GEER 08 01 2008

Ronnie Best: Good afternoon; uh, good morning. It's not afternoon yet. Give me a few more minutes. Come on in and sit down. Let's get started. Wow, talk about information overload. I think we're all at the point where; good conference, got a lot of very positive comments, but it's time to, uh, bring it to closure and go home. So the comment that I would also make regarding it's time to bring it to closure and go home, and what do you do on a Friday morning; okay, well let's just cut the conference in half and we'll have 12 concurrent sessions. Is that a good idea? Okay, so I don't know what the answer is, so how do we make sure that people are here from beginning to end, recognizing information overload?

So I think we have the opportunity to bring a lot of this together. There were a number of sessions that I've marked that I absolutely wanted to go into each session. There were three of 'em this morning. I stayed in one most of the time, and, uh, I wished that I had the opportunity to go to the other two. I regret that I did not. I had 'em circled and starred on my agenda, but I just; you can only be in one place at a time so; the good thing is there's a lot of good important information out there. The bad thing is we can't be in more than one place at a time. So, uh, I hope that all of you feel the same way.

Five minutes to 9:00 last night I left the, uh, poster room area and we were supposed to go until about 7:30. We were gonna leave it available to people here to be as late as they wanted to, but the intent was to start closing it down 8:00. My point for saying that is I think one of the major values of this type of setting and what we do at the GEER conference is the networking. As much information, if not more information, takes place out of these sessions and in the hallways and in the poster session, and that's where you really have some really interesting and serious and, and thought provoking and meaningful discussions that will lead to the decision processes as we move into the future.

Some of us had an opportunity to participate in one of the opportunities that we had for looking at the decision support tools, the decision support theater, the decision support modeling. And I hope that by the next year; on the one hand I wish we had demonstrated that at a plenary. We weren't quite ready for that this year in this particular conference, but I think that as we move forward, I think that there are opportunities to use this as we move into, uh, the decision process, especially as we start addressing some critical issues.

We had a wonderful session yesterday morning at the plenary on natural system hydrology. It generated more questions than it answered. Perfect. But it also generated the opportunity, I think, to have this kind of decision

support theater concept, you know, to help contribute to how we're gonna address these types of emerging questions that come out of it; that came out of the session yesterday morning.

Beth, when I showed her my notes for today I had it written on the back of a napkin and she said don't you dare walk up there with a napkin with your notes for the session today, so I just wanted to make sure that I did show you that I have the notes on a napkin right here. So I was sitting in one of the sessions jotting down the highlights I wanted to generate. At the very top of the list it is Beth Miller Tipton. The University of Florida (inaudible) Institute do a phenomenal job of facilitating the meetings. We owe them an enormous thank you for their work.

Dr. Reddy has been my companion throughout this entire process. Could you stand up, Dr. Reddy? We could not do this without Dr. Reddy and his underwriting of this with the University.

The GEER isn't an entity. It just exists. It exists; it started off with one history. It's evolved to an entity that just exists because we need to do this. But entities still need to have a residence, and a residence that allows it to continue to do this. We need to be doing this certainly for at least the next ten years, so we need to have at least five more years. Probably the next 20 years, so we need to have at least ten more years if we do this every other year. So there has to be a way for this to continue. Dr. Reddy and his role at the University; and I think the University of Florida is one of those opportunities for that because they have been involved in the very beginning; we are going to continue to work as we move forward in our current stages in life, and who knows what happens as we move to our next stage in life. But I think something like GEER does need to continue. I think everybody in this room I'm sure agrees with that concept of the GEER continuing.

We; and one of the comments that I think is worth repeating, a gentleman was walking out yesterday as I was coming in, uh, the front door. I asked him why he was leaving now 'cause we got a lot more to cover, but I don't, we won't go there. But the comment was, he said wow, I cannot believe how engaged your senior managers are in the process. I think to me that was a very positive statement; a positive statement about GEER and a positive statement that our senior managers recognize the importance of the engagement we get in this kind of setting. And I do think we will see senior managers more involved as we move forward into the, into, implementing Everglades restoration.

I would like to add, make one final introductory, let me get a spider off of this right here, okay. One thing I don't like is spiders, okay. And he was right here, too close to my mouth. Anyway; or she was. But, uh, uh, right

before I give my; yeah, one, one more. We, I'd like to say that we have added finally the ATLSS SESI models, uh, SESI ecological models to the IMC. For those of you who have been involved and have been waiting for that, they are now, as of Friday of last week they are at the IMC, so we will start taking requests as we move forward with that. I'm adding, that the point we are adding models to those already existing, uh, southwest Florida ecological models that are available through the, uh, IMC process.

There's special recognition to Laura Brandt; is she still around here? Wherever Laura is, wherever she is, pat her on the back. She was the team leader that made it happen this year.

But also one more special recognition to the National Wetlands Research Center and the team from that unit over at Lafayette with the USGS. December of last year I talked with 'em and said we can't do this. We've been trying for the last several years to get the models of the IMC. We can't do it. We had a serious conversation in February, here we are July, and something that has not been able to happen for far too long is now at the IMC. Thank you, NWRC, the National Wetlands Research Center.

And lastly, the web cast. We are, this has been web cast. We're gonna figure out some way to make the web cast available as a follow up. I do know that a number of folks have asked about some of the plenary presentations, Deputy Secretary Scarlett's presentation. Deputy Secretary Scarlett will be providing us a written copy of her presentation. She has allowed; and she has allowed us to release that written copy as part of the GEER conference, plus the web casting will be available on that as well. So we will figure out somewhere, someway between us and Greg May's office and GEER and SOFIA, someway to make this available in a form in the future. And I think we probably are going; the intent is to probably make this something that will be a continuing operation as we move forward in the future.

We stumbled a little bit. This is the first time for such a large conference and such a large activity, and we stumbled a little bit, but I think we are learning in the process and we hope we will stumble fewer times the next time we have this.

