<TITLE SLIDE>

ENHANCING THE RESILIENCE OF SMALL HIGH-LATITUDE FISHING COMMUNITIES TO CLIMATIC AND ECOSYSTEM CHANGE: A CASE STUDY FROM SOUTHWEST ALASKA

by
James R. McGoodwin

Opening remarks

First, I want to thank Ian Perry and George Hunt for inviting me to this meeting. It is an honor to be here.

This work has evolved since I sent in the abstract a few months ago and if you are here on the basis of that abstract I hope you won't be disappointed.

To begin, I must be clear that there can be no single magic bullet for enhancing the resilience of high-latitude fishing communities to climatic and ecosystem change. An ecological system coupled with a human social and economic system is a complex phenomenon indeed.

In this presentation I discuss the small sub-Arctic communities in the Bristol Bay region of Southwest Alaska. I will focus on problems they are currently facing, and along the way will suggest actions and policies that I think would enhance their resilience.

Resilience

What is resilience in a social-ecological system? Mainly it is the magnitude of a stressor that the system can absorb and still retain essentially the same function, structure, and identity. It is also the degree to which the system is capable of self-organization and to build its capacity for learning and adaptation.

Resilience is not a static, inherently fixed capacity to respond to extraordinary stressors, but rather the inherency of *processes* for adaptation and reorganization that ensure a system can sustain itself in the near future.

And although a social-ecological system's resilience can be undermined by a single factor such as climatic or ecosystem change, this is more likely when other pre-existing factors already weaken it. Moreover, in some communities climatic and ecosystem change will bring new opportunities that will actually enhance their resilience.

Most of the strategies that have been proposed for enhancing the resilience of social-ecological systems entail the development of highly inclusive social and economic institutions that have the ability to adapt by iterative learning. But there are some who categorically reject such proposals, thinking instead that resilience is best enhanced by giving the market and privately owned enterprises a freer hand.

<BRISTOL BAY REGION SLIDE>
The Bristol Bay region , situated around 59 degrees North Latitude, has 25 permanently settled communities with a total population of about 8,700 people. This population is thinly distributed over an area of about 40,000 square miles, or 102,000 square kilometers. There are also more than 60 seasonally-occupied recreational fishing lodges in the region.

<TYPICAL ATTRIBUTES SLIDE>
Bristol Bay's sub-Arctic fishing communities are especially vulnerable to climatic and ecosystem change because of certain **attributes** which they share in common with many other sub-Arctic fishing communities.

-regarding small population size, 24 of Bristol Bay's 25 permanently settled communities range in size from only a few dozen inhabitants to 355. The region's largest settlement and its hub town, Dillingham, only has around 2,300.

-relatively isolation: none of the 25 communities are connected to the state's road system and they are reachable only by air or small watercraft.

-regarding the low economic diversity and few economic alternatives, other than the commercial salmon fishing industry there is virtually no other significant industrial development, and the commercial fishing industry makes up nearly 90% of the region's entire economic base.

-the economy is highly seasonal. Bristol Bay's economy runs at a low ebb all through the long and harsh 7-month Winter season, then changes to a boom economy through the Summer and into early Fall.

-a high degree of dependence on local ecosystems for subsistence, food security, and livelihoods. Again, almost 90% of the region's economic base derives from its fisheries.

-and it goes without saying that low individual incomes, low standards of living, and low educational levels characterize most of the region's populace.

-higher costs for many basic necessities Despite the relatively low material standard of living, many basic necessities simply cost more. The relative isolation increases the costs of transporting people, goods, and services to and from the region, while the lengthy, harsh, and dark winters drive up energy costs for heating and lighting.

-lower revenue from taxation, weak infrastructures, and poor access to government services, education, and health care are also characteristic

-and vulnerability to social and economic colonization by people from outside the region

-70% of the region's population are natives. The majority of the native population are Yup'ik, with the remaining native population being mainly Aleuts and Athabascans.

<DILLINGHAM SLIDE>
In Dillingham 53% of the population is native. In the small villages the native population approaches 100%.

