APNEP Scientific and Technical Advisory Committee
Summer Meeting
July 30, 2008
Pitt County Cooperative Extension Office,
Greenville, North Carolina

STAC Members Present: Tim Spruill, Joe Fridgen, Lauriston King, Antonio Rodriguez, Richard Smith, Mike Piehler, Michael Rikard, Robin Dennis, Robert Reed, Rick Linthurst, Jud Kenworthy, Bill Hunt, Kirk Havens, Craig Landry, David Mallinson, Nancy White

Staff Present: Dean Carpenter, Bill Crowell, Lucy Henry, Chad Smith

Liaisons: Gordon Cashin (NC-DOT), Joanne Harcke (NC-DA)

Presenters: Jerad Bales (USGS), J.P. Walsh (ECU)

Call to Order: Tim Spruill: Tim convened the meeting at 10:10 AM. He asked if anyone had any changes or corrections to the minutes from the STAC spring meeting. Approval was moved and seconded.

APNEP Update: Dean Carpenter

- Greetings to agency liaisons: Joanne Harcke (NC-DA) & Gordon Cashin (NC-DOT)
- Welcome to STAC members for whom this is their first quarterly meeting: Craig Landry, Joe Fridgen, Rick Linthurst
- STAC members terms that ended or they resigned since Spring meeting: Emily Bernhardt, Dennis Borton, Barbara Doll, Chris DePerno, Mike Mallin, Martin Lebo, Lane Price
- STAC members whose new three-year terms began on July 1: Robin Dennis, Bill Hunt, William Porter, Enrique Reyes
- STAC Executive Board Meeting was held at DENR-WaRO on June 17
- REMINDER: all presentations (and updated staff bio's) made today will be posted on the "STAC Member Only" area of the STAC website (will need a password)

    1. Reminder: biographies will be made public; members will be asked to approve what they had written previously before it's posted in the public area of the STAC web pages
- Upcoming STAC quarterly meetings: Autumn 2008 will be meeting later in October; Winter 2009 will be scheduled shortly thereafter (Jan/Feb 2009)

APNEP Science & Technology Activities: Dean Carpenter

- May 1-2: Attended the NOAA Sea-Level-Rise Research All-hands meeting @ UNC-IMS
- May 9: Attended the NC Strategic Habitat Area Region 1 Meeting in Edenton
- May 12: EPA-Office of Research & Development (ORD) seminar by Dean Urban on Landscape Pattern & Ecosystem Services (via teleconference)
- May 13: Met with STAC Co-Chairs Laney and Spruill (to plan for upcoming two-year STAC session)
- May 19: SAV Imagery Teleconference
- May 20: APNEP Living Aquatic Resources Monitoring Team Meeting 2
- May 21: APNEP Management Advisory Committee (MAC)-STAC Chairs Exchange
- May 29: APNEP Living Aquatic Resource Monitoring Meeting w/ STAC Co-Chair Laney
- June 10: APNEP Climate Ready Estuaries Planning Meeting @ EPA-RTP
    1. APNEP won a grant for a pilot program to estimate climate change
    2. Focus of meeting was how to manage grant funds
- June 12: Attended the NC Strategic Habitat Area Region 1 Meeting in Edenton
- June 17: STAC Executive Board Meeting @ WaRO
- June 23: CBP-STAC [Chesapeake Bay] Visioning Workshop in Elkridge, MD
    1. Propose to model something similar for APNEP during winter or spring, regarding policy makers selecting "management endpoints"
- July 3: APNEP Living Aquatic Resource Meeting
- July 9: EPA-ORD Coastal Carolinas Meeting
- July 10: APNEP Living Aquatic Resources Meeting @ NC Wildlife Resources Commission
- July 15: APNEP Living Aquatic Resources Meeting with NC Natural Heritage Program (NHP) staff
- July 17: APNEP 303-D Stream Delisting Meeting

