Alaska after Prudhoe Bay:
Sustainability of an Island Economy

A paper presented at the Annual Meeting of the
Western Regional Science Association
Monterey, California

by

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March 2011

This study is one in a series of reports in the ISER program

Investing for Alaska's Future

Underwritten by a generous grant from

Northrim Bank

With support from

University of Alaska Foundation

The typical sovereign island economy is small and remote. For example the remote island nations of Nauru, Niue, and Saint Helena have populations in the range of 10 thousand each. Of course not all island nations are small or remote and neither are small or remote economies necessarily islands. However it is useful to think about the economies of small and remote islands because they can help us to understand the economic structure and prospects of larger and less remote places.

Island economies generally lack a comparative advantage in the production of goods or services for export to the rest of the world. This is due to distance from markets and suppliers as well as an absence of economies of scale and specialization, both of which drive up the cost of exporting goods and services. And although the economic theory of comparative advantage tells us that trade among countries can occur even if one has an advantage in the production of all goods and services, that theory can break down if costs in the small and remote economy are too high.

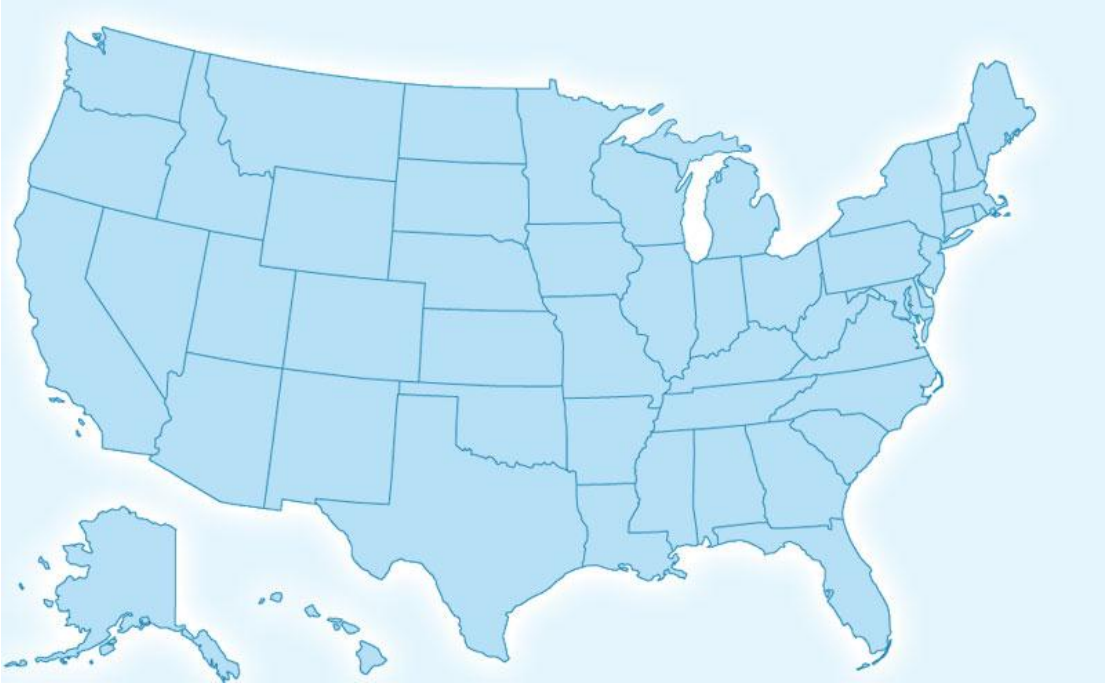
The mechanism by which the island economy gains access to export markets in the presence of high costs is through downward adjustment in the wage. But in some cases the wage would need to become negative to overcome the cost disadvantages created by distance and size. In such a case the island would have a subsistence economy with neither exports to the rest of the world or imports. The most important private economic activities one observes in these economies are agriculture and fishing.

Occasionally an island economy will be able to take advantage of a market niche to generate exports. Tourism is the most common, and mining has provided an export base in some other places. However these market activities will not necessarily be large enough to employ a large share of the population. Furthermore dependence on a single activity leaves these economies vulnerable or "precarious".

As a consequence many of these economies are dependent on foreign aid and remittances from emigrants. These funds allow these economies to purchase a basic level of imports that would not otherwise be possible.

Based on this description one could almost think of Alaska as an island economy, as it is often presented on maps of the United States.

Figure 1 the Island Alaska



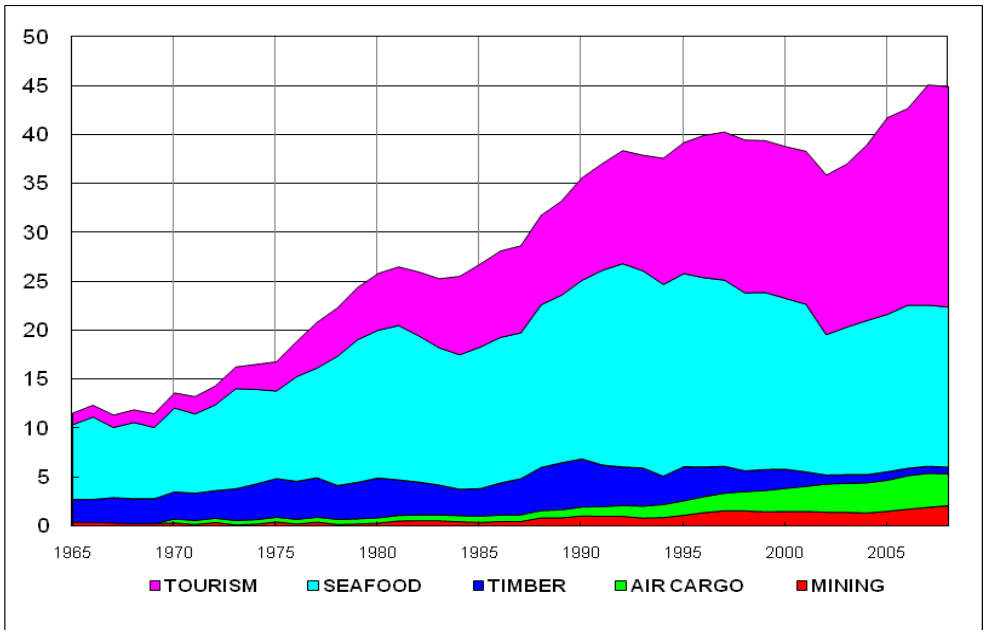
Alaska is certainly remote. The main population center, Anchorage, is a 3 hour plane ride (2,314 kilometers), a 4 day drive, or a week long barge ride from Seattle, the nearest US city of comparable size.

Although it is physically large, the entire population of the state is 710 thousand. Only North Dakota, Vermont, and Wyoming have fewer people.

These characteristics combine to drive up the cost of trade with the rest of the US and world and limit the traditional private sector economic base to a niche market consisting primarily of tourism, fishing, and mining.

