

Maximum Sustainable Yield: FY 2016 Update and Model

By Scott Goldsmith

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Plummeting oil prices in 2014 and projected huge budget deficits have focused more attention on a question we began examining several years ago: how much can Alaska’s state government afford to spend, without risking the petroleum assets that supply most of its income?

Sustainable annual General Fund spending is currently an estimated \$4.5 billion. That’s how much the state could spend for general expenses this year and every year, long into the future, without depleting Alaska’s nest egg: state petroleum assets. It’s less than last year’s estimate of \$5 billion, partly because expected oil revenues are smaller.

The state should begin moving toward sustainable spending now. At this time we don’t know how much the state will spend this year. State officials are re-thinking planned spending, given the drop in oil revenues. Budget cuts will affect the economy, which relies heavily on state money—so the cuts should be gradual rather than precipitous.

This paper introduces an interactive model to help people understand the fiscal challenges Alaska faces (see page 5). Users can download it from ISER’s website and investigate for themselves the implications of different assumptions about state revenues and fiscal policies

Alaska’s petroleum nest egg is currently an estimated \$135 billion—\$66 billion of money in the bank and \$69 billion of expected future petroleum revenues from various sources. As market conditions change, the size of the nest egg will continue to change—it has fallen in each of the four years we’ve been estimating its size. So the sustainable spending level changes somewhat as well, but it provides a reasonable guideline for building the budget.

Alaska’s Petroleum Nest Egg on July 1, 2015 (Billion \$)	
TOTAL	\$135
Financial Assets (in the Bank)	\$66.2
Permanent Fund	53.5
Constitutional Budget Reserve (CBRF)	10
Designated Reserves ¹	2.7
Future Petroleum Revenues (from petroleum in the ground ²)	\$68.8
Known Conventional Oil	44.5
ADOR Projection ³	26.2
ADOR Extended	18.3
Other Oil	7.7
Conventional Oil	4.7
Viscous/Heavy Oil	1.6
Shale Oil	1.5
OCS/ANWR/NPRA	-
Natural Gas	17
<small>1. Includes several smaller funds Legislative Finance has identified as spendable. 2. The net present value of future petroleum taxes and royalties (capitalizing the future revenue stream). 3. The Alaska Department of Revenue projects revenues (including small amounts of viscous oil and production from NPRA and OCS) for only 10 years. Projections beyond that are based on a 50-year time horizon.</small>	

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Estimating Sustainable Spending

The state draws on the petroleum nest egg to support Unrestricted General Fund and pay the Permanent Fund dividend. The value of the nest egg could be sustained for future generations, if no more than \$5.4 billion (4%) were drawn off in fiscal year 2016. Assuming \$1.4 billion of this draw paid the Permanent Fund dividend, \$4 billion would be available for general spending.

Nest Egg Draw and Disposition (Billion \$)	
Petroleum Nest Egg	\$135
Sustainable Rate of Return	4%
Draw	\$5.4 = (\$135*.04)
Permanent Fund Dividend	\$1.4
Unrestricted General Fund	\$4.0
Note: The estimated real rate of return on the Nest Egg is 5%. After reinvestment of 1% to offset population growth, the sustainable rate of return is 4% (5%-1%).	

The remaining \$0.5 billion of the estimated \$4.5 billion in sustainable spending would come from current non-petroleum revenues.

Fiscal Year 2016 Sustainable Spending (Billion \$)	
Unrestricted General Fund Sustainable Spending	\$4.5
From the Nest Egg	\$4.0
Non-Petroleum Revenues	\$.5

That level of spending—growing with inflation and population—could be sustained far into the future without depleting the value of the nest egg. The state could fund higher spending from additional sources of non-petroleum revenues. But if the higher level of spending were funded from the nest egg, its value would fall by the amount of overspending—putting a “fiscal burden” on future generations of Alaskans.

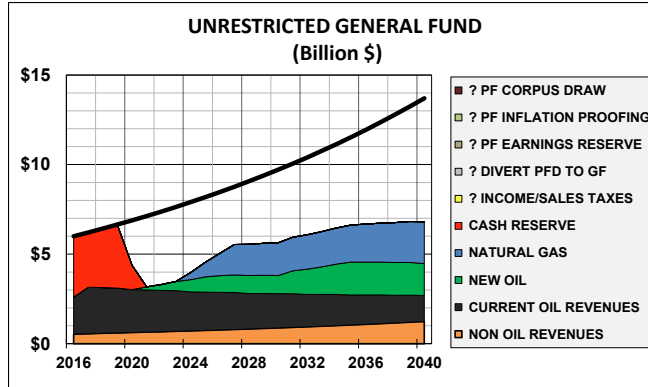
Estimating Future Revenues

Estimating future revenues from petroleum is fraught with uncertainty. They can move much higher, or much lower, depending on prices, production, costs, and government policies—federal as well as state.

