Sierra Club Three Lakes Group
Fall 2011 Newsletter

Three Lakes Group Officers: Roger Blanchard, Chair; Annemarie Askwith, Treasurer; Cathy Akre, Secretary; Carol Ward, Forestry; Diane Meyer, Conservation Chair.

Fall Program Schedule

Fall programs will be held at Bayliss Public Library in Sault Ste. Marie. Cookies and drinks will be supplied at the programs.

Thursday September 8, 6:30 pm: Anne Woiwode, Director of the Sierra Club of Michigan- Creating Michigan's Future: the role environmentalists must play-From the Great Lakes to an extraordinary diversity of habitats that support abundant agriculture and industry of all sorts, Michigan is a resilient place. But pollution, impairment and destruction of Michigan's natural resources and threats to our public health have too often been the byproducts of development here. In the 21st Century Michigan needs leaders to create a viable, healthy and sustainable future, and environmentalists are key to shaping that future. Anne will discuss current and past challenges, and look at the critical role environmental advocates must play in creating Michigan's future.

Thursday October 13 : 6:30 pm, The Frontier Renewables Energy (Mascoma) Project – This Sierra Club Three Lakes Group program will update the current status of the Frontier Renewables Energy (Mascoma) Project followed by discussion of the impact of the project on the local area. At this time we have not scheduled project employees as part of the presentation. We will involve other stakeholders, including neighbors, forest managers, health, and tribal officials. Information on the meeting will be forthcoming as the date moves closer.

Thursday November 10 : 6:30 pm, Dr. Geoffrey Steinhart, Associate Professor Lake Superior State University Great Lakes Invaders: The Good, the Bad, and the Ugly- More than 140 species have invaded the Great Lakes since the 1800's. These species have had a variety of effects, mostly bad but some good, on Great Lakes' ecosystems and humans. The history of three of non-indigenous species will be covered. The sea lamprey invaded in the 1800's and caused great harm to the native fish community. Since the 1950's, sea lamprey have been the target of a massive, and expensive, erradication program. The round goby arrived in the early 1990's, is still spreading, and has proven to be both harmful and beneficial to native species. Finally, new invaders, like the Asian carp, are knocking on the door to the Great Lakes: with unknown consequences if they do arrive. In addition to highlighting these three invaders, annecdotes about other non-indigenous species will be used to discuss the good, the bad, and the ugly of introducing new species

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Recent Commentaries

In recent months I've written 3 commentaries that have made it in the Association for the Study of Peak Oil-USA newsletter and Energy Bulletin. The 3 commentaries are below.

The President, the Media and Oil Supply
By Roger Blanchard

Recently President Obama, under pressure from Republicans and the public to bring down gasoline prices, announced a plan to expand domestic oil production in Alaska and the Gulf of Mexico.

The media appeared to joyfully trumpet the idea that with expanded oil drilling in the U.S., oil production would ramp up. No one in the media appeared to question that idea although I've made the case on several occasions (http://www.energybulletin.net/node/47588 and

http://www.aspousa.org/index.php/2010/04/drill-baby-drill-a-second-reality-check/) that U.S. oil production will, in general, trend down in the future even if every last acre of U.S. territory were soon opened for oil development.

The belief among the media, politicians and the public, in general, is that with increased drilling and expansion of available territory, oil production absolutely increases.

That has not been the case in Alaska. Since 2000, numerous oil fields have been brought on-line such as Alpine, Northstar, Fiord, Nanuq, Aurora, Polaris and Borealis yet Alaskan oil production declined by 342,000 b/d from 2000 to 2010 and another 55,000 b/d in the first 5 months of 2011 relative to the first 5 months of 2010.

Beyond the new production in Alaska during 2000-2010, much of the National Petroleum Reserve-Alaska (NPR-A) was opened for oil exploration and development during the Clinton and Bush administrations. Exploration results have been dismal and the U.S. Geological Survey (USGS), which had estimated a mean technically recoverable volume of 10.5 billion barrels for the NPR-A in 2002, had to downgrade their volume estimate to 0.896 billion barrels in 2010.

Alaska illustrates that increased drilling and the opening of new areas for oil exploration and development do not necessarily translate into increased production.

