Mobile Bay National Estuary Program
Science Advisory Committee Meeting

Friday, March, 14, 2014
10:00 a.m.- Noon

Alabama State Port Authority International Trade Center, Killian Room

Telecon: 1-888-848-0190
Passcode: 6307392

Agenda

1. Introduction to Biological Condition Gradient models and Dr. Bill Fisher, EPA Gulf Breeze Environmental Research Laboratory, who will describe adapting this model to more complex marine ecosystems: Coral Reefs– Tom Herder, Mobile Bay NEP

2. Presentation by **Dr. Bill Fisher** - Title: **Advancing a Structured Decision Process for Coral Reef Protection -** Synopsis: A project to protect coral reefs in southwest Puerto Rico is incorporating a variety of decision tools to support watershed management decisions. An overview of the Guánica Bay, Puerto Rico project demonstrates how the tools are being used and moving the decision process forward. The result will be a more goal-oriented, transparent management plan with thresholds for environmental (biological) performance. A biological condition gradient, which combines measures of environmental condition with human-generated stressors, is serving as the basis for threshold development. A structured decision-making process for environmental issues, which incorporates these approaches and tools, will be described.

3. Questions and discussion

4. Adjourn

Minutes of the Meeting of the MBNEP Science Advisory Committee (SAC)

Killian Room, International Trade Center
250 N. Water Street
Mobile, AL 36602
Friday, March 14, 2014

In attendance: Dr. Mohammad Al-Hamdan (NASA), Dave Armstrong (ADCNR-WFF), Dr. Alex Beebe (University of South Alabama), Dr. Ash Bullard (Auburn University), Renee Collini (DISL), Mike Dardeau (DISL), Maury Estes (NASA), Dr. Bill Fisher (EPA Gulf Ecology Division), Patrick Harper (U. S. Fish & Wildlife Service-Coastal Programs), Bob Howard (EPA Region IV), Steven Johns (GSA), Dr. Julien Lartigue (NOAA/NGI), Dr. Keyoung Park (DISL), Thomas Strange (Sustainable Ecosystem Restoration), Tim Thibaut (Vittor & Assoc.), Jason Wilkins (ADEM)
MBNEP Staff: Roberta Swann, Christian Miller, Rick Frederick, Tom Herder

The meeting got underway at 10: 00 a.m. Several folks from EPA Office of Research and Development, including Susan Jackson, Susan Davies, Peg Pelletier, Giancarlo Cicchetti, and Margherita Pryor participated remotely through WebEx and teleconference..

Tom Herder welcomed participants who provided self-introductions, then provided a brief explanation of biological condition gradients as a framework to assess condition of waters using attributes derived from biological indicators to guide development of water quality standards by states, to determine trends along an agreed-upon scale of conditions, and to set goals for improving water quality by implementing projects. He described his experiences at an ADEM/GSA-sponsored workshop to calibrate a BCG for northern AL rivers and streams using attributes based upon the tolerance of fish and macroinvertebrate taxa to degraded water quality. He then introduced Dr. Bill Fisher of the EPA's Gulf Ecology Division Laboratory in Gulf Breeze, FL, who has been involved in the development of a BCG framework for coral reefs in collaboration with Pat Bradley, Dr. Deborah Santavy, and Susan Jackson. Dr. Fisher's presentation is entitled "Advancing a Structured Decision Process for Coral Reef Protection.

Dr. Fisher's presentation if viewable on:
http://www.youtube.com/watch?v=xYTdjvFC_AM&feature=youtu.be

At the conclusion of his presentation, Dr. Fisher fielded questions during an audience discussion, the video of which can be viewed on: http://youtu.be/s9elkA8oMWE The audio is not of particularly high quality, and the video ends prior to the end of the discussion, so all questions, answers, and comments will be summarized below:

Tom Herder noted that the Landscape Development Intensity index worked so well to represent stress with a curve that fit nicely with biological condition. He asked what one does in cases where more than one stressor affects condition.

Dr. Fisher responded by referring to the slide where indicators dropped on both sides of the center of a disturbance. When there is impairment, and indicators communicate that things are looking bad, then it's necessary to go back and approach figuring out what was causing the

indicator response. Biological indicators only show decline. More work is necessary to identify which stressor underlies the response.