Three cases—middle, high, and low—illustrate the range of state fiscal futures. They demonstrate that the state deficit is a *structural problem*—petroleum revenues can’t continue to grow at the same rate as population and inflation. The deficit is not a cash flow problem that will cure itself if the state uses a “wait and see” fiscal strategy.

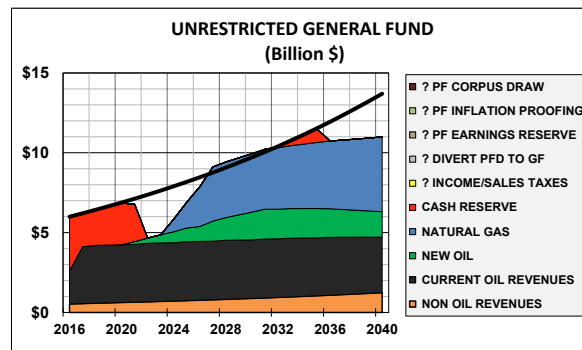
The MIDDLE CASE is based on future revenues as currently anticipated by the Alaska Department of Revenue, extended beyond their 10-year time horizon and augmented by an estimate of production from new fields, including the Alaska National Wildlife Refuge (ANWR) and the Outer Continental Shelf (OCS). It also contains an estimate of revenues from the commercialization of North Slope natural gas. If General Fund spending were to increase from its current level at the rate of inflation and population growth (“business as usual”), the state’s Constitutional Budget Reserve and other cash balances would be gone in five years—fiscal year 2020. A fiscal gap, the difference between business as usual spending and available revenues, would open wide and grow.

MIDDLE CASE



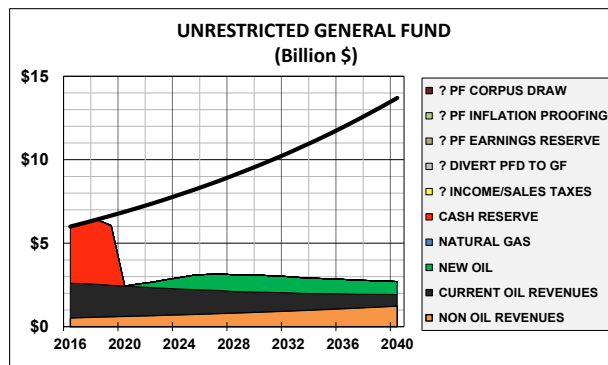
A HIGH CASE assumes the oil price recovers to \$100 a barrel in fiscal year 2017, that production declines at a slower rate than in the middle case, that there is more new oil (from ANWR and OCS), and that revenues from gas are higher. Even so, the cash reserves would be gone by fiscal year 2021, and gasoline revenues could fill the fiscal gap for only a few years.

HIGH CASE



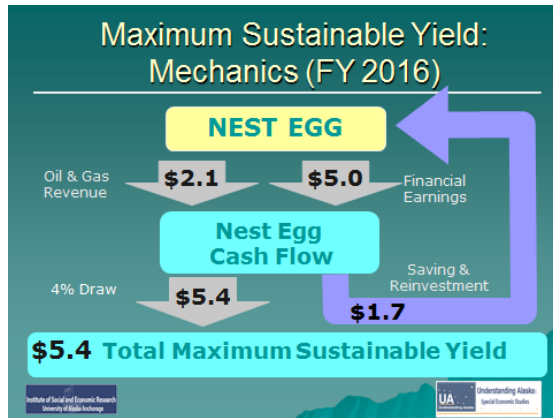
A LOW CASE assumes the oil price recovers to \$70 a barrel in fiscal year 2017, that production declines at a faster rate, that there is less new oil than in the middle case (no oil from ANWR or OCS), and no revenues from gas. In this case the cash reserves would be gone by fiscal year 2019.

