Cape Fear Arch Conservation collaboration 4th Quarter Meeting November 12 2013

Dan Tufford recognized Christine Ellis for the work she has done to get this meeting running and welcomed all to the meeting.

Dick Lefavre from St. James I have awakened in St. James a Conservation ethic, putting together a speakers conference. I come to Arch to mine speakers. We all elected to be here in my community we are less familiar with the environments in Southport and I am trying to awake people to out new home environments.

Molla Donaldson for Carolyn Pryor in Southport looking to improve trails and guidance about conservation. Jerry Donaldson and I'm with her

Chrstine Ellis I watch over the Wacamaw River.

Tom Osborne, educator from Cape Fear Museum. Redoing civil war display looking for environmental pieces from that era. Have secured a 1/2 million dollar grant to upgrade park space on campus. On behalf of New Hanover County we have just finished up our 4th grade programing for the year.

Sarah Babin TNC, we are gearing up for fire season hiring a 4 person crew. We've been doing conservation easement planning and monitoring. We'll have a growing season fire crew for summer 2014, hire after January, we are excited because we normally don't have a growing season fire crew. This one will be funded by the NFWF grant Suzanne mentioned.

Kathryn an intern at TNC from UNCW.
Brittney Pace a grad student at UNCW and intern at TNC.

Janice Allen Coastal Land Trust, preserving land in the coastal area we are pretty busy closing some land deals. The State of NC is repealing Conservation Tax Credit.

Dennis Allen from USC I'm giving a talk

Poul Lindegaard, recently joined BHI Conservancy as the Director of Operations

Maggie Pike lives in Holden Beach mainland

Merci McCurdy a citizen trying to encourage low impact development. Many groups from Arch have helped me but when I talked $ it really made a difference.

John Carpenter with WRC, I administer the safe harbor program for the Red Cockaded Woodpecker and I have two agreements in process right now. I'll work with a landowner with 1500 acres that could be good RCW habitat and another track that already has the woodpecker using it.

Rhodes Messick: No Port Southport has shut down because we fell we have stopped the port.

Amanda Brennan from USC, speaking today

Jim Lukens from Coastal Carolina, I work in the wilds of the academic landscape but will be talking about Venus flytrap.

Dan Tufford: Carolina's integrated Sciences assessments looking at climate impacts on coastal North and South Carolina. I am focused on stream flow and water quality impacts. We've been developing simulation models to study this. We've used this model to look at the potential change in distribution of *Vibrio* species, pathogenic bacteria that cause harm to humans from seafood ingestion. Wound infections also are becoming a problem from this bacteria. In future climate scenarios these are going to get worse. In future climate system drought issues are going to become more problematic and we have funding to study the indicators. Reservoir operators, for instance, have sets of indicators relating to drought that they use, but there is nothing equivalent for coastal ecosystems. This is important for the economic side of things as well as natural systems.

Dennis Allen, Director of Baruch Marine Field Laboratory, University of SC: Climate changes impacts on tidal systems

Climate change and variability includes: air and water temps precip freshwater inflow to estuaries, large scale atmospheric events like ENSO and NAO, sea level, ocean currents, wind patterns, cloud cover, and severe storms.

The work I'll report on has been generated over 40 years by researchers working at the North Inlet estuary a system just north of Georgetown SC. This field laboratory is the year round center of operations for 30 people. We are closely tied to main campus in Columbia. Serves as the basis of operations for M.S. and Ph.D. students as well as research faculty.

An estuary is where fresh water and salt water meet and mix. In the North inlet estuary there is no major source of freshwater input. Semi diurnal tides exchange 1/2 the water in that system everyday. Immediately to the south is the Winyah Bay Estuary which is a more traditional estuary with a freshwater source.

Understanding the structure, function and linkages between coastal ecosystems requires a multidisciplinary approach. Monitoring in the watersheds, salt marshes, and coastal ocean have provided a long term time series from North Inlet estuary, SC. Data includes, Water quality from 1978, Meteorological from 1982, Water chemistry from 1983, biological from 1974, other, marsh elevation, harmful algae...

