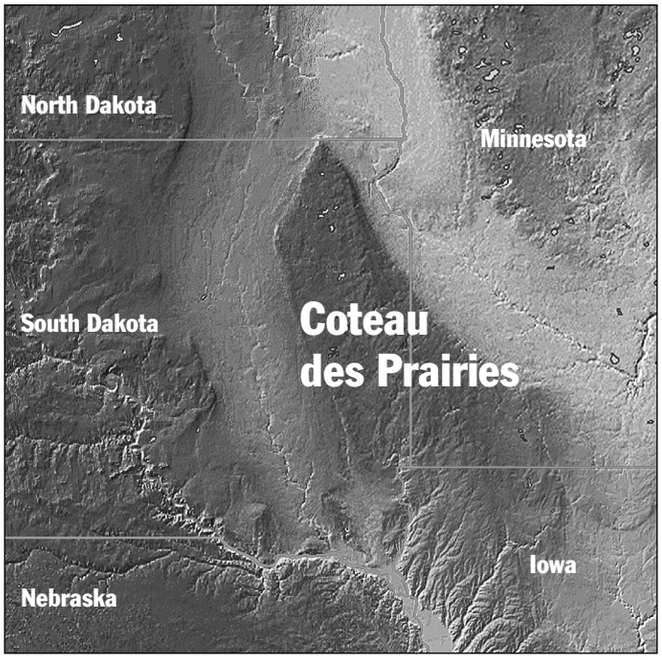
I am sure they all would agree that more important than dollars spent, current and past board members, sponsorships and politics, is where we go from here.

Lake Kampeska is no longer on the impaired waterbodies list, due to our efforts and a change in standards. Lake Pelican remains on the impaired waterbody list. As the area around Pelican becomes more developed, pressure will increase to do more to improve its water quality. The Big Sioux River also remains on the impaired water body list. As it feeds our lakes with water of questionable quality, our efforts must continue to promote practices to filter, settle, contain and improve the runoff that comes from the watershed.

As you the taxpayer ultimately fund this watershed project, your support, questions and ideas are critical to the continuation of the project. Your input started this 20-year adventure, and with your help we can make our water even better.

Contact me, Roger Foote at 605-882-5250 or the website at www.watertownsd.us. Find Government and Choose Departments and choose our page. The UBS is on facebook and twitter, too.

watershed (wat'-er-shed) 1.Chiefly British. The region or area drained by a river, stream, etc.; drainage area.



Johns Hopkins University

Region's history is filled with glaciers

Ice Age left highlands in parts of South Dakota, Minnesota, Iowa

The lay of the land in Northeastern South Dakota is far different from that found in the Western half of the state. That's because 15,000 years ago continental glaciers helped carve the distinctive terrain here.

This glaciated area includes the "prairie pothole" region – numerous water-holding depressions left by the glaciers, and the Coteau des Prairies.

The Coteau des Prairies is a wedge-shaped upland left behind by repeated movements of glaciers. The plateau was named by early French explorers from New France (Quebec), coteau meaning "hill" in French.

With each glacial advance, sediments were deposited one on top of the other until the materials were higher than the surrounding area.

The last ice sheet that moved through the area encountered this highland, and split into two segments. The divided glaciers eroded material in the adjacent valleys, making the Coteau an even more prominent upland.

The plateau is composed of thick glacial deposits, the remnants of many repeated glaciations, reaching a composite thickness of approximately 900 feet.

Since this land was higher than the surrounding lowlands, there is evidence indicating humans followed animals 12,000 years ago to the Coteau in search of fresh water on ice-free land.

The Upper Big Sioux River Watershed is in the northeast part of the Coteau.

The science of nutrient loading...

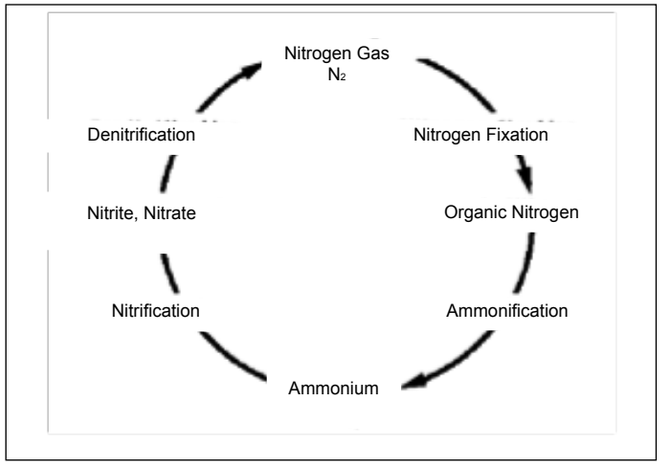
Nutrient loading has been a problem in Lake Kampeska for decades. Lake Kampeska, a natural lake covering about 5,075 acres, has a surface water connection with the Big Sioux River and ground water connections to the Big Sioux Aquifer.

The 245,000 acre watershed which feeds the lake is dominated by agriculture use. The majority of nutrients and sediments that accumulate in the lake come from the Big Sioux River watershed with steadily increasing loads from urban development in the immediate lake area. These elevated nutrient loads alter the ecosystem of the lake.

An effect of high nutrient loads is the potential for algae blooms and massive weed mats, making the lake undesirable for recreation and potential loss of value of lake properties. Another side effect of algae blooms and uncontrolled plant growth happens during the winter period. With thick ice and heavy snow cover, sunlight penetration becomes limited and photosynthesis may stop. This limits the production of oxygen in the lake causing stress to aquatic life.

If enough plants and algae die during this period, the decomposition process will strip remaining oxygen from the water column and cause a fish kill. This scenario happened in 2008 on Lake Pelican resulting in more than 100 tons of fish removed from the shoreline that spring.

As anyone who has purchased lawn fertilizer knows, all growing things need nitrogen, phosphorus, potash (NPK) to fuel photosynthesis. As we look at these macro nutrients and the life cycle of algae, we find that some species can fixate their own nitrogen (N) from the atmosphere, limiting success of efforts to control excess N in the environment.



However if we can limit phosphorus (P) in the runoff waters, we can somewhat control the excessive growth of algae in our surface waters. (See graphic below)

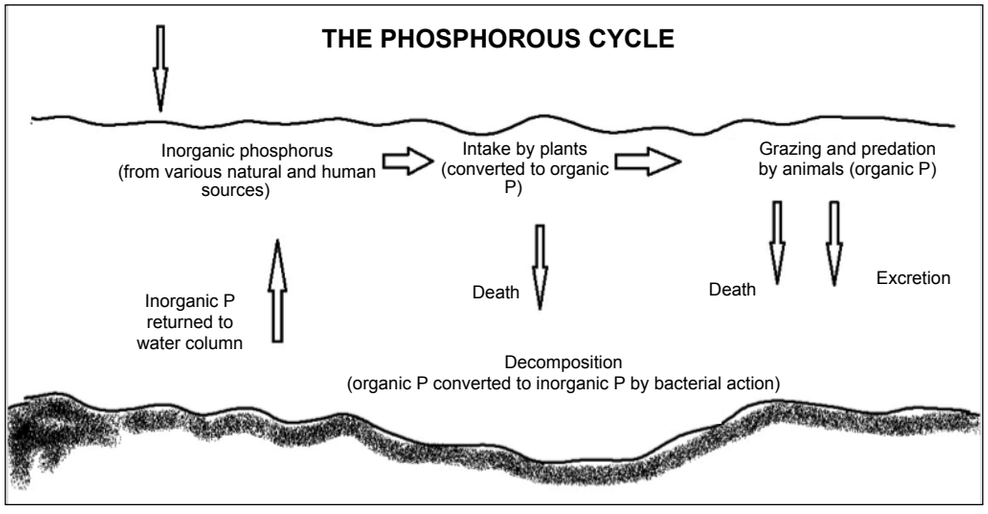
Lake Kampeska, with its inlet/outlet, acts as a giant buffer for the river system. High flows from the river system bring in nutrients and sediments which become trapped in the lake.

