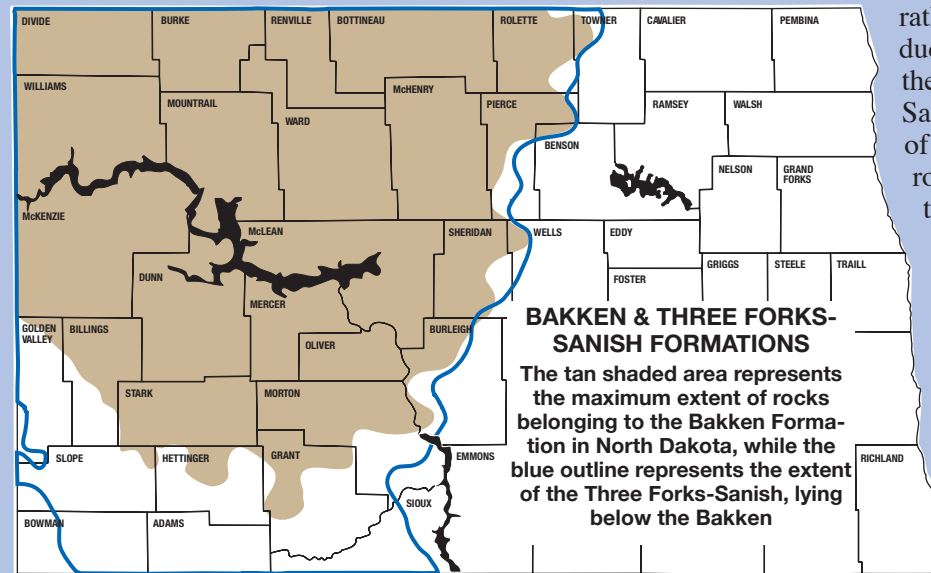


Non-Bakken formation drilling efforts can require as much as 0.3 acre-feet (100,000 gallons) of fresh water per well. In contrast, the Bakken Formation drilling process can require up to 12 acre-feet (4 million gallons) of fresh water to complete a single well.



rather than oil-producing shale rock, the Three Forks-Sanish is made up of sands and porous rock, which tend to have even higher yields than Bakken Formation wells. Thus, a growing interest in tapping those reserves can most certainly be expected in years to come.

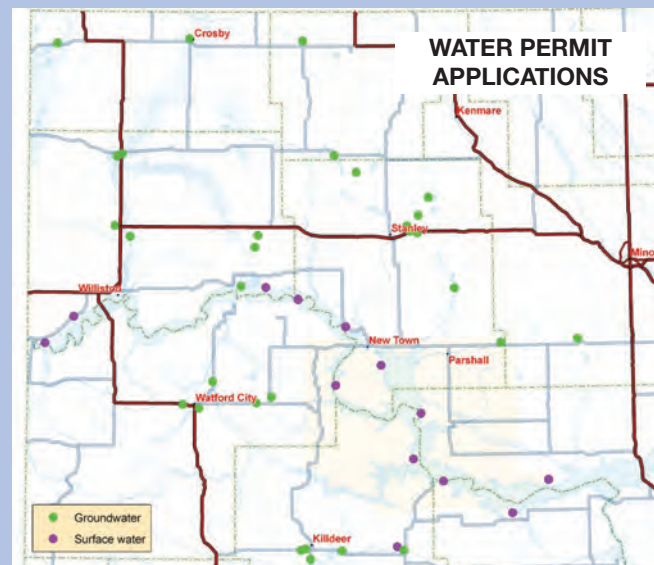
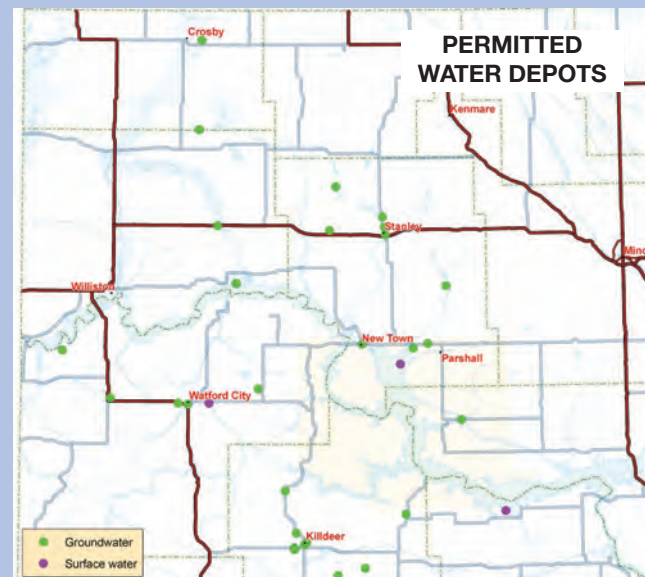
ted Water Depots).

More recently, the state now has 43 applications for water depots under review, with priority dates going back to 2006. Of those 43 applications, 32 are for ground water, totaling 10,073 acre-feet, and 11 are for surface water, totaling 49,850 acre-feet.

Of those 11 applications from surface water sources, all but one are requesting water from Lake Sakakawea (the Missouri River system). And, of the 49,850 acre-feet requested from surface sources, all but 50 acre-feet are from Lake Sakakawea.

As new technologies continue to make drilling more and more profitable in North Dakota, the demand for water to support those operations will also continue to grow. With the Missouri River system's abundant water supplies available in the northwest portion of our state, and with decreasing opportunities for available ground water sources, it is expected that Lake Sakakawea will play an increasingly important role in North Dakota's oil development for decades to come.