In the 50 years that Alaska has been a state those three activities have dominated the private economic base. Figure 2 shows the employment growth associated with these sectors. Tourism has experienced the most growth. Fishing is constrained by the sustainable harvest of the resource. Mining has provided only a small share of jobs. Air cargo is an activity that takes advantage of the location of Anchorage close to the great circle route between the far east and the US west coast. Timber has been in decline.

Figure 2 Employment in Alaska Traditional Private Basic Sectors (000)

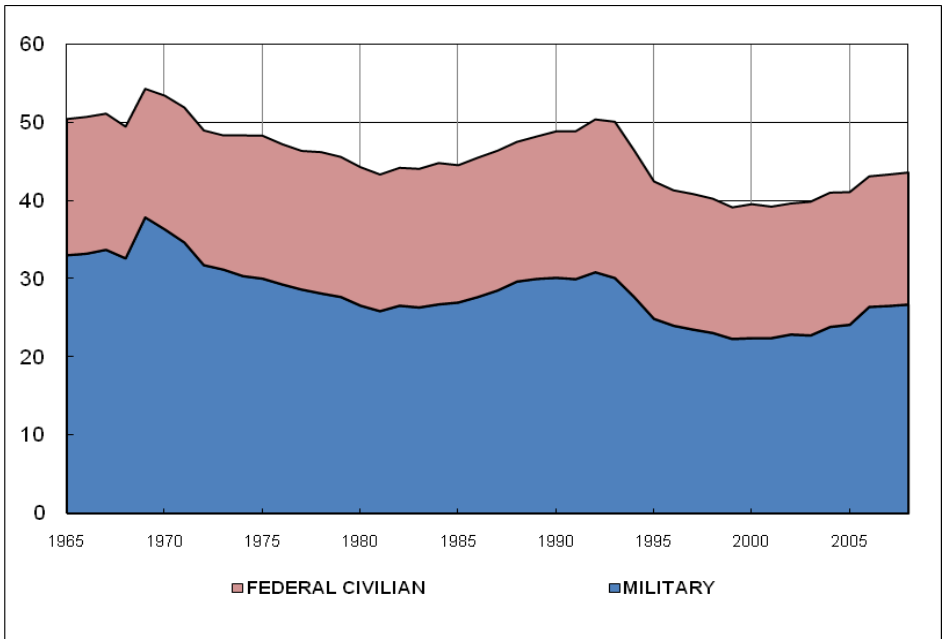


Notably most of the jobs and job growth have been in the two most seasonal industries which employ several times as many workers in the summer as in the winter. This seasonality makes it difficult for a support economy to take root in areas where these sectors dominate.

The state has struggled to develop a more diversified private sector economic base beyond the export of fish and minerals and the provision of services to tourists. Most have concentrated on processing or adding value to the natural resources extracted and exported. High production costs and distance from markets have prevented development of processing except in the seafood industry. Federal policies that restrict access to natural resources are also often suggested as the main impediment to development.

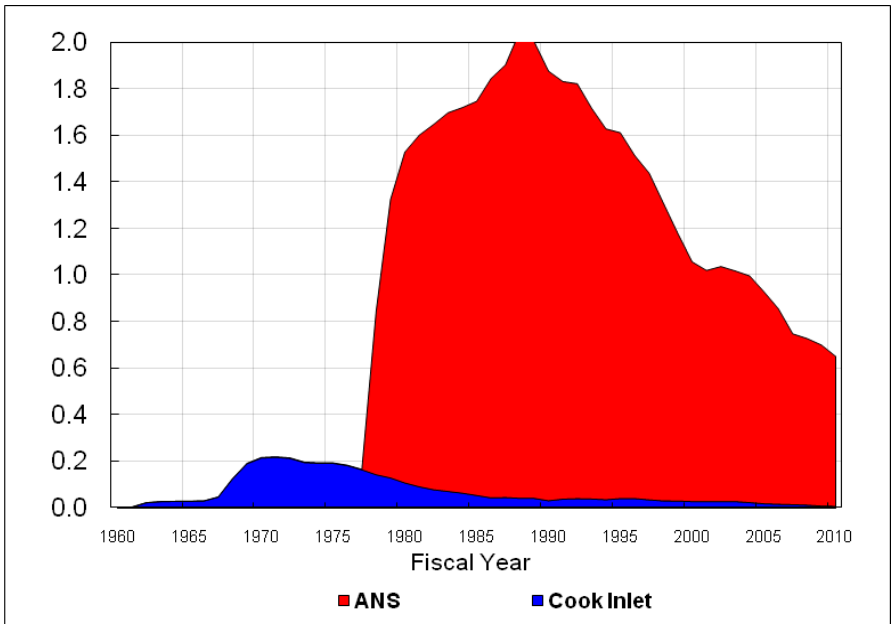
Like many small and remote islands, the import of public funds has been an important source of economic activity in Alaska. Figure 3 show that federal employment, both civilian and military, has historically been higher than employment in the traditional private basic sectors, and today remains on par with them. This figure underestimates the importance of federal dollars as it excludes any measure of the federal grants that flow into the state each year.

Figure 3 Employment in Federal Government in Alaska (000)



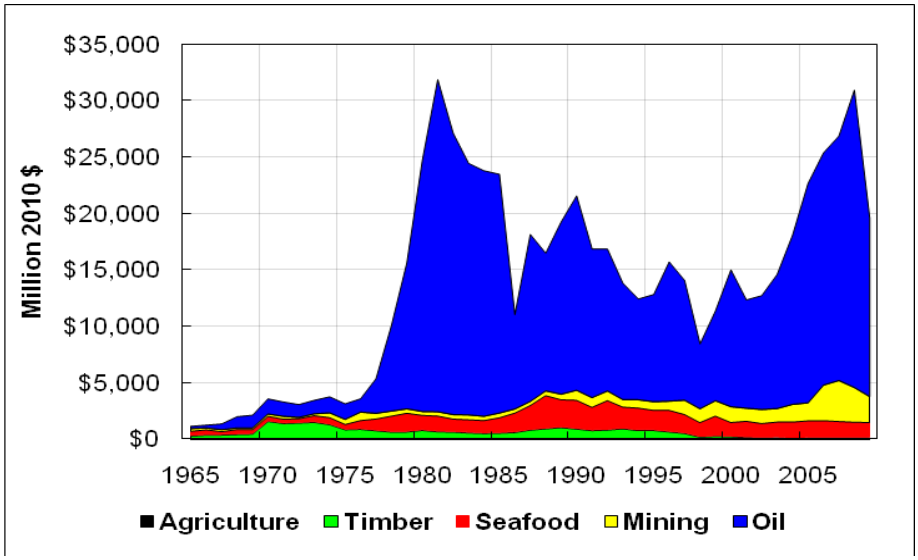
But there is one way in which Alaska is unlike virtually every small and remote island economy. Shortly after Alaska became a state the largest oil field in North America was discovered on the North Slope. Oil production began at Prudhoe Bay in 1977 and through 2010 about 17 billion barrels of oil have been produced from that field and others on the North Slope and Cook Inlet (discoveries and production began in Cook Inlet in the 1960s)

Figure 4 Alaska Oil Production (Million Barrels per Day)



The value of oil production has swamped that of all other natural resources combined.

