Sierra Club Three Lakes Group
Spring 2016 Newsletter

Three Lakes Group Officers: Roger Blanchard; Chair and Secretary, Carol Ward; Vice Chair and Forestry Chair, Annemarie Askwith; Treasurer, Pat Egan; Conservation Chair, Dave Aho; Communications and Internet Technology, Stephanie Aho; Communications, Kathy English; Group Representative

Spring Program Schedule

Programs are held at Bayliss Public Library in Sault Ste. Marie, MI at 6:30 pm

Tuesday February 9 – 'Oil & Water', the true story of Hugo Lucitante and David Poritz, will primiere Tuesday, at 6:30 pm, February 9 at the Bayliss Library in SSM.

Anxious about the growing effects of oil production on their community and rainforest, an Ecuadorian Cofan village asks a visiting University student, Miranda, to take one 10 year old child, Hugo, home with her to Seattle....

In Seattle, after working on a rainforest project in the 6th grade with another student, David Portitz, became fixated on a law suit against Texaco going on in Ecuador. In the seventh grade, he took on a summer project with the leading lawyer of that case and it changed his whole life...

Often studying other cultures can help us see values our own situations in a different light and spur creative solutions. Come join us for this interesting 55 mins presentation and some discussion. Suggested donation: $2 each; $4 for 3 or more persons. Sponsored byThree Lakes Sierra group.

Thursday March 17 – Echoes of the past, warnings for the future: a look at extinction in North America. This talk will look at the major extinctions North America has seen over the past 20,000 years, what we can expect in the future, and what the role of humanity has been (and is) in shaping the biodiversity of our continent. Special attention will be given to the pattern of extinctions that have played out here in Michigan.

Thursday April 21 – We will have a discussion concerning the history and basic science dealing with climate change, major concerns of climate scientists and how climate scientists view the recent Paris climate agreement.

What we are working on

In September we had a music event in which Susan Askwith, Roy Nason and I (Roger) played environmental and folksy songs to an enraptured audience, or a sleeping audience. We planned to do more events in the fall but we couldn't for various reasons. Hopefully we can do some during the winter/spring of 2016.

We had 3 programs during the fall:

Thursday Sept 10 - Renowned tree expert Steve Gregory gave a talk about tree planting and maintenance which was excellent.
Thursday Oct. 22 – Nancy Warren gave a talk on wolves which was excellent.
Tuesday Nov. 10 - Dr. Ted Ludwig gave a talk about Great Lakes colonial nesting birds, trends and problems which was excellent.

We had between 15 and 30 people at the presentations and I saw many new faces as well.

I (Roger) have been working hard on getting Bike Friendly Community Status for Sault Ste. Marie. I, Ken Miller and Megan Kelly met with the city manager and city engineer of Sault Ste. Marie in December. I expressed my view that the city should strive to obtain platinum status from the League of American Bicyclists for a Bike Friendly Community. I pointed out the various problem areas in SSM for bicyclists and pointed out streets that could be painted with bike lanes right now.

During the summer I sent a letter to MDOT expressing my concerns about the I-75 Spur in SSM. I had ~20 people sign it. I never received a response from MDOT. During the fall I informed our state representative that I had not received anything from MDOT concerning my letter. I then received a letter from MDOT stating they were looking into the issues I raised. I then received a letter stating that it was important for people concerned about biking issues to express their views to the city and to MDOT. If you are interested in getting involved with the biking issue in Sault Ste. Marie, you can e-mail me at rblanchard@lssu.edu.

The following is from Dave Aho about what he is involved with in terms of the U.P. Environmental Coalition, of which we are a member:

UPEC hired a new Business and Communications Manager, Gregg Bruff, who will assist in managing UPECs affairs and will also act as the newsletter editor.

The Celebrate the UP 2016 to be held in Baraga County at the Keweenaw Bay Tribal Community College on March 18th and 19th, with a board meeting on Friday and speakers on Saturday. All the events are free and open to the public. You can find current updates at: http://upenvironment.org/celebrate-upper-michigan/.

