CENTERLINE

The NCDOT Environmental Newsletter

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A Celebration of Great Memories and an Exciting Future

By: Phil Harris, PE, NCDOT Technical Services Environmental Analysis Unit Head

View Point

As I put together my last edition of Centerline, so many memories and good feelings come back to me – I have had a lot of experiences over my 30-year career in the Department. It seems like 1992 is just a blink in my eye now and it is crazy that I am finally at the point where I have a number of days left at NCDOT instead of a number of years.

I have heard it said that working in state government is an honorary profession, whether it be as a school teacher, a state trooper or in my case, a civil/coastal engineer. As my days here have become short, I wholeheartedly agree that this path has been very fulfilling. We have accomplished so many things and done our part in providing much needed transportation projects to the public while doing our best to protect the environment – always ensuring that we are making the best use of the taxpayers' money. Whether it be delineating wetlands, negotiating the National Historic Preservation Act Section 106 process, performing overnight bat surveys, holding public hearings or submitting permit applications to allow projects to go to let, the Environmental Analysis Unit has always been center stage and relevant to project delivery. Process Improvements have been many including the continued development of mitigation strategies incorporating both the Division of Mitigation Services, private mitigation bankers, and the occasional small on-site mitigation project. We have been busy developing new tools, handbooks, and guidance for consistent public outreach, have continued improvements to the NCDOT Traffic Noise Policy, and of course the creation of Advancing Transportation Through Linkages, Automation, and Screening (ATLAS) which will have lasting cost and time benefits for future project development.

While all the project and process accomplishments have been instrumental to moving our program forward, for me it has always been the people and the relationships behind the scenes that made things happen. I used to kid with folks that

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A Summary of Two Ongoing Wildlife Passage Projects in Division 11

By Kevin Hining, Division 11 Environmental Officer

Division Spotlight

Elk stops traffic in Cherokee, NC (courtesy of Asheville Citizen Times)

I spent the majority of my career working as a fisheries biologist for the NC Wildlife Resources Commission (NCWRC), so I'll be the first to admit that I knew very little about roads and bridges before accepting a position with NCDOT. Although wildlife/fisheries science and the transportation field are very different occupations, one issue that overlaps both is the ability to safely move animals from one side of the road to the other. Vehicle and wildlife collisions can be costly and dangerous to both people and wildlife. Furthermore, roadways can restrict wildlife access to various food sources and habitats, and reduce genetic diversity. Luckily, this issue is beginning to get more publicity, and as result, funding and research. In the following summary, I hope to share with you a couple of projects we are implementing in Division 11, that will hopefully improve the safe movement of various species from one side of the road to the other.

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Terrestrial wildlife tunnel - In 2020, the US Fish and Wildlife Service (USFWS) contacted Division 11 to inform us they had funding to improve connectivity between two wetlands that were separated by a roadway. Over the past several years they had confirmed numerous vehicle collisions with rare species at the site, and were hoping to collaborate with NCDOT on the installation of a wildlife tunnel that might provide safe passage for the small mammals, reptiles, and amphibians that inhabit the area.

Spotted salamander in roadway (courtesy of New Jersey DOT)

During the initial conversation, I assumed the location of interest would be on a narrow, rarely used dirt road somewhere in northwest NC. Little did I know that the location would actually be a paved, well used mountainous road that is routinely traveled by residential traffic, school buses, and even tractor trailers. The story becomes even more interesting when USFWS, along with NCWRC and The Nature Conservancy (TNC), added that they wanted to use a three-sided box culvert with a grated/open top structure, similar to a cattle grate. They preferred this design due to recent research, which suggested that the grated/open top approach increased usage by various species since it would help ensure consistent temperature throughout the structure (mimicking the ambient outdoor temperature), as well as keep the tunnel well lit. The flat bottom of the box culvert would maximize space within the structure, and allow a good base for adding natural substrate (in this case, soil from the excavation).

After some debate and dialogue with researchers and engineers, we decided to go with a structure used successfully by other states, including Ohio DOT (ODOT). Adopting a structure that had already been used and studied by ODOT allowed us to lean on another transportation agency with respect to the installation process and maintenance needs - I should mention that ODOT staff were extremely helpful and willing to talk to our staff, and early communications with them helped many of our initial concerns with the structure, including: motorist safety, noise and vibrations, snow plowing issues, and potential for vandalism.

