SESSION 01
AUGUST 2012

REPORT BY CLASS XII

NRLI

FLORIDA NATURAL RESOURCES LEADERSHIP INSTITUTE

Climate Change: The Impact on Aquaculture and Coastal Communities

Introduction to the NRLI Program

Laila Racevskis led us through the Curriculum Overview. We each received our NRLI Handbook which includes the program overview, class schedule, descriptions of tasks, and participant contact information.

Bruce Delaney led us in a discussion of the team tasks such as reporting on each session, stakeholder panel moderator, feedback panel, and debriefing the session. As a group, we agreed on "Group Norms", or a code of conduct that we would like to adhere to throughout the course. The Group Norms are detailed later on in this report.

Joy Hazell then facilitated a discussion of Expectations from the perspective of both the program Fellows and our project leaders. For this discussion we broke into small groups with some taking advantage of the open porch overlooking the Gulf waters of Cedar Key for their discussions. The NRLI Class XII expectations are attached to this report.

this issue

WELCOME to NRLI

Twenty-two hopeful and enthusiastic professionals from various walks of life and different parts of Florida came together for the first time on August 9th, at the Cedar Cove Yacht Club, Cedar Key, Florida. Like the 11 classes before us, we were to embark on a year of Natural Resource Leadership Institute Training (NRLI) facilitated by the University of Florida. Some of us began informal introductions while we had lunch at the Island Room Restaurant, voted the best restaurant on the island by some.

In the Cedar Cove meeting room, we were introduced to the NRLI instructors and each other. NRLI instructors included Bruce Delaney, Laila Racevskis, Joy Hazel, Jon Dain, and Paul Monaghan. Carolyn Cox of the Florida Climate Institute also joined us and would have an important role this year in assisting NRLI with its Climate Change focus. While the course has a climate change focus, we were told the emphasis of training would be on facilitating constructive and civil discussions on climate change, not a tutorial on climate science.

"STEPS" to NRLI

Jack Daugherty takes a "walk" through his life during the opening day in Cedar Key. "Steps to NRLI" help the Fellows get to know each other and make personal connections.

To get us started, Jon Dain directed us to use masking tape to draw a map of Florida on the floor, indicating significant locations in the state. As Florida's unique peninsular shape took hold, well known features like the St. John's River, Lake Okeechobee, Tallahassee, and the Florida Keys were pointed out. Jon led us in the exercise "Steps to NRLI", where we were asked to step onto the map one at a time and "walk" through our lives by stating our name, where we were born/call home, what two significant events in our life were, where we currently work and live, and what scent reminds us of home. Through this exercise, we learned about the breadth of experiences in the group and found many things in common among class members. The exercise highlighted the ways in which familiarity and personal connections reduce anxiety and increase comfort between groups of people, which helps them be more open in talking to and with each other.

Setting the Stage

On Day Two, we were totally immersed in the past, present and future history of Cedar Key, FL. We learned about Cedar Key stakeholders in a number of ways: 1) field trips led by key Cedar Key stakeholders who shared their stories in the places they have unfolded; 2) A Stakeholder Panel that presented their collective story, as well as different points of view on the key issues facing their community; and 3) presentations by experts and leaders within the community that know many of the stakeholders and can represent the diverse issues fairly. Through these stakeholder interactions, we grew to appreciate how this community has changed and adapted to different environmental, regulatory, and natural resource challenges over many, many years. It was notable that more often than not, a crisis had spurred the community to action and individuals had leveraged outside resources while building internal support to address the issues in question.

Sue Colson, former mayor of Cedar Key, speaks with the Fellows at Atsena Otie. Photo by Libby Carnahan

CEDAR KEY: A FIELD TRIP IN FOUR PARTS

Part 1: A Historical View

Sue Colson, former mayor, city councilwoman and NRLI alumnae took us by boat to Atsena Otie Key, an island offshore of Cedar Key, to help set the stage for the 2012 NRLI Fellows. Atsena Otie was settled by Native Americans in 500 B.C. and is the site of the first European settlement of Cedar Key. Arrowheads, oyster middens, and other artifacts are reminders of a time when the sea-level was lower. European settlers settled the area in the 1800s with populations reaching 2500 workers and 10,000 residents during the height of the lumber and oyster boom in both Atsena Otie and Cedar Key. This "boom" lasted until a large hurricane struck and wiped out the mill and displaced many residents. Those that remained lived only on Cedar Key and relied on oyster harvesting and fishing after the large cedars that had been the mainstay of the economy were gone. Tourism became an additional source of income starting in the 60s, however, even tourism wasn't enough to overcome the socioeconomic crisis the gillnet ban caused for Cedar Key fishermen and the community in 1994.