The board is currently reviewing applications submitted for UPECs new Community Conservation grant program. This program is designed to challenge UP communities to promote conservation values within their watershed or local areas. These grants are up to $10,000 each and are for planning or implementing local conservation projects that engage a variety of stakeholders within a community.

UPEC also has a Educational Fund which offers grants up to $500 for starting or maintaining environmental projects involving children. More information can be found at: http://upenvironment.org/mini-grants/

UPEC is also held a photograph contest, to highlight the "best of" the Upper Peninsula scenes and activities. The winners of this contest can be found at: http://upenvironment.org/photocontest/.

Kathy English has been active on several issues:

A). The Graymont project continues to move forward. They have purchased two (2) 40-acre parcels just outside the gates of the Wilwin Lodge estate from the American Legion as of December 18, 2015.

B). Hiawatha National Forest:
1. We attended the Hiawatha National Forest Open House on 10/7/2015, at which Robert West outlined the processes in relation to Graymont's request to purchase 1,700 + acres of Hiawatha National Forest Lands in Trout Lake Township. The evaluation is expected to take approximately three (3) years.
2. We attended the Friends of the Hiawatha meeting in which we met the new Hiawatha Forest Manager, Cid Morgan, coming from Albuquerque, New Mexico, and who is stationed in Gladstone. The NEPA process was discussed at length, as well as an overview of the project, although an actual application had not been received, only a letter of intent.

What's going on with Oil

"By our calculations it will require additional debt formation of $39 trillion over the next decade to keep petroleum production operating. Where that funding will originate from, when it is very unlikely to ever be repaid, will be of tantamount importance. It will take very strong-willed societies to make such sacrifices. If those sacrifices are not made, the integrated global production system will have disappeared by 2026. 2016 will be witness to the beginning of this event with dramatically increasing closures and bankruptcies throughout the world's petroleum industry."
The Hill's Group — "an association of consulting petroleum engineers and professional project managers"

North American oil-and-gas producers are losing nearly $2 billion every week at current prices, according to a forthcoming report from AlixPartners, a consulting firm.

Half of US shale oil producers could go bankrupt before the crude market reaches equilibrium, Fadel Gheit said Monday. The senior oil and gas analyst at Oppenheimer & Co. ultimately sees crude prices stabilizing

near $60, but it could be more than two years before that happens. By then it will be too late for many marginal U.S. drillers.

Oil and gas well drilling in the U.S. has declined significantly in the last year. Even though that is the case, the oil industry is still completing lots of wells in places like the Bakken region of North Dakota. That is because the oil industry had a backlog of many wells that were drilled but not fracked. The industry has to complete as many wells as they can afford to complete in order to make money to fend off bankruptcy (As of mid-Nov. 2015, there were 34 oil and gas companies that had filed for bankruptcy in 2015). As of Nov. 2015, there were 1364 more producing oil wells in the Bakken region of North Dakota while production was down about 45,000 b/d relative to the peak production month of Dec. 2014.

As I've stated before, the typical fracked oil and gas well declines 80-90% by the third year of operation so new wells have to be brought on-line at a fairly rapid pace to maintain production. The industry is losing money on every barrel of oil they produce from tight oil wells but they would be losing more money if they didn't complete new wells.

On another note, the U.S. Geological Survey downgraded the technically recoverable amount of oil in the Monterey shale (California) to 21 million barrels. To put that in perspective, the U.S. uses about 19 million barrels per day of liquid hydrocarbons.