He added that there are many ways to measure stress gradients, and LDI is just one. The World Resources Institute has several ways of estimating threat – bethnic threat (sediment), over-fishing threat, etc. that have been mapped on a global scale. We just use what we need to.

Bob Howard: It seems that this effort was somewhat "data demanding" and required a lot of follow up. Can you give us some idea of the need for securing the "right data" and what kind of "reasonable time frame" that we should expect from starting to where you can do something with this?

Bill Fisher: The entire "coral reef community" has used a single measure for about 50 years: "live coral cover." It only measures two-dimensional area, not height or rugosity, etc., a traditional way of measuring that is not responsive to human disturbance – time scale also has a role in that, but it is only "weakly" related. Some of these other things are more strongly related. Data driven? If we had always been measuring these things, we would have the data. If you decide performance measures first, you can avoid efforts collecting data that is not useful. I've been working to try to bring biological criteria to coral reefs for around 10 years now. The big issue is that some places don't understand that territorial waters are still part of the CWA – a big problem. The second thing is the concept of biocriteria (is offputting).
Designated uses have been used in the Virgin Islands (based on biocriteria) – publically reviewed, then "good to very good" is where you want to be. Economies are very poor in the Virgin Islands and Puerto Rico. Governors are elected to bring better economies. Things that don't support economies are hard to push.

Mike Dardeau: Question about LDI as well. How do you project those offshore? Are the scales that you had different provinces?

Bill Fisher: We sampled around the entire island, and anything that was directly off of one watershed was considered for that watershed, and if one kind of lopped over, depending upon current, we would push it into the upstream watershed. Just our best guest.

Mike Dardeau: So each province got an LDI?

Bill Fisher: These are watersheds, and each watershed gets an LDI…

Maury Estes: I have an LDI question, too. Is it basically a ratio of pervious to impervious, or is it a land use classification?

Bill Fisher: It's an analysis of land use classifications looking at satellite imagery, and a big component of that is impervious surface, looking at farmland, municipal, put together as an index.

Maury Estes: Have you considered using something else like a greenness index?

Bill Fisher: There's almost anything you could use. When this worked, we stuck with it. I liked the curve!! Remember, these are very coarse. The importance of this particular value is that it guides resource managers. There are a lot of people in the Virgin Islands that want to build and develop, but there are particular areas that we need really good reefs. How can make sure that they don't build too much? If they are going to develop in this particular bay, how much can they build before you begin to lose that quality of reef? That's why it gives them a handle to work with. If these other indicators gave them the same handle, we're good.

Maury Estes: Lots of flexibility.

Bill Fisher: Absolutely. You should do what's best for your question and your stakeholders. What means something to them? To us, LDI is where managers can use that information.

Renee Collini: You talked about the importance of choosing indicators that are responsive to stressors. To the people working on the estuarine BCG, what sort of indicators have you found most responsive; what are you settling on.

Bill Fisher deferred to Giancarlo Cicchetti or Peg Pelletier.

Peg Pelletier: It depends upon what data you have. Lots of things have been measured. Benthic invertebrates. Seagrass area. Marsh condition. A lot of indicators out there have been shown in the literature to be sensitive to stressors, so it will depend upon the metrics that you have data for and think are important… not necessarily in that order. The three that I just mentioned are the three big ones that are pretty common.

Bill Fisher: In our work, we can look at reefs downstream of watersheds with no development, with high development, Buck Island with no development whatsoever – a preserve – we can find these places to make these measurements to decide what we think is natural, but an estuary…it's all captured inside, so I don't know the answer to that.

Mohammad Al Hamdan: When you have multiple stressors, shown in the LDI here, have you guys tried to develop some kind of a composite index, with weighted averages of different stressors?

Bill Fisher: I'd love to. Down the line would it not be great if we know that sediment caused one particular species to go out, kind of an indicator that was diagnostic of a problem? Right now we're kind of stuck with major combined cumulative issues, and that's a strength. The weakness is when your impaired, how do you go up in the watershed, do you have to make everybody quit doing stuff or can you find that one place that's causing the problem? It's a problem in terms of tradeoffs. The closer you can get to knowing exactly what's causing it, the better you are. None of the things I discussed today do that. However there are a lot of procedures… and EPAs dealt with this stuff over the years. There are procedures, weight of evidence concepts, even things like using satellite imagery… all of the sudden you see they built a new factory there. What's that factory producing? They have a permit. That's a change in the biota that we haven't seen in ten years. Maybe we better look at that. The biocriteria are really the bellwether. Something's wrong. The nice thing about biocriteria – it's cumulative and

