DRAFT

APNEP Scientific and Technical Advisory Committee
Shoreline Development Meeting Notes
July 23, 2013

Auditorium
Willis Building, East Carolina University, 300 East First Street
Greenville, North Carolina 27858

STAC Members Present: Marcelo Ardon (ECU), Reide Corbett (ECU), Maurice Crawford (ECSU), Tom Crawford (ECU), Heather Deck (PTRF), Robin Dennis (USEPA), Scott Ensign (AquACo, Aquatic Analysis and Consulting), Erin Fleckenstein (NCCF), Joel Fodrie (UNC-CH-IMS), Kirk Havens (CWM-VIMS), Jud Kenworthy (NOAA-NOS, retired), David Kimmel (ECU), Wilson Laney (USFWS), Michelle Moorman (USGS-NC), Burrell Montz (ECU), Rachel Noble (UNC-CH-IMS), Hans Paerl (UNC-CH-IMS), Michael Piehler (UNC-CH-IMS), Randy Swilling (NPS-CHNS), Heidi Wadman (USACE-FRF), Jess Whitehead (NC Sea Grant)

State Agency Liaisons Present: Jon Blanchard (NC-DPR), Matt Slagel (NC-DCM) and Allison Weakley (NC-NHP)

Guests/Public Present: Carolyn Currin (NOAA-Beaufort), Molly Mitchell (CWM-VIMS), Lisa Schiavinato (NC Sea Grant), Carl Hershner (VIMS)

APNEP Staff Present: Dean Carpenter, Bill Crowell, Jim Hawhee, Jimmy Johnson, John McLeod, Lindsey Smart, Erin Thompson (APNEP Intern)

Call to Order

STAC Co-Chair Reide Corbett called the meeting to order and welcomed everyone to the meeting and expressed appreciation for all attending. This is the third of a series of meetings: the first was on sea-level rise, the second was on water quality. The STAC's next meeting will be part of a larger meeting, an APNEP conference in New Bern.

Reide noted that today's agenda has four speakers, and he thanked Mike Piehler and Dean Carpenter for spearheading the efforts to put this meeting together. The focus today is on shoreline development. STAC members should consider the 2012 APNEP Comprehensive Conservation Management Plan (CCMP), and think about the CCMP action items related to shorelines including assisting local governments, engaging in educational efforts, promoting living shorelines, and replacing hard shoreline structures with living shorelines. Reide suggested that committee discussions this afternoon focus on how to facilitate the CCMP measures.

Reide reviewed meeting logistics.

APNEP Update*,* Dean Carpenter:

Dean noted that he was really heartened by today's good turnout, noting the last time a STAC meeting had over 20 members present was in spring 2007. He thanked Dave Kimmel for arranging the meeting venue, and those who drove vanpools and carpools (Wilson Laney, Michelle Moorman and others).

Dean noted the passing of North Carolina Division of Water Quality employee, Guy Stefanski, who was historically involved with the APNEP, and asked for a moment of silence in memory of Guy.

Dean introduced John McCloud from the Virginia Department of Environmental Quality, the new APNEP Field Representative for Virginia. John gave the STAC a brief summary about his professional background.

Dean reviewed STAC membership changes, including those who left due to expired terms not being renewed, those who renewed (Pete Caldwell, Don Field, Joel Fodrie, Erin Fleckenstein, Andy Keeler, Jud Kenworthy, Dave Kimmel, Hans Paerl, Mike Piehler, Jess Whitehead, Rich Whittecar), and recognized the STAC's newest member, Dr. Scott Ensign.

The STAC's next effective meeting will be an APNEP conference/symposium on November 20 in New Bern.

Dean noted that he is facilitating his update with a presentation slide of APNEP activities. There have been many activities since the last STAC meeting in late March, so he would just mention the major ones. The Duke University Master of Environmental Management Program had three projects with APNEP that were completed in April: ecosystem-based management (EBM) governance, social networking, and a rapid assessment protocol for aquatic invasive species.

Dean as a member of the Defense Coastal Estuarine Research Program (DCERP) Regional Coordinating Committee attended an event at Camp Lejeune in early April, the first all-hands meeting of the second five-year phase of DCERP. He asked Mike Piehler, a DCERP principal investigator, to provide to his fellow STAC members a summary of where the program stands. Mike noted that the U.S. Marine Corps owns a great deal of the landscape in the New River Estuary. The first phase of the project involved looking at nutrients and eutrophication, and Hans Paerl is also engaged in the work. This next phase will look at climate change, and carbon cycling, and will look more at sinks and sources and how these change in response to land use and climate change, and translating the results into practice. Dean noted that he is envious of their funding, and hopes that some of the research insights will be applicable to the APNEP region.

Dean and STAC members Wilson Laney and Jud Kenworthy participated in a mid-April SAV Partnership meeting. The meeting's primary purpose was to plan logistics for ground-truth

sampling to support aerial SAV surveys in May and June. Dean asked Jim Hawhee, leader of the SAV Outreach subcommittee, to brief members on recent outreach activities. Jim noted that 50 really beautiful signs urging citizen protection of SAV will soon be installed near boat ramps along the coast. The North Carolina Wildlife Resources Commission will be erecting these. Also, North Carolina Sea Grant took the lead on publishing a brochure on SAV, and it is on the Partnership web site.

Dean noted that with regard to the SAV Restoration subcommittee, work has focused on creating a guidance manual that if followed will ensure the highest probability of restoration success.

