

**Testimony Presented to the
Senate Budget Committee
“Devils Lake Flooding Disaster:
A Stump Lake Perspective”**

**by
Todd Sando, P.E.
North Dakota State Engineer,
and Chief Engineer-Secretary to the
North Dakota State Water Commission**

Lakota, North Dakota

August 27, 2010

Mr. Chairman and committee members, my name is Todd Sando, North Dakota's State Engineer, and Chief Engineer-Secretary to the North Dakota State Water Commission. I appreciate the opportunity to address you and the committee regarding the Devils Lake flooding crisis. Resolving this problem is one of the most pressing issues facing North Dakota today. On July 8, 2010, I delivered testimony to your committee in Devils Lake to address what the federal government might do to respond to the Devils Lake flooding disaster. In that testimony, I provided background information along with suggestions for the federal government to consider that I believe are pertinent to the topic of this hearing. I have included that testimony in addition to what I am providing today.

I would like to begin by pointing out that the same issues of flooded homes, infrastructure and agricultural land that have plagued areas adjacent to Devils Lake have equally impacted the people around Stump Lake. Addressing the Devils Lake flooding problems will go a long way in addressing the needs at Stump Lake.

Today's hearing on Stump Lake is important because decisions regarding potential actions at the Tolna Coulee will have tremendous implications not only to people around Stump Lake but also to people inundated by Devils Lake and those living downstream along the Sheyenne River. Stump Lake is a critical piece in the Devils Lake flooding disaster puzzle.

Since 1993, Devils Lake has risen to a level that has inundated several otherwise separate lakes in the 3,800 square mile watershed. The upstream series of lakes from Pelican Lake, to Lake Irvine, Lake Alice, Chain Lake and Dry Lake are all now inundated and part of Devils Lake and continue to increase in size. Downstream from Devils Lake are east Devils Lake and Stump Lake. Like the upstream lakes, these lakes are also now part of Devils Lake. Stump Lake is at the bottom of the drainage system and is the location of the watershed's natural outlet to the Sheyenne River via Tolna Coulee.

The Devils Lake water level is currently about 1451.6 feet msl. Based on information generated by climate and statistical experts, Devils Lake can be expected to continue its rise over the next several years. As I've explained in previous testimony to this committee, North Dakota built an emergency outlet project on the west end of the lake system to enable us to move as much Devils Lake flood water as possible to the Sheyenne River in a controlled manner. The objective is to reduce flood damages around Devils Lake, but most importantly, to reduce the risk of a natural, uncontrolled overflow through the Tolna Coulee. With the project's increased capacity of 250 cubic feet per second (cfs), the latest model runs show there is about a 9 percent chance Devils Lake will reach its spill elevation of 1,458 feet msl within 20 years. The increase of risk of an overflow from the 7 to 9 percent is the result of updated modeling that includes wet conditions experienced this summer.

The very real potential of a natural overflow from Stump Lake, now Devils Lake, poses a serious risk for downstream interests. If Devils Lake spills, the contributing drainage area of the Sheyenne River near Cooperstown will quadruple from 1,270 square miles to 5,070 square miles because the entire Devils Lake basin would then contribute to the river's flow. This will have many consequences including long-term elevated flows in the Sheyenne River and a serious impact to downstream water users due to high sulfate and other dissolved solids. Stump Lake is at the extreme downstream end of the Devils Lake drainage basin and, as such, has been the collecting point for sulfates and other water quality constituents carried to the lake in runoff for centuries. Sulfate levels in Stump Lake today are about 2,500 mg/l while the water in West Bay near the state's emergency outlet is about 575 mg/l. Water quality impacts were discussed at length in your West Fargo and Lisbon hearings last week.

As Devils Lake continues to rise, the decision of what will be done at the natural outlet near Tolna Coulee is the subject of heated debate. Many people downstream are concerned about water quality impacts and high flood flows of long duration on the Sheyenne River. Valley City passed a resolution arguing the natural outlet should be hardened and Barnes County has suggested the spill elevation should be raised by a foot. On the other side of the issue, people who have suffered with rising Devils Lake flood waters for years argue the outlet should not be hardened with some saying it should be excavated by as much as several feet below its current 1458 feet msl level to move flood water out of Devils Lake as soon as possible. I believe the controversy over management options at the natural outlet is one of the most difficult issues being addressed by the Devils Lake federal task force. We are looking forward to seeing their recommendations.

