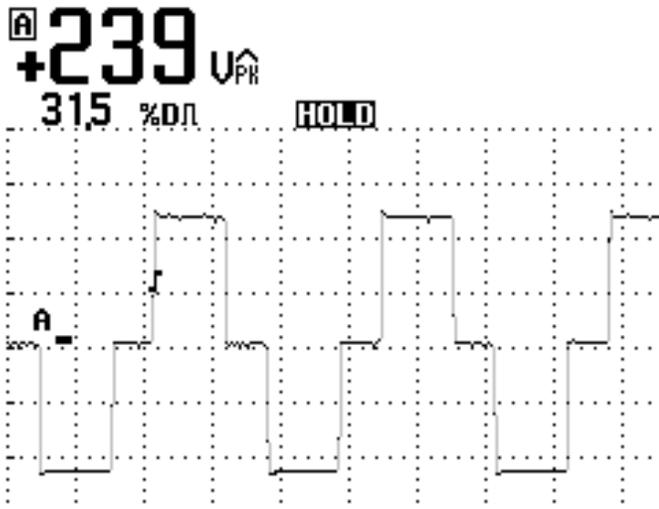


FLEUR DE LIS FISHERIES

US Fish and Wildlife Service



Electrofishing, Alligator Snapping Turtles, Mussels and More, Check out all that is going on at Natchitoches National Fish Hatchery.

Going Regional

By: Tony Brady

Since January, Tony Brady mussel biologist with Natchitoches National Fish Hatchery (NNFH), has been visiting with or talking to hatcheries across Region 4. The purpose of these visits and phone conversations is to help these hatcheries address the US Fish and Wildlife Service's priority of addressing the needs of listed threatened and endangered (aquatic) species. Freshwater mussels are one of the largest groups of organisms listed under the Endangered Species Act (ESA), and Region 4 has a majority of these mussels within its borders. There are so many mussels on the ESA because most major drainages in Region 4 have endemic populations of mussels and as all the drainages are facing similar problems such as siltation, non-point source pollution, and the effects of dams just to name a few, these endemic mussels are suffering the same fate.

As the USFWS works through the Landscape Conservation Cooperatives to implement best management practices for the drainage basins, the recovery and restoration of these listed mussel species will require some level of assessment, propagation, and monitoring. Many of the Region's hatcheries are located in or near these major watersheds, working with the listed mussels near them is a logical direction for hatcheries to take to meet the USFWS' mandates for hatcheries. Tony is the only full time Mussel Propagation Biologist in Region 4's hatchery system. In FY 13, he reached out to Dale Hollow National Fish Hatchery (DHNHFH) about starting a mussel program in Tennessee. Dale Hollow NFH was first approached because of past working relationships between Tony and DHNHFH's Project Leader Andy Currie. Between Andy and Tony,

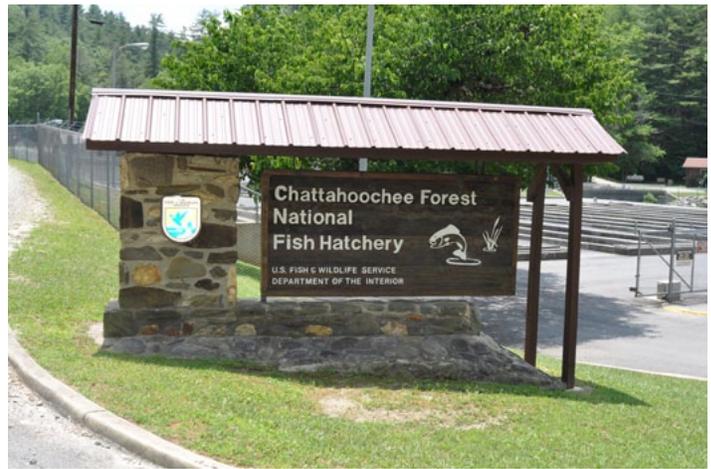


A team effort is required for the success of any project. Seen here are biologists from Wolf Creek NFH, Tennessee Cooperative Fishery Research Unit, and Natchitoches NFH placing inoculated fish into mussel culture cages at Dale Hollow Lake.

other partners such as the US Army Corp of Engineers, Tennessee Ecological Services Field Office, Tennessee Wildlife Resources Agency, and the Tennessee Cooperative Fishery Research Unit were asked to assist on this project. The first year was considered a success with two mussel species (the Mucket and the federally endangered Pink Mucket) being cultured in Dale Hollow Lake.