The gillnet fishery was critical to Cedar Key both financially and culturally and without it, Cedar Key would have suffered had it not been for the rise of shellfish aqua-culture After passage of the gillnet ban and collapse of the local commercial fishing industry, training grants from state and Federal agencies helped equip many fishermen with the knowledge to develop clam aquaculture in the waters off Cedar Key, where clams would grow faster than in colder waters. Cedar Key now ranks in the top three clam producing regions of the U.S. and has been the impetus for many of the town's sustainability efforts. The community has recognized that it must control further coastal development close to shellfish lease sites to protect water quality. Diminished water quality declines could lead to the closure of the lease sites. In addition to monitoring development, local elected officials have helped existing homes and businesses replace septic tanks with a wastewater treatment plant and associated infrastructure. Together these efforts have improved water quality and as a result increased the acreage of sea bottom open to potential aquaculture. Most recently the community has faced the threat of salt water intrusion into water supply wells, and is wrestling with long-term options to adapt to this new challenge.

Cedar Key Water Treatment Plant process . Photo by Libby Carnahan

Cedar Key Water Treatment Plant processes. Photo by Bette Loiselle

Greg Lang explains the Cedar Key Water Treatment Plant process during the fieldtrip. Photo by Libby Carnahan

Part 2: Water Quality and Water Supply

Greg Lang, VP of Community Development of Mittauer and Associates, took us to the Cedar Key wastewater treatment plant, where James, a Cedar Key resident and engineering graduate from U. Florida, gave us a tour. This plant is able to treat up to 180,000 gallons per day of wastewater during peak tourist season and 80,000 the rest of the time. We could see the dark grey water entering the treatment system and being screened for particulates before being run into a large system that uses microorganisms (algae and bacteria) that help digest much of the organic waste. It then flows through a sand filtration system, followed by chlorination, water clarification, and finally a skimmer system that leaves it clearer than the water in the bay. The reclaimed water is used for watering lawns and plants, and in some cases is released back to the bay. The result has been that this wastewater system has replaced leaky septic tanks on the island and improved water quality in the surrounding coastal waters. We thanked James and then ventured over to the water supply facility.

Greg explained that consecutive years of drought and a lot of withdrawal from the aquifer upstream by larger communities allowed salt water to move further into the aquifer where wells draw potable water for use by the people of Cedar Key. Saltwater is denser than freshwater and sits in a wedge below the freshwater layer. When there is less freshwater replenishing the aquifer, saltwater moves into the space and replaces the freshwater layer. In summer 2012 when the issue was discovered, the technician initially assumed that his instruments were off and had them recalibrated. Similar readings stunned him and indicated that the chloride content had already risen far above state water quality standards. Residents had to be notified they could no longer use the city's water and potable water had to be brought in by trucks while Greg worked with the Cedar Key Water Board and various water supply experts to address the issue. In a moment of crisis the community rallied behind a temporary solution which involved getting two reverse osmosis chambers (desalination technology) to remove the chloride from the water. With USDA grants and other funding, a $350,000 system that fits within a refrigerated tractor trailer was purchased and put together with the capacity to treat enough water for peak use. The tradeoff is the amount of energy needed to keep the high pressure system running and a wastewater stream equaling a quarter of what is treated that enters a polishing wetland. The town is still wrestling with how to develop a sustainable system that will withstand hurricanes and a potential future with more droughts and higher sea-levels that can make salinity intrusion more frequent.