As flows decrease, the cleaner water passes back into the river system. Trapped nitrogen and phosphorus nutrients and sediments have been the focus of concern. Proposed solutions from dredging to sheet pile sand filters have been evaluated. Each potential solution has its pluses and minuses: cost, time needed and what to do with the stuff once it is removed.

Most agencies do agree that stopping the nutrients and sediments before they get to the lake is the first step in improving water quality in Lake Kampeska.

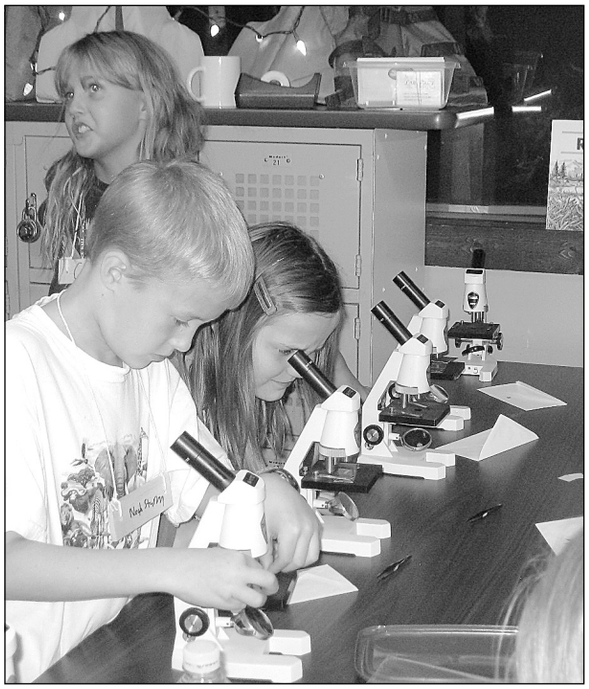
The nitrogen level in Lake Kampeska is fairly low. With nutrient limitation testing completed by Dr. Min of S.D. State University, Brookings, we have learned much about algae and nutrients.

Because of limited runoff the lake has experienced from 2013-2016, the nitrogen loading has been very limited. This is good in the short term. However the P levels do not decrease and the potential remains for large algae blooms the next time the lake receives normal to above normal runoff with high nitrogen levels from the watershed.



Education & info

2016 Castlewood High School Creative Science Writing Class went on a macroinvertebrate bug hunt with Roger Foote, project coordinator, to learn the science behind the writing.



2012 RiverQuest – through watershed project sponsorship, two retired elementary teachers took some Boys and Girls Club members on an exploratory journey of river ecology. Students participated in hands-on lab work, and then went to the field, sampling the water in the river.

2011 East Dakota Water Festival in Brookings teaches 4th graders about water sampling and macroinvertebrates (annual event)

Public Opinion file photo

Jim Madsen, former IWLA national president, checked out the native plants in 2013.

Izaak Walton League restores plot of land to native grasses

In 2010, the Kampeska Chapter of the Izaak Walton League leased the 120-acre site directly across from Stokes-Thomas City Park with the sole intent of restoring the area to native grasses and forbs so it could be enjoyed by area residents as both an outdoor education and recreation area.

In 2010 and 2011, 35 acres that had been previously disturbed and converted to native grasses were sprayed with Roundup to kill the non-native vegetation. With the help of the Nature Conservancy and the cooperation of the Watertown Fire Department, the area was burned in the spring of 2012 to remove all the dead vegetation.

It was again sprayed with Roundup that fall.

In March 2013, with the help of the S.D. Game Fish & Parks and a donation of several hundred pounds of native grasses and forbs from The Nature Conservancy, the area was snow seeded; in other words, large broadcast seeders were used to spread seed over the snow.

The chapter also purchased additional varieties of native plants, including Prairie Smoke and Pasque Flowers, bringing the total number of species seeded in to the site to 80. In 2014, there was an unexpected eruption of sweet clover that threatened to choke out all of the native seeding.

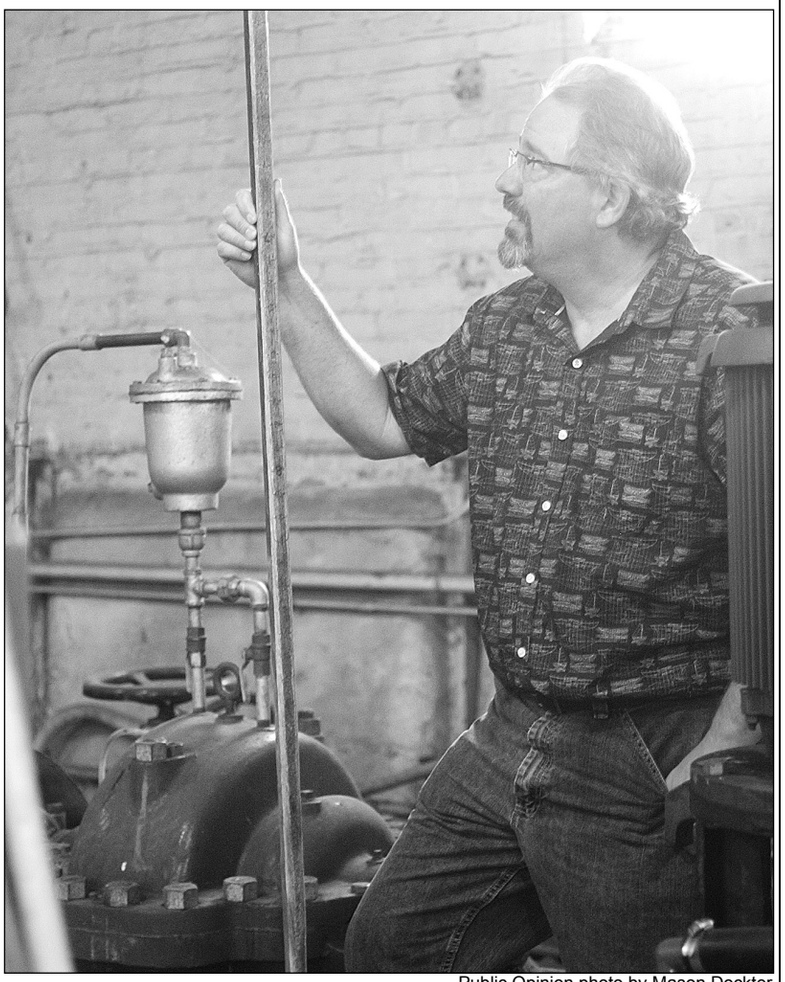
Larry Berg was kind and generous enough to volunteer his time and equipment to cut, harvest and remove the sweet clover. In 2015 and now in 2016, the area is being monitored for noxious weeds and increased signs of native vegetation.

