AON Social Indicators Project

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Main Science Questions

According to the SEARCH *Plans for Implementation* (2005:vii), "The overall goal of the Study of Environmental Arctic Change (SEARCH) is to understand the nature, extent, and future development of the system-scale changes presently observed in the Arctic." The overarching SEARCH science question, "Is the Arctic system moving to a new state?" leads to six other science questions, one of which is, "How do cultural and socioeconomic systems interact with environmental change?" Both of these questions drive the science in this project.

How is climate likely to interact with humans in the arctic?

Climate-linked environmental changes will directly affect ecosystems that provide services to people—including processes that support human life. Social drivers of change in the Arctic, such as development and government policies, affect individual and collective decisions about resource use and both commercial and subsistence harvests, creating feedbacks that may change the ecosystems.

Development—mainly resource development and tourism—provides flows of jobs and money, while government policies affect services, infrastructure, money, and rules. These factors all influence resource use decisions . Climate change also impacts development activities in the Arctic, along with infrastructure, transportation, and provision of government services. Studying the interactions within these arenas of change, and evaluating the coping capacity of communities, will advance the systematic assessment of Arctic societies' vulnerability to climate change.

How does this project fit into the SEARCH science plan?

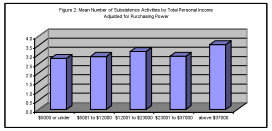
In keeping with the priorities of the SEARCH Implementation Plan, this project focuses on existing data. It is a first step in the long term SEARCH goal to "develop and deploy a pan-Arctic observing system that will enable [understanding and responding to change]. "

We anticipated that existing data would not be sufficient to support analysis to understand arctic change. A major product of the project is therefore an assessment of the adequacy of existing data and recommendations for improvements in the observing system.

Measuring the State of Subsistence in Arctic Communities

What Do We Mean by "Subsistence"?

Four decades ago, as wage work rapidly became more common in the north, scientists and policy makers assumed that indigenous people would take advantage of opportunities to participate in the cash economy, abandoning harvest and traditional food processing activities (Applebaum 1984; Usher and Wenzel 1987). Contrary to these expectations, local harvesting activities have continued. Results from the Survey of Living Conditions in the Arctic show that, regardless of cash income, Inuit in Greenland, Alaska, Chukotka, and Canada are active harvesters (Kruse et al 2008).



By subsistence we mean the harvesting of local resources for household production. Subsistence is not only important for household economies; it also directly contributes to well-being. In a multivariate analysis, satisfaction with the availability of subsistence resources and higher levels of subsistence activity both explain significant variations in overall well-being.

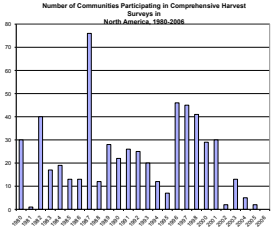
A major science goal of SEARCH is to understand how climate change interacts with other forces for change and with human responses to affect subsistence and overall well-being of arctic residents. A major goal of AON is to measure changes in subsistence over time and space.

Measuring Subsistence: How Well Are We Doing?

There are 572 places in Alaska and northern Canada. It makes sense to measure subsistence by place because the mix of subsistence resources available varies widely by location (e.g. coastal vs. inland). Harvest data in arctic North America are also gathered and reported by place.

We constructed an Alaska-Northern Canada subsistence database consisting of 1,521 place/year records of which 631 records include estimates of harvest of all resources as well as harvests of specific resources. Separate harvest reports are available for 131 species and seven resource categories (e.g. large land mammals, salmon) as well as total harvest. Harvests are expressed as kilograms of edible harvest per capita.

The mean per capita harvest of all resources for the 50 places in arctic North America for which we have data is 155 kilograms.



Compared with the number of places in arctic North America, we have little data on subsistence, especially over time. From 2000 to 2006 103 comprehensive harvest surveys have been conducted compared with 110 in the 1990s. There are 50 instances where it is possible to compare harvest amounts in the 1990s and 2000s. Thirty of these observation sets are separated by four years or less.

Conclusion: There is no existing network of comprehensive harvest studies in arctic North America. This is the largest data gap in the human observation system.

What Might A Subsistence Observation System Look Like?