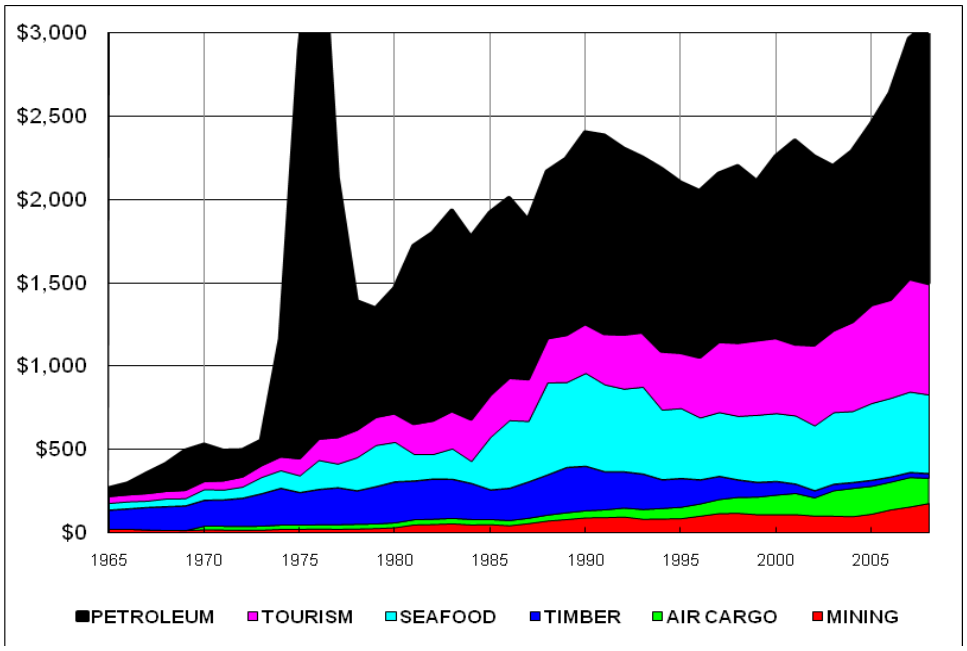
Figure 5 Alaska Gross Value of Resource Production (Million 2010 $)



The state has been able to capture a large share of the value added from production in two ways that have accounted for two thirds of the growth since Alaska became a state and have transformed the economy.

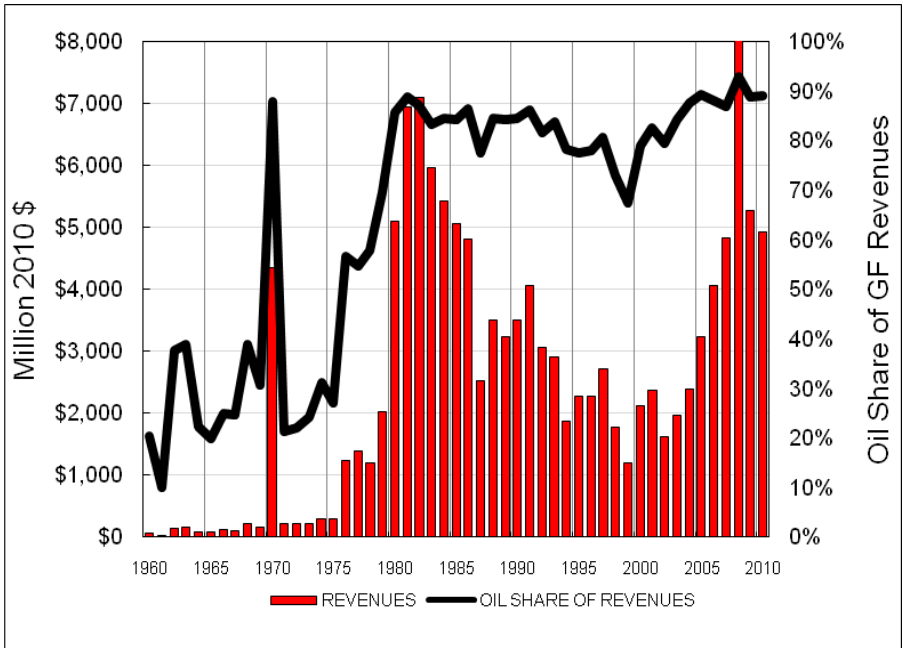
First, work in the oil patch has been a source of both payroll for Alaskan workers, and sales for Alaskan businesses providing services for exploration, development, and production activities.

Figure 6 Alaska Natural Resource Wages and Salaries (Million 2010 $)



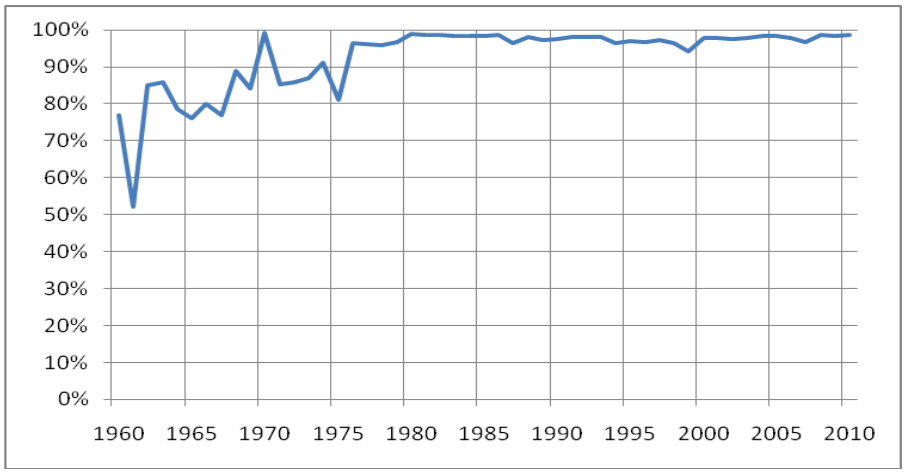
Second, Alaska has cumulatively collected $157 billion (2010 $) in oil revenues over the last 50 years. Oil has been the source of about 90 percent of state general fund revenues.

Figure 7 Alaska Oil Revenues and Their Share of State General Fund



Oil has accounted for virtually all state resource revenues.

Figure 8 Oil Share of State Natural Resource Revenues



Together spending on activity in the oil patch and the expenditure of state oil revenues today account for one third of all the jobs in the economy. But a number of spinoffs from oil activity have also contributed to expansion of the economy. Consequently today employment and personal income in Alaska are twice the size they would have been if the state economic base had only been its other natural resources

and federal government spending. The most important of these spinoffs are stability and wealth.