<PETER PAN PROCESSING FACILITY SLIDE>
-Dillingham is the site of the region's major fish processing facility--one of the first to be established in Alaska. It is also the site of various government offices, schools, and the region's only health care facility.

<FIELD WORK SITES SLIDE>
In 2002 I began field work in Dillingham and in 4 rural Yup'ik villages. This initial work compared measurable aspects of climatic variability with subsistence fishing activity. I had hypothesized that variability in the former would prompt variability in the latter. However, no significant relationships were found. In essence, subsistence fishers did the same thing every year, regardless of variations in the climate, and I concluded that the subsistence fishery is highly resilient to climatic variability. But to live in this region it still takes a lot more than just dependable subsistence fishing.

Since that initial work I have continued to study the region by gathering more data from published and online sources, and staying in touch with various people in Alaska by email and telephone.

This vast and sparsely populated region is unusually rich in natural resources, including fish and wildlife--and especially the sockeye or "red" salmon

<SOCKEYE SALMON SLIDE>
-Bristol Bay is site of the largest wild salmon run in the world, and-sockeye salmon have been the region's most important resource since prehistoric times.

-The region is also possibly quite rich in
<MINERALS SLIDE>
...minerals: especially copper, molybdenum, and gold
<OIL AND GAS SLIDE>
...and possibly quite rich as well in oil and gas

<DIRECT EXPENDITURES SLIDE>
Regarding direct expenditures for the Bristol Bay region's renewable resources, 70% of expenditures are in commercial fishing, almost 20% are in recreational fishing, and around 2% are in subsistence fishing

The recreational-fishing sector is therefore the second largest sector in the region in terms of expenditures on renewable resources. There are more than 60 fishing lodges scattered about the region, most of which are very isolated fly-in, fly-out, camps, which range from prosaic
<PROSAIC RECREATIONAL FISHING LODGE SLIDE>
to very luxurious.
<LUXURIOUS RECREATIONAL FISHING LODGE SLIDE>

These lodges are not particularly visible in the region, with most being reached only by small float planes.

The recreational fishing community is currently growing at a steady pace. The people involved include the lodge owners, their guides, other mostly menial employees, and their visiting clients.

< 2 SLIDES OF TROPHY RAINBOW TROUT>
By far the most important species for the recreational anglers are the region's renowned trophy class rainbow trout, followed in importance by salmon, Arctic char and grayling.

A few of the lodges are owned by Bristol Bay residents, but most are not. The wealth generated by the lodges accrues mainly to the owners, and most of the lodges are abandoned during the long Winter and Spring months while their owners spend the Winters elsewhere.

<DRIFT GILLNET VESSELS TIED UP AT PROCESSING PLANT SLIDE>
Regarding the commercial fishery and the *problems* that are currently weakening it
I am especially grateful for Ray Hilborn's article, "Fisheries success and failure: The case of the Bristol Bay salmon fishery," from which some of the following ideas were taken.

The Bristol Bay commercial salmon fishery has been regarded as an economic disaster in recent years by state and federal agencies, even though its catches, spawning stock, and total salmon returns have been at record high levels ever since the late 1970's. The main problems seem to be:
<SOCKEYE COMING INTO PROCESSING PLANT SLIDE>
First, geographical constraints on processing and port facilities The shallowness of the bays and their extreme tidal fluxes make it impossible to bring larger vessels to the main processing facilities. These factors constrain the transport of fisheries products, driving up shipping costs and put Bristol Bay's commercial fishery at a competitive disadvantage compared with other more accessible salmon fisheries.
<INTER-ANNUAL VARIABILITY OF CATCHES SLIDE>
Second, the high inter-annual variability of catches causes chaotic instability in the commercial fishery. Catches in some years are so low that fishers and processors cannot even cover their operating expenses and are left with losses, while in other years catches are so high they exceed processing capacity, driving down product quality, increasing waste, and depressing the already-low prices paid to fishers. Problematic too are the large fixed costs associated with maintaining the elevated level of processing capacity that is only used for a small part of each year. Moreover, the high inter-annual variability is made worse by the Alaska Department of Fish and Game's, or the ADFG's, management system, which mainly manages to ensure that escapement targets are hit, but otherwise does little to establish catch limits or maximize economic returns in the fishery.