LOW CASE



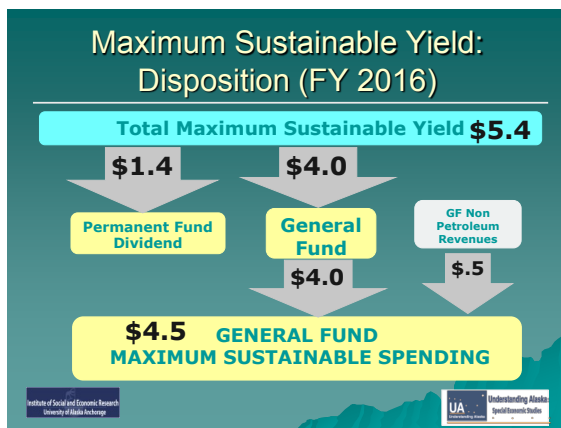
Across these three cases, the state Unrestricted General Fund Sustainable Spending level for fiscal year 2016 ranges between \$3 billion (Low) and \$5.7 billion (High). All are less than the Unrestricted General Fund spending originally proposed for fiscal year 2016.

Implementing Sustainable Spending



Implementing sustainable spending requires first calculating the annual cash flow from the nest egg—both current petroleum revenues and the earnings of all financial assets, including the Permanent Fund. The cash flow is then divided between a 4% draw from the nest egg and the reinvestment of the rest into the financial accounts.

This reinvestment has three purposes—converting a share of the non-sustainable petroleum revenues into sustainable financial resources, inflation-proofing the nest egg, and accounting for population growth.



The 4% draw, or Maximum Sustainable Yield, is divided between funding the Permanent Fund dividend and paying for General Fund spending. The Unrestricted General Fund Maximum Sustainable Spending level includes both the draw from the nest egg and current non-petroleum revenues.

Transitioning to a sustainable spending level by reducing spending (or imposing new taxes) will have negative effects on the economy, so it should not be done precipitously. Furthermore, as market conditions continue to evolve the value of the nest egg will change. So the sustainable spending level should be a general guide to spending rather than an ironclad “rule.”

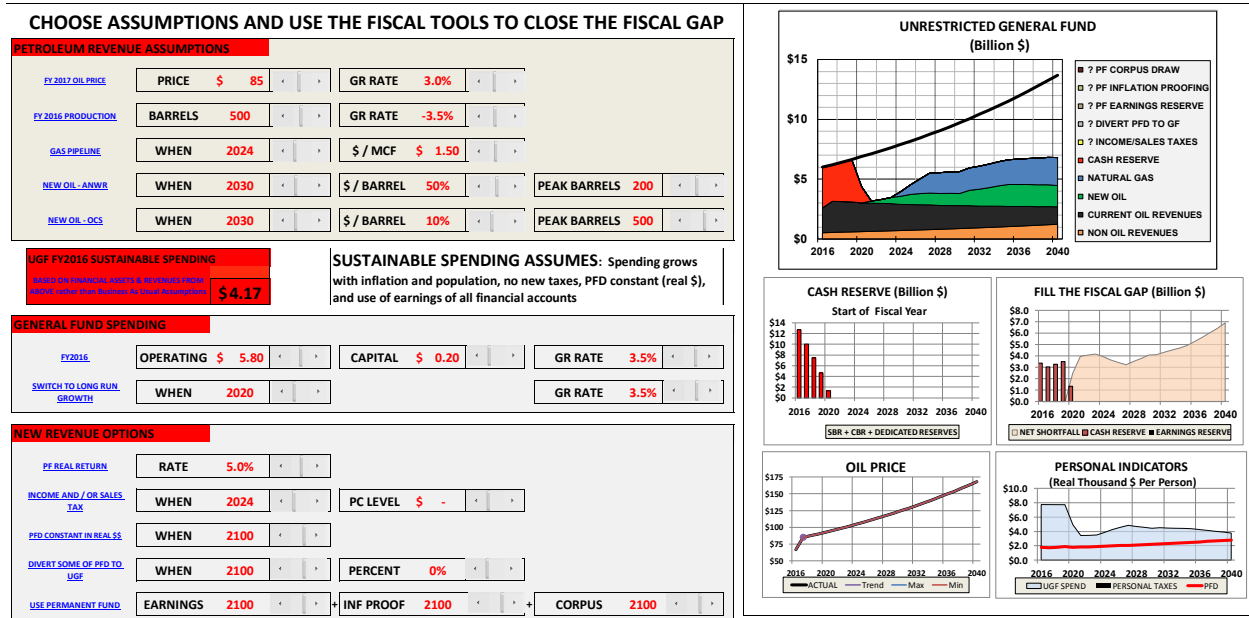
But postponing the move to sustainability will also have negative economic consequences that outweigh the short-run costs. First, the longer the delay, the larger the adjustment—and the larger the adjustment, the more likely it will have more severe effects. For example, a small adjustment might reduce the growth rate of housing prices, but a large adjustment might cause the floor to drop out of the housing market altogether. Second, the longer the delay, the less new investment in economic development there will be. The risk of higher taxes and economic decline will shut off the flow of investment dollars into the state.

