# THE SHEYENNE RIVER SACRIFICED for POLITICAL EXPEDIENCY?

Date: July 9, 2010

For: THE U.S. SENATE BUDGET COMMITTEE SENATOR KENT CONRAD, CHAIRMAN Valley City, North Dakota, Hearing

From: Richard Betting, Secretary People to Save the Sheyenne 11630 39 St SE Valley City, ND 58072

I am speaking on behalf of downstream Sheyenne River landowners, water users and all those who are concerned with--and affected by--methods used to deal with high water on Devils Lake.

#### THE THREE-LEGGED STOOL

Not many people refer to the THREE-LEGGED STOOL when talking about rising water on Devils Lake any more. For those who may have forgotten, the first leg was infrastructure protection, the second, an Outlet into the Sheyenne River, and the third was Upper Basin Water Management--or storage. Justification for an Outlet was that all three legs of the stool would be used. Almost a billion dollars has been spent on moving houses and buildings, many before they were flooded--a special privilege from FEMA--rebuilding roads and dikes and so on. Over forty million was spent on the ND SWC Devils Lake Emergency Outlet. By comparison, almost nothing has been spent to restore drained wetlands in the Upper Basin.

"Solving the Devils Lake Dilemma," an article in the May1998 **North Dakota Water**, states, "In 1995, the Available Storage and Acreage Program (ASAP) was initiated by the State Water Commission (SWC) with **the goal of storing 75,000 acre feet of water in the Upper Basin**, which at the time would have taken nearly a foot off of Devils Lake. Presently, 167 sights [sic] store 22,000 acre feet through this voluntary program. SWC approved an additional \$1.5 million for 1998 storage." (p. 27)

In fact, most of the news about Devils Lake in the past two years has been that the lake will soon overflow and a fourteen-foot wall of water will wash down the Tolna Coulee. Senator Conrad even convened a meeting in Devils Lake on May 3 to enlist the help of ten federal agencies (everyone but the Environmental Protection Agency) asking them for a solution to the problem of water on the lake. At the end of the meeting Senator Conrad gave an impassioned shout-out in favor of an East End Outlet to lower water on the lake. Then Joe Belford, Downstream Devils Lake Emergency Acceptance Coordinator, had the audacity to demand a solution from the same group and gave them thirty days to make a decision. That deadline came and went.

One has to wonder why federal agencies were asked to come up with an answer to the water problem on Devils Lake when the best engineers in North Dakota, as well as the U.S Army Corps of Engineers and others, could not provide one. Could it be because some people are looking for a political solution to an environmental problem?

The "solution" water managers and politicians seem to be seeking is divine intervention, or at least an "executive exemption" from EPA and Corps and State and Federal rules or standards. With administrative approval, someone could put as much degraded Devils Lake water as they wanted into the Sheyenne River through both East End and West End Outlets.

The irony is that they want to destroy the Sheyenne River in order to save it, and they want us to agree to its destruction. And afterwards no one would be responsible for the destructive downstream ecological impacts that resulted.

#### CAN OUTLETS SOLVE THE PROBLEM?

Most people who understand the details of the issue of high water on Devils Lake believe that trying to remove water from the lake as fast as it comes in is a losing proposition. Yesterday (July 8, 2010) the inflows into the lake were about 600 cubic feet per second. The Outlet was pumping at 250 cfs. At that rate, it would take the Devils Lake Outlet six years to remove last year's inflows. Evaporation will remove about thirty inches from Devils Lake each year, six inches or so in July. More than the outlet will remove all year.

In fact, the more Devils Lake rises, the less good an outlet will do. Should the lake reach 240,000 acres in size, for example, an outlet would remove only three or four inches per year. At the same time, the larger the lake, the more evaporation. From a lake at 240,000 acres in size, evaporation will remove 600,000 acre feet each year.

More outlets won't solve the water problem on Devils Lake. They will only add to downstream Sheyenne River problems.

#### Misleading the Public

The State Water Commission has known all along that outlets would not work. Unable to pump much water into the Sheyenne River because of water quality issues, those in charge misled all North Dakotans (but especially those around Devils Lake) into believing that outlets would remove more water from Devils Lake than reality would ever allow.

#### **RESTORING DRAINED WETLANDS**

Therefore, the only practical, long-term method of dealing with a rising Devils Lake is to prevent water from drained wetlands from reaching the lake in the first place. Once in the lake, water management is no longer possible. People in the Devils Lake Basin say that their water is everybody's problem. If that's the case, we insist on using restoration of drained wetlands as the next approach.