<PACIFIC DECADAL OSCILLATION SLIDE>
-there is also a longer term variability of catches which seems to be influenced by the Pacific Decadal Oscillation, *a climatic phenomenon* that many think prompts high returning salmon runs for several decades, and then low runs for other decades.

(Referring to slide) Over the past 2 or 3 decades Bristol Bay's salmon have enjoyed a warm phase in the Pacific Decadal Oscillation over their vast migratory range, which some think is more responsible for high stock levels than management efforts *per se*. And currently there is little idea how climate change may impact the Pacific Decadal Oscillation.

<BLANK SLIDE>

to reduce the high inter-annual variability in catches I would recommend

-First, that an independent board of scientific and economic advisors be formed to advise the ADFG regarding how to maximize the economic as well as the biological returns from the fishery.

-Second, this advisory board should help the ADFG to establish total allowable catches each season--basically an upper bound that limits total catches to levels the region's processors can handle and still assure high product quality and minimal waste. Limiting the total catch should therefore enhance the stability of the fishery and better sustain prices in years with extremely large runs.

-And coupled with this, the commercial fishing permits should be associated with certain *shares* of the total allowable catch. This too should likewise ensure that upper bound limits on the total catch are not exceeded, while also spreading the fishing season out over a longer period of time.

<PRICE PER POUND PAID TO FISHERMEN SLIDE>

A third and very serious problem has been falling prices due to the steady increase in the supply of farmed salmon over the past 2 or 3 decades.

In 1980**,** 98% of the world's salmon supply was wild and Bristol Bay produced 13% of it--enough to influence salmon prices--and back then everyone was making money. Today nearly 70% of the world's salmon supply is farmed, and Bristol Bay's share of the total world salmon supply is less than 2%.

But just last year, as a virus in Chilean farmed salmon drastically reduced Chile's supply to world markets, base prices for Bristol Bay wild-sockeye rose to $0.95 per pound, increasing the total value of the fishery by $40 million over what it had been just the year before.

<GENETICALLY ENGINEERED SALMON SLIDE>

-Recently also, a U.S. corporation has applied to the US Food and Drug Administration for a permit to begin commercial production of genetically engineered salmon. And because these genetically engineered salmon grow twice as fast as their wild counterparts, their commercial production will greatly add to the world's supply of salmon and likely depress wild salmon prices to the point that Bristol Bay's commercial fishery may have to close.

My recommendation regarding problems associated with prices is to see processors and marketers continue their efforts to publicize the nutritional superiority of wild salmon

compared with farmed, as well as to further publicize the very problematic environmental impacts of farmed salmon. Notable progress in public awareness about the problems surrounding farmed salmon has been made over the past decade, and these efforts should continue.

<BLANK SLIDE>

A fourth and very serious problem in the commercial fishery is the permit system itself

-Currently there are a total of around 2,800 commercial fishing permits in Bristol Bay's commercial fishery, but only about 1/3 of these are held by permanent residents of the region--an unfavorable distribution for Bristol Bay's communities for sure, yet things were not always this bad.

Until the mid 1970's the villages had mixed economies that entailed a mix of subsistence *and* commercial fishing activities.

But with the 1970s came the Limited Entry Act and a new type of permitting system. What was new was that the permits not only conferred access to the fishery, they were also now a privately owned property right that could be bought and sold just like any other commodity.

This was a radical innovation in Bristol Bay's traditional communities, which had freely accessed the salmon stocks for millennia.

The state's rationale behind the new permitting system was to protect the region's rural populace from outsiders who might flood into the commercial fishery. But over the years since it was enacted it has had the opposite result, as Bristol Bay's people lost around 70% of their permits. What happened?

- some villagers lost their permits because they did not have enough education to be able to complete the complicated written records and reports they had to submit to the ADFG.

