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EVOS GEM PROGRAM

GEM DRAFT PLAN WORKSHOP OPENING

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MS. McCAMMON: I would like to introduce Frank Rue, who is Commissioner of the Alaska Department of Fish and Game. Commissioner Rue is now starting, it's hard to believe, his seventh year on the Trustee Council, and has been very instrumental in getting the Gulf Ecosystem Monitoring underway and ensuring that it does meet the needs of managers. And so I'd like to have Frank come up.

MR. RUE: Thank you, Molly. Good morning. I know you all are interested in getting going and we're almost on schedule, but I'll make sure that Vera gets up here by 9:30 so we can keep going.

Molly called me up and said, well, I'd like to have you talk a little bit about what Fish and Game does and sort of the dilemma -- some of the dilemmas you face and the problems you face and how GEM might help resource managers. And then I saw the program, Resource Management in the 21st Century, that sounds way too grandiose. In fact, I was going to argue whether we were even in the 21st century yet. Isn't there some debate?

Actually I will spend a little time talking about what we face in the 21st century, but I'm going to spend more time talking a little bit about what Fish and Game does, what limits we have as managers in terms of information and how I think GEM could really help the

management of our resources. I'd also like to thank you for being here. I mean, what an exciting thing. As Molly mentioned, what other research endowment or foundation brings in this kind of participation in figuring out where we want to go, what our priorities are, what questions we ought to answering. I mean, it's really incredible, it's exciting, and as a Trustee Council member I'm really looking forward to hearing what you all have to say to help us shape the very best research program for the very, very long term.

Anyway, back to management. What are we going to see in the management world? Well, we're going to see change. I mean, think about it. Change in technology, we're now measuring things, looking at things from satellites and stuff that 40 years ago we couldn't have imagined. So we have this giant amount of data. We see things happening, but we may not know what they are. I think maybe it was easier 40 years ago when you were lucky if you could count the number of moose out there, much less how many plankton are floating around in the middle of the ocean. You know, sort of incredible in terms of the technology changes that we're seeing and they're just going to get greater. So we're going to have this bombardment of information as managers.

The other thing is we're going to see change in

economics. Look at what's going on with fisheries, farm fish, lots of things are changing the economics of our resource uses. Those have tremendous effects, not the least of which is I have seen the main protectors of the resource and the environment, those people who use it, whether subsistence or commercial fishermen, sportfishermen, people who use the resource, care a lot about it and tend to want to protect it. If we lose that foundation I think we lose a lot of our energy to protect some of these resources. Look at the Columbia River.

We're going to see change in regimes. Most of the folks who are working in the Department of Fish and Game, you know, came in on sort of like the stock market for young people, they've never seen a depression or a big recession. I mean, some of our salmon managers came in when things were world record kind of happenings out there. Now, as managers, we're seeing a different regime and our professional experience doesn't necessarily let us know how to deal with that. So change, there's going to be a lot of it. I've only mentioned a couple of them here.

I think the other -- well, let me just mention one other very important thing and I'll dwell on it a little bit. As a department we tend to focus on single-species management, you know, that's just the way of the world. That has got to change, we have got to understand better

how management of sockeye in Cook Inlet or wherever affects the larger system. And we know some of that, but I think we need to move more in that direction. We just have to.

Sort of the Reader's Digest form of what Fish and Game does, for those of you who don't know, and I know most of you do know, so I'll be very brief. We provide opportunity, we provide sustainable opportunity for people out there to eat food, make a profit. If we aren't providing opportunity, we don't have a job, we don't have a reason for being. So that's just a fundamental principle for us.

The tricky part of our job is providing an opportunity within a sustainable framework. You know, it would be easy to just kind of open the gate every spring, might be only for a couple of springs, say, go at it folks, you know, fish or hunt 'em. We have to provide a sustainable opportunity, that gets tough. So we're trying to control the human appetite for resources within these bounds of sustainability, which are tough to define sometimes, in what is really, as I mentioned, a complex world of incomplete knowledge. We don't know what's going on and we don't know all the effects of what we do. Of regimes shifts changing, more efficient methods of fishing. People are not dumb, they figure out lots of ways to get more fish faster at less cost. Heavy changing economics

and political pressures. Politics are changing.

The other thing that Fish and Game is dealing with is we have not been a growth industry. The legislature has been cutting budgets, we've been getting smaller. And in particularly in some of the areas that we're going to be talking about here where you try and understand the larger implication of your management actions, like limnology, that's one of the parts of department that has gotten very, very minuscule. I see James Brady out here and I hope he's nodding his head up and down. You know, we're not able to answer some really fundamental questions that we should be talking about and that's because we're not a growth industry.

Now, we do our job a little differently for different species that we manage. I think most of you are probably familiar with our salmon management program, basically, we don't fish the forecasts. For those of you who are from the Lower 48 may not know that, for salmon we fish -- we may enter the season thinking we're going to have a big run or a small runs, so it may color our first few actions, but basically we fish salmon based on real time information, how big is this run, where's it coming in, are we tracking with our escapement needs for the spawning streams. And we let local managers make those decisions, real time, right now, based on that information.

And that's been fundamental to our success. And so any information that helps us make those decisions better is good.

Now, herring, crab, those things, we fish to a, you know, biomass or a forecast of abundance and then harvest a percentage of the biomass or we harvest a certain size or sex during a certain season and call it good. So we do have different methods of managing depending on the species.

So given the nature of that job and those finite budgets I was talking about, it's not surprising that most of our research and monitoring is focused on single species and questions like how many of these things are out there. You know, how many moose are out there. How many herring are out there, how many sea urchins are out there that we can catch. And then measuring how many fish are spawning, for example, in a particular stream. Measuring who's catching what and where. Important questions when you're managing fisheries. We do look into the life history of some of these species so we better understand what kind of harvest regime we can put on them and still sustain them. But for, like I said, things like limnology, some of our more ecosystem-type research, we don't do much of that, we're mostly counting them, counting who's catching them, making sure we know how many are up there spawning.

So we have these databases, which I think will end up being very useful, long-term databases of abundance and things in these larger ecosystem questions which is where we really need help. And this is where I see GEM being a tremendous benefit, potentially, to the Department, answering some of these really tough ecosystem kinds of questions that would give us a handle on things like how much of what's going on out in a fishery or with a particular stock is caused by our management actions, how much is nature, regimes changing? You know, it's really depressing when an elder on the Yukon looks at you and says, what's going on? And you say, I don't know. Are we fishing too hard? Or is it the regime shift? You know, we'd like to be able to answer those questions and direct our management correctly. But, also, be able to tell the public what's going on.

The other thing that -- you know, when you look at the issues that are consuming managers right now, you can see those ecosystem kinds of questions are exactly at the root of a lot of the big issues that are consuming us. Steller sea lions, which I'm sure Ron is going to talk about, you know, it's not understanding exactly how that system is working and what's influencing sea lions. Is it harvest, you know, is it lack of capelin, whatever? It's just totally consuming -- totally, I'm exaggerating a

little bit, but consuming the management agencies. So this lack of information about how the system works, how the Gulf works, what our actions as managers mean within that larger context, is consuming us. I could list any number of them, Western Alaska chum salmon, same thing. The fact that we don't know a lot of things is consuming our ability as managers and focusing us in very frustrating directions.

Basically I think that if GEM can help us answer those questions we'll better be able to direct our management actions. And, don't forget, one of the few things we have control over out there is how much we harvest. I mean, that's something we really have control over, we can't move the Aleutian low over here, over there. We can decide not to catch fish or we can catch more fish or we can catch them at different places. So it's something that we have a lot of control over, and to the extent that you can help us do better at it, we can do the right thing in terms of the overall productivity of the Gulf of Alaska.

To close, I would like to emphasize that -- or actually before I close, having this information to communicate to the public what is going on is incredibly important and I kind of alluded to it a minute ago, but we sometimes forget as scientists, as managers, how important it is for the public to be aware of what's going on. I

think the fact -- I mean everything from an elder on the Yukon being depressed because we can't tell him why things are turning bad on the Yukon with chums to people going to court to stop our actions, our management actions, because we can't tell them what's going on. I mean, one, understanding ourselves what's going on in the ecosystem and how our management fits into it and, two, being able to explain that are critically important to successful management.

So, in closing, I guess as you go about your work the next couple of days, I 'd like you to remember the mission that the Trustee Council set up for GEM, and I'll just read it.

It's to sustain a healthy and biologically diverse marine ecosystem in the northern Gulf of Alaska and the human use of marine resources in that ecosystem through greater understanding of how its productivity is influenced by natural changes and human activities. I couldn't have said it better myself, that's pretty good.

Also, remember the programmatic goals that we have for GEM.

Detect change. We want to be able to detect change;

Understand the causes of change;

Predict the future status in terms of resources;

Inform the public, resource managers, policymakers by providing synthesized information, and;

Solve problems faced by resource managers and regulators by developing tools, technology and information.

Again, I couldn't have said it better myself. These are the sort of measures that I as a Trustee Council member, and I'm sure my fellow Trustee Council members will be using to look at our overall GEM Plan, to see if we've met those overall program mission and goals. And so I hope you keep them in mind as you're going about the next couple of days.

I really thank you for being willing to wrestle with these issues. It's going to be fun, but it's going to be challenging and it will truly help those of us who sit on the Council make our decisions on how we ought to direct the research of this long-term endowment. And I really do look forward to seeing the results that you all come up with over the next couple of days. I wish I could sit through some of the sessions, but unfortunately some of the brush fires I mentioned earlier force me to leave.

So thank you all very much, and I look forward to seeing your results.

(Applause)

MS. McCAMMON: Actually I don't think Frank was too far off in saying that sea lions and some other

issues are consuming National Marine Fisheries Service, because our next speaker was actually called to Washington, D.C. to deal with some of those issues. His replacement is actually his Deputy Regional Administrator, Ron Berg, speaking for the National Marine Fisheries Service, certainly one of the most high profile resource agencies in the state and one with a huge number of challenges before us.

So, Ron, if you could come up and describe that.

MR. BERG: Thanks, Molly. The reason I'm doing this little history lesson here on these time lines is just to kind of indicate some of the history of fishery management we've had here in Alaska, Federal fishery management. It's been an up and down session for 14 years during the Federal fishery management. I'm really going to echo a lot of the things that Frank was talking about, about the problems of single-species management that we do, compared to multi-species, ecosystem management that really has to be done in the future, in the 21st century.

A little history lesson here, first of all. A lot of Federal fishery management is done under the authority of the Magnuson-Stevens Fishery Conservation Management Act. That act has been around now for 14 years and it absolutely changed the way that Federal fisheries across the United States is done. It established, for example,

the North Pacific Fishery Management Council, which here in this state is really the planner of Federal fisheries management. The National Marine Fisheries Service is really an implementer, helping the North Pacific Council.

But the foreign fishery started out, first of all, we had five nations that were involved. We had the former USSR and China and Japan and Poland and the Republic of South Korea. So they started out and, of course, they were fishing under bilaterals even before the act, but then the act was implemented and we were finally managing those under Federal foreign fishing regulations. We opened and closed fisheries and it was also done under single species management. We had the last allocation, however, to foreign nations in the Bering Sea in 1987. In 1988 was the last allocation in the Gulf of Alaska. We had in 1980, however, a joint venture start up which was where U.S. skippers would make deliveries to foreign processors under foreign fishing regulations. It was still not an Americanized fishery. However, those people were really the seed of the U.S. fishery when it came along.

In 1989 we had the last allocation in the Gulf to joint ventures and then 1991 the last allocation to joint ventures in the Bering Sea. And so it was really after 1991 where the fishery was really Americanized. The observer program, as I've indicated there with the 1990

date, was when my job actually became interesting as a manager. Instead of just getting reports from the industry, we finally started getting reports of catches, by-catches, seabird catches, marine mammal interactions from a neutral set of eyes out there. It's been a major program that the United States needed, really, in order to manage a public resource.

Going through 1991, we established a very comprehensive recordkeeping and reporting system. And that, in conjunction with that observer program, really gave us the information we needed to manage the fisheries.

In 1992 we established the -- under the Fisheries Management Plans to the North Pacific Council, the first closed areas around key rookery and haul-out areas for the Steller sea lions. That was a very important part. We've been going that direction ever since and I'll talk a little bit about that more.

In 1992 we did a major regulation to rationalize, as we call, the pollock fisheries off Alaska. The pollock fisheries are really the biggest fisheries, you know, we have roughly 2,000,000 tons of groundfish in the Bering Sea and around 400,000, 350,000 tons in the Gulf of Alaska, but really most of that is pollock, so a lot of the pollock fisheries really govern a lot of management.

That was replaced in 1998, I don't have this date on here, though, by another act called the American Fishery Act. In October of 1998 Congress passed that act which gave certain allocations of pollock to what we called the offshore processing component as well as the inshore component, as well as community development corridors in Alaska, which is a social program that was planned by the State of Alaska.

Further rationalization of the fisheries happened in 1995 with implementation of the IFQ program, Individual Fishing Quotas, for the halibut and sable fish. We no longer had a race for the fish, for those two species, because now all these groups had their own allocations, they can make their own decisions on when to go fish. With respect to by-catch problems and so forth, that often occurs when you have a race for the fish, at least in those fisheries, that tended to go away.

One more slide on the history lesson and then I'll talk about issues. Okay, we're going to get back down to the Steller sea lion problem that Frank and Molly were alluding to. In 1997 we took the western stock of Steller sea lions, which was the stock east of 144 degrees longitude and declared them as endangered under the Endangered Species Act. In the eastern part of the range they still had problems there, but they're threatened, not

endangered. But ever since we've been involved through the courts with regard to compliance with the Endangered Species Act, as well as compliance with the National Environmental Policy Act.

In 1998 we had prepared a biological opinion, which is a term of art, it's a report of what we anticipated what impact would be on the fisheries, the pollock fisheries, on Steller sea lions. We prepared that biological opinion and we also, in 1998, started to work on an Environmental Impact Statement in order to bring us into compliance with NEPA, the National Environmental Policy Act, because we hadn't kept those analyses up to date for roughly 15 years and so we were working on that.

Now, a lot of you people in the audience probably are very familiar with NEPA and the pretty exhaustive requirements for doing an Environmental Impact Statement. However, when those were reviewed by the -- through a lawsuit and then adjudicated by the United States Western District Court, both of these documents were found to be inadequate. The biological opinion was found to be inadequate because what we call reasonable, prudent alternatives to protect Steller sea lions, were judged to be not understood by the court and they were remanded back to the agency to further explain. They had no problem with our jeopardy finding about Steller sea lions, but the

solution was in question.

Furthermore, our Environmental Impact Statement was also found to be inadequate because it wasn't at what we call a programmatic level. In other words, all of the aspects of fisheries management plans from quota setting to enforcement to observer coverage, all the regulations in those plans, the document didn't address those.

And then January 25 of this year we -- after we had worked on the biological assessment, that document itself was rejected by the court. The biological opinion, because it itself needed to do a comprehensive look, and so we didn't do a wide enough scope on these documents.

So in closure of the history lesson part of this, you know, most of you know through reading of the newspaper accounts that the judge actually ordered the trawl fishing of groundfish off Alaska closed out to 20 miles, it's what we call critical habitat, it's also a term of art under the Endangered Species Act to protect the Steller sea lions.

So that's kind of the background of the history, real fast, over the last 14 years, but it does show the problems that resource agencies have with regard to managing stocks, managing the ecosystem. Like Frank was talking about, we have a need to communicate with all the user groups, with all the public, with all the stakeholders, including the environmental groups. We had

to do a better job with respect to these documents.

We'll still have certain management issues over the years that are still with us and they need to be fine-tuned. We've had gear conflict in the fisheries, that are mostly resolved by regulation. We've had ground preemptions where one user group can preempt another user group by getting his gear on the ground first and so forth. We've had the by-catch of prohibited species, like halibut, salmon and herring and crab, which are important to other fishermen. A lot of those problems are resolved, more and more, by this comprehensive rationalization of fisheries, like having, say, individual fishing quotas or allocation opportunities that have been implemented by the American Fisheries Act.

We have subsistence issues, which is new for this agency. The State of Alaska has been involved with subsistence for years, but it's only now that the National Marine Fishery Service is getting into that. The North Pacific Council last week in Sitka came up with a final recommendation for halibut subsistence in Federal waters. And that will be new for us as how to implement it.

But when I look at the biggest issues that we have now in the 21st century, and I'm getting back now to these lawsuits that we're involved with, that's why GEM in the future can be instrumental in helping us resolve these.

It's how to comply with these, what we call, unapplicable laws, mainly the National Environmental Policy Act and Endangered Species Act. These are major pieces of legislation that when we conduct Federal fisheries we have to have documents that go a long way to describe what's going out there in the ecosystem. We have real good science coming out of the Alaska Fishery Science Center, but the problem is we have voids in that science. We have good information about numbers of animals that are taken in the fisheries, but we don't have real good information on the distribution and abundance of those on a much smaller scale.

For example, in critical habitat, which is in place to protect Steller sea lions, we don't have that measuring stick which talks about how much fish is in out to 20 miles, compared to the entire Gulf of Alaska. Or, if we knew that, how much is really needed by Steller sea lions. These are the types of information that, to manage Federal fisheries, we need to have. You know, we're managing in conjunction with the Fish and Wildlife Service, by-catches of marine birds. I saw a bird like a short-tailed albatross, which is also endangered and it was caught in the hook and line fisheries off the Alaska. In very small numbers, but nonetheless those are other elements of the ecosystem that need to be looked at.

Of course, we manage the great whales, we manage -- working with Fish and Wildlife Service, which manages the walrus and birds and otters off of Alaska. These are all other elements of the ecosystem that we need better information on in which to better manage.

The lawyers on both sides, including the ones that defend us, as well as those representing the plaintiffs, they estimate that we're probably going to be sued for 10 years. Now, that's a real challenge and you can see that over that period of time that organizations like GEM with the types of information that they would produce could yield a significant amount of information for us to be putting into the Environmental Impact Statements, so when we do these documents we're able to address all sides of the issue.

So I would say that over the coming years of the 21st century, the concept of ecosystem-based management is going to be at the forefront. We need to understand habitat, important habitat as, for example, central fish habitat, which is defined in regulations. We need to understand why that habitat is important to the various elements of the ecosystem. And even though we have commercial catches occurring, well, how do those catches relate back to other elements of the ecosystem? See, what are the impacts, the cascading impacts, all the way down to

tube worms? Those are massive problems to try to figure out. It probably takes, a little tongue and cheek here, but maybe I'm not far off, maybe billions of dollars in order to answer questions like that. Nonetheless, these types of information gaps is the types that GEM can contribute to.

We certainly are going to have to have a good understanding of -- if we try and protect animals like Steller sea lions and critical parts of the range, well, what are the ecosystem relationships outside of that range and how that might impact animals within the range.

So, in closing I would like to say that we certainly understand the challenges that we have in fisheries management in the coming years. We certainly understand the absolute need to communicate with all the stakeholders, whether it's the environment groups or the fishing industry or the State of Alaska. In order to build better partnerships in managing these resources it's going to take a lot of coordination, communication with Congress in order to provide monies for increased surveys, not only the Federal government, but possibly through grants or organizations like GEM. And these will be the challenges, as I see it, coming forward in the 21st century.

So thanks very much.

(Applause)

MS. McCAMMON: Thanks, Ron. In the past few months we've been doing a lot of coordinating and talking to different groups across the country about other kinds of monitoring programs and other models and, as I said earlier, it's amazing the attention that's now being placed upon our nation's oceans and coastlines. There are all kinds of programs out there and whenever in any of these national or international arenas if there is an Alaskan on the committee or a board, in all likelihood, that Alaskan is our next speaker. It is amazing, I don't think she ever is at home because of all the things she's on.

Dr. Vera Alexander was born in Budapest, Hungary, but in 1962 she moved to Alaska, she joined the new University of Alaska, Institute of Marine Sciences as its first graduate student and, in fact, she was the first female to be awarded a Ph.D. at the University of Alaska, which I thought was pretty interesting. In 1980 she became Director of the Institute of Marine Science and in 1989 Dean of the School of Fisheries and Ocean Sciences. During this period she became involved in national and policy matters working on the evolution of PICES and now serves as one of two U.S. delegates to PICES. In 1995 she was appointed by President Clinton to the Marine Mammal Commission and she's also a member of the Scientific

Advisory Committee to NOAA and of the Ocean Research Advisory Panel to the Senior Ocean Leadership Council, as well as a number of other entities and groups that she serves on.

And I'd like to welcome Dr. Alexander to talk to us about national and international approaches to important research questions for the north Pacific Ocean.

DR. ALEXANDER: I was sort of chuckling to myself when we were talking about hearing about the fact that Phil Mundy couldn't figure out what NOAA was doing and I pose that's because NOAA is doing so much that's it's hard to figure out. Before I say what I'm going to say, I must say that I love NOAA, it's my favorite agency. As you know, now I'm on the Science Advisory Board to Jim Baker and even more important our biggest single source of funding for the School of Fisheries and Ocean Sciences is from NOAA. So what I'm about to say is not to insult NOAA. But as I understand, the acronym stands for No Organization At All.

