

**Albemarle-Pamlico National Estuary Program
Living Aquatic Resources Monitoring Team
First Workshop
February 21, 2008**

Present: Jeff Bruton (DENR, DWR), Dean Carpenter (APNEP), Bill Crowell (APNEP), Tom Cuffney (USGS, NAWQA), Anne Deaton (DENR, DMF), Shannon Jenkins (DENR, DEH, Shellfish Sanitation), Wilson Laney (USFWS, South Atlantic Fisheries Coordination Office), Sarah McRae (DENR, NHP), Milo Pyne (NatureServe), and Bryn Tracy (DENR, DWQ).

10:05 AM: Dean convened the meeting. We did introductions.

Dean explained the intent behind the meeting. He noted that each NEP was supposed to develop a monitoring program. He noted that it was difficult, but what we are trying to do regional ecosystem monitoring, trying to create some sort of decision support system that will feed policy development.

Dean indicated that he was going to give us an introductory presentation, to get our juices flowing. He indicated that he would like feedback on our organizations perspective. He will then hand it over to Wilson, to facilitate, how we can produce our product. We are looking toward an April 30 time frame for having a draft product. Dean noted that Dr. Marty Lebo, of Weyerhaeuser, will be leading the Water Quality Team effort. They will begin their work tomorrow. At the next STAC meeting, Wilson and Marty will be asked to give a presentation on how the workshops are going. They will say how the monitoring is going to be done.

Most of the team didn't receive the most recent e-mail message from Dean which contained background for this workshop.

Dean explained that the STAC has no representation from state agencies, so the body is completely independent of the APNEP. However, to maintain coordination, there are state agency liaisons for all the NC and VA agencies. That is how the members of this team were selected. Dean sought nominations from the STAC liaisons. He sent the slide of measures out to each individual.

Dean asked Wilson to comment. Wilson noted that he had been drafted to take over for STAC member Doug Rader (Environmental Defense), who has moved on to bigger things. Wilson's vision is that we have some updating to do, of the existing monitoring programs. Then we can look at some examples from other NEPs. Then we have to develop draft monitoring proposals for all the LAR indicators, by April 30. Dean indicated that he envisions a second workshop, where we will review everything, and prioritize. Right now we have 35 candidate measures in the LAR list.

Dean gave his presentation as background for the team members.

Dean reviewed the organizations invited to the workshop. They included NC and VA, as well as federal agency representatives. None of the VA representatives were able to attend. Ones invited: NC-NHP, NC-DEH, NC-DMF, NC-DWQ, NC-DWR, NCWRC, VA-DEH, VA-DGIF, VA-MRC, VA-NHP, VA-DEQ, EPA, FWS, NOAA and USGS. Dean and Bill had tried hard to get someone here from NCWRC, but were unsuccessful. Dean noted that there was interest from EPA (STAC member Ross Lunetta) but the person was recovering from surgery. Other potential representatives were unable to attend, due to conflicts.

Dean asked us to consider whether we needed any additions? Wilson asked whether it would be desirable for us to have someone from the NC State Museum of Natural Sciences? He indicated he would defer to Sarah and Bryn on that point. They weren't sure who we might ask. Wilson stated that we definitely need someone from NC-WRC, possibly from the non-game aquatic staff. Sarah agreed that

would be desirable, maybe Chris Wood or a colleague.

Dean noted that where we are ultimately headed as a program, is ecosystem-based management. An alternative term is Landscape-Based Management. Bill noted that another term from Britain is "Evidence-Based." Dean noted that borders on adaptive management as well.

What we want to do is to evaluate conservation policy. Evaluation of the impact of conservation policy intervention lags other policy fields. Paucity of data on the response of the species to which the intervention is targeted is an issue as well.

Dean stated the challenge he wants to know if APNEP accepts? The challenge is integration.