The jobs generated by activity in the oil patch and the jobs paid for with state oil revenues are year round, unlike those associated with either tourism or fishing. This creates an environment within which support businesses can grow and prosper. As a result the "economic multiplier" is larger than it otherwise would have been.

The oil revenues have reduced the tax burden on businesses and households and at the same time allowed state government to spend on public services at a level nearly twice the US average, measured by per capita spending. The lower tax burden on businesses has provided an environment for them to prosper and the public services have made also more attractive both for businesses and households. The rapid growth in the retiree population in the state is one consequence of that.

This oil driven rapid economic growth raises the question of whether the state has been stricken by the "resource curse". Although the oil wealth has led to some corruption and rent seeking behavior, it seems that the state has escaped one of the important symptoms which is a weakening of the rest of the export base. This would result from the bidding up of the price of labor as a result of the boom in the oil patch which would make the rest of the export base less competitive. However in an economy where migration of workers can equilibrate labor markets across regions, this is less likely to happen. Consequently the public expenditure benefits for the rest of the export base have probably more than offset any labor market related costs.

Has oil provided a way for Alaska to escape the island economy syndrome? That might be the case if oil production and revenues were sustainable looking forward. Unfortunately that is not the case. As Figure 4 shows, annual production peaked more than 20 years ago and is today only at one third of that level. Although the state forecasts a slowing of the decline rate for the next 10 years (Figure 9), if one pushes the projection out another decade, the decline accelerates significantly (Figure 10).

Figure 9 Alaska Department of Revenue Oil Production Forecast (Thousand Barrels per Day)

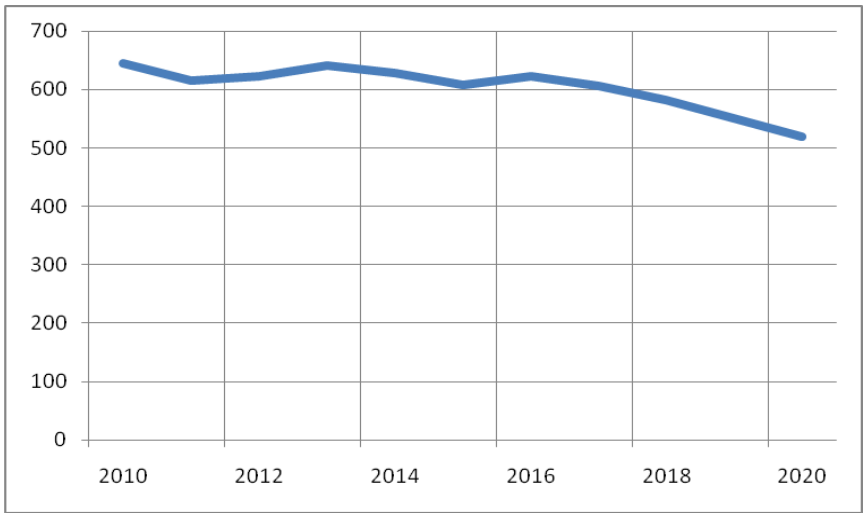
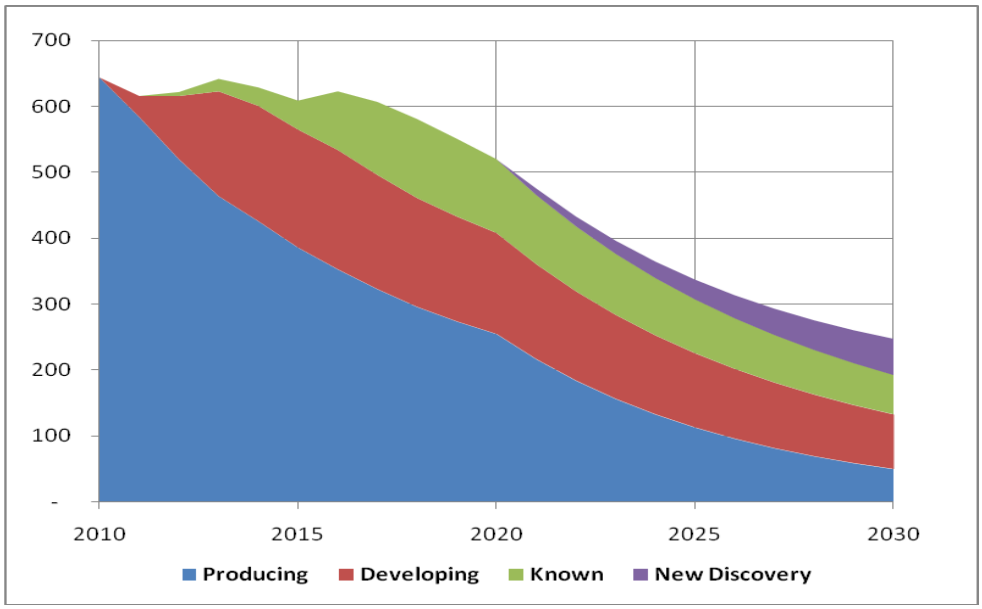


Figure 10 Oil Production Forecast: ADOR Extended (Thousand Barrels per Day)

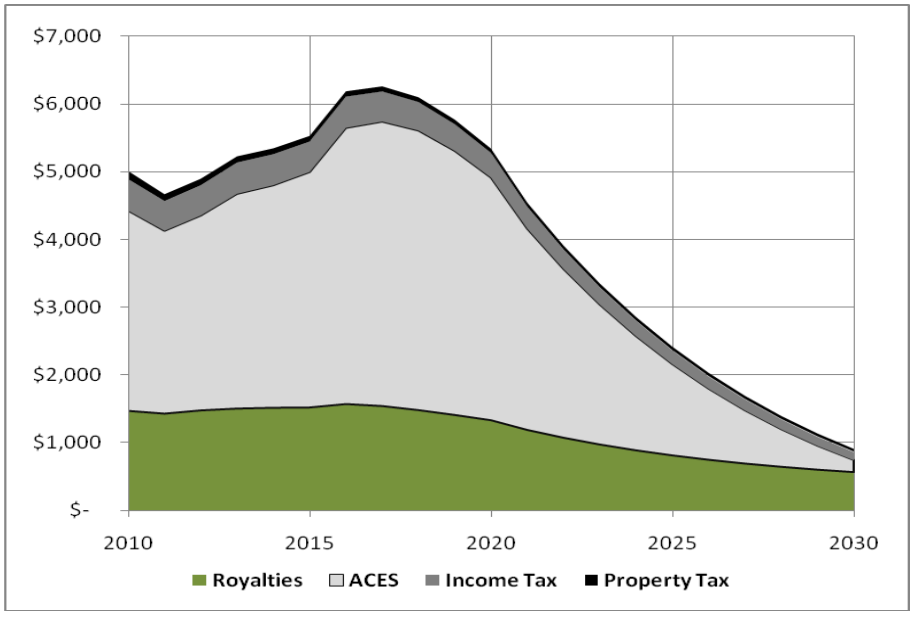


In has taken the state a long time to become concerned about the oil production decline for two reasons. First, during the last two decades total employment has continued to grow as production has fallen. This suggested that perhaps the economy was not as dependent on oil as some thought. Second, the high oil prices in the last decade have driven up oil revenues to unprecedented levels, and this has damped concerns about the need to think about the dependence of state government spending on the rate of oil production.