U.S. oil production increased in 2009 and 2010 largely due to developments in the deepwater Gulf of Mexico (GOM), the Bakken Shale region of North Dakota and Texas. I'm confident in predicting that deepwater GOM production peaked in 2010. Based upon my modeling of Bakken Shale oil production, it could peak as soon as 2015.

In terms of the deepwater GOM, oil geologists know where the most favorable geologic locations are for oil accumulations and that's where they look first. They find the big fields early in the exploration phase. In the deepwater GOM, the oil industry has had more than 15 years of extensive exploration and has drilled wildcat wells down to the Mexican border. The industry is now in the "looking for scraps" phase of exploration in the deepwater GOM, so intensifying exploration will not significantly alter the future production profile for the deepwater GOM.

The public's understanding of oil supply issues has not been enlightened by media coverage. From my perspective, the media does a terrible job of providing factual information concerning oil supply and oil price issues. Aspects of these issues appear to be taboo even for a media outlet such as National Public Radio which supposedly has the objective of educating the public about important societal issues.

I follow media coverage of the oil supply issue closely and there are several fundamentally important aspects that I have neither seen nor heard from media sources in recent years even though they are integrally related to the price of oil.

One is the anemic growth of global total liquid hydrocarbons (TLHs) production and more importantly, the decline in the energy content of that production.

Fundamentally, the reason the price of oil has been rising in recent years is that global production has mostly been flat while demand has been rising. In 2005, global TLHs production was 84.595 million barrels/day (mb/d) and in 2010 it was 86.711 mb/d according to United State Department of Energy/Energy Information Agency (US DOE/EIA) data. That's a rise of only 2.50% over the course of 5 years.

The production increase is actually deceptive because what has been increasing is largely the production of natural gas liquids and ethanol, both of which have much lower energy densities than crude oil, while crude oil production has declined.

The US DOE/EIA doesn't have energy content data for total liquid hydrocarbons but they do have it for crude oil + condensate. In 2005, the energy content of global crude oil + condensate production was 153.2 QBtu while in 2009 (most recent data) it was 146.9 QBtu.

Using reported energy density values for natural gas liquids (US DOE/EIA value) and ethanol, the two other major components of total liquid hydrocarbons, provides a summed crude oil + condensate + natural gas liquids + ethanol energy content of 165.5 QBtu in 2005 and 160.8 QBtu in 2009. Those four components constitute approximately 97% of total liquid hydrocarbons production,

The decline in energy content doesn't incorporate the fact that the energy needed to obtain those liquid hydrocarbons is increasing as more energy intensive extraction and production are necessary over time.

Beyond the decline of TLHs energy content, another important issue related to the price of oil is the decline in global oil exports. According to US DOE/EIA data, global exports of crude oil declined from 44.415 mb/d in 2005 to 41.299 mb/d in 2009 (most recent data). That decline has occurred during a period in which oil demand has increased rapidly in the developing world, particularly China and India.

Unfortunately, magical thinking appears to now rule what goes on in America rather than critical analysis. The media and politicians are merely feeding that type of thinking.

A Look Back at North Sea Oil Production Projections And Forward to the Deepwater Gulf of Mexico
By Roger Blanchard

In 1999, I wrote a paper concerning the production decline of North Sea oil fields and made projections for the future of Norwegian and United Kingdom (U.K.) oil production (crude + condensate). For comparison purposes, I compared my projections with projections by the U.S. Department of Energy/Energy Information Administration (US DOE/EIA). Table 1 is from that paper.

Author and U.S. DOE/EIA
Projections of Norwegian and U.K. Oil Production to 2020

Author's Projections	Peak Year	Peak Oil Production (mb/d)	2010 Oil Production (mb/d)	2020 Oil Production (mb/d)
Norway	2001	3.2	1.6	0.77
U.K.	1999	2.7	1.5	0.92
U.S. DOE/EIA's Projections				
Norway	2005	3.9[a]	-	3.2[a]
U.K.	~2006	3.3[a]	-	2.2[a]

Table I

[a] Excludes NGL's and processor gain. From 1995 through 1998 crude + condensate made up 90% of U.K.'s total oil production and 96% of Norway's total liquid hydrocarbons production. It's assumed that these percentages won't change in the future.