Restoring native prairie is time consuming, labor intensive and can be a very slow process. The site continues to get new species and an increase in existing ones.

At some point the chapter intends to provide mowed walking trails through the area with interpretive signs. In the meantime the public is invited to walk through the area and experience a little of the tall grass prairie that dominated this area up until its conversion to agriculture over the last 140 years.

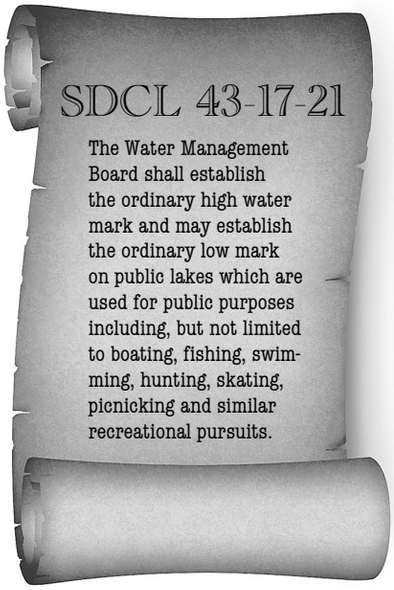
The same stick is used to measure Kampeska's level today

Reprinted with permission from the *Watertown Public Opinion, 1969*



Public Opinion photo by Mason Dockter

It's really called the dip stick and it's used to measure the water level of Lake Kampeska at the old Watertown Filtration Plant. At left, Harlan Hoy, filtration plant operator, is pictured reading the dip stick in 1969. The calibrated bar is lowered into the hole (next to Hoyle's right foot) and lowered into the well for sea level measurement of Lake Kampeska. At right, Roger Foote of the Upper Big Sioux River Watershed Project recently checks the same stick.



How high's the water, mama?

S.D. law requires an 'Ordinary High Water Mark' for public lakes

When Lake Kampeska is full, the surface of the water is exactly 1,717.8 feet above sea level.

The "Ordinary High Water Mark," is 1718.3 and state law requires that mark to be established for every public body of water in South Dakota.

Seems simple enough, but determining the "OHWM" is actually a difficult task. It was first done for Lake Kampeska in August 1980 by the State Water Management Board. Water Resources Engineer Jerry Steffen's report to the S.D. Department of Water and Natural Resources on his investigation to find the OHWM was 10 pages long.

The report noted that Kampeska is about 2 1/2 miles wide and five miles long, covering approximately 4,800 acres. Its average depth at that time was 11 feet.

Steffen reported that the immediate watershed area is small for a lake of that size, so water levels are "influenced mainly by the extensive aquifer connection and the diversion waters of the Big Sioux River, rather than surface runoff."

To find the OWHM, engineers examined the beds and banks of the lake to determine where the presence of the water line has been most common. They had to consider the size, watershed, topography, soils, vegetation and general characteristics of the lake, according to the report. Soil examinations were conducted along the shore and observation of the growth paterns of trees were made.

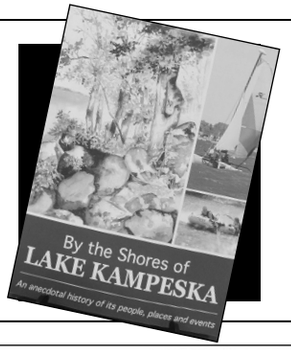
Steffen's conclusion: "From the examination of the bed and banks of Lake Kampeska and of the vegetation found on the shore, it was determined that the Ordinary High Water Mark for Lake Kampeska has been established by the existing conditions at an elevation of 1,718.3 feet above mean sea level."

He recommended that the S.D. Water Management Board establish that OWHM, which it did.

Historical Society gathers Lake Kampeska stories

The Codington County Historical Society has gathered pictures, history and anecdotes about Lake Kampeska in its book, *"By the Shores of Lake Kampeska"* in an effort to preserve the history of this important natural resource.

The Codington County Heritage Museum is selling these books this summer for $20 each.



At right, a solar livestock drinker provides alternate (not from the river) water for cattle of Steve and Neil Kane. The solar pump delivers water from the ground for the livestock.

Wildlife artist contributes to area lakes

Proceeds from one of Terry Redlin's paintings went into a Save Lake Kampeska fund, and it was slightly more than $300,000. That money was used along with about $800,000 in city money to build the Terry Redlin Environmental Center. Prior to that, Terry had agreed to lend his name to the Terry Redlin Freshwater Institute, which received funding from the EPA and was run by Chad Foust.That led to the environmental programs now being taught at Lake Area Technical Institute. A conversation with Terry also led to the city buying the approximately 100-plus acres along Highway 20 where the Izaak Walton League tallgrass restoration project is ongoing.

Education & info

2004 WMS Chad Foust (Freshwater Institute) and Denise Ottenbacher (WMS teacher) introduce watershed concepts to Watertown Middle School students about how the lakes were formed, and why clean water matters (an annual event for about 15 years).

2005 Camp Chance at Memorial Park and later years at Joy Ranch. Chad Foust demonstrates the properties of water using cool techniques and illusions (annual event since inception of program begun by the Watertown Police Department).

2009 First Grade Visit to the Farm – Roger Foote explains the composting barn process in a dairy barn and invites the kids to smell the clean compost. Lots of "eewws" ensued.

Lake Pelican

Watertown's 'other' lake

- **12 miles** of shoreline (Public: 5.6 miles, GF&P: 6.4 miles)
- **Surface area:** 2,796 acres
- **Watershed area:** 16,749 acres
- **Maximum depth:** 8 feet
- **Average depth:** 5 feet.
- **Three public access sites:** Northwest Lakeside Use Area and Pelican Lake Recreation Area, both maintained by the SDGF&P, and East-Side Access (Maintained by the City of Watertown).
- **Land use:** Primarily agricultural including a mix of pasture or grassland, cropland, and scattered shelterbelts.
- **Ordinary High Water Mark:** The Water Management Board established OHWM ar 1,710.2 feet above sea level.
- **Fish species:** Walleye, yellow perch, bigmouth buffalo, black bullhead, black crappie, common carp, green sunfish, northern pike, orange-spotted sunfish, spottail shiner, tadpole madtom, white bass, white sucker, yellow bullhead

Public Opinion photo by Roger Whittle

This photo was taken from the west side of Pelican Lake looking east. The lake is about five miles long and a little more than one mile wide.

Lake Pelican Preservation Society

On August 20, 2002, the Lake Pelican Preservation Society was incorporated by the State of South Dakota as a non-profit organization with its main purpose being: to preserve, protect and restore Lake Pelican through stewardship, education and networking.

E.C. (Skinny) Krull spearheaded this organization, wishing to have individuals living on or around Lake Pelican to become personally involved regarding the welfare of this lake, even though membership was open to all. Initial directors and officers were: Dean Jordan, Bob Hanson, Jeanette Towle, Gerri Bigham, Steve Bachman, Don Heim, Dale Miller, Skinny Krull, Liz Hanson and Courtney Livingston.

Through cooperative efforts with our friends at the Upper Big Sioux River Watershed Project and South Dakota Game Fish and Parks, we have been successful in several conservation efforts such as shoreline restoration, watershed management projects, water testing and monitoring, and helping homeowners to become aware of the benefits of non-phosphorus lawn fertilizers.