National Estuarine Research Reserve also has water quality and atmospheric condition monitoring. Salinity from 1979 shows an average of 31.9 ppt and deviations from the long term mean and periods of low salinity associated with winter-spring periods. Periods of big low salinity events are correlated with El Niño events. The stronger the El Niño events the greater the rainfall and lower the salinity.

Zooplankton: microscopic animals in the water column tend to be small, some like copepods spend their whole lives there as do the early developmental stages of many larger species. Monitoring since 1981 shows a significant long term decrease in 16 of the 17 taxa monitored. This is a radical change that is likely caused by their with food source. Phytoplankton seems to have decreased and we think it has to do with the river discharge. As water from the uplands come out of the Winyah bay it delivers nutrients to the coastal zone. The source of nutrients for phytoplankton in North Inlet is coastal the ocean and as the river discharge decreases so do the

nutrients that they deliver. This is typical of what's going on around the world. Of all the things that have been identified and most problematic the flow from rivers is considered a top problem. In SC flow is associated with El Niño so recently there has been fewer events delivering less water to rivers.

Long term changes in fish, shrimp, and crab populations in an intertidal salt marsh impacts the abundance, growth and production of fish species. Starting in the 80s we saw an increase in animals this trend turned around when salinity trends decrease starting around 1998.

Water temperature shows significant long term increase of about 1 degree C over the past 30 years or so. If we break this down season by season you see it especially in the winter. This is important because it has impacts on the metabolism of animals, especially for invertebrates. Colder winters can impact species distribution abundance and impact of disease and parasites and contaminants.

Arrival dates of brown shrimp post larva has changed as a result of warmer winters. It now arrives earlier December/January vs. March/April in the past. This represents a major commercial fishery for SC. The presence/absence of these species has impacts on community level food web structures.

Sea Level shows an increasing trend in North Inlet of about 3.9 inches in the past 30 years. This forces tidal marshes to migrate into uplands. Stumps of cedar trees that were thriving well above the spring high tide line 35 years ago when sea level was 4 inches lower. Spartina has moved up the estuary. Spring high tide line is migrating. If we barricade the edges with bulkheads then we're stopping the natural progression. Salt marsh cordgrass, Spartina, comprises one of the most productive ecosystems on earth. To keep from being drowned, marshes have to accumulate enough sediment to keep up with SLR. More time underwater for cordgrass means its not going to survive. Right now the system looks very healthy. Intertidal creeks and oyster reefs are the primary nurseries for fishes. The work that we're doing has been repeated up and down the East Coast of the U.S., in every case we are finding that marshes are NOT keeping up with SLR. The projection is that these systems are going to be open shallow lagoons. Spartina is threatened especially if we harden our shores.

Over 20 to 30 years the system has become warmer saltier, higher oxygen concentration. SLR is up and river discharge is down.

Is there evidence that climate change is affecting assemblages over 30 years: YES. We have observed changes in environmental conditions decreasing the animal abundance and primary production. We have also seen shifts in the timing of reproduction and migration of some taxa. At this point the composition of the assemblages and structure of the food webs do not appear to have changed much. We have recognized, however that major shifts are likely coming. This may not have happened yet because the distribution of our animals is distributed widely. We are not likely to see complete loss of keystone species but shifts instead.

With changing climate nature can adapt but humans presence on the coast with coastal development remains something that is unpredictable. These systems will change but will still be there in future generation?

What is the role of variability in your measurements? There is more variability these days...not so much in temperature but in rainfall associated with the incident of storms.

Are estuarine environments providing a lot of buffer and is there a tipping point?

Are you able to predict what might happen with the food webs as some of the interconnections change or disappear? No we can't exactly predict this, but people use this to create models and that's where the predictions can come into place.

