DRAFT

# Albemarle-Pamlico National Estuary Partnership
# SAV Monitoring and Assessment Workshop
# 9:30am – 4:30pm
# February 27, 2017

NC National Estuarine Research Reserve
101 Pivers Island Road
Beaufort, NC 28516

## MEETING NOTES

**Team Members Present**: Jud Kenworthy, Brandon Puckett, Don Field, Ken Reilly, Jessie Jarvis, Mike Durako, Anne Deaton, Patrick Gillam, Joe Luczkovich, Hilde Speight, Matthew Duvall

**APNEP Staff Present:** Dean Carpenter, Jimmy Johnson, Marygrace Rowe

## Meeting Discussion:

Dean: The purpose of this introductory presentation is to facilitate a rebooting of APNEP's monitoring & assessment teams (MATs) in 2017. The MATs were placed on hold in the 2008-2010 era. Science was getting too far ahead of the policy and had been put on hold while APNEP crafted a new strategic plan (CCMP). The first APNEP MAT kickoff (Wetlands) was last Wednesday (February 22). Will be talking about monitoring and assessment of this program. Big picture. Plugging into greater APNEP framework.

Program area is approximately 22,000 square miles. Upper Roanoke basin is not included because in the late 1980s there was a sensitive topic of inner-basin transfer between Upper Roanoke and Virginia Beach. APNEP border goes along barrier islands. Given it's an EPA program, the programmatic boundary was restricted to the estuarine system. With a movement toward an ecosystem approach I have been advocating a whole-basin approach by incorporating near marine and the upper Roanoke, a position that has been supported by the STAC and presented in our assessments. But if APNEP want to do management activities (protection, restoration, outreach) in upper Roanoke or near marine APNEP must seek partners to lead.

Joe: Was coal ash spill in APNEP boundaries?

Dean: Origin of the spill was in Upper Roanoke on North Carolina side of border then flowed into Virginia. In planning and processes there is a special dimension. APNEP is a partnership… collaboration. North Carolina challenges: state agencies are an important part of game. Virginia component… coordination. APNEP is seeking a supra-agency memorandum to promote joint work between North Carolina and Virginia agencies. Getting people in room. SAV… Back Bay in

Virginia have been included in past SAV surveys. Federal agencies often divide into regions at North Carolina/Virginia border. That is where APNEP can devote our resources: Back Bay to White Oak. SAV has not been present toward the South Carolina border. Funding the flights for 2006-2008 SAV surveys was a multi-partner effort. For the 2012-2014 flights APNEP was the lone funder. Ann's team secured CRFL funding to survey the North Carolina coast south of White Oak River.

Anne: NC-DMF must survey the whole coast and thus they focus on that portion outside the APNEP region and APNEP does the rest.

Dean: Questions to address. Sentinel sites. Talk about uniform protocols and unique protocols. CCMP is the APNEP plan that tries to answer four basic questions. Plan came out in 2012. What is a healthy system? Ecosystem management… adaptive management. Indicators… tracking over time for trends and status. STAC helped develop indicator framework. EPA defined indicator as numerical metric over a specific geographic domain. What makes a good indicator? (criteria from EPA on presentation). Ad hoc assessments. Based on level of uncertainty when working with decision makers. What level of confidence do you want? Now that we have new plan we must think about level. Indicators for this group? Tying to decision makers' questions. The 2012 ecosystem assessment was the first comprehensive assessment since the early 1990s – Albemarle-Pamlico Estuarine Study era. Between 1988 and 1994 a lot of research was funded. The 2012 version was a status and trends assessment, with 24 indicators featured. Targeting indicators based on current and old CCMP. No evaluation of whether trends were good or bad. Just showed how resource metric is changing. The next version of assessment will begin in 2017-18 and continue, they will roll out. What is a healthy metric target? Over next ten years what do we hope to see? Indicator development begins with the technical partners and then is vetted by the policy and citizens' communities. APNEP has two SAV-themed teams: Monitoring and Assessment and Action Team, the latter responsible for planning and management… policy and rule making. At least one STAC member is assigned to each action team. Within the SAV action team there are multiple members who know the science as well. Conversation with management from beginning: What time frame do we expect so see these changes? If the system doesn't respond like we thought, managers should support alternative approaches.

Jud: There is a predictive element to this. We may not have all the necessary info. Outcome could be the monitoring and assessment team identify needs by collecting information. Seagrass is migrating, action could be to figure out how to monitor it better as it migrates.