To understand relationships between climate change and subsistence it is necessary to track harvests by species and to calculate total harvests. Comprehensive harvest surveys include separate questions on 50 or more species. Interviews are therefore burdensome to respondents and expensive. As a result, there are few instances of harvest observations for the same place over time. A notable exception to the lack of time series harvest data is Kivalina, Alaska. Tiger Burch and the Subsistence Division of the Alaska Department of Fish & Game collectively account for a time series of harvest observations spanning almost 50 years.

As the table below shows, harvests in Kivalina still are high: 594 pounds per capita. Harvests were even higher in earlier decades. One reason for the change in harvest levels is the switch from dog teams to snow machines.

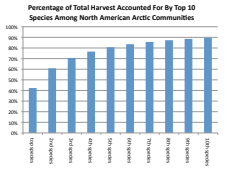
Pounds Usable Weight Per Capita

	1958-60	1960-61	1964-65	1985-86	1971-72	1982-83	1983-84	1992	2007
All Resources	1,836	1,671	1,341	1,549	1,541	778	940	761	594
Caribou	382	581	209	830	371	179	284	138	85
Moose			0	12	0	11	11	26	5
Other Large Land Mammals			1	3	0	1	2	1	0
Rowhead			0	0	0	0	147	39	0
Beluga	96	48	53	107	53	159	166	29	51
Bearded Seal	339	107	295	236	279	169	74	157	224
Other Seal	244	78	380	204	213	49	26	30	14
Walrus	5		0	19	12	14	13	62	3
Polar Bear	3		0	3	2	0	3	3	
Furbearers/Small Land Mammals	0	0	0	0	0	0	0	0	0
Waterfowl				0	4	3	4	7	8
Eggs			3	0	3	0	0	2	2
Upland Birds				0	0	0	1	1	1
Dolly Varden char			378	113	510	179	178	203	158
Other Non-Salmon Fish			10	28	77	1	18	35	18
Salmon			6	0	3	1	5	15	8
Berries	10			3	8	10	4	13	17
Plants and Wood	5			1	6	0	0	1	2

Source: ADF&G 2009; ADF&G 2008b; Burch 1988; Ssanio & Kessel 1996; Patterson 1976

Blank cells indicate data not available

Fortunately, it is possible to track both changes in overall harvest levels and to limit the number of species included in the observation system. By measuring harvests for the top ten species harvested in each community participating in the observation system, it is possible to account for 90 percent of the total harvest.



Harvest data for top species combined with local knowledge concerning changing harvest conditions can be a core component of a community-based observation system.

Species	Number of Places	Species	Number of Places
CARIBOU	377	BROAD WHITEFISH	15
MOOSE	258	SEALS UNSPEC	15
SOCKEYE SALMON	251	BOWHEAD	14
COHO SALMON	225	SHRIMP	14
CHINOOK SALMON	187	GRIZZLY	13
RINGED SEAL	159	HERRING	11
ARCTIC CHAR	136	BLACKFISH	10
BELUGA	119	HERRING ROE	10
CHUM SALMON	101	CISCO	9
SEAL	88	EIDER	8
CLAMS	81	SMELT	8
BEARDED SEAL	77	CANADA GOOSE	7
CHAR	77	INCONNU	7
WHITEFISH	77	SWAN	6
PINK SALMON	72	TANNER CRAB	6
MUSKOX	50	DUCKS	5
CRABS	48	HERRING SPAWN ON KELP	5
LAKE TROUT	48	KINGCRAB	5
BLACK BEAR	46	WHITEFRONTED GOOSE	4
POLAR BEAR	44	ARCTIC GROUND SQUIRREL	3
WALRUS	40	BERING CISCO	3
DOLLY VARDEN	38	GEESE	3
HARBOR SEAL	36	HARPSEAL	3
PIKE	32	MUSSELS	3
DALLS SHEEP	26	ARCTIC CISCO	2
GRAYLING	25	FURSEAL	2
TROUT	23	SPOTTED SEAL	2
BEAVER	22	YOUNG BEARDED SEAL	2
HUMPBACK	22		
WHITEFISH	22	GEESE UNSPEC	1
SNOWGOOSE	22	LAKE WHITEFISH	1
STELLER SEA LION	22	LEAST CISCO	1
NARWHAL	18	PTARMIGAN	1
BURBOT	16	RAINBOW SMELT	1
COD	16	ROUND WHITEFISH	1
HARE	16	TURBOT	1

Recommendation: Conduct international pilot testing of targeted harvest surveys in collaboration with participating communities. Foster development of the approach as part of a community-based observation network.

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