(Laughter)

DR. ALEXANDER: And then I was just thinking that Dr. Balsiger was in Washington fighting battles, I thought maybe we should change that, it's now the National Organization for the Advancement of Attorneys.

(Laughter)

DR. ALEXANDER: So on that light note I'd

like to say thank you very much for letting me come and I'm going to take my mission in a couple of ways. First of all, originally I was asked to talk about some research questions for the north Pacific. And then I thought, well, I'd really like to tell you about all these exciting things that are going on. So I'm going to try to do a little of both. I'm going to start out with the question of important research questions, very briefly, just so I can get my oar into -- and everybody's listening. It's a real opportunity, you just don't let a person like me up here.

I was just reading an interesting paper, it was a by a guy called Therous and it wasn't by him only, 10 authors altogether, and I was impressed by this paper, it dealt with the changes in the Arctic and it took a number of datasets, lots of datasets, all real datasets, not pseudo-datasets, which is what I call modeling datasets, but the real thing. A very conservative group, I mean, really scientists that aren't going to go out on a limb and they sort of said, yeah, we're getting -- we're having global warming. The way they termed this was very different though, it said -- let's see, what do they say here? Let me find it.

They said, such changes are not inconsistent with anthropogenic forcing and include general positive phases of north Atlantic, et cetera, et cetera, et cetera. So it

was that kind of a conservative approach. But, nevertheless, they did sort of confirm what we've all been talking about, that is that we're undergoing change. And against that background of that change we also have to realize one thing, that as things do change, and that's not just unidirectional, but also cyclical, they're not -- if there's a major change it's not likely that the situation will ever go back to what it was before. We can say of the regime shift in 1976-77, yes, there was a very, very marked one up here.

A lot of things changed. I know the Bering Sea better than the Gulf, there was a step change in many ways. And there's been several times since then the systems has tried to revert a little bit, but it can't do it. It just does not quite go back. So how are you going to predict? It's almost impossible. So there's our challenge. It's a grand challenge indeed.

And maybe if we have the first illustration, please.

So here we have a changing system and what are we going to do about it? I might also point out that when the huge El Nino came along in the late '90s, that really shoved the system a little further over even. And didn't -- you might have expected it to reverse a bit, but it just gave it another little nudge, and so we're in a totally

different regime. And one of the things that you see now that that El Nino event brought into the Bering Sea a very visible phenomenon, this blue of cocclipifords that covers the whole shelf and reflects blue from remote sensing pictures. That's unprecedented and it didn't come from the regime shift, it came from the regime shift plus El Nino.

So, anyway, we have a tremendous opportunity with the GEM Program and the opportunity is simply a continuing stream of money. And money, as I'm going to say, is not really the only important, but the thing is that there are certain things, and I'm not sure we've figured them out, we can measure, not necessarily expensive, that will give the baseline information needed so we at least know what the system is doing from the physical -- and some of the simply measured biological parameters against which experimental tidal work can be done.

The Gulf Ecosystem Monitoring Program is also very timely in putting the name "Monitoring" into it. It would have been sort of brave a few years ago to do that, but right now it's the wave of the future, and it's about time. The tendency to require hypothesis-based research for every research program or project has been good, it's resulted in valid science. It's resulted in science that can be confirmed or proved wrong. But the approach does not ensure that you have the information that you need in the

long-term. And so what's happening now is very exciting. There's a wave of enthusiasm towards a more broad view of how you go about doing research.

The importance of long time studies has been known and has been recognized in the Gulf of Alaska for quite a while and so I will talk about some of the developing initiatives that can promote and work in with continuing the basic knowledge needed for the Gulf of Alaska.

In the National Research Council's publication entitled "Opportunities and Ocean Sciences Challenges on the Horizon" they identify these three broad research areas. I don't think anybody is going to really argue with them, that these are the important things that we need to do here and I think they're consistent with the aims of the GEM Program. However, I would simplify those, and from my own point of view.....

And if I may have the next one, please.

.....I would simply say that what we really need to know is how changes in climate, on a local and global scale affect the north Pacific Ocean ecosystem and what are the mechanisms? If we can answer that question, we got everything right there. You don't need anything else. Within that you can look at sea lions, you can look at birds, you can look at whatever, but without that kind of broad view you won't get anywhere.

I could readily identify a handful of specific knowledge needs. For example, if you ask me what are the most important datasets under this kind of a program for the north Pacific Ocean, I would say mixed layer depth. I would say temperature, salinity and the nutrient content of the surface layer. With those you will have the information to know how the primary productivity is being affected. Possibly, also, how the food chain is working, or how the zooplankton are doing and where they are, and so and so forth.

But you also have factors there that affect the migration of Pacific salmon. Because the Pacific salmon also respond to these surface conditions in the Pacific Ocean, in ways that we don't, yet, completely understand. Welch, in some of his work, although this is a little south of our area, has said that with respect to the Pacific Northwest salmon stocks that changes in marine survival appear to be related to sudden shifts in the climate of the ocean and atmosphere. And that these climate changes appear to have been intensifying or worsening since the 1960s.

So the evidence apparently supports reduced ocean productivity as a primary cause of the differences in growth and survival. And this is just one example. Another from an area closer to home, the Bering Sea, where

massive changes in biomass followed the regime shift and El Ninos, there's substantial evidence for change in primary production regimes that the importance of the spring bloom, the allocation to the benthos, all of those things. But possibly also total primary productivity as well.

And so while in the Welch case it appears that the cause was development of a nitrate limited ecosystem with increased surface temperatures, a reduced supply of nutrients from below during summer because of low salinity and high temperature on the surface, shallow mixed layer, et cetera, et cetera -- somewhat different mechanisms are obviously operating in the Bering Sea and it appears possible that this is partly related to the flow up onto the shelf from the north Pacific.

I'm not proposing that we consider only global warming, but also change in the fluctuations which may or may not be cyclic. Also, of course, there are a myriad of human impacts. Oil spills, as we know, pollution, fishing and so on. Those can't be ignored, but I'm saying that we -- without the most basic understanding of the system, and its responses, we're in no position to manage anything. And certainly not to predict the future. And that's the ultimate goal, of course, is to have some kind of a predictive ability.

In considering a response to the overarching

question, I told you I'd mention money again.

Could you put the next one up, please?

I was just recently on a program advisory team -- an assessment team, I beg your pardon, to the Oregon Sea Grant Program and while there listened to a presentation by a very fine scientist, John Fryer, who said "I'd rather have a modest level of annual support than have someone throw a $1,000,000 in my lap and say, spend it now." And I've had some first-hand experience recently on that particular subject, but it's not easy to spend money quickly and do it well. I like this very much. The grand challenge for GEM is not to spend a lot of money quickly, necessarily, but to do the right things now and forever and this is the grand challenge.

Technology is on our side, and other people can address that better than I can. There are wonderful, marvelous new tools available from a sensor you can put on the bottom of the ocean and wild and strange places, to very simple well-established moorings and AUVs or autonomous underwater vehicles, which I understand there will be one working on the GLOBEC Program out of Seward, and so and so forth. It's just incredible, we have opportunities, we can do the job, the technology exists and that which doesn't exist is being developed. So it's important to take into account what there is available.

Let's go back and talk a little bit about historical perspective. My first experience with the Gulf of Alaska was during the OCSEAP Program, the original baseline monitoring program in preparation for oil and gas exploration and development. We were trying to find baseline information then. Now we know there isn't such a thing. So this is very -- except, perhaps, in pollutants and contaminants you can have baselines, but most conditions are not -- there is no such thing. There's a norm for a particular period of time, perhaps, or an average or a mean condition.

So let's have the next one, please.

One of the most prescient people here was Dr. Tom Royer. I just wanted to show you this. Dr. Tom Royer was very prescient in 1970s he started making measurements at a station just south of Resurrection Bay. And this was done by ordinary hydrographic station work, shipboard based. Everytime a ship went by there from Seward, where we keep the ship, it would stop and take the station. So from 1970 we have this incredible dataset. And what you can see is that the top left-hand panel shows you temperature. And if we think we're going anywhere near back to the cold years of the early '70s, this will make you think again. You can see how incredibly cool, because blue is cool, and you can see the signal of the 1997-1998 El Nino very strongly. And

it took about seven months for that to promulgate up into this northern Gulf of Alaskan area. Dr. Royer thinks this is a Kelvin wave, don't ask me to explain.

But this kind of dataset is just absolutely essential too. The salinity doesn't show very much freshening in this particular case, although there is some evidence in some years. So that kind of a thing is really important to do.

Could we have the next one, please?

I might mention another important effort and that was FOSI Project of NOAA in Shellikof Straits, it's been ongoing for a long time and has some long time series. One of the things we managed to do with the North Pacific Marine Research Program in the brief time we had it was to install a couple of buoys in the northern Gulf of Alaska, about 50 miles south of Seward. And these are pretty comprehensive. If you look at the one on the left, that's primarily physical, it's upward and downward looking current meters so that you can estimate current. It's got salinity and temperature meters. This one is the biological one, this one on this side. This also looks at transmitter mitsomitry, fluomitry. Photos make available radiation and has a nitrate meter or two nitrate meters, actually, on it. And we're hoping to be able to keep these going, although, of course, with gaps in the North Pacific

Marine Research Program right now, we're sort of shoe stringing it. But again, we're trying to get that long-time series data for the northern Gulf. And hopefully this would coordinate with the NOAA plan moorings under GLOBEC further south and so we'll have a whole line of those.

Okay, now, let's talk about some of these programs that are related. And I know I only got about 10 minutes to finish up, so I'll try to be good and stay on schedule. GLOBEC, of course, is an important one.

Could I have the next one, please?

Oh, I should have mentioned, just showing you this one very quickly, sorry. This is from the Gulf of Alaska, not from -- the is from the Bering Sea and not the Gulf of Alaska, but it does show what you can do with a mooring in terms of following what's happening with the spring bloom. And all I'm trying to show you, if you look at the black parts on each of these panels, that's when the ice was present and it was really cold. And you can see in some years as the ice retreats you have a massive spring bloom and quite a sudden one. Most of that material goes to the bottom and supports a benthic system, but where the ice doesn't stay very long or it doesn't even advance that far, you don't get very much in the way of phytoplankton production. So this doesn't work for the Gulf, but again, it shows what you can do with this kind of time series.

And you can get -- here, you got actually five years of data all on one panel and pretty comprehensive.

Now, we can have the next, thanks.

GLOBEC, I'm sure you all know about. I can't go by without mentioning it. It's perhaps one of the most important programs. It's a term program, as we've heard, it's not going to go on forever but, I again think, that's what you need to have, you need to have a long-term monitoring program with nested shorter projects which address questions.

PICES, by the way, has selected as their most important and major research planning activity a GLOBEC project, it's call the four Cs, Climate Change and Caring Capacity, and it's moving into the implementation phase now. It's closely allied to International GLOBEC. And they're looking at two scales, basin and regional scale studies and planning. They've gone through a lot of monitoring workshops, they're worrying about data management, they're worrying about all the things that you have to manage, so it might be worth looking at their documents as you move through this process.

By the way, again, with north Pacific marine research monies we were able to fund a PICES effort to get continued plankton recorders moving over the Gulf of Alaska to get more synoptic information and that is underway now

and, hopefully, can be continued.

Now, there's a surge of recognition of the importance of the oceans around the United States. The Consortium of Oceanographic Research and Education, I think, played a major role in promoting this in Congress. And also making sure that a major effort in the United States was undertaken with the Year of the Ocean in 1998. At that time there was a major conference in Monterey, I think some of you were there, and it was attended by both the President and the Vice President. And at that conference President Clinton announced the commitment by the United States to provide one-third of the proposed 4,000 ARGO drifters for the world monitoring of ocean conditions. And this promise is being fulfilled.

I don't know whether anybody else was planning to mention the ARGO drifters, but I'll just say I'm really excited about these, they drift around at 2,000 meters and then every 10 days come to the surface and take a salinity temperature profile as they come up and transmit this information and back down they go again until their batteries die. And to get such synoptic information for the world oceans, 4,000 of these things is great, but I don't think it'll do much for our coastal areas. So we've got to worry about coastal monitoring.

Now, I'd like to talk a little bit about ocean

observing systems, although you'll hear more by the next speaker on this. In a response to a request by Congressman Weldon and James Saxton to John Dalton, Secretary of the Navy and Jim Baker, the Secretary of Commerce for Oceans and Atmosphere, a report was prepared by people sitting in our room here, so how can I talk about it? Anyway, it was toward a U.S. plan for an integrated sustained ocean observing system. This was submitted to Congress in April of 1999. The team was actually headed by Worth Nolin and Tom Malone. And the Ocean Research Advisory Panel to NOAA -- to the National Ocean Research Leadership Council reviewed the report.

Could I have the next one, please? Right, you're ahead of me.

This tells you a little bit about the organization of the National Ocean Research Leadership Council and its relationship with the Ocean Research Advisory Panel and also with the National Ocean Partnership Program. I'd like to point out in the lower left-hand corner is something oceans.us. This is now considered the U.S. integrated ocean observing system that came out of this initiative and this is being called that.

Next, please.

And this, very quickly, is the National Ocean Research Leadership Council, it's essentially the heads of

most of the agencies that support and conduct ocean research.

Next, please. I'm going to keep you hopping now, because I need to move through these.

The National Ocean Partnership Program operates by the primary agencies putting money into the pot and an office at Consortium for Oceanographic Research and Education coordinates the RFPs and the funding. And most of the initiatives so far that have been funded have been to try to put the pieces together for this integrated ocean observing system for the U.S. And one of the reasons I mention this here is because it would be very desirable if whatever we develop in Alaska will fit, to some degree at least, into this overall plan and will contribute to it.

And the other point is, it is unlikely that given the history that any of the early efforts, pilot efforts, will be put up in Alaska, unless we really clamor or do it ourselves.

Next, please.

These are the priorities of the National Ocean Partnership Program.

Next, please.

And here are the plans for the contributions for the next year and also the emergent themes and at the bottom integrated ocean observing and prediction, data

management and access and education and outreach.

Next, please.

Now I'm going to move on to the Census of Marine Life, which is another program that's coming down the pike. Census of Marine Life sounds sort of hoke, I'll be the first to say so, it sounds as though we're going to go out and count everything. In fact, the thing started with Jesse Osabell (ph) who works for the Sloan Foundation proposing to count all the fishes in the sea, but fortunately got himself a steering committee and that steering committee is trying to focus this into something a little more reasonable.

But actually the idea is to fill certain gaps on an international basis in our knowledge about the sea and particularly the biodiversity there. And I think it's going quite well. I think it's probably going to result in some useful approaches.

Next, please.

So here we have it. The concept was developed by the Sloan, there's been lots of workshops, there's been lots of involvement of people in this. And as secretary to establishment of CORE -- you'll see CORE is into everything and the steering committee was established in 1999 and now we are -- because I'm on that steering committee, too. We're drafting a strategy as we speak and should be out

with it in a couple of weeks.

Next, please.

So the idea is to have a program that will examine changes, it'll be international for biological fields and it will identify key questions and support observations and research over the next five, 10 years. This has a timeline, it's not going live forever. It's going to depend on partnerships with agencies, Sloan is not going to be able to support all of the research, that's very clear. And so here, again, is a potential for a partnership with GEM, depending on which way it goes.

Next, please.

So what is happening now is that the steering committee is working with the Secretariat to develop some pilot projects, to get them going. One of the first ones has been the history of marine animal populations. There's been two workshops on that and that's being looked at as a doable pilot project on a regional basis.

The next one is OBIS, Ocean Biological Information System. This is a data management system for data coming out of this program, but it's viewed as one to be developed for a much broader use to be made available to the community. And I don't know how that would fit into anything that GEM wants to do.

Next, please.

Here's the steering committee. Not very large, but we do a lot of hammering and we seem to be getting somewhere.

Next, please.

I just put something down here about CORE because I keep mentioning CORE and I'm glad that your briefing books have a section on acronyms because I don't have to go through this defining everything. We use way too many of them.

Next, please.

So now we're drafting the scientific strategy, convening workshops, supporting the development of the pilot research programs, designing coastal proposals and there is topics, again, through the National Ocean Partnership Program.

Next, please.

This is the biogeographical information system and the idea is to make it compatible with all existing systems developed for other biological communities and for non-biological oceanographic data. Again, the idea is to manage and govern this under Census of Marine Life, but it's designed to exist after it goes away.

Next, please.

And I just wanted to point out one pilot project that we are developing now, it's for the Gulf of Alaska and

it deals with the salmon issue. And it's to develop and implement new technology for data storage tags and the idea is to better address the at sea stages of the Pacific salmon to find out what's going on. And that's being led by a Dr. Welch of Canada.

Next, please. And this seems to be repetitive, let's go on to the next one, sorry.

And that's the information on the website. Now, I need to wrap up, in fact, I'm running late, I think. I just wanted to point out one more thing and that is in a memorandum to the Secretary of Commerce dated June the 12th of 2000, President Clinton stated that he was announcing steps to immediately enhance our ocean exploration efforts and develop long-term exploration strategy recommended by you and the rest of the Cabinet, together these actions represent the start of a new era of ocean exploration.

He then went on to charge the Secretary to convene a panel of leading ocean explorers, educators and scientists and report back within 120 days of recommendation for a national ocean exploration strategy. He emphasized new partnerships, new tools, involvement of all sectors, education, community, the private sector, government organizations, including opportunities for Federal agencies to provide in-kind support for private ocean exploration initiatives. I love that. The

opportunity for Federal agencies to provide support, wonderful.

Clearly this is thinking outside the box of our traditional funding agencies, but it was not intended to trivialize scientific exploration, but rather to encourage and revitalize it. So the panel was established under the NOAA Science Advisory Board. Rather intense efforts resulted in a report, which was reviewed by the board last week and which has now been sent, through the Secretary of Commerce, to the President.

Could I have the next, please? Oh, we have it already.

These are the major recommendations, they're informal yet, because the President hasn't accepted them, but nevertheless the idea is mapping, physical, geological, biological and chemical and archaeological aspects of the ocean. Exploring ocean dynamics, interactions. Developing new census and systems and reaching out in new ways to stakeholders. All very important aspects. All of them, again, applicable to the GEM Program.

Is that the last one or is there on more?

MS. HENNIGH: That's the last one.

DR. ALEXANDER: Wonderful. So here we have the challenge to GEM to work within the context of climate, change and variability, utilization of resources, toxic

effects, habitat modification and try to come up with some kind of understanding which will allow for prediction and -- so I'm going to just sum up with saying the valid goal for research in the Gulf of Alaska is to diagnose the state of the ocean at any point in time with an intelligent level of predictive capability. I don't know if that's achievable, but I think with a long-term stream of funding we can get closer than there's ever been hope before. And if we cooperate with all these other things that are going on and leverage and form partnerships and, therefore, make even better use of the money flow, including external from Alaska and the other internal Alaskan potential sources, I think we've got a hope of making real progress for the first time.

Thank you.

(Applause)

MS. McCAMMON: Thank you, Vera. We're going to take a 21-minute break here and we'll reconvene back in this room at 10:30. Thanks.

(Off record)

(On record)

DR. MUNDY: Okay, this is the morning session. My name is Phil Mundy and I'm the Science Coordinator for the Exxon Valdez Oil Spill Trustee Council. And it's my pleasure to introduce our speaker for the

second session.

About five months ago I was here in Anchorage and I went over to a meeting to learn something about the Kasitna Bay Laboratory and their plans for development in Lower Cook Inlet and I happened to hear a presentation by our speaker on the Global Ocean Observing System. And I was so impressed with their approach to defining a core set of variables and their ambition to detect and understand change on global level in the oceans, but also coastly as well, that I made a point of getting to know the speaker and to getting to know the Global Ocean Observing System program. I think you'll find this to be very instructive and very much supportive of what we're tying to do in the Gulf Ecosystem Management Program.

So with that, I'll introduce Dr. Tom Malone, he's Director and Professor of the Horn Point Laboratory at the University of Maryland.

(Applause)

DR. MALONE: Thank you, Phil, I'll try to live up to that.

First of all, welcome to the acronym jungle. I apologize in the beginning for the number of acronyms that I'll use, but I noticed that you have one, too. I kind of like the notion of the GEM and GOOS, although somebody suggested this morning it ought to be the GEM in the GOOS.

As I think you all know, the U.S. and the international community is in the process of designing and implementing something called the Global Ocean Observing System. The development of the coastal component of that, which will be clearly an integral part of the whole system, will occur, most likely, by building federations or building a federation of regional systems, much like GEM. And in many respects the development of GEM may become a model for how we go about doing these sorts of things, both nationally and internationally. The point I want to emphasize up front and it'll occur throughout my talk this morning, is that the successful development of GEM will enable the successful development of other regional programs in the United States, such as another wonderful acronym, GoMOOS. I like that a little better than GEM actually, that's the Gulf of Maine Ocean Observing System. And there are other observing systems that are beginning to spin up around the country, in Southern California, the Northern Gulf of Mexico, et cetera. All of these efforts can learn and benefit from each other. It's incredibly important that you coordinate these activities.