The debate over a control structure at Tolna Coulee stems, in part, from the nature of the soil structure at the outlet location. Over the centuries since the last glacier, Devils Lake's repeated rise and fall has deposited beach sand and gravel

at the outlet location leaving a highly erodible soil structure at the outlet. If Devils Lake is allowed to fill and overflow, the outlet elevation could change drastically as soil is washed away. Several variables will determine how much or how fast the outlet will erode.

The State Water Commission initiated monitoring of Stump Lake and four observation wells located in the outlet area between Stump Lake and Tolna Coulee in 2006. The purpose was to address the concerns over Stump Lake water, or ground water influenced by Stump Lake elevations potentially breaching the divide. An initial report published in 2007 and a supplemental report published in 2009 conclude that there is no indicated influence of Stump Lake waters on ground-water elevations or chemistry in Tolna Coulee ground water. Monitoring is continuing.

Investigations have shown that the Tolna Coulee is not the only natural outlet for Devils Lake. An ancient drainway that includes Black Slough located south of East Devils Lake is another. A survey of this area shows that Devils Lake would spill through Black Slough at elevation 1,465 feet msl. While this outlet is 7 feet higher than the Tolna Coulee, it offers some advantages as an east end outlet alternative. Foremost is the better quality water in East Devils Lake versus Stump Lake. The latest readings at East Devils Lake indicate about 1,100 mg/l sulfate concentration while Stump Lake has about 2,500 mg/l. It is possible to build a gravity outlet along the Black Slough route to supplement the water removed with the state's emergency outlet on the west end of Devils Lake. Here again, water quality constraints in the Sheyenne River are a major obstacle. If an accommodation were made allowing temporary higher sulfate levels in the Sheyenne River, a significant additional amount of flood water could be removed from Devils Lake. This would further reduce the risk of an overflow at Tolna Coulee where water quality is worse and there is no current way to control the flow volume to the Sheyenne River. This is a worthwhile option that I hope is being considered by the federal task force.

In closing, I would request that the specific actions I recommended in my July 8, 2010 testimony be considered by your committee and appropriate federal agencies. Specifically, I hope that the Black Slough outlet from East Devils Lake will be given serious consideration. It would be a relatively inexpensive measure that could help preclude devastating downstream damages should Devils Lake spill uncontrolled through Tolna Coulee.

Thank you.

ATTACHMENT:

***Testimony to the
Senate Budget Committee Devils Lake Hearing
“Devils Lake Flooding Disaster: How Should the Federal Government
Respond?”
July 8, 2010
Lake Region State College, Devils Lake, North Dakota***

***Todd Sando, PE
Interim North Dakota State Engineer***

My name is Todd Sando and I am speaking as the Interim North Dakota State Engineer and Chief Engineer/Secretary of the State Water Commission. Thank you Senator Conrad for hosting this hearing and to the members of the committee for their interest in learning about, and helping to resolve the devastating flooding problems facing the people of the Devils Lake region and eastern North Dakota. I will not focus my testimony on the magnitude of the problem as it has evolved since serious flooding began 17 years ago. You have heard that over \$650 million will have been spent by the end of 2011 to address infrastructure and other needs around Devils Lake. Others will talk about the hardships that this long-term flood has forced on the area residents. Instead, I will try to highlight what we see as steps needed to reduce additional damages that can become even more catastrophic both in terms of geographic area affected and environmental and economic damages.

Solving the problems we face with ever increasing water levels will require that all local, state and federal entities work closely together in a partnership to decide our course of action and implement decisions quickly. For nearly 17 years we have been working within restrictive physical, financial and legal constraints. While we have made some progress, much more is needed. As I see it, there must be unprecedented actions taken to prevent an uncontrolled overflow from Devils Lake to the Sheyenne and ultimately Red River. A few years ago, the Corps of Engineers estimated that an uncontrolled overflow could cause \$21.3 million in damages annually to infrastructure downstream. At a minimum, the cities of Valley City and Lisbon would be devastated.