Our efforts and concerns are ongoing and we invite anyone with similar interests to become a member of our organization – helping protect, restore and preserve one of Watertown's greatest natural resources.

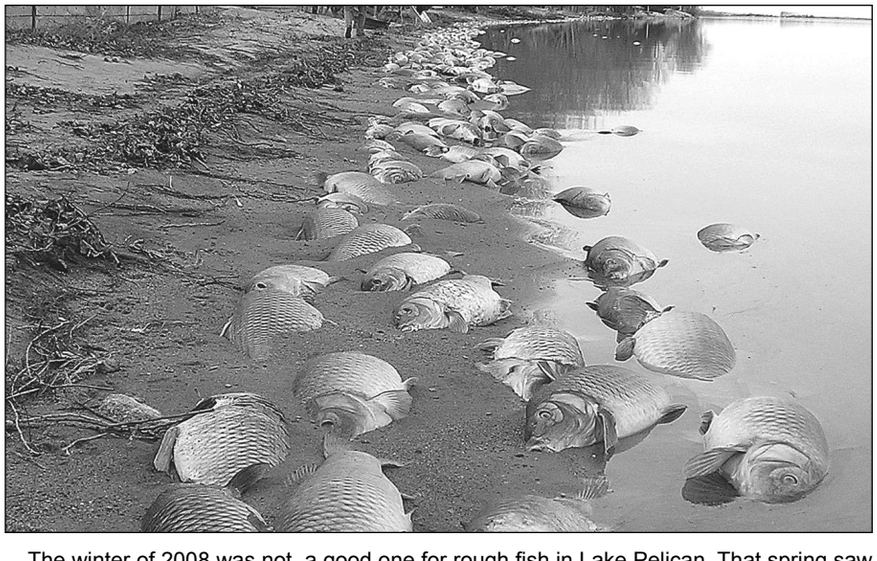
Current officers are Dale Miller, President; Bill Towle, VP; Linda Miller, Secretary; and Bob Hanson, Treasurer. There were 48 member households in 2012.

Pelican Lake — Thoughts and memories

Thoughts of the Kittleson Dog House. Clifford Kittleson developed a housing area on the north side of Lake Pelican. He was probably most known for having dog kennels and training dogs. For awhile, there was also an establishment at the site where a person could relax and enjoy a beverage, conversation or maybe a little altercation. Located in the county, its hours of operation could be late, so when the establishments in town closed, a person could make a little side trip to the "Dog House."

It was rumored that when one went through the door you should be on the lookout for a person or persons coming out the door quickly and if that wasn't the case, maybe it was just a closed fist that met you at the door. It might not have been the place you took your date to for an evening of conversation.

— Recalled by Courtney Livingston



The winter of 2008 was not a good one for rough fish in Lake Pelican. That spring saw tons of huge carp wash up on Pelican's shores, which was not a good thing for the eyes or the noses of nearby humans. But it was good news for sport fishermen and women who consider the rough fish a nuisance.

The Lake Pelican Water Project District

The Lake Pelican Water Project District (LPWPD) was formed as a district in 1988 to improve the quality of the water in Lake Pelican.

The district became a taxing entity in 1991.

Since its formation, various projects have been done to improve the quality of water such as: fencing all the cattle away from the lake, shoreline stabilization and finally constructing a silt diversion weir in the inlet-outlet channel of the lake.

This weir prevents 85 precent of the sedimentation from entering the lake.

In 1998, the upper watershed landowners approached the LPWPD to join with them to improve the water quality and get a handle on the water quantity in the Big Sioux River. The expansion of the Lake Pelican Water Project District to include the Upper Big Sioux River Drainage Basin was completed in May 1999, thus becoming the largest Water Project District in the state of South Dakota.

It encompasses the entire watershed draining into the Sioux River that is north of Watertown and the area around Lake Pelican.

This adds up to approximately 220,000 acres of watershed. The District's members and directors are agricultural producers, Lake Pelican residents and landowners living inside the district's boundaries.

These people are concerned and interested in both water quantity and its quality as it comes through the Sioux River system into Watertown, into our lakes and all communities to the south.

— Information from the website

Phosphorus? Forget about it!

Experimental project aims to keep pollutant levels lower in Lake Kampeska

By Mason Dockter
Public Opinion Staff Writer

From an open manhole in the dank, damp basement of Watertown's 127-year-old water filtration plant rises an intense, eerie pink glow. A ladder invites the courageous to take a dip into 98,000 gallons of gurgling fluid below.

At first glance, it would appear to be a pool of some deadly substance belonging to a villain in a science fiction movie. In reality, the tank is filled with lake water and algae hard at work eating up phosphorus pollution. It glows because of 3,500 LED lights that help the algae thrive.

The mastermind behind the algae-filled tank (called a "growth chamber") is Roger Foote, coordinator of the Upper Big Sioux River Watershed Project.

The experimental endeavor – Watertown's Phosphorus Removal Facility – completed a three-year trial period, and Foote says, the project has been met with what he called "limited success."

Housed in the old water filtration plant near Lake Kampeska, the facility uses algae to remove phosphorus and other pollutants, including nitrogen, from the water of Kampeska.

Paradoxically, the algae in the growth chamber eat up phosphorus and nitrogen from the lake water, thus avoiding unwanted algae blooms in the lake that occur because of the pollutants. Phosphorus, once it enters a body of water, will not leave on its own, necessitating intervention when phosphorus levels are high.

Initially, the idea to use the filtration plant to clean the lake water came about when the plant was put on standby in 2006 and shut down permanently in 2010.

An inability to meet EPA regulations was the downfall of the aging filtration plant, said Jeff DeVille, Watertown's superintendent of water. It was replaced by the new water treatment plant.

Immediately, the old filtration plant seemed poised for a new life as a way to clean up the waters of Kampeska.

The first idea for the plant was to use it to treat lake water the way it had been filtering drinking water - essentially, using the plant to turn large quantities of lake water into drinking-quality water. After the Kampeska Water Project District analyzed this idea, it was deemed cost-prohibitive.