To put the oil industry's increasing demand for water into perspective, North Dakota's Office of the State Engineer issued 10 permits for water depots over the course of 27 years, from 1980 to 2007. In the last three and a half years, from 2007 to present, 25 water permits have been issued for water depots. Of those 35 permits, 32 were for ground water, totaling 2,334 acre-feet; and three were for surface water, totaling only 1,629 acre-feet (see map of Permit-

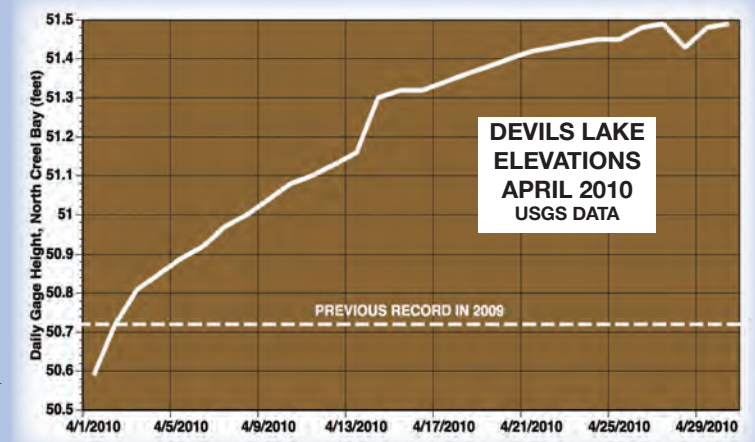


Devils Lake Breaks More Records in 2010

On April 2, Devils Lake crept to a new record elevation, surpassing the previous record of 1450.72 feet above mean sea level, set on June 27, 2009. After breaking the record mark, the big lake continued to surge upward, ending the month of April at 1451.5.

That's 0.78 feet above the previous June 2009 record, and 28.88 feet above the lake's lowest

1993 elevation – which was around the time it began its most recent rise. At its end of April elevation of 1451.5, Devils Lake covered about 177,100 acres, or



Abundant Lake Sakakawea Water Becoming Focus for Oil Development

Lake Sakakawea will play an increasingly important role in North Dakota's oil development for decades to come.

By Patrick Fridgen

North Dakota's Industrial Commission recently released a study suggesting the amount of oil North Dakota is sitting on is far greater than previously expected. But even before the release of this report, North Dakota has found it challenging to meet the oil industry's growing appetite for water supplies and depots to serve drilling efforts.

This most recent revelation will only increase the need for additional water supplies for drilling operations throughout the northwest portion of the state. The question is – where will all of that water come from?

Two years ago, the United States Geological Survey estimated there was approximately 4.3 billion barrels of recoverable oil from the Bakken Formation in North Dakota and

Montana, with 2.6 billion of those barrels recoverable from North Dakota wells. This new report suggests that because of new drilling technology, there may be an additional 1.9 billion barrels available for recovery from the Three Forks-Sanish Formation in North Dakota.

The Three Forks-Sanish Formation is located directly below North Dakota's portion of the Bakken, but

about 280 square miles.

According to the most recent (April 27) National Weather Service exceedence probabilities, there was a 50 percent chance of Devils Lake reaching 1451.8, and a 10 percent chance of it reaching 1452.7 by the end of September 2010 (see table). At 1451.5, Devils Lake is within 6.5 feet of its overflow elevation, where the big lake spills naturally into the Sheyenne River.

The volume of Devils Lake (and Stump Lake) at elevation 1451.5 is 3,630,450 acre-feet. The volume increase to Devils Lake for 2010 alone, as of the end of April, was 255,000 acre-feet.

At its spill elevation of 1458, the volume of Devil Lake will be just over 5 million acre-feet. That means from its current elevation, there are about 1.4 million acre-feet of storage remaining. It is important to note that the lake may only be a few major inflow years away from overflow. In the spring of 2009, record inflows of 585,000 acre-feet came into Devils Lake. If that happened again, nearly 42 percent of the lake's remaining storage could be used up in one year.

In response to the lake's current elevation and projected levels,

the U.S. Army Corps of Engineers (USACE) is continuing to move forward with a levee raise and extension for the city of Devils Lake. According to the USACE, the current embankments protecting Devils Lake are approximately 8 miles long, and are at an elevation of 1460. The new embankments will be approximately 12 miles long and at an elevation of 1466 to 1469. Actual embankment elevations vary because of the calculated wave run-up in different reaches of the project. The estimated cost of the levee/dam project is about \$100 million.

The city of Minnewaukan contin-

ues to be threatened by rising lake levels. The community's school, which is currently at or above capacity for student population, is at an elevation of 1458, but the city's sewer and water lines are already starting to experience problems from groundwater and saturated soils at the lake's current elevation.

In addition, the rising lake continues to take a major toll on surrounding roadways. According to North Dakota's Department of Transportation, approximately \$152 million will be spent this summer and next on roadway raises and other improvements in the Devils Lake area.



Snow plows are used to clear debris washed up on Highway 57 south of the city of Devils Lake, April 2010.

PHOTO: TIM HEISLER

PERCENT CHANCE OF DEVILS LAKE REACHING VARIOUS ELEVATIONS

| Chance | 90% | 80% | 70% | 60% | 50% | 40% | 30% | 20% | 10% |
|-----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Elevation | 1451.7 | 1451.7 | 1451.7 | 1451.8 | 1451.8 | 1451.9 | 1451.2 | 1452.2 | 1452.7 |



North Dakota State Water Commission
 Dale L. Frink, State Engineer
 900 East Boulevard Ave. • Bismarck, ND 58505
 (701) 328-2750 • <http://swc.nd.gov>

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