Now more attention is being directed at the question of what the prospects for the economy are because commercialization of North Slope natural gas looks less likely. Revenues from gas production could partially substitute for oil. And as North Slope production declines, the continued viability of the pipeline carrying that oil to market comes into question. A lower throughput means that oil moving through the pipeline is slower and colder. Both of those characteristics cause problems for operation of the pipeline so there is now more attention being given to the question of how to keep the flow rate through the pipeline as high as possible.

Future oil revenues depend on production and price, and again the outlook for the next 10 years appears to be good based on the Alaska Department of Revenue forecast, but beyond that the projected decline in production drives down revenues.

Figure 11 Projected Oil Revenues (Million 2010 $); Alaska Department of Revenue to 2020 and then Extended by the Author



If the industry that accounts for one in three jobs in the economy and has accounted for two thirds of the growth in the last 50 years is going into decline, what does the future hold for Alaska. Will the economy contract in a pattern that is the

reverse of the growth the state has enjoyed? Will that contraction lead to an outmigration population?

It is not inconceivable that the decline in petroleum could usher in a long term period of economic stagnation and population decline. Looking a decadal population change by state in the US since 1910, there have been several instances where population has not increased for a 20 year period. Many of these have been associated with migration out of the south and the great plains. However there have been at least three instances of more prolonged decline. The North Dakota population peaked at 681 thousand in 1930, fell to 620 in 1950 and had only increased to 673 by 2010. Arkansas was 1.949 million in 1940 and only 1.923 million thirty years later in 1970. West Virginia was 2.006 million in 1950 and only 1.853 million sixty years later in 2010.

Many people with limited understanding of the structure of the Alaska economy believe the economy can continue to grow independent of petroleum, but the economic history of the state suggests that the other export base sectors are too small to take up the slack that a declining petroleum industry would create. Others think that state government efforts to diversify the economy could work, even though there is no evidence of success after more than 50 years worth of efforts.

In 1978 Alaska created the Permanent Fund as a vehicle to both save a share of oil wealth in recognition that oil production was not sustainable, and to dampen the economic boom associated with the immediate expenditure of oil revenues when collected. More recently Alaska established the Constitutional Budget Reserve as a vehicle to save a portion of current petroleum revenues for use in times when revenues were low. Through a combination of good planning and good fortune the state has set aside $37 billion (2010 $) in these and other smaller financial savings accounts—24% of the $157 billion collected through 2010. With accumulated earnings the currently value in these accounts is about $45 billion. The savings in these accounts provides a vehicle for the state to offset the anticipated decline in production and revenues.

This oil wealth that has been converted into financial assets represents only a portion of the total oil wealth the state will receive from production of the resource. The state will also collect revenues from future production. The amount is impossible to know, but it makes sense to try to estimate this wealth still in the ground. Table 1 provides such an estimate of $81 billion based on what little information is available about the amount of oil (and gas) still in the ground, and the fiscal terms that will govern the state share of the total proceeds from the sale of production. This is the estimated net present value of future state petroleum revenues, discounted at a 5% real rate.

Table 1 Value for State Petroleum Wealth in the Ground in 2010 (Billion $

Total	$81	
Oil	$74	
State Land—North Slope 2011-2020	$45	Alaska Department of Revenue
State Land—North Slope 2021+	$27	Author estimate
State Land—Other Locations	-	
State Land—Heavy Oil	$1	Author estimate
Federal NPRA	-	Included in ADOR forecast
Federal OCS	$1	Author estimate
Federal ANWR	-	Author estimate
Gas	$7	TransCanada AGIA Application adjusted by author

In order to minimize the disruption due to the anticipated decline in economic activity associated with declining oil production and revenues, the state could convert its oil wealth—the financial assets and the oil in the ground which together sum to $126 billion—into an annuity. If it spent only the earnings thrown off by that annuity each year, it would last forever, and the amount spent would be constant so that it would have a stabilizing influence on the economy.

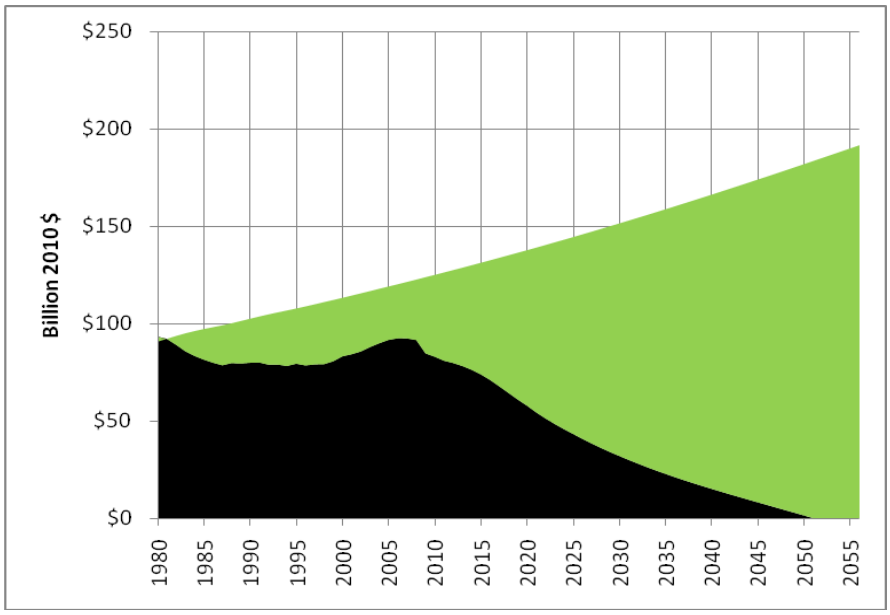
For example, if we believed that the oil wealth could earn a 5% rate of return, we could spend 5% of the value of oil wealth each year and still maintain its value. This

would be $6.3 billion, or $8,900 per person. If we believed the population of the state would grow at 1% annually, then we could only draw 4% each year--$5 billion, or $7,100 per person. Then the oil wealth would increase in value 1% each year to match the growth in population.tal NPV.

The amount we can spend does not depend upon how our oil wealth is held, that is how much is in the bank and how much is in the ground. Over time, as oil production continues, there will be a gradual transition from oil in the ground to financial assets, as shown in Figure 12. Here we see the value of the state oil wealth before production began was slightly less than $100 billion (2010), all in the form of oil in the ground. As the oil has been produced, a share of the revenues have been converted into financial assets, and each year the combined value of oil in the ground and financial assets has increased by 1% to account for population growth. Eventually, all the oil will have been produced and at that time the state will hold its oil wealth entirely as financial assets.

Each year the draw from assets would be $7,100 (2010) for each resident. There would be no restrictions on how that money was spent. It could be used to support public programs or distributed to individuals for private consumption.