About 6 years ago, the U.S. Department of Energy/Energy Information Administration (US DOE/EIA) was saying there were 15.3 billion barrels of oil in the Monterey shale. Then in roughly 2011 they reduced the estimate down to 13.7 billion barrels. Around 2013, David Hughes, a petroleum geologist, published a report which made a strong case that there was very little oil in the Monterey shale. In 2014, the U.S. DOE/EIA lowered their estimate of the amount of technically recoverable oil to 600 million barrels. Now it's down to 21 million barrels or 0.13% of the US DOE/EIA's original estimate. U.S. government agencies have had a long history of seriously inflated oil reserves estimates and future production predictions.

You probably haven't heard about that from the mainstream media. What I've heard repeatedly since ~2010 is how U.S. tight oil has changed everything in terms of U.S. oil supply. The original US DOE/EIA oil estimate for the Monterey shale represented 2/3rds of the total estimated tight oil available in the U.S. so the revised estimates are significant.

Below is an article about Barnett shale gas. The Barnett shale was where fracking for gas got started. In 2008 there were 194 drilling rigs working the Barnett shale. In early 2015, there was 1 drilling rig. There is no reason to have lots of drilling rigs in the Barnett shale if there are few places left to drill. The same process of declining drilling will occur in other shale oil and gas regions as worthwhile places to drill disappear.

The media has given the impression that there are many shale formations producing oil and gas in the U.S. and that the shale regions cover huge areas. In reality most of the oil or gas produced in a shale region comes from a relatively small portion of the total shale region. In the Bakken region of North Dakota, 4 counties out of 16 produce about 90% of all the Bakken oil. In those 4 counties, it's common for initial well production to be greater than 1000 b/d. In the other Bakken counties, it's common for initial well production to be under 100 b/d.

In terms of oil, almost all of the tight oil production in the U.S. comes from 4 regions: Bakken, Eagle Ford, Permian Basin and Niobrara. In terms of oil, I believe that the peak production in the Bakken and Eagle Ford shale regions has already occurred. A recent article by David Hughes made the case that Eagle Ford oil production has peaked. For gas there are 6 regions that produce almost all of the shale gas, one of them being the Barnett shale.

Going forward, oil companies producing tight oil from shale formations will have two problems: first, they have drilled up the sweet spots like there is no tomorrow such that the sweet spots have largely been saturated with wells. Oil development outside of the sweet spots will be nothing like what it has been in the sweet spots. Second, the Federal Reserve threw money at financial institutions after the financial problems in 2008. Much of the money ended up financing the oil and gas industry. It's questionable whether that process will be possible in the future.

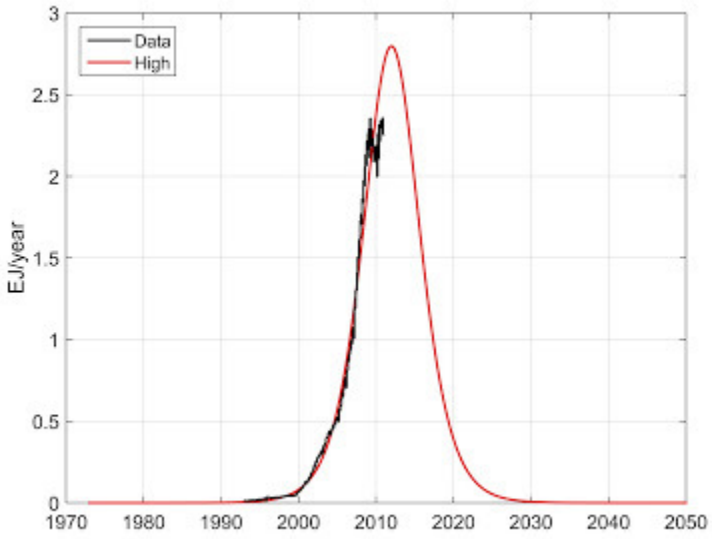
Peak of Gas Production in the Barnett Shale