And there is a real danger that delaying the move toward sustainable spending will lead to gradual depletion of the Permanent Fund—which makes up the largest share of the nest egg.

Interactive Model: Implications of Assumptions about State Revenues and Fiscal Policies

To help people understand the nature of the fiscal challenge Alaska faces, we have created an interactive EXCEL model of state finances, available for downloading from ISER’s website. It enables users to investigate the implications of different assumptions about state revenues and fiscal policies.

Below is a screen shot of the main page.



To download the model, go to:

<http://www.iser.uaa.alaska.edu/>

Before opening the Excel spreadsheet you will need to “Enable Macros”. Simple instructions for this can be found in the Excel Help file.

For further and more detailed information about Maximum Sustainable Yield, go to:

http://www.iser.uaa.alaska.edu/Publications/webnote/2014_01-WebNote16-MaximumSustainableYield.pdf

The final page of this paper shows the worksheet used to estimate the sustainable General Fund spending level and how it has changed over the last 4 years.

PETROLEUM WEALTH MANAGEMENT WORKSHEET (BILLION \$)							4 YEAR AVG*	CHANGE FY15 to FY16
		FY 2013	FY 2014	FY 2015	FY 2016			
PETROLEUM WEALTH (NEST EGG)								
1	FINANCIAL ASSETS (2+3+4+5+6)	\$ 60.00	\$ 60.00	\$ 65.27	\$ 66.20	\$ 64.69	\$ 0.9	
2	Permanent Fund Balance	\$ 42.00	\$ 43.00	\$ 48.50	\$ 53.50	\$ 48.05	\$ 5.0 a	
3	+ Constitutional Budget Reserve	\$ 16.00	\$ 11.00	\$ 12.00	\$ 10.00	\$ 12.66	\$ (2.0) b	
4	+ Statutory Budget Reserve	\$ 2.00	\$ 5.00	\$ 2.07	\$ -	\$ 2.36	\$ (2.1) b	
5	+ PERS / TRS Reserve				\$ -		\$ -	
6	+ Other	\$ -	\$ 1.00	\$ 2.70	\$ 2.70	\$ 1.62	\$ -	
7	PETROLEUM REVENUES IN GROUND (8+11+18)--Net Present Value discounted @ 5.0%	\$ 100.68	\$ 88.69	\$ 73.76	\$ 68.76	\$ 85.74	\$ (5.0)	
8	Conventional North Slope--State Lands	\$ 80.54	\$ 67.11	\$ 47.44	\$ 44.51	\$ 62.02	\$ (2.9)	
9	DOR projection (10 years)	\$ 50.89	\$ 43.11	\$ 30.52	\$ 26.19	\$ 39.03	\$ (4.3) c	
10	DOR extended	\$ 29.65	\$ 24.00	\$ 16.92	\$ 18.32	\$ 22.99	\$ 1.4 d	
11	+ Other Oil	\$ 6.75	\$ 9.85	\$ 9.82	\$ 7.67	\$ 8.77	\$ (2.2)	
12	Conventional	\$ 2.14	\$ 4.75	\$ 4.85	\$ 4.65	\$ 4.20	\$ (0.2) e	
13	Viscous/Heavy Oil	\$ 1.56	\$ 1.72	\$ 1.33	\$ 1.55	\$ 1.58	\$ 0.2 f	
14	Shale Oil	\$ 1.57	\$ 1.72	\$ 1.85	\$ 1.47	\$ 1.70	\$ (0.4) g	
15	OCS	\$ 1.49	\$ 1.67	\$ 1.80	\$ -	\$ 1.29	\$ (1.8) h	
16	ANWR	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
17	NPRA	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
18	+ Gas	\$ 13	\$ 12	\$ 17	\$ 17	\$ 15.08	\$ (0.4) i	
19	= TOTAL PETROLEUM WEALTH (1+7)	\$ 160.68	\$ 148.69	\$ 139.00	\$ 135.0	\$ 150.43	\$ (4.0)	
SUSTAINABLE DRAW RATE								
20	Real Rate of Return Net of Inflation	5.0%	5.0%	5.0%	5.0%	\$ 0.05		