It's also important that you coordinate with the development of international programs. I put one up here, GODAE, that's the Global Ocean Data Assimilation Experiment. I think ARGO was mentioned a little bit

earlier this morning. Basically what this is, is an attempt to -- it's a pilot project, a proof of concept to see if we really can integrate data from different sources and Cite To Data remote sensing to be able to predict weather and climate better. That program is going to be very important to the development of GEM because it gives you the larger scale perspective, which you'll need to understand your local scales, your local changes.

My purpose today is to introduce you to the design plan for the coastal component of the Global Ocean Observing System, which I'll refer to as C-GOOS from now on. My hope is that you'll find it useful as you proceed to design and implement GEM.

Next slide.

My talk is going to be divided into three sections, I'll first talk a little bit about some of the challenges that you present in the program document. Having been involved in working on this for the past couple of years I think that some of these are going to be a little bit more difficult than one might thing when you begin to scratch the surface.

I'll also talk a little bit about the design plan for Coastal-GOOS and I'll try to talk about those aspects that I think are most relevant to the design and implementation of GEM. And then I'll conclude with

recommendations that I think might be useful as you begin to take the next step in developing the design for the program.

Next slide.

The monitoring and research plan, as you all know, is built around three themes, the one that I will spend the most time addressing and much of what I will say will address, primarily, the coastal process theme. It is this component that will provide the environmental data required to predict fluctuations in living resources and required to manage in an ecosystem context.

Next.

The GEM science program addresses many important issues that are both a major challenge and critical to the development of the monitoring program. The first one is to build strategic partnerships, and I'll talk a little bit more about what we mean by that in a moment. Second, is working with user groups to define their needs. This is going to be a difficult and ongoing process that needs to be initiated as soon as possible, and I think you already have.

Next.

There's much reference to the backbone of GEM being a long-term monitoring system. I want to talk a little bit about what the implications of that are in terms of how

various different research establishments and mission-oriented agencies function. I was very pleased to see that there discussion about the importance of synergy between research and monitoring, but I think we need to think a little bit about what we mean by research and monitoring, especially when we get in the whole issue of hypothesis driven science.

Next.

I'll go into these in a little more detail in a moment. You talk about identifying key species and processes. Well, I wonder just how you're going to go about doing that?

Next.

You talk about managing resources in an ecosystem context. This is a very nice objective, very easy to say and we all know it's important, but I don't think we really know what that means yet.

Next.

I love the statement in there that we're going to develop a data management system before we make any new measurements. Well, we'll see.

(Laughter)

DR. MALONE: That's a very important aspect of what you're proposing to do.

Is there one more on there? No.

Okay. Before I get into the coastal component of GOOS, I'm going to give you just a very, very brief background. For roughly about the last decade there has been an international effort to develop something called the Integrated Global Observing Strategy that was based on three components or modules. The Global Threshold Observing System, GOOS, the Ocean Observing System and the Global Climate Observing System. Internationally, the effort to organize GOOS is being led by the GOOS Steering Committee that is chaired by Worth Nolin who is here. The sponsors of that effort are the Intergovernmental Oceanographic Commission, UNAP, WMO.

It has been developing in four modules, the ocean observing panel for climate which is primarily concerned with the ocean climate system. The health of the ocean, HOTO module, the Lunar Resources Module and the Coastal Module. The latter three are in the process of being merged into one effort, which makes a lot of sense.

Next.

The U.S. effort is being led by the U.S. GOOS Steering Committee, which is chaired by Worth Nolin again, and I co-chair that. As Vera indicated earlier, the plan for a sustained Integrated Ocean Observing System, at least the first steps, went to Congress last April and we're in the process of trying to move that forward.

Okay, so what's Coastal-GOOS all about? The goal of the coastal component of GOOS is to create a system that will provide data and information required to sustain and restore coastal ecosystems and limning resources. It's going to sound very familiar. Next. Enable safer, more cost-effective marine operations. Forecast and mitigate the effects of storms. Detect and predict the effects of climate change. And, finally, to protect public health.

The basic concept, and I'll come back to this again, is that many of the properties that need to be measured in an observing system are common to all of these, and I'll give you the rationale for that in a moment.

Next.

Okay, I want to emphasize the point that the Coastal-GOOS and GOOS in general is not another research or monitoring program. This is an effort to better organize ourselves to build, enhance and supplement existing programs to develop a user driven end to end sustained and integrated system. I'm going to address each one of those words in a moment. To provide the data and all as required to predict change in a timely fashion. Key word in there is in a timely fashion. Most of us who are engaged in coastal research, for example, know that if you want to do something like relate population density to nutrients and estuaries or something like that, it's a five-year research

project to pull all that data together. We ought to be able to pull that data together in five hours not five years. So timely is a key aspect of this, and I'll come back to that.

Okay, next, please.

I put this up here primarily to emphasize not just the kinds of things that we need to be detecting but the time scales. The system is going to have to address scales of variability that go all the way from the scale in which weather and storms vary to the scales on which the seasonal anoxia develops, for example, to decadal scale fluctuations in fish stocks, to global climate changes. So we're talking about a very, very broad spectrum of scales of variability that we're going to have to address in this system.

Next.

Okay, I want to spend a little time addressing six basic questions that always come up when we get into developing or talking about Global Ocean Observing Systems. The first is a global system for coastal ecosystems. We know that most of the changes that are taking place in the coastal zone are local in scale, a harmful ARGO bloom, a hypoxic of that, a fish kill, whatever it is. A storm. Why bother to develop a global system, why bother to develop a national system? Come back to that.

Next.

What makes you think such a system is possible? We just went through a wide array of things we want to be able to address in this observing system. There's sort of a Don Quixote aspect of this and, again, I'll come back to that.

Next.

Research programs and observing systems. We have the tendency to muddle these things a little bit and as a person who used to argue that there's no difference between monitoring and research, I'm not going to take a different point of view and I'll tell you why in a minute.

Next.

Sustained and integrated, what do we mean by these two terms? End to end and user driven, what does that mean? And, last, core variables. This is always a great subject, I'm sure that many of you have gone to workshops where you talked about what are the core variables we have to measure. And you always end up with this endless list of everything you want to measure. Why? Because you get scientists together in these meetings and they want to measure everything they like to measure when they're doing research. There's a difference between research and an observing system, they've got to be interactive, and I'll come back to that.

Okay. Let's deal with why a global system. Well,

we all know, especially you folks up here who experienced the last El Nino, that large scale variability promulgates some large scales and small scales. If you want to understand the changes that are taking place in your own backyard you've got to look at those changes in the context of large scale variability that's taking place not only in the oceans, but in the atmosphere and on land. So these local changes can't be viewed in isolation.

Next.

Local and scale global ubiquitous. Many of these problems, many of these changes where the harmful ARGO bloom, coastal (indiscernible - podium rocking) ...cation, whatever, are taking place throughout the world, they occur on local scale, but they're occurring everywhere. I would argue that given the complexity of the systems in which these are taking place we need to do, at least, two things which require a larger scale national and global system. One has to do with temporal coherence, what's the spatial coherence -- the spatial scale on which these changes are temporally coherent? That's a critical question if we want to get at the whole issue of prediction.

Another is these systems are complex, we're not going to be able to develop the predictive capability unless we do a comparative analysis of how differet systems respond to similar forcings.

Next.

Finally, and this is looking at it from the other way, basic scale models require coastal boundary conditions. So the people that are worried about the ocean climate system, for example, are going to need to have coastal boundary conditions to address that issue.

Okay, next.

Okay, there is also good reason to believe that the time is right to initiate a Coastal-Global Ocean Observing System. The technologies required to sense change, to communicate data and to analyze data, computing power, are in place sufficiently enough, have been advanced sufficiently enough, that an ocean observing system is feasible. At least we can initiate it.

Next.

Finally, we're beginning to develop the theoretical basis for building models that are able to describe variations in ecosystems. Models of ecosystem dynamics. A theory is beginning to emerge and two very important aspects of this, which makes me believe that the system is feasible is that, one, physical processes drive structured marine ecosystems. If we don't get the physics in these ecosystems right, we're not going to get the biology right.

The second is that changes in ecosystem health and living resources are related to changes in these processes

through a hierarchy of ecological interactions and we are beginning to quantify those interactions and parameterize them in ways that we're not that far away from developing fairly robust models of coastal ecosystems.

Next.

Then there's this whole issue of research and monitoring. I want to emphasize this for two reasons. We heard a lot about the NOT Programs, for example, that have been funded. These have been funded like research programs. This is critical in how we think about this now, you'll see why in a minute. The current GEM document builds a monitoring system around hypotheses.

Next.

But I want to distinguish between these two. It's clear that there must be an interaction between monitoring, monitoring is there to detect change, the research is there to explain it. Research is motivated by the desire to discovery, to discover. It is driven by hypotheses, it's experimental and research projects are of finite duration.

Next.

In contrast, monitoring programs are motivated primarily by the desire to detect and predict change. These are very closely related things, as I think many of you know. If you've ever been involved in weather forecasting, detection is not only a matter of detecting

change, detection becomes critical to prediction in the sense of it being able to improve the skill of prediction by being able to detect change in real time. It's driven by societal needs. We've listed some of those a little bit earlier. It's routine and it's sustained.

Now, I've talked a lot about -- I've used words like l sustained and integrated. Next. The observing system must be sustained for at least two reasons, one, is to capture the scales of variability that characterize those changes of interest. And, two, to provide the continuity required in the data streams and data products. The system must be integrated in a variety of different ways. It must be integrated in the sense that it measure physical chemical and biological properties synoptically in time and space.

We're never going to be able to predict variations in the biological properties, whether it's fisheries or weather in these systems if we don't do that. We need to be able to incorporate data from remote and in situ sensing. Remote sensing in order to be able to see the spatial and temporal dimension of change and surface properties, and in situ sensing and measurements to be able to detect the temporal and vertical changes in these properties in order to get four-dimensional representations of change. It also means to be integrated in the sense

that if we're ever going to sustain these kinds of systems in terms of how much it's going to cost, the data that this generates must serve many user groups.

To date, there are no systems that are both integrated and sustained. Programs like the Numerical Weather Prediction System is sustained, but it's not at all integrated in the context I just talked about. Research programs, like GLOBEC, or GEOHAB, JGOFS, et cetera, are research programs that have a finite duration, that have all the characteristics I just went through. The interaction between these is very important, but the target for the coastal component of GOOS is to be both sustained and integrated.

Next.

Okay, what do we mean by an end to end system? Linking the user needs to measurements requires a managed two-way flow of data and information among three subsystems. The observing subsystem, which is the measurement end of the system, the data communications and management subsystem and modeling and applications. The communication network and data management subsystem are critical and, arguably, the greatest challenge.

Next.

This is an attempt to sort of represent the way we operate today. We have several different observing systems

or research projects or whatever you want to put over in that category. They generate data that goes into their own data management systems, we manage data on a project by project basis, in general. If a user needs to integrate diverse data from different sources, it takes a lot of time, because you've got to go through and access all these systems. It basically makes it impossible for us to move into a predictive mode the way we're operating today. We've got to design our data management systems so they can be interfaced in ways that will allow the rapid access to data, diverse data from disparate sources.

Next.

This is the goal and this is very easy to say. I'm not an expert on data management, but what we need to have is a data management system for the observing system that interfaces all these other systems in ways that any user can get all the data that they need or process data in the ways that they need in what amounts to one-stop shopping.

Okay, the last issue I want to talk about in that list are core variables. I put these up here, this is the usual list of issues that need to be addressed in the coastal zone, all the way from issues -- the problems of protecting and predicting sea state to secular trends in temperature and salinity that might be related to global climate change. The point of this is to talk a little bit

about how one goes about defining core variables. You don't get a bunch of scientists in a room, like me, and have them list what they think is important in a system. You've got to start with what the issue is you're trying to address. Ideally, you start with the user group you're going to provide the data to.

And then you ask the question, what needs to be -- what kinds of models are going to be needed to be able to generate the information products, or the data that that particular user group or that is required to address that particular issue. And then you work back and say, what kind of data is required to feed those models? Then you define the core variables.

The way we try to do this in the Coastal-GOOS panel is we invited a bunch of experts in to one of our meetings and we said, okay, let's take this list of issues, for each one of these issues, independently working by yourself, identify what variables need to be measured to detect and predict change in that particular issue. What do you need to measure in order to be able detect and change -- and to be able to detect changes in sea state and what do you need to measure to be able predict changes in sea state? The same thing for each one of these issues. Then we basically used a matrix analysis to answer the question what is the minimum number of variables that we

can measure to address a maximum number of issues?

Next.

And this is what we came up with. And, again, this list is not particularly interesting in and of itself, via that process we came up with meteorological variables, physical variables, chemical variables and biological variables that should be measured and were also feasible to measure as part of an observing system.

We then showed, and I won't show that here, but we had six or seven different ecosystems type models that we were able to show given this kind of information. We could make predictions if we had the theory right on a number of issues that relate to ecosystem health and sustainability of living marine resources.

Next.

Okay. I want to conclude with a few thoughts on what I think are particularly important things that I think need to be addressed as you begin to develop GEM.

The first has to do with coordination and collaboration. In the report in the program document you address these issues, you talk about working with user groups, building strategic partnerships, developing data management systems first, et cetera.

Next.

I think we need to elaborate on these somewhat, and

I'm not sure, but I think that there may be some tension here. In GOOS we talk about involving stakeholders from the beginning, and this is not going to be an easy process. And what we mean by that is you involve all of the important stakeholders in the design, in the implementation and in the operation of the observing system. I don't see any other way that we can ensure the observing system develops the kind of data products that are going to required without doing that.

We talk about coordinating with other regional and global programs. This is not just a matter -- when you talk about strategic partnerships, we're not just talking about making more effective use of existing infrastructure programs and expertise in the Gulf of Alaska. We're also talking about the kinds of partnerships that are going to be needed to develop this larger scale system that we refer to as GOOS.

Next.

Okay. When I first made this slide I had long-term monitoring up there instead of an operation system. I think when you talk about long-term monitoring, you're talking about an operational system. And here are some of the characteristics, they have very important implications to this whole issue of science or research and monitoring. Number one, the measurements have to be routine. Access to

the data has to be timely and free.

Next.

As I've said before, it's got to be an integrated system, multi-disciplinary with appropriate data syntheses serving many different user groups. And it's got to be sustained. Now, these two words, routine and sustained, have very important implications. You're talking about guaranteed data streams and products. If any of you are in a research mode, and unfortunately there are too many of us that are trying to do this, have tried to maintain moorings, for example, that guarantee data streams, that when the data stream goes down all hell breaks loose, it's not an easy thing. The research community is not organized to do this kind of stuff. We haven't figured out how to transition research into an operational system very well.

Next.

Okay. This whole research monitoring interaction and applications and that sort of thing. Again, it's clear from the GEM program that fostering synergy between research and monitoring is a priority. But as I said earlier on, what does it mean in terms of monitoring key species and key processes? In terms of predicting changes in the status and trends of living marine resources? Of managing resources in the ecosystem context? These are great objectives, but how should an observing system be

designed to achieve them? We need to make sure, and here there's been a lot of debate about this, but when we talk about an observing system, we're not just talking about a monitoring system, we're talking about something that incorporates this whole interaction into it and that's an important thing to consider.

Okay, next. And I'm going to conclude with this.

This is another wonderful acronym, it took me about a year to figure out what an OSSE is. And OSSE is an Observing System Simulation Experiment which is code for the kind of modeling that one does when you look at the effects of aggregation, for example, on model outlets. What difference does it make if I measure X number -- you know, X, Y and Z or if I measured A, B and C? If I aggregate so I only have six departments compartments instead of 50 compartments in terms of the output? If I have a certain sampling scheme that has a certain spatial resolution and certain temporal resolution if I reduce that, how does that affect the output? These are basically model experiments run to answer those kinds of questions.

Now, I would argue that given the emphasis of things like monitoring key species and key processes, you need to engage in this kind of thing. I described earlier the Coast-GOOS process by which we identified core variables. This kind of activity, running OSSEs, need to

be incorporated in that process. And I think that in systems like the Gulf of Alaska you got enough information that you can begin to start asking those questions.

The last point I'd make in terms of OSSEs has to do with cost. Given the complexity of coastal ecosystems and the cost of observing them we're going to have to engage in this kind of a process in order to make sure that our systems are cost-effective. It's been pointed out, for example, one of the parallels that we -- comparisons that we make with developing an ocean observing system is with weather. We'll weather watch and the whole system is in place to predict weather. It's been pointed out that OSSEs have never been run to decide where to place the meteorological stations upon which the data is based. Usually it's determined by where airports are or something like that.

Well, I would argue that, number one, the value of getting good weather forecasts and the costs of generating it are completely different than the kinds of issues that we're having to address here.

Next.

I couldn't resist, I love this diagram. In fact, I used this in the design plan for Coastal-GOOS and I put this up here to illustrate something that I think is very important, and this gets us back to the coastal processes

theme to close my talk this morning. And that has to do with, as I read that document, there's a hypothesis in there that says the fluctuations we're seeing are related to the PDO, to the Pacific Decadal Oscillation index. Now, that may be true, but you're never going to develop a predictive capability that predicts status and trends of these resources or manage them in the ecosystem context just by focusing in on the PDO. You're going to have to measure other environmental variables.

I strongly recommend, in closing, that you establish an objective process to identify those variables that must be measured to improve the skill of predictions in terms of what are the key processes, what are the key species. The key species aren't necessarily always going to be species that we fish.

Finally, and I jotted this down in response to something somebody said earlier today, of course this means that you must focus the goals of GEM much more than they are now. It's going to be very important, especially in terms of achieving some early successes over the next five years, to focus those goals.

Thank you.

(Applause)

DR. MUNDY: We've got to get the bongo effect out of the podium here. Oh, you know what it is,

it's the floor.

MS. McCAMMON: It's the floor.

DR. MUNDY: It's the floor, so my advice to the next speaker is once you take your position, don't move.

(Laughter)

DR. MUNDY: Okay. Many of you have worked with our next speaker over the last 11 years since the oil spill. Bob Spies has been Chief Scientist of the peer review process during restoration and it's been my pleasure and privilege to work with him during that time. And I've always been amazed at Bob's ability to move from bird projects to fish projects to mammal projects and back to bird projects with very much ease in doing it. And Bob has one more trick to perform here and that is to show us how to move from the Restoration Program into the Gulf Ecosystem Monitoring Program with a similar ease.

So with that, I'll introduce Bob Spies.

(Applause)

DR. SPIES: Thanks, Phil. Sounds a bit like a creaking ship up here as you kind of shift around your weight, but I've had 11 years of standing still as a target, so maybe it'll work.

(Laugher)

DR. SPIES: Thanks for coming, everybody.

We're at an extremely exciting time, I think, for not only the nation as a whole, but particularly Alaska. There's some emerging opportunities in terms of institutions, in terms of peoples' awareness of the importance of measuring change in the ocean that are converging, in a way, politically and with the public and with the scientific community that's extremely exciting. I think it's a very exciting time to be a marine scientist and to be involved in this kind of a program.

And as I look at all the different things that are going on on a national level, I still go back to some of the things that Molly said, we're so lucky to have this endowment set up and to have a state and structure which is somewhat simple compared to the national picture in which I think we can really accomplish some of these goals and make some great headway. So it's good to be here and it's good to be a part of this effort and thank you for coming.

I don't think Tom Malone has disowned this statement, but hypothesis driven research functions best within the contexts of observations generated by long-term monitoring. And that's kind of what we're about here. And the bridge between the Restoration Program and GEM has really been through a development of conceptual foundations about how the system works. And I want to describe, you know, kind of the evolution scientifically or technically

in thinking about these sort of things. And we've gone out on a limb in putting this conceptual model out. And I'll talk more about that and alternative models and how one must keep a broad perspective and not be too focused on one explanation of the world and to be adaptive, but that's another topic for later.

What we're really asking you to do is to look at what we're proposing here and how it flows down through the different elements of the program, what those elements should be and how all that should be stuck together so it's a logical progression. Are there any major omissions in the elements of the conceptual foundation? Are there other ways to look at it? I would love to see an alternative model developed or some things that we could elaborate and talk about in terms of other things so that we can design the measurements that we take to address any or most -- as many possible explanations that we can think of in terms of how the system operates.

And, secondly, we're asking you to -- if there are any major physical and biological processes that needed to be incorporated into our thinking here that aren't yet incorporated or not fully represented the way they should be.

Next slide.