by Tad Patzek, originally published by Life Itself | Aug 18, 2015

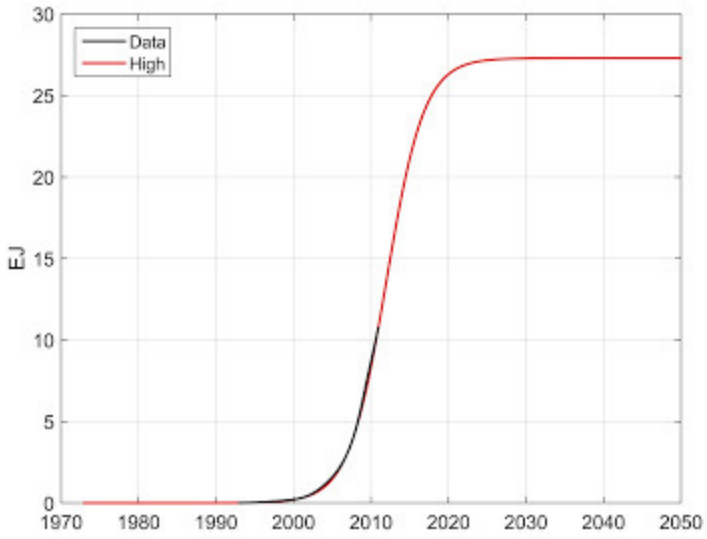
An ocean of ink has already been spilled on pros and cons of using Hubbert curves to model production from a large collection of wells in one or many reservoirs. In 2010, I published together with my last graduate student in Berkeley, Dr. Greg Croft, a highly cited paper on this subject. I have also commented multiple times in this blog on the different aspects of the Hubbert curve analysis, its limitations, and predictive power.

Since I cannot out-talk or out-convince the numerous critics of this type of analysis, let me give you a simple example of its robustness. This particular story is as follows. At the end of the year 2010, Greg Fenves, at that time Dean of UT's Cockrell School of Engineering in Austin, asked me to make a presentation to the School's Engineering Advisory Board (EAB). Using the results of our recent paper with Greg Croft, I chose to speak about my new work on unconventional resources in the U.S. On April 09, 2011, I made the presentation, which was then internally published by the Cockrell School.

The first two Barnett shale plots shown below were based on the Texas Railroad Commission data through October 2010. In the presentation, I called these plots the "high production scenario." The Hubbert curve with which I matched the production data ending in October 2010, went right between the two local peaks of the data. Of course there was an element of luck, helped by two decades of my experience as a reservoir engineer. Such experience or - for that matter - any other knowledge of reservoir engineering is absent among the economists, political scientists and journalists, who are paid to criticize this type of work.

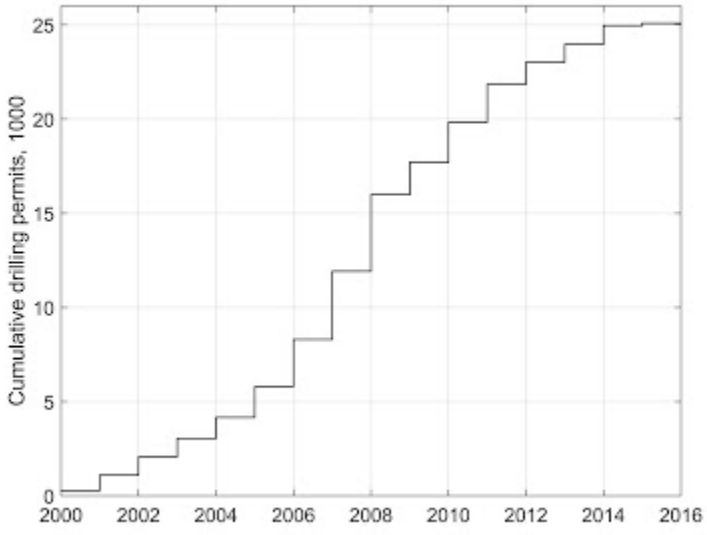


is image in full resolution, please click on it. The total rate of gas production in the Barnett shale through October s matched with a single Hubbert curve. 1 EJ/year ~ 1 trillion standard cubic feet (TCF)/year. This "high on case" was presented in April 2011, at the Spring meeting of the Cockrell School Engineering Advisory Board the University of Texas in Austin. It was also made available electronically to the EAB members.



is image in full resolution, please click on it. Cumulative gas production in the Barnett shale through October 2010, ched with a single Hubbert curve (an integral of the bell curve shown above). The projected ultimate production was 7 TCF. 1 EJ/year ~ 1 TCF/year.