APNEP had an ecosystem-based management (EBM) models workshop in late April with the VIMS staff. The purpose of the meeting was to take the original models developed to support creation of the 2012 CCMP and make them more quantitative and specific.

The APNEP Policy Board also met in late April, in Beaufort, primarily to approve the APNEP Fiscal Year 2014 work plan. The meeting was also part of the USEPA Onsite Implementation Review. Dean explained how the review works, which is part of the process to ensure that the grant for APNEP is being implemented. The reviews take place every five years now, rather than three as was formerly the case. The USEPA sends a three-person team comprised of representatives from Headquarters and the Region, and also a representative from another NEP. The team met with local agency staff and others. Wilson attended the Policy Board meeting as one of the STAC representatives. Dean asked APNEP Director Bill Crowell to summarize the meeting and the review.

Bill provide a brief overview of the meeting. Some STAC members had also met separately with the review team. The team was very impressed with the 2012 CCMP and ecosystem assessment. Funding, however is being reduced 14% next year as a consequence of the federal sequestration. The final USEPA review letter hasn't been received yet. Dean recognized those members who had interacted with the team. Wilson also participated in the field trip to the North River Farms wetland restoration project site, during which the group encountered a pigmy rattlesnake. He offered Wilson the opportunity to comment on the meeting and the field trip.

Wilson noted the old story about encounters with venomous snakes in habitat, which goes something like the first person on the trail who encounters one wakes it up, the second person makes it angry, and the third in line gets bitten. He noted that in this case, he was the first in line, and APNEP Policy Board member Todd Miller was second, and was the one who realized the snake was there. Bill noted that they discovered that Todd has the ability to leap very high vertically. Wilson noted fortunately no one was bitten. He reported the encounter to the North Carolina Natural Heritage Program and they advised that no pigmy rattlesnake had been documented previously from North River Farms. Bill noted that his conveyance of the observation to the Natural Heritage staff had been met with skepticism, until he noted that Wilson was the one who identified the snake. Wilson noted that USEPA Regional

representative, Rhonda Evans, had tried to photograph it, but the dense vegetation prevented her from getting a clear shot. Wilson noted that the meeting was a good one, and that there was good interaction with the EPA review team. Many of the field trip participants had dinner afterwards at the Ruddy Duck Tavern in Morehead City, and were able to discover connections with members of the review team. The team was pleased with the progress which the APNEP had made since the last review.

Dean reviewed the activities for May, which included more of the on-site review: the day after the APNEP Policy Board meeting there were scheduled visits to UNC Institute of Marine Sciences, NOAA-Beaufort Laboratory, Duke University Marine Laboratory, and DENR-Office of the Assistant Secretary for Natural Resources. The final report will be shared with the STAC once it is received.

Dean reviewed the Coastal Ecological Flows Workshops, noting that Bob Christian during his STAC presentation in March had asked STAC members, and others interested, to assist the state's Ecological Flows Science Advisory Board with developing recommendations for coastal flows. There have been three workshops, one each in May, June, and July. Scott Ensign and Mike Piehler participated in multiple workshops in the series. Dean attended all three of the workshops as well as the presentation by Bob last week to the EFSAB. Dean noted as much of the insight as possible will be integrated into the EFSAB's work.

An aerial SAV survey began on Memorial Day weekend. Bogue and Back Sounds, as well as Ocracoke Inlet to Manteo were flown by North Carolina Department of Transportation (NC-DOT) Photogrammetry staff. The weather flipped into a new pattern with much rainfall, which prevented the Core Sound overflight, so Core Sound data/imagery for 2013 will be missed. Plans now shift to flying Back Sound in spring 2014.

Moving to June-July, Dean noted that he had already talked about the two coastal ecological flows workshops. Dean and Michelle Moorman attend a workshop on the US Army Corps of Engineers, Field Research Facility, to participate in strategic planning. Dean asked Heidi Wadman to address that meeting.

Heidi noted that while the facility has been level-funded for a while, there is a push to expand the FRF mission. She doesn't know what that means in the short run, but she hopes to see an expanded budget for the next five years. Heidi is getting a lot of support for expanded monitoring, and is getting a lot more support so support APNEP.

Wilson asked Heidi about the potential for collaboration with scientists who are using acoustic technology for tracking fish and marine mammals. Heidi noted that is part of the discussion and she envisions more involvement in those types of studies.

Dean noted that the Executive Committee of the Policy Board will be meeting August 1 in Greenville to discuss APNEP implementation, including the 15 workgroups which are being formed to implement the CCMP actions collectively.

Dean asked for any other updates. There were none.

Mapping North Carolina's Estuarine Shorelines, Dr. Reide Corbett,

Reide noted that he and J.P. Walsh (presenter at last STAC meeting) have been doing work on shorelines. He has spent a good bit of time talking about our inner shorelines. North Carolina has over 300 miles of ocean shoreline, and over 10,000 miles of estuarine shoreline. They developed a method for looking at shoreline change using aerial photos. This is a fairly accurate technique. Their study focused on the Neuse River Estuary, looking at annual rate of change. They looked at two different time periods, in this case 40 years apart. In the Neuse, things are changing on average about a quarter-meter per year. There is some spatial variation. The rate of change of the marsh shoreline doesn't change that much, regardless of where you are, being about a half-meter per year. Fetch seems to be an important variable with regard to how fast change occurs. They examined the shoreline change rate relative to wetland, forest, sediment bank, and "other." They had a lot of data, but none of them showed really great relationships. Yet wave energy and fetch did come into play.