Dean: That was the case of the Ecological Flows Team where the initial project is to find as many flow data as they can. Why can't we fully report or do a full assessment? We must have the discussion and identify shortcomings.

Mike: Tampa bay. One of the things they were trying to target was bottlenecks. Area that should be available to SAV but wasn't growing. Did restoration in upper regions. Bottleneck can impede. A case where recruitment was a target.

Dean: Jud has expressed the factors required to assess potential SAV habitat, including fetch and sediment types. Matt's NRCS team is preparing to conduct sub-aqueous soil surveys in our region. What areas have favorable sediment types for SAV? If we want to do restoration or retention, we need to know this stuff.

Matt: Up until a few years ago NRCS surveys were exclusively terrestrial.

Dean: A past STAC meeting had as it theme ecosystem-based management. EPA colleague knew legislative bottlenecks in policy. Identify bottlenecks ins science and management. Let's identify them and bring them to policy makers.

Mike: Used bottleneck areas as targets. Let it grow from north to south.

Joe: Lack of recruitment and seed source. Should be investing in that in action group. Why is there not a poor rating on bullet two? Areas where we have watched it disappear.

Dean: If you're at poor, what are the health targets? Get it to fair.

Joe: How does that relate to the trigger value, zone of confidence?

Dean: Second question gets at trend

Joe: 2010 to now went from lots of SAV to none

Dean: We have baseline of 2006-08. We would like to move the baseline back if possible based on Don's research using older imagery.

Jessie: The outcome would be the report card.

Dean: Trigger is associated with activities we implement on the ground. This is how you would expect SAV to expand if we institute this action. If five years down the road and things aren't improving, let's try something different.

Anne: Triggers are based on indicators.

Dean: After five years we should be here. If not, why?

Jessie: What will the system be after five years?

Dean: We don't fully understand the system.

Anne: We're so far from that. Same thing for fish stock assessment. Can locate multiple parameters from tons of data. We don't have that. Is this realistic?

Dean: We know the stressors.

Anne: Are we collecting enough data for indicators to accurately predict?

Jessie: What parameter are we building this model with?

Dean: The first assessment in 2012 was just trends. 2017 we want to include evaluation. Citizens report card could be subset of metrics featured in the ecosystem assessment. Hope to feature SAV.

Joe: Citizens monitoring component would be report card and technical manager person will have that.

Dean: After monitoring trends then move to diagnosis. For the manager, you need a model to explain trends in data. Natural and human stressors. Let's try to get there.

Joe: We're not there on the last bullet but should work to get there.

Mike: Put model out there. Extensive modeling land different ecosystems. We have an understanding of how we can kill SAV.

Dean: Have discussion with policy makers. If we pursue these paths this is how we expect SAV to behave. Want to be ahead of the game but we are low on ability to do assessments right now. Not sure whether anyone is working to create that regional model. APNEP focuses on regional scale. Working on restricted patch but when you scale up. Developing a larger scale model for SAV in those regions.

Jessie: Are there water quality or SAV parameters for each zone?

Jud: Trying to do that.

Jessie: Each will have a suite of tables.

Anne: Got a table from multiple sources.

Dean: Chesapeake and Tampa Bays have more resources. They have different geographies.

Mike: Tampa Bay issue was stormwater runoff, lots of money but it worked! Good news got public and manager support.

Dean: Assessments addresses the science and policy interface. North Carolina ranks third in SAV acreage. We had approximately 140,000 acres of visible grass based on the 2006-2008 surveys. APNEP did an economic valuation of SAV that only considered the ecosystem service of fish habitat and used a conservative estimate of $12,000 per acre, which meant figures in the billions… valuable resource. Juvenile species from Canada to Florida spend some of their lifetime in this estuarine system. APNEP published in 2016 an economic assessment for the region. SAV was one of the metrics considered.

Ken: When you start adding evaluations on SAV it would be a change in practice for North Carolina to allow mitigation for SAV. Urge caution in evaluations. As development impacts seagrass on a regular basis. Use caution about using economic evaluations. No mitigation for SAV in North Carolina?

Anne: Not meant for mitigation.

Ken: Mitigation banks for SAV in Tampa Bay. Monitor and map permitting actions that directly impact SAV.

Dean: APNEP staff worked with economists. We talked with other NEPs and found that it useful for policy makers to see the value. Separate from ecosystem assessments. Focus on services.

Ken: Issues on last economic evaluation?

Dean: Will address that next time around. If it's well received and get more funding and primary research done. Better evaluation.

Ken: Comparing to Tampa Bay?

Hilde and Joe present.