# Since nothing else has worked so far, why not try preventing water from reaching Devils Lake in the first place?

Many North Dakotans sent their comments on this issue to the State Water Commission and to Senator Byron Dorgan and his Senate Appropriations Energy and Water Development Subcommittee after the Senator's hearing in Fargo February 19, 2010. Most of what was submitted then could serve a similar purpose today.

In an aggressive attempt to dismiss further discussion by Concerned Citizens about why Devils Lake continues to rise, State Engineer Dale Frink, in a March 30 letter, told them, in effect, to butt out.

Although he did not testify at Senator Dorgan's hearing, Mr. Frink apparently decided to give the committee his version of the Devils Lake story before they came to any conclusions based on the evidence presented to them.

The four issues Mr. Frink outlined in his letter to Concerned Citizens were (1) "the causes of Devils Lake flooding, and effects of drainage"; (2) an "analysis of the Devils Lake outlet impacts on the Sheyenne River"; (3) the "effectiveness of the outlet"; and (4) "the potential for armoring the Tolna Coulee."

#### WHERE DOES THE WATER COME FROM?

People who live and work along the Sheyenne believe that the way the entire Devils Lake water problem will be handled depends on how the first of these questions is answered: **What causes Devils Lake to rise?** 

A few people go so far as to claim that water from drained wetlands "Would have gotten there (into Devils Lake) anyway." Nonsense. Water doesn't drain from a tub until someone pulls the plug. That's what they want to do to Devils Lake now, pull the plug, before the tub is full.

One of the reasons Devils Lake is filling is that precipitation has increased slightly over the past sixty years. Prior to 1989 precipitation in the Devils Lake Basin area averaged 16.98 inches per year, and from 1989 through 2009 precipitation averaged 20.55. From 1992 through 1999 it averaged slightly more than 21.1 inches per year. (West Consultants Study 2001)

Mr. Frink cites the 2001 study done for the US Army Corps of Engineers by WEST Consultants of San Diego, California. According to Mr. Frink, the WEST Study concludes that "less than a 2-inch reduction in water levels" on Devils Lake if all of the available storage were used.

Unfortunately, Mr. Frink failed to tell Concerned Citizens--or Senator Dorgan--the rest of the story. Citing the WEST Study as if it were complete was deliberately misleading.

In fact, the WEST study is deeply flawed. The WEST study used National Wetlands Inventory (NWI) data which were incomplete at the time, and the data "do not include depressions that were completely drained prior to 1979.... [and] are not incorporated into the data set." (page i)

Did the WEST Consultants Report mislead? No, WEST knew its study was incomplete and based on faulty evidence. They said so.

WEST Consultants explicitly stated: "Since the results of this study indicate that depression restoration can reduce the volume of runoff entering Devils Lake, **further studies should be conducted** to more accurately quantify the runoff reduction resulting from depression restoration." (vii)

#### **DRAINED WETLANDS**

As wetlands were drained, the water they held flowed into gullies and coulees on their way to the lake below. Wetlands became faucets helping to fill the larger Devils Lake tub. Individually, drained wetlands became small faucets, and when combined by the thousands, their flow became small rivers, churning from the upper basin to the lower through the Edmore Coulees, Starkweather, Mauvais, Little Coulee and others. Late spring and summer flows through these coulees can be measured in the thousands of cubic feet per second.

A study done for the North Dakota legislature--the **1976 Devils Lake Basin Advisory Committee Report**--showed that 569,000 acres of wetlands existed in the basin at statehood. A 1983 US Fish and Wildlife-SWC study--**Wetland Storage Capacity of Natural Depressions in the Devils Lake Basin of North Dakota**-- arrived at a total of about 400,000 acres. And in January1999 the US Fish and Wildlife Service (W. Pearson email "Rationale") estimated that about 400,000 acres of sloughs (wetlands) existed originally.

# **ORIGINAL WETLAND ACRES IN THE UPPER BASIN OF DEVILS**

DEVILS LAKE BASIN ADVISORY COMMITTEE (1976) 569,000 acres

LUDDEN, FRINK and JOHNSON (1983)

412,000 acres

#### **REMAINING (NOT DRAINED) WETLAND ACRES IN THE UPPER BASIN**

U.S. FISH and WILDLIFE SERVICE & ND STATE ENGINEER (January 1997)

211,000 acres

# THEREFORE, TOTAL DRAINED WETLAND ACRES IN THE UPPER BASIN

# SUBTRACT REMAINING ACRES FROM ORIGINAL WETLAND ACRES & THE RANGE OF ESTIMATES IS from 189,000 to 358,000 acres in the upper basin that have been drained

The West Consultants Report Devils Lake Upper Basin Storage Evaluation (April 2001) estimates the "possibly drained" acres at 92,429 with a volume of 132,729 acre-feet. The West Report estimated **total wetlands at 115,668, with 52,210** as " possibly drained."