Dean covered who will contribute to the APNEP Ecosystem Assessment. The federal, state and local partners will contribute. The assessment will contain timely technical information within a decision-support system to help answer seven policy-based questions: magnitude, extent, trend, cause, source, risk and solutions. The target date for the Decision Support System is ASAP. The last one was in 1991. Dean asked us to keep all these in mind, when we are discussing the metrics. What is the magnitude of change, what is the trend, what is the source, what is the cause, what is the risk, and what are possible solutions.

Dean noted that he put ASAP as the due date, because pulling together all the existing data, and looking at what has happened during the last 17 years, would be highly beneficial. Things on the radar back then have changed, for good and bad, and other things, such as climate change and invasive species, weren't even considered back then.

Regions and sub-regions are to be assessed, to support the NC-CHHP, NC/VA basinwide planning and APNEP.

The Spatial Assessment Continuum which Dean envisions is, global, sub-global (North America), regional (South Atlantic Large Marine Ecosystem), the basin (APES), watershed, and local.

Dean showed us the APNEP EPA Level IV ecoregions in NC and TNC in VA. He noted that we would like to be able to report on these units. They would be the smallest units. We wouldn't discuss localities, or counties. This assessment might point out hot spots, and lead to more investigations, but that isn't the scale we are targeting.

Anne asked if the black lines coincide with the DWQ hydrological units? Dean thought they might. Bryn indicated the lines represent the eight-digit HUCs (hydrological unit code). Jeff Bruton stated that staying at the large scale, might not get us to the need for restorative action, at the local scale.

Dean agreed and noted that there is a temporal assessment continuum, for example, century, decade, annual, monthly and daily. We are really looking at longer time steps.

Jeff indicated that he was thinking more on a spatial scale.

Wilson noted that he and Bryn had heard Tony Roux give a presentation on fishes in Mecklenburg County, and that prompted Wilson to suggest that we need to be aware of any county-level monitoring of water quality and/or living aquatic resources that might contribute to APNEP.

Dean noted the NEP at the national level had generated guidance a year ago, for developing indicators. Dean reviewed the steps they recommend. He noted we have taken a first cut, at the first three bullets: program planning, conceptual modeling, and indicator development.

We are really at the initial stages of developing a Regional Ecosystem Model. We adopted the Pressure State Response model. The first model (pressures) is human dimensions. The State is measured by eight compartments, one of which is LAR. There is also a species introduction and removal box, which is cross-cutting. Jeff asked Dean to explain material balances. Dean explained those are such things as water, carbon and nutrients.

Dean showed us a figure from one NEP (Puget Sound) that depicts one compartment of their model, the nearshore. In the figure, the thickness of the arrows reflects the amount of information feeding the model. This model transcends the individual compartments. Dean showed us another one which looks at nutrient and pathogens. Dean noted that he hopes this team can develop a LAR conceptual model. The model he showed us originally is the lowest conceptual level, a black box. He would like us to be able to open it up a little and define relationships.

Dean shared the definition of an APNEP indicator. They should be a numerical value derived from actual measurements of a pressure, state or ambient condition, exposure, etc. and be trackable over time.

Dean reviewed the indicator criteria briefly.

In the middle of 2006, Dean noted the STAC had created an Indicator Steering Committee, which included the stakeholder and policy types as well as STAC representatives. They considered links to regional ecosystem model. They took the recommended indicators, and looked at the metrics that would be needed to track them. This was sort of like a gap analysis. There were quite a few gaps where the STAC didn't make any recommendations. This wasn't a criticism, just a fact, since the STAC doesn't cover everything.

There are modules (such as LAR), categories, dimensions and metrics.

Dean noted that he would review the indicators, but asked first if there are questions on the big picture, on what we are trying to do? There were none.

Dean reviewed the indicators. Under Incidents of Concern, there were three dimensions, with five metrics. The second category is Habitat Adequacy, with four dimensions. There are eight metrics for those.

Anne asked if there is a list of all the metrics? There is. Dean and Bill indicated that we reviewed that list at the last STAC meeting. Anne indicated that she would like to be able to share that with colleagues.