Year two of the Dale Hollow NFH's mussel program is reaching across regional borders by producing mussels that will aid in the restoration of mussels lost in Region 5's Ohio River Islands National Wildlife Refuge. With assistance from Ohio River Islands NWR and our fore-mentioned partners, two mussel species, the Pink Mucket and the Black Sandshell will be cultured for release in the Ohio River. Final production numbers will be reported in the fall of this year.

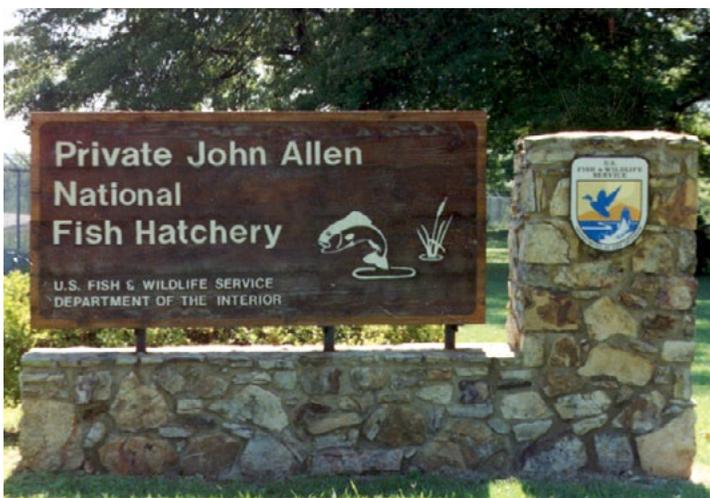
In January, Tony met with the staff of Private John Allen NFH to begin to develop a mussel program in Mississippi. Private John Allen NFH is situated in a location where they could work with mussels from three major watersheds; Mississippi River, Tennessee River, and Mobil Basin. As soon as water levels allow, a joint effort between the staff of Private John Allen NFH and the Alabama Aquatic Biodiversity Center and Tony will begin to collect gravid mussels for use as a surrogate species for potential listed mussels in the Mobil Basin.



Plans are set to begin mussel culture in Georgia at Chattahoochee Forest NFH starting in FY15.

In March, Tony met with the staff of Chattahoochee Forest NFH and the Georgia Department of Natural Resource's mussel biologist to discuss development of a Georgia mussel program. Both parties were very interested and like Private John Allen NFH, Chattahoochee Forest NFH is located where they too could work on mussels from three watersheds; Tennessee River, Atlantic Sloop Drainage, and Rivers in the interior of Georgia. Plans are currently in the works to produce mussels starting in the Spring of 2015.

In the next few months, Tony will meet with Wolf Creek NFH (KY), the Orangeburg NFH (SC) and the Welaka NFH (FL) and bring in state and other federal partners to develop mussel propagation programs at these facilities. Going Regional, by coordinating with and assisting other Region 4 hatcheries to develop mussel culture programs, is one way the Region 4 hatcheries plans to make a positive impact for these unique threatened and endangered mussel species.



Private John Allen NFH will be the third Region 4 hatchery culturing mussel in FY14.

Striped Mullet Taxis Study in Arkansas

By: Jan Dean

This title contains some unusual words or associations. The word taxis means a movement toward or away from a stimulus. More on that later. The unusual association part of the title involves mullet and Arkansas because striped mullet are basically a saltwater fish which can enter brackish and even fresh water to some degree, but seeing them as far inland as Arkansas is strange indeed.