    1. EPA Region 4 wants to get one stream to be adopted, cleaned up, and then delisted
- July 17: APNEP/AP3C Climate Change Listening Session
    1. Citizen input: looking for non-government groups to have input on climate change, sea-level rise, and coastal population increases
- July 18: Teacher Institute Panel Presentation in Salter Path (water quality issues), co-sponsored by APNEP
- July 22: SAV Imagery Teleconference
- July 23: MAC members of NC Interagency Leadership Team's Climate Change Group
    1. Trying to coordinate "transportation issues" (see MAC Chair, Linda Rimer)—wants to coordinate APNEP study with those issues
- July 28: NOAA CI-FLOW Meeting @ NC Sea Grant
    1. Model link from Doppler to flood estimates on the coast-trying to define the "human hazards" angle
- APNEP Policy Board next meets on October 15, 2008
- CSC Meeting: Next meeting is August 12, 2008

US Geological Survey: Science & Data Program: Dr. Jerad Bales*

**note*: presentations can be found in their entirety on the STAC website in the "members only" section. "Rough outlines" only are provided in these minutes.*

- Dr. Bales has been involved with APNEP since the mid-1980's [he is also leader of the APNEP Water Monitoring Team]
- USGS Mission: Support other Federal/State/Local agencies
- The USGS has worked in the Albemarle-Pamlico region for over 100 years
- APNEP relevance:
    1. Loads: the measurement of N or P in water
    2. Problem: water doesn't always flow downstream to the sea (some flows return upstream), thus it can be hard to accurately measure N/P loads
    3. See seasonal patterns of N/P flows (e.g., The Neuse River)—heavier loads in winter (wetter) and less in summer (drier)
    4. Spring loading=summer algal blooms
    5. "216 Study": Army Corps of Engineers (ACE) is trying to mitigate the impacts of previous projects (e.g.,. Roanoke River, Kerr Lake)
        - Concern: water releases from Kerr Lake and what downstream consequences those may have
        - How can ACE manage reservoirs for the Roanoke River?

- Made one- and two-dimensional water quality models (e.g., for simple dissolved oxygen [DO]) which make it easier to predict flows across a floodplain
- These models are also able to simulate flows (e.g., Oak City 2001-2007)

6. Agricultural Watershed Modeling
    - Models are helpful to ACE, NC-DWQ, and other agencies
    - Trying to model DO flow
    - USDA's SWAT model (sampling points)-monitored the runoff/flow from a spray field
    - Currituck Sound Watershed models-used to get yields for Best Management Practices (BMP's), etc.
    - SPARROW (SPAtially Referenced Regional On Watershed attributes)
        1. Relates <u>sources</u> to outputs so one can generalize trends/conditions across river basins
        2. Example: 196 USGS sites where nutrient loads are measured
        3. Start with monitoring data, then spatial data (inputs of watershed nutrients), then add rainfall, bedrock layers, etc., then you can model predictions (outputs of watershed)
        4. You can use <u>models</u> for basins *without* monitoring data to simulate their nutrient loading capacity
        5. Then you can identify coastal areas sensitive to nitrogen inputs
        6. There are already working nitrogen models; currently phosphorous models are under development
    - Benefits to APNEP
        1. Improved understanding of river basin dynamics
        2. USGS is also doing groundwater work
            a) Studying flow: groundwater (GW)/surface water interaction
            b) Take regular GW flow model and can "scope down" to use as a "pinpoint" management tool
            c) Example: Onslow County-could help determine what can and cannot be used as GW resources (a local

issue)—there is NO nutrient component to these flow models

- USGS: continuous real-time estuarine water quality monitoring
    1. Statewide stream flow, rainfall, GW, and water quality
    2. Scientists are now beginning to measure the effects of "personal care products", endocrine disruptors such as human hormones, antibiotics, effects of urbanization on stream ecology, nitrogen, pathogen transport from fields to streams
    3. How does urbanization affect chemistry/habitat/biology of streams?---# of published papers from this national study already (including some data reports out of Raleigh)
        a) One component studied intensely is stream gradients—from highly urbanized to less affected
- USGS has national capabilities which can help APNEP
- Research and Informational Needs of Eastern NC
    1. Study the fluxes of freshwater and contaminants to coastal waters (need Cape Fear River basin info, etc.)
    2. Sustainability of water supplies (What population can GW resources support?)
    3. Managing for climate change: sea level rise (SLR), population change, etc.
        a) Invasive species, changes in jurisdictional wetlands, marsh retreat, hazards and resiliency
        b) Land cover change data