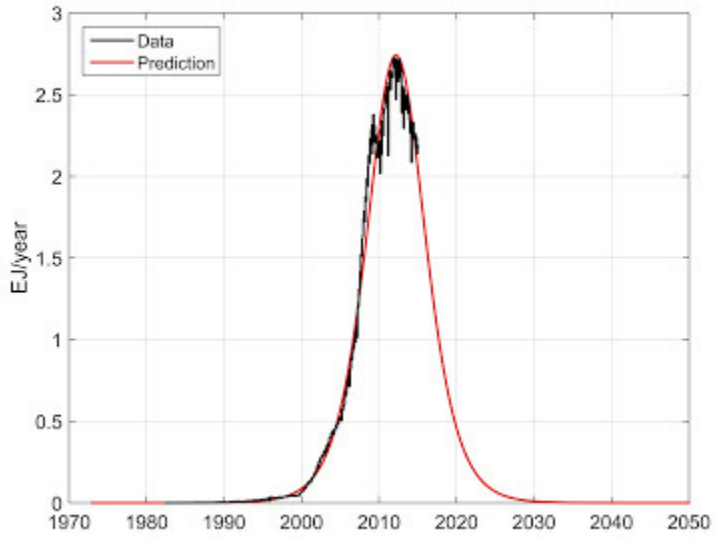
In fairness to lay people, the respected reservoir engineers who saw these curves in 2011, smiled at my naïveté and predicted 60, 100 plus, or more TCF of gas production from the Barnett. In short, most experts were also amused.



ive drilling permits issued by the Texas Railroad Commission for (the mostly horizontal) wells in the Barnett shale. the cumulative permit curve follows a logistic S-curve similar to the cumulative gas production above, only shifted Peak wells (4,065 at the inflection point in 2008) were drilled ahead of peak gas production in 2012. We are g to see the ultimate "carrying capacity" of past drilling in the Barnett. To change this S-curve, we need a brand new cycle of drilling.

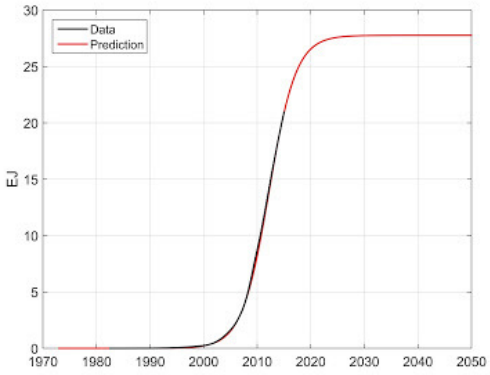
What did I do? I used a two parameter curve (height and width) to describe and extrapolate production from close to 20,000 wells in the Barnett. I knew two things: (1) this production could be matched with one Hubbert curve or 2-3 of them, and (2) I had to go above current gas production (overshoot it) because this production had not already peaked. The first observation

is based on the Central Limit Theorem explained in our paper, and the second one is an admission that more wells will be drilled and production will increase further, we just do not know by how much. Experience and intuition allow one to reasonably guess the size of this production increase. Guessing is an art and not all experts are artists.



is image in full resolution, please click on it. The total rate of gas production in the Barnett shale through March matched with a single Hubbert curve. 1 EJ/year ~ 1 trillion standard cubic feet (TCF)/year.