However, at that time there

Please see PHOSPHORUS, Page 14

How it works

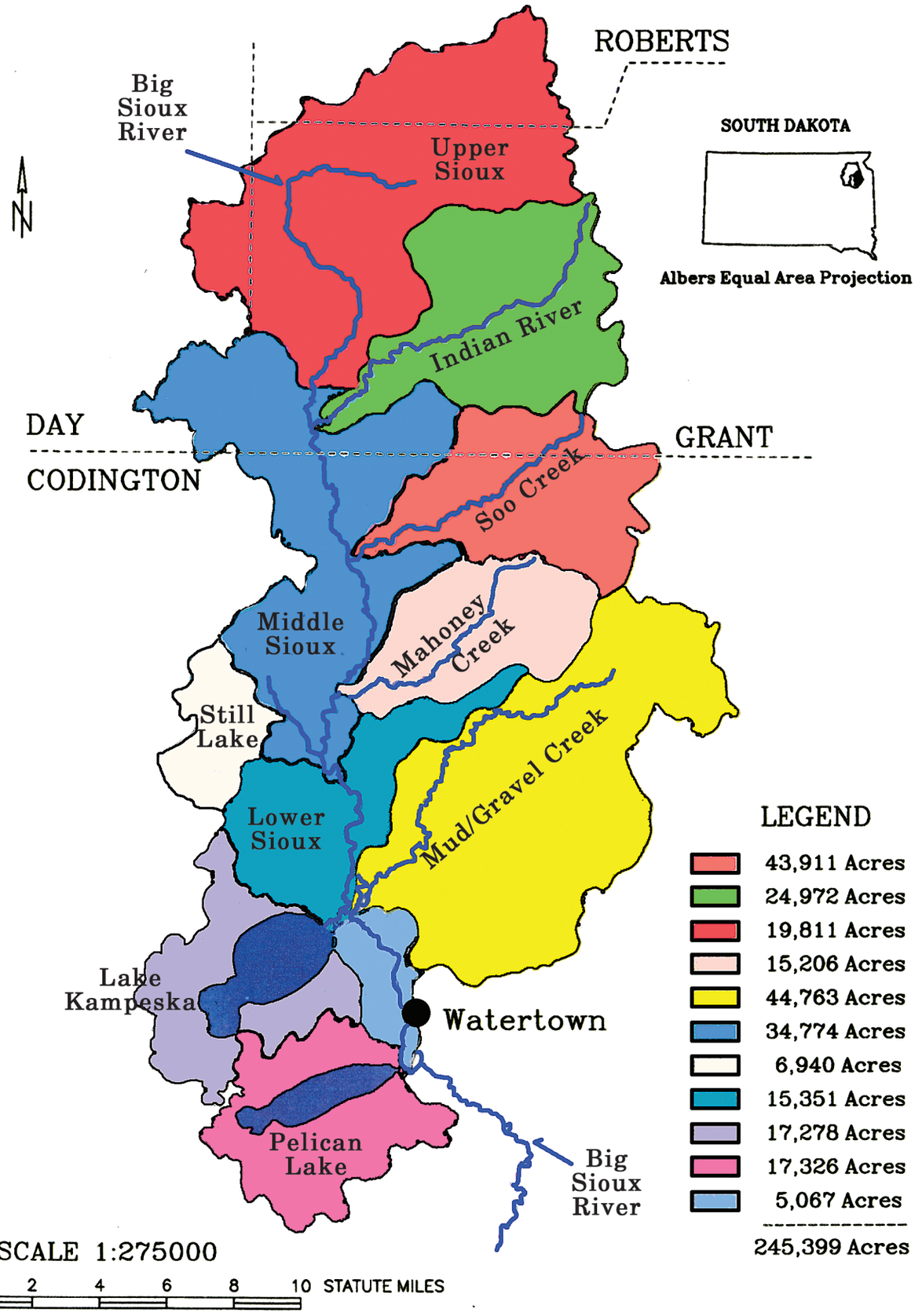
- Water is pumped from Kampeska through a 1,500-foot long, 18-inch wide intake pipe into the "growth chamber," a 6 1/2 foot deep, 98,000 gallon tank filled with algae and lighted with 3,500 LED lights (at right).
- Algae feeds on phosphorus in the water for about three days, After leaving the growth chamber, water is filtered twice and pumped back into the lake.
- Monitoring occurs when the water comes in and when it leaves to determine the amount of phosphorus removed.

Public Opinion photos by Mason Dockter

Above, the LED lights that keep the algae alive cast off a pink glow.

At left: Roger Foote is the driving force behind the Phosphorus Removal Facility. He is the coordinator of the Upper Big Sioux River Watershed Project.

UPPER BIG SIOUX WATERSHED



U.S. DEPT. OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

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GEOGRAPHIC INFORMATION SYSTEM

Ways YOU can help protect our water

Each one of us has an impact on local water supplies, both in terms of water quality and the amount of water we use in times of drought. Here are some things you can do to help protect water quality and tips to conserve water.

Don't use antibacterial soaps or cleaning products

Most of these contain triclosan, a registered pesticide that has been found to harm aquatic life. The American Medical Association warns that use of antibacterial agents may lead to "superbugs" that will be antibiotic resistant. Regular soap and water kills germs just as effectively.

Never flush unwanted or out-of-date medicines down the toilet or the drain.

Find out if your county or city has a site or program to collect unwanted phamaceuticals. If not, remove all labels and wrap the products before disposing in the garbage. If possible, pour water or vinegar in the bottle to destroy pills and make them inaccessible to children.

Don't put anything except water down storm drains.

These drains carry storm water to local waterways. Used motor oil, detergents, lawn fertilizers, pesticides and other contaiminats get carried by stormwater to local waterways and cause unnecessary harm.

Fix leaks that drip from your car and put down a liner in your driveway to collect oil and other materials.These leaks and drips contribute to stormwater pollution.

Avoid using pesticides or chemical fertilizers.

They pose a serious threat to your health and safety and they pollute both ground and surface water.

Choose non-toxic household products whenever possible.

The best way to keep from polluting is to use products that are not dangerous to the environment in the first place.

Pick up after your pets.

Like other contaminants, pet waste can run down the storm drains spreading bacteria and nutrients.

The Watertown Municipal Utilities Department sends out ideas to conserve and protect water in its monthly bills to customers, courtesy of the City of Watertown Stormwater Initiative.

2008 Biodigester Information Meeting – meat and dairy producers come together to learn about alternate animal waste management handling and use. (Avatar Energy).

2012 Law Enforcement National Night Out, which is held annually, included an Enviroscape hands-on demonstration about how water washes down from rural, urban and commercial properties into the river. Kool-aid and cocoa make pretty good examples of what goes into the river.

2007 Stakeholder tour EPA Region VIII representative, Don Crouse (Izaak Walton League Kampeska), Mike Williams, UBSRW Coordinator, and Ken Madison, DENR Project Scientist, visit about Best Management Practice sites to visit.

At right, 2015 *Fifty Shades of Wetlands* — Marinus Otte, far right, from NDSU, an expert and advocate of wetland values, presented a program on the what and how and why of wetlands. Jon Wendel of the S.D. Department of Ag discussed plants and shrubs that are water tolerant. At right, Otte (far right) visits with an attendee.

At left, the 2010 Watertown High School Earth Science Class learns how to do a macroinvertebrate (visible, spineless water bugs) survey to demonstrate how clean (or not) the water is. Some organisms are more sensitive to pollution than others and won't be found if the water isn't pristine. Some can be found in any kind of water. A wide variety of species indicates healthy water.

Clean water doesn't just HAPPEN

By Mason Dockter
Public Opinion Staff Writer

On average, a Watertown resident uses roughly 70 gallons of water per day to take showers, cook, wash floors, and flush toilets.

But despite water being the namesake of the city, not everyone in Watertown takes the time to consider the source of the substance fluid.

Watertown's water superintendent Jeff DeVille says Watertown's water comes from a network of 33 wells, most of which are several miles north of the city.

After being pumped from the wells, the water is sent to the city's water treatment facility. There, it undergoes a four-stage process that prepares the water for use and consumption by city residents.

The first stage is called "aeration," which strips hydrogen sulfide from the water and puts oxygen into it. The reason that hydrogen sulfide must be removed from the water, DeVille said, is mainly an issue of odor.

"It smells like rotten eggs, so it's not a desirable thing to have in your water," he said.

After aeration, the water goes through lime softening, which removes two-thirds of the mineral hardness from the water. Some level of mineral hardness is intentionally left in the water, because water that has all of its mineral content removed would be corrosive to pipes.