Figure 12 Conversion of Oil Wealth from Oil in the Ground to Financial Assets



This strategy stabilizes the fluctuations from the spending of public revenues and distributes oil wealth equitably across current and future generations of Alaska residents. This is a reasonable policy if we care as much about future generations as we do about the present, and we expect future generations to be no richer or poorer than we are today. Although we might have some ideas about how rich the next generation will be, and recent evidence suggests they may be less well off than we are, economists cannot tell us how much we should care about the well being of future generations of Alaskans. If we care less about them, obviously we can spend more today, but of course they are not here today to make their case.

An oil wealth annuity might seem like a good idea in the abstract, but there are a number of practical challenges to implementation. First, the accumulation of so much money in a financial account might be politically difficult if not impossible to maintain. The temptation to spend would be intense and the discipline to hold the draw through good times and bad would be hard to maintain. Of course the state does have the Alaska Permanent Fund, which has a balance of $35 billion, so there is a precedent for such an account. Many argue that the Permanent Fund has been successfully maintained only because of the annual dividend check distributed to all Alaskans from the fund earnings.

Two popular arguments against holding a saving account aside from the philosophical one that the public should not hold wealth (Of course the public sector holds many types of assets.). One is that money in the bank does not generate any benefits.

The more relevant one is that the wealth should go into physical investments in infrastructure—transportation and energy are the ones most often suggested—to help to overcome ”remoteness”. These have two kinds of benefit--the short term benefit from the construction of these projects, and the longer term benefit from the services that they deliver for the economy.

If the annual flow from an oil wealth annuity would otherwise be stable, then putting more into construction spending would create a non sustainable boom. The value of the longer term services would be the wealth those services generated. Ideally a new road or dam would result in an increase in the export base or a reduction in the

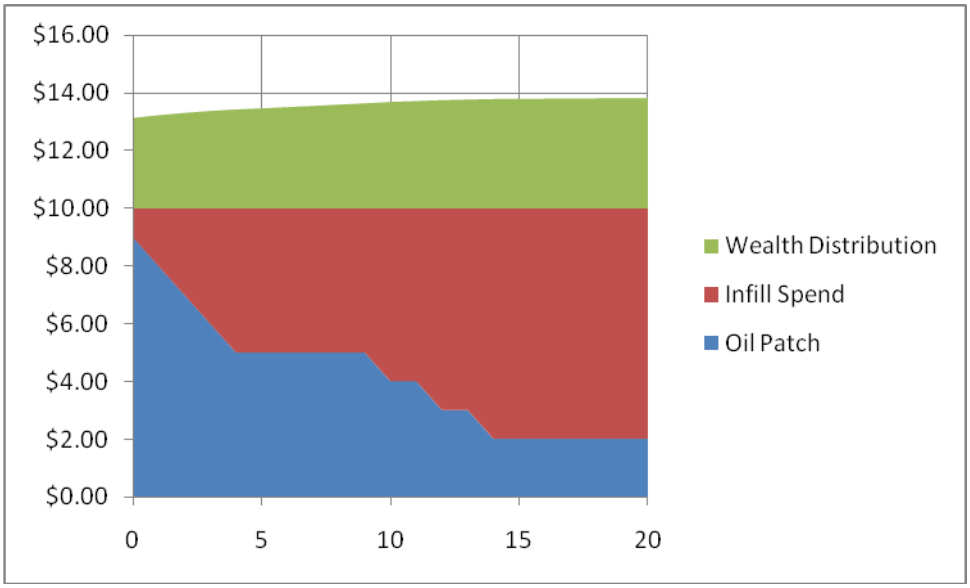
cost of goods and services for residents. The value of these would be the increase in wealth generated for residents. If the increase in wealth from that spending exceeds the growth if the money were alternatively reinvested, then those infrastructure projects should be undertaken.

Current state spending from oil wealth is roughly $5 billion. Based on our analysis the state could continue to spend from oil wealth at that rate for the foreseeable future. This spend rate would maintain the oil wealth of the state and forestall any economic decline associated with the need to cut back state spending as petroleum revenues declined in future years.

Although somewhat more than half the economic expansion from oil production has been the result of the spending of public revenues, we cannot ignore the boom associated with activity in the oil patch. If activity in the oil patch falls as production declines, the economy will contract in spite of a well designed oil wealth annuity as we have described it.

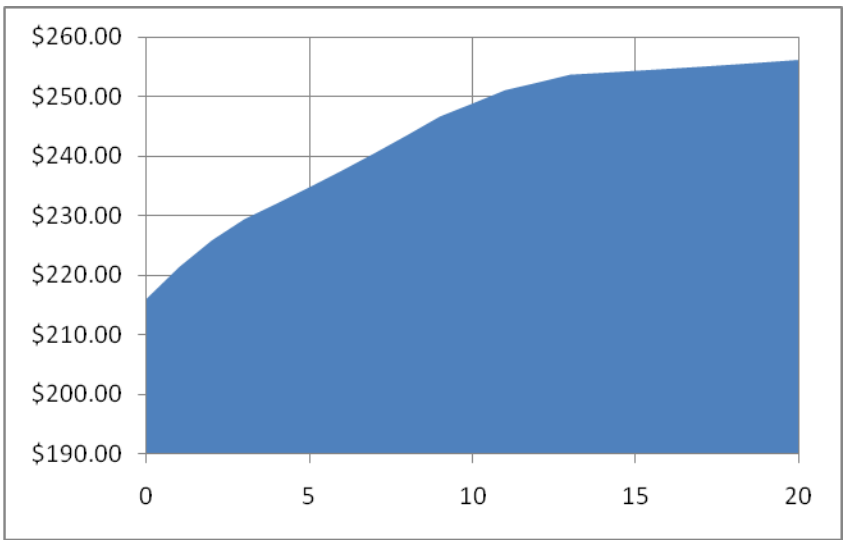
In Figure 13 we illustrate the challenge. Initially the economy is supported by oil patch spending that generates income of $9. Over time as oil production falls, oil patch spending also falls so the economic contribution of that activity declines until by year 15 it is only $2. An oil wealth annuity that pumps $3 into the economy each year (not growing with population) would smooth spending from petroleum revenues but not from oil patch spending. In order to smooth spending over time and eliminate the decline from the drop in oil patch employment, the spend from the oil wealth annuity would have grow as income from oil patch activity fell as reflected in the area labeled as “Infill spend”.

Figure 13 Maintaining Economic Stability with Decline in the Oil Patch



The math now gets a lot more complicated because the draw from oil wealth is no longer a fixed percentage. In addition, there are two important questions—what will the "infill spending" be spent on as a replacement for oil patch spending, and how can the discipline necessary to expand the size of the oil wealth account in the short run be maintained. Figure 14 shows the time path for the size of the fund consistent with the maintenance spending in Figure 13.