Figures 1 and 2 are graphs of historic (through 1998) and projected (after 1998) production for Norway and the U.K. based upon my projections.

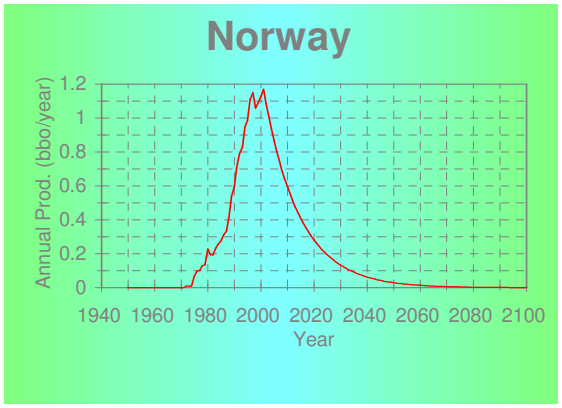

Figure 1-Historic and author's projected oil production for Norway

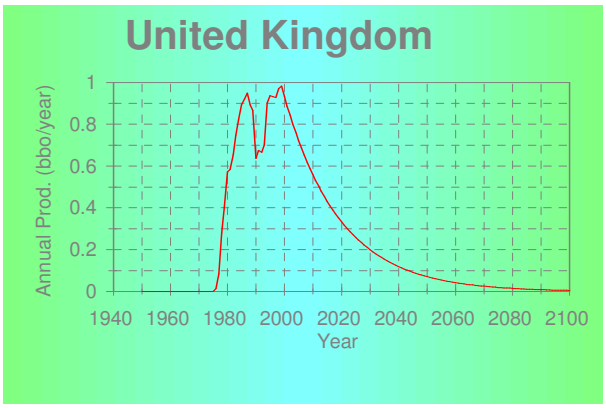

Figure 2-Historic and author's projected oil for production for the U.K.

Figures 3 and 4 are graphs of historic (through 1998) and projected (after 1998) production for Norway and the U.K. based upon projections by the US DOE/EIA.

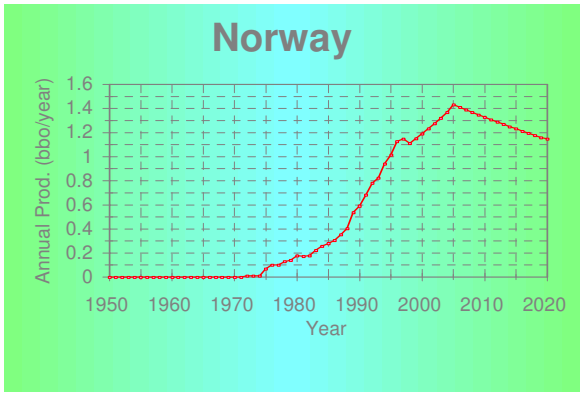

Figure 3-Historic and projected oil production for Norway by the US DOE/EIA

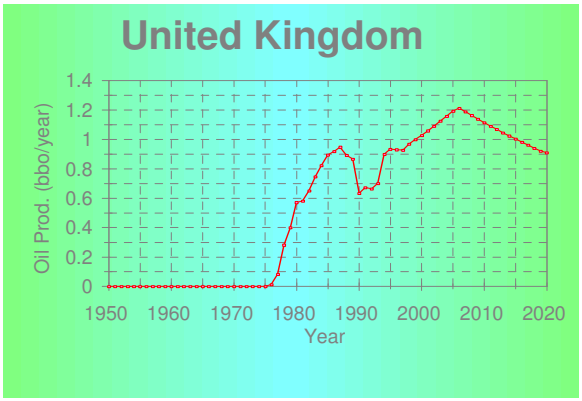

Figure 4-Historic and projected oil production for the U.K. by the US DOE/EIA

How did the US DOE/EIA and I do in our projections of Norwegian and U.K. oil production for 2010? Table II shows the comparison.