-and some lost them because the permit system required the identification of a responsible owner-operator, whereas most fishing operations in the villages--consistent with longstanding cultural traditions-- had been conducted by extended family groups and other ad hoc groups having flexible compositions.

-and some also lost their permits because ownership of a capital asset such as a commercial fishing permit disqualified them from being able to receive benefits from various state and national programs benefitting indigenous people.

-but most lost their permits when they found themselves with losses at the end of a poor fishing season, and then, strapped for cash, they sold them to buyers from outside the region who were able to offer the highest prices for them.

Prior to the 1970's approximately 90% of all households in the villages earned modest cash incomes from part-time commercial fishing. Only 27% do today.

Now the village communities are worse off than they were prior to the launch of the limited-entry permitting system Now displaced from commercial fishing, most villagers live from subsistence fishing and migratory wage labor jobs they find elsewhere. And virtually everyone is increasingly dependent on state and national welfare programs.

<SALMON SUN DRYING SLIDE>
<POOR SHACK SLIDE>

Today Bristol Bay's rural villages are experiencing high unemployment, steady depopulation, and economic marginalization.

<MAN AND KIDS ON ATV SLIDE>

And now there is a whole new generation of young people who have no experience in the commercial fishery at all.

<BLANK SLIDE>

My recommendation regarding the fishing permit system is to

Urge the state to return a substantial proportion of the commercial fishing permits to the permanently settled residents of the region--and not as a commodity that can be subsequently bought and sold, but as a fishing right to the holder. Currently, 2/3rds of all of the region's commercial fishing permits are held by persons who do not permanently reside in the Bristol Bay region, and 44% of all permits are currently held by persons who do not even live in the state.

The state of Alaska should promote legislative action that buys back all permits that are currently held by persons who do not live in the state of Alaska, and then reallocate these to residents of the region.

There is considerable precedent for this in the United States, where the individual states have the primary responsibilities for managing wildlife resources and typically grant preferential access to state residents while making access more difficult and more costly for non residents.

In principle, I strongly feel that people who live contiguously with renewable resources, and who have traditionally depended on these for their livelihoods, should have first priority in the allocation of such resources.

A fifth problem facing Bristol Bay's commercial fisheries is a proposed open-pit mine that threatens the region's aquatic and marine ecosystems.

<POTENTIAL MINING FOOTPRINT SLIDE>

A U.S. and Canadian owned enterprise, The Pebble Limited Partnership, wants to create North America's largest open-pit gold, copper, and molybdenum mine in a mining district near Lake Iliamna in the headwaters of the Bristol Bay region.

The principal method of mineral extraction will be heap and vat leaching using cyanide to extract the gold, and sulfuric acid to extract the copper, and would also require the construction of huge dams to contain tailings that will be rich with cyanide, acids, and residual heavy metals. .

<FORT KNOX GOLD MINE NEAR FAIRBANKS SLIDE>

The Pebble Mine poses a great threat to the Bristol Bay region's aquatic ecosystems and the people who depend upon them. Similar open pit mines have devastated entire watersheds and their fisheries, both in the United States and around the world.

<BLANK SLIDE>

Safeguarding the region's aquatic ecosystems must be the first priority for enhancing the resilience of Bristol Bay's fishing communities, and to accomplish this they should begin by capitalizing on the strength of several already-existing social institutions. For example: the township of Dillingham, several of the village councils, the Bristol Bay Native Corporation, and notably a new voluntary organization, the Bristol Bay Alliance, have all declared their strong opposition to the proposed Pebble Mine.

<PURVIEW OF BRISTOL BAY NATIVE CORPORATION SLIDE>

The Bristol Bay Native Corporation, which was founded by the Alaska Native Claims Settlement Act in 1971, is an overarching organization that has purview over the entire Bristol Bay region, as well as rights to control natural resource use in several specific areas--although, unfortunately, not in the area of the proposed Pebble mine. A year ago the Corporation declared its opposition to the proposed Mine, but problematically there are serious schisms within the organization, including many members who are in favor of the mine because of its potential for job creation. The internal conflict within this organization is a serious problem that will have to be mitigated if it is to play an important role in protecting the region's fisheries from mining development.