Striped (or black, or flathead) mullet are a versatile fish found throughout much of the world in warm, coastal marine waters and sometimes in fresh water. They have many other colloquial names, including Biloxi bacon. Adults migrate offshore in large schools to spawn, and the juveniles migrate inshore at about one inch in size, moving up tidal creeks.

Mullet are sometimes called jumping, or happy, mullet because they leap out of the water and skip along its surface with great exuberance. My first experience with striped mullet was along the coast of Louisiana

at Rockefeller Refuge where I was a student intern in the summer of 1974. We were cruising along a canal at night when these fish started jumping in the air and landing in the boat. What a great way to fish; no tackle or bait needed.

Though they can be good to eat and were held in high esteem in ancient writings, we did not value them so highly. They eat zooplankton, dead plant matter, microalgae and other detritus, sometimes by consuming the top layer of sediments or the layer at the air-water interface. They contain a gizzard-like structure which allows them to process the detritus they consume. Their body can take on the flavor of their surroundings. It can be really good to eat when living over clean, sandy bottoms. Reportedly, mullet flesh is excellent when smoked.

Now that you know a bit more about the striped mullet, let's get back to the reason for the taxis study. Lindsey Lewis of the Conway Arkansas Ecological



Fish and Wildlife Service biologist Lindsey Lewis as we prepared to capture striped mullet in Arkansas.

Services Office has been studying a unique population of mullet found in Southeast Arkansas. He has been catching them with a boat electrofisher and wanted to test some in a tank study to determine electrical waveforms which may be useful for attracting them in front of the boat for easier capture by someone with a dip net standing on the bow. The plan was to capture some one day and take them to a test tank set up by Dr. Steve Lochmann and co-worker Kyler Hecke in the Department of Aquaculture and Fisheries, University of Arkansas at Pine Bluff.

I drove to Southeast Arkansas on March 25 to meet Lindsey, and we went out the next morning to capture some mullet. We started out downstream of the Wilbur D. Mills Dam (Dam 2) on the Arkansas River and began electrofishing just below the dam. We caught no mullet in the first try, so we motored downstream and tried along the bank, still without seeing mullet. My initial confidence was beginning to wane a bit as we continued shocking along the shore. Then we moved over to a steep sandbar and bam, there they were.

We collected over forty striped mullet in short order, hauling in two or three in each dip net. Lindsey came through for us, big time. Most of the fish were 16-20 inches in total length.

We then transported them to the University of Pine Bluff and put them in tanks for the evening in preparation for testing the next day. We set up the electrodes and power supply – an ETS ABP-3 backpack electrofisher – then tried the setup on one mullet before heading back to the river for some evening electrofishing for eels. Garrett Grimes, a graduate student

from the University of Central Arkansas, is conducting mullet research, but he helped us with the evening fish sampling. We saw other fish, including several Asian carp and a male bowfin in breeding colors, but we did not collect any eels. Such is life.

The next morning, Garrett, Lindsey and I headed back to Pine Bluff to conduct the study in a long rectangular tank outfitted with plate electrodes at each end to establish a uniform electrical field throughout the tank. A uniform electrical field is important for quantitative studies to determine the power levels needed to cause fish response such as immobilization or attraction to the positive electrode, the anode. Both reactions are considered capture-prone responses, and taxis to the anode was the primary response of interest for this study. One fish was placed in the tank at a time and then subjected to a brief (four second) exposure to electrical current. Different frequencies and lengths of electrical pulses were used, and the power required to elicit the desired fish response was recorded. We conducted testing in the morning at one water temperature and then increased the temperature slightly for the afternoon tests. The mullet did exhibit attraction to the anode using several frequencies and durations of direct current pulses. Hopefully, these findings will lead to more successful capture of mullet from the river, and we hope to do more such testing of mullet in the future, perhaps this fall. Storm clouds were brewing as I headed back to Natchitoches. It was a good trip.