multiple stressors – but as long as everything is good, you don't have to do anything. It's when something is wrong you have more work to do to figure what out exactly what it is or you have to take these grandiose steps to cut down on it.
Roberta Swann: There are a lot of new faces here, and a lot of expertise, between you, Bill, and who's on the phone. I would like to give a little bit of a summary of what the SAC has done to date. Because as I watched your presentation, there are bits and pieces of things that we've already done that you're hitting on. The first thing we did as a community was a values forum. We came up with six values or goals:

- Increase access
- Protect/sustain resilient, healthy beaches
- Increase or sustain healthy populations of fish and wildlife
- Protect heritage and culture
- Increase environmental health and community resiliency
- Improve water quality

These are the things that are framing our next comprehensive conservation management plan.

Bill Fisher: All of those lead to something. Why do you want to do all of those?

Roberta Swann: To maintain the chemical and biological integrity of our waters for living resources and human uses. So, we did that, and found out what people valued. Then we went out to the SAC and scientific community and asked scientists to evaluate the level of stress from 13 identified stressors, the level of impact from these stressors on the ability of 11 habitats to provide 12 ecosystem services. And those impacts were zero (no impact), blank (we don't know), one (a little bit), two (a little more), and three (a lot). We never really defined as a SAC what zero was, or what one, two, or three were. We left that to people's best judgment. Should we have been describing those levels of impact?

Bill Fisher: You either describe it or leave it up to the judge. You could describe it or leave it as qualitative. Sounds like that would be something you'd want to do, maybe take the approach that Pat Bradley or Debbie Santavy took with coral reefs. Have people look at an area and have people describe whether it's good, or bad, or heavily impacted. We found ten sites that are this way and ten that are that way. What do they have in common? This has really murky water, or three inches of silt on top. And begin to describe those characteristics or attributes.

Roberta Swann: We determined that the three most impacted habitats were freshwater wetlands, intertidal marshes and flats, and streams and rivers, which all indicate up in the watershed feeding down. And overall the stressors, land use change, fragmentation, dredging, sediment, sea level rise (when you get to intertidal marshes and flats), freshwater discharge… all things related to that landscape development index probably. However when we had our scientific symposium that we have every two years and put this out to that community of 300 scientists, one of the things that they suggested we do is create a habitat quality index… how do we do that, what would it look like, do we need that, or should we just go back to a landscape development index?

Bill Fisher: What do they mean by habitat quality index – habitat quality in the watershed or in the estuary? Because that was two different things you talked about. Here are the particular

areas we have problems in, but then we have all these landscape stuff going on in the watershed; do you want a habitat index for the watershed or down here in Mobile Bay?

Mike Dardeau: I think their issue was "you can have a lot of *Juncus* marsh, but in terms of services, that *Juncus* marsh needs to be of a certain quality." And so, they're looking at the more the value of the habitat here as opposed to the stresses upstream .

Mike Fisher: That's like attribute 3 - condition of organisms.

Tom Herder: I think that's attribute 7, actually.

Mike Dardeau: They thought it was impractical to just use acreages of those compared habitat, since you could have lots of degraded habitat or just a little high functioning habitat, and they would be equivalent.

Roberta Swann: I have a question for Rene or Mike. In Ashley's research we wanted to look at response to restoration projects that we put in place, so we commissioned a graduate student to do a two-year study monitoring service provision at Helen Wood Park (salt marsh), Dog River Park (freshwater shoreline), and Mon Louis Island (intertidal marshes and flats). Was she comparing a control to what we've restored? Was she looking at a pristine area?

Mike Dardeau: She was looking at the areas that have been restored and track progress in indicators to relative to a reference site…

Tom Herder: It's kind of the opposite of what you asked. The reference site is pre-treatment – not pristine.

Mike Dardeau: When we were initially confronted with this, we had a lot less information than we have now; the strong feeling of the SAC was that habitat is important. But more importantly habitat is something in which we can effect change. We're not likely to be able to change a lot of things that create stress. Habitat is one of those things that, particularly in today's environment, we may see some funding for restoration. We wanted to focus on something that we could have an effect on, and would result in increased ecosystem services. The reason we funded the graduate student was to identify some indicators that would show some improvement in ecosystem function with restoration. That's why we approached in that way. The initial thought was that habitat trumps everything else and it's something that we can do something about. We may have some data, and it turns out that we don't have a lot, but we may have some data going back to historical habitat.