Devils Lake is a natural lake at the bottom of a 3,800 square mile watershed. The outlet elevation connecting this lake to the rest of the Hudson Bay drainage basin is quite high resulting in a lake level that rises and falls widely over time. Devils Lake only infrequently rises high enough to spill naturally doing so only a few times in the last several thousand years. The last time it overflowed was prior to statehood. Our studies show the changing water levels in Devils Lake provide a fairly accurate a barometer of whether we are in a climatic wet or dry cycle. As demonstrated by Devils Lake flooding and severe and frequent flooding along the Red River, the entire region is currently experiencing a very

wet climatic cycle. The impact of the wet cycle is demonstrated by the inflow to the lake. The average annual inflow from 1950 through 1992 was 33,800 acre-feet, while from 1993 through 2009 it was 243,700 acre-feet. Climate experts and those who study historic trends tell us the wet cycle may continue another 10 or more years. Many fear that the worst is not over.

The Army Corps of Engineers is currently building another congressionally and state funded raise to the embankment that protects the City of Devils Lake. Due to the depth of water standing against the embankment, what was once called a levee is now considered a high hazard dam. As such, the new structure must have an emergency spillway that will pass one-half of the probable maximum flood (PMF). In this case, the natural outlet at the Tolna Coulee is the emergency spillway. Unfortunately, the soil materials at the natural outlet are comprised of a mix of silt and gravel left over from ancient beaches and sediment blown in from the surrounding countryside. Once water begins to flow over those soils, there is little question that the outlet, or emergency spillway in this case, will erode. The Corps of Engineers has determined that one-half the PMF represents about 1.4 million acre-feet of runoff. The storage capacity of Devils Lake between its current elevation and the natural outlet elevation is only about 1.3 million acre-feet. As Devils Lake rises to its spill elevation additional land (78,800 acres) will be flooded around Devils Lake. There is not sufficient storage in Devils Lake to contain a one-half PMF event.

The record annual runoff of approximately 590,000 acre-feet occurred in 2009. Today, there is ten times more acres of water in sloughs and small lakes in the Devils Lake watershed than there was in 1991 and more that twice as many acres than there was in 1995. The soil profile is full and the many small lakes and wetlands in the watershed are full and overflowing. In 1993, the year when severe flood damages began to occur, a seven inch rain over part of the watershed caused the lake to rise about five feet. This was at the end of a five-year drought with an extremely dry soil condition and bone-dry upper basin lakes and wetlands. A similar rain over a large portion of the watershed today could push Devils Lake to the brink of a natural spill. The region has seen several rainstorm events of that magnitude and much larger in recent years. Summer storms at Ada and Roseau Minnesota and the 15 inch rainstorm along the Turtle River in North Dakota are examples of near misses. As I mentioned earlier, climate and statistics experts are telling us the wet cycle is not over and that it is entirely possible that the Devils Lake watershed will experience additional large runoff events whether as a result of summer storms or spring snowmelts.

The USGS has estimated that there is a 13 percent chance Devils Lake will spill in the next 20 years without an outlet and 7 percent chance with North Dakota's current emergency outlet. They have also estimated that there is a 10 percent chance Devils Lake will spill in the next ten-years without the state outlet. We have expanded, and are operating the state emergency outlet at 250 cubic feet per second. Other options are being explored but authorizing, funding and

building a new and/or enlarged outlet could take one to two years. Even then it could take some years to remove enough water to prevent a spill. The situation is critical.

Solutions to the Devils Lake flooding problem are complicated. Because Devils Lake is a terminal lake in a very large watershed, dissolved sulfates and other elements from the soils have naturally washed down into the lake over the years with each runoff event. As the water evaporates, sulfate and other minerals are left behind. Sulfate concentrations in Devils Lake change as the lake level changes over time. The nature of the way runoff enters Devils Lake results in a gradient of sulfate concentrations increasing from west to east in Devils Lake. The highest concentrations occur in the eastern part of the lake system. That happens to be where the natural outlet is located, at the Tolna Coulee. Herein lies one of the most difficult problems challenging a solution to the Devils Lake flooding problem. It is not just about too much water, but it is also about the quality of the water versus what exists in the receiving waters.