Dean noted that we in many cases, haven't gotten down to specific species. We have to do that. Bill Crowell noted that they also want feedback on whether we should eliminate, or add, metrics. This is by no means cast in stone.

We had a discussion of how we are going to proceed. We need to look at the 35 metrics, and see if they are appropriate. Then we will have to draft a proposal for each one, and we should consider cost, as well as other factors.

Anne noted that we had put together, during the Smithfield workshop, information on the available programs and data.

Tom noted that from his perspective, what we need to do is consider the software that will analyze the information. He felt that we need to consider that, before we jump down to the metric level. We need to establish what we want to assess, in space and time, first.

Dean noted that we haven't finished the metrics first. He suggested that EPT, or IBI, may have monitored

the community. Tom stated the community is being monitored in some cases, but noted that if we aren't monitoring the entire community, some of the metrics may not be available.

Dean continued his review of the metrics.

Bryn noted that for the Toxicant Burdens, NC-DWQ already has the first four bullets covered. He wanted to know, who is going to be working with this? Bill stated that we will be discussing, is what we are doing effective, and if not, then APNEP can be an advocate for getting the resources needed, to do an assessment.

Bryn noted that one thing we lack, is an estuarine benthic monitoring program. That was done away with, about five years ago. One of the students at the NCAFS meeting indicated that there is little work going on, with zooplankton. Wilson noted that Hans Paerl may have a handle on that, but perhaps not. At some point, he suggested that we need to review the water quality metrics.

Bill noted that while a lot of the information may be out there, he and Dean don't know where the data are located, and who is responsible for them, and how to access them.

Dean noted that for mercury in fish, for example, he would be interested in knowing the magnitude, which fish, and what is the level of confidence in the data? What is the sample size, for example.

Bryn noted that we have a good idea of what the concentration is for mercury, in largemouth bass, in the APNEP basins, over time.

Dean noted that is the starting point, to lay out what is being monitored and where. Once we compile the subset of measures, once we look at what is being monitored, then we can refine the strategy. Bryn noted they have been monitoring fish kills, since 1996, and report that annually to the legislature.

Dean noted there are two ways to approach this, one being top-down, the other being bottom-up. The STAC was asked to consider what was needed, from the top down. They could have asked the agencies from the bottom up.

Jeff Bruton suggested that a first step would be to ask the agencies already doing the work, what trend is apparent? Then we can assess the trend information. Dean stated the big question is, what is going on now, and can we garner resources to make it better?

Dean asked if this kind of evaluation has even been conducted before?

Bryn noted the deficiency in estuarine benthic monitoring, is in the area of the state where growth is greatest, and we have no idea what is going on. He noted they go by the shellfish closures, as a surrogate.

Anne asked if we were aware of an ongoing EPA program, for which the samples were collected by DWQ, for the EPA Coastal Condition Program. Bill noted the funding for that one has been cut.

Dean added some other metrics on which they need help. He pulled from the Invasive Species component, a list: amphibians; estuarine fish; freshwater fish; mollusks; crustaceans; and aquatic macrophytes. The same list is needed for vulnerable species.

Dean noted that toxicants in the materials balances category, also has metrics for mercury prevalence in biota, and toxicant prevalence in biota.

11:25 AM: Dean completed the presentation on metrics.

He showed us a diagram which depicts the relationship between monitoring objectives and the other components.

Dean showed us the NEP monitoring plan outline. There are six steps. Define monitoring objectives and performance criteria; identify testable hypotheses, specify monitoring variables, including sampling locations, monitoring frequency, field and laboratory methods and QA/QC procedures; specify data management system and statistical tests; and two more. Dean stated that we need to focus on the first three for now.

Dean noted we may want to use the New Hampshire NEP template, and he will provide us examples for our use.

The whole point is to create an Ambient Monitoring Program for APNEP.

Dean noted that one point of this workshop is to determine the status quo of the 2000 monitoring update.

Dean reviewed the Monitoring Integration Continuum: he envisions that we will have knowledge of partners monitoring strategies; take advantage of common geography and timing; find opportunities to leverage partners' monitoring networks; and work toward a common set of regional ecosystem objectives.