Bill Fisher: That's something I wanted to ask. Do you have influence in the watershed, and you kind of led me to believe that you don't, but that you feel then that your efforts could be in habitat restoration…

Roberta Swann: However, as this has evolved, and we're redoing our comprehensive conservation management plan, our Management Conference is divided into different subcommittees. One of those is the Project Implementation Committee, and Patric Harper in the

green sheet is the Co-Chair of that committee. Their strategy for the next five years… we've fallen into a protocol of sorts… we do have influence in the watershed. We need to have influence in the watershed or we're not doing our job. We're looking at HUC-12s – first priority those that are intertidal - and we're putting forth a strategy of creating comprehensive watershed management plans that would address outreach and education, regulatory changes, private sector incentives, and habitat restoration that's all based on a preliminary sediment study – sediment is somewhat of an issue down here – and so we use that sediment analysis to be a bellwether of sorts for us. For instance Bon Secour… we're doing a sediment study there, and the people are saying "Oh my God, there's so much sediment here," but after doing a scientific study, sediment isn't the issue that they think it is there. In other watersheds it's a huge issue. We kind of use that to direct how our watershed management planning process rolls out. What I'm trying to figure out 1) how do we connect all of these committees together, because we're now looking at the government side, the private sector side, the individual side, and the restoration side. How do we use the SAC and the BCG to help guide us in 1) protecting or improving freshwater wetlands, intertidal marshes and flats, and streams and rivers primarily in those intertidal watersheds, and how can we use the BCG to guide us in measuring the improvements in watershed management as we get these plans online and start implementing them. And is it a landscape density index that we use our NASA scientist to help us create, because they're really good at that stuff.

Margherita Prior: This isn't really a question, but it seems like one of the things that you may want to do, if you've done an analysis of your restoration projects, you may want to say where those restored areas are demonstrably linked to a high quality, healthy watershed verses a restoration that occurred in an area where you knew that the upper part of the watershed was degraded. It may be the answer to that question about linking upstream and downstream, because you will see that your restoration is actually sustainable as opposed to doing it over and over again to an area that is affected by upstream inputs, and I wonder if your restoration analysis took that into account.

Roberta Swann: The restoration analysis that we did was mostly on the downstream end, however in one watershed we'll be beginning some restoration higher up in the watershed, and we have to look at that, because it's funded by BP oil spill money, and we're going to need some help with the SAC in assessing, as we reduce the sediment loading coming out of those streams, how is it impacting the reestablishment of SAV in D'Olive Bay downstream of that watershed. That's something that we have on the horizon, moving forward. We don't have that right now.

Tom Herder: And I don't know that we have places that we can compare restoration outcomes where condition upstream is good verses where it's not. At this point we don't have that.

Margherita Prior: Because that would help you as your CCMP tries to describe a system as opposed to individual habitats. This is the issue even with the Chesapeake Bay Program. They find it very difficult when you get the classic question from the public: "How is the Bay doing? We've spent x-teen billion dollars. What can you tell me about it?" "Well, we can tell you about this facet or that facet, but we can't tell you about the system." We're trying to get to the point where we can make some observations about the system, and I guess that ecosystem services provide a nice way of getting our arms around that. You guys are sort of at the beginning edge of that and it would be a great thing to build into your CCMP development.

Maury Estes: I think we have data, and we have modeling capability and capability with remote sensing data and different things that could help you, and I'm trying to understand how to help you. You described something broader than the biological condition gradient, so just thinking in terms of stepping back to just the BCG, what is your goal? What is the end state? A dynamic operational system for monitoring variables represented in the BCG baseline. Is that the end state, or is it something different?

Roberta Swann: I'd like to redirect that to Patric and maybe Mike or Tim.

Patric Harper: The end state is a better bay. Increase or maximize all of the habitats. For the fish and the water quality. We know it's not good, we don't know exactly where we're at, but we want it better.

Maury Estes: So you want to be able to monitor it…ideally in real time, every day, or near real time…

Patric Harper: In a perfect world.

