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# FROM THE STATE GEOLOGIST

## “Predictions” for the new Millennium

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Along with a bunch of other folks, I was asked in late December, 1999 by Steve Foss of the *Grand Forks Herald* to provide a list of “predictions” for what is in store for us in the 21<sup>st</sup> Century and 3<sup>rd</sup> millennium. I responded to Steve with the comment that, as a geologist, I’m in a little different position than someone predicting technological or medical advances. Geology just moves too slowly. For that reason, I speeded some things up a bit. To my credit, I think, I made no comments about Y2K computer problems.

I reworked some of my original Grand Forks Herald predictions and added a few others. I suppose I could have concocted a few dozen more “predictions,” but these will do for now.

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These observations were provided by the state geologist of North Dakota from a retrospective point of view on December 31, 2999 as the new century and millennium dawned (although there is some debate in the matter because no one can decide whether the 4<sup>th</sup> millennium begins in 3000 or 3001).

1. **Energy.** The era of “cheap” and easily available energy ended early in the 21<sup>st</sup> century – very early in the third millennium. The world supply of oil peaked early in that century and began an inexorable decline that resulted in frantic efforts to find a substitute to fuel our transportation needs. Finally, in accordance with the popular placebo on energy problems, “the scientists will think of something” – the scientists thought of “something” (but I am not at liberty to say what it is).

We never really ran out of oil, but the remaining supplies are being utilized to manufacture valuable petrochemicals. People look back in awe at the 19<sup>th</sup> and 20<sup>th</sup> century petroleum era “spike” and wonder how anyone could actually have burned such a precious commodity.

As supplies of oil dwindled, intense bidding for remaining production under the supply curve sharply

increased prices, with unpleasant, but enlightening results. Oil-exporting countries continued to benefit during the transition to competitive and sustainable energy supplies.

High prices for oil and gas required oil-importing countries to reduce wasteful consumption and promote more efficient, alternative energy sources.

The world’s supply of cheap oil ran out something like this:

1) In 1970, the U.S. reached peak production of 11.3 million barrels of oil per day (BOPD) and production began declining. This “event” was followed almost immediately by the Arab Oil Embargo, which resulted in the first oil shock.

2) North America (Canada, Mexico, and US) reached peak production in 1984. Other oil-producing nations that also peaked in the 20<sup>th</sup> century include, in the following sequence, Libya, Iran, Qatar, Romania, Trinidad, Brunei, Peru, Cameroon, F.S.U., Egypt, Mexico, Algeria, and Syria.

3) By 2002, the following countries peaked in their production of oil, leading to steady declines thereafter: Norway, UK, Denmark, Italy, Ecuador, Argentina, Angola, Gabon, Australia, Malaysia, Oman, and Yemen.

4) The following countries peaked before 2010: Indonesia, China, India, Vietnam, Congo, Nigeria, Venezuela, Tunisia, and Iraq.

5) Saudi Arabia and Brazil peaked in about 2011, Colombia in 2012, the U.A.E. by 2017, and Kuwait by 2018.

6) World oil production peaked in 2007, beginning the irreversible decline that continues today (Dec. 31, 2999).

*[Archival Note from 2000: I acknowledge the input and considerable influence of a friend and colleague, Dr. Walter Youngquist, who is a Geological Consultant in Eugene, Oregon. Walter Youngquist and Jack Century provided the peak-production dates I’ve noted, in a talk given to the Canadian Society of Petroleum Geologists on June 16 in Calgary: “Consequences of Reaching Peak Global Oil Production.”]*

New uses were found for North Dakota’s vast coal resources and the area became one of the main North

American suppliers of exceptionally clean and affordable electrical energy and chemical by-products made from non-polluting lignite-burning conversion plants and gasification/petrochemical plants. Huge quantities of methane are produced from North Dakota lignite using advanced microbial technologies and CO<sub>2</sub> injection techniques. All of this energy is supplemented by vast amounts of wind-generated electricity.

2. Global Climate Change. As the new (4<sup>th</sup>) millennium dawns, a fierce debate rages about how to deal with global chilling and the impending ice age.

3. Red River Flooding. The former Fargo-Hillsboro-Grand Forks metropolitan area has finally been completely evacuated and the city re-situated 50 kilometers west (the US finally and actually and really-truly went metric in 2832), out of reach of the raging Red River, which has produced sixteen 500-year floods in the past 100 years. Floodplains like those of the Red River are absolutely off limits for development.