Striped mullet, *Mugil cephalus*.

Mussel Biologist does Detail at White Sulphur Springs NFH

By: Tony Brady

As the calendar rolled over into 2014, White Sulphur Springs National Fish Hatchery (WSSNFH) found out that their mussel propagation biologist was transferring to Harrison Lake NFH. With mussel season a couple of months away, there wasn't enough time to hire a mussel propagation specialist to start the work required to meet their current commitments. That's when Keith McGilvray, project leader for White Sulphur Springs National Fish Hatchery (WSSNFH), contacted Natchitoches NFH (NNFH) about sending their mussel propagation biologist Tony Brady to West Virginia for a short detail. Natchitoches NFH, always willing to show our hospitality, sent Tony to



Melvin Woody, biologist for WSSNFH tries his hand at glochidial extraction.

for the WSSNFH staff how to extract glochidia (larval mussels) from the female mussels. The glochidia were then used to inoculate all the fish that were collected earlier that month. The mussels were then returned to the Ohio River Islands NWR and West Virginia Division of Natural Resources to be returned to their home streams. At the time of this writing, these microscopic mussels should be finished dropping off the host fish, where WSSNFH is growing them out to one day be released back into the Ohio River.



Tony demonstrates how to extract larval mussels (glochidia) from the adult mussel.

WSSNFH for two different weeks, bookending the month of March. On the first week of the detail, Tony meet with the staff of WSSNFH and talked with state and federal partners to develop a schedule that would allow all the work to be completed on time. Between Tony's visits the WSSNFH staff collected over 500 fish that would be used as host fish for the Round Hickory Nut Mussel. On his second visit to West Virginia, Tony made plans to pick up gravid mussels from Ohio River Islands NWR biologist Patty Morrison. Upon returning the mussels to WSSNFH Tony demonstrated



Fantail darters being inoculated with glochidia.

Conquistador Chelonia Connection

By: Jan Dean

Generating creative titles for the same work is becoming more of a challenge. Back when I was in college, around the time of the last Ice Age, the taxonomy of turtles included Class Reptilia and Order Chelonia. You'll just have to read more to find out about the Conquistador connection.

We at Natchitoches National Fish Hatchery have been overwintering Alligator Snapping Turtles for several years. We used to do that for the University of Louisiana at Monroe and then for the Tishomingo, Oklahoma National Fish Hatchery. Lately, it has been for the Louisiana Department of Wildlife and Fisheries, our oldest and closest Partners in Conservation.

Kristi Butler, Biologist Manager of the LDWF Hatcheries Section and Manager of the Booker-Fowler Fish Hatchery, delivered 150 hatchling turtles to Natchi-

toches NFH September 12, 2013. We placed them in rearing tanks in our Four-Stall building and began feeding them soon after with Purina Aquamax 5D05 extruded feed of size 5 mm or 3/16 inch diameter. A few of the turtles were weighed to determine initial feeding rates as percent of body weight, then all of the turtles were weighed September 20. At that time, they averaged 20.1 grams each. By October 16, they averaged 32.1 grams, and this increased to 59.3 grams by December 4.

We typically lose two or three turtles soon after stocking and then maybe another or two along the way. It is common to see some hatchlings with deformities, and some just never eat and grow well; we call these runts. This year, we had several runts to the end of rearing here in April, and the mortality was higher than in



Young Alligator Snapping Turtle showings its vermiform “wormlike” tongue lure.