Concrete tunnel in roadbed (courtesy of ODOT)

Tunnel with top installed (courtesy of ODOT)

The structure materials were purchased by a grant from the USFWS, and NCDOT agreed to provide staff and equipment to install the structure, scheduled for mid-August 2022. Once installed, the USFWS, NCWRC, and TNC will erect several hundred feet of wildlife fencing, to help funnel animals into the structure and prevent movement onto the roadway surface. Since the structure we are installing serves no hydraulic function and is purely meant to provide wildlife passage, all maintenance of the structure and fencing will be handled by the other partners, as defined in a signed agreement. The other partners will also evaluate the efficacy of the structure, using a variety of tools, including motion detection cameras/trail cameras and mark-recapture techniques. This will allow us to determine which species are using the structure, and hopefully add to the growing knowledge base for similar structures in NC and other parts of the world. While USFWS has requested that we not provide the location to help prevent possible poaching of rare organisms, any NCDOT staff interested in visiting the site are welcome to contact me.

Wildlife barrier fencing (courtesy of ODOT)

Retrofitting culverts with baffles - The second project I'd like to highlight deals with aquatic passage. Our Clean Water Act Section 404/401 water quality permits often require us to install structures and drainage features that will not hinder the movement of fish, amphibians, or other aquatic critters. While barriers to aquatic passage are numerous, these issues often occur with culverts when the water flow is too swift, too shallow, or the culvert is perched and creates a small waterfall at the outlet. While the permitting process often involves requests to improve passage whenever we work on a culvert, it can be difficult to really improve passage without replacing the culvert.

The NCDOT has been partnering with NCWRC to study a potential method for retrofitting existing culverts using a flexible, easy to install baffle system. These "Flexi Baffles" have been designed to assist with upstream fish passage by altering water flow through culverts and providing areas for fish to rest. There are a few things that make these structures very promising - they are relatively cheap, can be designed for a variety of structures, and are easy to install. But one of their most promising attributes is that they have minimal effect on hydraulic capacity, as the baffles are designed to lay flat during high flow events. The baffle size is based on the culvert size and the number of baffles needed is based on the culvert gradient. They are installed with self-tapping screws, and as a result, there is very little impact to the structure and no need to dewater. That said, severely degraded culverts are not a good candidate since the self-

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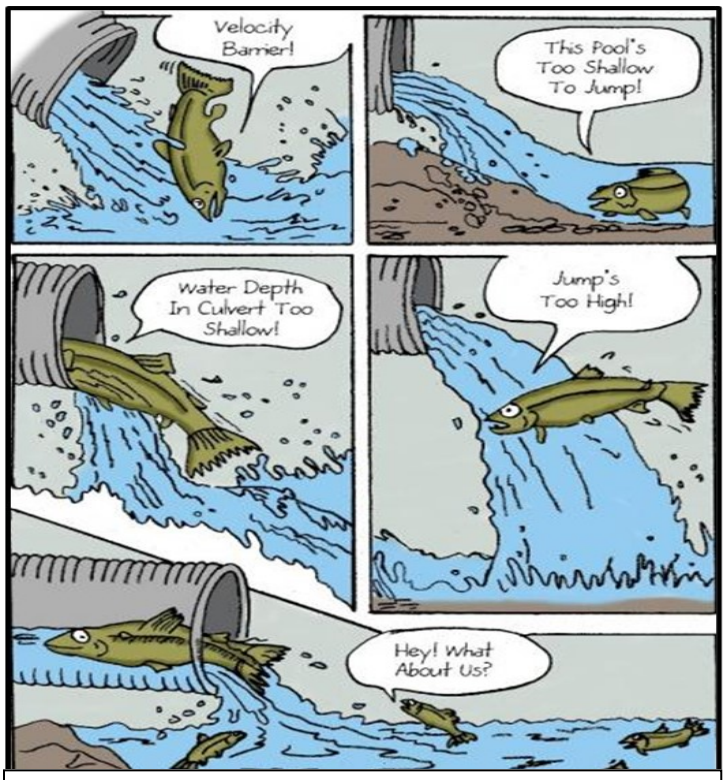

Cartoon courtesy of Washington State DOT

Typical Flexi baffle installed in a culvert

Culvert with Flexi baffles installed

tapping screws are more likely to loosen, and possibly cause leaking under the structure.