Figure 14 Oil Wealth Growth to Provide Offset for Oil Patch Decline



As it turns out, activity in the oil patch as measured by employment, has not declined over time with production as Figure 15 demonstrates. In spite of dramatic technological advances in the last 20 years, two factors seem to account for this pattern. First there is a large fixed cost component associated with production. And second as fields age they require increasing levels of maintenance and repair. Figure 16 shows this more dramatically as the decline over time in daily barrels of oil produced per employee.

Figure 15 Historical Comparison of Oil Production and Oil Patch Employment

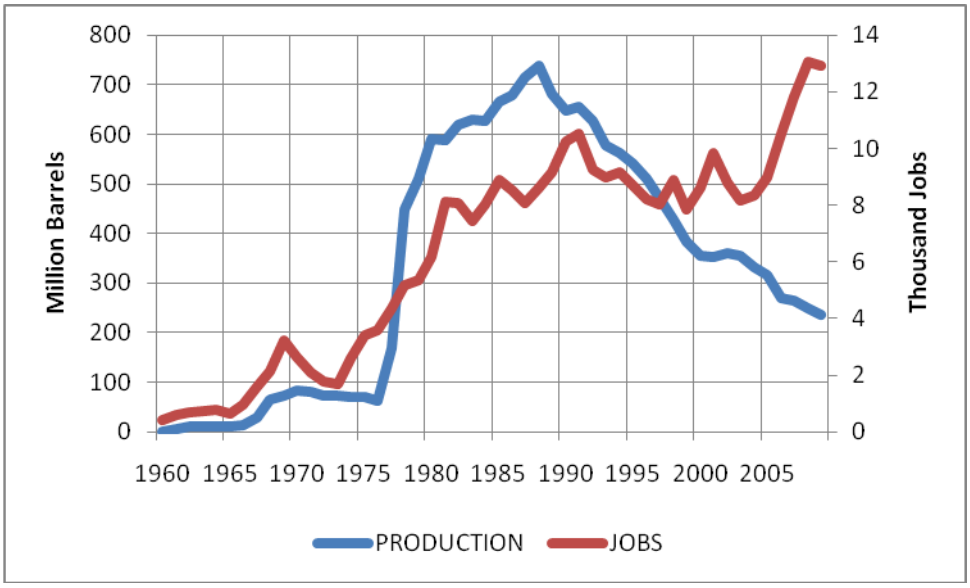
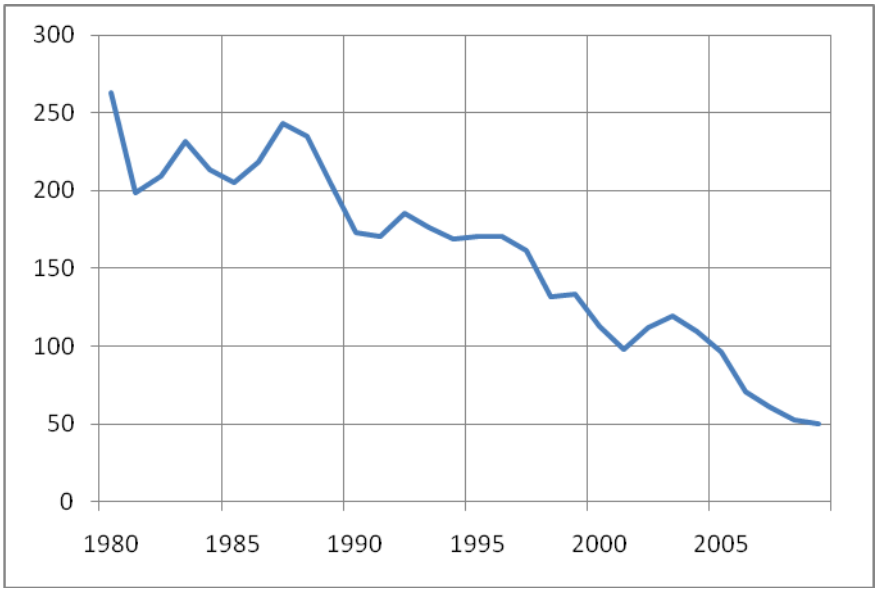
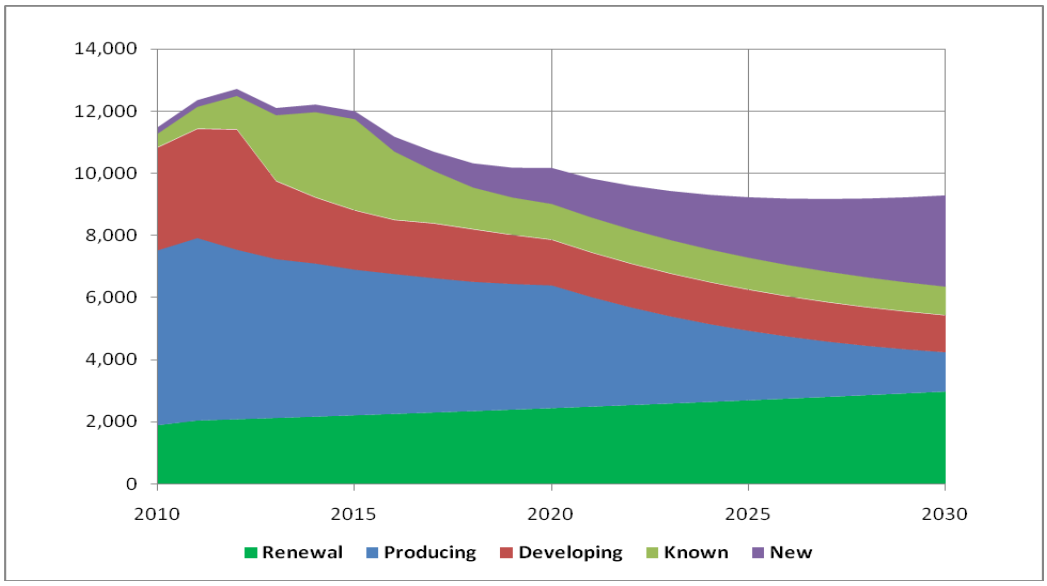


Figure 16 Barrels per Day per Employee



Looking forward, the prospects for stability in oil patch employment are good and the the possibility for expansion depends on possible developments in areas beyond those currently under production.—on federal lands onshore and offshore, and on the commercialization of gas, and technological advances that will make production of heavy oil or oil from shale attractive. For example one recent projection of employment in currently producing areas shows only a modest decline in employment over the next two decades.

Figure 17 Projection of Oil Patch Employment excluding Federal Lands



The Figure 18 Map shows the petroleum provinces on the North Slope. Most production to date has been on state lands onshore in the central North Slope. Bordering this province are the federal provinces—ANWR to the east and NPRA to the west. Two provinces of the outer continental shelf in federal waters are the Chukchi and the Beaufort Seas. The combined oil resources in these provinces is currently estimated to be about 70 billion barrels (Table 2), but this is only a guess and does not factor in how much might be technically or economically recoverable. (By comparison about 17 billion barrels have been produced from Alaska in the last 50 years.) Nonetheless the extraction of only a small part of this resource would generate a large number of jobs in the future, although only modest revenues for the state. Table 3 shows in detail how state revenues fall as production moves to federal land or federal offshore provinces.