Storms are key drivers of change. Hurricane Earl caused some major changes.

The North Carolina Division of Coastal Management (NC-DCM) was very interested in the study, and suggested that the study be expanded to the entire state. At this point the state did not have a digitized shoreline, and Guy Stefanski began working with them to develop goals for the project. There were three goals, developed around 2007. There was an Estuarine Shoreline Mapping summit held in December 2008. They also did a survey, which included 60% managers and 40% technicians. They discussed and compared methodology. Most people were using orthophotography for digitizing the shoreline. Reide reviewed the survey results with us. That meeting led to an understanding of what people were doing for the shoreline, and ultimately the development of the methodology. The document is on the web, and has been updated to 2010. Reide noted that other states are using the North Carolina methodology to digitize their shorelines as well. The North Carolina shoreline was digitized using a "sweatshop" of graduate students. This required the digitization of over 12,000 miles of shoreline by sitting in front of computer screens, over roughly a four-year period. Reide noted that they characterize the shoreline by habitat type. The resultant dataset is available online. All the structures on the shoreline are also mapped, along with boat ramps, bridges and piers. It is segmented by county for ease of downloading. They used the most current aerial photography available.

Reide showed photographs of the shoreline types classification. Marsh, swamp forest, sediment bank shoreline, and modified. Dean noted that some classifications divide habitats into finer types. Such classifications provide a snapshot of what the shoreline was when the imagery was taken. Reide noted that some of the areas were very interesting to map.

Reide gave us some examples from Dare County.

Reide created a training exercise to provide training prior to actually allowing individuals to do the work. There is a detailed manual.

Reide shared a table with the final statistics. They have begun to do some analysis with the data. They were asked to do some on-the-ground verification, which they did, to verify the data. In one case, heads-up digitizing showed 146 structures, and the boat survey revealed 155. The difference may be attributable to the changes which had occurred since the imagery was flown.

Reide provided an example NC-DCM application. They can be used for tracking coastal permits, and other purposes. The dataset is incredible. The NC-DCM cursory analysis is available online. ECU is doing some additional analysis. Sixty-five percent of the North Carolina shoreline is dominated by marsh.

They have further looked at regional variation, looking at the north, central and southern coastal regions. The amount of shoreline length doesn't vary all that much. If you look at the estuarine versus the ocean shoreline, the northern inner coast has significantly more shoreline than the other areas. The relative distributions of habitat are similar. When you look at the data normalized by distance, the central area has more piers and docks. The larger counties have more shoreline, and therefore more docks and piers. When the parameter is modified shoreline, some of the smaller counties have more. They did a "hot spot" analysis which looked at the total amount of modified shoreline within a ten-km radius. When the radius is dropped to 2-km, there are fewer hot spots, located in the Pamlico River, and Dare County. Collington Island is one such hot spot. Atlantic Beach is another.

They also looked at rip-rap. The area of the old Suffolk Scarp shoreline was heavily armored, where the shoreline is sandier.

Conclusions: North Carolina has come a long way in the last five years; an extensive dataset has been collected; the data highlight areas of impact and change; there is a need to analyze more areas and make the data available; they are open to feedback and questions. The data can be used more beyond just answering questions, and can be used for research.

Reide noted that the question is where NC-DCM wants to go from here. On the ocean shoreline, NC-DCM annually reviews rates of change. Perhaps such monitoring is desirable on the estuarine side as well.

Michelle Moorman asked if the hot spot data are available. No, not at present. Reide noted that they have a report due to NC-DCM sometime in August, after which the data would be available.

Jud asked if the data are available in layers. Yes, they are, and you can download them by county.

Reide asked Matt Slagel if there are plans to update the database. Yes, NC-DCM do have a digitizer employed to update the data to 2012.

Maurice noted that looking at the relationship to SAV would be very interesting.

It was asked if oyster reefs can be distinguished in the imagery. In some you can, but not all, so quantifying that habitat would be very difficult.

Bill asked Matt if he was the POC for this project. Yes, he will be, although there is another person as well who works on an aspect of the project.

Ecological Effects of Estuarine Shoreline Stabilization and Alternate Approaches, Dr. Carolyn Currin

Carolyn noted that she would cover a variety of projects, beginning with the north side of Harker's Island which is exhibiting some pretty dramatic erosion. The problem is that estuarine shorelines erode due to wave energy. Sea-level rise, storms, boat wakes all exacerbate the problem and increase demand for control. Hardening the shoreline will reduce the level of ecosystem services. One question is whether erosion can be decreased, while at the same time maintaining ecosystem services.

Carolyn noted that Reide had just reviewed the shoreline mapping program. NOAA mapped the entire shoreline of Marine Corps Base Camp Lejeune using boats. The New River Estuary shoreline is different in that smaller amounts are marsh, and modified, with most of it undeveloped. In some cases overhanging trees make it difficult to spot armored shoreline. Carolyn showed data for the shoreline change rate. Because they surveyed via boat they were able to break the sediment banks down by height. The higher the bank, the higher the erosion rate. In many of the habitats, the rate accelerated during the period 1989-2004 when compared to the 1956-1989 period, which was explainable by the large storms which occurred in the latter period. They were able to detect the difference between shores with narrow fringing marshes, and those without. There is benefit to having the marsh present. Carolyn noted that when the sediment banks erode, they do provide sediment to marshes, which may help to keep up with sea-level rise.