Dean noted that he was trying to move us up from independence.

Dean shared a management diagram from the U.S. Department of the Interior, for a new paradigm of Adaptive Ecosystem Management. The six steps are: assess problem; design; implement; monitor; evaluate; and adjust. Dean reviewed how APES and APNEP have met, or failed to meet, each step. Dean noted the monitoring step failed. The 2000 conference was an effort to move it forward, but as far as he knows, the spreadsheet was the only product and nothing else happened, in part because the funding dried up. What we are trying to do now, is make the six-step "wheel" spin.

Bryn noted that Dean had said that EPA wasn't very involved. In 2007, he was contacted by EPA and asked for data in conjunction of a regional fish-monitoring program. Dean and Bill knew nothing about it. Bill noted they frequently hear first from the newspaper about such programs. Bryn noted they send in much data, often, and then never hear anything back about what they submitted. Dean promised to follow up with our EPA representative.

Dean reviewed the integrated framework of what we would like to be able to do, with the LAR information. We will have indices at the most aggregated level, which will tell the public what the overall condition is, in the APNEP. We may have sub-indices for fish, shellfish, etc., and will report on those using a scale of from 1-5, or something similar. Dean noted that we will target four general groups: the general public, politicians, natural resource managers, and scientists. The latter group is envisioned to be most interested in the individual metrics. The indicators will be aggregations of the individual metrics.

Wilson noted the EPA Coastal Condition Reports use this approach.

Sarah noted that she has had to do these kinds of analyses, and suggested that we might want to use high, medium, or low, rather than numbers. Bill agreed and indicated that the public version of the report might employ colors, rather than numbers. Anne noted that Chesapeake Bay uses a report card approach. Bryn noted that TVA had done some similar reports, using colors, and they were useful to the public.

Dean agreed that those will be useful, but also interested parties will be able to look at the more specific metrics as well.

Dean provided the Regional Ecosystem Goods list, as well. He noted that EPA is now pushing to focus their research in four geographic areas in the country, one of which is the coastal Carolinas. One of their themes is ecosystem valuation, including goods such as food for humans and animals (fish, shellfish, seagrasses, livestock, grains); salt; minerals and oil resources; etc.

Another is on regional ecosystem services, such as shoreline protection; etc.

Dean briefly reviewed his proposed development of an integrated GIS environmental database portal. This would enable a spatially-enabled content management system. The first compilation could be NC-DENR and VA-DEQ/DCR/DFG/DF sponsored environmental data. The second compilation could be environmental databases from other NC and VA agencies.

Tom asked if Dean was aware of the NC one-map effort? Dean was. Tom suggested that might be a good place to begin this effort.

Dean shared with us the concept of a Decision Support System, with an accompanying Digital Basin (Landscape). It could have layers for land cover, material balance, atmospheric, water quality, living aquatic resources, wetlands, terrestrial, species introductions and removals.

11:46 AM: Dean completed his presentation. The team decided to break for lunch, until 12:30 PM. Bryn asked, so what if we want to recommend a benthic estuarine monitoring metric? Wilson and Dean described the process and how it would ultimately be approved and pursued.

11:50 AM: Milo Pyne from Nature Serve joined the group.

The group dispersed for lunch until 12:45 PM.

12:50 PM: The team reconvened.

We discussed how to proceed. Wilson suggested going through each metric, one by one, and discussing its appropriateness, who is doing it, whether it is ongoing, and who should write it up. One thing that Dean needs is a monitoring objective for each metric. Milo noted when they think of these, they are graded by occurrence, i.e., A, B, C and so forth. This helps in prioritization.