To see how good this December 2010 prediction was, fast forward five years. I should remind you that the Hubbert cycle predictions of future production of a very large number of wells and/or reservoirs are remarkably stable - the Central Limit Theorem makes sure of this, but I would not be happy if I predicted gas production in the Barnett shale with a 50% error. Luckily, as the plot above shows, I was right on the money, and no corrections were needed. Nevertheless, I could not resist tweaking the peak almost imperceptibly and increased the ultimate gas production from the Barnett by less than 1 TCF. Call it a reservoir engineer's decease.



is image in full resolution, please click on it. Cumulative gas production in the Barnett shale through March 2015, is with a single Hubbert curve. The projected ultimate production is at least 28 TCF. 1 EJ/year ~ 1 TCF/year.

In summary, given the current number of wells in the Barnett shale (over 25,000 drilling permits by now) and the already traversed peak of gas production, it is unlikely that I will have to adjust this prediction in the future, but let me play devil's advocate.

The Barnett shale is most unusual in that it has two sets of fractures in the hydrofractured rock surrounding horizontal wells.

One set is formed by the stress relief cracks from shear rock failure during hydrofracturing. Think of these cracks as being almost parallel to main hydrofractures and extending some distance away from both sides of these hydrofractures. But the Barnett shale is also likely to have another set of critically stressed (ready to pop), cemented natural fractures perpendicular to the hydrofracture planes. Together these two sets of fractures link during hydrofracturing and form large complex fracture systems that also communicate with the main hydrofractures. Thus, one *could* use this wonderful property of the Barnett mudrock, not replicated in other major shales, to create in the future many better and cheaper wells in the Barnett. If this happens, I will add a new Hubbert curve to my Barnett shale production model to account for the new wells, and happily report a significant increase (but *not* by 50%) of gas production there.

Roger

What's happening with Global Warming

As I've pointed out previously, the science surrounding global warming dates back to the 1820s when Jean Bapiste Fourier first hypotheses that gases in the atmosphere trap heat. In the 1850s, John Tyndall made quantitative measurements of the heat trapping capacity of greenhouse gases, including CO_2. Below is an article about global warming science back in the 1960s.

Scientists warned the US president about global warming 50 years ago today

Posted on 5 November 2015 by dana1981

Fifty years ago today, as the American Association for the Advancement of Science highlighted, US president Lyndon Johnson's science advisory committee sent him a report entitled Restoring the Quality of Our Environment. The introduction to the report noted:

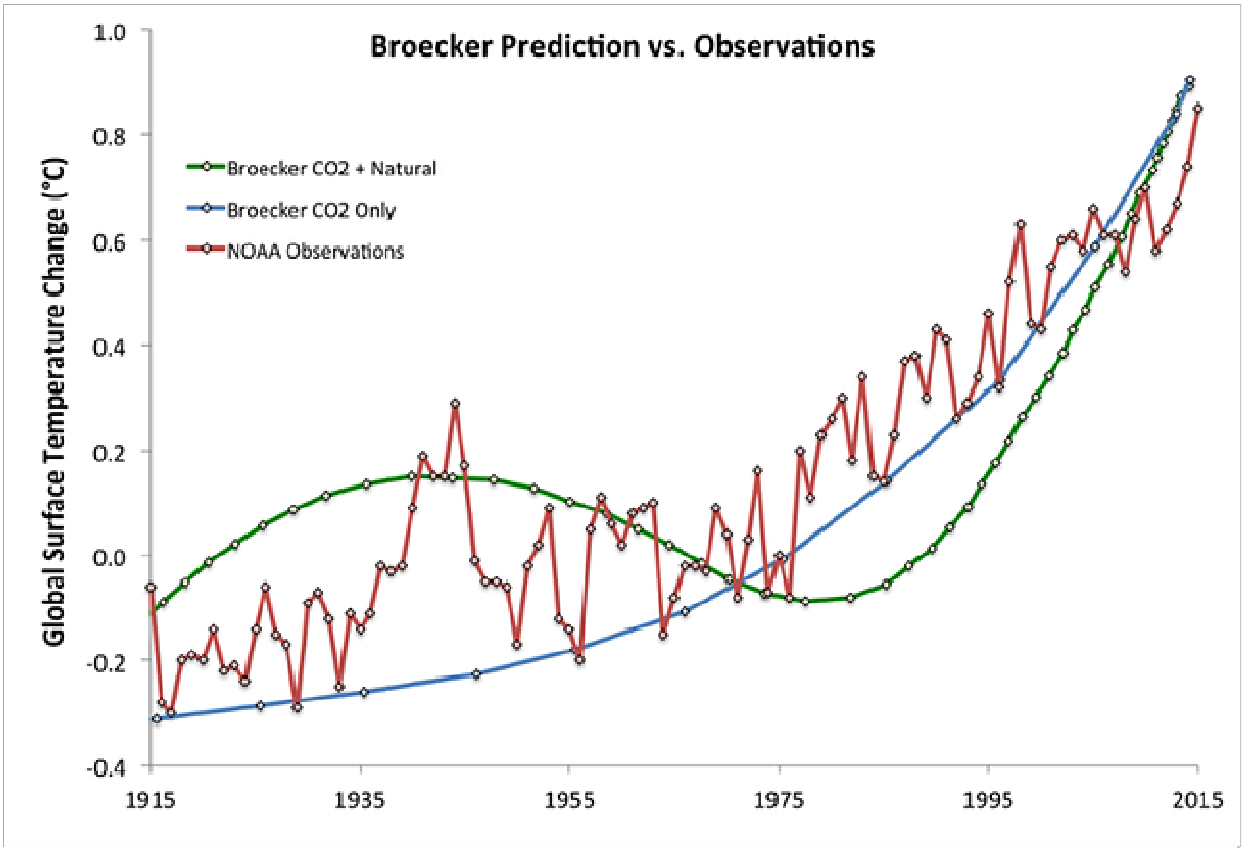
Pollutants have altered on a global scale the carbon dioxide content of the air and the lead concentrations in ocean waters and human populations.

The report included a section on atmospheric carbon dioxide and climate change, written by prominent climate scientists Roger Revelle, Wallace Broecker, Charles Keeling, Harmon Craig, and J Smagorisnky. Reviewing the document today, one can't help but be struck by how well these scientists understood the mechanisms of Earth's climate change 50 years ago.

The report noted that within a few years, climate models would be able to reasonably project future global surface temperature changes. In 1974, one of its authors, Wallace Broecker did just that in a paper titled Climatic Change: Are We on the Brink of a Pronounced Global Warming?.

You can read the details about this paper and Broecker's modeling here and in my book Climatology versus Pseudoscience. His model only included the effects of carbon dioxide and his best estimates of natural climate cycles. It didn't include the warming effects of other greenhouse gases, or the cooling effects of human aerosol pollution, but fortunately for Broecker those two effects have roughly canceled each other out over the past 40 years.

Broecker's model predicted the global warming anticipated by 2015 both from carbon pollution alone, and when including his best estimate of natural climate cycles. In the figure below, the carbon-caused warming is shown in blue, and in combination with natural cycles (which Broecker turns out not to have represented very accurately) in green, as compared to the observed global surface temperatures from NOAA in red. As you can see, the climate model predictions from over 40 years ago turned out to be remarkably accurate.



Wallace Broecker's 1974 climate model global warming predictions vs NOAA observations. Created by Dana Nuccitelli.

The 1965 report also debunked a number of myths that climate contrarians continue to repeat to this day. For example, the first section of the climate chapter is titled Carbon Dioxide from Fossil Fuels – the Invisible Pollutant. Although the US supreme court ruled that carbon dioxide is a pollutant in a landmark 2007 case, many contrarians object to this description. Nevertheless, climate scientists realized a half century ago that human carbon emissions qualify as pollution due to the dangers they pose via climate change.