Carolyn reviewed ecosystem services. A natural shoreline is shallow with sunlight reaching the bottom to support the micro-algal community. Shallow bottom also provides a refuge for small fish, and you don't have that with deep shorelines. Services include primary production, wave attenuation, sediment trapping, habitat for fish and shellfish, and nutrient and contaminant removal. They asked how placement of hardened structures affects these services.

Carolyn shared a slide which depicts the services from fringing marshes: wave attenuation and sediment trapping; fisheries habitat; primary production, nitrogen cycling and carbon sequestration. Even though these are narrow marshes, they do provide the full suite of ecosystem services, same as full-size marshes.

In 2002 they looked into using citizen monitors to assess natural and stabilized fringing marsh in North Carolina. They compared three paired sill and reference marshes. They found that fish were abundant, similar immediately, and expensive to sample. The vegetation was similar after three years. Hurricane Isabel came during the study and resulted in pretty significant sediment deposition. Sediment elevation increase greater in the marshes behind the sills than in natural marshes.

They did a fringing marsh study in Carteret County and had seven sites, looking at stone sills and intertidal oyster reefs. They were interested in whether marshes could keep up with sea-level rise. Carolyn explained their technique and noted that they can measure changes in millimeter increments. They track elevation change, and sediment accretion, using feldspar markers.

There were four paired reference and stone sill sites: Pivers Island, Harkers Island, the North Carolina Maritime Museum, and North Carolina Aquarium at Pine Knoll Shores. There were three paired oyster/no oyster sites: Middle Marsh (North Carolina National Estuarine Research Reserve), Cape Lookout, and Mill Creek. They found that the lower edge of natural marshes didn't exhibit any surface elevation change at all; at the upper edge, they found an annual change of 2 mm. The stone sills showed accretion rates of 2-3 times those of natural marshes, so the sills are performing as designed. The oyster reefs do increase the accretion rate. The fringing salt marsh can therefore slow down erosion if an oyster reef is adjacent.

Carolyn explained how they can create a digital elevation model of their sites, using a fixed station and a wheeled rover. By taking data at time intervals ArcGIS can estimate the rates of change within the site, and map accretion versus erosion. Natural marshes aren't changing much, but marshes behind sills are accreting more.

They have seen some cases where a stone sill next to a soft-sediment shoreline did appear to cause accelerated erosion. That is a concern in siting stone sills. They also looked at vegetation transect design. There are good and bad aspects to the sill projects because accretion does keep up with sea-level rise, but the accretion does impact the salt marsh.

Carolyn reviewed the relationship between distribution of *Spartina* marsh across the tidal elevation gradient. Under an accelerated sea-level rate, they find a pretty steep decline in the shoreline after 75 years. The model they used doesn't consider shoreward movement by the marsh.

Carolyn showed us her personal conceptual salt marsh rebound model. There is some growth of tall *Spartina* in areas where shoreline slumping has occurred. Planting salt marsh is cheap and relatively easily done.

Carolyn showed us the graph of where stone sills have been built in North Carolina, with associated wave energies, and noted that it appears that some have been built in places where they aren't really needed.

Carolyn reviewed the key findings of their study. They did look at birds and she presented some of those results. There have been efforts to look at both natural and stone sill marshes. Rachel Gittman et al. investigated the impacts of Hurricane Irene on marsh sills. The sills protected the shoreline from damage.

Reide asked about the shoreline changes and rebound.

Carolyn noted that it may be two steps back, one step forward sort of thing. The sills do appear to slow down erosion.

Reide noted that if you look at sedimentation rates, the marshes do appear to be keeping up with sea level rise. One point of interest is how much the elevation tracking is related to the erosion of the marsh front.

Hans was curious what the two time periods were based on. Carolyn noted that they segmented based on the availability of the best aerial photography. Hans wondered if the recent increase in the frequency of hurricanes had anything to do with the observed changes.

Carolyn was asked if accretion rates should be taken into account when designing sills. Yes. She noted that if one's intent is to maintain intertidal flats, the accretion behind the sills is problematic, because it allows the marsh to grow over the flats.

Estuarine Shoreline Development Policy and Regulations in North Carolina, Lisa Schiavinato:

Lisa noted that she was happy to be here and was pleased that Dean and Reide had invited her. There will be a lot of commonalities in her talk with the prior ones. One is how much more data is required, and the other is formulation of policy. For the past couple years, she has been looking at emerging policy and regulations and a lot of the work has been done by others in the room, including Dr. Currin.

There are separate rules for the ocean and estuarine shorelines. It has been traditional to harden the estuarine shoreline, and there are issues therefore affecting the health of the estuary. Lisa noted that she will address how to better preserve our estuarine environment, yet also accommodate future shoreline development. The questions are pretty much the same as everyone else has.

Lisa would talk about the rules in a general way. North Carolina policy and rules permit a variety of methods, including bulkheads, revetments and marsh sills. Streamlined permitting is available for some methods. In most cases federal approval is also required, either the US Army Corps of Engineers (USACE) Section 404 process, or the RHA Section 10 process.

Lisa would try to look at this through the lens of homeowners, since they are the ones who usually influence the legislators. She reviewed the what and who that have informed shoreline policy. North Carolina Coastal Habitat Protection Plan (CHPP), North Carolina Estuarine, Biological and Physical Processes Work Group, Virginia living shorelines work group and others.