Currently in Division 11, we are focusing efforts on a couple streams that harbor Brook Trout, NC's only native salmonid. Trout are extremely important in western NC, and provide a huge economic boost to the economy. In addition to the social and economic focus towards trout, they are also a good indicator of water quality. What is less known, is that of the three prominent species of trout in Western NC, both Rainbow Trout and Brown Trout are introduced species - originally found in drainages to the Pacific Ocean and Europe, respectively. As a result of competition by these introduced species and dwindling habitat for Brook Trout, there has been a growing effort to look at the genetic fitness of the remaining brook trout populations to best determine where to put preservation efforts. NCWRC approached NCDOT to study the effectiveness of these baffles in a couple streams in Watauga County that have unique strains of Brook Trout, but also have some existing structures that may be inhibiting upstream passage.

To evaluate their effectiveness, NCWRC recently installed some baffles on a couple of municipal culverts managed by the town of Beech Mountain, and there are plans to do some additional installations on NCDOT managed structures in Watauga County. To study their effectiveness, Brook Trout are collected using electrofishing equipment, tagged, and moved below the culvert. The stream is resurveyed several weeks later to see if any tagged fish have made it upstream of the structure. If numerous marked individuals are discovered, then that might suggest the culvert is not impeding passage of trout. However, if few or none are found, then it might be a good candidate to install the Flexi baffles. Once the baffles are installed, fish are captured, marked, and relocated below the culvert and the survey is repeated a few weeks later to determine the percentage of marked fish making it through the culvert. While still early on, these experiments should help us understand the effectiveness of the Flexi Baffles and determine areas where they will work the best.

Brook Trout *Salvelinus fontinalis*

While passage is usually the goal, there are instances where we might intentionally isolate species like Brook Trout from upstream movement of nonnative species like Rainbow and Brown Trout. In fact, somewhere right now, there is a fisheries biologist trying to think of a way to create a good barrier to prevent upstream movement of certain fish species. So, while surprising, there are cases when improving passage would not be in the best interest of conserving native species, and that undersized, steep, perched culvert might actually be a conservation tool.

Electrofishing survey for trout

I've included a couple links below, and please contact me if you would like more information. Also, I'd be interested in hearing about similar projects in your Division. While we have a long way to go, we are seeing innovative ways to provide transportation needs with less impact to our natural surroundings. I'm confident these improvements will continue at an accelerated rate as our knowledge base grows.

Wildlife tunnel: https://rosap.ntl.bts.gov/view/dot/62338
Flexi Baffles: https://www.ats-environmental.com/solutions/culvert-baffles/

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some would prefer me to pop into a cube and ask staff about the status of a project, whereas I would more often ask about a child's baseball season or maybe the upcoming weekend plans – I just felt having a personal relationship

with folks always led to this being a great place to work and influenced folks to become high performers. Through my career, I have been fortunate to be influenced by some very knowledgeable supervisors and friends including Jay Bissett, Jim Buck, Barney O' Quinn, Charles Bruton, Greg Thorpe, and Richard Hancock. All of them had very successful careers and were quick to bring me in and educate me – I hope the good stuff rubbed off on me a little bit!!!

I have always taken every opportunity to put my staff out front and have them in a position to make good decisions – basically get out of their way and let them do what they know to do. Most often than not, they achieved overwhelming success and grew in confidence through these achievements. We have been blessed throughout my tenure to have what I consider to be the most knowledgeable environmental staff in the country. We also have been fortunate to have such a strong group of private contractors that we can lean on for critical project deliverables. Our relationships with the Federal and State regulatory agencies have created partnerships that have allowed us to do many cutting edge initiatives that are leaps and bounds above what other state DOTs are doing.

I could talk for days about my supervisors and staff, but simply put, they feel like family to me. They have been with me through some struggles and celebrated many exciting life events. Those friendships will continue long past retirement and I hope they will still ask me to meet them for lunch when they are in the Greenville/ Washington area. It is not easy being in the natural and human environmental field in North Carolina when you consider the diversity of the mountains versus the coast, as well as the diversity of our population --- but my folks have grown accustomed to handling anything that comes their way, and they are the best of the best - they have achieved "the rank" of Top Gun!!!