Mike Dardeau: That's the issue that we keep coming up against, trying to find out what those upper numbers are going to look like, a one and a two. We don't know, because nobody's been monitoring. It could be a good excuse to start monitoring and to sustain that monitoring into the future. That's just a piece of it. The goal is to improve the ecosystem services that the habitat provides.

Roberta Swann: Maury, here's my dilemma. Are efforts are focused on the estuary… on the intertidal area and then the Bay and three miles out into the Gulf. And yet, you're asking me what our end point is or should be. We don't control what comes into our Bay. Our watershed is so big, and yet we're focused on the funnel mouth of it. When people say we want a better Bay, hmmm, we can only do so much, so maybe what we really want is to optimize the functionality of our estuarine system, where that fresh and salt water mix, and that kind of keeps us down around the rim of the Bay, frankly. And it begs the question, is it a biological condition gradient that we should be going after, or should we be trying to create more of a watershed condition gradient where we could actually measure over time... let me give you an example. The D'Olive Watershed, that has been the poster child for dumping sediment into D'Olive Bay…filling up D'Olive Bay and then spitting sediment out into Mobile Bay. From the restoration, from the regulatory changes in that specific HUC-12, could we define a watershed condition gradient that could measure the effect of new subdivision regulations that implement LID practices, or the effect of stream restoration not in headwaters, but midway, and how that helps to heal what's happening in the intertidal marshes and flats.

Bill Fisher: First you have to determine your objectives, then your decision options.

Roberta Swann: What do we need to do to move forward?

Bill Fisher: Begin your objectives hierarchy. What is it about this habitat that we need to protect? Parse it out in the finest detail, until you establish the finest available biological indiators.

Susan Jackson: How did Bill's presentation resonate with you?

Roberta Swann. We've been at about the same place for two years. We have lots of pieces…

Ash Bullard: (Ash followed up with an email that refined the comments he made, and the text of that email is pasted below:)

If your goal is to lead the collection of novel data on the bay, consider…
1. establishing reference and impacted sites for each of the marsh/intertidal, wetland, and river/stream/riparian zones, and within the impacted sites pair the sampling such that you have managed and unmanaged controls.
2. planning for 5, 10, and 30 year research goals/targets (ala Long Term Ecological Research)
3. invite a multidisciplinary team for each organismal group under study as well as the abiotic side (ichthyologist, botanist, malacologist, crustacean biologist, aquatic animal health, chemist, sediment geologist, microbiologist, quantitative ecologist, etc.)
4. plan on laboratory-based experimental validation of the "stressor" on the sentinel organism being studied
5. consider a two-pronged environmental sentinel (single species "canary in the coal mine") and whole ecosystem function approach for each of the 3 priority habitat areas
6. expect that if you want novel data and a high-value dataset accompanied by published, peer-reviewed literature, you'll need to fund research teams for 3-5 year project work periods
7. realize, and do not undervalue, the fact that this represents an unprecedented opportunity for the Gulf Basin to establish an integrated ecosystem monitoring network-- it's something that could be a model for the region and the expertise to execute the project is right here in Alabama.

I do not agree that beginning at the end point (alleged root cause), comprising an *a priori* determination of cause (e.g., sediment load), is the best approach because it limits what sort of data you can gather. What if you are wrong about what you think you know? This happens a lot in science, and it's important to not limit yourself. Another approach would be to plan to collect data across a spectrum of potential stressors and perceived effects so that, over time and space, you can begin to piece together a process from the observed pattern.

Beyond the philosophical ramblings, you also don't know what sort of crises will hit the bay in the future. Another oil spill? A chemical waste spill? An industrial development? If you set up a network for monitoring an array of fundamental biological and abiotic attributes, you can capture "baseline" data (which, again, means very little UNTIL "time zero" [=start of data collection]) that informs the change from normal to impacted. If you're only collecting data on sediment loading, all you can address is sediment loading now and in the future.

Finally, I think the "end state" of this or any similar project/network should be the ability for the project manager and participants to field the question "Are things better, worse, or the same as when we began concerted, codified environmental monitoring of the bay?"

Anyway, those are my thoughts. Let me know how I can help. I assume the DISL Faculty (I'm adjunct there now) are helping considerably here and they are certainly the ones to lead it. I'm happy to help regarding expertise on Aquatic Animal Health and Ecosystem Functioning aspects.

Roberta Swann: So what do we have Tom do when he gets back to the office?