Rather than risk city wide pipe corrosion, DeVille said that some minerals are left in the water, which result in the opposite effect – an essentially harmless "scale" layer of minerals builds up on the inside of pipes.

Too much "scale," however, leads to excessive limescale buildup in pipes and on faucets, another undesirable outcome, so mineral levels must be kept in check.

At this point, the pH balance of the water is about 10.5, which is too high, so it is "recarbonated," which brings down the pH level. A very high pH means that the water is too alkaline, and a very low pH means the water is too acidic.

In "recarbonation," carbon dioxide is added to the water, lowering the pH balance to about 8.6.

After that, the water goes through filtration, which removes the remaining lime from the softening process. The filtration system used is called a "dual media high rate filter," which is a two-step filter that uses anthracite coal to remove larger contaminants and sand to remove smaller contaminants.

During this step, chlorine and fluoride are added to the water. Fluoride occurs naturally in the water at a level of 0.2 parts per million (ppm), but a desirable level is closer to 0.7 to 0.9 ppm, so extra fluoride is added.

The finished water also has between 0.5 and 0.7 milligrams of chlorine added per liter of water, DeVille said.

The purpose of adding fluoride to the water is to promote dental health; chlorine is added to ensure that the water is free from harmful pathogens.

Finally, the water is pumped to one of the city's six water towers or its ground storage tank. At this point, the water is ready for use in homes.

The six water towers have varying water storage capacities. The largest two, one near the mall and the other near the Mellette school, each hold 1,000,000 gallons of water. The tower on 19th Street holds 500,000 gallons, and the one on 14th Avenue holds 400,000 gallons. The two towers near Lake

Please see CLEAN, Page 12

2016 Sixth Grade Environmental Days at Bramble Park Zoo. An annual event including five public and three private schools. Stations include Riparian Values, Water Quality Sampling, Mr. Drip's Trip (the water cycle) and behind the scenes at the zoo.

Jeanette Towle's shoreline is rock riprapped, located on Lake Pelican. The riprapping helps protect the shoreline from damage.

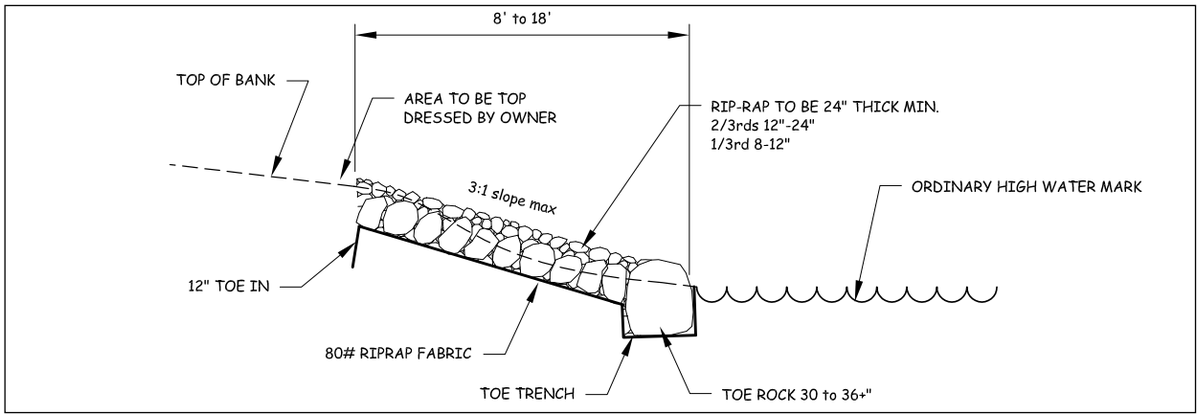
Property owners have three options to protect shoreline

Lake Kampeska is of glacial origin; it was created by a giant ice cube breaking off the last glacier and was covered with sand and gravel. When this ice cube melted it left behind a depression five miles long and two and a half miles wide which filled with water and became the lake.

As more urban development continues around the lake the need for shoreline protection increases. High winds along with lake levels over full create waves that can be quite destructive to the shorelines. Winter ice expands and can bulldoze large quantities of shoreline, lifting huge rocks and placing them dozens of feet from the water's edge.

To help stabilize these shorelines, methods have been developed to mitigate the dangers. Using the proper techniques, it is possible to have a useable, attractive shoreline for many years to come.

The most common type of shoreline protection is rock riprap. It generally is the least expensive and easiest to repair. Rock provides the most natural look and temporary lake access structures can be placed on top of the rocks in the spring and removed in the fall. Annual rock replacement may be needed if ice or waves move a few of the rocks, but seldom is the complete structure damaged. Natural plantings complement the rock and stabilize the top of the bank.



There are three basic types of bulkheads: steel sheet piling, supported wood bank retainers and concrete seawalls. The most appropriate uses for bulkheads are for toe protection of eroding bluffs that are subject to erosive forces during periods of extremely high water.

Bulkheads have two major drawbacks. The first is the high cost of the structure and the second is that they are doomed to massive failure from the forces of nature. Major points in favor of these structures are that they have little maintenance after installation, until the catastrophe happens, and they can be quite attractive. Experience has shown that placing an overtopping apron of fabric, decorative stone or sidewalk will protect the lawn from high water wave action.

Steel sheet pile bulkheads are driven into the shoreline one foot for every foot exposed. This could vary from site to site depending on the longshore drift.

Wood bulkheads are used but not recommended. Toxins leach out from the treated wood and are not recommended for lakes that serve as drinking water sources.

When damage does occur floating battering rams escape to pound the neighbor's shore and serve as hazards for boating traffic. Wood bulkheads should be used only in harbors or areas not prone to large waves or ice flows. The major advantage to this type of bulkhead is that it is less expensive than others are at the outset.

Concrete bulkheads are attractive and can be built to divert ice movement. A slanted face on the wall will encourage ice to curve upward as it expands on the shore. Installation costs can be high because of steep banks that need to be protected.

Concrete can be expensive to repair and once damaged, requires annual repairs. Access to the shore and water can be built into these structures, which makes them popular. They normally have about a 20-year life expectancy.

■ CLEAN

Continued from Page 11

Kampeska each hold 200,000 gallons.

When water is needed, it's gravity fed from the towers through the city's 150 miles of water pipes, which mostly run under the streets. Some sections of this pipe date back to the late 19th century, DeVille said.

The Highway 81 construction project has benefitted the water department somewhat, DeVille said, because it gave them the opportunity to replace some of the piping under the highway.

Watertown's city water supply sees fairly little of what are called "unaccounted-for losses," DeVille said, which essentially amounts to water that disappears from the system due to leaky pipes or bad water meters. The city loses about seven percent of its water, which DeVille said is a reasonable figure.

Given the water department's rule-of-thumb estimate of 70 gallons per person per day of water usage, the city as a whole uses approximately 1.5 million gallons of water per day.

Per-person water usage has declined somewhat in recent years thanks to the introduction of more water-efficient fixtures, DeVille said.

However, "it's still pretty close to 70 gallons per person per day," DeVille said.

On the whole, DeVille said that concerns about the municipal water quality are few and far between.

"We don't get a lot of calls on the water quality," he said.

Note: Jeff DeVille chairs the UBSRW Advisory Board

Constructed wetland

A three acre wetland is constructed to provide habitat for wildlife and filtration for the water runoff from surrounding farmland. This practice can be used for mitigation of other projects and for improving water quality downstream of animal feeding operations and erodible farm fields.