#### INFLOWS INTO DEVILS LAKE FROM UPPER BASIN

WHATEVER the total number of drained acres, from 189,000 to 358,000 acres that once were wetlands, now they no longer hold water. Of the precipitation that falls on those acres, what does not evaporate or sink in, runs off. The results can be seen in the amount of inflows from the upper basin into Devils Lake each year.

1979 inflow into Devils Lake	248,000 ac/ft
1987 inflow into Devils Lake	174,000 ac/ft
1988 inflow into Devils Lake	19,700 ac/ft
1993-1999 average annual inflows into Devils Lake	317,000 ac/ft
1997 previous record inflow	522,000 ac/ft
2009 (record) inflow into Devils Lake	587,000 ac/ft

The maximum water level rise on Devils Lake in a 30-day period was 3.82 feet in 1979. [For this and inflow data see Wiche, Hoetzer and Rankl, "Hydrology of the Devils Lake Basin," NDSWC, 1986; and Wiche and Pusc, "Hydrology of the Devils Lake Area," NDSWC, 1994]

[Another obvious question here is what is the correlation between inflows into Devils Lake and its rise over the years.]

#### **FIND THE ANSWER**

In order to begin to make decisions on how to handle the inflows into Devils Lake, a complete and accurate scientific study of the effects of upper basin drainage on the runoff into Devils Lake is absolutely necessary. THE U.S. Fish and Wildlife Service should be given the task of conducting an independent, comprehensive review of Upper Basin Drained Wetlands to determine the amount of drainage and its contribution to the rise of Devils Lake. That information would help lead to a scientifically-based decision on how to deal with the problem.

#### **USE LIDAR**

A new technology, known as LIDAR (Light Imaging Data And Radar) might be used.

The process results in topographic elevation mapping within a two-foot elevation contour, with people on the ground checking photo accuracy. This process could determine--for the first time--just how many wetlands in the upper basin of Devils Lake have been drained, how many acre-feet of water they once held, and how much of that water reaches Devils Lake.

The answers to those questions will help reveal to North Dakotans how much of water on Devils Lake is on the lake as a result of drainage. Unless that is done, all of the methods of managing higher water on Devils Lake will deal with results of too much water on the lake, not how and why it got there.

#### **A CRISIS, AN EMERGENCY**

To say that this is a crisis and that we don't have time for studies is false.

Devils Lake began its rise in 1993, they say, when this "wet cycle" began. Actually, it could have begun in 1983, when the lake rose six feet in three years and then fell again as far. In fact, Devils Lake has risen only four feet in the last seven years, going from 1448 feet above msl in 2004 to 1452 feet msl in 2010. Thus the label "emergency" cannot be fairly used in the Devils Lake situation.

#### WHEN DID THIS ASSAULT ON THE SHEYENNE RIVER BEGIN?

In response to a request from the City of Devils Lake, July 7, 2009, and the SWC on July 13, on July 15, the North Dakota Department of Health allowed an increase of sulfate in the river through the Devils Lake Outlet from 450 mgL to 750 mgL with no hearings, without adequate study on downstream effects, and without notification of water users, such as Valley City and the Federal Fish Hatchery north of Valley City.

From the ND Department of Health: "The rule changes the maximum limit of sulfate in a segment of the Sheyenne River that runs from its headquarters to 0.1 mile downstream from Baldhill Dam, including Lake Ashtabula, from 450 mg/L to 750 mg/L."

On June 9, 2010, the SWC notified North Dakotans that that permit change was made permanent. As a result, the SWC will pump West Bay water at 250 cfs into the Sheyenne River until the sulfate level in Lake Ashtabula reaches 450 mg/L, its statutory limit.

The North Dakota Water Commission West Bay Outlet has not prevented the lake from rising, nor will the Outlet prevent an overflow. An Outlet cannot keep up with inflows. Even increasing outlet pumping from 100 cubic feet per second (cfs) to 250 cfs will only remove five or six inches annually from the lake. USGS statisticians estimate that there is about a 10% chance of the lake overflowing within ten years. A 90% chance that it won't.