Figure 18 Oil and Gas Provinces on North Slope of Alaska

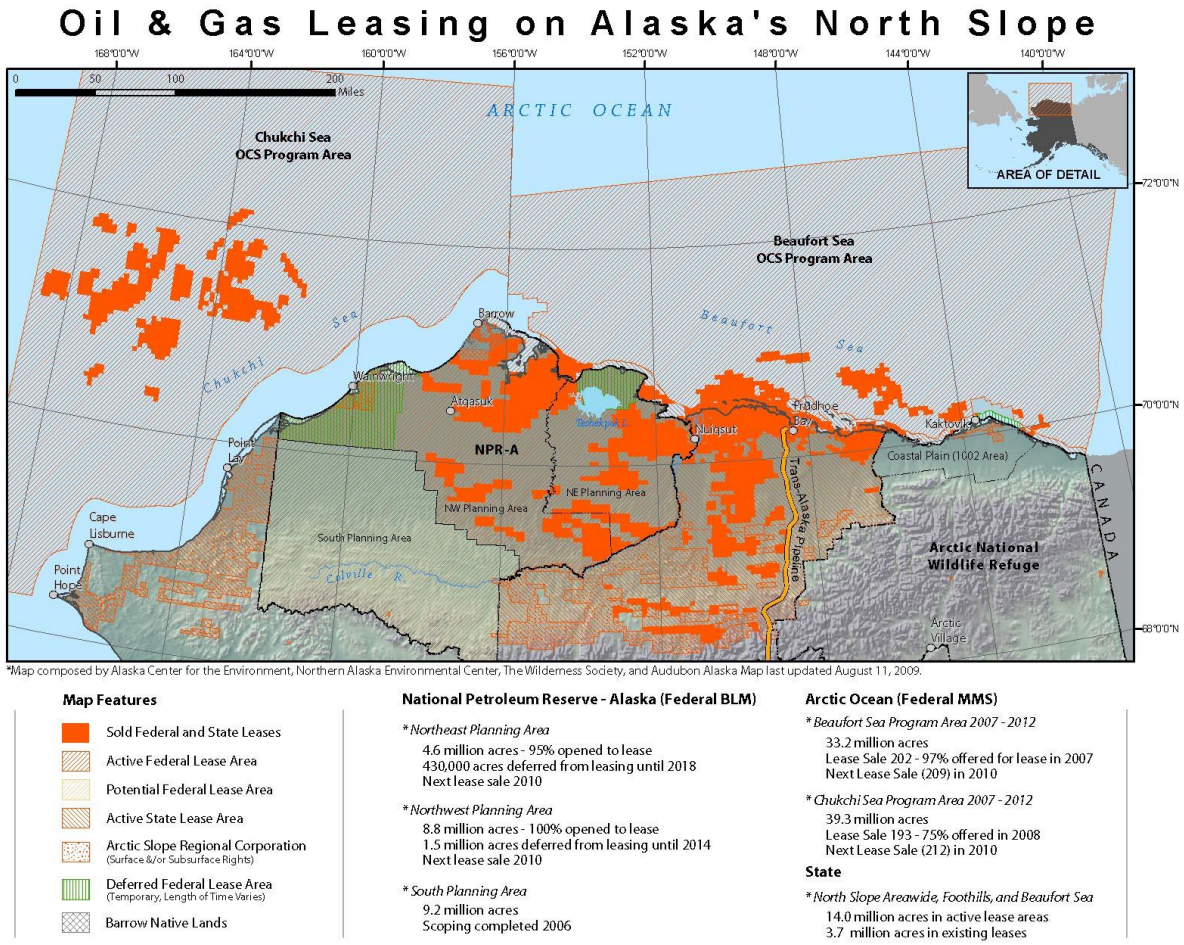


Table 2 Estimated Remaining North Slope Oil Resources

Location	Billion Barrels of Oil
TOTAL	
State	
Producing Fields	5
Yet to be Discovered	2
Heavy Oil	30
Federal Onshore	
NPRA	1
ANWR	10
Federal Offshore OCS	
Beaufort Sea	
Chukchi Sea	

Table 3 State Fiscal Terms for Oil Production on Lands under Different Ownership

	ONSHORE TO 3 MILES OFFSHORE[1]							OFFSHORE	
	STATE				FEDERAL[2]		PRIVATE	FEDERAL	
	North Slope		Cook Inlet						
	Lease <1980	Lease >1980	Lease <1980	Lease >1980	NPRA	ANWR		3-6 Miles	More Than 6 Miles[3]
ACES Production Tax	Yes	Yes	ELF[4]	ELF	Yes	Yes	Yes	No	No
Corporate Income Tax	Yes	Yes	Yes	Yes	Yes	Yes	Yes	?[5]	?
Property Tax[6],	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No[7]	No
State Royalty[8],	Typically 12.5% of value	Typically 12.5% of value	Typically 12.5% of value	Typically 12.5% of value	-	-	--	-	-
Federal Royalty	-	-	-	-	Typically 12.5% of value	Typically 12.5% of value	-	Typically 12.5% of value	Typically 12.5% of value
State Share of Federal Royalty[9],[10]					[11]	50%		27%	0%
Royalty—PF Share[12]	25%	50%	25%	50%	25%	25%	-	25%	-
Royalty—GF Share	75%	50%	75%	50%	75%	75%	-	75%	-

[1] The state owns the continental shelf up to 3 miles offshore.

[2] Both NPRA and ANWR have private (Native) in holdings.

[3] Although Alaska shares no federal royalties beyond 6 miles under current law, the Gulf states receive 37.5 % of federal royalties until 2017. After that they share royalties only on properties leased after 2006.

[4] Cook Inlet production can still pay taxes at the rate under the old production tax based on the economic limit factor (ELF).

[5] Aggregate state corporate income tax revenues would change from production in the OCS since the formula for producers to allocate worldwide income includes property, sales, and production. OCS reduces the state allocation but increases total worldwide income. In some circumstances the total liability of a producer would increase while in other it would decrease.

[6] The state property tax is shared with local government jurisdictions within which the petroleum property is located.

[7] It is likely that some OCS related infrastructure would be on shore and thus taxable by the state.

[8] A royalty is a contract negotiated between the owner and developer of the petroleum. Although 12.5 % of wellhead value is typical, many fields have different rates or methods for determining the payment, like net profit sharing.

[9] The statehood act specified 90 percent state sharing of federal royalties, but this has been modified by law for NPRA and ANWR.

[10] Federal bonuses are shared with the state based on the same formula as royalties.

[11] Based on federal law, the state must share NPRA royalties with locally impacted communities, and in the past has retained no revenues. The vehicle for sharing is the NPRA Special Revenue Fund.

[12] The Permanent Fund contribution from shared federal royalties is governed by a different statute than state royalties