What are North Carolina's rules? New projects require either a general permit or major permit. The general one allows for expedited process, due to well-understood and predictable impacts. Major permits are required for projects outside the scope and conditions of a general permit. Major permits require consultation with 10 state agencies and up to 4 federal agencies.

Lisa projected the rules for the general permits. She reviewed the general permit conditions for marsh sills, versus those for bulkheads and revetments. There are 29 conditions. For marsh sills, approval takes three weeks or longer, whereas NC-DCM approval for bulkhead and revetments takes only one to two days. The marsh sill process makes things less attractive for the landowner. There is an agreement between agencies, however, which does try to simplify the process.

Lisa addressed the differences in permitting time. Much depends on the scope of the project. Sills take longer, especially if federal issues have to be addressed, such as essential fish habitat.

She addressed why differences exist. There are some North Carolina agency concerns about marsh sills, Office of Attorney General concerns, homeowner concerns and preferences, and marine contractor education. There is concern about conversion of public waters to private property, resulting from sediment accretion. Some people are concerned that the sills will allow more snakes on their property. Wilson noted he would consider that a benefit. She noted that marine contractor education is another need. There is still much work to be done in that regard. Contractors who know how to construct bulkheads well tend to recommend bulkheads.

Lisa presented some data from a forthcoming report. In comparison to other states, North Carolina's processing time is very short in comparison to Delaware. That goes for Maryland and Virginia as well, for all stabilization types. The message is that with regard to marsh sills North Carolina is not out-of-line with other states, but our processing time is much shorter for bulkheads and revetments.

When comparing across USACE districts, Wilmington District may be somewhat shorter. Lisa noted that individual permits simply require longer processing times.

Lisa posed the question, what does North Carolina want our policy to be? Do we want "equal footing" or not? The North Carolina timeframe for marsh sill permit is comparable to other states. North Carolina is fastest for bulkheads, but it is highly unlikely the state would seek to increase this permit timeframe. The focus is on keeping NC-DCM staff educated about all forms

of shoreline stabilization. The need is to focus on education of property owners and training of marine contractors, and to continue to work on education.

Kirk Havens noted that from Virginia's perspective, they found the contractors to be more the drivers of determining particular erosion prevention solutions than the homeowners. Hence they have been concentrating on the contractors. The contractors can do more bulkheads in a shorter period of time than they can do marsh sills. Lisa noted that if a state decides that living shorelines should be the default then that will change the policy. She noted that Delaware made that decision and requires a higher threshold for bulkhead.

Jud noted that he didn't understand the value of the metric, time to acquire permit. He wondered whether the ultimate issuance wasn't a more important metric, and whether more time shouldn't be required. He asked Lisa to clarify. She indicated that part of the issue is for agency staff to investigate the suite of options. This usually requires more time. From the homeowners' perspective, they do want it to take less time. Homeowners want to have a manicured lawn. She agreed with Jud that the focus should be more on time for analysis, instead of making the permit easier to acquire.

Jud asked if they had ever looked at approval versus denial rates. They had for bulkheads, and found the denial rates to be fairly low. She wasn't sure whether they had looked at the marsh fill statistics.

Jud noted that it was hard to imagine that a process lasting two days could allow for any realistic assessment. Lisa agreed but noted that it isn't realistic to increase the time frame.

Matt noted that he agreed with Lisa on the time frame issue. There are 29 conditions for the sills, so that is one reason it takes more time. In terms of property owner outreach, NC-DCM staff are working on that issue. They do have a new guidance document, but unfortunately, often the owner has already made a decision to go along with the contractor recommendations. During storms, bulkheads fail more often than sills do. They are trying to get everyone on the same playing field. Currently, USACE does require more scrutiny for the marsh fill projects. NC-DCM is working with USACE to try to get there. NC-DCM has developed a living shoreline strategy recently. There are six short-term actions: looking at the 29 general permit conditions and whether they can be reduced; property owner options; field investigations; training courses for owners and contractors; signage which explains how sills are different; leveraging grant resources. There are four long-term ones, including partnering with the military, and conducting additional research. Permitting, preference and contractor ability all have to do with the prevalence of bulkheads. NC-DCM does not believe that the marsh sill is the be-all and end-all.

Reide reconvened the meeting after members secured their lunch. A motion was made and seconded to approve the minutes from the spring (March 26) meeting. The motion passed.

Jim Hawhee gave an update to the STAC regarding APNEP media options. He reviewed the icons on the web site. If members wish to be on the APNEP mailing list, they just need to sign up. He reviewed the Facebook site. APNEP has a Twitter account as well. Jim asked how many used Twitter, and three folks raised their hands. Jim noted that it is used by a lot of news organizations. It can be used to keep your thumb on the pulse of what is going on. Jim noted that there are several APNEP groups on LinkedIn. One is the Science and Technology Group, and he would like to see that one reach critical mass. There is also a FLICKR web page as well, where photos are stored, and the photos are there free for use. Jim's personal favorite is the RSSP. He reads news from North Carolina and Virginia, and clips all the news of interest. Jim reviewed some of the current articles. This is a good way to stay up with the news in the region. Members may wish to set up specific folders for some of these transmittals. Jim asked for questions. There were none. He encouraged members to take advantage of all of these services.

Someone asked about Soundings on the APNEP home page. Bill asked if authors are needed for Soundings. The answer was yes. Jim noted that it is a great place to cover work that STAC members are doing. They can write about their research and how it relates to the system. Articles need to be only 500-1000 words. Jim will help with articles. The "Echoes" portion of the page also has posted articles.