So now let's go on to the summaries. There are a couple of sessions that we identified as overarching sessions that were going on. It's not to downplay the rest, but we emphasized both, uh, the Biogeochemistry and Contaminants Symposium and the Climate Change. So we're gonna start off with Dr. Reddy. And I assume we'll get people to just come on up here, uh, and get in line so we don't have to take too much time between transitioning. Dr. Reddy, if you'll come on up. Glenn, if you'll stand off in

the, uh, on the sidelines. I'm gonna move down into the lower floor and get people migrating through to give their presentation.

K. Ramesh Reddy: Thank you, Ronnie. I've got a couple of slides, if somebody could load my presentation? Before I get started, I'd like to say a couple words about the, uh, the symposium, this conference organization. Many of you probably do not know Ronnie as well as I know him. I know Ronnie for about almost, pretty close to 30 years now. He and I came to the University of Florida approximately the same time. Ronnie is one of those, uh, scientists; and a lot of us are working there; wetlands, you know, I work wetlands, but very few have passion. He is one of those who is really truly passionate to the system. He breathes wetlands every day. So he is one of those guys who really quietly has been doing all the work and gives the credit to other people. So I was one of those actually getting credit and he was doing all the work. So let's give a big hand to Ronnie for all his work in the GEER conference. I know we made a few mistakes here and there, so any mistakes we made, so I, I, you can blame it on me, okay?

With that, I just want to talk to you, about five or six slides I have, mainly focusing on the biogeochemistry, uh, and water quality of the Everglades and focus, a little attention given to events, to restoration. Here are some of my key observations, uh, what I've seen during the presentations. What we plan to do, uh, I think Ronnie talked about this in the beginning of the symposium, uh, is that we want to edit a book; it's gonna come out of this special symposium. The editors of the book, uh, are Ronnie Best, uh, Gary Rand and Fred Sklar and myself. Uh, a key part of that, uh, the book will be a synthesis paper which is authored by Nick Aumen, Mike Lewis, Paul McCormick, Frank Nearhoof, Lee Shugart; and this group of scientists spent a lot of time for the last four or five days taking notes and summarizing the key findings and which will be a part of this synthesis paper. Hopefully the paper will not only, uh, synthesize some of the key findings, but also provide some recommendations and the future directions for this particular topic.

These are the broad topics that we covered in the symposium. Uh, we identified some of the key sources and types of contaminants and nutrients and looked at the landscape patterns, how they vary over the landscape. And we also looked at some of the basic, uh, fundamental processes regulating the fate of these contaminants in the system, and then we also looked at the responses, how these contaminants actually affect the biotic all the way from microbes to periphyton to vegetation, uh, to wild life. And then we also looked at the transport processes of how these contaminants move through the system. And then there was an effort that went on and the modeling and integrate analysis of these contaminants and several case histories have been presented at the

symposium. And the synthesis paper is now under development which will contain the recommendations and the future directions.

Here is my key observations. Uh, as I went through some of these presentations and talking to some of the folks, we were able to, uh, talk a little bit not only on the anthropogenic nutrients and contaminants coming into the Everglades, but also some of the natural processes regulating contaminants in the system. And there was a heavy emphasis, as you know for not only this GEER conference and the previous ones on phosphorus fate and transport; is heavily studied. And the landscape patterns in the system are very well established now and the more information emerging on other contaminants; uh, pesticides; and, and we're seeing the information on sulfur issues and metal, mercury issues. And the studies have been conducted at multiple scales, you know, all the way from molecular level to the landscape level. But one thing I've noticed, that they did those studies have occurred independently and it still lacks integration across these scales. And also the linkage between, uh, the phosphate biogeochemistry and the other elemental cycles is now recognized, uh, with a lot of emphasis in the last 10 or 15 years or so focusing on the phosphorus issues. But now the linkage of this phosphorus loading and the phosphorus biogeochemistry to other cycles like salt water cycle, mercury cycle and carbon cycle and nitrogen cycle, and those feedbacks are being now recognized.

One of the key things affecting the restoration process is the legacy nutrients, especially with reference to phosphorus. And this has been now recognized, especially in the mouth of Lake Okeechobee, the legacy of phosphorus is a major issue. That's one of the reasons, I think, that the loads to Lake Okeechobee has not been reduced, and the cycling of sulfur and mercury which is now linked to hydrology and the nutrient loading,

Uh, what I've seen is I think that multiple groups are working on different topics, and often some similar topics. What, what I've seen is I think the groups are functioning on their own. I see very little integration or the lack of coordination among these groups. So what I'd like to see is a more holistic and integrated approach to some of the complex issues. The issues are becoming more and more sophisticated and more and more complex.

There are several modeling approaches that have been emerging in the system, but the clear utility of these models by many, this is still not very clear of the many who are actually using this model or not, it is really not clearly established. And often the connection between the experimentalists, the people who are doing the actual data collection and the people actually doing the modeling, I think that connection is still missing, uh, and the relevance of the key to such findings to restoration

and management are not clearly identified. Hopefully these things will emerge as we get a better understanding of these processes functioning in the system.

To me, I think that some of the future directions the way I see it, the, the hydrologic restoration must be clearly linked to water quality. I think that this information is emerging, but I think it becomes more and more important as, with respect to rehydration of some of the agricultural lands now in the process (inaudible); when you rehydrate some of those, uh, lands, I think that new issues re-emerge I think, so it's very important to think about it in that direction. Uh, and the mutual dependency of one elemental cycle or other cycles, the feedbacks and controls, I think these need to be looked at. I think that, that information emerging now, how the phosphorus cycle affects the carbon cycle and vice versa.