In the unlikely event that Devils Lake fills and overflows--at whatever level--all of the water entering the lake from the Upper Basin will then flow immediately into the Sheyenne River uncontrolled.

For example, if the Tolna Coulee were ditched to 1455 feet above mean sea level (msl)-three feet lower than its present level--and Devils Lake reached that height, all of the water entering the lake from the Upper Basin would flow through the Coulee and into the river uncontrolled. A control structure that could hold all of the annual inflows from 2009 would have to be larger than Baldhill Dam.

#### SHEYENNE RIVER WATER BETTER THAN DEVILS LAKE

Water quality in the Sheyenne River is much better than in Devils Lake. That is why Devils Lake water must "blended" with river water. Sulfate levels in West Bay are about 600-700 mg/L while the sulfate level in the Sheyenne is usually about 200-250 mg/L below Baldhill Dam.

As Outlet pumping continues, West Bay water will replace Sheyenne River water. When the outlet pumps at 250 cfs, Devils Lake water will overwhelm the river, which flows at less than 25 cfs typically during late summer and fall.

Ten times as much Devils Lake water as normal Sheyenne River water will turn the river into a West Bay ditch.

Filled with Devils Lake water, Lake Ashtabula will become a sink, trapping nutrients and other contaminants, which are much higher in Devils Lake water than in the Sheyenne River. [Readings below from USGS site: nd.water.usgs.gov.devilslake/science/hydrology.]

	SHEYENNE RIVER	WEST BAY	STUMP LAKE
sulfate	200-300 mg/L	600-700 mg/	2870 mg/L
total dissolved solids	600-700 mg/L	1200-2000 mg/L	10,000 mg/L
calcium	50-60 mg/L	60-75 "	?
magnesium	30-35 "	80-85 "	?
sodium	75-85 "	150-250 "	?
arsenic	4-5 mic/L	12-15 mic/L	20-30 mic/L
phosphorous	175-250 mg/L	400 mg/L	900 mg/L?
chloride	10-20 "	125-150 "	515  mg/L
hardness	250-300 "	400-550 "	?
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mercury, strontium, cadmium, aluminum and others?

North Dakota antidegradation rules state: "Proposed activities that would lower the ambient quality in a water body of any parameter by more than 15 percent... or increase permitted pollutant loadings to a water body by more than 15 percent will be deemed to have significant effects." [Appendix IV]

From the 2008 "Statement of Basis" from the North Dakota Health Department: "North Dakota's water quality standard for sulfate is 450 mg/L in the Sheyenne River." (p. 2)

The Citizens of Devils Lake do not drink Devils Lake water.

# THE SHEYENNE RIVER FISHERY AND ECOSYSTEM

After rising in Sheridan County, The Sheyenne River meanders for 581 miles through eastern North Dakota before joining the Red River of the North on its way to Canada. The 63 miles of river from Lisbon to Baldhill Dam are an integral part of the Sheyenne River Valley National Scenic Byway.

**North Dakota Game and Fish** described the Sheyenne River fishery as follows: "Native game fish found in the Sheyenne River are the channel catfish, northern pike, walleye and lake sturgeon. Records indicate 53 species known to inhabit the Sheyenne River; about twice the number found in other tributaries of he Red River. There are 30 species of fish above Baldhill Dam and 46 species below the dam. Many of these species are smaller fish that belong to various races of 'minnows.'... Two rare fish, the rosyface shiner and the pugnose shiner; and three rare mussels, the mapleleaf, black sandshell and pigtoe clams live in the Sheyenne." (ND Outdoors, July 1996) Few fish species are able to reproduce in Devils Lake. No mussels do. What will Devils Lake water do to the fish and mussels in the Sheyenne River? Will they survive? Have definitive studies of adverse effects on the Sheyenne River fishery have been done?

In a letter to the ND State Water Commission, Aug 13, 1999, Francis Schwindt, Chief, Environmental Section, **North Dakota Depart of Health concluded** that the Tolna Coulee drain being planned at the time would be harmful to the Sheyenne River. Schwindt wrote, "Furthermore, designated beneficial uses of the Sheyenne River would not be maintained; these include municipal water supplies, aquatic life, irrigation, industrial water supplies, and recreation."