12: p.m. Working Lunch: Human Dimensions of Shoreline Development, Dr. Burrell Montz:

Reide introduced Burrell to share insights about the human dimensions of estuarine shoreline development. Burrell noted that human dimensions is a pretty broad topic, so she picked and chose what she wanted to cover. Tom Crawford and others have looked at population trends and found that the estuarine areas are under particular pressure, because the oceanfront is already largely built-out. She noted that most of her data are from 1990-2000, but some are more recent. Between 1990-2000 much of the estuarine counties were in the middle to top quintile with respect to housing units built. From 2000-2011, the average percent changes were exceeded, for income and housing prices, less so for population growth. Most of the coastal counties saw an increase in income. More well-off people are moving in, and housing prices are increasing. When the social and demographics change, networking and community cohesion can change as well, but Burrell indicated that she wasn't going to discuss such changes today.

The largest percentage of the growth happened in the 1990's. A lot of that was in the estuarine watersheds. Except for the Raleigh area, most of the growth was in the coastal areas. Burrell noted that there are few urban areas within the overall region. Much of the growth is occurring along the shoreline. New Bern is the only community in the estuarine area which is increasing in population. Much of the landscape is undeveloped or agricultural, so much of the development is occurring on the shoreline and with higher value than before.

The "lure" is recreational opportunities, boat access, views (bluffs), land costs, and a perception of relative safety. This was at least true prior to Hurricane Irene in 2011. Another lure is real

estate and realtors' advertising. Protected (already bulkheaded) lots bring higher prices than those that are not so protected. She shared one ad with us for a one-acre bulkheaded lot, and another for "Riversedge on the Chowan." The advertisements sound enticing, and also imply more safety, since one would not reside on the ocean. Another advertisement was accompanied by a photo of an elevated home, with "spectacular views of water, sunrisings and sunsets." All of these ads promote the lure of the coast.

Burrell showed us a map of septic density. This is one of the adverse impacts of shoreline development. Most of these lots have no access to sewage treatment. Also fertilizers and other lawn additives create pollution. She noted that cutting grass does not seem like a vacation ideal to her. Another impact is erosion acceleration. Flooding is another impact, when infrastructure is built on the shoreline.

Managing the impacts: modify the cause (engineering), modify the loss/impacts, distribute the loss.

Comparing sounds to oceanfront, less expensive structures are required (bulkheads, rip-rap), less unpredictable consequences (less current and breaking surf), individual protection, or at least small groups, is an option. Possible ecosystem externalities, but much less significant recreational externalities. Burrell noted that marine contractors will obviously help the process along.

Burrell addressed the value of modifying the cause. There are huge benefits to property owners, because protected property tends to have high values.

Elevating property modifies the loss. You get the value of the waterfront location, but elevate yourself above the issue. Another way to modify the loss is simply not to build on the shoreline. She noted that the Dare County Land Use Plan classifies lands into three categories then addresses attributes of private lands. Burrell noted that a lot of government property cannot be developed. Dare County's plan notes that there is little land available for development. One issue is whether environmental suitability is a primary criterion for development. Dare County does specify lands which are unsuitable for development. There is relatively little land left for development in Dare County. Hands are tied to a certain extent, if any development is to happen at all.

Value of Modifying the Loss: structure elevation; long term protection; can take advantage of amenities while reducing risk; higher costs to builder at the outset; fewer negative ecosystem externalities; and public infrastructure not necessarily protected.

Value of Modifying the Impact: suitability analysis/avoid building; long-term protection; few if any negative ecosystem externalities; avoidance of infrastructure damage; building pressure; perceived benefit from tax dollars.

Distribute the Loss: insurance, flood insurance came about because private market was not working, predictable disaster assistance from flooding; erosion insurance, should it exist. Government assistance (disaster assistance as an example).

Value of Distributing the Loss: insurance, those at risk pay, not all taxpayers; avoids "moral hazard"; forces disclosure of risk; phase out uneconomic development versus encourage risky development; assistance, moral hazard; available for rebuilding public infrastructure; risk-reducing incentives need to be built in.

The availability of flood insurance has precipitated building in hazardous areas.

Addressing the driving factors: underlying causes include demographic factors, economic factors, policy/institutional factors; and culture factors. Proximate causes include residential changes, commercial change, infrastructure change and recreational changes. All of these led to land use/cover change. There are other factors, which aren't fully understood.

Another impact of shoreline development is the loss of infiltration by creating more impervious surfaces.

The causes and how to address them must be recognized if there is any hope of ameliorating shoreline development.

Burrell comes at this issue from several perspectives including environmental impacts.

Burrell asked for questions. She noted one question is where development should occur.

Reide noted that a lot of research on how shorelines have changed have been presented, and asked her if there is any idea whether or how much shoreline property owners take any of this information into consideration.

Burrell stated that those who are wealthier recognize the problems more often. Whether or not they do the right thing is another story.

Lisa noted that the idea of coastal real estate disclosure has been discussed, but right now it is still voluntary. If a property is not within the storm surge zone, it doesn't apparently have to be included.

Burrell noted that some people recognize that there is risk everywhere. Some realtors wait until things are almost set before they undertake notification.

Michelle noted that she liked the "Riversedge" sign. She noted that there is a lot of development which has grand plans which have never been implemented.

Tom Crawford noted that there are modeling approaches, regression models which look at the sales price of houses and determine willingness to pay for coastal North Carolina. Yet there aren't such studies for the estuarine area. It would be interesting to see what happens for that market share.