Living Aquatic Resources I:

- Incidents of Concern
 - Community Simplification
 - Low-Diversity Fish Faunas
 - Low-Diversity Benthic Invertebrate Faunas

Wilson noted these two likely originated from the NC-DWQ-IBI program. Bryn agreed. He noted that low diversity would only apply to Piedmont streams. It won't apply to naturally acidic, low diversity blackwater streams. Anne asked if we should characterize it as change in diversity, rather than low diversity. Bryn noted that some Coastal Plain channelized streams have high diversity. Dean asked if we couldn't get a good metric. Tom noted that what we are really saying is that we have to assess change against background. The direction of change may be different. Milo noted there is an implication that there must be some sort of ...

We noted that these two cover only freshwater systems. Anne noted that we have the data which we could analyze, for the fish, for the estuaries. Bryn noted that coverage is likely not there for some streams in the NE part of the state, for fish. There are a few benthic sites. Anne asked about issues with

swampwater. Bryn noted they do that sampling right now, during the flow season.

The agency doing the work is DWQ. The NCWRC also has been doing some sampling which can be used to generate fish metrics.

Wilson asked if everyone agreed the metrics are important and appropriate? Milo stated that he assumed there is some sort of typology of stream order, water chemistry, and substrate, which would be used within the category. Wilson deferred to Bryn. Bryn indicated it is adjusted for Level IV Ecoregions. Milo asked if you go to stream order, within that? Sarah indicated there isn't anything below that, comparable to terrestrial ecosystems. Bryn stated they do use a different set of criteria, for the Pamlico River, versus a second-order pocosin stream. There is a different sampling technique and a different set of metrics. Milo thought that was a good approach.

Tom stated, what are we measuring in terms of diversity? Can we do the same things for fish, benthos, in both freshwater and estuarine systems? Do we have any idea of what we want to do, in that regard? Bryn stated they use taxa richness, pollution indicators and so forth. Tom asked if we need to focus on particular metrics?

Anne indicated that there is a post-doc, Tim Ellis, at NCSU, who is looking at all the NC-DMF Primary Nursery Area data, with a view toward assessing change. We might be able to get some guidance from him with regard to a recommendation on what metric to use.

Tom suggested that we need a recommendation on one, versus several measures of diversity. Dean agreed that would be useful.

Sarah stated that we could take out a couple, and use that for our measure. Dean noted there are different ones. Sarah understood, but she noted the question is if those are sufficient, or if additional ones are needed. Wilson expressed the hope that NC-DWQ has already written the objectives and justification down. Bryn stated that they have done so for the benthos, but are still working on that for the fish.

Tom felt that we are pretty well set up here, in this state, for the fish. His question is, if we limit it to the number of things they are using for their condition index, some things that might link to terrestrial or water quality issues, may not be present. We may not have everything that the managers and policy-makers need. How do we capture all of that?

Responsible Agencies to cover whole AP Ecosystem: NC-DWQ, NC-WRC, and NC-DMF. Freshwater portion is partially covered; needs expansion for fish in NE Coastal Plain. No estuarine fish index, although NC-DMF has the data. No estuarine benthic program currently exists. Bryn indicated it was halted five years ago, and covered a 5-10 year period, prior to that, but it was reduced in comparison to the freshwater coverage. Tom noted there is also a historic NAWQA data set, and another in the Piedmont, for which he is the contact. The USGS NAWQA monitoring is down to three sites which aren't sampled every year. The urban one is no longer collecting data.

Responsible Person: Bryn Tracy

Dean asked about coverage in Virginia? Wilson noted that we will have to coordinate with our Virginia colleagues on that portion of the watershed. We may have maps that show some gaps.

Acute Events
Algal Blooms (WQ Module)

Dean indicated that the Water Quality Team would take care of this one. NC-DWQ is monitoring it, on an as-needed basis.

Fish Kills

The responsible agency is NC-DWQ. The responsible person is Bryn Tracy, working with Mark Hale (ESS).

Fish and Shellfish Diseases/Parasites
Acute Fish Disease Incidence
Chronic Fish Disease/Parasite Incidence (American eel, LMB, SVC)
Chronic Shellfish Disease Incidence

We discussed this one. Wilson thought it was in here likely as a result of Pfiesteria. We noted there are other diseases as well, such as spring viremia of carp. Bryn noted that this one is linked to the fish kills. Dean asked if when we do fish sampling, we note diseases? Bryn stated yes, but we see very few diseased fish. He noted the WRC is tracking the largemouth bass virus.