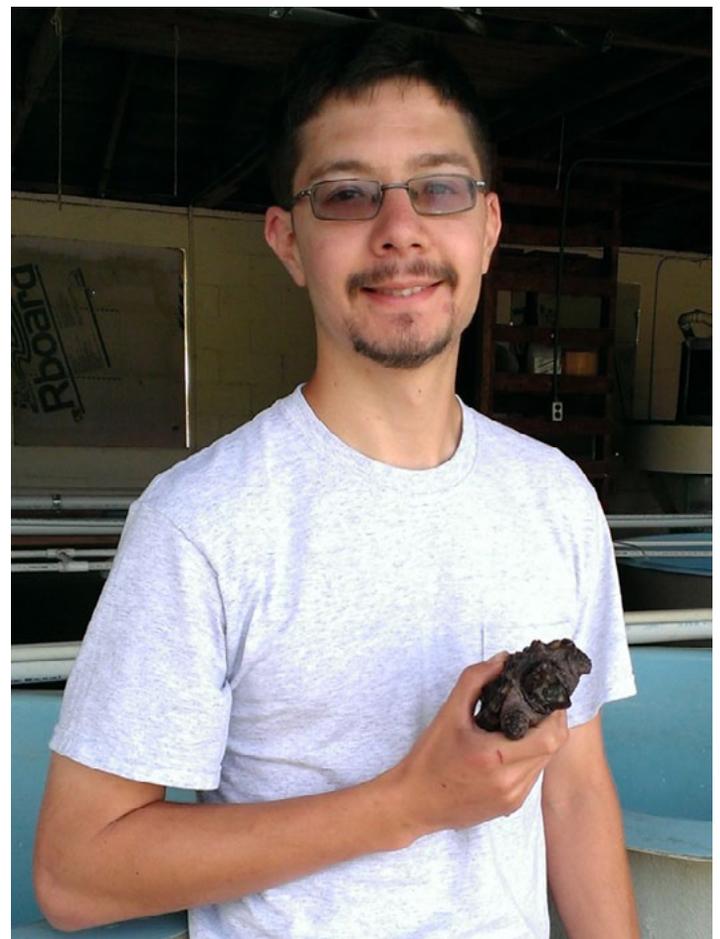
past years. Overall, the survival was about 81 percent from September 12 through April 24. The overall average weight for all turtles at harvest was 164.3 grams, and without the runt tank the average was 173.7 grams, so the average weight of the latter group was over 8 times their stocking weight. They were fed only Purina Aquamax feed, and they were not being fed to achieve maximum growth.

Surveys of Alligator Snapping Turtles are being conducted to determine where these should be released into the wild after a couple more years of rearing in captivity. Monroe Fish Hatchery Manager Donna Bowman and co-worker Charles “Chuck” Battaglia arrived April 24, 2014 to pick up the turtles and

transport them back to Monroe for that extra rearing before release. Chuck’s last name was interesting, and he revealed that he is descended from Spanish Conquistadors – those soldiers, explorers and adventurers from the 15th to 17th Centuries. Conquistador means “Conqueror.” We hope these turtles will grow to be conquerors of their environment as they are released to enhance snapping turtle populations in Louisiana. We at Natchitoches NFH are pleased to be able to assist the LDWF in their conservation efforts. They help us in many ways. That is what true partnership is all about.



Monroe Fish Hatchery Manager Donna Bowman inspecting, and being inspected by, an Alligator Snapping Turtle at Natchitoches National Fish Hatchery April 24, 2014.



Chuck Battaglia, the Conquistador Connection, holding an Alligator Snapping Turtle at Natchitoches National Fish Hatchery April 24, 2014.

Backpack Electrofisher Evaluation

By: Jan Dean

Several months ago, I was asked to make a presentation on certain electrofishing topics at a Fisheries Project Leader's Meeting, so I did. Shortly after the meeting, I was asked by Cindy Williams of our Regional Office to evaluate a backpack electrofisher which she had purchased. The unit is an Aqua Shock Solutions B-1-L. In fact, it was the first one built and sold by this new company. However, the former owner and company, Appalachian Aquatics, had built basically the same backpack electrofisher several years prior, and we had purchased one of those for collecting potential mussel host fish from streams in Louisiana.