About the results of an overflow from the Tolna Coulee into the Sheyenne River, in a letter to the U.S. Army Corps of Engineers, St Paul District (May 24, 1999) the **U.S. Fish and Wildlife Service** concluded that "the combination of high total dissolved solids (TDS), sulfates, and chlorides (plus unknown levels of other toxic or harmful constituents), would likely devastate the freshwater aquatic life in the Sheyenne River. . . . little if any natural reproduction of fish species would occur, and survival rates for juvenile fish would be in jeopardy. . . . will significantly degrade water quality, increase erosion and sedimentation, and result in conditions detrimental to aquatic mollusks, such as freshwater mussels, pill clams, and snails."

# THE VALLEY CITY NATIONAL FISH HATCHERY

Concerning the U.S. Fish Hatchery north of Valley City, the U.S. Fish and Wildlife Service went on to say, "**The hatchery's water source from the Sheyenne River will likely be unusable.** Therefore the hatchery would need to obtain a source of fresh water in order to operate. Furthermore, it is unlikely that the hatchery will be able to maintain its ability to provide fish to the State of North Dakota."

The Fish Hatchery is an industrial site that relies on Sheyenne River water for its production and its existence. **No state or federal agency has estimated the effects of higher levels of Devils Lake water on its continued function.** 

#### Other NEGATIVE EFFECTS OF DEVILS LAKE WATER ON THE SHEYENNE

Studies done by the U.S. Army Corps of Engineers (FEIS 2003) determined that adding Devils Lake water to the Sheyenne will increase bank erosion and sedimentation and degrade water quality in the river.

High water damages or destroys cattle crossings, pasture, and river access, as banks are eroded. Negative economic impacts to cattle operations due to decrease in water quality (EPA, February 2000) could result. Farm and ranch operators will suffer.

Potential for serious flooding during seasonal heavy rains increases. Will the Outlet be shut down during flood conditions below Devils Lake? Under what conditions?

Loss of riparian trees and plants will increase. Dead trees will increase the cost of riverbank clearing.

### **HEALTH ISSUES**

West Bay of Devils Lake contains over 600 mg/L of sulfate. About fifty percent of the total dissolved solids in Devils Lake is sulfate. Sulfate can cause diarrhea. The EPA suggested standard for sulfate is 250 mg/L.

Baby formula should not be made with water containing more than 450 mg/L sulfate. (Minnesota Department of Health)

The threshold level for sulfates is assumed to be 450 mg/L for all livestock.

From June 29, 2010, Winnipeg Free Press: "The fear is without a filtration system in place, algae, pathogenic bacteria, fish parasites and fish diseases could enter Manitoba's waterways.

Dwight Williamson, director of the water science and management branch of Manitoba Water Stewardship, said the draft results of an International Joint Commission study found seven fish pathogens in Devils Lake that were not found in Lake Winnipeg."

# Valley City WATER TREATMENT PLANT

How much will the cost of treating municipal water in VALLEY CITY increase after the reverse osmosis treatment plant is installed?

Adding poor quality Devils Lake water reduces the beneficial uses of Sheyenne River water all the way from Devils Lake into Canada, meaning this act could result in an illegal taking, from municipalities and from individual users.

#### Note: Devils Lake has risen only three feet in the last seven years.

[not to scale]

1449 Former height of Tolna Coulee before the City of Devils Lake removed a foot of dirt.

1458 feet above mean sea level. Devils Lake will begin to overflow at this height.

At the height of 1458 the size of DL will be 261,000 acres; it will contain 5,033,000 acre-feet.

At 1452 the size of DL = 182,244, acres; it contains 3,720,279 acre-feet of water. DEVILS LAKE IS ABOUT 75% FULL.



#### A POPULAR MISCONCEPTION and SCIENTIFIC NONSENSE.

John Bluemle and others conclude that since the lake overflowed in the past when no wetlands had been drained, draining will have little to do with whether Devils Lake rises or falls. The lake overflowed before, it can overflow again.

The fallacy in that logic is that we don't know how much precipitation it took for the lake to rise to the point of overflowing in the past. Scientists don't know if it rained a hundred--or four hundred--inches each year for forty years or four hundred and forty years.

#### AND THIS: Outlet proponents claim, "All of the wetlands are full."

Drained wetlands no longer hold water. Instead, they shed water and then produce barley, wheat, corn, other crops and pasture. The water they once held now covers someone else's land in the lower part of the Basin. Aerial photos of upper basin farmland reveal thousands of acres of former wetlands now being farmed.