Wilson noted that there were several national or regional disease-sampling programs. The FWS was involved in these. He will check with the Fish Tech Center in Warm Springs to see if these are still ongoing.

Dean asked why the word "acute" was there? Wilson thought it was due to Pfiesteria.

Shannon indicated that DMF is monitoring the presence of Dermo and MSX. It is being done annually. The data are spatially categorized.

Responsible Agency: EPA, FWS at federal level; NC-WRC and NC-DACS at the state level.

Responsible Person: Wilson Laney, to coordinate with other agencies.

We discussed the importance of this one. We agreed that it is important from a public relations perspective, although we may rank it low priority, when we get to that stage of our planning.

Responsible Agency for Chronic Shellfish Disease: NC-DMF. Responsible Person: Anne Deaton

Living Aquatic Resources II:

- Habitat Adequacy
 - Overall Habitat Adequacy
 - Rare Organism Presence
 - Rare Community Representation
 - CHPP Habitat Extent and Value

Wilson indicated that the reason we had put rare organism presence and rare community representation on the list, was to assess habitat adequacy. Sarah noted that the presence alone doesn't necessarily say the habitat is adequate. This is where the ranking comes into play. A healthy occurrence is good, a non-viable one may not be indicative of habitat adequacy. Milo concurred that is the case, noting that healthy populations are good.

Sarah noted she wasn't sure how these two were related. She noted that NC-NHP only tracks sites with healthy populations. She suggested that we might be able to combine the two rare organism metrics. She wondered if we should go back and look at the details of why these were broken out? She noted NC doesn't have a classification for aquatic communities. DWQ does have aquatic community classifications.

Wilson noted that we may be tracking rare aquatic organisms, but we aren't doing so and haven't done so in a systematic fashion. Sarah agreed and noted the surveys have been opportunistic. There has been no systematic survey. Some of the NC-WRC staff are doing such surveys. But it is definitely not systematic. Sarah suggested using the NC-NHP sites as the indicator, since we are talking ultimately about Overall Habitat Adequacy. Dean asked, if we track the sites, what would we track as a trend indicator? Sarah stated size, condition and landscape context are the three criteria they use for tracking sites. There are ranks associated with those, over time. Dean asked what the frequency of evaluation is? Sarah stated it is every two years. Milo indicated they are interested in taking these criteria and turning them into more measurable attributes. Size you can do from aerial photos, so you can do some of them remotely. Milo noted that you can assess buffers from the air as well. Sarah asked if this is what Nature Serve is calling their marine and estuarine classification? Milo indicated this involves the EO ranking methodology.

Tom stated that we may have some issues with how we are defining habitat, as well as scale. He noted that he is hearing two different things with regard to rare, also. Specific rare taxa are one metric, specific rare communities are another.

Anne and Wilson noted that it was very difficult to set a target level, at which the presence of rare organisms or communities would be appropriate.

Bryn asked, could we track the communities using aerial photography, for the aquatic communities? Dean noted that we could, once we have identified the classes, and we are going to do so for land cover. Sarah noted that if we characterize the NHP sites, using species, or local land use, we could track change over time, by species dropping out and being added. In terms of tracking, she wondered what the ultimate goal is.

Bryn suggested that we could say, we have to track the species once every generation, or some other criterion. Milo felt that Habitat Adequacy, and Overall Habitat Adequacy, were to some degree redundant. He felt that the entire top category should be revised.

Anne indicated that she felt the CHPP Habitat Extent and Value metric was really covered in several other areas, and perhaps was duplicative. She asked Dean if he was talking about tracking distribution and abundance, those are already being done. Dean noted there are six CHPP habitats, and water is being covered elsewhere. SAV is in here, as are wetlands, and oysters. We talked briefly about hard

bottoms, both offshore and upriver. We don't cover the soft bottoms either.