The report noted that although carbon dioxide is an invisible "trace gas" – meaning it comprises a small percentage of the Earth's atmosphere as a whole – it can nevertheless have significant impacts on the climate at these seemingly low levels. As the scientists wrote:

> *Only about one two-thousandth of the atmosphere and one ten-thousandth of the ocean are carbon dioxide. Yet to living creatures, these small fractions are of vital importance … Within a few short centuries, we are returning to the air a significant part of the carbon that was slowly extracted by plants and buried in the sediments during half a billion years.*

Contrarians today often repeat the myths that because carbon dioxide is invisible and only a trace gas, it can't possibly cause significant climate change. This report demonstrates that scientists understood the greenhouse effect better 50 years ago than these contrarians do today.

The report documented the several different lines of evidence that prove the increase in atmospheric carbon dioxide is entirely human-caused, concluding:

> *We can conclude with fair assurance that at the present time, fossil fuels are the only source of CO2 being added to the ocean-atmosphere-biosphere system.*

This is yet another fact understood by climate scientists 50 years ago that some contrarians, including a few favorite contrarian climate scientists like Roy Spencer and Judith Curry, continue to cast doubt upon to this day.

The report also projected how much the atmospheric carbon dioxide level would increase in the following decades.

Based on projected world energy requirements, the United Nations Department of Economic and Social Affairs (1956) has estimated an amount of fossil fuel combustion by the year 2000 that with our assumed partitions would give about a 25 percent increase in atmospheric CO2, compared to the amount present during the 19th Century.

A 25% increase from pre-industrial levels would result in about 350 ppm of carbon dioxide in the atmosphere. The United Nations underestimated the growth in fossil fuel combustion, because the actual carbon dioxide level in 2000 was 370 ppm.

In addition to rising temperatures, the report discussed a variety of "other possible effects of an increase in atmospheric carbon dioxide", including melting of the Antarctic ice cap, rise of sea level, warming of sea water, increased acidity of fresh waters (which also applies to the danger of ocean acidification, global warming's evil twin), and an increase in plant photosynthesis.

These climate scientists warned President Johnson in 1965 not just of the dangers associated with human-caused global warming, but also that we might eventually have to consider geoengineering the climate to offset that warming and the risks that we're causing by inadvertently running a dangerous experiment with the Earth's climate.]

Odds and Ends

Sault Ste. Marie had an interesting year in terms of weather. February was one of the coldest February's on record. The second half of the year was extremely warm and we broke the record for the warmest second half with an average temperature of 52.7 F. The old record was 52.1 F. We broke warm temperature records for September and December and tied the record for November. The average temperature for the year was 42.1 F. Below is a table of average temperature data for Sault Ste. Marie going back to the 1890s.

Historic Sault Ste. Marie Temperature Data

Average Temperature per Decade

Decade	Average Temperature (^{o}F)
1890s	39.5
1900s	39.9
1910s	39.4
1920s	39.6
1930s	40.8
1940s	40.4
1950s	40.2
1960s	39.9
1970s	39.8
1980s	40.2
1990s	40.8
2000s	42.1
2010-2016	42.6

Sierra Club Calendars

The sale of Sierra Club calendars provides funds for the Three Lakes Group. We are looking for regular supporters. If you would like a calendar or calendars, they can be ordered from Annemarie Askwith at askwitha2@gmail.com. Prices: $12 for wall (always features spectacular wilderness areas); $13 for engagement (award winning nature photos every week) spiral, firm paper)

Web Page and Facebook

We're on the Web and Facebook. The addresses are:

http://tlgsierraclub.org/

https://www.facebook.com/ThreeLakesGroupOfSierraClub?ref=bookmarks

Please take a look at what we have online. We'll try to supply material regularly to these sites. Feel free to contact us with questions, concerns and suggestions.