Discussion of STAC Strategic Plan Draft 2008-2010: Tim Spruill

- Wilson Laney and Dean Carpenter distributed an e-mail detailing the STAC plan draft
- Comprehensive; ambitious; lays out STAC's mission [will be posted online when the final draft is approved]
- "Indicators of Change"—put together monitoring teams that can document various aspects of river basin changes
- Why a two-year plan? Because the STAC Executive Board's term is two years

1. Use this strategic plan draft to check STAC's progress (helps the Board know where they're at as far as goals)—maybe make a major edit one year later?
2. STAC members were requested to provide written input to Board next week or two so the Board can discuss
3. Draft has no prioritization (perhaps this needs to change?)

- Track key indicators; develop GIS database; describe how to develop long-term action plans and proposal requests
- Mandated Activities & Proposed Tasks for 2008-2010
    1. Monitor entire Albemarle-Pamlico (A-P) region & track key indicators (too big? Too much to do?)
    2. Maintain an "action part" of tenable tasks that STAC can actually accomplish—keep action list "small & doable"
    3. Teams: where action meets the mission
    4. Current organization: developed teams are starting to come together
    5. Plan: Integrated Monitoring Team (IMT)
    6. Note that most sections under the STAC draft plan are pulled directly from STAC by-laws
    7. Original Plan: start monitoring design teams in tiered fashion (that won't work)—new plan: to get all monitoring design teams up and running simultaneously
    8. Still have four monitoring teams to convene (six teams total)
        a) Revised plans of CCMP
        b) Monitoring Strategy: how can we track progress of the CCMP?
    9. IMT members will have many complimentary skills—an IMT should be "cross-discipline"
    10. Tracking Indicators of Health-assessment of current A-P monitoring system—develop two levels:
        a) Preliminary Level: teams draft strategies and provide "mini-assessments" of historical baseline, articulate mid-1990s data, and current (2010) assessment information
        b) Intermediate level (two years): a more comprehensive assessment of current A-P monitoring data
            - STAC plus Dean/contractors/post-docs "redo" an assessment that hasn't been done since about 1995—this will give a better picture of regional resources
        c) What about lack of funding for STAC's many goals?

- Yes, there is a balance between a volunteer group like STAC and funding sources
- Should assessments be done first to determine the best way to spend limited funding?

d) Indicators and assessments dovetail because they show where we need to get more data or what areas we need to work on more
e) APNEP staff alone can't complete all the necessary assessments
f) Getting computer database together: this will be linked to indicator work—will show data sources, etc. and link them through a web portal/meta-template
g) Working with Julia Harrell, DENR-GIS coordinator, a "test database" is being made for Puget Sound. This can be a prototype/template for A-P database
h) There will need to be much feedback between GIS database, assessments, and indicators. This won't be perfect at first, but it will get better as the project goes on and more data is entered into the system.
i) Question: How long to get the database up and running, even in a "prototype" form? Three, six, nine months? ---will have to talk to Julia about that. Also, APNEP $ for this project will be mainly for computer hardware.
j) Memo Of Agreement (MOA)—this will help different groups coordinate data efficiently
k) Research and collate best practices (example: stormwater, toxics, remediation)
l) Develop Requests For Proposals (RFP's)
m) Renew/evaluate proposals for funding
    - Can get ideas from committee members on first Technical Ideas Workshop scheduled for 2009
    - Technical Workshop: will cover 1 topic so that members & outside experts can familiarize themselves with a specific topic
n) Other ideas: may want to have some type of "Science in the Sounds" symposium or something similar
o) Could tie workshop(s) to a larger, national audience of experts/agencies—draw some national experts to our regional meeting