Uh, the linkage between the biogeochemical processes in biotic communities, especially looking at the microbes in the small place doing bigger things, how it affects the periphyton communities, how it affects the vegetation, and how all this biogeochemistry affects the wildlife in the system. So I think these integration need to be looked at holistically. And like I mentioned before, I think the integration across scales is very important, and that we need more sophisticated approaches, uh, on statistical and geospatial, and process based models.

For adaptive implementation, relevant synthesis of new information is very important because that's a feedback. We really need it as you document management during the restoration process.

A couple of more, uh, bullets. Uh, influence of extreme events. Hurricanes, I think, and the climate change issues, I think all of them affect the biogeochemical cycles, so we need to think about in that direction. And as sealevel rise. what effect that would have on some of these biogeochemical cycles. It definitely would have salt water coming in, salt water issues will increase because the salt water is coming into the system.

Uh, we haven't really addressed the greenhouse gas emissions as a result of the restoration process. Is it a positive or negative? Natural emissions coming from some of this natural system need to be documented.

Currently the restoration study should be linked to, uh, other ecosystem services. For example, carbon sequestration. During the middle of this conference, uh, I needed to go to Orlando to give a talk to the, a subcommittee of the Century Commission. They are interested in carbon sequesterion issues and carbon reservoir issues in the Everglades. So when I looked at some of the information I summarized, I think it's pretty,

uh, daunting in, show that the complexity of all our decision processes that improve the carbon issue in the system, there's a lot of positive things that are happening with respect to carbon issues.

But finally I think the point I would like to, one final type of message is we need to strengthen the linkage between the researchers, the managers and policy makers. It gives me the impression that we're all on different islands all the time. The researchers are in one group sitting on their own island, the resource managers are doing their own thing, the policy makers are deciding everything. So somehow if we can bridge these gaps, uh, I think that would strengthen all our effort on what we are trying to do to restore the system. Thank you for your attention. Uh, I really appreciate your support and the time you spent here for the whole week, and the fact I think that so many of you are still here I think shows that you are interested and dedicated to this project restoration program, and thank you again.

Glenn Landers: Good morning. I'm Glenn Landers reporting on the Climate Change Workshop, and I'd like to start by thanking my co-conspirators in putting that together, Dr. Leonard Berry, Dr. Marguerite Koch, and Kalani Carnes; and also Nick Aumen and Jayantha Obeysekera helped, uh, with that.

Key points for us, stationary in terms of climate is dead. All future studies must address climate change on certainties and risk. The 2007 IPCC Report shows a 90% probability of 7 to 23 inches of sea level rise by 2100. But if you've been following the news and recent field observations in polar regions, uh, melting of the arctic ice and the breakup of ice shelves in Antarctica, you'd recognize that that estimate may turn out to be low. We're also expecting a guidance from the, uh, National Academy of Sciences in the CISRERP review due late September, that will provide us additional guidance on sea level rise.

There are many uncertainties in climate change forecasts, uh, and most of 'em tend to increase the risk of some higher ranges of sea level rise and/or an acceleration in the rate of change. Global models, uh, currently indicate that the future annual precipitation in subtropical areas like Florida will likely decrease and rainfall events will likely be more; be less frequent and more intense.

It's important to create some regional scale, Florida scale models, so, uh, one of the recommendations, we worked on downscaling global model results to a Florida scale model and include, uh, natural variability and then run a range of future scenarios that; as proposed by the, the agencies cooperating in the survey.

Uh, consider accumulation or loss of sediment and peat due to storm surge, fire and deposition when calculating relative sea level rise in the natural areas. The comment was made about, uh, buildup of some marl or some sediments from the storm surge, uh, raised ground elevations in Flamingo Area, I think, quite a bit. Natural system model targets based on this, uh, potential climate change adjustments of -10% in rain and +1.5° centigrade, uh, indicate there will be a future, uh, decrease in water supply and we need to consider that in, in the natural system model targets. Climate change will certainly increase the competition for water. We need to understand the role of long term multi-decadal natural variability in climate change concerns.

We need to; it would be important to develop a coordinated inter-agency approach for addressing climate change, and that probably goes beyond just the agencies directly involved in CERP. It might involve, uh, FEMA as a potential, uh, avenue to buy out some of the homes most at risk, uh, from rising sea levels or other flooding impacts. We will need legal and policy changes since we are no longer dealing with stationary future conditions. We need a coordinated inter-agency outreach plan, uh, for climate change. This needs to include the universities and others. The message is climate change is happening. It is happening, and, uh, perhaps we could provide some updates via a web site. But there's a sense that many in the public, uh, perhaps, uh, don't understand that climate change really is happening or the impacts coming in the future.

With Everglades restoration we have what many do not have, broad authorities and planning capabilities to begin identifying potential climate change impacts and ways to address them. In FY09 there's, uh, we plan to initiate a CERP sea level rise sensitivity analysis. This is basically a screening level activity led by the RECOVER planning team to quickly identify key areas of concern and develop coordinated plans for future actions.

Everglades restoration is likely more important in a time of climate change and rising seas. Thank you. Any questions?

Agnes McLean: This is rather imposing up here. Good morning. For those of you all who don't know me, I'm Agnes McLean. I work for Everglades National Park. Uh, I was I suppose the primary organizer on two different tree island workshops that we had this week. But it certainly would not have been as successful as I believe they were without the help of Fred Sklar, South Florida Water Management District; Lorraine Heisler, Fish and Wildlife; uh, Pamela Fletcher with NOAA and Greg Kiker with the University of Florida.

And Ronnie mentioned earlier that we demo'd a decision making, uh, computerized process, and we of the tree island workshops were the guinea pigs. So what I'm gonna show you; and I literally threw; we finished a little after 10. I literally threw these slides together and I'm not even sure what order they're in, so bear with me. Uh, but I'm going to show you a little bit about where we started, which is, this is a tree island, draft tree island conceptual ecological model. So I'm gonna show you where we started, I'm gonna show you a few of the results of the voting that we did both Wednesday night and this morning and kind of what we came out with.