First, let me describe a few physical features of the unit. It has direct current (DC) and alternating current (AC) modes with voltage settings for each mode of 75 to 850 volts, in 17 steps. These are the only controls. The DC mode is actually a pulsed direct current (PDC) with a frequency of 120 Hz, whereas the AC mode has a frequency of 60 Hz. The input voltage of 12 volts DC is supplied by two 12-volt batteries wired in parallel. The sealed lead acid batteries had capacities of 9 amp-hours each, so double that for the two wired in parallel. The semi-square electrodes were each about 12 inches wide and were made of approxi-

mately ½ inch diameter aluminum stock material. The anode and cathode electrodes were of the same size for a 50:50 power distribution, and the anode was fitted with a net for fish capture. The weight of the backpack without the electrode poles was 20.50 lbs, and the battery pack was 12.25 lbs, so the total weight without poles was 32.75 lbs. Lighter batteries are now available from Aqua Shock Solutions.

Testing of the backpack output was done twice in the same rectangular fiberglass tank at Natchitoches National Fish Hatchery. The first testing was done in early March using City water, and the second testing was done using the more conductive Cane River water. The objective was to test the unit in two different resistance situations which exert different loads on the unit. Based on past experience, the resistance for the first testing equates to a stream ambient conductivity of about 50 micro-Siemens per cm; for the latter testing, the corresponding stream conductivity would be approximately 190 micro-Siemens per cm. The higher conductivity test placed a somewhat higher demand on the electrofisher to produce the same voltage.

For both tests, the peak voltage and peak current were checked with independent instruments for voltage settings from 75 volts to as high a voltage setting as could be maintained for 30 seconds. In the first test, both DC and AC modes were evaluated. Only the DC mode was evaluated in the second test at higher conductivity. Peak voltage was measured with a Fluke 124 scopemeter for both tests. For the first test, peak current was measured with a Fluke 80i-110s current probe, aka current clamp, attached to the Fluke 124 scopemeter. For the second test, the current probe was attached to a Velleman HPS1040i pocket oscilloscope for measuring peak current. The latter configuration with two oscilloscopes allowed both peak voltage and peak current to be read simultaneously, so that was much quicker.



Setup for tank testing of Aqua Shock Solutions B-1-L backpack electrofisher at Natchitoches National Fish Hatchery. Also shown are the Fluke 124 scopemeter, the Velleman HPS1040i pocket oscilloscope and the Fluke 80i-110s current clamp.

As mentioned before, the PDC frequency was 120 Hz and could not be adjusted. The duty cycle of pulsed direct current is the percent of time that the current is on. For the first test in lower conductivity, the duty cycle varied from 61% at low voltage up to 83% at the highest voltage, and the relationship was not linear. For the latter test at higher conductivity, the range in duty cycle was 63-83%, again not linear. One reason duty cycle is important is that average power equals peak power times duty cycle, and average power limits the output of an electrofisher. Peak power equals peak voltage times peak current.

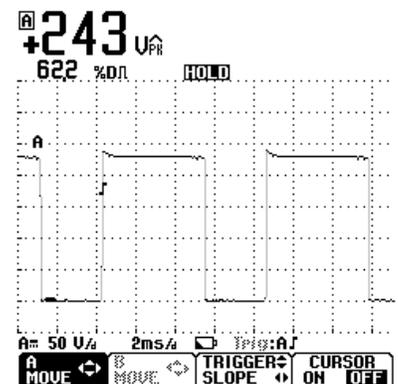
For the first test, the maximum sustained voltage was 445 peak volts at the 600 volt setting. That equates to 327 peak watts and 270 average watts of power. For the second test, the corresponding maximum sustained voltage was 228 peak volts at the 300 volt setting; that again equals 327 peak watts and 270 average watts. The B-1-L backpack is rated by the manufacturer as a 200 average watt unit. In both tests done here, the unit produced 270 average watts, so it exceeded its rating. All of those results are for the DC mode, which again is actually a PDC mode. For the first test using the AC mode, the output was slightly higher. The unit was able to sustain an output of 452 peak volts at the 650 volt setting.