Ken: Humans aren't hardwired to appreciate slow changes over time. So it is difficult for us to respond to this type of change. Tom: I think looking at child rearing is a long term trend based reaction and if you relate this to that psychology. Amanda: Public health component is another area that seems to generate response from the public...so a focus on Vibrio and poison ivy. Wildfire and air quality issues are also a big impact. That is an emerging communicating issue that's resonating. Christine indicated that Dr. Allen is involved in small businesses along the coastline and the messages were pretty clear in an October press conference. Local decision makers seem to be climate deniers here. Not enough journalists have the background to report effectively on this. Need to be able to formulate this into a way that lay people can understand it. Dan: One of the messages that came through very clearly is salt marshes are in danger. Marsh migration has been an active topic of discussion in the research community but less so for policy makers.

Amanda Brennan -- Climate Outreach Specialist: Carolinas Integrates Sciences and Assessment (CISA), USC: Understanding Drought in Coastal Ecosystems.

Part of Regional Integrated Sciences and Assessments (RISA), part of NOAA funded programs to support research teams that help build the nations capacity to prepare for and adapt to climate change.

Our core areas include drought, climate and watershed modeling, coastal management, public health, and adaptations.

Coastal Climate projects include a Vibrio modeling and changing exposure levels; effect of salt water intrusion on water supplies, the Vulnerability and Consequences Adaptation Planning Scenarios (VCAPS)--a tool to help coastal communities adapt to climate.

Drought impacts on coastal ecosystems: We have unique species and ecosystems that are impacted differently than more inland areas. E.g. Blue crab fishery--NC is #1 producer on East Coast- and the need for the correct salinity regime.

Drought impacts components we think about how drought impacts coastal ecosystem can connect with decision makers. Drought impact interviews were made in Beaufort and Carteret county. Wanted to learn first hand about the mechanisms that people use to cope with drought. What information do they use and need: forecasts and impacts information. Other stressors, water quality, development etc. Commercial fishers, Outdoor recreational business, Land/Resource managers were all included. So far we are learning that there are direct and indirect impacts. Direct: decreased water supply, saltwater intrusion, salinity changes, fire regime changes. Indirect: reduced catch, increased business costs and broader environmental and economic stressors.

Drought compounds other existing stressors especially with regard to water quality. Compared to these variables drought alone is not a major concern among study participants. However,

given the vulnerability of these industries/areas due to other factors the impacts of droughts may be intensified.

How are people coping with drought: Hope and prayer, drought funding, diversification and shifting strategy. Hope and a prayer: Wait and see approach for better conditions. Reactive, temporary adaptations. Focus on reducing loss, more common when adaptive limitations exist. For fisheries may supplement income with work outside of industry.

Non rainy day fund: Approaches designed in anticipation of drought to blunt degree of impact. Proactive adaptations for fisheries are an option only when a small cushion exists.

Short of long-term adaptation: shifting to one or another species. Expanding the types and diversity of species of interest.

Strategic shift: Shift in long term strategies to manage under a "new normal" prescribed burring in maritime forests, find new resource sources or advocate for regulatory changes adjusting infrastructure or system to deal with drought impacts.

Limits for copings strategies include: fuel costs, human and financial resources, policies and regulations, available technology. Dependent on infrastructure equipment availability and condition.

Broad themes: Scale matters, as scale of the activity increases in commercial fishing the ability to cope with drought is often limited in the short term and more costly in the long term.

Interaction matters: Drought can create user conflict. commercial vs. recreational fishing

Information matters: Not formal in drought monitoring yet...people are relying on local information so far.

Citizen Science Monitoring: The Community Collaborative Rain, Hail and Snow network. The main focus is to provide quality precipitation data for use by a variety of state, federal and private networks. Precipitation measurement, include an official rain gauge to take daily precipitation. Report zeros and rain numbers. Weekly condition monitoring now is asking citizens to submit weekly condition monitoring to help identify the early signs of drought, identify when conditions begin to improve, and identify any lingering impacts. Participating organization includes master naturalist gardeners.

Evaluation and research for this citizen science based monitoring: Quality and connecting the information with decision makers is another component. We are hosting the climate resilience conference. An interactive conference geared towards networking and information exchange. Conference topics include climate change research and information and communications sector specific projects and activities. The conference web site is:
http://www.cisa.sc.edu/ccrc/index.html

Using citizen scientists? Arizona drought watch and a research project to evaluate the project. People did not participate without active recruitment.