[Note: There is a gap here in notetaking of at least 45 minutes so staff could get and prepare lunch for the participants] .

Jud: Recommendation?

Joe: Great question. Refining protocol?

Hilde: Edenton Site. Crigging map. In the midst of the Quible sites.

Joe: When to conduct sentinel site surveys? Spring or Fall or in between?

Don: Did a spot to the east of this site. Grass 200 meters beyond beds that had been digitized from imagery.

Joe: This location-grass out to 2-meter depth. SAV forms a basis in shallow water but can expand to deep water.

Hilde: Little River Site. Stays near shore. No statistical difference from spring to fall. Kitty Hawk Bay and Edenton are the sites with the most SAV.

Hilde: Need more years of data. Want to possibly look at land use and fetch/wave activity.

Joe: Nutrients from development.

Jessie: Paired water quality and SAV monitoring.

Jud: What can we say as a group based on this approach?

Dean: Reminder- We needed boat-based efforts in addition to aerial efforts to fully tackle this issue. 1-meter isobaths to detect presence of stumps? Conversation about sampling where SAV is located. Fly the area every five years and annual monitoring at sentinel stations and 1-meter isobaths survey every 5 years. How did 10 stations come up in Albemarle sound?

Joe: Lowrance system = $2,000, processing requires a license = $2,500

Anne: Looking at this method because it is too turbid in Albemarle. No more flights?

Dean: Won't continue doing flights. Monitoring on the order of 10 years?

Joe: Salinity fluctuations.

Joe: No long-term allocation of funds for sentinel sites. What are we going to do? Annually or another interval?

Jud: Convince responsible agency to fund it.

Anne: Joe and Hilde should come talk to DMF staff in Anne's section. The problem is you're talking about needing to hire a program crew and vessels.

Dean: Flight areas can be ground-truthed on annual basis if sentinel stations in place.

Joe: Expanding that out to the whole sound. Development.

Mike: Transect at 1 and 2 meter isobaths and gather percentages.

Anne: Go shallower because you will hit more SAV.

Joe: At some sites, it does go to 2 meters but 1 meter and less is a more reasonable depth. But docks.

Ken: AUV's?

Jud: Same problem as you have with aircraft, areas you won't see.

Ken: Little boats that map bathymetry. Maybe for future?

Joe: Z-boat runs with Biosonic system. Not cheap and battery powered.

Jud: Can't map as fast as sonar.

Joe: Not quite there yet.

Jud: The quality of the image is the issue.

Dean: CRFL report. Transects with cameras. Interpretation would require watching tons of footage.

Joe: Citizen monitoring in front of their properties? Provide them with gas cards and SD cards. The sonar equipment is on most people's boats. More cost effective than drones and AUVs.

Jud: Those are the people that want to get rid of it.

Joe: Some fishermen do realize the necessity of SAV for fishing.

Dean: Do we need to update this program?

Joe: Need to write a paper publication?

Ken: The industry is ready for this protocol to be used for coastal development. This should be used by all of the southeast. We need to get this method out and peer reviewed.

Dean: This method is designed for this system.

Joe: Peer review report is in order.

Jessie: Hobo lights?

Dean: Suggestion at 0.75 and another for SONAR?

Mike: Provide some sort of numerical standards at two depths. It's sustainable and gives you a value.

Joe: You have to have a crew on a boat for two months. 63 kilometers. Two people needed.

Jessie: How can you measure physiological indicators that the grass is dying without actually having to see it die. Get seeds for a seed bank in cores. Germination test. Take it while you're there and process it later.

Jud: How many monitoring programs in the country are using anything other than structural?

Jessie: Grab some leaf samples and send to UNCW and help monitoring efforts to know if there is any indicator in the leaves that its dying. Direct link between nutrients and SAV.

Joe: Me and UNCW and Anne get together to combine efforts?

Joe: Can make a condensed version of the methods of what we've been doing.

Anne: Could use and propose to DMF colleagues.

Jessie: Crigging methods. Biovolume… canopy height differences. I felt better about percent cover.

Joe: Biosonics was more accurate. Didn't have as many false positives.

Jessie: Need to understand difference in using Lowrance and Biosonic.

Dean: Upcoming field season.

Joe: Presentation on Pamlico and Neuse river this upcoming field season. Need to pick sentinel site in Neuse river.

Dean: Started in Albemarle and moved south. Who is following behind Joe and his team?

Jud: Have the sites picked for Neuse?