Just some highlights of the Restoration Program

that led us to some of these ideas about changes in the ecosystem. I think many of the lawyers -- I started out in 1989, they were drawing straight lines on the board and talking about the baseline and the system and how the spill affected that baseline, we dipped below it and now we got to return to it. And even at that time, of course, we knew that things changed, but not to the extent that we developed an understanding that's been emerging, particularly in the north Pacific over the last eight to 10 years on the nature of that change and the relationship between climate and other major forcing factors and biological change.

So things we've learned, for instance, just a couple of examples. The spring plankton blooms were more intense in Prince William Sound in the early '80s than the early '90s. Evelyn has looked at a lot of the settled plankton blooms from the hatchery programs and started relating that to what the herring have to eat in Prince William Sound. So there's kind of a decadal change that's going on. That's one example that came out of the Restoration Program.

We know that looking at the seabirds that were in Prince William Sound and also in middle Cook Inlet or Chisik Island, that many populations of diving seabirds have been decreasing in coastal systems. In Prince William

Sound more than 50 percent and there have been very precipitous drops at Chisik Island as well.

Standing stocks of plankton and neckton in the Gulf of Alaska, we know from the work Rick Brodure that went on independently of the Restoration Program, of course, but again in the north Pacific and very relevant to the questions that we know that the standing stocks of plankton and neckton were very much substantially higher in the last 20 years than they were in comparison to what was out there in the '60s.

And, finally, an example that harbor seals we knew were decreasing quite precipitously during the 1980s in Prince William Sound. And we can go on and talk about all kind of other changes that we became aware of, but the thing is that scientifically, in terms of how we understood and the models that we had in our mind of the system began to evolved into appreciation of the profound nature of some of these changes. And it became obvious that we needed to focus on these sorts of the things as we move forward into understanding marine resources in the long term.

Next slide.

This is an aerial radar image of the Gulf of Alaska and I just put it up here to show you some of the main features that we -- or some of the concepts we're talking about. Of course, this for Prince William Sound where a

lot of the spill work was carried out and along the Kenai Peninsula and then in the Cook Inlet and a little bit in Kodiak and along the Alaska Peninsula. But we're dealing with a system here in which we have a continental shelf, you can see quite clearly here, quite broad through the Gulf of Alaska as it is in the Bering Sea and then narrows down quite a bit out toward past Kodiak Island, the Aleutian Chain. We can see sea mounts in the ebisal plain here that's quite deep in the Aleutian Trench and so forth.

And to overlay, next slide, some of the main oceanographic features here -- most of you are familiar with this, but it does help just to briefly mention. We're looking at a gyre system, a subarctic gyre, which the north Pacific drift here is partitioned in to the California current and the Alaska current somewhere off the coast of British Columbia. The Alaska current is very broad over the shelf here, as is the shelf in this part of the Gulf. And we've got various kinds of eddies that occur and then the whole thing narrows and becomes kind of a stream right, more or less, at the shelf break as it moves out past the Aleutian Islands.

And, of course, we have the Alaska Coastal Current, which is an extremely important feature affecting our coastal environment that is a buoyant eastern boundary current and it gathers its strength by the presence of

freshwater that flows into the system all the way around the system. Tom Royer has worked on this system for years and Tom Weingartner and Jia Wang are both actively working on this system in various aspects, including some broad-based models now. A very important part of the circulation.

Next slide.

Of course, you're all familiar with this sort of phenomena by now and we've been talking about it for several years and it's the link between climate and oceanography in the northern Gulf of Alaska. There's certainly lots of other things going on, but one of the predominant influences is the position of this low pressure system in winter and when it's out here further out into the southwestern part of the Gulf of Alaska, into the north Pacific we tend to get this west wind drift splinting and more of it going to the California current than the Alaska currently. Conversely, in winters where the average low pressure system is lower and more intensely up into the northeast Gulf of Alaska we get a stronger gyre here in the Gulf of Alaska and more of the west wind drift goes up in here as opposed to the California current.

There's a lot more going on in the PDO, and you can see in the next slide that, in fact, we're getting some more sophisticated determinations of it's not just one

regime or another, but we have a continuum of different effects out there. If we look at the green line, this is something like the PDO, it's called the North Pacific Index, and it fluctuates. And this is all based on the atmospheric pressure at sea level, but Minobe has then decomposed the signal mathematically into a multi-decadal signal, here in red, by band pass filtering the data. And band pass filtering it a different way gives you this 50-year kind of oscillations going on.

And what these different oscillations are doing here and relative to one another and additive and subtractive effects and so forth, are probably making us think in a lot more sophisticated terms about what these regimes really are, and developing information about feedback loops and the fact that these changes are very quickly and there may be some positive feedback loop versus with a positive MPO between water temperature and evaporation and wind and so forth, that maybe these systems get stuck in certain modes for periods of times until something happens rapidly, as we saw in 1977.

Next slide.

So we're dealing with these populations that are changing quite a bit and one thing that struck me really quite spectacularly, as people, like Frances Wier, and so forth were describing how during a positive PDO that

salmon populations were just doing hunky-dory and there was a lot of standing stock of zooplankton and phytoplankton in the Gulf of Alaska. At the same time we were looking at what was going on in EVOS and we realized that there had been precipitous drops in these many inshore resources over the last 20 years, starting probably somewhere in the '70s, although baseline data, our pre-spill data was so patchy that it was difficult to tell exactly, in many cases, the nature of those drops.

But offshore we had increasing salmon, perhaps cod and pollock. Sea otters are possibly a separate subject here. There's certainly offshore plankton. Inshore we had decreased in herring in Prince William Sound, harbor seals, inshore sea lions, some seabirds, in many cases very rapid drops, red king crab and shrimp. And so we've got something going on, generally looks like inshore things are going down when things are going up offshore. That's a very simple way of looking at the system, but certainly it's going to be a feature.

Next slide.

And so as we moved into the planning for GEM, realizing that we had to have some model of the way the world works in order to proceed, we started to put these things together and came up with the kind of things that you see here and it's been in both the GEM Program

description and also in -- it's going to be part of the GEM Program, but it can be changed, it can be added to. Alternative models can be made, so we need your thinking about these sorts of things and we must also, of course, keep in our minds, as I said earlier, that we want to gather data that doesn't just relate to this particular view of world, but can inform us down the road of what other possible views of the way that system out there may be working.

But it starts with this wintertime atmospheric pressure that I alluded to earlier being lower and the positive PDO. This is just the physics that we're talking about here. And with increased wind stress, and this actually goes into the paper, into the screen and that results in Echman Transport being increased inshore, a deeper mixed layer in the summertime and we now have pretty good evidence that upwelling also in the central Gulf has increased.

Looking at the upwelling anomalies that have been plotted for the Gulf of Alaska, it looks like, at least, during the early years that the upwelling was not as strong and we don't have many measurements, that I'm aware of, perhaps Professor Nadu or some other people at the University of Alaska may know this but we think that there's increased downwelling and the implications of that

is maybe more biological material is reaching the bottom.

We know, of course, as we move onto the shelf break we've got a couple of fronts. There's a front right at the shelf break, usually, and these things are not there as lines in the sand, but they move around, but often there's a good front at the shelf break. Another front inshore, along the shelf somewhere, with the Alaska coastal current is freshwater boundary current that's moving along the coast and being pushed up against the coast by the wind. It breaks with the outer shelf water. And, of course, during this positive PDO period we have more warmer water that's being carried across the Pacific, there's more precipitation runoff, so we've got warmer conditions in the water and precipitation and we're posing maybe that we're getting more contamination in the system because of that sort of a phenomenon.

Next slide.

What might be the implications of such physical phenomenon? Well, we know that there's higher standing stocks of plankton and neckton and so it seems reasonable to hypothesize that production out there in the central Gulf of Alaska may be higher. We don't have all that many measurements of primary and secondary productivity, per se, just more standing stock information, so that probably needs to be tested in a more definitive way. It's actually

very surprising the lack of measurements of primary productivity in any part of the Gulf of Alaska.

And we think, then, because of that there's more forage, we know there's more necktons certainly out there and salmon production is very -- and salmon survival is very high and they're feeding in this offshore area around the shelf break, at least later in their life history. And then inshore because of what we think is increasing stratification because of warmer temperatures and more freshwater the fact that we're proposing that plankton and neckton production generally is lower in the inshore areas. And we're getting more terrestrial plant carbon being moved off, perhaps. And because of larger salmon runs perhaps we're moving more marine nitrogen back into the terrestrial systems.

Next slide.

And I won't go through this in a great deal of detail, but this is kind of the opposite picture for the negative PDO index. And decreased atmospheric -- increased atmospheric pressure in the wintertime, decreased wind stress, decreased Echman Transport, increased upwelling onto the shelf, decreased downwelling. A summer mix layer that's shallower and less developed and less robust Alaska coastal current on the shelf here.

And then the next slide.

And we're proposing, then, that there's lower planktonic and necktonic production, more inshore transport of materials because of nutrients and carbon because of the increased upwelling and then higher planktonic production because of less stratification due to the conditions in the Alaska coastal current being relatively more saline and a little cooler.

So that's kind of the general picture. Now, it's a pretty simple in terms if you look at the satellite photo of the Gulf of Alaska because there's a -- spatially, as you move along the shelf and the shelf break there's a lot of different things going on in terms of geomorphology. We've got, you know, good evidence that there's tremendous mixing in the entrance of Cook Inlet, that stratification probably doesn't exist much there in the summer at all, as opposed to Prince William Sound. So these are kinds of regional differences that we need to think about and perhaps elaborate on.

Next slide.

Now, what we've tried to do is as a result of this conceptual model is to try to elaborate some general questions, and these have not been fully developed and put in your binder. There are some things in there, but we very much tend to focus more on these questions to give you a flavor of the kind of direction we'd like to see the

monitoring and research go in terms of what it's trying to find out. And so this is just to remind you that we're dealing with oceanography for the first set of questions.

Next slide.

Questions like, and these are just examples. What is the annual, interannual and interdecadal variability and the position and strength of the Alaska coastal current? What is the annual, interannual and interdecadal variability in the Alaska current and Alaska stream? How is downwelling of onshore driven water and upwelling of deep water affected by changes in wind and coastal precipitation during different climatic regimes? Does freshwater induce stratification, and when induced, does mixing on the continental shelf change significantly under various climatic regimes? Next slide.

This is just to remind me, this is a satellite view taken this spring in the Gulf of Alaska to remind me that we're into questions on biological production, but here you can see generally along the shelf break here, very intense levels of chlorophyll, some of the highest levels of chlorophyll A in the world. And Tom Royer and Tom Weingartner tell me that on cruises out there they actually -- the concentrations of chlorophyll A at 10 or 15 meters are much stronger than they are here on the surface, so we have an intensely productive system. I think we all knew

that. But we do have these geographic differences as we move from place to place here, it's not just one continuous -- probably because of the eddies and then different bottom features that occur here.

Go ahead.

So some of the questions that might evolve out of that picture, biologically, how do fronts and eddies affect biological production and onshore/offshore transport? How do nearshore and shelf exchange processes change over time and what are the biological consequences of such changes? How are nutrient transport and recycling in the central Gulf of Alaska on the shelf different in different climatic regimes? What are the relative roles of local nutrient cycling versus water supply and cross shelf transport in Prince William Sound and Cook Inlet and Kodiak Island? Next slide. Are Prince William Sound, Cook Inlet and Kodiak shelf net importers or net exporters in nutrients, carbon and energy? What combinations of physical conditions and primary/secondary production lead to favorable conditions for higher trophic level consumers, fish, birds and mammals? And what is the spatial and temporal variability and frequency of occurrence of these combinations? It's probably too long a question, I think.

(Laugher)

DR. SPIES: What are the mechanisms

responsible for interannual and interdecadal variations and populations that measure species of forage fish, herring, pollock, capelin and eulachon in the Gulf of Alaska? Are there particular combinations or period -- this is another mouthful here. Are there particular combinations or periods of wind free onshore transport of deep water with high nutrient content and periods of wind driven mixing that prevent prolonged stratification of surface water that are optimal for inshore survival of young herring and salmon?

Molly's an English major, I think she cringes every time she sees that. Does enhanced late season plankton production favor survival of zero plus age class fish, such as herring? Next slide. And how do populations and productivity of benthic and intertidal communities fluctuate interannually, interdecadally? What conditions cause fluctuations and the fraction of spring bloom that falls ungrazed to support the benthic fish and the vertebrate community?

Next slide. How do populations and productivity of seabirds fluctuate interannually and interdecadally? Is the availability of fatty forage fishes, for example, herring, capelin and eulachon in the shelf environment that may determine the population success? How do populations and productivity of harbor seals fluctuate interannually,

interdecadally? Do populations and productivity of sea otters fluctuate interannually, interdecadally? Does food supply play the main role or do disease and predation?

Next slide.

And not to forget contaminants because they're a very important part of this whole system and it's something that we continue to be concerned about and this program is, after all, rooted in questions about contaminants. Are anthropogenic chemicals having adverse effects on the health of marine organisms, especially APEX predators with high accumulations of persistent synthetic chemicals? Are natural toxins having adverse effects on the health of marine organisms, such as killer whales and other apex predators with accumulations of persistent synthetic chemicals?

Next slide.

Okay, so those are kind of a long list of examples, but I wanted to plant if firmly in your mind that there's a flow down from the conceptual model to what we're trying to do here and eventually trying to measure specific parameters and specific places in the Gulf of Alaska to answer those kinds of questions.

Okay, we have taken a theme approach, I'd like to switch a little bit now into, at least, kind of a warm-up for Phil in describing what we're trying to do in terms of

organizing GEM. And the questions came up, Tom Malone, I think, in the last talk posed it, and we've certainly heard lots of people pose it. Okay, you've got five or six themes here, how do you pick those themes? Should there be other themes and how can you say one theme is necessarily better than the other? I would like to say that the theme approach certainly isn't new, within even our program or other programs. During the Restoration Program and the Sound Ecosystem Assessment we essentially had a theme program organized around pink salmon, juvenile pink salmon and herring. There was a lot learned about pollock as well. There was a lot learned about the things that support and detract from those populations in terms of sources of energy and sources of removals.

In APEX we did a tremendous amount of work with kittiwakes and murres and some with puffins and other things and we were worried about food in that system. In NVP, the Nearshore Vertebrate Predator, we focused on the harlequin ducks, pigeon guillemots, even river otters, so that we had four theme species there, if you will and looked at their -- as a way to enter the ecosystem through the eyes of those species, if you will.

And in GLOBEC we've got Pacific salmon and mostly pink salmon, but other species of Pacific salmon, as well, as an entry point into the ecosystem and something that

people care about. So what we're trying to do here, folks, is to deal with inshore species that mainly that people really care about. At the same time integrate process into that, so we're trying to put those two things together in a way that makes sense scientifically, in a way that also answers the questions of the user groups and because the continual questions we ask about the decline of this or the decline of that and what's happening in the oceans, we find we don't have the answers to. And the reasons we don't have the answers is we don't have enough continuous long-term data on the root processes that describe production and the limits on production and predation, food and habitat.

Next slide.

So, food, habitat and removals together control all animal species. These are the concepts that we're dealing with here, these are our assumptions. And we got a conceptual model that deals with production at the shelf break, there's a lot of production at the shelf break and it's -- we're proposing -- and species that are able to utilize that, that it's a very important process. It could be a limiting process and it could explain a lot of the fluctuations in these break-coupled species.

And climate controls the bounds of food production. That doesn't mean that bottom up forcing is the only thing

we're looking at, but it sets the bounds of what's available. Predations, removals, habitat are also all important concepts.

Next slide.

So the concept is that food, habitat and removals control animal populations. The amount of food available is largely determined by events at the shelf break and the extent of inshore water stratification. The amount of habitat available is determined by geophysical processes and by human activities that degrade and destroy habitat. Removals, the third part of this, include human harvests as well as natural causes, such as starvation and non-human predators. Basic assumptions about the program, how we're going to proceed. Break-coupled species are food limited, the productivities of many of the birds, fish and shellfish and mammals are coupled, to some extent, to the amount of food produced at the shelf front and its subsequent geographic distribution.

It's a major concept, you know, are we right, are we wrong? Are we measuring the right things? Are there alternative ways to approach this?

Next slide.

And climate controls the bounds of food production, that is, food or primary productivity, this is bottom up forcing is controlled by effects of climate, and all the

geophysical processes on plant species composition, temperature, light and availability of macronutrients and micronutrients. So I think you saw that in the last slide that Tom Malone showed, an integrated series of models that dealt with all these things in terms of primary productivity in the ocean. And finally climate controls and break-coupled species.

Next slide.

Okay. I'll turn it back over to Phil to take it from here, logically and develop the next part of that plan and how this workshop would go and how we'd like to enlist your help.

DR. MUNDY: Thank you, Bob, for a complete and also very sobering look at the task ahead of us. Now, I'd like to begin by saying I've had a chance to greet many of you in the room here this morning. And I'll bet you heard me often say, I'm glad to see you and I'm so glad you came. And, believe me, as the Science Coordinator of this program I do genuinely and deeply mean that. As the keeper of the bibliography I know that the scientists in this room are responsible for thousands of pages of peer reviewed science that's backed by tens of thousands of pages of data. I know that by looking at the age distribution in the room, and by the number of participants we have at least 3,500 person-years of experience in this room and

getting more all the time.

We really do genuinely want your help, we really do genuinely need your help because I've learned over the past year as a person who's seen ecosystem through a salmon lens most of my career, and having worked with people who see the ecosystem through bird lens and mammal lens, that really it's going to take a combined effort of geophysical, biological scientists, managers and policymakers to really make GEM a relevant part of Alaska and a relevant part of our culture worldwide.

So, if I could have the next slide.

Okay, we're going to step through these things. Some current issues, what information gaps cloud the issues, how themes could be used to close gaps, ecological questions of the conceptual foundation and themes, questions and gaps in how these things work together and interact. And then, finally, what we need from you.

So, humble of fish, I believe that George Rose brought these in from eastern Canada on his trip. The buzz this summer is that the capelin are back. And the reason that people are really excited about this is that capelin may not be bellwethers, which I understand is sort of a sheep with a bell around it which leads a group of sheep, but probably the vanguard of significant ecological change, or maybe not. Long-term declines in salmon catches, return

of shrimp fishing, the rebound of sea lions could be indicated by the return of the capelin. These are some highly significant issues for Alaskans and for biologists worldwide.

Next slide.

All right. In current issues, are the recent failure of salmon runs bellwethers of long-term declines in statewide catches of salmon and other species? Remember that the last time we had a big regime shift, not only did the salmon go up, lots of other things went down as well. Were these related to the oceanographic conditions and generally part of the regime shift or not? We still have significant questions.

Okay. Current issues. Return of red king crab fishing in the Gulf of Alaska. At the time the red king crab fishery on Kodiak went down in the early '80s it was one of the most economically valuable fisheries in the world. Okay, so we have a world class fishery. There are some indications that things may be turning around over there. Are they real?

Next slide, please.

Current issues. How many hatchery salmon should be released? The real issue, given that in many parts of Alaska the majority of the catch, that is the majority of the commercial catch, now originates in hatcheries, and

that's particularly true in Southcentral and Southeast Alaska. We need to understand whether or not hatchery fish compete with one another and whether or not hatchery fish compete with wild fish.

Okay. Now, the issues and questions, I've just hit some of the highlights. Some of the questions, I believe, will be on the table during the GEM Program and some of the things that relate to the elements of the ecosystem that we'll be considering and describing during the workshop. Other issues, such as how changes in human uses impact watersheds of the marine environment, accumulation of contaminants, we have to be very wary of this because we saw in the 1960s, 1970s the devasting effects of accumulation of contaminants in terrestrial bird populations and marine bird populations and we want to be on guard for that. How do watersheds depend on the flow of marine nutrients? Particularly important in northern latitudes and how do nearshore marine environments depend on the watersheds is also significant questions.

Okay. So what information gaps cloud the issues? Now, what is this? Is this a food web? Well, no. No, it's not. Focus on the central part here, the big question mark. These are the elements of the ecosystem and whether these arrows really should be here or somewhere else, whether they represent the flow of carbon and nitrogen,

whether they represent the forces of predation, the flow of toxicants from one species to another, these are open questions and we don't pretend, at this point in time, to understand these very explicitly.

Down here at the bottom you'll note that this is not really a top down or a bottom up kind of schematic because although we've got oceanography and climate here, we also have things like human uses and contaminants. But these are major factors, major foundations that follow us up to just about every issue that we've got. The issue in red king crab, sea lions, salmon and shrimp. When this is the issue, we can't really understand, or so we believe, any one issue in isolation from the other issues that we're dealing with and we believe that they're fundamentally based on the oceanography climate, human uses, contaminants, primary productivity and secondary productivity.

Now, if we could just step through these. Next slide, please, next slide, next slide.

Okay. These are the relationships. Again, what does phytoplankton have to do with salmon, well, harmful ARGO blooms kill fish. I don't really know, but the point is we have these elements of the ecosystem, if we want to put together a comprehensive program we need to try and understand what the relationships are but, on the other

hand, we don't want to presume that we know too much going into this.