Who sponsors that master naturalist project in SC: Clemson University. I have contact information for that.

How many people are actively using the project? In terms of citizen scientists there are 12,000 people signed up. 4-9,000 people log in daily. In SC there are about 900. Condition monitoring is new and we have about 15 people signed up. What about mobile apps? Not yet.

Jim Luken Coastal Carolina University. The Venus flytrap *Dionae muscipula*

Venus flytrap is my personal project, not too many students involved...because "plants are boring." But not this one.

VFT is a carnivorous plant that catches bugs with a snap trap one of only two in the world. This one is unique in terms of its specialization. These are small plants. The endemic range is about 300 miles between North and South Carolina. By and Large the VFT evolved right here in this location. Within its range it has specific requirements, wet open sunny , nutrient poor, fire, disturbance but with all these elements there are questions. Sometimes flooded sometimes dry. Open habitats but also overgrown. Soil can be sandy to organic.

Although past scientists (Roberts and Oosting 1958) predicted that the endemic region was never going to be used in development, things have proven different. Venus flytraps face loss of habitat. Development, poachers hurting population....press releases. Plants are gone outside of protected areas...loss of habitat is the biggest issue facing this plant right now. Poaching is also an issue but habitat loss is the biggest.

Poaching is the biggest threat in protected areas. Everybody thinks they are commercially viable. By and large they are not because you can buy them anywhere.

Habitat, usually a wetland with thick vegetation pond pines then there's a transition zone up to a dryer area and its something about that transitions zone where the Venus flytrap finds its sweet spot. It's also the sweet spot for other rare and carnivorous plants like sundews and pitcher plants, frogs breaches, fringed orchids all found in edge habitat. Also some more specific aspects of that habitat where you tend to find the species.

Can people establish new populations of venus' flytraps? We did a restoration project and cleared on the edge of a Carolina Bay. We collected seeds and leaves and put the plants on the newly cleared area. Sure enough we got some new venus fly trap growth. Venus fly trap is an insectivorous plant from day one...it's locked into that strategy. We only had funding for a few years but last year there was a big fire (8 years after restoration) and we went back and found the original numbers or more of the Venus flytraps Take home message: its not too hard to reestablish the populations.

Any commercial cultivation--oh yes that's how you get them in the big box plants

Are there any "escaped populations in NJ" No they're not escaped they were planted in NJ and in Florida.

Did you do any experimentation where you cleared but didn't plant? Yes seed bank reestablished themselves in these sites.
What do Venus flytraps capture? Charles Darwin maintained that the costs of capturing small insects exceeded the benefits and thus the traps acted like filters and allowed the small and useless fry toe escape". CCU scientists take on this theory. Size distribution for prey indicated that the traps are eating small things and that Darwin was wrong. Traps tend to catch little things like ants and spiders not so much flies.

Long term population trends indicate slightly declining populations. Fire makes the traps flower.

Famous people I've met due to Venus flytrap: Roland Alston tv radio personality. I was able to locate "the worlds largest Venus flytraps." Roland was not impressed with the size of the traps. Richard Crane, from the Kew Botanical Garden in England.

How do we communicate science to the general public. We as scientists need to think hard about how we do this. By and large we are failing. When you think about Venus flytraps something interesting happens. The public wants something exciting they want the big animal. Little Shop of horrors, Audry 2...coincidentally named after Audry in Supply who cultivates traps for distribution.

What's the harm in this? If we don't communicate accurately there can be misconceptions. We as scientist have a lot of work to do to communicate to the public because people are naturally drawn to the dramatic.

Poaching? I don't know it's as much as a problem in SC as you do in NC. It's bad everywhere.

What is a big population of traps: several hundred plants.

How would you tell a scientist to communicate with the press when you need the public awareness especially for grant money. Make finding the small hidden species the reward...give the press the challenge of finding it. Be mindful and pay attention to the details. Suggestion: This is nature's Mona Lisa.

Ken McDermond--coordinator, South Atlantic Landscape Conservation Cooperative: South Atlantic Landscape Conservation cooperative--overview and opportunities for integration.