Part 3: Clam Aquaculture and Oyster Reef Restoration

Captain Bobby Witt and his daughter took us out on his boat and quickly motored to his 2 acre shellfish aquaculture lease site located among a number of other sites in one large state sanctioned shellfish area. The only indication that you are at a shellfish aquaculture site is the PVC pipes that jut out from the water marking the corners of each lease site. The production process begins when Captain Bobby buys seed clams from a nursery, and places 10 to 15 thousand in a small clam bag that gets staked to the sea floor at the lease site. Three to six months later, he pulls up the bag and takes the clams, 1 cm or larger, and puts them in a grow out bag that is then put back in the water at the lease site. The clams work to push the bag into the sandy, mucky bottom, where they grow for 1 to 2 years depending on the size needed for the market. Different size clams are called pasta, little-neck, 1 inch, middle-neck, and top-neck clams. When an order comes in for clams, Bobby winches the shellfish bags onto his boat; a bag can weigh 40 to 50 lbs. The clams are taken home where he tumble washes them, puts them in clean baskets and has them on their way to the market within 3 hours. Some clams go to shellfish processers who are local. Clams that aren't the right size are re-bagged and put back in the water. The main challenges facing clam aquaculture are getting healthy seed clams, controlling predators like starfish, stone crabs, and bat rays; avoiding high-temperatures; and maintaining water quality.

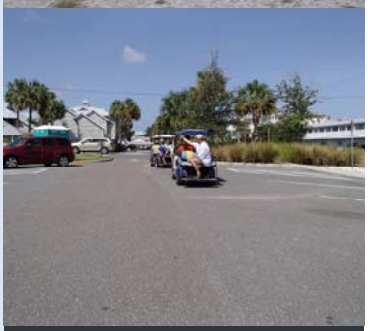
Captain Bobby then drove us over to an oyster reef where Dr. Jennifer Seavey, Assistant Director of the University of Florida Marine Research Institute, explained how oyster reefs serve multiple purposes for the marine ecosystem as well as the Cedar Key community. First, oyster reefs are ecosystem engineers, they build in vertical relief in a tapered line that shapes local currents and sediment deposition. Through feeding they filter water and improve water quality. Second, they provide habitat to over 300 different species including many important recreational and commercial fishery species and their prey. Third, they help provide an additional barrier against storm surge and help reduce erosion of the shoreline, an essential function for Cedar Key where the average elevation is 2.5 ft. above mean high-water. Dr. Seavey has been working with the community to communicate the value of restoring oyster reefs in the coastal areas around the island so as to improve the overall coastal ecology. She and her team have obtained grants to add oyster reefs off Cedar Key while working with fishermen and shellfish aquaculturists to determine which areas won't impact their fisheries by either displacing bottom or adding oyster spat that can cover clam space.

Dr. Seavey made a convincing case for local sea level rise by sharing three aerial photographs of oyster reefs off Cedar Key and near the Suwannee River outfall from 1980, 1990, and 2010. The oyster reefs visibly decreased during that 30 year period and using photogrammetric interpretation, the study team was able to determine that approximately 66% or two-thirds of the oyster reef area was lost. Her theory is that reduced freshwater flow down the Suwannee River is the key culprit. Backed with graphs depicting the increasing number of low flow events and flow vs. range of rainfall, she built a case that freshwater has been reduced rather significantly over this period. In addition to reduced amount of freshwater entering the system (which impacts younger oyster lifestages) sea-level is also continuing to rise. Over the past 100 years, local sea-levels have risen 23 cm (2.3 cm a decade). The rate of this rise has also increased slightly over the past 30 years. Oyster reefs typically able to grow at a rate that keeps pace with sea-level rise, however, if the rate becomes too high or if other stressors affect oyster health like reduced freshwater, then oyster reefs are unable to keep up and remain submerged. Dr. Seavey now needs to consider these possible future sea-level rise scenarios when siting areas for oyster reef restoration. Ultimately, restoration efforts should target areas that are more likely to be able to adapt to future climate scenarios and can help the coastal system maintain some resiliency.

Captain Bobby Witt shows off some of the Cedar Key clams during the 3 part of the field trip.