So this is a typical; again, conceptual ecological model. There are I think 11 regional models and one total system model that have been developed over the past ten years or so for, uh, south Florida ecosystem restoration. There was a recognition I think that we needed to gather and synthesize the information that we have on tree islands and we chose this venue to, uh, do that. Again, a typical model. The boxes at the top, or the rectangles at the top are what we call the drivers. The next tier down in kind of a pinkish color are the stressors. Then everything in the middle in the diamonds are really the guts of the model. These are the ecological effects, uh, of those, of those stressors. And then, uh, at the bottom of the model are the attributes. And the attributes are things that we care about about tree islands.

We added a different dimension to the development of this conceptual model that we had not done before. Uh, this is something that has been used in coastal Louisiana and also in CALFED. And so we're adding a layer of complexity to the models. Uh, so we asked the group on Wednesday night if; let me go back for just a second. You see all the numbers? Those are all, there were 30 linkages between the, the stressors and the effects, the ecological effects. And so we asked the participants of the Wednesday night conference to rate each one of those as to its degree of importance, uh, how well we understand it, what's our current, you know, state of, of research on this linkage, and because we eventually want to have performance measures that we can both assess in the field and be able to predict to evaluate restoration plans, we wanted to know how predictable we think this linkage is.

So after devoting of Wednesday night, we came out with this diagram, and this is the diagram that we worked from this morning. Uh, so the thickness of the line indicates how important is it. And if you take a look, there are a lot of thick lines on that diagram. So a lot of these linkages, a lot of these ecological effects were thought by the group to be very important. When we get to understanding, it's kind of more of a mixed bag. We have high, medium and low there. And predicability probably is our weakest link I would say in this.

Um, this was not my presentation. I told you. Okay, let me, uh, let me regroup here for a moment. One of the slides that I had wanted to show, and let's run thorough these to see if they're actually here, was the fact that on Wednesday night that I had a group of 21 scientists in the room and we're voting on these three different things for each of those linkages that I just talked about a moment ago. And I know some people say you get 21 scientists in a room, you got 21 different kind, opinions about a subject. But we really showed; uh, and again I apologize. I'm sorry this isn't here. We really showed that there was a lot of agreement. There really was a lot of agreement. There were a few things that people said I can't really answer this or we need to have more discussion of this, but there was a lot of agreement in the room.

This was also a question that we asked, uh, both on Wednesday and this morning. Uh, so there was obviously quite a few people who actually had been on tree islands and were doing work on tree islands in the not too, you know, distant past.

Uh, demographic questions; again, I apologize. I think the next three are the ones I want to end with. However, so we started with the stressors, and what we wanted to get to today was a priority ranking of these six stressors. Those were those pink boxes that you saw second, second tier on the conceptual model. We wanted to get to a ranking of what should we really focus on; in the development of performance measures, what should we focus on kind of first. Uh, hydrology jumps out, as I think that's a no brainer for people, but it doesn't jump out by all that much. Uh, nutrients and exotics were thought to be pretty important also.

Then these were the attributes. Again, we, we've got a lot of work ahead of us. We can't jump into this all at once. We can't do everything at once. And so we asked the group this morning which of the attributes, the one, two, three, four attributes that we had, do we need to work on first? And, again, folks thought that vegetation was important, spatial extent was important and accretion rates were important. Uh, I'm not sure how we're gonna deal with this data in trying to, to work out priorities, but that's yet to come.

And then these effects were the last thing, the intermediate effects or the linkages were the last things that we voted on. And again, no clear priority in my mind that I can see to start the next phase of the work. So, uh, we've got some, some digging in to do. There were a couple of demographic slides that we looked at; you know, like are you a manager? Are you a physical scientist? And, so we're gonna, we're gonna slice the data up in, in some different ways and, uh, see what people thought about all of this.

Now the original model, uh, that I showed is a result of a workshop that we held back in December. We had about, uh, close to 30 Everglades, uh, tree island researchers that came together and; so we're definitely building off of the work that was done, that was started in December.

We'll do a summary of this workshop, of these two workshops that we had on tree islands. That will be sent to, to Ronnie to be put on the GEER web site. There will be, uh, links in that summary so that if folks are interested, you can go back to the December workshop, you can download everybody's presentation, download all the, everything that's been generated so far in this work, uh, to develop a tree island conceptual model and the next step, which will be, uh, trial and performance measures. So with that, I thank you.

Jud Harvey: Good morning. I'm Jud Harvey of the U. S. Geological Survey and I'll be briefly reporting on the results of the workshop on Role of Flow in a Sustainable Everglades. My co-conveners for this workshop were Fred Sklar of the South Florida Water Management District and Leonard Pearlstine of Everglades National Park.

Our workshop focused on research progress reports. We had 14 oral presentations and eight poster presentations that updated research progress over the last two years, since the last GEER meeting. Within that context we had lots of time for discussion and debate on the, uh, main processes responsible for origin, maintenance and the main issues facing restoration of a sustainable ridge and slough landscape.

We recognized, started by recognizing that the changes over time, loss of water storage, decease in wetland areas, subsidence, are associated and, along with loss of major areas of ridge and slough landscape structure throughout the central part of the Everglades. There's, there do remain areas of remnant ridge and slough and it's within this area that most of the research is taking place.

In terms of points of consensus. The first one, sheet flow is ecologically significant, especially to maintaining habitat connectivity within the ecosystem. Now this seems basic at first. But when you think about it from the perspective over the last five years since the Science Coordinations Team's White Paper, there are six independent research groups, both from government and academic institutions, trying their best to refute this hypothesis, and instead we're finding a lot of consensus.