Author and U.S. DOE/EIA
Projections of Norwegian and U.K. Oil Production for 2010

	Peak Year	Peak Production (mb/d)	2010 Production (mb/d)	%Error Relative to Actual Values for 2010 Projections
Author's Projections				
Norway	2001	3.2	1.6	+14.4
U.K.	1999	2.7	1.5	-22.0
Sum		5.9	3.1	0.0
US DOE/EIA's Projections				
Norway	2005	3.9	3.7[a]	+97.9
U.K.	~2006	3.3	3.0[a]	+143.9
Sum		7.2	6.7	+116.1
Actual Values[b]				
Norway	2001	3.226	1.87	
U.K.	1999	2.684	1.23	
Sum		5.91	3.10	

Table II

[a]The 2010 values for the US DOE/EIA is based upon an interpolation between the peak projected values and the 2020 projected values
[b]Based upon data from the US DOE/EIA

Why did the US DOE/EIA do such a poor job at projecting future Norwegian and U.K. oil production?

It's obvious that they did not base their projections on actual field production data. It appears that their objective was to be optimistic rather than realistic.

By the late 1990s it was clear that most of the large (+50,000 b/d) oil fields in both Norway and the U.K. that had been in production for more than 4 years were in decline with decline rates of typically 10%/year or higher. There were also a limited number of large fields scheduled to come on-line after 1999 in both countries that could negate the rapid decline of the older fields. It should have been obvious that the peak production years wouldn't occur as late as the US DOE/EIA was projecting and that the decline rates would be higher than they were projecting.

The poor performance of the US DOE/EIA at projecting future oil production in Norway and the U.K. suggests that their projections for other regions, as well as globally, should be viewed with a high degree of skepticism.

An example of the optimism that still permeates the US DOE/EIA is exemplified in the following paragraph from the Annual Energy Outlook 2010 (AEO2010):

> Total U.S. crude production increases from 2008 to 2035, as rising world oil prices spur both onshore and offshore drilling. In the short term, a vast majority of the increase comes from deepwater offshore fields. Fields that started producing in 2009 or are expected to start in the next few years include Great White, Norman, Tahiti, Gomez, Cascade, and Chinook. All are in water deeper than 800 meters, and most are in the Central Gulf of Mexico. Production from those fields, combined with increased production from fields that started producing in 2007 and 2008, contributes to the near-term growth in offshore production. Over the longer term, production from the continued development of other recent discoveries, as well as new discoveries, offsets production declines in older fields, resulting in an increase in production through 2035.

The AEO2010 projects that Lower 48-Offshore oil production will increase from 1.67 mb/d in 2010 to 2.36 mb/d in 2035. For the projection in 2035 to be valid, the deepwater Gulf of Mexico (GOM) would have to produce at least 1.4 mb/d in 2035. I see no possibility that the deepwater GOM will produce anything remotely close to 1.4 mb/d in 2035.

Even prior to the restrictions placed on U.S. offshore oil exploration due to the Deepwater Horizon explosion, I was making the case that deepwater GOM oil production would peak around 2010 (see Drill baby drill-a reality check, http://www.energybulletin.net/node/47588) and I stand by that prediction.

Seven +50,000 b/d fields were brought on-line in the deepwater GOM during 2007-2010 with a summed peak projected production of ~900,000 b/d. That led to a substantial increase in deepwater production for 2009 and 2010. Just as in the case of North Sea oil production, there are a limited number of large fields to bring on-line in a timely manner to negate the decline of the older deepwater fields. Only 2 significant fields are expected to come on-line during 2011-2013 with a summed peak projected production of 90,000 b/d.

Oil geologists know where the most favorable locations are to drill for oil and that's where they look first. They find the big fields early in the exploration phase. In the deepwater GOM, oil companies have had more than 15 years of extensive exploration and have drilled wildcat wells down to the Mexican border in the GOM. The oil industry is now is the "looking for scraps" phase of exploration in the deepwater GOM so don't expect many, if any, +100 million barrel fields. To put 100 million barrels in perspective, the U.S. goes through 100 million barrels in about 5 days

If, as I expect, yearly deepwater GOM oil production starts declining in the near future*, I expect to hear that the decline was due to drilling restrictions. That sounds good but production over the next 4-5 years will be dependent on production projects that had been started by the time of the Deepwater Horizon explosion, not on wildcat drilling.

The media, public and politicians like the optimistic projections by the US DOE/EIA, US Geological Survey** (on-shore) and Minerals Management Service (off-shore) but that optimism doesn't mean their projections and assessments are accurate.