Joe: Still need to pick sites in Neuse. Blounts Bay: saw some small SAV growing. Nice to revisit some sites but don't have funding or plans to. Need to budget for that.

Jessie: If funds we could divide and conquer.

Joe: Hilde is doing Albemarle again. I need partners. NFWF grant.

Dean: NFWF funds came from coal ash settlement. Neuse and the Albemarle but not the Pamlico.

Jud: What do you get for Neuse?

Joe: I don't know. 2 years?

Jud: Nothing to go back to Pamlico?

Joe: Correct.

Dean: We need to draft a plan for annual visits.

Joe: Important to do annually to know how fast these beds change.

Anne: With NFWF, two years in Neuse and Albemarle. You need sentinel site monitoring in Pamlico.

Dean: Six sites in Pamlico.

Anne: Right now, there is no extra money. We could maybe get staff if you guys have equipment. Temp solution. Need a report and maps.

Joe: Get APNEP report to Anne.

Anne: When you come, maybe fisheries staff in Washington could help.

Joe: Jill Paxton?

Anne: Was on rapid response but at the water science lab.

Jimmy: Scrounging together team every time she goes out.

Joe: Get you a report from the Albemarle and Pamlico.

Matt: Is this an alright time to step in with what we're going to do?

Dean: Sure.

Matt: NRCS agency with federal authority for soil mapping. Historically focused terrestrial ground. Many people interested in soils in the subaqueous soils. Soil scientists expressed interest in a subaqueous soil survey in the APNEP region. In the process of acquiring a boat. Been doing it in New Jersey and Rhode Island. We don't work in water depths above three meters. Part of soil surveys now are ecosystem site inventory, relationships between plant communities and soil types. Asked Dean to come up with priority area for soil surveys. Hoping to start this summer. Getting boat built right now. If there's a protocol for measuring the

vegetation ecosystem while doing soil survey, we can participate. Something for partnership to think about but if there's a need for your needs to be met.

Jud: What's the diameter of your core and what do you process?

Matt: 3-4-inch diameter core. Variables are dictated by partner.

Jud: Grain size, organic matter?

Matt: Depends on funding. We can do any soils analysis and collect to any protocol but is driven by partnership. What are the most meaningful interpretations? What are the variables of interest?

Jud: Carbon sequestration data?

Matt: One of our previous partners is Barnegat Bay (New Jersey). We need to work with a partner that leverages what we produce.

Dean: The Corps is coming up the coast in 2017 with a lot of technology. Charlene Sylvester.

Matt: We need bathymetry, not always available. Current LIDAR bathymetry would be the gold standard but if we need to develop bathymetry. If you're in need of partners to assist with SAV monitoring if you pick your soil survey areas to correspond with SAV areas we can kill two birds with one stone.

Don: Charlene Sylvester Army Corps presentation. They will be flying up the coast in the summer. Really cool plane. 500 meters from the shore which may reach the sound but not in many places. Willing to fly over areas on the sounds. She seemed willing to talk to us she might possibly be willing to help.

Matt: Gave a price estimate $2,500 dollars per square mile. If we did 80,000 acres that's like $300,000! If there are funding sources available, she is willing.

Jessie: Acoustic was cheaper and not much more precise a few years ago.

Don: Topobathy lidar will be on website?

Matt: If you guys have good aerial nearshore imagery, they're getting good at techniques to measure relative bathy. Tie relative values to absolute values.

Don: From three-band sensors you can create reasonably reliable bathy. Down to 3 or 5 meters still within a foot or two of accuracy. Satellite-derived bathymetry.

Matt: Vegetation monitoring can be done wherever we are contracted to do soil surveys.

Dean: Feedback on soil survey data? Where should the sites be? Does data have to contiguous?

Matt: I don't see why not.

Dean: Is 1 km a good-sized ribbon to go out on? Parallel to shore, how thick should it be?

Joe: If we wanted to go out to 3 m depth, how many could you do?

Matt: Opportunistic sampling designs. Don't get as much bang for buck if completely randomized.

Jud: What is driving this for NRCS? The biggest need is that there are growing numbers of people that need info on subaqueous soils. Why are you interested?

Matt: We are the only federal agency that is entirely non-regulatory. We will be mapping 80,000 acres in the sounds no matter what and you guys have the best reason for sampling this area. We do soil surveys that we can do for free. Lab analysis has a cost. There are several initiatives to measure sequestered carbon.

Jud: There could be carbon analysis done?

Matt: Yes, some for blue carbon metric.

Jud: Direction they're going for carbon, countries that participate are responsible for generating inventories. It's official now that SAV is a part of carbon initiative. Profiles we can trace back.