Here's one example, it's one group's conceptual model but it really represents a consensus amongst a number of research groups. And up in the upper right hand corner, well, ridge and slough geomorphology is in

the center and, uh, there are two main interacting sets of processes affecting its origin and maintenance. Up in the right hand corner, a familiar one, differential peat accretion feedbacks. And this is driven by, primarily by water table, also by phosphorous concentration and redux potential. This drives peat accretion. This type of work has been going on for decades in the Everglades and it's a strong basis for the recent progress. But the, uh, the recognition that people have made is that in the lower left hand corner, it is impossible to have elongated ridges with interconnected sloughs without interaction between velocity, sediment entrainment, and especially redistribution of carbon from sloughs to ridges to maintain that, uh, that connectivity within the sloughs.

So, uh, a second point of consensus that I think deepens our understanding, the remaining ridge and slough ecosystem, the one we see out there is unsustainable without restoration of flow. It is degrading right now, even though at my opening slide showed what looked like a functional ridge and slough ecosystem, it's not. It's degrading. Uh, about 40 scientists agree on this point. And in fact there was a lot of emphasis, uh, and reminders for me to say that, uh, it, without attention soon, uh; the more it degrades, the harder it'll be to restore, so without attention soon it will be that much more difficult and possibly impossible to go back to the original slough ecosystem.

Another point of consensus; there's been remarkable progress in measuring flow in the Everglades, something that just a few years ago, just five years ago was thought to be impossible because the velocities are so slow. But both due to technological advancements and also due to the experience of researchers doing the work, and this is not just one group, it's many groups now, we can measure flow at various; many spatial and temporal scales in the Everglades. And I show just one example of that.

Here these are frequency diagrams showing measurements of flow ranging from zero to three centimeters per second at three sites in Everglades National Park. These show that velocities differ between sites. Notice also the color coding. It also shows that velocities differ between years. And now we can contrast that; there's enough measurements to contrast that with sites in the water conservation areas. Note the big difference. This is something that we knew conceptually a few years ago, that flows were slower in the water conservation areas, but now we know to great detail that, to two significant figures how much slower the flow is, uh, below a half centimeter per second in the water conservation areas, where we approach a centimeter per second or more in Everglades National Park. We even know why. We know about; we now through groups like EDEN and those type of measurements, water slope, surface slope measurements and more detailed land surface slope measurements

are possible in various parts of the Everglades, so we even know the controlling processes.

So that brings us to our last point of consensus. At this point we acknowledge remaining uncertainties. We can talk about that in detail here. I decided not to do that. I'd rather just to acknowledge that there are remaining uncertainties, but there's consensus amongst this research group that those uncertainties can be addressed as part of an adaptively managed DECOMP program. And there was a lot of excitement, both at the South Florida Water Management District, Everglades National Park, and USGS, as well as academic institutions, about being involved in, uh, a DECOMP physical model, an on the ground landscape scale experiment that wold represent a real positive step towards getting DECOMP underway. Thank you.

Matt Harwell: Good morning everybody. My name is Matt Harwell. I'm an ecologist at the Loxahatchee National Wildlife Refuge, and what I wanted to talk briefly about today was the annual science workshop that the Refuge held in concert with the GEER conference. A number of players were involved in putting this workshop together and so their names are listed here, and so it's not just me. I'm just a figurehead for the day. Every year the Refuge puts on an annual science workshop to try to bring together the state of science, state of knowledge, bring scientists together to talk about research and other things that are going on relative to the Refuge. We've had this held at the GEER conference once before and we were grateful that we were able to bribe ourselves into, uh, going to GEER this year.

Male: (inaudible)

Harwell: Thank you. So the science workshop setup that we had is essentially a forum for learning, about discussing research that's being conducted at the Refuge, work that we're doing ourselves, work that we're contracting out, work that we're having academic and other agencies come and do with us; uh, all that combined together. And, and one of the great things about this GEER forum is, is we basically presented; between five and ten percent of the total abstracts that were submitted for GEER had either direct relevance or very close relationship to the Refuge itself, either explicitly tied to the workshop or scattered throughout the rest of the conference.

As Mark Myers mentioned on Tuesday, it's, it's the forming of these critical relationships among agencies and institutions that's desperately needed to get the job done from the science perspective, and that's exactly how we get the science done at the Refuge as well. We had two components to our science workshop for the Refuge. We had an oral component and

we had a poster session component. We had oral presentations for over the course of an entire day with a series of 14 speakers. We had, uh, three main themes. These are the speakers that we had listed with us. We had three main themes for our oral presentations.

The first session was we had our friends from LILA come play with us, and we were very grateful that they came to do that. LILA is a very important, uh, component of the work that we do at the Refuge and we were delighted that they were folded into the mix for us.

The second component that we had was tied to, uh, hydrology, and most of it focused on, uh, modeling aspects, water budget, hydrodynamic water quality modeling, uh, EDEN aspects, so we were very grateful for that as well.

And the third part of our workshop from the oral presentations focused on the biology aspects. And it started with talking about things like the age of water and, uh, the (inaudible) issues and the water age. Then it moved on to water chemistry in the marsh. And then from there it moved on into, uh, more of the ecological trophics with periphyton and so on up the food chain. And then we also had some paleoecology work presented as well.

The poster presentation was a separate session and it was the next day, at the night, so we were grateful that we had them back-to-back. And we had a series of more than a dozen posters, uh, as part of our workshop, as well as others that were scattered through out the conference. And these are, these are the authors that we had present posters for us. We were grateful we had a smattering of students to professors, academics to agency scientists; so we had a good spectrum all the way around.

What we were really grateful for was that we had a combination of scientists, we had a combination of managers and planners and decision makers. And we also had a series of; we had the whole spectrum of people who were used to coming and playing with us at the Refuge and those that really hadn't spent much time with us and wanted to come learn more about it. And we had a couple of instances where people said you know what? Come, come see me afterwards. I bet we can run some samples for you and maybe we can get to the answer to this question, and so that was great for us.