*Looking at 6-month increments for total GOM oil production, production reached its highest level in the second half of 2009 at 1.73 mb/d. In the first half of 2010 it was down to 1.63 mb/d and for the first 4 months of the second half it was down to 1.59 mb/d suggesting that deepwater GOM production may have peaked although yearly production in 2010 should be higher than in 2009.

**In 2010 the USGS had to downgrade their assessed volume of technically recoverable oil in the National Petroleum Reserve-Alaska to about 1/10th of their previous estimate

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A Case Study of Cellulosic Ethanol
By Roger Blanchard

The March 28, 2011 edition of the ASPO-USA newsletter had a brief which I found of considerable interest. It stated:

> A perspective paper in *Journal of Chemical Technology & Biotechnology* makes a case that conversion of biomass to cellulosic ethanol is the most efficient and productive use of biomass to create a high-octane, environmentally friendly transportation fuel. (3/23, #17)

I found it to be of considerable interest because there is a proposal to build a commercial cellulosic ethanol biorefinery in the eastern Upper Peninsula of Michigan, not far from where I live.

Based upon information provided by the corporation proposing the biorefinery, Frontier Renewable Resources LLC, owned by Mascoma Corporation and J.M. Longyear, I would not consider cellulosic ethanol to be efficient from an energy perspective.

The facility would have 6 boilers rated at 90 million BTU/hour that will operate 24/7 for 347 day per year according to information provided in the Department of Energy's Environmental Assessment. Converting the BTUs to megajoules, the boilers would generate 4.7 billion megajoules per year of energy that will be used to make ethanol.

The plant is projected to produce 40 million gallons of ethanol/year according to the DOE's Environmental Assessment and Frontier's air pollution permit application, which has an energy content of 3.3 billion megajoules of energy. The boiler energy consumed in making ethanol would be 1.43 times more than the energy content of the ethanol that they plan to produce. According to the DOE's Environmental Assessment timber harvesting, wood processing and wood transportation would require approximately 3.75 million gallons of diesel fuel per year. When diesel fuel energy use is included into the energy required for the production of the ethanol, the ratio of energy consumed/energy produced increases to 1.59.

There is a question as to what fuel will be used in the boilers. The air pollution permit application indicates that natural gas will be used. It appears that Frontier claimed they would use natural gas so they could easily meet air pollution regulations.

In the Department of Energy's Environmental Assessment, Frontier states they will almost exclusively use lignin and wood in the boilers. I assume Frontier makes that claim so that the project appears "green".

The "green" idea is that the trees that will be used for boiler fuel, as well as cellulosic ethanol, took CO_2 out of the air to grow but the wood, lignin and ethanol will burn to create CO_2 that will go back into growing new trees that replace the original trees.

Burning lignin and wood in the boilers would create more particulate matter which would make meeting air pollution regulations more difficult. My impression is that for convenience sake and as a cost advantage, they will use natural gas as long as the price of natural gas is favorable.

From my perspective, Frontier's biorefinery would not be economically practical without substantial government subsidies and it appears Frontier will receive substantial subsidies.

Frontier will received, or is likely to receive, nearly $80 million in state and federal grants as well as $60 million in state and local tax waivers over the first 15 years of the facility's lifetime. Along with that, Frontier wants government assistance for road, water, wastewater, rail and utility construction.

For all the money that governments are providing, the facility will provide employment for approximately 70 workers.

There is also the issue of the available wood supply within the 150 mile limit that the corporation states they will get the wood from. Frontier will use only hardwood trees in their production process. The DOE's Environmental Assessment states that net hardwood growth in the area of analysis is 4.188 million green tons/year and that present extraction is 2.391 million green tons/year. Frontier would use 1. 130 million green tons/year of hardwood. The sum of present extraction and Frontier extraction would be 84% of total net growth, which is not that far removed from 100%.
State and federal lands within the 150 mile limit are at or close to their timber cutting limit so Frontier will have to rely on private landowners who may or may not want to sell their timber. If private landowners don't want to sell their timber, it could tighten the timber market and drive current wood processors out of business.

Is this really the most efficient and best possible use of our wood resources?