Next slide.

So how themes close gaps. Well, what are the themes? The themes are the ecological crossroads, the themes are the place where forces, geophysical forces, biological forces come together to produce change in things that people care about. Here, we've tried to suggest that the fundamentals, the oceanography climate and here we've translated some of human uses and contaminants into ecological questions of removals, food and habitat. These coastal processes within our themes are addressing the fundamentals. The coastal processes would also look at things like juvenile salmon. They might also encounter juvenile or larval king crab, larval shrimp and larval capelin. Nonetheless, these are -- the coastal processes are the fundamental theme in our collection.

Things like forage fish, seabirds and terrestrial linkages really should contribute heavily to our understanding of salmon, even if we're not funding the collection of salmon information, per se, directly in most or all of these projects. The idea of a theme is to organize our information and organize our efforts around concepts that will look at food webs, generally look at microalgae based food webs, such as forage fish and

seabirds, that look at macroalgae or primarily macroalgae based food webs, such as nearshore plants and animals and to try to -- some information set that will allow us to contribute information to managers to help them solve their problem.

So in looking at moving around the forage fish, the seabirds, the terrestrial linkages, the nearshore plants and animals, again, forage fish, seabirds, would we be measuring shrimp in the forage fish and seabirds? Well, perhaps, perhaps, if we are coordinating and integrating out data collection activities we may be collecting plankton samples along with observations on birds and forage fish. So, in any event, the idea is to use the theme approach to close the gaps.

Okay. Now here are the ecological questions. We have in our mission to understand the effects of human causes, natural factors on productivity of plants, animals that are managed. We have ecological questions here, removals, food and habitat. Human uses, human impacts on the questions. Natural factors, primarily oceanography and climate impact to ecological questions. And these should lead us directly to information that's helpful to understanding issues like the return of capelin, increase in cod and pollock and the return of red king crab fisheries to the Gulf of Alaska.

Now, this is an attempt to show how to use the lens of synthesis to focus the information that we're bringing up from the themes. We have two, sort of, process based themes, coastal processes and terrestrial linkages. We have a cluster of three themes here that deal with the primary food webs, indicated by the forage fish, the seabirds and nearshore plants and animals. These things are focused through the process of synthesis, which is an extremely critical part of GEM, I believe, on issues such as capelin, salmon, hatcheries, king crab and pollock. So having a liberate synthesis approach which crosses institutional boundaries, which crosses boundaries such as terrestrial and freshwater and freshwater and saltwater boundaries, I think, will be an extremely powerful tool very useful, particularly to natural resource managers.

Next slide.

Okay. All right. So what we need from you. Well, first of all, as I mentioned, we have a lot of expertise in this room, there is an incredible amount of knowledge under one roof and we need you to consider not only what you would like to do in looking at the ecosystem through your salmon lens or your sea otter lens or your kittiwake lens, but also to consider the issues and the questions that are on the table that are facing resource managers, such as we heard about from Commissioner Rue and from Ron Berg. We

have the need to understand what to do, but also since we have a very long-range program, we have the luxury of dividing this up. We would like to know what to do and we would like to know what to do within the next five to 10 years. So what do we need to do and what do we need to do immediately.

Now, there are questions in your workbook to help guide this process, but that's the basic idea, everything is really still on the table. We do have the opportunity to completely rewrite the components in your workbook, and intend to do it, if necessary.

Again, when you bring a group of people like this together, we have a lot of people here from different walks of life and from different institutions and it's very important for you to contribute your knowledge about your agency's programs or your organization's program and what they're doing and how they might help us, but also think about how they might hang together and work together to help us get the job done more cheaply.

Now, again, in the gap analysis, we were hoping at the beginning of this program, in August of -- at least my beginning of the program in August of last year, that I would simply get the big book of agency projects off the shelf and I would look through it and it would tell me exactly where the gaps were and what was missing and how we

could fit in. Clearly, we don't yet have that, but we have something that's getting there, that's getting fairly close. So in your workbook you have a gap analysis and you have the pages on the gap analysis and for those of you who contributed corrected information and it didn't get into this addition, I apologize, but that doesn't mean that we don't have it and that we don't value what you gave us. But we do need people to continue to update that and correct that. Help us understand what's going on out there and help us understand where the most important gaps are that need to be filled.

Now, I would point out to you another thing about how the component section, that is the -- what people might call individual projects, although I'd put quotes around that because they're not projects, but how these things are structured. We have organized these things into themes but we've also collected them in the ecological questions and disciplines, so that even though you may not be comfortable with a theme organization, per se, there are other ways to organize that. And we've indicated these in the way that we've structured the work sessions.

The very first work sessions you're going to right after lunch is the one that I would ask you to hold your assignments on, even though, you know, nobody is indentured here, everybody is free to move around. We've tried to put

people in unlikely places and unusual places and that's intentional, it's purposeful. You may tend to gravitate towards seabirds or towards mammals or those types of things that you're most interested in but, please, try to give us the cross-disciplinary perspective in this first working session. You'll have an opportunity to come together with people from your groups and your discipline in the very next session and that's why that's been provided.

Insofar as the ecological questions go, again, we've tried to mix the disciplines to the extent that we could understand what your professional interests were, we tried to bring a cross-disciplinary view into the sessions on ecological questions. You'll notice in your work book that the items are organized by theme, but they're also organized by hypotheses and that behind each hypothesis is a set of strategies and then within that you have organized components. The way that that's been set up has been to basically allow you to look at the hypotheses, to see whether or not they relate back to the workbook, to organize strategies for addressing the hypotheses, but we also recognize that these hypotheses are real speculation and not testable hypotheses, per se. We very much need your help in that.

So, in general, I hope that this workshop and this

working session will be something that's fun for you, that's intellectually challenging and engaging and I'll just close by saying that I really am glad you're here and thank you for coming.

(Applause)

MS. McCAMMON: Okay, just two announcements. One, if you did not preregister then you don't have any session assignment so you're free to go to any of the sessions during the next two days. But do look in and kind of make sure that there's seats available and that, again, not everyone is going to one.

(Off record comments - re: lunch.)

(Off record)

(END OF PROCEEDINGS)

C E R T I F I C A T E

UNITED STATES OF AMERICA)
) ss.
STATE OF ALASKA)

I, Joseph P. Kolasinski, Notary Public in and for the State of Alaska and Owner of Computer Matrix do hereby certify:

THAT the foregoing pages numbered 2 through 98 contain a full, true and correct transcript of the Opening Session of the GEM Draft Workshop, recorded electronically by me on the 12th day of October 2000, commencing at the hour of 9:00 a.m. and thereafter transcribed by me to the best of my knowledge and ability.

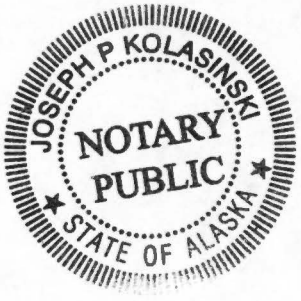
THAT the Transcript has been prepared at the request of:

EXXON VALDEZ TRUSTEE COUNCIL, 645 G Street, Anchorage, Alaska 99501;

DATED at Anchorage, Alaska this 23th day of October 2000.

SIGNED AND CERTIFIED TO BY:

Joseph P. Kolasinski
Notary Public in and for Alaska
My Commission Expires: 04/17/04



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EVOS GEM PROGRAM

GEM DRAFT PLAN WORKSHOP CLOSING

Regal Hotel, Anchorage, Alaska

October 13, 2000

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PROCEEDINGS

MS. McCAMMON: We're going to get started now. I want to thank all of you for your participation in the last two days. I managed to sit in on a number of the sessions and the discussion was really -- it was really actually heartwarming to think about where we've come in the last 10 years in terms of the oil spill program and the kinds of issues and discussions that we're having now. This is the last session of the program and what we'd like to do is there are a number of invited guests and group leaders and also our core peer reviewers who have been with the program for a number of years. And we gave them fair warning when they were invited that this end of the session, that we were going to ask them to give some observations and some comments about the sessions that they've been in, about the program, about where they think things should be going, what they think priorities maybe should be, how we might structure a long-term program. And just looking, we have -- there are 15 people that we've asked to speak and so we actually have two panels here. And so we'll go through this panel and then we'll take a real quick break while we swap seats here. We're actually going to start with someone -- just to kick things off in case anybody's shy about speaking, we're going to start with somebody who we know is never shy about speaking.

And, in fact, Allan, if he goes too long, give him a kick.

MR. SPRINGER: Oh, that's okay, I'll just take it off my end.

MS. McCAMMON: But anyway, we would like to start with Pete Peterson and I know most of you are familiar with him. He's been a core reviewer with the program since -- almost since the spill, since a very long time, very long term. He's a long-term dataset actually. But he's from the University of North Carolina Institute of Marine Science. So Pete. No, you can do it right there, unless you'd rather stand up.

MR. PETERSON: Don't take this as an indication that I've got a lot to say. I really don't. I think this was a superb meeting. I was very happy to see and meet a lot of people whom I didn't know and that indicates to me a reaching out of the program at a time where reaching out is appropriate because it is clearly into a new phase. And the people who have been involved in some of the restoration are clearly an important component as the future moves ahead but so is getting the input from all Alaskans and other people who haven't been directly involved because we're asking a new set of questions. So I felt that that was a very great thing. I thought people were very forthcoming and helpful and sharing and that that was terrific. Now, my particular experience, of course,

since we had five, or something like that, concurrent sessions, my particular experience is limited and biased by the ones that I attended, the 20 percent of the interaction. So I can't speak for the others in which some differences may have arisen. But speaking for the ones that I participated in I would say that there's been a great concurrence that the general, unifying conceptual theme that was developed by the folks who put the elaborate GEM plan together that we have to date, was a success and was accepted as a reasonable basis. Now having gone through this myself and going through the birth of GLOBEC, one of the early programs that Tom Malone spoke to and talked a bit about, I can say that we had just tremendous battles and a terrible time getting any kind of consensus and agreement that a general theme or even a general description of the program could suit the various interests at the table. And of course that was just a bunch of scientists. Maybe they just fight like cats and dogs. This, though, has so many other users and owners than just the scientific community that I think it's a great tribute to the work that the staff has done on behalf of the Trustee Council when putting together a plan and a general conceptual theme that really met the test of this group. And so I am very pleased to see how that lived and didn't die in the workshops and the meetings that I was in.

However, you knew there'd be a "however" that particular general theme reflects what I characterize, although others disown, as a sort of a bottom-up approach to the forcing of change in marine ecosystems and the change in populations. And I think there's an equal commitment in the literature and among those of us working in marine communities to viewing top-down organization as an important one. Furthermore, there's a lot of evidence that both our exploitation of species in the marine environment and the risk of effects of contaminants are all focused much more strongly at the top ends of ecosystems. And that APEX consumers are likely to be affected and, in many cases, have very important influence on the abundance, distribution and dynamics of marine ecosystems. And so in that regard, and this came out in a lot of the discussions, I think that particular part of the plan is one that needs more explicit development and that that will strengthen the process and the hypotheses as a whole.

There are other factors that people in sessions that I worked in, and those tended to be the nearshore ecology sessions, brought up and thought should be incorporated. And I think the plan, and I give credit personally to a very clever strategy in here where there is a general conceptual theme running this way and then these other hypotheses running across that can incorporate

alternatives to the general concept. And in that it strikes me that some more explicit assessment of the role of contaminants, of the role of various types of shoreline disturbance, logging, sedimentation from streams, of the role of various human usages along the shoreline, perhaps subsistence but also other trampling of the shoreline in various ways might ought to be incorporated into the studies with appropriate partners whose mission incorporates a need to know what that is. There also is, of course, a carrot to this. How do you bring in other agencies? It's a bit tricky to suggest to the Trustees that they develop a research plan for about 10 or 12 different agencies and organizations and ask them to contribute 90 percent of the funding for those portions of the plan. So there has to be a rationale for why that might be successful. And one of those rationales is the very rationale that underlies the broad conceptual theme of GEM. And that is, with this information on the climatic physical oceanographic forcing of the system, there is a real opportunity to be able to distinguish natural, if you will, climatic forcing from anthropogenic interference and operations in marine ecosystems. And so many programs that are set up as monitoring programs to assess the effect of x or y, whatever that may be, never have opportunity to get the natural climatic forcing right and to develop that

understanding. So it confounds their ability to test what their mandate is. And hopefully that can be a carrot that will bring aboard a number of partners in this enterprise. And that was one of the things that disturbed me was how many partners are needed to make a go of what we've had before us.

There, I think, are some processes that need to continue and many people spoke to this. The need to have perhaps smaller groups on each specific sub area to develop the specifics of the plan. We here have been talking generally about broader conceptual issues and whether the whole process was appealing. We haven't gotten to the detail and the devil is in the detail and they're a group of specialists who know those particular systems are going to be needed. I would hate to think that I could sit here and specify the location and the types of physical oceanographic moorings. That would be a complete failure. And I think it's clear that the folks doing the GEM plan and moving it forward understand the need for that sort of expertise as well.

Finally, I do have a question and that is one that others have raised. It strikes me that while the GEM mandate is a different one from that of restoring the resources that were injured or continue to be injured from the oil spill, that there is a wealth of historical data.

There's a 10-year long-term dataset in many cases. There's a wealth of spatial as well as temporal information that could be better incorporated into the GEM plan as we move ahead. Now, this is not a criticism because in fact the GEM plan hasn't really identified the wheres and whens of many of the measurements that want to be made. But that particular ability to tie it in to what we already know, what we've already paid for, and what we already have as information about the system seems to me likely to enhance the value of the GEM plan and give us maybe a 10-year, 11-year head start on the long-term databases.

And finally it strikes me that one of the nitty grittys that's going to be really important is the cost estimation of various components because ultimately that prioritization that we make of topics and what to do is going to depend quite realistically on how much they cost. And that was a little frustrating here to me and to others but understandably because we're not at that level. But if we see the sort of development in this program that we've seen from the April binder draft to this one in the next six months or even in the next year, this will be a program second to none. And I should add that this one is groundbreaking. We keep looking towards other models for how to guide this, other community owned, in this case Alaskan owned projects, that are trying to do wonders for

understanding the role of climate versus human intervention in changing important aspects of the marine ecosystem. This GEM plan is going to be the one and we are breaking new ground here in a way that is exceptionally exciting and will attract the attention of the world. Anyway, thanks.

MS. McCAMMON: Thank you, Pete. Our next speaker is Allan Springer. Allan has been one of our core reviewers for about a year now. He specializes in seabirds and particularly in the Bering Sea and the Bering Sea ecology. And that was one of the benefits that I think he's added to our program is the ability to coordinate and kind of see the connections between the Gulf of Alaska and the Bering Sea. And hopefully once the North Pacific research board ever gets going there will be a lot more connections there in terms of long-term research for both the Bering Sea, the Arctic and the Gulf of Alaska. So, Allan, if you'd like to -- and you can just sit there if you just want to flip on a mike there too, if you don't want to stand up here.

MR. PETERSON: Can I just sit here and flip on the mike and call that good?

MS. McCAMMON: No.

REPORTER: All the mikes are on and I'll turn them on up here.

MS. McCAMMON: They're on, okay.

MR. SPRINGER: All right. Well, Pete brought up in one of his comments, which I'll guess begin with as a place to start, that taking advantage of these long-term data centers that have been accumulated over time beginning with -- or I don't know, beginning with OBSET but that was certainly one of the big genesis points and there are undoubtedly ones that precede that. That's, in my mind, a component of synthesis of information that we have in hand about the ecosystem of the Gulf of Alaska, there's -- this GEM program will carry forward the work of the trustee council. It's not the only work that's gone on and that is going on in the Gulf of Alaska. And one of the things though that's not going on is the drawing together of the common knowledge. There must be a lot of it. There's certainly a lot of opportunity to get into that. And it seems to me that if GEM does -- and I think GEM wants to do this, I think maybe it should and I think that there's a lot of reason why it should provide the source, the impetus, maybe even the program to become a synthetic arm of research in the Gulf of Alaska.

As sort of another aspect of this organizational role that -- and this overarching role that GEM might play I think is to serve as -- well, one of the issues that came up in more than one of the sessions I was in was that before you begin doing something, be sure you know what

isn't done and what is done and that's this gap analysis exercise. And GEM can do that, provide the mechanism and the resources to identify what has been done and what hasn't been done and what needs to be done from any number of points of view, sort of serve as a clearinghouse in that regard, and help coordinate this development of filling these gaps, some of which they will do as part of their programs and others of which hopefully will be obvious things that need to be done by other agencies that might have more direct responsibility for those kinds of things and incorporate them into their normal routine.

As a part of that analysis there was some question about what in particular we know and the GEM conceptual model was based on a sort of an assessment of pattern, pattern in the ecosystem that was drawn on some observations. And there was concern that we don't really -- we're not really certain of what these patterns are. And the hypothesis is built on what's kind of the best knowledge but not everybody is necessarily agreeing that those patterns exist or that they're the correct patterns. And so just being aware of this and this -- recognizing or identifying something beforehand carried over into other people's concerns about how do you measure the effect of something on something else when you don't know what the amount of necessarily either one of those is. And so in

order to do this kind of monitoring or detection you really have to know what you're dealing with to begin with. And so that has to do with inventories, I think and being sure that you've spread yourself around and looked in all the right places to see if you've really captured what is there.

As far as just sort of nuts and bolts a little bit, there was another -- on several different occasions the need to use as a sampling device the people that live in the region. And this was brought up as an opportunity for a variety of different kinds of things. But the point of it is is that there are -- there is really a valuable opportunity out there and that's the people that live there who are there day in, day out, concerned with this, observant of this ecosystem and who provide really it's an array, not a moored array exactly but, you know, an array in place that's very extensive and very capable of doing this. They just need the mechanism, the infrastructure as it were, the website and the technology as an example to accumulate this information and make it available to other people who are interested in it for whatever reason. And so that was a widely sort of held opinion that that would be very useful as something that GEM could do right off.

And then just another thing in terms of process or how you go about what you're -- what kind of work you're

going to do. Whenever -- and I share Pete's concern or reluctance to try to identify sites right now, where would you go and why would you go there, but those sites will be identified. There will be some kind of sampling design that is eventually sort of proposed or people will propose it in one way or another and there will be places that are selected and there will be reasons for that. But when possible you should load up on your sampling at individual sites and try to make it incorporate as many aspects of the system at -- you know, at these sites. And so there were some various proposals on how to do this. But the point was to do -- on the basis of whatever you select your sites, really do intensive work at these places and not get yourself spread out too far to be sure that you capture the salient features of these individual places.

MS. McCAMMON: Thank you. Our next speaker, Gretchen Oosterhout, is a private consultant from Oregon and she specializes in modeling and decision-making analysis. Did I get that right?

MS. OOSTERHOUT: Close enough.

MS. McCAMMON: Close, okay.

MS. OOSTERHOUT: You know, through this whole process I started out feeling like I was drinking from a fire hose. I don't know if the rest of you -- I sort of assumed other people knew what was going on and

that eventually I would kind of figure it out. But it reminded me of when I -- I spent about like the first year of my dissertation arguing with -- basically not getting along with my dissertation chair and finally one day he said, you know, I know what the problem is. He said you're really focused on the forest and you think I'm just focused on the trees. And that kind of tension has really been kind of driving, I think, at first a sense of frustration that I had about, well, God, what is this overall sort of big picture; what is this big picture thing we're trying to do and yet knowing that there must be some, you know, tree level sorts of questions that we were trying to sort out that ultimately the GEM managers are going to have to sort out.

And one of the people, I think it might have been Phil, made a reference to sort of a schizophrenic approach. I don't know if you would call it top down versus bottom up or big question versus small question or what. And then in the sort of evolution of my adaptation of the process I realized that really in the early part of problem structuring, which seems to me, you know, where you guys are at right now, it is important to be taking a kind of a top down view and a sideways view and a bottom up view. And it's kind of like the, you know, five blind persons and the elephant, you start out looking at these general

themes, which I thought was a really good way of organizing information, but it might not work for everybody. Everybody thinks -- you know, people's brains just work differently, and then going at it from the perspective of issues and the perspective of disciplines, looking at it from different angles. Some of them work better than others, I thought.

But that was -- that's really innovative. I don't think I've ever been involved in a process where they said we're going to look at the same problems from multiple perspectives and try to get some insights out of it. So that was very useful to me. I'm not sure what the take home messages are yet. I don't think -- it doesn't seem to me that there really is an overall top five or six take home messages. I was hoping to be able to make a list of the top seven questions that I'd be able to e-mail my clients and say, you know, here's what it seems to me your top seven questions are but they're not there yet. But they didn't prematurely converge on what those questions were. That seemed really important to me.