<BLANK SLIDE>

But there is also a very promising and even more overarching organization which has recently sprung up: the Bristol Bay Alliance. Originally launched by owners of the recreational fishing lodges who think the possibility of mining effluents escaping their planned containments is too great a risk, they were soon joined by many others, including the village councils, the town of Dillingham, the Native Corporation, and many other local residents. At the same time the Alliance was also joined by many of the lodges' relatively affluent and influential clients from all over the world, as well as by corporations involved in recreational industries, and by some of the world's most prominent environmental- and wildlife-conservation organizations. Thus, many of the Alliance's members have more education, organizational know-how, and political influence than is typically found among the region's permanently settled populace.

In my opinion this vigorous and relatively new organization exemplifies the necessary attributes of a resilience-enhancing institution --broad inclusivity; ability to adapt by iterative learning; active articulation with government institutions; insistence on having a

role in co-management; the ability to evolve as necessary; and the ability to mobilize considerable support at local, regional, state, national, and even international levels.

It is therefore a good model for the type of organization that will be necessary for enhancing a sub-Arctic community's resilience to change. Still, with the total value of Bristol Bay's commercial fishery being only around $100 million a year, compared with the Pebble Mine's estimated value of $400 billion, the Alliance is in for a tough fight.

I also have one additional recommendation for revitalizing and strengthening Bristol Bay's rural communities, and it is to develop...
...state and national programs that offer education, planning, technical assistance, and credit extension to the region's residents to establish *their own* recreational fishing and hunting lodges, as well as cottage industries and other enterprises that will diversify their local economies. The new lodges should be modeled on the economically very successful hunting and fishing lodges that are found on various Native American reservations in the contiguous United States.

Finally, to conclude with some general thoughts about enhancing the resilience of sub-Arctic fishing communities

A majority of the problems facing Bristol Bay's communities are shared by many other Alaskan salmon fishing communities, and also shared to varying degrees by other small sub-Arctic communities around the world. And the first priority in all of these communities should be safeguarding the aquatic and marine ecosystems that they depend upon. Moreover, this should be the core unifying factor underlying their development of the resilience-enhancing social and economic organizations that they will need.

They should also reach out to other environmentally concerned persons and organizations, from local to global ones, to enlist their support. In doing so they will discover they have many sympathetic friends around the world, including many who are quite powerful and influential.

At the same time, they should also strive to anticipate new opportunities that climatic and ecosystem change may bring their way.

Almost certainly Bristol Bay's climate will change in the near future, but right now nobody can say how and what the consequences will be. But even if accurately forecasting climatic and ecosystem change is currently beyond our means, building more resilient communities is not.

If the immediate future will be anything like the past, the future challenges, whatever they turn out to be, will be mostly met by *muddling through--the timeless way that humanity has always adapted to change*. Even so, humanity can do a better job of muddling through if it can develop more flexible, better informed, and more inclusive social and economic institutions that have the ability to adapt to change through iterative learning.

By now it should be obvious that this orthodox approach is the one I favor. I am less sanguine about approaches that urge freeing up the market and simply letting private enterprises enhance

resilience. After all, it was the market freely running its course that over time marginalized Bristol Bay's fishing communities. Still, I would be enthusiastic about seeing market-based approaches where new economic incentives were instituted to enhance social and environmental well being, putting those two priorities ahead of all others.

I agree with Arthur F. McEvoy, author of *The Fisherman's Problem* who underscored the problematic ability of market forces to sunder the social-ecological bonds between natural resources and the human societies that depend on them. I have also long been a devotee of economist E. F. Schumacher, author of *Small is Beautiful*, and his urging that we create... "*economics as if people mattered*."

<WONDROUS PHOTO OF SOCKEYE SALMON SLIDE>
Thank you.

<ACKNOWLEDGMENTS SLIDE>