Jim asked if currently there is a mixture of public amenity and public assistance. Yes, there is. You still must have flood insurance. Burrell noted there is typically very little individual assistance. The flood insurance is there for a good reason, but things like Hurricane Irene, and Tropical Storm Sandy, drain the coffers. Also what WAS the 100-year floodplain on the map in 1982 is no longer the 100-year floodplain today.

Hans noted that while Dare County may be out of developable land, it isn't out of agricultural land, and that is from where a lot of the nutrients originate. Burrell noted that she had not addressed agricultural impacts.

Committee Discussion and Action, Dr. Reide Corbett:

Reide noted that he would bring the APNEP action items back up for review, now that the four different presentations have been completed. The actions are from the 2012 CCMP:
B3.1: Assist local governments in the development of incentives for protecting natural shorelines.
B3.2: Develop and distribute educational materials encouraging landowners to protect natural shorelines.
B3.3: Facilitate the development of requirements for living shoreline stabilization projects that optimally protect estuarine aquatic and shoreline habitats while minimizing regulatory requirements.
C1.3: Facilitate the restoration of riparian and estuarine shorelines.
C2.2: Facilitate the development of incentives to replace hardened estuarine shorelines with living shorelines.

These all relate to the shoreline. He wasn't sure how the best way would be for APNEP to proceed. A number of years back, APNEP had developed some materials regarding estuarine shoreline erosion. The erosion rates are sometimes greater on the estuarine side than on the ocean side. The value of land, and the fact that a lot of that land is lost, should be brought out. STAC is here to advise and help things move forward. Where do members want to see APNEP go from here? Sometimes STAC can help to steer things in the right direction.

Reide suggested that STAC can provide guidance on where they might want to see research focused. There is little work done on the economics. The committee can facilitate the integration of natural science research with the social research. He would personally like to see things go in that direction.

Tom Crawford noted that to him, shoreline means certain things, and to his knowledge the economics of it hasn't been developed. Reide thought that the data should be available NC counties. All of the data do not speak to each other. It isn't always as easy as you think.

The STAC was advised that North Carolina's Center for Geographic Information & Analysis is beginning to put these data together now.

Matt noted that the Governor's South Atlantic Alliance is putting some of these data together, and defining what "vulnerable" means. He noted that this will cover parts of Dare County.

Tom Crawford noted that the Federal Census changed in 2010. They aren't' covering all the same variables they used to cover.

Michelle noted that contractors had been discussed. She asked if there had been any economic study of bulkheads, with regard to their marketability and other factors. Bill Crowell noted that in eastern North Carolina there is not suitable involvement.

Kirk Havens noted that when you put in a bulkhead, your property value goes up, as does your tax. When you put in a living shoreline, the taxes don't necessarily go up. One thing that STAC could do, given the brainpower in this room, is for members to brainstorm things that would be good to add.

Jud stated regarding the last action, facilitate development of incentives to replace hardened estuarine shorelines with living shorelines, he wondered if it had ever been done. Carolyn noted that some projects have been done. He suggested some educational tools on the APNEP web site would help.

Reide asked Matt to address the NC-DCM guide they had produced. Matt noted that the guide was less than prescriptive.

Reide noted that in their survey a lot of the bulkheading was taking place in areas where it wasn't needed. A lot of bulkheading occurs in tributaries.

Kirk noted that bulkheading contractors don't have much incentive to put in living shorelines.

It was noted that in some cases, homeowners can't afford a living shoreline project. Kirk noted that he had been a Wetlands Board chair in Virginia, so he was aware that there isn't much incentive to do the work. They will say they can't afford it, but it is really a matter of priorities.

Burrell noted that bulkheads fit well with a manicured lawn from an aesthetic perspective.

Michael noted that a lot of it has to do with getting boats in the water. Kirk noted that they get that in Virginia as well. A lot is done based on the priorities of the landowner.

Michael noted that the education piece is great, but by the time it gets into homeowner hands, they have already made the decision. He thought a broad educational effort on what shorelines do for us would be beneficial. STAC should try to tell the homeowner what the value is to them.

Reide noted that the signs about SAV are going up on boating access areas, so perhaps STAC could consider the merits of another sign about shorelines for educational purposes. Although, he noted that such a sign might not be reaching the right audience.

Kirk noted that if you are going to affect the intertidal area in Virginia, you must either mitigate the loss or pay an in-lieu fee. There is no in-lieu fee for living shorelines. Unfortunately in a lot of cases it comes down to the money.

Hans asked how many around the table know, or think they know, a local government that would be good to target for measure B3.1. He speculated that some governments would like to do it the right way.

Reide stated he would like to pursue that himself. He noted that Dare County might be a good place. Hans suggested Beaufort may be a place to start.

Bill Crowell stated that another incentive could be the development of criteria for sound-friendly businesses, or communities. That is something for STAC to consider.

Burrell suggested that STAC might want to look at places which have not been amenable to living shorelines, and compare it to one that has, and explore the difference. We need to know not only who is doing it correctly, but also who is doing it wrong, and why.

Reide noted that he would be interested in seeing which counties have more sills. He can determine that from the data.

Bill noted that part of it may be a function of population density. Reide noted that you can normalize all of the variables, like population.

Jud asked about the 29 requirements for the sills, and what sort of questions they entail. He asked if you have to grade down your shoreline, or have to fill out further. Matt articulated a lot of the considerations which have to be addressed. Matt indicated he would pull out the general permit and read them.