Gail Grimes, who originally hired me back in the summer of 1992, once told me that upon her retirement, the lights would still come on the following Monday morning and the big NCDOT machine would still crank up. It will be weird to not drive in to work that first morning, but she is correct that life at NCDOT and with me, will go on. In retirement, I will be living Down East with my beautiful wife and our family. I hope to spend many summer days listening to Jimmy Buffett on the beach and afternoons in the fall on a high school football field --- I have always said there is no better place to be on a Friday night than on the sidelines!!! Hitting that little white ball and driving around with the jeep top off. I also have plans to follow my daughter's college career and all the new life adventures that lie in front of her. I definitely want to stay busy and spend as much time outside as I can handle.

I made one of my best decisions 30 years ago to come work at NCDOT and it has been an honor and privilege to serve this great state and work beside some super people!! Similarly, to what I have told past retirees at their sendoff parties, I hope that my retirement will be everything that I dreamed it would be. I wish everyone good health and happiness and I will see you on the beach!!

2021 Mitigation Monitoring Update

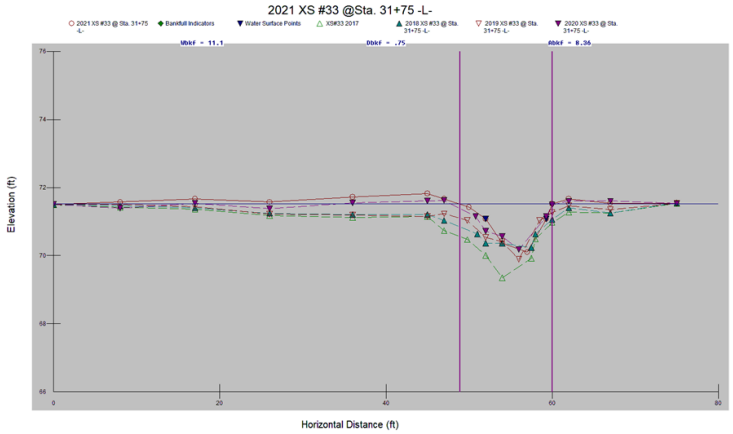
By: Dave Johnson, NCDOT EAU Monitoring & Stewardship Group

Technical Article

The NCDOT has three primary focus areas of their work: planning, construction, and maintenance. Many NCDOT employees may spend an entire career working in only one of those three areas. Something that is unique about the Environmental Analysis Unit (EAU) Monitoring & Stewardship group is the responsibilities span all three of those areas. The group is involved in the planning, design, construction, monitoring, and long-term stewardship of stream, wetland, and buffer mitigation sites statewide. This is required for state and federal environmental permit compliance associated with highway construction projects. In this article we're going to review our 2021 post-construction monitoring efforts and give you a look into what's involved.

Cross-section survey of the stream channel at R-2554 Claridge Nursery.

Just to refresh our memories, the present monitoring guidance from the United States Army Corps of Engineers Wilmington District and North Carolina Interagency Review Team, *Wilmington District Stream and Wetland Compensatory Mitigation Update, 2016* addresses all aspects of mitigation monitoring in North Carolina such as visual monitoring procedures, stream and wetland hydrologic monitoring techniques, performance standards, remediation practices, etc... This guidance helps ensure consistency for mitigation monitoring across the district.