We decided to amend the CHPP metric, to include only hard and soft bottoms. We discussed the fact that the South Atlantic Fishery Management Council is tracking the offshore hard bottom habitats and we can use their data to track that one. The inland cobble-gravel habitats aren't being tracked by anyone.

Milo turned us back again to the designations. We decided to change "Habitat Adequacy" to "General Habitat Condition." We discussed what we might want to change the dimension name to.

After further discussion, we decided to eliminate the CHPP Habitat Extent and Value. We decided to leave Hard Bottom in its place.

We discussed which of the remaining metrics to leave. Sarah stated that we could use rare organism presence, since those are tied to NHP aquatic sites. The rare community representation however, is not possible right now, because we have no classification. Wilson had noted earlier that the National Fish Habitat Initiative national team is working on an aquatic classification scheme, for the entire country. Sarah and Milo indicated that there was someone in NC who did some work on an aquatic classification scheme, that might prove useful.

Dean noted that this might be one we identify as needing more work for development. Sarah explained how the process could work, using a variety of criteria in a GIS system to classify the stream systems. Sarah noted aquatic community classification is something they want to do. She noted that undertaking such an effort is beyond her available time, at present.

Responsible Agency for rare aquatic taxa and communities: NC-NHP, working with NC-WRC.
Responsible person: Sarah McRae.

Responsible Agency for Marine Hardbottom Habitat Extent: FWS, Wilson Laney, working with Roger Pugliese and Anne Deaton.

Freshwater Hardbottom Habitat Extent: NC-WRC, Anne Deaton working with Chad Thomas and Brian McRae.

Tom and Bryn noted they do have some of these data for the Piedmont.

Sarah noted that DWQ has a habitat assessment program. Bryn indicated they use a number of metrics, in localities where they do IBI or Benthic sampling. Sarah suggested that we might want to add that one as a metric. It would be called Freshwater Habitat Condition.

Responsible Agency for Freshwater Habitat Condition: DWQ; responsible person: Bryn Tracy.

Dean asked, if we are going to use that one, do we need the rare ones? Sarah felt the rare ones still provided useful information.

Milo stated the problem with rare species, is, they are rare. The linkage here may not be appropriate, for assessing habitat quality. If you can say, more of organism x means better habitat, and you can show that over time, you are legitimate. Milo suggested that perhaps we want to use habitat viability.

Anne noted that one person has stated, we don't want either the really common, or really rare things, as indicator species.

Sarah asked for guidance on what she was supposed to write. We discussed the fact that she is going to have to write up a proposal for the monitoring of the metric. Sarah noted that they might be indicator

species other than rare species. Bryn noted that the GAP program is developing tools for keeping common species common. Milo provided Sarah with a CD from the GAP program. Wilson noted there are no strictly aquatic species addressed by that program. Bryn gave a couple possible examples of indicator, not necessarily rare, species. We decided that we would leave up to Sarah to recommend some indicator species. Wilson asked if we change to "indicator" from "rare," does that mean the agency changes.

Anne suggested that we skip this category, and go through the rest of them, before we make a final decision.

Anadromous Spawning/Nursery Areas: Agency DMF and WRC: Anne Deaton and Bennett Wynne

Total Area and Area by Species: DMF, WRC, FWS: Anne Deaton, Bennett Wynne, Wilson Laney

Obstacles to Upstream Migration: DMF, WRC, and FWS: Anne Deaton, Bennett Wynne, Wilson Laney, to coordinate with Doug Newcomb of FWS.

Aquatic Macrophytes:

SAV Area/Zone/Density/Potential/Phenology by Species: Agency: DMF, NOS, DWQ: Jud Kenworthy.

Macroalgal Distribution and Abundance: doesn't exist, no one is monitoring. This one was added by Dean, because it came up in some other NEPs. Anne noted there are some macroalgae that have posed problems in NC. We are unsure how important it is. We left it on the list, and will consult with Jud Kenworthy about whether we need to leave it on the list.