South Atlantic Landscape Conservation Coop is a partnership of fed, state, and private orgs dedicated to conserving a landscape capable of sustaining the nations natural and cultural resources for current and future generations.

This cooperative is for everybody--it is not any one agency or organization that is running the show.

Why does what we're doing matter. Climate change, urbanization, coastal development. How can any one organization bring the science together needed to address those changes and work together to make something happen. Trying to solve these problems alone isn't effective. The buck stops with people coming together.

I worked in California for 8 years. There are lots of problems from urban development and water use. Those problems are coming here. What are we as conservation organizations for? That's what the cooperatives are trying to address.

SALCC basics: 89 million acres terrestrial freshwater and marine in our area of cooperation. 92% in private land and 120% increase in urban areas by 2050.

There is a network of 22 cooperatives established throughout US, Canada, Mexico and Caribbean. SALCC mission: create a shared blueprint for landscape conservation actions that sustain natural and cultural resources into the future.

What's a blueprint. An interactive living map that describes the places and actions needed to meet the SALCCs conservation objectives in the face of change.

Goals: provide a shared vision/blueprint, provide support, facilitate collaboration, promote data integration and sharing, evaluate and report progress.

How do we operate? Steering committee -- staff -- partnership committee, science committees and web communities.

Steering committee includes influential folks across the geography NOAA, EPA national park service GA dept. natural resource Florida fish and wildlife USGA VA dept. of game and inland fisheries DOD NC WRC, US Fish and Wildlife Service.

Diversity of investors: NC WRC provides offices, Active web community

How can you get involved: join the web community. communicate with the steering committee reps, participate in web forums, participate on committees, call a staff member or liaison. www.southatlanticlcc.org

What's different from past efforts? We are planning for the cooperative not to be any one organization. This is an adaptation strategy incorporating climate change, urban growth and other future changes. Bigger scope and scale.

Case 1: Finding the best places to work together. Case 2: Bringing in new conservation dollars. The trust for public land for instance, NFWF, Howard Dobbs Jr. foundation, Turner foundation Inc. Case 3: guiding infrastructure development. Case 4: creating incentives as an alternative to regulation. Case 5: bringing landscape perspectives for local adaptation efforts (how do I fit in?). Climate adaptation strategies are large scale! Case 6: Responding to major disasters.

Where we've been: March 2012 determined our mission March 2013 established measures of success. March 2013 decisions to create version 1.0 of Conservation blueprint by March 2014. Indicators and targets are important, Indicator for the state of the south Atlantic, and a conservation blueprint.

Where we're going: Regional workshops recently now a draft blueprint by January, state of the South Atlantic by March and final blueprint 1.0 by March.

How does it relate to Arch...compare their blueprint to the Arch Conservation priorities. [Reaction from Suzanne, Dan, & John: Initial review showed much alignment, although the Conservation committee should consider communicating with the SALC to ensure an appropriate level of coordination.]

Keeping up with projects in the works: SALCC projects page. Cooperative has funded some projects. Lots of work is easy to see on this page. These projects help inform landscape based decisions.

How do we make all this available to you? Conservation planning atlas. This is focuses on landscape scale planning information and future change. You can store important search view

and basic analysis. Now we have foundational spatial data and will be moving that into the blueprint.

Kacy--at the workshop one of the other reasons to create a blue print is to channel funding to conservation projects on the ground. Ken--this will do a couple of things....this project will help focus funding into areas of needs. Bringing new conservation dollars to this area...we will go out to everybody very soon and ask what are the issues that would benefit from the collective. If we can tell a story about why this work will really help with the overall mission to attract big conservation dollars. We are just starting to pivot towards that kind of thinking but part of the answer is how we develop priorities.

Dan T--What does an organization like ours bring to you? Local knowledge. I don't think we had enough people from this area representing. In the future as you get the draft you'll need to reality check the blueprint. On the other side we are thinking about facilitating some of the action? Implementing new money for instance.

Dan Tufford and Suzanne Dorsey Thanked everybody for their participation and the meeting adjourned at 12:35