*[Archival Note from 2000: In response to Steve Foss' request for predictions, the Grand Forks Herald published "predictions" by several dozen people in one of their first editions of 2000. I'm unsure, but I think there was only one follow-up "letter to the editor" in response to all of the predictions. That letter-writer objected to my [implied] suggestion that the best way to deal with flooding in the Grand Forks area is simply to get out of the way. In rebuttal to my comment (which, to be sure, was a bit flip), the writer suggested, that by 3000 the problem will be solved by an engineered solution. I don't, of course, really advocate evacuating Fargo and Grand Forks, but I respectfully disagree with the writer's point of view, insofar as I understand it. Effectively dealing with the flooding problem requires defining and understanding the causes and dynamics of flooding and, following that, responding appropriately. Overpowering a river with massive construction feats is not the best solution. We need to remember that nature ultimately wins and we need to learn to live with the nature of the river – this may mean getting out of the way!]*

*I entirely agree that my suggestion (evacuation of the floodplain) here is simplistic and, under present circumstances, outrageous, but I also think it would be useful if everyone directly involved would take a deep breath, stand back, and really evaluate the problems that river and lake-side communities like Grand Forks and Devils Lake face from flooding. We cannot hope to always engineer our way out of problems we've created through our own mistakes.]*

4. Devils Lake Flooding. A fierce debate has raged in the North Dakota legislature for the past several hundred sessions about how to deal with the serious situation at Devils Lake, where the lake is now poised to overflow (without benefit of a diversion), into the Sheyenne River. Downstream residents on the Sheyenne and Red Rivers in North Dakota, Minnesota, and Canada (now nine of the 90 United States/Canada states – Quebec remained independent) have successfully objected to every proposed diversion plan, but nothing better has yet been suggested (some things never change!).

5. Earthquakes. The North Dakota tectonic plate started moving rapidly northward during the early 21<sup>st</sup> Century (according to major news organizations, a response to global warming). Now that global chilling is the problem, the plate is trying to go back south and this has precipitated a series of disastrous earthquakes. Major news media are blaming global chilling on people who still eat meat.

6. Realty Development/Highway Construction. After North Dakota's most recent state-wide earthquake, and the destruction of most of the urban infrastructure along the major river valleys, on floodplains, over old landfills, and in other geologically unsuitable locations, there was an almost religious conversion, resulting in highway construction engineers and land developers starting to pay attention to the geology. The many landslides that resulted from the recent earthquake destroyed all the roads that had been built on landslide prone areas, without regard to the geologic implications. As a result of this, highway engineers began to seek out the advice of geologists and geological engineers as to how to better locate roads that need to be re-built to replace those continually being destroyed by landslides.

7. Oil Exploration and Development in North Dakota. The U.S. Dept. of NoRoads (formerly U.S. Forest Service) recently outlawed the use of levitating pads for further oil exploration and drilling in the western North Dakota badlands. With the price of crude oil now at \$723/liter (in terms of 2000 dollars), demand to open restricted areas to development is increasing. However, NoRoads is responding to concerns that the endangered native prairie dogs (and the plague, an endangered disease hosted and transmitted by the prairie dogs), as well as the Saber-Tooth cat and Woolly Mammoth, which were re-introduced into the badlands following their successful cloning in the 29<sup>th</sup> century, might be alarmed by the sight of the levitating pads.

8. Dams. During the past millennium several of the large dams that had been built in North Dakota during the 20<sup>th</sup> century either failed or reached the end of their useful lifetimes when they became completely silted in. When it became filled with sediment, the former Lake Sakakawea (everyone else finally accepted North Dakota's spelling of "Sakakawea" in the 25<sup>th</sup> century) became a flat, fertile plain that was, for a couple of hundred years, used as prime

farmland. With the sedimentation, the reservoir lost its water-holding capacity and ability to control floods. Consequently (along with the loss of other dams along the Missouri – Fort Peck, Oahe, and others), the river once again began flooding. South and far-northwest Bismarck, for example, along with other urban areas that were developed along the floodplain of the Missouri River, were subjected to repeated, increasing flooding problems. Damage would have been much greater if all homes and businesses had not been removed from a construction-free corridor along both sides of the river early in the 22<sup>nd</sup> century.

The Sakakawea, Oahe and Peck plains are now being rapidly incised and shaped into badlands as rivers are cutting their way downward.

Other dams and reservoirs (Ashtabula, Lone Tree, Burlington, Jamestown Dam, etc.) also reached the end of their lifetimes, either through silting in or catastrophic failure.

However, the most important “dam” problem facing North Dakota as the Third Millennium draws to a close is the one resulting from the southward-advancing glacier as the Manitoban Epoch ice age continues to encroach. New Lake Agassiz is forming ahead of the glacier margin, which has now advanced to the Winnipeg area, and acts as a dam to the northward-flowing drainage, including the Red River.