Aquatic Protected Areas

Sanctuary Extent and Location by Closure Type

We discussed this one at some length. We decided that we need to know what the logic was behind the inclusion of this metric. Dean will provide the indicators spreadsheet to us, but we may decide to eliminate this one. We will leave it in for the meantime, and Anne will provide the information to us. Anne thought that DMF has all the data. For Shellfish closures, Shannon will be the contact person for shellfish closures.

Living Aquatic Resources III-a:

Marine Mammals

Mammal Species (TBD) Range and Population Condition: NMFS, DMF: Red Munden. Bottlenose dolphin will be the designated species.

Fish

Fish Stock Condition (SSB and Age Structure) by Commercial and Recreational Species: DMF and WRC, Wilson Laney to contact Louis Daniel.

Fish Population Condition by Ecologically Important Species: DMF for marine; WRC and DWQ for freshwater: use PNA database? Contact persons: Anne Deaton, Bennett Wynne, Bryn Tracy.

Rare Fish Occurrences by Species: agencies, NHP and WRC: person: Sarah McRae.

Living Aquatic Resources III-b:

Reptiles

Diamondback Terrapin Range and Population Condition

Freshwater Turtles Range and Population Condition

American Alligators Range and Population Condition

Sea Turtles Range and Population Condition

Agency: NCWRC, contact Bennett Wynne, to coordinate with NMFS for the sea turtles. There are multiple sea turtle data sets. For alligators, Alligator River NWR may still be surveying annually.

Crustaceans

Blue Crabs Stock Condition (SSB and Age Structure): DMF, Anne Deaton

Shrimp Stock Condition: DMF, Anne Deaton.

Crayfishes Occurrences: WRC, NHP, DWQ: Sarah McRae.

We have some good information on these, there is no systematic sampling program, however. The WRC did some systematic sampling of designated Gamelands. DWQ does routinely sample crayfish, during their sampling.

Living Aquatic Resources III-c:

Bivalve Molluscs

Oysters Extent of High-Quality Beds: change to "Extent of Beds": DMF, Anne Deaton.

Hard Clams Extent of High-Quality Beds: DMF, Anne Deaton.

Freshwater Mussels Range and Population Condition: WRC, NHP: Sarah McRae, Rob

Nichols and Chris Wood of WRC.

Freshwater Invertebrates

Extent of High EPT Faunas

Bryn noted this one has to be fleshed out. The "high" will only apply in the Piedmont, not the Coastal Plain. Tom suggested that we say NC EPT Index, and also the NC IBI Invertebrate Biotic Index. That will capture what we want. That means that we have two metrics. Agency: DWQ, person Bryn Tracy.

Microbes

Zooplankton Community Structure

No one knows anything about systematic sampling for this one. Dean will take it and talk to Hans Paerl about.

Algae

Algal Community Structure

This one also will fall under DWQ, but also possibly under EPA, for coastal ecosystems.

Living Aquatic Resources IV:

Toxicants in Tissue

Total Toxicant Body Burdens in Species (TBD)

Mercury in Species (TBD) Tissues

Dioxin in Fish Tissue

Fish Consumption Advisories

Marine Mammal Tissue Contaminants

All the toxicant metrics fall within the purview of DWQ. The contact person is Bryn Tracy. Wilson suggested that we need to touch base with Tom Augspurger and Sara Ward, regarding any FWS programs that could contribute here. He will also touch base with Robert Bakal.

Dean will send out the New Hampshire pdf as an example template. Everyone will review it, and if changes are needed, will advise Dean and Wilson, and they will produce a new outline for templates.

Anne asked if we were going to eliminate any metrics? She asked specifically about the aquatic indicator species. Sarah noted that she still needs some guidance. Dean suggested that it could be one of the

metrics in the developmental stage.

We discussed the fact that we will have to send drafts to the Virginia representatives, and ask them to integrate Virginia sampling needs into the drafts.

Dean will send out a message with the proposed date(s) for the next meeting.