In building and operating the state's emergency outlet, it is necessary to strike a delicate balance between moving the greatest amount of water possible from Devils Lake while at the same time preventing exceedance of the water quality standards set for the Sheyenne River. Construction also required very careful design in order to avoid triggering the need for an environmental impact study under National Environmental Protection Act. This added greatly to the complexity and cost of the state's project. To maximize the potential for moving Devils Lake water, the state's outlet was built to take water from the west bay where the sulfate levels are the lowest.

The West Bay of Devils Lake including the Round Lake portion of Devils Lake where the outlet is located had sulfate levels of between 500 and 600 mg/L in 2009 and so far this year. Without Devils Lake water, the sulfate level in the Sheyenne River in the area where the outlet discharges into the river has generally been between 200 and 400 mg/L since 2005 although levels as high as 1600 mg/L have been measured during low flows. The water quality standard for the Sheyenne River was 450 mg/L until last year when an emergency rule modified the standard to 750 mg/L above Baldhill Dam. The standard remains at 450 mg/L below the dam. The 450 mg/L standard below Baldhill Dam will constrain the operation of the outlet at times, and challenges discharges of significant quantity of water from the east end of the lake.

Discharging water from Devils Lake also raised concerns in Canada and Minnesota that unique, harmful biota might be transferred to the Sheyenne and Red Rivers thus negatively affecting sport and commercial fisheries. Working with committees of technical experts, North Dakota has participated in exhaustive studies on biota present in Devils Lake comparing that to what is known about biota that already exists in the rest of the Hudson Bay basin. After years of sampling and analysis, no unique biota have been found in Devils Lake that do

not already exist the Hudson Bay basin. In fact, these studies have shown that Manitoban waters harbor far more threatening aquatic organisms. Despite this, and the fact that the state outlet has moved more than 29,000 acre-feet of Devils Lake water through a gravel filter to the Sheyenne River, Manitoba continues to raise concerns about any Devils Lake outlet. I should note that the upgraded state outlet includes an enlarged gravel filter system.

Many contend that modifying the Tolna Coulee to remove more water more quickly from Devils Lake must be done as soon as possible. Unfortunately, the naturally high sulfate levels and other dissolved solids in the far eastern end of the Devils Lake system, makes this very difficult. If an east end outlet is to be considered it may be best to move water from East Devils Lake through Jerusalem Coulee or the Black Slough area to the Sheyenne River to reduce the water quality impact downstream. Sulfate concentrations in East Devils Lake are 1,000 milligrams per liter versus 2,600 milligrams per liter in Stump Lake compared with the 575 milligrams per liter in the western portion of the lake. The sulfate concentration in East Devils Lake exceeds the new, higher limits set for the upper Sheyenne River by 250 milligrams per liter.

From our years of experience battling the Devils Lake flood, we know there are no simple solutions. Many factors have limited our ability to make as much progress as we would have liked. Foremost among them has been meeting the water quality standards of the Sheyenne River when Devils Lake water, even from the west end, is added. We are grateful that the North Dakota Department of Health has eased the constraints to the degree they have but even with these altered stream standards, our ability to remove floodwater from the lake is severely limited. We fully understand the need to protect downstream water users from harmful effects, however, the risk of a natural overflow and the potential damages an overflow would cause outweigh the impacts of a controlled discharge even from the east end of the lake. If the wet cycle continues, additional water must be removed from the lake in a controlled fashion.