Matt: Any one core I need 10-15 different bulk density samples.

Joe: Every time we survey we get sediment composition from SONAR right at the surface based on the reflectiveness of the sediment.

Anne: There is an association with shellfish to hardness of sediment.

BREAK

Anne: Contracted with NC-DOT for imagery and interpretation. Bottom line: delineated 2,271 acres but don't know total acres of water. 549 acres dense and 1,722 acres patchy. I'm unhappy with the interpretation. Would rather hire someone and do it in-house next time. They were able to zoom in and do smaller patches. What I've found is that where there was grass before it's filled in? Ground-truthed 171 points.

Jud: Were any points clarified with ground-truthing efforts?

Anne: Yes, but not enough. Maps passed out from New River and south.

Jud: Any way you could identify species on the map?

Anne: Yes. Is there any central location for all this data?

Brandon: Coastal Atlas?

Dean: Anne mentioned 2015 effort south of our region. Second cycle interpretation (2012-2014) to be published this year. Don giving update on interpretation.

Don: NC-DOT interpretation had some issues. Marygrace is reinterpreting the 2013-14 imagery. Her current focus is on areas from Manteo to Buxton.

Dean: Once that map is finalized we can estaimate a trend based on two maps.

Jud: For data requests, is it possible to get a table on a computer to see the year, date, what was flown, where, the condensed specifications. Especially where it resides. Get lots of requests for imagery.

Dean: Since 2011 the 2006-2008 map has been available, while newer stuff is not available.

Jud: Interpreted imagery or not where is the imagery located? How can you get to it to download it?

Ken: Be respectful of Dons time.

Jud: If it's something where people can find it they won't need to bother Don.

Dean: Coley Cordeiro is working on this.

Don: We can do that with shapefiles from 2006-2008 and 2013-2014. Don't have manpower to do anything about imagery. To get it in usable format you have to have a technician that mosaics it together for public and compress it. Right now that's tough.

Jud: Valuable to have that info too so someone else can do it.

Dean: Access to imagery over time to look at change detection. Work plan has been approved for SAV, so there are plans to conduct a third survey in spring 2018.

Jud: A year to plan?

Dean: APENP has to work with NC-DOT.

Jud: Leverage this effort with other funding to establish sentinel sites and supplement ground truthing.

Dean: Bill and I can work with APNEP policy board and partners.

Jud: Restricted air space.

Jud: Partnering with soil people.

Matt: Dean mentioned cooperation to get things done.

Conference call for soil sampling and blue carbon

Jud: APNEP's State of the Sound this fall…we should produce two presentations for this meeting. Joe and Hilde produce one on their research.

Joe: Demonstration.

Jud: Other action item- Dean and Don organize data spreadsheet for imagery. Still pushing forward developing monitoring protocols.

Joe: Most important action item is to get peer review article written about Hilde's work. It would help DMF.

Jud: Another action item planning for 2018 flight. Lead? Don? Who organized ground truthing?

Ken: Patrick?

Jud: Jessie and Joe are going to coordinate protocols.

Ken: For the project in Neuse consider funding opportunity; Department of Justice for remediation of hog waste. RFPs come out in July and letters of intent due in September.

**Action Items**

1. Joe and Hilde will collaborate with Anne Deaton to inform and educate NCDMF staff on the practical application and protocols for sonar surveys designed to map and monitor SAV in NC.

2. Joe and Hilde will develop a peer-reviewed manuscript on the development and implementation of sonar methodology for mapping and monitoring SAV. This will include a comparison of Biosonics and Lowrance/Biobase approaches.

3. In conjunction with #2 above, Joe and Hilde will prepare a presentation for the APNEP "State of the Coast" meeting in Nov. 2017.

4. Jud and Dean will coordinate with Matt Duvall (NC USDA) on developing plans for a USDA submerged soils sampling program in the APNEP region.

5. Dean and Don will collaborate to develop a metadata spreadsheet documenting the availability of remote sensing data (aerial photography, satellite imagery, reports, etc) for SAV in the APNEP region.

6. Dean, Don, Anne and Patrick will coordinate to plan spring 2018 aerial surveys for SAV in the APNEP region.

7. Joe, Hilde and Jessie will coordinate monitoring protocols for SAV research and monitoring programs planned for 2017 and 2018 at ECU and UNCW.

8. Jud and Don will collaborate with David Johnson (Duke University) on the development and application of AUV technology for mapping and monitoring SAV in the APNEP region.