Someone suggested a day-long workshop to determine what about the priority habitats is important to us. Bill Fisher liked the idea and claimed that we don't need experts to accomplish this step. Rene Collini noted that we already know what people care about through the community attitudes assessments that led to CCMP revision. Mike Dardeau wondered how we get the data necessary to determine one through six on the biological condition scale. Roberta Swann added that just because we don't have the data on the first cut doesn't mean that we can't enlist the state and others to prescribe appropriate indicators.

Sedimentation was mentioned as an example stressor, followed by the question, "What is sensitive to sediment load?" That question is followed by "What is it about this (indicator) organism that is sensitive?" Then THAT is what we should measure. .

Maury Estes: Remote sensing can be used to measure temperature, salinity, land use/land cover, primary productivity, water quality, vegetation, and water clarity.

Mohammad Al Hamdan: If you can validate remote sensing products, remote sensing data can be used as a surrogate for *in situ* data.

Maury Estes elaborated in a subsequent email message about the capabilities of remote sensing data:

It was great to have the opportunity to participate in the SAC meeting last week and visit with you and Roberta again. The talk by Dr. Fisher was interesting and the subsequent discussion. I really liked the succinct definition he gave for a biological condition gradient (BCG); a common scale for understanding state and change of biological condition. The subsequent discussion underscored the diverse challenges with the implementation of a BCG for the Mobile Bay estuary.

Depending on the direction you and Roberta choose for the BCG implementation there are a number of ways that we can potentially benefit your effort. We can develop several types of landscape diversity indices for you based on either land cover land use (LCLU) remotely sensed data or vegetation indices such as the normalized difference vegetation index (NDVI) that is well known in the science community. Either of these indices could be produced at a 30m or 1km spatial resolution and the NDVI could be updated seasonally or even monthly though 4 times a year would likely meet your needs. Water surface reflectance and sea surface temperature (SST) products at 1km spatial resolution can be used to establish a historical baseline for general water quality in the estuary. Gross and net primary production products could be evaluated for the estuary and surrounding watersheds to determine the trajectory of change (good, bad or steady state). Salinity estimates can be derived from remotely sensed reflectances to produce a 1 km

gridded product throughout the estuary. To summarize, the remotely sensed data that I think could be the most useful for the BCG effort is as follow:

Product	**Sensor**	**Spatial Resolution**	**Temporal Resolution**
Surface reflectance (water quality)	MODIS	1km	daily
NDVI	MODIS	1km	daily
NDVI	Landsat	30m	16 days
Reflectances algorithm (salinity)	MODIS	1km	daily
SST	MODIS	1km	daily
LCLU	MODIS	1km	annually
LCLU classification	Landsat	30m	current
National Land Cover Dataset (NLCD)	Landsat	30m	2006*

*More recent updates are in progress and other products exist for 2001 and 1992 that could be used to easily evaluate LCLU change in the watersheds surrounding the estuary.

These type data offer two major advantages for your effort. One is the capability to construct a historical baseline (up to 14 years from MODIS and longer for Landsat) of physical conditions/stressors in the estuary. The other advantage is the daily availability of the MODIS products for continuous monitoring of changes in the state of the estuary.

We can offer as Mohammad mentioned in the meeting physical modeling capability that could be beneficial to the BCG baseline development and follow-up efforts. As you know, we do have model outputs (temperature, salinity, TSS) for a suite of land use and climate scenarios focused on the watersheds contiguous to the estuary and the effects on the shallow aquatic areas, which is related to at least one of the top priority habitats (intertidal marshes and flats).

We would be pleased to assist further as you think we can be helpful to define a reasonable path to develop a BCG for the estuary that meets your objectives. While we do need funding to accomplish the tasks described above, I will volunteer as much time as possible to support the BCG effort and the potential value of remotely sensed data and physical modeling. Working with you and Roberta to support good stewardship of the estuary is a priority for us. We look forward to discussing further how we can engage with you to support this effort at your convenience.

Mike Dardeau suggested that one session at the December Bays and Bayous Sympsium be directed towards solicitation of potential indicators.

Susan Jackson indicated that she would like to check in with the Office of Research and Development and discuss our situation with them before coming back to us with guidance.

Roberta Swann thanked participants, indicating that she hoped to be able to rely upon further assistance, and the meeting adjourned.