Part 4: Solar Power Tour of Sustainability

Sue Colson took us on a solar-powered golf cart tour of the town. Numerous efforts have been put in place to increase the town's sustainability. Oyster and old clam shells are recycled for oyster reef restoration efforts right down at the town dock as part of a state funded program. The community center, where weddings, Christmas parties, and other events are held, now boasts solar panels and low flow toilets. Walking into the center, we met UF professor of Urban planning Gaile Easely who worked with kids on a summer camp focused on sea level rise. The children's projects were on display, including pictorial representations and building models of towns facing differing levels of sea water. Some kids stated they would build houses on stilts, others indicated they would "go to Ohio", and still others would just move further inland. The drawings and models reflected different ideas and experiences as awareness is raised of dealing with this somewhat difficult to visualize challenge. Back on the tour of the city, Sue pointed out that storm water runoff areas have been constructed, historical trees saved when roads have been rebuilt, sidewalks have been installed to help encourage safe walking and boardwalks created to go around a graveyard to a park. In addition, fats, oils, and grease (FOGs) bins have been installed in neighborhoods to help prevent grease from clogging drainage systems. All of these projects were intended to improve the community from a sustainability standpoint. In some cases, these projects initially faced opposition that required considerable engagement to address stakeholder concerns before being implemented.



Top: Cedar Key youth model Sea Level rise for Cedar Key; Center: Historic Indian Burial Mound; Touring the city on solar powered golf carts. Photos by Joy Hazell

Fellows participate in their first stakeholder panel discussion as NRLI Fellows. Stakeholder panel guests (L-R) David Beach, Dr. Earl Starnes; Jennifer Seavey, Greg Lang, and Bill Roberts. Photos by Joy Hazell

Stakeholder Panel Discussion

In the afternoon, we prepped for our first stakeholder panel. The project team helped us prepare by explaining how the panel would work and by asking us what type of questions we would like to ask the panel participants. We also reviewed etiquette for posing questions. The stakeholder panel was comprised of Dr. Jennifer Seavey (UF Post Doc), Greg Lang (VP of Community Development. Mittauer & Associates, Inc.), Bill Roberts (Fishing Guide), Dr. Earl Starnes (Retired Planner & Author), and David Beach (Chair of Cedar Key Water Board).

Key points from the discussion included:

- Young residents of Cedar Key leave for college and rarely return back to Cedar Key. This is a great loss for the community.
- Tropical Storm Debby caused damage to some infrastructure on the island and clam lease sites in the water. If such damage could result from a minor storm, the community is NOT prepared for a major catastrophe.
- The community pulls together in time of crisis. However, the threat of sea level rise or climate change may not be an immediate enough threat for the community to respond to.
- There is anecdotal evidence of climate change (community shift on islands, drought, salt water intrusion), however very few people are talking about Climate Change.

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This report forms part of a series written by current NRLI Fellows. Reports represent and are a product of the experiential learning process that is a highlight of the NRLI program and have not been formally peer reviewed.

Climate Change Science

On Saturday morning, we heard a presentation from David Zierden, Florida State Climatologist, on the science behind climate change. The presentation was detailed and presented both sides of the climate change debate, identifying both natural and human-induced sources of global warming. He explained that he felt it was important to present both sides from a factual standpoint so that the true issue could be understood and polarized stakeholders would be better able to talk to each other about the issues. The state climatologist's role appears to be to present the science on the issue in a transparent way to decision-makers. David indicated that the primary decision-makers that receive the information are state agencies and he felt strongly that many of the risks presented by climate change (e.g., increased sea-level rise and saltwater intrusion, increased damages from tropical storms) are already manifesting themselves. If communities, both locally and across the state address those issues now, they will be better positioned to handle future increases in the range of climate change effects.

> Many of the risks presented by climate change are already manifesting themselves. If communities, both locally and across the state address those issues now, they will be better positioned to handle future increases in the range of climate change effects. David Zierden

David was thanked and the NRLI class debriefed the presentation with the help of a project team facilitator. The Fellows were divided into pairs and each person described their take home points from the talk before reporting on their partner's thoughts. When the room's buzz died down it was time to stop and present the results of the session. Some of the main comments that resulted were related to the complexity of the science and the need for better ways to communicate that science to different stakeholders. In addition, focusing on the issues that are affected by the climate now is useful in helping to build understanding and (potentially) support to take actions both locally and at higher levels of government.

Feedback and Debrief

The Feedback panel of Ondine, Jennifer, and MJ led us in an exercise designed to provide feedback to the project team on positives aspects of the session , as well as areas with room for improvement. Overall, the responses were very positive. The group was impressed with the caliber of the stakeholder panel, though some would have like to have seen some additional representation from state agencies who had worked with Cedar Key. The group thoroughly enjoyed the venue and the food! The project team will take feedback into consideration and adjust where possible.