Grassed Waterways

This practice, at left, protects sites where gully erosion in a field is evident and recurring. The eroded waterway is shaped, seeded and later mown. This gentle broad grassed area filters water and captures nutrients and sediments before runoff leaves the field.

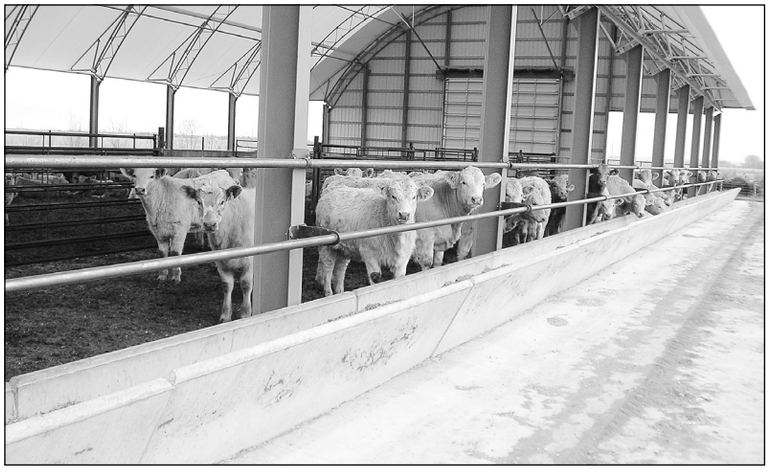
Streambank stabilization

At right, a 2006 partnership of Codington Conservation District (plants), Watertown Middle School Geography Club (labor) and the Upper Big Sioux River Watershed Project (goal, oversight and direction) to plant willows and high bush cranberry plants along the Big Sioux River south of 10th Avenue near the Kiddie Ponds. Plants stabilize the slope, slowing erosion of sediment into the river.

Compost facility designed for benefit of animals, environment

Inside – Composting facility is designed to have a feeding area and a bedding pack area where solids are reduced by decomposition. The feeding area is scraped periodically and added to the pack. The pack is maintained and aerated by tillage equipment.

In order to exclude animals from sensitive wetland areas, a composting facility contains the manure and the animals. When managed correctly, it provides a healthy environment for both with increased gains and a richer fertilizer product. Below, animals reach through the southern side to the waiting feed.



Education & info

2006 Grazing Management Seminar with national and local speakers on intensive grazing management through pasture rotations and grass management. Poinsett Water Project District, UBSRWP, Natural Resources Conservation Service, and Codington and Hamlin Conservation Districts partnered to host the presentation.

2014 Lake Area Technical Institute environmental technology students often come to UBSRWP to learn basic surveying techniques.

2013 *50 Shades of Grass* seminar included three professionals on natural grasses and soil evaluation and preparation. They presented alternatives to Kentucky bluegrass to a packed house.

■ PHOSPHORUS

Continued from Page 8

was buzz about the idea of using algae for a variety of novel scientific and environmental purposes, including to remove contaminants from water. Since the purpose of cleaning the lake water was to discourage algae blooms, Foote became interested, so he researched the possibility. Over the following year he worked with engineers and formed a plan around the idea.

The experimental system was up and running in July 2013. In the ensuing three years, Foote and a part-time facility employee have made modifications to the system and have had a number of learning experiences.

The amount of phosphorus the facility removes from its filtered water is tracked monthly, and it has varied significantly from month to month.

The best months were February 2014 and January 2015, when the plant removed nearly 30 percent of the phosphorus of the incoming water. The worst month was July 2014, when the outgoing water actually had 20 percent more phosphorus.

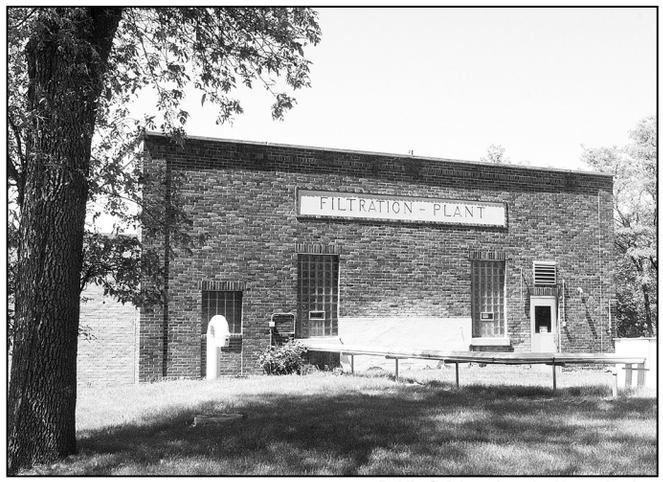
Foote said the reason the plant pumped phosphorus into the lake at times was because nutrients had built up in filters and eventually washed out.

"We learned that, as the algae dies and decomposes, it does it rapidly, and it was building up nutrients on top of the sand filters," he said. "It would accumulate there, and then the (phosphorus) levels going out would increase."

That problem was largely corrected with a modification to the system, Foote said, though they have faced sundry other issues, including piping issues and technical challenges with the algae tanks. The percentage of phosphorus removed has leveled off since the shaky first year, when less was known about manipulating the system.

In general, the project has gone in a different direction than Foote initially expected it to.

"Originally, we wanted everything to work perfectly from the beginning. We wanted to be able to pump 1,000 gallons a minute and maintain this process indefinitely. We've learned that that's not really the case. It's not gonna' work like that," he said. "However, we've learned what our limiting factors are and we're going to come up with a plan to improve (the system)."



Public Opinion photo by Mason Dockter

The facility is located in the former Water Filtration Plant at Lake Kampeska.

So far, the plant has yet to remove an appreciable amount of phosphorus from the lake as a whole, because it runs too slowly and at too small a scale to put a dent in the lake phosphorus.

"We're running at testing speeds, 20 to 60 gallons a minute – and that's a 5,000 acre lake. At those speeds, we would never live to the end of that. But running at the slower speeds tests the system and helps us find out what the limitations are," he said.

The speed necessary to achieve significant phosphorus removal would be on the order of hundreds of gallons per minute.

If possible, Foote said he would like to bring the total quantity of phosphorus in the lake down by about 25 to 35 percent. This would leave some phosphorus in the lake, but should help cut down on problematic algae blooms.

The next step for the plant will be a three-month trial demonstration of filtration equipment from Clearas Water Recovery, a Montana-based company that has developed a mobile system to filter water with algae. If that system proves successful, Foote said that he will try to develop a system similar to it.

Ideally, a successful demonstration of the Clearas system would bring Watertown's plant one step closer to practical, large-scale phosphorus removal.

Funding for the facility has come from several sources, most notably $200,000 from the state to retrofit the filtration plant, and $90,000 to cover three years' operation from the EPA. The city provided extra funding to help cover operating costs.

Overall, the project has put its funding to good use, Foote said.

"This experiment has been less than $300,000 over three years, and that's pretty cheap as far as experiments go," he said.

The city of Watertown has been supportive of Foote's efforts, he said, because of its dedication to the well-being of the lake.

"Anything to improve Lake Kampeska. Because it's kind of the heart and soul of the city, they're wiling to try just about anything," Foote said.