This is a slide I showed in one of my talks that talks about the kinds of science that we're putting together as we're trying to apply that in a, towards resource management. And, and the examples of information that was presented here focused on things such as tracking canal water movement, characterizing water quality in the marsh, modeling; I described the spectrum of modeling that we had; ecological effects

ranging from looking at periphyton to apple snail studies and so on. And we also focused on taking that science to the next level. It's great to provide science and make management recommendations based upon that science, but it's that next step, the implementing those recommendations in a management decision, doing something, finding out what happened, taking information then and relearning about it, and then working towards the next round of recommendations. And we were able to do that too and present some of that here as well.

And again at the bottom, I mentioned that we had our, we had our special friends from LILA come play with us. And; okay, that's a different topic so; uh, that was, that was it, Refuge Science Workshop.

Matt Harwell: Good morning. My name is Matt Harwell. I'm gonna speak to you today about the, uh, the RECOVER System-Wide Assessment Workshop that was held at, here at the session. Ronnie, you made the comment earlier about not being in two places at once. The two workshops I was involved with were held concurrently, so I know exactly how that works. And cloning technology has not quite yet been perfected.

We had an all day session that presented the science-wide assessment of south Florida ecosystem health. This is functioning, this is focused on the RECOVER aspects of work that had been happening over the past handful of years. We wanted to bring together as a big picture synthesis of sort of where we were, where we are and where we're headed. And a number of people were involved in this. Actually, a large number of people were involved in this. And just a few of them are listed here.

The workshop we had had five main components to it. Four of those components were sort of geographical based and focused on the science learned on those four group components, starting with the northern estuaries, Lake Okeechobee, the Greater Everglades and the southern estuaries. We covered a spectrum of science related topics in each one of those categories to give everybody a smattering of the kinds of research that's been happening at this system-wide, at this RECOVER level.

In the northern estuaries we had presentations on oysters, macrobenthic communities and sea grasses. Lake Okeechobee had covered the whole spectrum about characterizing the status of the health of the lake. The Greater Everglades session focused on vegetation indicators, aquatic fauna and also on the EDEN connections that's trying to draw connections between the Greater Everglades and the southern estuaries, which led directly into the southern estuaries component of the workshop. It focused on things like salinity aspects, water quality SAV and the higher up in the trophic level with fish and invertebrate communities. So you see we covered a pretty broad spectrum.

We also had a fifth component that focused on the system-wide science, and that really focused on providing a history of what RECOVER has done, describing where we work currently and where we're headed in the future. And that had an aspect that was intentionally applied for, for the purposes of relevance for managers. And we had managers that were present throughout just about all of those components of the workshop; all five components, whether it was the technical aspects or sort of the system-wide management implications.

And finally, we tried to lay the foundation for the technical argument for the need to pursue aggressively the reauthorization of funding to continue system-wide science, specifically as it relates to providing management recommendations in applied forum that we can do to make better plans, to make better improvements, to make better optimizations as we go down the restoration path.

Briefly I'll talk about looking back. We talked about, we presented information about the applied science strategy, the original monitoring assessment plan, the history of, including conceptual models; and Agnes talked about an example of one earlier today; hypotheses and performance measures and how all of those things are wrapped up in terms of how we try to do science to inform management. We talked about the assessment strategy, how we translate that scientific information and present it in a forum, in a manner that's tangible for people who can't spend their time reading 400-page reports. We talked briefly about those reporting mechanisms that we do have. All of those things were relevant to pretty much all of the monitoring in the monitoring assessment plan, whether you're talking the northern estuaries all the way down to the southern estuaries.

We discussed what was going on currently. We talked about extensive efforts undergoing, underway under the MAP monitoring and research. We talked about applications of that research with these assessment protocols and how we're focusing on detecting change. Looking at the interface of MAP monitoring, that's the system-wide perspective, and down at the project level, that's our project levels. This is an area we've been aggressively trying to pursue those connections over the past couple of years.

And finally we talked about using system-wide science to inform decision-making, focusing on adaptive management, and indeed there were linkages between the system-wide workshop and the adaptive management special session that happened the next day. And it was great to see that there was a good overlap of people between those both from a technical level and from a policy level.

One of the examples of the current work that was presented was, uh, was the oysters in the northern estuaries. We focused on not just simply the performance measures of those oysters, but how we developed tools, predictive tools that could be applied towards monitoring and assessment and predictions and focusing on options that can be used for science, by scientists to serve up to managers for decision making. If I'm spending $100,000,000 on a restoration project and I'm not getting those oysters in, it might not take that much money to do the monitoring, to do the additional piece of throwing out oyster cults to be able to get that success that we're looking for to make that large, expensive restoration project successful, and so we're starting the process of serving up those kinds of information.

The workshop also then focused on looking forward to where we were heading next. It talked about MAP refinement and streamlining hypotheses and performance measures in monitoring. Agnes gave an example of how they're trying to take the tree island conceptual model and evolve that into the next generation.

We talked about using monitoring information to help us reduce risk and uncertainty; that was not me, thank you; and focus on things like benchmarks and thresholds, and that we shouldn't be afraid of things like uncertainty, but we have ways to mechanistically fold those, that into our efforts and activities, so that when we're serving up management recommendations they're tangible.

We talked about effective communication. We talked about issues of scale. We talked about integration again of, we're sort of focusing on integration again at the system-wide and at the project level. The one key example of how we're trying to look forward was discussed, uh, at the interface between the Greater Everglades in the southern estuaries module components of the workshop focusing on EDEN and the coastal gradients of flow, salinity and nutrients, trying to tie those two pieces together, so that we're not necessarily talking about them as distinct geographic pieces. And that was our workshop. Thank you.

Betty Grizzle: Good morning. I just want to thank Ronnie for allowing me to include my session, the Lake Okeechobee Historic Session, in the conference. And based on the comments that Rosanna Rivero and I received, I think our session was very successful and I want to thank the presenters. I know some of them probably have left. But I want to thank them for the time, and especially Cherise Maples for driving over yesterday and providing the Seminole tribe perspective on this issue.