p) Assessing climate change in A-P sounds (many grants come from EPA) –synergistic effect of multi-agency cooperation through EPA's funding
q) STAC will develop proposal for technical workshop in 2009 for APNEP (will reword draft)
r) Other tasks: outreach activities (as assigned by STAC), develop science-based partnerships with other entities (EPA, NOAA, U.S. F&W, etc.)
s) Look over draft, make suggestions, in the next STAC meeting we will try to forge the final document
    - Will take suggestions over the next two weeks
    - Should have suggestions prior to next STAC executive board meeting
t) STAC goal: develop an ecosystem-based assessment plan for the Albemarle-Pamlico Region
    - There is no working system available right now
    - Form partnerships with different agencies/entities so everyone is on the same page, working toward the same goal using the same criteria & methods
    - Tremendous effort to coordinate all these people for a single purpose/mission
    - "Exploring" resources of other agencies/entities to leverage resources for APNEP's mission, tap into funding/resources/personnel for APNEP's use
    - Problems with relying on federal agencies: "top-down" management style, un-funded activities
    - Work is underway to create a Southern Alliance of Coastal Southern States for coastal issues; will be able to better coordinate with federal agencies

Open Topic Discussion: Tim Spruill

- Issues (topics): Five STAC technical issue papers were done/reviewed, submitted to policy Board. Should we continue the review process or "rephrase" original issues
- Topics not done: tracking land cover changes, monitoring Submerged Aquatic Vegetation (SAV) in A-P system, and potential invasive species to NC
- Proposed topics: Statistical design and indicator networks (Richard Smith can spearhead), Watershed master and monitoring ("in progress somewhat"),

Predictive monitoring of Ecological processes, Importance of Disturbance from Sea Level Rise (SLR-needs to be addressed in more detail), Direct effect of SLR on human activities

- Shoreline hardening—this topic needs a position paper
    1. Plan: link position papers to MAC concerns—there is no prioritization of topics (yet)
- Submit these *proposed* topics (bulleted list perhaps?) to MAC for review/refinement (hopefully the MAC will prioritize and then topics will go to technical paper leads)
- Tim Spruill will put "lingering issues" in list to STAC, get member approval and send to MAC for comment
    1. Is it logical to link related topics/subtopics together? (maybe not at this level right now)
- End goal: this process allows STAC to "interface" with policymakers and environmental managers/stewards
    1. Can some of these topics/papers be sent to the NC General Assembly?
    2. MAC implements policies/actions on behalf of A-P management, so it is important to stress most pressing needs to them
    3. One major concern: that all this hard work "doesn't end up on a shelf somewhere"---perhaps need to network with other agencies/entities than just the MAC (legislature, EPA, etc.)?
    4. Comment: Topics should be vetted by the MAC first (which includes the Director of NC-DWQ for example) If there is a STAC "pressing issue" that MAC doesn't address, then STAC can "kick it upstairs" to someone like DENR Secretary Bill Ross or whomever
    5. Could also release such a "pressing issue" to the press, but have to be *very careful* ---that is always a double-edged sword…

US EPA's Office of Research & Development (ORD) Ecological Research Program (ERP): Rick Linthurst *

- Ecosystem Research Branch (ERB)
    1. Check out the UN Ecological Systems Report (on finite resources)
    2. Main goal of ERB: to create markets for ecosystem services
    3. Provide scientific foundation with information on ecosystem importance

- GOAL: transform the way we understand and respond to environmental issues, and how our choices affect type, quality, and magnitude of services we receive from ecosystems
    1. Educate us on how valuable and finite ecosystems are to us
    2. Use a more system-level approach to manage these areas
- "Sell" this approach to natural resource managers, including the MAC, to help them make decisions
- Advancing the "Art of the Possible"
    1. Try to get more than one thing out of ecosystem
    2. Go from reactive management to proactive (plan ahead)
    3. Sustainability of resources, and "environmental outcomes" of the choices we make
- EPA does monitoring-mapping-modeling
    1. Looking at system-wide effects of changing policies and regulations
    2. Currently the EPA is focused primarily on human health issues
    3. Ecosystem Services brings $MONEY$ to ecosystem health focus
    4. One example: Oregon—a study of man-made vs. natural wetlands (found many differences between the two)
    5. National Projects---Gulf of Mexico hypoxia vs. Mississippi River headwaters (coastal residents on the Gulf would get benefits, but what benefit to northerners who live on the headwaters?)
    6. Willamette River Ecosystem Services Martketplace program---a model/prototype for placing a monetary value on an ecosystem, rather than just saying "we need to have a healthy ecosystem"
    7. One goal is to get scientists, economists, and citizens together to realize the value of the whole program
    8. MOU between APNEP & EPA (ERP) could facilitate A-P ecosystem management
    9. Currently EPA-ORD is trying to do more southwestern US projects (since they don't traditionally focus on that area)
- MAC can get EPA data; question is: would this change your mind or change your approach to resource management?
- How do you <u>monitor</u> ecosystem services?
    1. Can we put together programs to monitor, then model various ecosystems? ("place-based" studies)
- End Product (assessment issue)