The specific question posed by the committee in scheduling this hearing - "Devils Lake Flooding Disaster: How should the Federal Government respond?" - I have several suggestions:

First, the most expedient and effective way to move more floodwater than is being accomplished today is through further modifications to the water quality standards downstream from Valley City. This would require approval by the North Dakota State Department of Health and concurrence of the U.S. Environmental Protection Agency. Based on our experience, this would require a specific directive from Congress. It will also require adjustments by downstream municipal water users to adjust or modify their treatment plants to handle higher concentrations of Devils Lake water. Should these steps be accomplished, the state outlet could operate at a higher rate for a longer period of time. Downstream communities should recognize and agree with the Devils Lake

elevations at which would trigger moving even more floodwater, possibly from East Devils. Moving floodwater, even poor quality water, in a measured fashion is much better than the alternative of an uncontrolled, natural spill.

Secondly, the permitting processes at local, state and federal levels must be adjusted to accommodate more rapid decision-making. As one example, federal decisions requiring NEPA compliance are one area where we have experienced difficult, if not impossible time delays. Considering the dire consequences of a natural Devils Lake overflow, an emergency directive to speed environmental reviews to address the Devils Lake situation would be helpful.

A third area would be diplomatic participation. As was pointed out earlier, Canada has steadfastly continued their objection to operation of any type of Devils Lake outlet. Their stated concerns are two-fold; one being biota transfer; and the other being the need to meet water quality guidelines established in response to the Boundary Waters Treaty Act for the Red River as it comes into Canada. North Dakota has been in court several times on these issues and has thus far prevailed. Canadian concerns should not be ignored, however, the flooding situation in Devils Lake has been a growing catastrophe for many years. Therefore, it is necessary that the State Department be enlisted to seek an accommodation with Canada in order to avoid the dire consequences of an increasingly likely uncontrolled, natural overflow that would result in rapid and substantial impacts to the quality of water crossing the boarder. The more desirable outcome would be a controlled, much less significant water quality impact with a managed discharge from Devils Lake.

Canadian leaders must understand that an unregulated spill from Devils Lake is indeed a very real possibility. They must understand that removing as much water as possible from Devils Lake as soon as possible is critical. Moving floodwater from Devils Lake is a temporary emergency action that will be necessary only during this extreme wet cycle. This is not a permanent alteration of the drainage system. We do not believe this action will have detrimental affects in Canada.

As I draw to a conclusion, there is one final point that needs to be made to clarify the situation regarding wetland drainage in the Devils Lake basin and its relationship to Devils Lake flooding. No one can contest that there are wetland drains across the Devils Lake watershed with nearly all constructed prior to 1985. The question has been whether Devils Lake has risen appreciably because of it.

Over the course of an eight-year-long lawsuit, every aspect of that issue was carefully considered, beginning in 1999, when approximately 100 individuals who own land around Devils Lake sued the State of North Dakota and other local government entities, alleging that drainage and other water projects in the upper Devils Lake basin caused the lake to flood their property. During that trial, the court admitted over 1,000 exhibits, and heard testimony from numerous experts

on statistics, computer models, geology, hydrology, Devils Lake, the Devils Lake basin, and climatology.

In the fall of 2007, the North Dakota Supreme Court ultimately concluded the plaintiffs failed to establish that *any* of the alleged projects were the cause of flooding to their property. The court further concluded that a dramatic shift in Devils Lake area climate conditions over several decades, and especially during the 1990s, was the *sole proximate cause* for increased water elevations in Devils Lake – not the alleged drainage or other water projects.

In summary, these are the specific things Congress and the federal government can do to address the Devils Lake flooding issue:

As the federally led inter-agency task force completes its work, the federal government must be prepared to quickly fund implementation of its recommendations;

Further ease water quality limits along the entire Sheyenne and Red Rivers;

Develop alternatives for an east end control structure and outlet from Devils Lake amongst federal entities that would have jurisdiction;

Continue federal funding necessary to support infrastructure protection and modifications required by rising Devils Lake water levels;

Continue financial assistance via FEMA to home and business owners flooded by increasing Devils Lake water levels – consider the unique conditions affecting homeowners around Devils Lake and alter rules etc. accordingly to provide assistance in this unusual flood circumstance

As NEPA requirements have continued to delay mitigation projects, Congress should direct CEQ to abbreviate and/or accelerate NEPA compliance reviews relative to Devils Lake flood relief