Uh, there was lots of information presented. I'm certainly not gonna go through very much this morning. Uh, all the abstracts are obviously available. Uh, I'll go through a few highlights. I think one of the interesting parts was the origami presentation we had from Christopher McVoy and Robert Fennema, and basically it's, you know, here's the lake. It's just another dipping bowl. This is the south end and this is the water coming in. And the shoreline was very different back then. As you see, it was largely sawgrass plains. The photo over here is from 1911. We don't know the exact stage of the lake at that point. It's probably close to 18, 17 feet. Uh, that cypress is the lone sentinel cypress, which is still in the city of Moore Haven. That's about eight, nine miles from the open water of the lake right now, so just to give you a perspective of where the lake was historically. Uh, one of the key points was Robert Fennema showed a nice slide of the fluctuations of the lake levels even with the regulation schedules. We do have data from 1912 and you just see these wild fluctuations, uh, in the lake since then. Historically it stayed pretty tight between 18 and 21 feet.

This is also from Robert Fennema. One of the key points we came up with was lake, high lake stages did provide the hydraulic head to the Everglades. This is especially important in the dry season. This is something that we need to think about when we put this piece; the puzzle back into the system. And you can see the, the profile of the lake historically, you know, up at 21, 22 feet, sloping down to Florida Bay. And then the surface elevation is; obviously we've lost a lot of the peat south of the lake. And that has implications for the restorations and the EAA obviously.

We had a panel, a nice panel discussion in the afternoon. I'm sorry more people couldn't of attended that because we had a, we had a very robust discussion about the U. S. Sugar project, uh, what was going on north of the lake, uh, water quality issues; which was not the focus of the talk, but of course it's extremely important for the lake. So I think we all concluded you need to restore some of that historic, uh, storage function of the lake, but you do need to clean the lake up; and I mean that in a very general sense. But, and there's lots of talk about that obviously.

Before you decide on what storage options you want to consider and at the same time; this is all connected as everybody knows in this room, you need to open up the system in the south, water from 3A to 3B and through the Tamiami Trail, to get the flows through, uh, the southern end of the system into Florida Bay. But the timing of this is very critical. We talked about this quite a bit yesterday. You need to consider dry season carryover and storage considerations for that, as well as, you know, how much you can put through in the wet season without blowing out not only STAs but the system to the south.

And that's basically it, and I'll be around for a little while this afternoon if you have any questions. Thank you.

Lewis Hornung: Good morning. My name is Lewis Hornung and, uh, you may be relieved to know that I've only got three slides. Our workshop was on the, uh, issues related to Lake Okeechobee and the discussion of the holistic approach that's being taken to address the problems of water quality and water management in the lake. I did have three slides which I put together earlier this morning. I'd hate to see all that work go to waste. But I'll proceed on.

We, uh, we had a series of presentations that, uh, related initially to describing the problems in Lake Okeechobee from a water management and water quality standpoint. Uh, the problems are at a tremendous scale and they are so massive that the solutions to those problems are gonna require, uh, input from virtually every entity that steps foot in the watershed or, uh, and all of the agencies and individuals that, uh, that have any responsibility are gonna play a role in the overall solutions. Uh, there have been a long, there has been a long history of, uh, recognition of the issues particularly related to eutrophication in the lake. As early as the late 1970's the problems were recognized.

Uh, the first real comprehensive plan for restoration of the lake was developed in the 1989 SWIM Plan. And, uh, since that time there have been a series of, uh, followup plans that have built upon actions recommended in the initial SWIM Plan and added to those actions. So this has been a, there's been a long history of restoration efforts addressing Lake Okeechobee. And as I say, each one of those has accumulated the past efforts and built on those and it's been a remarkable period of, of 20 years plus where, uh, there's been consolidated efforts towards the purpose of restoring the lake.

And most recently in February of this year, uh, the South Florida Water Management District in cooperation with DEP, DAX and IFAS developed a Lake Okeechobee Construction Project Phase II Technical Plan that was the result of the northern Everglades and estuaries protection legislation by the State. And this is, this plan lays out conceptually the overall umbrella of all of the actions that are gonna be required to restore the lake and to meet the TMDL by 2015.

We had presentations on all of the activities that are, uh, related to that plan, including CERP, the CERP components in, in the Lake Okeechobee watershed itself and the C43 and C44 basins. The EAA reservoirs are all adopted into the, uh, Phase II Technical Plan. DAX is working with landowners, with all of the agricultural landowners in the watershed, uh, in

developing conservation plans for each individual farm and then providing financial support for the implementation of BMPs that are recommended in those plans. Uh, they have made remarkable progress in the last five years, uh, and they are on track to have, uh, the entire watershed, uh, covered with BMPs in the next few years. It's really been an amazing level of effort. DEP has played an important role in the establishment of water quality standards, setting the TMDL for Lake Okeechobee phosphorus in 2001, and most recently setting, establishing, uh, or at least publishing a proposed TMDL for the tributaries that's out for public review right now.

Uh and in addition to that, uh, there have been some very innovative approaches. We had a presentation on one of those by Patrick Bohlen, who presented with Sarah Lynch of the World Wildlife Federation, an approaching for making, allowing individual landowners a, uh, potential profit by storing water on their property, reducing phosphorus and, uh, and through a contract that would be signed with a State agency, and they have had remarkable success on that. They have found a number of landowners that have been willing and able to sign up for that program.

And, uh, I think that's about it. Thank you.

Sharon Ewe: Hi. I'm Sharon, and Carlos Coronado from the South Florida Water Management District and I put together this workshop on mangrove ecosystems. And the reason we wanted to put this workshop together was to try to get an idea of who was doing the latest and coolest research in mangroves in the Everglades ecosystem. So we asked people to come up to this meeting and share their talks with us, and we're really excited to see the, uh, great findings that have come out of this session.