Water superintendent DeVille said the facility's technology and concept are sound, but so far it's effectiveness has been limited based on the small size and small output. Nonetheless, he did offer some praise of the facility.

"It's a pretty neat project," DeVille said.

LKWPD formed in 1986

The Lake Kampeska Water Project District (LKWPD) was established on Nov. 17, 1986. The first elected board members were Steve Lowrie, Gary Williams, John Wiles, Joe Iverson, Tom Green, Paul Hinderaker and Gregg Forsberg. Steve Lowrie was the first chairperson and held that post for several years.

In 1987, the board outlined three major projects to be undertaken: working with the Corps of Engineers to study the feasibility of a dam north of Watertown, rip-rapping of shorelines that are eroding into the lake and dredging.

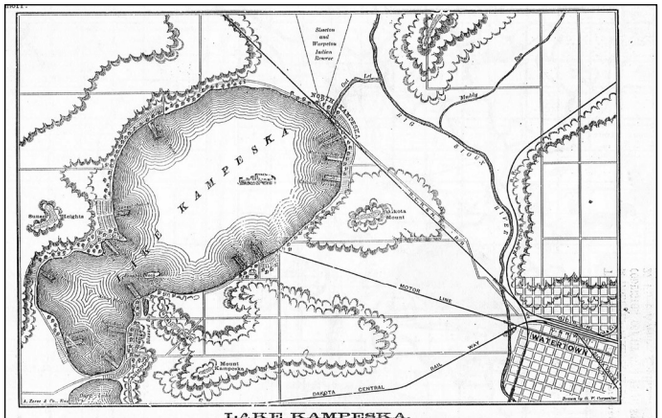
Rip-rapping or large sections of the shores of Kampeska started during the 1990s with financial assistance from the federal government. Also during this time, the LKWPD undertook a project to erect a weir at the inlet/outlet of the river. The purpose of the structure is to divert early spring runoff and not allow this water into the lake. The weir height is set to divert low-river flows, so in the event of a major flood, the lake will take in substantial river water.

The board has consistently funded efforts to improve the water quality in the Upper Big Sioux . LKWPD has funded projects in the Upper Big Sioux area in excess of $295,000. These projects have included riverbank stabilization, agricultural-waste treatment and other efforts to improve water quality of the Big Sioux River and reduce sedimentation.

The board does not have any regularly scheduled meetings, but continues to meet whenever necessary.

— Taken from the website

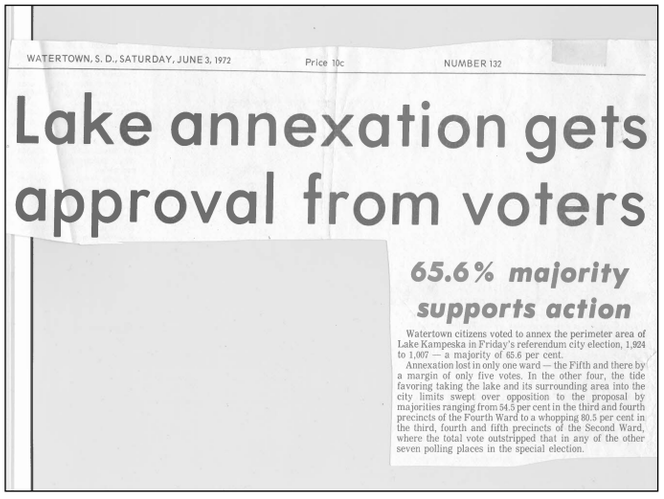
Motor line and rail lines to Kampeska in 1898



LAKE KAMPESKA.

A body of pure spring water, covering an area of eighteen square miles, situated four miles west of Watertown, South Dakota.

Map Source: Codington Co Hisotrial Society, Inc. ph. 886-7335, 27 1st Ave SE, Watertown, SD. HEADLIGHT magazine, 1898, no publisher noted.



WATERTOWN, S. D., SATURDAY, JUNE 3, 1972 Price 10c NUMBER 132

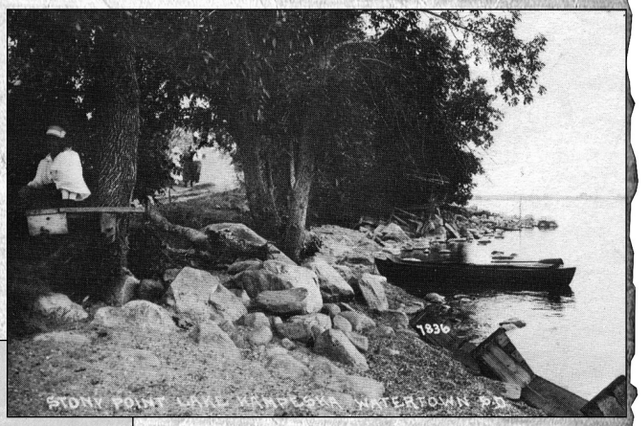
Lake annexation gets approval from voters

65.6% majority supports action

Watertown citizens voted to annex the perimeter area of Lake Kampeska in Friday's referendum city election, 1,924 to 1,007 — a majority of 65.6 per cent.

Annexation lost in only one ward — the Fifth and there by a margin of only five votes. In the other four, the tide favoring taking the lake and its surrounding area into the city limits swept over opposition to the proposal by majorities ranging from 54.5 per cent in the third and fourth precincts of the Fourth Ward to a whopping 80.5 per cent in the third, fourth and fifth precincts of the Second Ward, where the total vote outstripped that in any of the other seven polling places in the special election.

Glimpses of the past...



Photos and postcards from the Codington County Historical Museum in Watertown.

Rhet Russell, left, a wildlife biologist with South Dakota's Department of Game, Fish and Parks, looks at a plot of native grasses and plants near the home of Ron and Margaret Schulz. Helping grandma is her granddaughter, Taylor. The plot of native plant species helps to stop erosion, thanks to the plants' long root systems.

Roger Foote, left, coordinator of the Upper Big Sioux Watershed Project, explains the complexities of the Big Sioux Watershed to area elementary students, who visited Bramble Park Zoo this spring.

Public Opinion photos by Mason Dockter

Riparian Area Management

As the only cattle producer on a small tributary that drains directly into Lake Kampeska, Al Raeder, at right, wanted to have a positive effect on the runoff that leaves his property. As room and resources made a full ag. waste facility prohibitive, with NRCS and UBSRW assistance, he installed a buffer strip and animal exclusion fencing from sensitive areas. The results have been fantastic, not only are his animals more healthy, so is the water that passes through.

Watertown fire chief Doug Kranz shows off a sign indicating that the area behind the fire station is planted with native buffalo grass. This grass needs less maintenance and water compared to standard lawn grass.

The crafty, meandering ways of the Big Sioux River and the stern, non-negotiable ways of government red tape are working against Lake Kampeska's weirs and the people who try to help the lake.

Kampeska has two weirs – a type of river barrier – at the intersection of the lake and the Big Sioux River. One works to keep out the filth and pollution associated with the "first flush" of spring water in the Big Sioux, and another diverts some Big Sioux River water into Kampeska when the lake is low.

— Reprinted with permission from the Watertown Public Opinion, July 23, 2016

Google maps

This map shows the location of the breached weir on the Big Sioux River that is supposed to help control the level of Lake Kampeska. Lunkers Restaurant is seen at the lower left corner.