More testing in an actual stream environment should be conducted at some point. Based on these results and upon experience with a virtually identical predecessor, a conservative range of ambient water conductivity for successful fishing with the DC mode is 40 to 450 micro-Siemens per cm. In streams with conductivity much below 40, it likely will be necessary to use the AC mode for full success. The upper conductivity range for successful fishing can be controlled at various points in the circuitry of a backpack electrofisher, so it may be harder to define than the lower limit. The prior manufacturer of the predecessor backpack estimated an upper conductivity limit for successful fishing with DC mode of approximately 500-600 micro-Siemens per cm, and that may be true for this unit, as well. I do recall successful fishing in a stream at 40 micro-Siemens per cm using an Appalachian Aquatics backpack, which was virtually identical to this one. In fact, we also used two other brands of backpack electrofishers that day, and all fished successfully on their respective 400 volt settings.

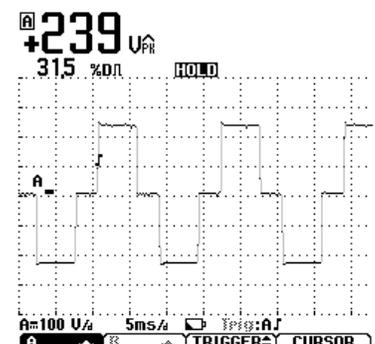
I should add that the peak voltage met or exceeded

the voltage setting in both tests beginning at the 75 volt setting and for some higher settings. For the first test, peak voltage fell below the setting at about 350 volts. For the second test at higher conductivity, this point occurred at about 180 volts. This is expected at some point as the power limitation comes into play. The high duty cycle of this unit restricts its power output and causes the battery charge to be consumed relatively quickly. A later version of this model backpack reportedly will have the option of a lower duty cycle. This will allow output of higher voltages and will allow the batteries to operate for longer shocking times between charges. The manufacturer is designing a more sophisticated backpack electrofisher which will allow independent controls for voltage, frequency and duty cycle using pulsed direct current. That will provide operators with more sampling options and will allow higher peak power outputs for successful fishing over a wider water conductivity range. Testing of this backpack was a learning experience for me, and I hope these results and comments provide useful information to those who will use it for capturing fish from streams. I look forward to the possibility of evaluating future designs with independent controls.

Oscilloscope trace for 200 volt DC waveform.



Oscilloscope trace for 200 volt AC waveform.



Natchitoches NFH Biologist Is Head of the Class at Louisiana Tech University

By: Tony Brady

In May of 2013, I had the pleasure of being a guest lecturer at Louisiana Technological University (LTU). The ecology department at LTU offers an ecology class taught by a team of three professors. As part of this class, the professors invite professionals in different areas of biology and ecology to come and present topics in their area of expertise. In January of 2014, I was asked again if I would come and give my lecture to the class. Through the course of the lecture the students learned about fish and mussel conservation activities performed by Natchitoches National Fish Hatchery and our partners, and how those activities impacts the aquatic ecology of Louisiana and the surrounding states. When the subject of the lecture focused on freshwater mussels, I was able to use video clips produced at Missouri State University to explain

the life history of freshwater mussels, and then explained how ongoing research at the hatchery was helping to better understand the life history of the Louisiana pearlshell mussel which is a federally threatened species only found in two Louisiana parishes. The students learned that the US Fish and Wildlife Service was focusing on programs that impact not just a species, but was working on projects that impacted the entire landscape and their watersheds. This Landscape approach provides not only for the species of interest, but helps to recover, restore, and enhance multiple species at the same time. As with the first lecture, I was very well received by the students as indicated by their many questions at the end of the lecture. When asked if I would be willing to come back next semester, I told the professors YES.



“Professor” Tony lectures the class on fish and mussel conservation.