I think the question that got brought up several times that I think is a long ways from being beat to death and needs a lot of attention is really who is it you're going to serve. You can't serve everybody. And what are the overall questions that you need to answer? You can't

answer them all. The conceptual foundation is a great place to start but if you try to take that and say what are the key questions that you're going to use out of there to prioritize your research efforts and your modeling activities and your monitoring activities, it's going to have to be focused down onto whatever, the three to five critical few. And this seemed like a really good place to start, with a very broad overview but, boy, that seems like the big challenge ahead to me. That's basically, I think, the kind of top points I had to make. Did you -- Tom was going to help -- if there was one more thing that you wanted to add from our last session?

DR. MALONE: Doing great.

MS. OOSTERHOUT: Doing great, okay.

MS. McCAMMON: When Gretchen started talking about trees I got a little concerned because we had a group leaders dinner last night and we went around introducing ourselves. And I think one of the participants there said, okay, now what kind of a tree do you imagine yourself as? It was just a joke but I was hoping you weren't going to go there. We're really fortunate at this session to have the participation of Worth Nowlin who is from Texas A&M University, Department of Oceanography. He's one of the co-chairs of U.S. GOOS, the Global Ocean Observing System, and chair of the International GOOS

Steering Committee. And both he and Tom Malone, the other co-chair of U.S. GOOS, have served as group leaders and have really given us a lot of advice as we've tried to begin the structuring of a long-term program. So we look forward to your comments.

DR. NOWLIN: Thank you very much. I was privileged to participate in the sessions on coastal processes, physical geochemical and chemical oceanography and effects of climate and food habitat interactions as well as the modeling. But I think I'm speaking here a bit for myself but also trying to summarize the consensus, if you can call it that, from these first three groups; coastal processes, the oceanography and climate, and food and habitat. The first thing I want to say is something about the scientific background. If you look at the document that was given to the academy for review, the document says that it provides the foundation for GEM -- the GEM program. And it says that Section 4, which is the one on scientific background, presents and organizes the scientific information available to guide the Trustee Council as it develops and implements the GEM program. According to that section it seems to be inclusive of all the biological and physical components of the Gulf of Alaska ecosystem.

I think in all three of the sessions that I'm

summarizing we didn't believe that. We found the scientific background statement to be rather deficient. It was tailored specifically to give information about the general hypothesis that we'd structure this around the PDL oscillation rather than to give the general background on what we do know with regard to this ecosystem. And if you're going to do a real planning exercise here, I suggest you redo that to provide a lot more additional information. I can give you a few examples in the physical area. We should acknowledge the lack of information or knowledge regarding the North Pacific jar as well as the ACC, probably should state what is really known about the Alaska coastal current. We should acknowledge here, which we don't at all, that there may be significant interactions between the gulf and the shelf, not just the stylized one given in two figures, as well as between the shelf and the coast and estuaries and that those are really poorly known. Should acknowledge some of the needs that exist for improved forcing, especially freshwater input to this reason.

Now they move on a little bit to themes. I think this is a very innovative approach, as other people have said, for themes. But how do we know that these are reasonable themes? In all of these three sessions I think that the feeling was that we probably should first here in

GEM, as we've acknowledged I think that is necessary in all the GOOS programs, determine what the real user needs are. And a lot of those user needs are top down. Once those user needs are determined then I think it might be possible to identify the products that might meet those needs. And then you have a basis for prioritizing the information that you have to gather and the kind of synthesis you have to put to that information to determine those products that meet those needs. There's a logical sequence to this. I don't think it's being followed here.

I think that, in general, one of the things that several people pointed out is that the present assessments where -- of areas where really long-term research efforts are going on may not be complete. Now I realize that you're not going to be able to get all of those. But I think an attempt should be made to identify as many of those long-term time series as possible. To follow onto that is something that was said just a moment ago and that is that so far there doesn't seem to be an assessment of what is available in the datasets. And let me just give you a couple of examples. You've had two satellite altimeters up since April of '92. You should by now have daily pictures of sea surface height anomaly for the Gulf of Alaska. We do elsewhere. We have it for India, for Indian Ocean, for example. We have them for the Gulf of

Mexico. You should have similar pictures, I think, where the clouds allow and during the time that it was up for SeaWIFS. Both of those things could give you an awful lot about the variability and also perhaps about the relationship of variability to productivity. So I think that in that area you've got a lot of work to do to get ready to design a final plan. I don't mean to be discouraging. I'm just being honest with you.

With regard to the hypothesis, even if we take a bottom up approach and not consider that it might be both bottom up and top down, I think we felt, in the meetings that I was in, that it's probably a mistake to use the PDO conceptual model as the basis. Two reasons for that, one is the PDO responses are not proven. They're sort of cartoons. They're today's best guesses. They're not hard scientific proof that that is the response that we get for a high and low PDO at the moment. The second thing is that we should be monitoring a whole spectrum of scales. You can really fool yourself if you design a program, as we've seen in the predecessors of the TOGA program and even in the way they tried to first do modeling in TOGA, if you limit yourself to a narrow spectrum of scales because they're all interactive.

Now those, I think, are the general comments and I would like to make on behalf of these two, three groups a

few specific things. In the coastal processes and physical geochemical and chemical oceanography discussions there was a suggested approach on how to proceed with the physics based part of the program, not in very specific detail but in generality. And the first thing is to provide necessary physical background. We will require some validated numerical circulation models. Perhaps one might start -- and this is strictly up in the air as to which end you start in but one way to start might be with a three-dimensional circulation model of the Gulf of Alaska, which requires boundary conditions forcing, freshwater influx, together with a hydrologic model over the land because you don't have the adequate gauges to look at stream flow and you also have a lot of point source -- I mean you have a lot of line source that are not in rivers. Offshore boundary conditions for that model may be needed and you might even think of a thin Pacific model.

But that's just -- the next thing you need to do with any of these models is to validate them. Now, it's not clear, I think, where you would go about getting the information, where you would put moorings or what type of information you really want to have to validate these models. And the models are going to have to be able to take the data into them. They have to assimilate the model. That is, they're going to have to be able to

extrapolate those data in time and space because you can't sample everywhere here. You've got to think about, in the long run, a thin sampling program. And so you probably include as a minimum sea surface height anomaly but that's not going to be everything that you assimilate into these things.

The second recommendation is to maintain the existing long-time series that you have. If you give up many of those, you've lost a lot of information, particularly the GAK 1 and its line. Three, the suggestion was that probably would not start any new time series monitoring, at least for physics, in the Alaska coastal current until such time as the moorings that are being placed there for long-term observations as part of GLOBEC have been analyzed so you see what the structure of that current looks like. You could take advantage of that. Now, for the Alaskan coastal current you might want to either use a nested model with boundary conditions from the offshore model or you might want to change grid spacing with the general model. But eventually you'll probably have to validate and constrain that model, too. It's way too early, I think, to decide where you might do that.

One suggested, following on from an earlier comment, that it might be reasonable to initiate a series of combined physical nutrient, phytoplankton, zooplankton,

forage fish as intensive as you can, monitoring at a selection of stations. And it was suggested by several people that one might put that grouping of stations, one, off Prince William Sound; two, off the entrance to Cook Inlet and along the east coast of Kodiak Island; and, three, along the Alaska Peninsula. That is not to cover the entire coast but it is to give you some grids and maybe you can't afford to do that. You probably can't seasonally because we estimated that it would run you 15 to 20 days of ship time. But you might supplement that with seasonal or even burst sampling on a series of fixed stations or lines, a limited number of those. And those might well be done by utilizing fishing boats or other in situ assets that you have here rather than doing it otherwise, in following on your comment I think. So that might give you -- that's sort of the coastal process section. Am I out of time?

MS. McCAMMON: You're using up some others, before you, time who were shorter. So you're fine.

DR. NOWLIN: Okay. In the food and habitat -- which I found most interesting because I don't know anything about that, so I actually learned -- maybe learned something. I'm not sure. But there were a number of suggestions and one is to try to characterize in some systematic way for the Gulf of Alaska, maybe a GIS system coverage, the physical geochemical properties of habitats

that are favorable for specific species, especially in terms of food. And another suggestion which seemed kind of very interesting was can you assess how habitat really affects the value of food to specific species because we -- a number of examples were given where apparently equal value habitats produced quite different productivity in the same species. And can you -- would it help to consider food not just in terms of its caloric value but nutritional value so that you have additional factors depending upon where the habitat is even though the same food source.

I could go on with these a little bit. I'll mention one other thing and that is is the factor limiting a specific species range more physical characteristics of the habitat or the availability of the food from that habitat and how do those characteristics change in time? Well, I think the rest of these I would just give to the recorder. But I would make one comment, in the section on food and habitat there was a little bit of trepidation regarding the suggestion that one might start as part of GEM as early as possible truly hydrographic based or full physical oceanography based ecosystem models. And I think that maybe some of the other people that report on the modeling session will follow up on that. But the concern was that we may be at a very early stage and we may be able to -- we may have to rely more on statistical and on energy

based models for the ecosystem, at least in the beginning here.

Thank you very much.

MS. McCAMMON: Thank you, Worth. Our next speaker is Charles Falkenberg. And Charles is a private consultant specializing in data systems. And he's been working for the last year, actually, on a contract for the Trustee Council in anticipation of GEM in terms of setting up a data management and transfer system. So, Charles.

MR. FALKENBERG: Thank you, Molly. I think the data system issues are impeded by the same thing that the other questions -- that the other speakers up here have spoken to, which is the lack of a clear understanding of our user community. But I think it's important not to focus on that because I think with a program the size of GEM, certainly we can't predict all the users that will take advantage of these data nor are we at the stage to understand what -- a part of the goal of this meeting is to understand what that user community is. And so -- and it's possible to address the data system issues I think, or at least to begin to address them, devoid of the user concerns. I mean, we certainly have a basic understanding of the users. And I would like to pick up on something that Worth mentioned, which is that I found many of these sessions to be interesting because in some regards they're

all outside of my area of training. And that this has been a very exciting opportunity to discuss these issues and feel the consensus begin to take hold of the user community and the issues that need to be addressed.

But the data system issues are quite large. And I think Tom's point about asking whether or not they will be even addressed before the first byte comes rolling in the door is a valid concern. And the task seems to be -- the task initially is framed as a wide disparity of data that might include raster data. It might include satellite data, large chunks of satellite data at regular intervals. It might include acoustic data that has a certain raster characteristic or a large volume characteristic at regular intervals, oceanographic data. These data all have a certain consistency and are tractable in many ways. Compare that with observational data, which can be quite irregular and may contain observations that are completely unrelated to the study at hand or the monitoring contract at hand. These data become very difficult to organize and standardize and yet some of those ad hoc observations can be quite important and need to be captured.

Going further down this spectrum, there was even a discussion that traditional ecological knowledge should be captured and kept in the database, research projects that might have one off datasets that need to be captured. So

there's a huge disparity in the types of data and the ways that it might be standardized. The session that I led was on the data management system and transfer. And the user community in that conversation included the management -- resource management community here in Alaska as well as nationally perhaps, researchers, the scientists that have traditionally taken advantage of EVOS research and the general public, maybe even K to 12. Bridging the gap between this disparity of data and this disparity of users is untractable. You know, the possibility that we would be able to create a system that could meet the needs of that community for that wide set of data is probably impossible to do. But in the last year thinking about this problem I have taken advantage of the one thing that we can utilize in this program, and that's the fact that it will go on for a long time. We don't have to solve this problem in a three-year time frame or a two-year time frame.

The problem that we do have to solve immediately is that of data storage. The data will come in. As Pete said there's already data out there that should be incorporated into this system. That archiving function, those questions of how we store the data, do need to be addressed immediately. And in some regards as a consensus is reached of what data will be collected, what will be monitored, those decisions can be made on how those data will be

captured and how they will be stored and which data don't fit the -- you know, fit the model and how we can accommodate those data. So once we address those concerns it seems to me that we have the opportunity then to begin to ask our user community, our projected user community, what they want and tailor systems over time to meeting the needs of particular users. Some of the management applications that were discussed in the meetings I was in were highly tailored, permit generation that might require some very specific analysis that GEM might be able to supply data for. These are highly tailored applications that are usable by a few people. But that kind of an application can evolve out of -- as the system moves forward once we've addressed the archiving concerns.

And so as part of this, these concerns need to be put together in the data management plan. And Molly has organized a data advisory committee and this was the first time we've gotten a chance to get together and talk. And as part of that -- as part of the first deliverable from that committee will be a discussion of how we can build this data management plan which will be an important component of the GEM plan. And the issues that we addressed initially are focused on these archiving questions and less focused on the questions of transfer. Because, as I say, I think without a clear picture of the

user committee we can't spend too much time there and it -- we do have the luxury of time, to some degree, in that area.

So the issues that we really addressed in the -- in our meeting, and I think the initial issues that need to be addressed, are issues of data policy, how -- what the policy is for the data that is collected, who owns it, how is it transferred to the GEM archive, how is it described in the proposals that are submitted. This, I think, is a key issue in organizing the data system, that the data that will be collected will -- is outlined in the proposals and a time table is provided in the proposals of when those data will be submitted and in what format they will be submitted so that the completion of the proposal will include an evaluation of the data that's submitted.

Certainly standards are a big issue. Some standards are in place. I think the community has done a pretty good job of organizing metadata standards. There's -- you know, there's FTDC, there's things -- there's other metadata standards out there that are usable. But there's tougher issues that need to be addressed there, questions of units, questions of coordinate systems. You know, there's a sticky set of religious issues that get -- that can drag out and we need to look to partnerships to solve these problems. We need to look at the individual

disciplines and try to adopt the accepted standards in those. I think the Global Ocean Observing System is a start, certainly with the oceanographic data. But my initial concern in reading the plan, certainly there's not a lot in the plan currently about managing data and I think in some regard that's understandable since it lags behind the organization of the program in general. But I would very much like to see the description of the archive, the goal of that archive included in the plan so that as we think about the various monitoring programs or various research programs that are funded, their contribution to that archive can be evaluated. So even beside the data management plan I think it's important to articulate the vision for that archive so that we can gauge the contribution that individual monitoring efforts will make to that plan.

As I say, the -- there's a data advisory committee. Just as a status, we are going to collect the information that we got in the data and information workshop and circulate it, add comments to it and get it to the GEM committee as the start of the data management plan. The first recommendation will be what -- you know, how we would go about formalizing this data management plan.

Thank you.

MS. McCAMMON: Thank you, Charles. I know

one of the failings of the oil spill restoration program has been the lack of data management overall. And a lot of that was due to the fact that the whole program was born during basically a war-like -- war-time situation and we don't have that now. So we really need to do a better job in that aspect. Our next speaker is Ted Cooney, who's a former University of Alaska Fairbanks professor. He was also the leader of the SEA, the Sound Ecosystem Assessment program. He now lives in luxury and ease in Montana but Northwest Airlines has a direct flight. So, Ted.

DR. COONEY: Thank you very much, Molly. I'd like to begin by thanking Phil and others who prepared the documentation that we all reviewed this time and sent it out ahead of time. I think it was a tremendous help to everybody here. It certainly was to me and I think if we made progress at this meeting it was largely because of that organization. It really paid off. That's the way to pull off a meeting.

At the risk of sounding a bit redundant, I want to beat the data base and data management drum just a little bit. I was a bit skeptical looking at the plan and still remain concerned that we don't have a strong enough commitment within GEM to deal with the kinds of problems that Charles has mentioned. And I hope that that can be addressed in a very meaningful way. What a tragedy it

would be if the Trustees bought Phil and Molly a nice BMW only to look under the hood and find there was no motor there. I mean, we've got to have all of the parts and GEM is about information, I think, information in the short period but also over the long haul. It may be that 50 years out somebody wants to redo somebody's data, wants to do a re-analysis. Let's go back and look at the archive. Let's pull this out. So at the heart of the program, and maybe not as sexy as some of the field stuff with the hot instrumentation, is this need to have data archive, data management retrieval, all that goes with it. And so I am counseling that enough horsepower be put into that part of the program.

I wonder if as just a strategy as GEM has implemented, one strategy might be to start a little slow, maybe an incremental start-up, rather than ripping the entire rabbit out of the hat as the gun goes off, why not start with some pilot test bed programs and run those for awhile allowing adaptive management procedures to inform, you know, what's working and what isn't working. This program is so important that it seems like getting it right from the beginning, or mostly right from the beginning, would be very important. And I think that would take a little of the pressure off things if it was a more prudent and careful start, not that I've heard that it wouldn't be

but I'm just suggesting that that might be a way to go.

I have been beating the drum for a couple of years now on the hopes that the entire restoration body of work would be summarized in a sort of super synthesis. I had hope -- I had heard I think -- maybe it was Pete, maybe it was Allan, maybe it was just in my mind that someone mentioned this earlier, I think there's a huge amount of information there that goes beyond the level of what did we find and really seeks the knowledge of what have we learned in that 10-year period of time that could inform GEM. And so I continue to think that that is a project that ought to be done. I'm not sure that I will be able to convince anyone that that project ought to be done. But I think that the information arising from super synthesis would be very important for us all and a great legacy for the project as well as we transition from the restoration aspects on into the monitoring.

Much of what was done in the sessions that I happened to be associated with, the terrestrial linkages, the biological oceanography, the habitat and then community monitoring or community participation, I think that much of the excellent discourse debate ideas that came forward, came forward with the understanding that there will be some further collaborative reviews of this work down the line. I think people felt free to bring their ideas to the table

knowing that essentially this wasn't kind of the last desperate shot at pulling something together but rather an orderly progression in refining a plan that is pretty good and can get better. And as a result of that I think people very honestly brought their expertise, their ideas and we debated and filled up reams of paper with ideas that I hope someone will be able to unravel. And it was, I think, a very good exercise. So I look forward to interacting again sometime I hope in the future, coming up from Montana to see the plan. I am on the web so I can pick up stuff and I think it's all headed in the right direction and it's -- there's a wonderful feeling of community, I think, in this room. It's fun to be back and looking at something in a sort of starting way and I wish us sort of all luck in proceeding. I think it will happen.

MS. McCAMMON: Our next speaker is Steve Braund. And Steve is a private consultant here in Anchorage who has served over the last couple of years as one of our core reviewers on subsistence and community projects. I think his specialty is in kind of community environmental issues and leading and facilitating meetings and discussions like this. So, Steve.

MR. BRAUND: Thank you, Molly. When I was first involved in this program they called me up and I basically have been a peer reviewer in subsistence

proposals, different proposals and reading an occasional report. This is the first time I've been involved with any people other than other peer reviewers in this whole process. So it's really nice to see that there are other people involved. When they called me the first time my phone rang and said, well, it's time to come and get these reports. And I said, please, oh, just mail them to me. And they said, well, we think you better come and pick them up and I didn't think much. I said, fine, your office is only a couple blocks away. That happened to be the day my teenage junior high son was at my office for the share the day with your parent and see what your parent does at work. So I thought this will be a nice -- something he can go do and get him out of my hair for a minute. I can get something done. Well, he was gone for a long time and I finally thought, I wonder what happened? Well, I'm on the third floor of an office building and he finally struggled back in with 22 pounds of notebooks. And that was the reports and he's not been back to my office since. This was several years ago.

So then when they called me and said would you work as a facilitator here for a few days I think I asked, well, what do I have to review? I was kind of trained at this time and it was only one notebook. And I thought, oh, well, that's going to be a piece of cake compared to what

I've had in the past. Well, then I opened the notebook and I didn't open it soon enough because I waited for a couple of days before the meeting and I started grappling with themes, disciplines, questions, issues, components, hypotheses. I struggled and I struggled to see the sense in this and I can identify with another one of my speakers here and say, well, I sure hope the people coming to the workshop know more than I do about this because this is going to be very difficult.

Well, I was in four workshops and I was very impressed. I want to thank all the participants in those workshops because you really did have a great dialogue. Everybody was involved. I think the council really got its money's worth because people really did participate in most all of my workshops. Ninety percent of the people were agency people and I found that very interesting. I'm an anthropologist so some of my comments and my observations are going to reflect that. But there was very good participation and specifically the workshop that I was in on the synthesis, one of the things I left there was more public dialogue in the synthesis, not just scientists coming to a bi-annual meeting, standing up, giving a report, talking to other scientists, but somehow engage the public more, engage a dialogue with the public.

Another workshop we had was human impacts I was

involved in. And there, again, I left that workshop with a human element that there needs to be more attention paid in the GEM to the human side of things. There needs to be more monitoring now of different variables so in 50 or 100 years there are a lot more people coming up here. You're going to be able to measure the difference, what's been the difference of these human beings here. To the point at the end of our workshop they talked about another theme, maybe a human impacts theme.

And not to leave out the marine mammal people, the workshop. That one somewhat concluded with more marine mammals. And I think also the participation in the workshops I was in, everybody was very free, very open, lots of good ideas. I think there's going to be a process of synthesis of all these ideas going back to Phil and he's going to have a lot of food for thought to see what came out of it. But I agree with the previous speaker that I think the idea was this was the first phase of one draft and they're going to see something else before it's off and running yet. Before the train leaves the station I guess we're going to see another iteration.