An illustration of drainage in southern Cavalier County from 1954 aerial photographs indicates 1390 acres of intact wetlands in about four sections of land. In 2009 there were only 55 acres of wetlands remaining, a loss of 1335 acres of wetlands.

# THE TOLNA COULEE

When the lowest part of the Basin fills, Devils Lake rises, as it did several times in the distant past. With enough runoff, Devils Lake could fill up to a point where it begins to overflow from Stump Lake through the Tolna Coulee (about 13 miles long) into the Sheyenne River. The overflow level used to be 1459 feet msl, but since the city of Devils Lake took a foot off the Tolna Coulee, overflow will now begin at 1458 feet msl. With the lake at 1452 in 2010, the lake will overflow if it rises about six more feet.

USGS soils studies reveal that the Tolna Coulee did not wash out when Devils Lake overflowed several times in the past ten thousand years.

Armoring the coulee would ensure that it would not erode with an overflow.

The City of Devils Lake removed (at a cost of \$193,000 for the land and about \$30,000 for moving dirt) a foot of dirt from the coulee in the fall of 2009, claiming it was blow dirt and had been added since statehood. Therefore, returning an overflow point to its original condition. (If the entire Devils Lake basin were to be returned to its original condition, however, all of the upper basin drained wetlands would have to be restored.)

Lowering the Tolna Coulee increases the chances of an overflow from Devils Lake into the Sheyenne River. When the city of Devils Lake removed one foot from the Tolna Coulee, it increased the chances of an overflow within ten years from 5.6% to 8.1%, an increase of 46 %.

# WHAT THE North Dakota DEPARTMENT OF HEALTH SAID ABOUT STUMP LAKE WATER in 1999

Comments from a letter dated August 13, 1999, from Francis Schwindt, Chief, Environmental Section, North Dakota Department of Health, to David A. Sprynczynatyk, State Engineer, State Water Commission in reply to "a preliminary review of the City of Devils Lake's proposed project." Schwindt wrote,

"The project entails the construction of a 7,344-foot channel, from Stump Lake to the Tolna Coulee. There are many important plan details that are not available at the time of this evaluation.

"This project is extremely complex from a water quality perspective. The water quality parameters that are of concern include **total dissolved solids**, **sulfates**, **chlorides**, **copper**, **lead**, **arsenic**, **selenium**, **boron**, **ammonia**, **and nutrients**. The concentration of each of these constituents needs to be determined when blended with the Sheyenne River at the point of discharge, and several locations downstream, including the confluence with the Red River of the North, and at the International Border. Additionally, biological factors, such as algae, can result in taste and odor problems, and perhaps toxins for municipal water supplies...

"Furthermore, designated beneficial uses of the Sheyenne River would not be maintained; these include municipal water supplies, aquatic life, irrigation, industrial water supplies, and recreation."

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#### **WAFFLE Storage Plan**

Minnesota Representative Collin Peterson plans to secure funding for water retention in Red River Basin, of which Devils Lake is a Sub-Basin. Peterson's plan is to help fix the valley's flooding problems by increasing water storage, using what has been called a "Waffle Plan." Several mechanisms would be available for use, including restoring wetlands and holding water on fields temporarily and using control structures. A July 7, 2010, Forum article explains that North Dakota Rep. Earl Pomeroy, Senator Kent Conrad and Minnesota Senator Amy Klobuchar support the plan.

"Floods are Acts of God; flood damage largely acts of man."

**History of Devils Lake:** In the beginning, after the glaciers melted away, the Devils Lake Basin in North Dakota was one large tub. The size of the entire Basin, actually a Red River of the North sub-basin, is 3810 square miles. The Basin itself contained thousands of small tubs, otherwise known as wetlands or sloughs. Over time, Devils Lake--at the lowest point in the Basin--rose and fell as the climate changed from wet to dry, dry to wet. Devils Lake is now in one of its filling cycles.

In the past whenever it reached a height of 1459 feet msl, the lake overflowed through the Tolna Coulee into the Sheyenne River. Devils Lake overflowed several times during the past ten thousand years, the last time over a thousand years ago. Since scientists don't have the data, we don't know how much precipitation it took to raise Devils Lake to the point of overflow in the past. Since thousands of acres of wetlands have now been drained and the Devils Lake Basin is no longer in its natural condition, we don't know how much precipitation will be needed to raise the level of the lake to the point of overflowing. Since the City of Devils Lake removed foot of dirt from the Tolna Coulee in 2009, the lake will overflow sooner than it otherwise would have.