1. There are many ecosystem types in the A-P region—is it more important to maintain the various types of ecosystems or the services? (need a pros vs. cons approach)
2. How would the net value of services change with varying conditions? (can calculate in monetary figures)
    a) What is a management unit and how do different areas have different ratios? (you can't always optimize every service in an ecosystem)
    b) You can show how different areas in an ecosystem provides different services
    c) One tool is the National Coastal Condition Report (that details the condition of US coastal estuaries), as opposed to a broad report like the State of Environment Report (which does not necessarily focus on a particular ecosystem)

- Core Ecosystem Services (four classes):
    1. Supporting Services (carbon storage, habitat maintenance of biodiversity)
    2. Regulating Services (nutrient cycles, flooding, etc.)
    3. Provisioning Services (food/fiber products, fuels, water provisioning)
    4. Cultural Services (recreational opportunities, sense of place)—though this is not nearly as well-defined and studied as the first three services, cultural services get to the heart of why people care about an ecosystem
    5. This will all depend on a trans-disciplinary environment: lawyers, psychologists, etc.
    6. Identify how to motivate people with incentives
- Applications of Research
    1. Setting policies and guidelines
    2. Quantifying benefits for national rule-making
    3. Develop environmental metrics and indicators for environmental services
    4. Catalyze market innovations
- Coastal Carolinas Environmental Services Initiatives
    1. What is proposed?
        a) An account for types/location/extent/quality of ecosystems
        b) Establish links
    2. Drivers---climate change, land cover change, demographic change
        a) Helps define environmental services

    b) Human health and well-being (in EPA-ORD—mainly toxicologists)
    c) Hard to find people to understand—much less quantify---"well-being"
- Land cover changes—track annually using satellites to map where changes are occurring
- APES headwater watersheds
- The USGS is better at modeling larger systems; EPA models "bottom-level" local models—need to extrapolate to larger models
    1. Models are not always useful to management due to the extremely large data volume
    2. A "prototype" model is a project that will model mercury distribution in the Cape Fear River system
- ERP Long-term goals in the Coastal Carolinas
    1. Effective decision support (valuation, human health and well-being, outreach and education)
    2. Landscape characterization (monitoring, modeling)
    3. Nitrogen assessment
    4. Ecosystem-type assessment—wetlands (including submerged lands)
    5. Place-based demographics
- Questions/Comments
    1. Any talk of probability-based sampling for Ecosystem services? Yes: but that is not the main focus of research—the volume of data is always a problem)
    2. What criteria are used to measure present ecosystem services vs. historical models of ecosystem services? (historic vs. greatly altered)
        a) Counter: what could it be now with some alterations? (no focus on getting back to "virgin state")
        b) Example: Returning to 10% vs. <u>restoring</u> 100% virgin state
        c) <u>Restoring</u> <u>ecosystem</u> <u>services</u>: tried to quantify money vs. biodiversity—you can't have the ideal functions of each, so where do you get maximum economic benefit and maximum biodiversity? The challenge is when bundling services, it's hard to maximize closely-related services (water bundling and forest cover, for example)
            - Cooling salmon waters in Oregon by 6°-9°, putting back stream meanders would accomplish this, but then you have to figure out the effects on landowners, etc. Is it worth it?