And I want to acknowledge the people from the villages here. I see them sitting here. I've read the proposals from the communities. I've read the community involvement reports over the last two years. And I dare

say you probably wouldn't be here unless EVOS had made a concentrated effort to have the community involvement program, to have the Youth Watch program, and to have these programs. So I'm really glad to see that you're here and participating.

Thank you.

MS. McCAMMON: Thank you, Steve. Our final speaker in this panel is John Blaha, who's with the Naval Oceanographic Office at the Stennis Space Center in Mississippi. And he's working on a Gulf of Mexico observing system and you should also note that he is not the astronaut John Blaha. He was asked this last night.

MR. BLAHA: I knew that was coming.

MR. McCAMMON: I know you knew.

MR. BLAHA: Well, one nice thing about being last is there's very little new to say. So I'm just going to make three short comments here. And GEM, of course, is about change in a marine environment. And I just want to remind folks that I think there are changes in the ocean sciences occurring at the same time. And, at least from my perspective working in the operational side of oceanography, I see a lot of research now being directed or very much integrated with operations, that is providing some product immediately and very much integrated with their research. And I think that GEM should feel

comfortable with that notion and use it as much as they possibly can.

And the second point is related to that. I kept looking for a lot of quasi-operational products that could be early results of the GEM development. And certainly I was maybe pushing a little bit hard in the sense of trying to find modeling applications that could be implemented early on. But if there's one thing I have learned, it's that modeling fish and the marine environment is very difficult to do. And that I think there are -- the monitoring program really needs to be very inclusive of parameterization on which models -- new models can be built and evolve. And there ought to be some special review to make sure that that aspect of GEM is well done so that marine biological model development can occur early.

And finally, I'm very impressed with the enthusiasm of the community here compared to some of my own experiences. But I want to say that GEM has a commonality of purpose with other groups around the U.S. And they will be very much encouraged not by -- not only by your enthusiasm in GEM but also by your successes. And encouraging action -- the potential encouragement of action to fund these other groups that also would like to do things similar to what GEM is doing here. And so our eyes are looking toward you in that sense.

MS. McCAMMON: We're going to take a three-minute break. And please don't leave the room because we do have to be out of here by 5:00 o'clock today. So we're going to do this switchover real quickly.

Thank you very much.

(Off record)

(On record)

MS. McCAMMON: Okay, we're going to get started now, so if you could take your seats. I guess we'll go from left to right again, since it's linear and I tend to be a linear type person. Our first speaker here is Tom Malone, who as I mentioned earlier is the other co-chair of the U.S. GOOS program. He's with the Hornpoint Lab at the University of Maryland. Tom.

DR. MALONE: Thank you very much. First of all, I want to thank you all for the opportunity to be here. One of the valuable things for me is I always learn a lot from these interactions. It's like new blood in the poker game and new information. I want to reiterate something I said yesterday and something some of the speakers earlier said and that is GEM is potentially an incredibly important program in terms of being -- potentially being a prototype for what is needed in terms of regional development of coastal ocean observing systems throughout the United States. And so I encourage you to

proceed in the directions that you started so far.

The second thing I want to say is Ted said something in the last panel that is incredibly important and that is you're in a unique position in terms of funding to be able to start off slowly. Not all programs have that capability, especially those that are funded by the Federal government. Take that advice. That's extremely important. And in that context -- and I say this -- in some ways it's a no-brainer but it's incredibly difficult to do. I've been involved in a couple failures in this regard myself and that is get modeling and data management out in front of the design process. You heard many speakers talk about the fact that there's a lot of data out there that has yet to be brought to bear on the questions. You've got a lot of work that's been done on models, et cetera. I really think that you're in a position to use models to do a variety of things.

Let me say a few words about data management first and then modeling. In terms of data management, I just mentioned the need to mind existing data. I would take a little exception to something Charles said and I understand the dilemma in terms of designing a data management system. One of the problems we face in terms of past data management systems is that they have been pretty much designed from the perspective of just capture as much data

as you can or designed from the perspective of the so called data provider. Very few, if any, have ever been designed from the perspective of the data users and how the data's going to be used in the first place. And while there has to be some reality in this I think that you should not throw out the idea of thinking about how the data's going to be used as much as possible up front in that regard.

The other thing in terms of data management is I really believe that we're on the verge of making a transition between having to rely almost exclusively on sampling and measurements and analyses that take lots of times to complete to systems that are more and more dependent on real time data telemetry. In those areas where we're doing that right now, where people are using that kind of instrumentation, we kind of suffer a paradox. And that is too much data and too little data. On the one hand we've heard a lot about having too little data to be able to really adequately describe these systems, to develop the models, to make the predictions, blah, blah, blah, blah. On the other hand, if you've ever been involved in some of these programs that are continuously collecting data, be it satellite data, be it from in situ moorings, be it from towel instrumentation where you've got continuous streams of multidisciplinary data coming in,

they're overwhelmed by it. And why are they overwhelmed by it, it's because they didn't think through the assimilation techniques that they're going to need to assimilate that data in ways that they could use it to feed models, for example. So the more you can get that kind of thinking and planning out in front of this whole process, boy, I think the better off you're going to be.

In terms of modeling, I really think that you have enough information on this system right now to develop and steps have been done in this regard to develop the conceptual framework, the conceptual models that you need to provide a framework for not only organizing the knowledge that you have but for helping to set priorities in terms of what you're going to build into the long-term monitoring program. There are three other aspects of modeling and there's been a big emphasis on probability based forecasting, which is important. But I don't think you need to hang your hat totally on that. Modeling is going to be extremely important and continue to be important in terms of developing a better understanding of the system by making predictions and testing those predictions to find out what you know and what you don't know and that sort of thing.

The other aspect I think that is important to consider is that -- is the kinds of model outputs that are

going to be important for public outreach and science education. These tools are tremendously powerful and that could be an extremely important aspect of GEM as it develops. My final comment is on this whole issue of specifying the data products first before you start deciding what you're going to measure. Again, I don't think this is a linear A to B kind of thing. It's going to be a little bit of A to B and a little bit of B to A in terms of specifying products. But there really should be an attempt -- a serious attempt, and, again, I say this because it's not an easy thing to do, and that is to specify the kinds of products that are going to be needed by various user groups or know that you can't be all things to all people. But really put some effort into that so that you can then ask the question, okay, what kinds of models and analytical techniques do we need to be able to produce those products. Then you ask the question what kind of data do you need to feed those models. That tells you the variables that you need to meet.

Now we're always going to find, especially right now, that there are many things that we don't understand about these systems. That we can't really go through that process but you can use that process to also identify priority research areas that are going to be required to develop the models or required to learn what kinds of

variables need to be measured and what times and space scales. So I'm going through all of this just to try to emphasize the fact that this really needs to get up front. I don't know what it is about scientists because every program I'm involved in, even those that were funded specifically to do that and which we said we would do it, we didn't do it. We had to go out there and make some more measurements before we could get into modeling. You've got an opportunity to do that and I really, really recommend you do so. And I wish you the best of luck. Thank you.

MS. McCAMMON: Thanks, Tom. Our next speaker is Brock Bernstein, who's a private consultant from California. And Brock specializes in developing and reviewing monitoring systems.

MR. BERNSTEIN: So I come at this from the perspective of having been involved in the design and evaluation of many different kinds of monitoring programs, large and small. And basically I want to say what he said because the problem with science driven programs is that scientists always can think of more to study and more data to get -- to capture and to collect. And I would -- I can't encourage you strongly enough to start building on the framework that was developed in that -- in the folder we all got, the notebook we all got. I thought it was a courageous attempt to put some structure on a really huge

and difficult and complicated problem and to push that structure as hard as you can.

And in the groups that I was in we found lots of things wrong with it, places where it fell apart, places where it didn't go far enough. But what I -- the usefulness that I saw in that was that everybody used it as a very concrete starting place from which to push their understanding of the system. And in that regard it's incredibly useful. And what I would encourage you to do is to start building right now the frameworks for data synthesis and data analysis, whether it be modeling or time series or GIS maps or whatever, and to use those to then start fine tuning not just the framework but the studies that would be needed to use to develop it further and to also start distinguishing between competing conceptual models.

You don't need to hang your hat on just one. You can definitely develop alternative scenarios for how this system works and then use those to start identifying how you would choose between them and what sorts of synthesis you would need to do. Because without that sort of an organizing framework it's so easy to fritter all this money away and this tremendous opportunity on just collecting whatever seems like it's useful and interesting at the moment.

Thanks.

MS. McCAMMON: Our next speaker is Jon Isaacs. Jon is with URS Corporation. He's a private environmental contractor who has been a peer reviewer on and off for us on various projects and has worked a lot with communities throughout Alaska evaluating different programs and projects. Jon.

MR. ISAACS: Thanks, Molly. I remember in the mid-'90s when I got a call from Bob Leffler when he was at EVOS and it was kind of, Jon, we have these grant applications in. We have some social science ones and we don't quite know what to do with them. Would you mind coming over and taking a look at them? And it was part of a group that included Bob Spies and others and looking at applications. It was the first time I think we had seen some of the applications come in from the villages and the communities and community involvement and monitoring. And there was really a lot of effort put into them. There was some really great ideas but it was obvious that they hadn't had much experience putting together grants and applications.

And under the scoring process, you know, this effort didn't really bring the results because they just didn't compare and weren't scored and didn't hold up well compared to some of the applications that had been put in

by the universities and the scientists. But I think to the credit of EVOS and the Trustees they recognized the need and the interest there and they started putting effort into working with the communities and the regional groups. There was a subsistence conference that was organized probably about three or four years ago. And I see a lot of the folks here who were here then. And there's been a lot of effort put into supporting community monitors and funding different community elements. It's been an evolving process and there's a need for continuing evolution.

We had a really great group of folks today at the workshop and came up with a lot of ideas. You can see some of our papers there on the back wall. And in the end we sort of asked what are some of the main points to bring up to summarize for this conference. One of the first ones was to provide a decent mechanism for getting the communities involved in terms of community monitoring and incorporating traditional environmental knowledge. There's a real need for training so that the local folks can be involved in data collection, data entry and also provide them access to the data once it's been collected, to have some feedback on what the research has done that they can use.

Another part of the mechanism is, you know, these

sort of meetings are great but there's really a need for more small regional workshops where people can get together; they can share ideas; they can interact, not be presented to and come up with sort of different work plans and compare some of their notes across what's a fairly large region. There's also a need to continue to fund programs that exist that are really valuable like the Youth Area Watch. They can be used to both educate, create new leadership, new participants in these programs and use them for data collection.

Second point has to do with the challenge of how do you integrate traditional knowledge and scientific knowledge and take advantage of some of the resources you have out in the communities. There needs to be some standardized measures for involvement. You need to develop protocol for data collection, for reporting, for observations, so that you can get standardized data and regular data in from the communities. Standardized training programs so that everybody in the different communities are being trained the same way to collect the same data. There's a lot that you can do in terms of using some of the existing monitoring information and platforms to share data. There's a lot of different networks out in the communities.

People mentioned the GLOBE [sic] program which is

out there, which is a computerized interactive program where you can enter data; you can get data back and you can see what's going on in different parts of the country. There needs to be sort of a standardized mechanism for data collection techniques that use -- that can be widely used. But they have to be things that aren't too complicated, aren't too expensive. There also needs to be standard procedures for quality control and reporting because we know one of the areas of skepticism is how good is the data that you get back from the communities. If you have protocols, if you have quality controls, standardized reporting, there should be no reason not to use these resources.

There needs to be a long-term commitment to support the infrastructure out in the villages. EVOS has been making a great effort but, you know, it takes time and money. It takes money to travel, have people go back and forth. A lot of the communities are still lacking decent internet access and adequate servers to be able to communicate with each other. There also needs to be some looks at commitment to long-term management structure. There is a lot of interest out there in terms of co-management and there are a lot of programs that already exist. And if you can have co-management, you can sort of formalize some of the resources, the trading of

information; you can develop protocols; you can provide training. And what you're doing is you're building capacity, building resources in the community and you're also creating equity and partnership and you're giving people who are resource users a voice in some of those decisions. And what sort of data should be collected; what do they need? Adequate funding for the coordinators for travel costs for some of the programs and the monitoring.

One suggestion was don't treat community monitoring and traditional knowledge as either token or an after thought. And I don't think there's an intentional action to do so because I think there has been evolving commitment on the part of EVOS. But when you still look sometimes at the scientific emphasis in the community and the TK emphasis it can come across that way. If you look at the use of the community monitoring TK, it can really enhance the value of GEM. And if you start training the local participants, you're getting the best of both worlds. You're getting a traditional knowledge, that community monitoring, that local experience and you're increasing their scientific capability. You're going to get much better data. You're going to get better people in the villages.

I think there's a lot of models out there that can be used for this sort of work. And the other thing is when

you have the monitoring, the TK, it builds trust and partnership in the communities. They're going to bind -- the results are going to bind to some of the management measures and they're going to help with the implementation. Another suggestion was that really each element of the GEM program should evaluate and ask the question how can you incorporate community monitoring and traditional knowledge? If you look at a lot of the elements and then your book, and for almost every one you could probably ask that question and come up with some way, how can you use the community to monitor, how can you incorporate the traditional knowledge? And along with that you consider, you know, what are some of the user driven issues? They may have research questions and needs that are very different than the scientific community but just as valid. You should be asking the communities what are their research questions and needs; what sort of research should be done? And I think also by having them involved in reviewing some of the programs they may have some better suggestions of where to monitor. They may know where to look for, you know, sea lion populations, where sea otters are going to be. They might give you better research if you involve them at the outset rather than having it as an afterthought.

And then the last one was to set some priorities

for community monitoring and traditional knowledge. I mean; you can start with the basics, with some practical projects, and then grow. I mean, there are a lot of ideas out there and take a start with some of them and see what you can implement. Some other quick observations, there's a heck of a lot of resources and programs out there. I don't think anybody has a really good inventory of who's doing what in the communities and I think that's one thing that's needed because you'd be surprised how many folks are out there collecting data, how many regional structures, how many village structures are out there that can be used. And that way you can maximize involvement and return to research in GEM. There's a lot of new technology that can be used, things like, you know, video and microphone monitoring that are used in some of the remote islands to track what's going on. That can be hooked up into a computer and transferred back almost immediately.

The geographic distribution of the communities is an incredible asset. If you can set up standardized procedures in monitoring those communities, it allows you to take a look at variables on sort of a large scale, deal with some ecosystem and large scale change issues as compared to individual site research. You can sort of see what the variability is between communities and sort of the larger picture. And then, finally, many of these

communities and regional organizations are setting up their own resource managements plans. They're looking at co-management. They're going to have tribal or regional management plans. They would really welcome advice, welcome support and training from agencies so they can set up their programs that serve them best but are also useful to provide information that others can use. They're really looking for a partnership here. So I think, in conclusion, you have a great resource available with the communities. They're eager to help with research. They're eager to help with management and they appreciate the ability to participate and work with you all. And I would like to thank everybody in my workshop for all the effort they put in today.

MS. McCAMMON: Thanks, Jon. Our next speaker is Karen Murphy and Karen is currently with Department of Interior's wildlife refuge system. But she was formally with the Forest Service and when she was with the Forest Service she was detailed to the restoration program and was one of the early architects, I guess, of the Restoration Plan. And as such she has lots of history knowing that the Trustee Council thinks nothing of tossing out plans and starting fresh. So if we don't get it right the first time, we'll do it again. But as such she was also a big proponent of trying to make sure information was

brought to the resource management level. So, Karen.

MS. MURPHY: Thank you, Molly. Although I'm not sure I learned my lessons very well because when you first called me and asked me to do this I thought, sure, you know, I'd like to do that. I like doing this sort of thing and it'd be fun. Then I got the notebook and I sort of panicked; how am I going to adequately facilitate a discussion from a resource management perspective with all the different themes and all the different ways to look at it? And so I have spent the last day and a half until actually this session, late morning and this afternoon, listening to each of the sessions that I attended and trying to hear from the perspective of management issues and concerns and how GEM -- what sort of role would be good for GEM to play. And it's been sort of really interesting to sit here and listen to this panel because even though we've attended different sessions the comments are very similar. I didn't even know Jon was here yet much of what he just said I can repeat right now. From the standpoint of, you know, what I've heard people talking about from resource management perspectives is very positive in the sense that there seems to be real common agreement that a long-term monitoring program that is set up to detect change and help us understand what the Gulf of Alaska system is. And if we can pin down the variables, which is

the big catch, that we want to measure, there's real belief that that information will be very useful to us in the future. We all recognize that management issues change and we -- management agencies tend to deal with the current issue, you know, what we need to address right now. But often we end up relying on these datasets that we never dreamed would be important in providing that information to us.

So one of the things that I wanted to talk about, you know, we've heard interest in making sure that the users help select those variables. And I think they really need to be involved in that both -- not just managers but stakeholders and, you know, users in general. But also to keep in mind that we really are looking long term and we're not just trying to capture the things that affect us right now and that might provide useful information right now. But we're trying to get those variables that detect change over time that we might be able to use in the future. The other thing is that there's real recognition that the synthesis part is hugely important in this and if you're going to get the information out where we're going to use it, that's probably one of the key roles that GEM can play. And I've heard other speakers of panels talk about a need to synthesize other oil spill information that's been collected in ways that we haven't done so far. But there's

also information that's been collected outside of the oil spill process and that information may not even be analyzed. But it certainly hasn't been integrated in a way that GEM might be able to provide an ability to integrate that data and give us another picture and another piece of the puzzle for what's going on in the Gulf of Alaska ecosystem right now.

And the last thing is just, again, an encouragement to make sure that we use -- kind of in our partnerships not only with other agencies and with the resource managers, but to look for the ways that we can capitalize on user groups that are out there. And whether it's the commercial fishing industry or, you know, the cruise ships that regularly go through the area that we're interested in, they can really provide us with a lot of information that I think would be extremely valuable to answering a lot of the questions that will arise in the future because they can provide a lot of the extra information that, maybe real site specific monitoring, that we have that real continuous time series for can't answer. So good luck.

MS. McCAMMON: Thanks, Karen. Our next speaker should be familiar to a lot of you. George Rose is with Memorial University of Newfoundland. He's what makes our program international. And I think he got his first start with the program in the early days of the SEA program

in Cordova and since that time he has been one of our core reviewers.

MR. ROSE: Thanks, Molly. One of the goals I have is to get Molly to pronounce Newfoundland correctly. But, anyway, since you mentioned it, Molly, you know, I've been worried ever since last night as to what kind of a tree I am. The problem that I have is where I live we only have these stunted spruce. So it doesn't give me much variety. Anyway, I think one of the things that I can bring to this process and probably why I'm here is that being from an old fishing culture we've already made most of the mistakes. So while we don't really know exactly how to do it right; we certainly know really well how to do it wrong. And a lot of the things that I'll probably say and a lot of my feelings about this stem from that.

One of the things we're trying to do in Newfoundland right now is similar to what you're thinking in Alaska and what people are thinking right now around the world and that is long-term processes in the ocean, how to deal with these and so on. And one of the things we've tried to do, initially we realized, is to go back and try to identify and integrate all of the existing and potential data that are out there. And that's one thing that I kept hearing here in almost all of the sessions that I was involved in was I kept on hearing things going by me here

and there about, well, you know, there's this data over here; then there's this data over here. I mean I have no idea but I am led to believe and I know enough about the situation here that there are many existing programs, many fairly long-term data series that already exist and will continue in the future, which is very, very important. We're looking here at long-term processes and the continuation of those data series is probably paramount.

So I think that one of the most important contributions that GEM could make is to do that, is to identify and integrate the existing and potential data that's there and to try to act as a sort of an honest broker among the people that may have these data and will have them in the future and provide a means to put these together. And then this leads to some of the other things, which I'm not going to talk about because it's not my specialty. But in terms of data storage and data management and all of that mumbo jumbo, it's -- that is an important part of this and GEM could really play the role of broker in that. And I think that would be a major, major accomplishment to bring things up to date right now before anything is done in the future. So that's one thing that I think came through this. And our experience in Newfoundland would certainly suggest that that's a very important thing.

Another thing is to try to identify what the long-term questions of importance are to management and the communities and the fishing interests and so on. What are those long-term questions? And we had a long discussion in -- particularly in one of the groups about short term goals versus long-term goals and so on. But it's always struck me that the real unique thing about this GEM program -- because, you know, there's so many of these programs going on all over the world that have short term goals. There's a bazillion of them everywhere. The thing that's really unique about this program -- and it really is unique. I'm sure most of you realize how unique it is but if you don't, you should stop and think about it, is the aspects of this that involve the long term, the long haul and the ability to make measurements over a long time period, which is, I think, unique in the world right now. I don't think there's another opportunity like this that exists anywhere. And that's the thing that I think should be really, really stressed.

Now what are those questions? Well, I think, you know, I don't know what they are but I think that you've got to get the people, the stakeholders, involved in that and management involved in that to try to identify what those questions might be. And there was a lot of talk about sort of short term fires and putting that all out.