One of the, uh, key fortunate coincidences of this workshop was that several of these folks were utilizing the same techniques and working in different parts of the Everglades, so there was a synergistic interaction which we did not expect when we were first putting this session together that, uh, I'll show you briefly.

So the first group I'm gonna briefly talk about is, uh, Donna Devlin and Ed Profitt from FAU, and they were looking at maternal influences that influence restoration success. And they have been planting mangroves from the west coast and east coast of Florida in different coasts, so they're doing reciprocal transplant experiments. And they've done this for three years and they've actually found some interesting trends that you would not normally see in a shorter term experiment. Uh, what Donna found was that, uh, Distichlis spicata, which is the grass that you find growing at the edges of the mangroves, can actually reduce the predation of a moth on Rhizophora propagules, and they sort of form like this protective barrier

against the moth infesting and killing the mangrove propagules. As a plant biologist, I thought that was really cool.

Ed used the same setup, but he was looking at slightly different questions. He was looking at growth and height in these plants, and they found that the plants that were planted at lower elevations, regardless of whether they came from Tampa Bay or an inland river or lagoon, grew better at deeper waters. Uh, the other thing that they found was that some maternal populations grew better at, uh, higher elevations, whereas some other maternal populations grew better at, uh, lower elevations. So maternal influences on survivorship and growth is important, which I thought was kind of cool. I just go out there and I look at mangroves and you don't think about what maternal influences can do to the long term survivorship and genetic structure of a population. So I thought that was pretty neat.

And then we moved on to, uh, the second afternoon session where we talked about, uh, more landscape scale dynamics and long term dynamics as well. And the peat that we all step on as we're running around the mangroves turns out to be quite a dynamic substrate. And there are all these interaction effects that only long term studies would show. And Tom Smith has a beautiful data set that shows that, uh, the elevation, accretion and mud flat elevations, they all do different things. And you only capture that variability if you do it over 10, 15 years. If you do it one year, you might or might not see a trend that's representative. And I know I'm not doing justice to Tom's, uh, data, but I don't have ten minutes to try to explain it. It's really cool data. You should talk to him.

Um, the other data set was from the LTR from Florida Bay by Carlos and the, through the FCE and South Florida Water Management District collaboration, and this was done in Florida Bay and you see very different patterns compared to what you see in southwest Florida. And it's really cool, different habitats, um, different vegetation and totally different dynamics.

Then we looked also at, uh, hurricane impacts on mangrove forests. And what Tom has found is that mortality can occur several years, up to several years after a hurricane has gone through. And this next couple of slides I'm gonna show you is from work from, uh, Hurricane Wilma. So we're starting to see, uh, results and data and publications forthcoming from these, uh, effects of hurricanes on vegetation and sediment dynamics.

And Vic Engel had a really cool talk. We were all looking forward to it. Unfortunately, his PowerPoint didn't load up at the, uh, session so; in any case, Vic has kindly slapped together a couple of slides for us so that we don't miss out on his cool findings. And what this first figure on the left

shows is that pre-Hurricane Wilma, this is at Chart River Slough, 4.1 kilometers inland from the, uh, Gulf of Mexico; and the forest was intact before Hurricane Wilma. Post-Hurricane Wilma, you can see the boardwalk has gone, the forest has flooded and more importantly you see that the temperature at the, uh, soil surface is much higher after Hurricane Wilma. Now what sort of implications does that have on the forest structure and forest dynamics? It turns out that Vic has been measuring the, uh, CO2 efflux from the soil and, uh; well, from the forest and from the soil; and what we're finding is that when you have a negative value, the CO2 from the forest, the forest acts as a CO2 sink. But when there is a positive value, the forest is a source of CO2 to the atmosphere. And what you clearly see is that pre-Wilma, which is the blue bars, the forest is a CO2 sink, but after Hurricane Wilma the forest has become a CO2 source to the atmosphere. And this is especially clear during periods of high temperatures and low tidal cycles. So I think that's a really cool finding, and this long term data set has allowed us to show that.

Um, the last part that I thought was really neat was Edward Castaneda from LSU talk where he showed hurricane deposition on the mangrove forest. And they went out right after the hurricanes and actually measured sediment depth across the, uh, mangrove forest. And what they found is that those sediment depositions, from 1 to 4 centimeters in the mangrove forests, and it was greatest closest to the mouth of the Shark River on the west coast of Florida and it decreased as you went inland. And what sort of implications does that have on the forest? Well, it affects the accretion rates within the forest itself. It also affects phosphorus accumulation within the forest itself. And the, uh, accumulation of phosphorus from the hurricane, one single hurricane event, was equivalent to 0.9 and 2.2 times an annual deposition event. And I thought that was really cool.

So in any case, these were great speakers. I was really excited to have them and we've got some great findings from this talk. And it underscores, the need for long term monitoring in mangrove forests, if we're going to try to understand what's going on in terms of restoration and climate change. And I'm sure those speakers who are still here would be happy to take any questions after the session. Thank you.

Ronnie Best: All right. We're coming to closure. We do have the opportunity for questions. If you have a question, come up this way. If it involves one of our folks who summarized it, identify that and we'll get 'em up here as well. Do we have any questions? And, Lewis, I certainly hope that Everglades restoration, unlike your PowerPoint presentation, isn't a day late and a dollar, a dollar short. It showed up as you were walking off the stage. But if I had any sense I would of reversed the order of the two of you, but I don't have any sense at this stage of the meeting.

Any questions? Any comments? I would like to ask, make sure you please do turn in the forms because we listen to this, we make our future assessments on your recommendations. Please recycle your name tag. Be friendly to the environment. We try to do the best we can to do that. Please remember that this is a green hotel because we are here and we started the process. Drive safely. Rob? Yes?

Male: (inaudible)

Best: Drive safely.