21	- Projected Population Growth Adjustment	1.0%	1.0%	1.0%	1.0%	\$ 0.01		
22	- Projected Real Per Capita Budget Growth Adjustment	0.0%	0.0%	0.0%	0.0%	\$ -		
23	= SUSTAINABLE DRAW RATE (20-21-22)	4.0%	4.0%	4.0%	4.0%	\$ 0.04		
24	= MAXIMUM SUSTAINABLE YIELD (19 x 23)	\$ 6.43	\$ 5.95	\$ 5.56	\$ 5.40	\$ 6.02	\$ (0.2)	
UNRESTRICTED GENERAL FUND MSY SPENDING CAP								
25	Maximum Sustainable Yield or Maximum Sustainable Draw (=24)	\$ 6.43	\$ 5.95	\$ 5.53	\$ 5.40	\$ 6.01	\$ (0.1) j	
26	- Permanent Fund Dividend Distribution	\$ 0.57	\$ 0.96	\$ 1.07	\$ 1.40	\$ 1.02	\$ 0.3	
27	= General Fund Nest Egg Spending Cap (25-26)	\$ 5.86	\$ 4.99	\$ 4.46	\$ 4.00	\$ 4.99	\$ (0.5)	
28	Item: General Fund Earnings Spending (from Petroleum Wealth)	\$ 0.18	\$ 0.07	\$ 0.08	\$ 0.03	\$ 0.10	\$ (0.1)	
29	Item: GENERAL FUND CURRENT PETROLEUM REVENUE SPENDING CAP	\$ 5.68	\$ 4.92	\$ 4.37	\$ 3.97	\$ 4.89	\$ (0.4)	
30	+ General Fund Non-Petroleum Revenues (excluding GF earnings)	\$ 0.56	\$ 0.54	\$ 0.51	\$ 0.53	\$ 0.55	\$ 0.0	
31	= UGF MSY SPENDING--inc PERS/TRS (27+30)	\$ 6.42	\$ 5.53	\$ 5.00	\$ 4.53	\$ 5.54	\$ (0.5)	
ACTUAL (PROJECTED) UGF APPROPRIATIONS								
32	UNRESTRICTED GENERAL FUND APPROPRIATIONS (inc PERS / TRS)	\$ 7.80	\$ 7.20	\$ 6.00	\$ 6.00	\$ 6.97	\$ -	
33	OVERSPEND = EXCESS BURDEN (32-31)	\$ 1.38	\$ 1.67	\$ 1.03	\$ 1.47	\$ 1.43	\$ 0.4	
34	PETROLEUM WEALTH DEFICIT (33/23)	\$ 34.6	\$ 41.9	\$ 25.8	\$ 36.8	\$ 34.6	\$ 11.0	
35	PETROLEUM WEALTH DEFICIT PERCENT (33/19)	22%	28%	19%	27%	23%		
PETROLEUM WEALTH NEEDED TO OFFSET DEFICIT**								
36	IN THE GROUND	\$ 101	\$ 89	\$ 73	\$ 69	\$ 86		
37	IN THE BANK	\$ 60	\$ 60	\$ 65	\$ 66	\$ 65		
38	SHORTFALL	\$ 35	\$ 42	\$ 26	\$ 37	\$ 35		
39	= NEST EGG TO SUPPORT ACTUAL UGF APPROPRIATIONS (36+37+38)	\$ 195	\$ 191	\$ 164	\$ 172	\$ 185		
MSY Assumptions: No new taxes								
Growth of General Fund spending and Permanent Fund Dividend account at the combined rate of population increase and inflation								
All financial assets earn maximum rate of return								
50 years of future petroleum revenues included in NPV analysis								
** PETROLEUM WEALTH DEFICIT CALCULATION ASSUMES FUTURE GROWTH IN APPROPRIATIONS EQUAL TO POPULATION AND INFLATION								
* 4 YEAR AVERAGE ADJUSTS EARLIER YEARS WITH THE ANCHORAGE CPI								
a	PF earnings higher than expected trend.							
b	Balance reduced to cover FY2014 and FY2015 deficits.							
c	Lower Projection from DOR Fall 2014 Revenue Sources.							
d	Extension of DOR Projection starting from higher base							
e	Startup in 2020 but revenue per barrel reduced							
f	Startup postponed to 2022 and revenue per barrel increased							
g	Startup postponed to 2021							
h	OCS removed from projection							
i	Startup postponed to 2024							
j	Dividend formula incorporates higher earning years.							