But putting fires out and people from ADF&G, of course, you know, will claim that that's all they do but my response to that is sort of, well, you know, the reason why that is, the reason why we have to put so much effort into fighting fires and into the short term thing is because we don't understand the long-term picture. So if -- you know, if we just keep on doing that, if we keep on fighting fires, well, that will be it. I mean that's all we'll ever do. So, you know, the clean break, I guess, is to put the priorities on the long term.

It doesn't mean as some people might interpret and then the short term stuff gets short shrifted or it doesn't get attention. I don't see it that way at all. I don't think that there's any incompatibility at all. I think through the long-term project you will be able to address the short term goals but not the other way around. And I think that that's something that's really a key to the success of this problem.

On the overall model, the conceptual model we were all asked to look at and think about and so on. I had a similar reaction to this as some other people have already spoken to. I thought it was a little bit narrow and probably inadequate as it's stated. I started to think back on, you know, if this is a kind of a bottom up approach and there's not a whole lot in here, at least it's

not real specified about top down predation effects from both animal predators and the most important predator out there often, which is us, there's not a whole lot in there about this. And I started to think about our ecosystems back home and, you know, how would we do if we just had the physical models. Well, I can tell you right now we wouldn't do anything. It would just fail entirely to capture what we'd like to capture in long-term monitoring. So I think, you know, incorporating the -- some of the top down effects, particularly the human elements in this are really very, very important.

And I'm sure that, you know, other people have spoken to this issue as well and I'm sure this is not in any way an original thought but I'd just like to stress that from the view of ecosystems in the north Atlantic that are older in the sense, not older geologically, although perhaps they are that, too, but older in the sense that they've had human interactions and longer data bases and been studied longer and so on, that you cannot overlook the top down effects, particularly from humans. They may in fact override all the physics in the end. So that's a note of concern. And the other thing, we did the forage fish business and we decided, well, we first of all couldn't decide what a forage fish was. My own bias is I don't like the term at all but I, you know, don't want to dwell on

that one. Forage species anyway, what is food for the animals in the ecosystem and the people in the ecosystem? If we look at it as forage species, this is probably a key to this. And one of the things that came up time and time again, and I know this is true, is that these critters are often very, very difficult to assess and to measure and to get a real handle on. We're talking about sort of the large -- everything from the large zooplanktors, which are really important, up through the pelagic fishes and so on. Many of them are very difficult to measure and a lot of times that's a real hole. There are not good data series for these sorts of things. Maybe that's something that should be considered in the gap analysis, that that's a major gap and a major contribution that GEM could make.

I also thought a little bit, and we kept on coming back to sort of various strategies that GEM might use and one of the sessions that we did was on -- we had the triple interaction, you know, the sort of triple whammy stuff. And this was really amusing because, you know, it's easy enough to talk about food or habitat or removals in isolation. I mean, God, we know how to do that. We've been doing that for 100 years and we know how far that gets, nowhere. And, you know, our fisheries models that are basically based entirely on fisheries removals, in a lot of cases have failed us entirely. And we know where

that road is going to go. Now getting beyond that is not a trivial matter. It's very, very difficult from many, many standpoints. And we discussed this at length in terms of, you know, what type of a sampling design could you possibly dream up, what type of a conceptual model and then followed with a design that would test it, could you dream up that would get at this multiplicity of potential interactions in a system. And this is a very, very difficult question to answer and I think something, that if this is an important question, I'm not suggesting that it is an important question, but if it turns out to be a very important question, it's going to take a lot of work. Some of the things that did come up in discussion, which I thought were kind of interesting, were the ideas of using a kind of a regional nested design to do this study.

This brings in the scientific aspects of scale, which have been talked about and you're probably all familiar with that and other people have mentioned it so I won't dwell on it. But those types of strategies of how to actually implement a program which will test hypothesis and provide monitoring of interactions over the long haul, that may be a way to get at this because you can get at the comparisons through geographic areas. The other thing that came -- I think this was actually my suggestion so nobody picked up on it but I'm throwing it out again, yeah, we're

stubborn, is the idea of adaptive management as a way to get at some of these problems. Adaptive management, if you're not familiar with it, is a fairly, fairly old concept and I think Carl Walters is the one who pushed it maybe 15 or so years ago. And the idea that when you have complex systems like this where you've got the effects of natural resources of people and of natural factors, one way that you can try to tease out the differences is by applying different management regimes in different areas. This comes again down to a sort of a regional scale approach to things and see what happens. This is a way you can learn perhaps what the effects are in a more rigorous manner. So this is something that hasn't been used a lot in the world, to be truthful, because it's so damn difficult to apply. It involves a lot of cooperation between management and users and science and so on, which is difficult to attain but I would throw it out as don't just eliminate that concept because it's difficult. That may be in the end one of the only ways that you'll actually be able to answer some of the questions that you may want to answer. And it may be that some of these interactive questions following the old methods are just unanswerable and you'll have to face that.

The last thing I wanted to talk about is just in methods, standardization of methods and other people have

mentioned this. This is not a trivial matter. I just think back, you know, if 100 years ago we were sitting here saying, you know, how are we going to design a monitoring scheme for the next 100 years, you know. We'd all be out here with our mercury thermometers, you know, and we wouldn't even have a trawl. I mean we'd just have a sort of baited line to catch the fish with, you know, and so we'd say, okay, well, we got a standardization so we'd have that -- we'd have our little standard hook and our mercury thermometer and then, you know, as time marched on and all the technology changed and everything, what would we do? I mean, I know a lot in fishery surveys what happens, people will say, oh, yeah, we've been doing it wrong all these years. But, you know, that -- we're going to keep doing it because that's the way we've always done it. So there's a problem here which is not trivial in terms of a long-term monitoring program of standardization but recognizing the fact that the technologies are going to change, the people are going to change. You know, you and I are not going to be here in -- well, I hope we're here for awhile but, you know, it won't be that long. And, you know, there'll be other people around and they're going to have to do this. So this is, again, something I think GEM's going to have to think about.

My last -- very last comment, it's kind of hard to

shut up sometimes. But my very last comment that I was thinking about that always comes up in Atlantic Canada is -- when you talk about things like this is why are we doing this; who are we doing this for? And a lot of people think, you know, are we doing this for the ducks; are we doing this for the marine mammals? And, you know, my answer to this -- this is my sort of for whom the bell tolls question, you know, I go back to the people that I deal with, the people that I live with in Newfoundland, and I say, no, for whom the bell tolls, it tolls for you and that's where we have to get that across if this program's going to be successful. Thanks.

MS. McCAMMON: Thanks, George. Our next speaker is Josie Quintrell. Josie is a planner with the state of Maine and she's working on the infamous GoMOOS program, the best acronym out there.

MS. QUINTRELL: Thanks. Yes, we've gotten a lot of attention with GoMOOS. I am with the Coastal Zone Management Program in the state of Maine and we have been working for the last year and a half on starting up a Gulf of Maine Ocean Observing System. And it's a real treat for me to be here and also just -- it's what you have starting before you is just such an incredible opportunity. I'm going to try and make my comments brief because it's at the end but I wanted to just give you a little bit of

background of what GoMOOS is about and maybe that will help you realize what a special situation you have before you.

We are -- while you're sort of focused on environmental monitoring we are really looking at doing observations. We have two years worth of funding. Our goal is to be long-term and sustained. We have an initial funding for two years, maybe even for three. So that is as long as our long-term plan sustained funding is at this time. We have our goal to be as, you know, 10, 15, 20 years. So to hear people sitting around this meeting and talking about 50 to 100 years is just such an exciting possibility. We are very much focused on physical and optical measurements linked with codar long range radar measurements, which will be pulled together with models. And our goal is to make our information available to a variety of users in a real time or near real time basis.

And what that means is our user community is very varied. We are looking at working with the shipping industry. Harbor pilots are very interested in what we're doing because the information we have is very spotty in terms of just, you know, what the wave conditions are, what the weather conditions are. The lobster industry in the state of Maine is very interested in our information because of the larval transport of larvae from one end of the Gulf of Maine to the other. And they want to start

using that to better understand what future stocks will be. The oil industry is interested to sort of -- in preventative terms or tracking terms. The marine insurance industry is interested in this, you know, what they can learn from this kind of data. So my comments are going to focus a little bit from, you know, my view from the East Coast looking to the west.

And there's been a lot of comments in the sessions I attended about users. And the one thing I would say is is you need to be a little bit sophisticated in trying to decipher what users need. The worse thing you can do is say what do you need from a monitoring system because if somebody came to me working in the coastal policy realm that I do, I would, you know, give you a blank stare back. And I think this is where we can learn some lessons from the market research industry. You don't ask people what they need. You sit down and learn what it is they do and then how you can help them do their job better. And it takes -- it's a bit more sophisticated but you need to understand what it is the users are trying to do and then what it is that you have in terms of your infrastructure or your data and then how you can apply that.

Another theme I sort of have been aware of is I still think that there's a tension between monitoring and research in GEM. And when I came and I heard that you had

six million per year, to me that was a lot of money and I thought, wow, that is just an incredible opportunity. But in the sessions I sat in I realized each individual session could have spent the six million. And so it's going to take some backbone, I think, to create the backbone of GEM. It's really going to take some time to clarify what it is that GEM is going to do in a monitoring long-term role, vis-a-vis, the research, hypothesis driven research, and I still see some tension there. I'd like to reiterate what Tom said, which is, you know, we got our funding in June. We are going to have our moorings deployed. We have our first mooring deployed. We're going to have our moorings deployed next spring. You know, we are -- you know, we got the money and now we have to spend it. You do have the opportunity to be a lot more thoughtful, careful, to start slow and then build. And that is a real gift and make the most of that.

On the data management we learned the hard way. We thought we thought about data management but what we're turning into we realize is really a data management operation, how to take the data and disseminate it. And we didn't budget near enough for that. It's very complicated. You're dealing -- I mean I won't reiterate. I think other speakers have spoken to the needs. But in many ways, you know, a monitoring system is a data management system. And

to that end I will say that I think one of the most important things is to make sure you get products out there in an immediate user understandable way. And this may take working with public relations people or that the people who can understand and translate science -- scientists are sometimes not the best people to articulate or communicate to the public. It's a real art and I think that you need to get feedback to the variety of user groups of what GEM is going to be doing. And the web is one excellent opportunity to do that. It's not the only opportunity but it is an amazing tool. And I wouldn't worry too much about getting specific data products at first, start general.

Lastly, we were -- I did sit in on a synthesis workshop and I think the big theme that came out of that was what is written in the plan is really not a synthesis plan but an outreach plan. And that there is a real -- a key role that GEM could play in this area is both synthesis and integration. And this would happen at several different levels, one is a scientific synthesis within a discipline but then between disciplines. And that's something that I think a lot of people were not -- had articulated wasn't happening. But then the synthesis in the feedback loop that Tom had talked about yesterday between resource managers, users and scientists, and that needs to be thought about and moved forward.

I have a lot of other comments but I think I'll submit them in writing and do that. But the one thing I will say is that I think GoMOOS and GEM and perhaps Gulf of Mexico, we all have a lot of commonalities between our programs and I think we can really learn a lot from each other. I've learned a ton from being here and I hope that, you know, we can share information as we move along. And I just wish you all the best of luck.

MS. McCAMMON: Thanks, Josie. Our final speaker on this panel is Bob Spies. And Bob has been Chief Scientist to the Trustee Council since almost the beginning and he's been involved with the spill and the spill area almost since the beginning. So, Bob, would you like to sum up here?

DR. SPIES: Thank you, Molly. I'd like to make -- do two things, make a couple of personal observations that are somewhat -- and many of them are somewhat repetitive because, coming at the end, I think most of the exhortations have been made but maybe many of them might bear a little bit more emphasis. And then I would like to move on to just a few general comments.

First of all, I think that everybody has agreed for the need of synthesis. But I think the reality of the situation is that this program is probably going to get off the ground at some stage in the next several years and we

need to put that synthesis on some sort of track that will produce early results and give us a little more information before we go into a full-blown program. And in that connection this idea of starting small with a few core measurements that we know are going to be very important, continues some important series of observations, I think is going to be extremely important to focus on. And not only from the standpoint of what those core measurements -- a small group of core measurements can capture some both physical and biological characteristics of the systems that we -- of the ecosystem that we know to be important. But also from the standpoint of institutionally, there's a lot going on out there in a lot of different agencies. And I think kind of linking and integrating other efforts together is going to be a long-term effort. It takes a lot of time to get in and talk to other scientists and groups of people that are working on similar problems and to see where the commonalities are, see where the integration can take place. And I think putting a big program in the field to start with is probably not consistent with a very efficient use of funds and effort along those lines. So I'm very much a fan of starting small and building slow. And a number of speakers have also emphasized that point.

Tom Weingartner said something very interesting and it relates a little bit to the conceptual model, which I'll

talk about next. But it's very, very interesting, just from the standpoint of oceanography and what we know about how organic matters produced in the ocean and why some areas are fertile and why some areas are not, that the Gulf of Alaska seems to have several strikes against it from the first blush look at the physics and the way the climate works in terms of a lot of inshore stratification of freshwater, a downwelling system and so forth. It kind of mitigates against, one would think at first, a very productive system. So trying to grapple with that basic question to why is the Gulf of Alaska so productive then and asking at the same time how do we see these long -- why do these very long-term fluctuations that are quite dramatic that we see and the resources taking place? That's not to discount the important effects of top down processes including fisheries and other sorts of removals. But this is a basic question about the system.

There's also been, I think, in a number of sessions that I rotated between the thought that the -- we give serious consideration to some sort of a nested model approach that would look at a couple of different areas in the Gulf of Alaska, maybe Cook Inlet and perhaps something around Prince William Sound and something further at Kodiak or further down the coastal current and Alaska stream system towards the Aleutian Islands. And when these long-

term fluctuations take place, and we've seen this probably most clearly in some of the long small mesh trawl datasets that we have, that almost all these -- the regional scale fluctuations and valuable biological resources take place on a local basis. And I think if we can capture those first, we may be able to capture those in just a few sites. And I think we need to seriously consider that sort of approach.

I think also Tom Weingartner made the suggestion just in the most recent session that I've gone to that we need to understand in that context how this -- these factors that seem to mitigate at first glance against productivity, what are really the mechanisms that do make it productive and how do those changes get propagated into these local nearshore areas?

One of the things that I think we did that was fairly brave is to put forward a pretty aggressive idea scientifically about what the system may be doing in terms of conceptual models. And it was our -- really our intent to get some feedback on those and we certainly got a lot of feedback. And what I would like to move to -- I think there's two things that we need to do in that connection. First, as I mentioned in my opening comments, I think we need to look at the possibility of other alternative models and also make sure that the source of long-term datasets

that we have don't focus exclusively on any predominant model but have room as best that we can design it to test other sources of alternative models in the system. I think that's extremely important from the outset.

Also the top down processes we've tried to capture and viewing these theme species in terms of removals, and we need to integrate those further into these -- the conceptual model. We need to build a conceptual model because, right now, it pretty much just captures all the biological processes in more of a bottom up fashion. So we need to give more thought and anybody that has ideas on how to do that in a way that's fairly integrated I would -- I think that sort of input would be welcome.

I think we need -- in terms of education and outreach I think we need to think of innovative ways to exchange local observations. There are a lot of people out in this environment making important observations on the ecosystem, whether they be fishermen, local villagers, scientists, tour boat operators, what have you, there's a lot of eyes out there. And with the new technologies that we have available, through the web especially, I think there may be some good ways to capture and immediately make available that source of information. So that an individual in an isolated area might be able to contribute both on observations that are very important that may be

missed by scientists that are not there at that time or place or other sorts of observers or the instrumentation we may not be able to afford to put in every place. But at the same time those sorts of observations could be contributed -- they could be seen. An individual could see how the overall picture is developing in relation to their model. So there may be some graphic ways to display that in terms of GIS formats that can actually capture on kind of a moving basis what's going on in the Gulf of Alaska. And we might be able to show what all the humpback whales are doing, if there's large congregations of those and their important points of trophic transfer. And once we start to look at this data over the long-term we may be able to understand how we may modify the biological aspects of the monitoring program.

The other -- I guess that is kind of the results of my -- I mean the summary of my specific comments on this process, just a couple of closing comments in terms of the program as a whole. Going back to George's analogy of 100 years ago what will we do, well, we'd have maybe a mercury thermometer that we would dip in the ocean and sit at the same place and drop a fishing pole with a hook on the line and maybe that is our long-term set. And, you know, one of the problems is we haven't really done that. And in a way I'm thinking that if we -- given all the conceptual models

that might be possible and the things that ought to be measured, I think if we come across with a reasonable set of observations that most people think are probably pretty important and we have some ideas and questions and hypothesis, no matter what we do we're going to capture a lot of system behavior if we get some good long-term datasets that are reasonably well placed. And the hypothesis may change with time. The questions may change with time. And the data will undoubtedly be used in ways that we don't really realize. So I'm not perhaps as cynical as some people about, you know, the possibility of doing something really useful in the long term. But if we get a reasonable set of measurements out there and we're persistent in taking those measurements, and over the time they're going to pay off.

One of the things that we see in Alaska frequently is kind of crisis in natural resource management. Maybe it's the cruise lines dumping waste this month and two years ago it was the apparent demise of the Bristol Bay sockeye stocks and so forth. And the way the political process works is that these things come up, large amounts of money are allocated towards them and then you look back two years later at how that money was spent and you see in many cases that the long-term observational sets that were needed were never put in place or never started. And so

you continually go from one crisis to the next and the root causes of those things were never investigated. And because they can't be -- they're not -- the case is not made compellingly enough in the political arena that we need to do that. And I see GEM as a tremendous opportunity to bust out of that kind of cycle of doing things, that way of doing things. And, you know, I truly believe that the difficulties of this moment are in fact the difficulties of every moment. And once we put some of these long-term datasets in place we may not be able to answer every question that comes up but we can certainly narrow the uncertainties and give much better answers in the future.

I would like to thank you all for coming and participating in this conference. I saw a tremendous amount of energy invested in here, a tremendous amount of goodwill in terms of people freely contributing ideas energetically and in really engaging the materials because it was quite a challenge. That binder is pretty formidable in terms of materials that were in it. So I thank you for coming prepared and I thank you for your participation. I was going to make a last comment but thank you.

MS. McCAMMON: Sorry to interrupt but we're supposed to be out of here at 5:00, which is 10 minutes ago. My final synthesis is really short because you can't synthesize when you're brain dead. So I just have a couple

of thanks yous to our staff, to Paula Banks and Sandra Schubert for organizing the logistics on this, Cherri Womack, Brenda Hall and, Debbie Hennigh, for helping with that; Phil Mundy, Andy Gunther, thank you for doing everything here. Out on the tables we do have an addendum to the participants list for those who didn't preregister. But, you know, we'll acknowledge them anyway. That's out there. Please be sure to fill out your evaluations even if it's on the blue sheet or if you just e-mail us. And remember it's to GEM@oilspill.state.ak.us. All of those of you who reported and took copious notes, your comments are due on electronic form by next Friday. Thank you. And several people have asked us what we intend to do with all of these notes and if you're going to get a published document saying everything that everybody said, no, you're not. But what we will try to get you, we will be putting everything into just, you know, kind of one piece that will be unedited, un-spell checked; it will be just raw, raw, raw but we will put it all together and we will send it out to you. So you will get kind of a summary of what other people said in other sessions and I hope you'll find that useful.

Looking back at all my notes and everything for the last year of planning I realize that we have had three major workshops in the last 19 months, starting with the

10th anniversary of the spill in March of 1999. And so I want to promise you that the next workshop will not happen for at least 15 months. And with that, it's been great to see you -- that doesn't mean that we won't have smaller ones but we're not going to do a big doodah. But it's been great to have all of your participation. I really appreciate it and hope it was as worthwhile for all of you as it was for us. Thank you very much.

(Off record)

(END OF PROCEEDINGS)

C E R T I F I C A T E

UNITED STATES OF AMERICA)
) ss.
STATE OF ALASKA)

I, Joseph P. Kolasinski, Notary Public in and for the state of Alaska and reporter for Computer Matrix do hereby certify:

THAT the foregoing pages numbered 2 through 82 contain a full, true and correct transcript of the Closing Session of the GEM Draft Workshop, recorded electronically by me on the 13th day of October 2000, commencing at the hour of
3:00 p.m. and thereafter transcribed by me to the best of my knowledge and ability.

THAT the Transcript has been prepared at the request of:

EXXON VALDEZ TRUSTEE COUNCIL, 645 G Street, Anchorage, Alaska 99501;

DATED at Anchorage, Alaska this 26th day of October 2000.

SIGNED AND CERTIFIED TO BY:

Joseph P. Kolasinski
Notary Public in and for Alaska
My Commission Expires: 04/17/04

JOSEPH P. KOLASINSKI NOTARY PUBLIC STATE OF ALASKA