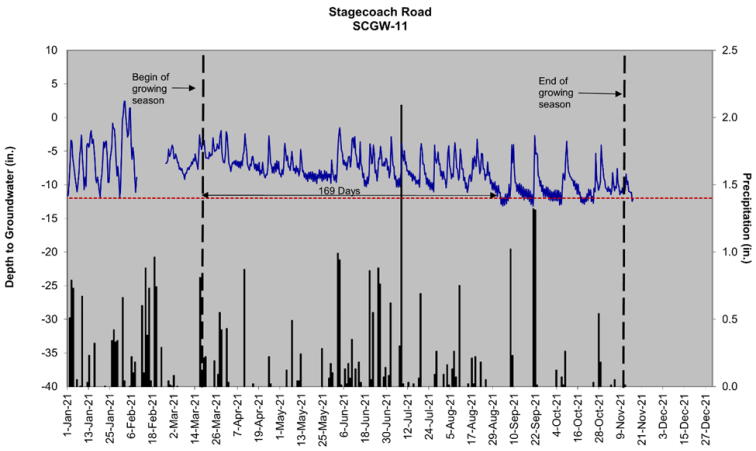


Stream channel cross-section graph Comparison

While temporary impact sites do not generate permanent mitigation credits, they are a common type of project that the group oversees. Temporary impacts typically occur when some small area of disturbance to jurisdictional features occurs through construction or utility relocation activities. Usually, these areas are visually monitored to ensure that they re-attain jurisdictional status. In some cases, the area is allowed re-vegetate naturally and NCDOT documents in annual monitoring reports over a few growing seasons. Other times, some minor grading may be required to return the area to pre-project elevations or supplemental planting is conducted when natural re-vegetation is slow to take place

Stream restoration projects typically require the most intense monitoring efforts of any mitigation projects. Stream morphology data is collected through traditional survey methods at designated cross-sections and along the profile of the stream. The

At NCDOT mitigation projects range from small temporary impact sites to large stream, wetland, and/or buffer restoration projects. Monitoring requirements vary for these projects and specifics are documented as environmental permit conditions. All sites are visited at least once during the growing season and site conditions documented with photographs. In 2021 NCDOT monitored 31 mitigation projects across the state. This work was comprised of 24 permanent impact projects (5 wetland and 19 stream) and 7 temporary impact projects. Below we'll review the general practices for each type of monitoring project.



Groundwater gauge data at Stagecoach Road site (R-2303B). Note the groundwater level (blue line) does not cross below the -12" mark (red line) for 169 consecutive days. This area around this gauge is quite wet and easily exceeded its minimum threshold of 30 days though it rarely ponded on the surface.

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data collected is then summarized using Rivermorph software, which calculates channel metrics used to ensure the stream is stable. If anomalies from one year to the next appear, the group may investigate further and perform any necessary corrective measures. Stream sites usually have a crest stage gauge installed to monitor for over-bank flood events. By dissipating energy across the floodplain during high flow events these flood events indicate that the stream is functioning correctly. Lastly, streambank and buffer vegetation stem counts are conducted in vegetation plots to monitor survival.

In general, monitoring requirements for wetland restoration sites are geared towards demonstrating that the site is wet enough to support hydrophytic plants. For wetter sites, where water ponds during the growing season, the focus may be on ensuring those plant species are surviving on the site through vegetation monitoring. On marginally wet sites, groundwater monitoring wells are usually installed across the site to verify existence of wetland hydrology. These wells continuously collect the groundwater level throughout the growing season. The data generated are then analyzed in conjunction with rainfall data to verify presence of wetland hydrology during the growing season. More specifically, the soil must be continuously saturated within 12 inches of the soil surface for at least 12.5% of the growing season. Across NC, this equates to approximately 30 days between mid-March and mid-November. Along with vegetation stem counts, these hydrology data are summarized and presented in our monitoring reports.

Hopefully this gives everyone a good summary of ongoing monitoring activities being performed by the EAU Monitoring & Stewardship group. For those wanting to read further full monitoring reports can be found on the EAU website at:

https://connect.ncdot.gov/resources/Environmental/EAU/Monitoring-Stewardship/Pages/default.aspx

Temporary impact site at Surf City Bridge (B-4929) where temporary work bridge was removed. The area parallel to the new bridge was supplementally planted with marsh species to help the site re-attain jurisdictional status.

Employee Spotlight

Jeff Hemphill has been a member of the Environmental Coordination & Permitting (ECAP) grooup for over 17 years. Before coming to ECAP, Jeff worked as a Division Environmental Specialist in Division 7. This experience gives Jeff the ability to look at designs from a different perspective- allowing him to apply his experience with an eye towards constructability around environmental resources. Jeff has handled environmental coordination on some of our largest projects including the Shelby Bypass and the Asheville Connector. He enjoys the collaboration and challenges of putting the pieces together on complex environmental project puzzles. He's also a great problem troubleshooter and resolves issues promptly and thoroughly. Originally from Ohio, he was interested at a young age in the outdoors and had an appreciation of forests and trees. He pursued this interest and is a proud graduate of THE™ Ohio State University. Jeff enjoys all things weather and celestial. Give him a rainstorm on his back porch and he is in his element. One entertaining fact about Jeff — before working in the environmental sector, Jeff worked for a global aviation transporter who moved everything from gold to whales.