Jud noted that North Carolina has a conservation program which provides tax credits. It was noted that was just abolished by the Legislature. Jud suggested that a requirement of any living shoreline should be that you not encroach into any estuarine waters, but if you grade down, you could get an incentive.

Bill noted that the deed stamp program had been abolished.

Jim Hawhee noted it would be good to tell the story of a landowner who got a grant from NC-DCM, and benefitted from it.

Carolyn agreed that it would be a great story to tell.

Jim noted that he envisioned that anyone would be willing to bend over backwards in order to tell such a story.

Reide asked if there is such a story in North Carolina.

Matt thought that one might be located.

Jim noted that there may be a $5,000 grant available to assist with such an installation.

Tom Crawford noted that the discussion has focused on the living shoreline. He suggested that with all of the data available and all of the GIS capability is there a way to create a decision tool to help the process along. They had a student who did something similar. He asked if that was something that people are looking at, or worth looking at.

Reide thought that would be in NC-DCM's purview.

Matt noted that there is concern about such an effort being almost a property-scale effort, but it is worth looking into. The scale is a concern.

Carolyn noted that a common definition of living shorelines is important.

Kirk stated that it is useful in context. A property owner would benefit from some general guidance, before they get down to the contractor level. At least there would be an opportunity to define living shoreline before a contractor has told them what to do. Once they have drawings from their contractor, it is hard to get them to change their minds.

Matt asked if there is any sense of how many owners are going with living shorelines.

Kirk noted that in Virginia they try to put the burden on the property owner for saying why they aren't using a living shoreline.

Maurice stated that not all the contractors should be placed in the same category.

Kirk agreed and noted that some of their contractors have been enlightened, because they see they can put in a living shoreline for a lower price, but then have a long-term maintenance contract.

Michelle noted that they had a meeting with Heidi and others, and they thought that it would be useful to put together the information on the benefits of living shorelines in a way that it would be useful to USACE and others who need the information.

Carolyn noted that she has seen an older poster, which depicts the benefits of vegetated shorelines, versus walled-off shorelines. The poster used to be at the NEER office in Beaufort.

Tom Crawford noted that you would have to be honest about the benefits and the costs.

It was noted that people do have values that are not economic, and some North Carolina property owners do have an interest in living where they can hunt and fish, and may be willing to spend some more. A fact sheet telling what the values are and how they can be maintained would be useful. The information should be targeted for certain areas.

John McCloud noted that in cases of which he was aware, the property owners had the values which led them to living shorelines, and some of them seek out non-profits.

Tom Crawford noted that there may not be enough history for living shorelines here.

Wilson asked if there is any literature which attempts to quantify the ecosystem services provided by natural shorelines. He often uses as an example of the impacts of shoreline bulkheading, the inability of turtles to climb vertical bulkheads to get to their nesting habitats. He noted that he would bet that diamondback terrapin populations are probably lower in areas with extensive shoreline bulkheading. It is far easier to deal with population sustainability, before species decline to the point where they are listed as threatened or endangered. Bill asked if there is "essential fish habitat" for diamondback terrapins. Wilson noted that there isn't since that species is not covered under the Magnuson-Stevens Fishery Conservation and Management Act.

Michael thought that there is much knowledge about the ecosystem services provided by natural shorelines, and STAC would just have to cobble it all together into a document. He did agree that a living shoreline must be defined clearly, as well as what isn't a living shoreline.

Carolyn suggested that's maybe there is a way to better present the information. Developing some educational materials might be a good starting point.

Reide noted that the NC-DCM pamphlet is online, and Matt noted that they are printing more of them.

Michelle suggested that STAC try to find some information already done, and perhaps just try to condense it into a useable format.

Matt agreed that a one-pager about the ecosystem services of natural shorelines would be a useful tool. He read from the NC-DCM document their definition of living shorelines, noting that they tried to get beyond just saying it was a marsh sill.

Dean thanked all the presenters today, and suggested that he would like the STAC to continue to be proactive, instead of only reactive. The APNEP Citizens Advisory Committee (CAC) and Management Advisory Committee (MAC) are now gone, and instead APNEP has an Implementation Committee. One of the implementation groups has actions involving shorelines, so they will receive these detailed notes as a starting point. They will also need assessments, and data, and help with specific actions. Whether it is determined that STAC will do a one-pager, or something else, that will be beneficial. Dean envisions the implementation workgroup dealing with ecological flows doing the same type of process.

Maurice asked if all these implementation workgroups had yet been formed.

Dean advised they have not. The Policy Board Executive Committee will be discussing them next week.

Bill noted that once a workgroup is operational among their first discussion topics is likely to be who else needs to be on this team.

Dean noted that all the presentations today will be posted on the STAC page, as are most of the other presentations since 2004. The Bylaws, and the Action Plan, are also on the STAC home page. Those are the key materials. As far as the remainder of 2013, APNEP has the symposium where all STAC members are encouraged to attend. Also, the APNEP Monitoring and Assessment Teams likely will be meeting before year's end. These teams were active in the indicators component, and now they will begin to map indicators and ecosystem outcomes, plus attempt to define monitoring strategies for those teams. All STAC members are on at least one of those teams. Also, Dean is seeking themes, not necessarily for STAC meetings, but should be issues the STAC should tackle. These can be provided to the STAC Executive Board.

The meeting adjourned.