3. "Social choice"—trying to make it more ecologically and economically feasible for smart growth
4. Examples: why study coral reefs? US Virgin Islands—seeing climate change there, it is relatively easy to measure the effects of system inputs/outputs and how they affect the corals (and no, there is currently no EPA proposals to study the deep water coral reefs off NC's coast)
5. Midwest Biofuels Project
    a) Predictions made now, and how will those change future landscapes and environmental services?
    b) Then economists will get involved, also probably the USDA
    c) Marginal lands are "going away", disappearing due to economic pressure—thus there is a decline in wildlife habitat (birds) and a decrease in buffer zones which leads to increased nitrogen and phosphorous runoff from agricultural lands
    d) For scientists, it's hard to make the "right" decisions, but it is important to policymakers
    e) Thus environmental ecologists, psychologists and others get into the mix of making policy
    f) Scientists don't always know what data is economically important to policymakers
6. Rick wants to investigate whether EPA-ORD can help/dovetail with STAC to achieve common goals

APNEP Living Aquatic Resources Monitoring Team Update: Dean Carpenter*

- 30 indicator-metrics to evaluate
- Monitoring proposal template for each indicator-metric modeled after that of the New Hampshire estuary monitoring program
- Example monitoring proposal for vulnerable mollusks (2-3 pages each)
    1. Freshwater mussels: range & population condition
    2. What are the objectives to be measured under the present sampling program?
    3. What are the existing program costs?
    4. What are the objectives under the enhanced sampling program?
    5. Establish enhanced minor costs
    6. Establish enhanced major costs
    7. Define measurable goals
    8. Data quality objectives under present & enhanced sampling programs

9. Data analysis, statistical models & hypotheses
10. Data sources
11. References/contact person

- Still in the process of getting other APNEP monitoring teams up and running
- Data can be extracted from quality assurance plans of monitoring organizations

Sea Level Rise Impacts on the Neuse River Estuary Shorezone: J.P. Walsh:*

- Generally interested in impacts of SLR—looking at the past, evaluating future effects through computer modeling
- Ultimate goal: to model shoreline changes in a "typical" NC estuary for future prediction of SLR impacts
- The study encompasses a massive land area with less than a 2m height difference
- Study focused on the shorezone (floodplain)
- Importance of studying the impacts of SLR:
    1. Loss of habitat(s)
    2. Coastal development
    3. Loss of coastal infrastructure
- North Carolina doesn't have "long" geological data to study historic changes in SLR
- Methods:
    1. Defined shoreline points for monitoring wind/wave action
    2. Extrapolated shoreline changes using aerial photographs to measure change rates over time
    3. Studied erosion rates at four specific areas: Flanner's Beach, Pine Knoll Island, Cedar Island, Roanoke Island
    4. Greater fetch usually indicated greater erosion rates
- Work in progress: Neuse River trunk
    1. Look at different scales of erosion
    2. About 93% of the shoreline in the trunk of the Neuse River is eroding at roughly 0.58 m/yr
    3. The Neuse trunk was divided into about four sections based on orientation and fetch, and the erosion rates for each section were averaged together for the total shoreline erosion rate
    4. Shoreline structures were mapped via GPS and then digitized

5. Discovered that the Neuse estuary shorelines are being "hardened" as time passes, and that currently about 30% of the shoreline is hardened

- Land Cover Changes in the Neuse River Estuary
    1. First, mapped different wetland types along the trunk
    2. Questions: how does shoreline change across the estuary? How does it change over time?
- SLR pushes marshes more upland as low areas flood over time
- What "products" can one get from the research?
    1. Note changes, make predictions to possibly model future erosion rates
    2. Could calculate flood zones/hazard zones by erosion rate (or even show by parcels of real estate)
    3. Can also use to expand inlet-hazard areas over time
    4. Website idea: have one web portal where the public and others can learn of coastal hazard areas in North Carolina (link to Google Maps or something similar?)
    5. Also working on a real-time coastal hazards website—would show wind/waves/dissolved oxygen levels/flooding/etc. (NCCOHAZ website <www.coastal.geology.ecu.edu/NCCOHAZ/> is the prototype right now)
- There is insufficient data on SLR rates to put into the project at present
- Also, there has been no attempt (so far) to correlate substrate types and locations to erosion rates
- This project was limited due to the restrictions on field work