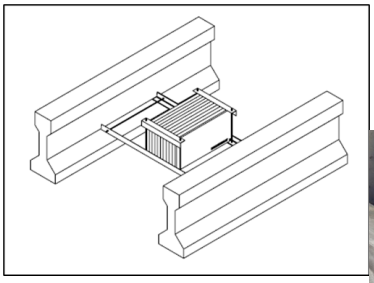
Monitoring Gray Bat Populations on the I-26 Project in Asheville

By: Tyler Stanton, NCDOT EAU Biological Surveys Group

Project Spotlight

The NCDOT currently has three projects on I-26 in the Asheville area (I-2513, I-4400, and I-4700). These projects were determined to have impacts to the federally listed Gray Bat's (*Myotis grisescens*) foraging and roosting habitat along the French Broad River through formal consultations under Section 7 of the Endangered Species Act. As part of the minimization efforts, NCDOT opted to experiment with a unique and innovative method to provide supplemental roosting habitat for displaced bats during construction.

The NCDOT has temporarily placed artificial modular roost panel systems on existing bridges near the action areas of the I-26 projects. These artificial roosts will remain installed for the duration of the construction phases for each project. The roost panels are constructed of fiber reinforced concrete with additives to mimic the thermal mass of roosts preferred by bats. These devices will simply hang between the girders of each bridge without the need to fasten directly to the bridge. Due to this innovative installation method, the artificial roosts will not interfere with maintenance activities and the guano produced by the bats is directed away from bridge surfaces. They are also relatively lightweight, so they do not compromise the structural integrity of the bridge.



One benefit of this type of device is flexibility. Since the systems are modular, various dimensions and configurations can be achieved to adapt to different bridge designs and the unique requirements of various bat species. Some of the configurations are analogous to traditional bat boxes which provide vertical roosting habitat, and others mimic cave or mine habitat. Once the construction phase is complete for all three projects along I-26 within the French Broad River Basin, the roost panel systems will be removed and stored for future use.

New ECAP Manager Named

Congratulations to Michael Turchy for his recent promotion to the EAU Environmental Coordination & Permitting (ECAP) group leader position. Michael has over 20 years of NCDOT experience, rising through the EAU ranks and recently serving as the ECAP Western Regional Manager. In his previous roles, Michael has coordinated with both central and division units while assisting to deliver several major highway projects across the state. Michael is excited about his new role and is thankful that he will be leading such an experienced and knowledgeable group of staff within ECAP. Thanks Michael for you contributions and we look forward to seeing all the great things you can do in your new role!!!

Welcome Tracy Roberts to the EAU

The EAU welcomes Tracy Roberts as the new leader of the Traffic Noise & Air Quality group. Tracy's previous work history includes 7 years with the Town of Cary as an urban planner, and the past 21 as a private consultant working as a NEPA practitioner and noise/ air quality specialist. Most recently, Tracy was embedded in this group and twice served as the interim group leader.

Tracy is originally from Greenville, North Carolina and attended both ECU and NC State. Tracy is also served 7 years in the U.S. Army.

We are excited the Tracy has joined the team and we know he will do great things in his new role.

Farewell to Linda Fitzpatrick

After 29 years of state service, Linda will be moving in to much deserved retirement life. In her role as the Ecosystem Enhancement Program (EEP) coordinator, Linda has served as the liaison between the Department and the EEP and has been instrumental in this coordination and planning of annual mitigation orders. We hope you will enjoy your new adventures, traveling and family time.

Happy Trails to Gordon Cashin

After over 30 years of state service, Gordon Cashin has retired from NCDOT. Gordon became a member of the Natural Resource Branch while it was in its infancy, mentoring many staff and sharing his experience through his career. We hope your retirement will be everything you wished it to be and include many fishing and hunting trips

MVE (Most Valuable Editor) - Tim Bassette

I want to extend a big **THANK YOU** to Tim Bassette in the EAU Biological Surveys Group. Over the past several years, Tim has served as the Centerline editor and his contributions have been enormous for helping us get the newsletter out in a timely fashion and most importantly, grammatically correct. Many times he would review drafts and provide comments that covered the entire page. His reviews were always very meticulous and complete. His attention to detail was remarkable.

Thank you Tim - I could not have done it without you!!!