Students Use Drones to Tackle Marine Debris at the Reserve

High School students in Tammy Schooley's Advanced Placement Environmental Science class at East Carteret High School are using innovative technology to tackle a major environmental issue along our coast. With help from the Duke Marine Lab Unoccupied Systems Facility (USF), the students are using drones to study marine debris at the Rachel Carson Reserve, part of the N.C. Coastal Reserve and National Estuarine Research Reserve.

The Rachel Carson Reserve is protected and managed as an outdoor laboratory where students and researchers study coastal ecosystems and processes, making it an ideal location for this project. One of the primary management challenges at the Reserve is marine debris that washes ashore from boaters, businesses, residences, and improperly secured boats and fishing gear. The site's protected status doesn't safeguard it from the thousands of pounds of debris that piles up on the Reserve each year. Locating and removing the debris is a challenge with a small staff and limited resources, so the Reserve welcomed the opportunity to have Duke Marine Lab USF use their technology at the site.

Duke Marine Lab USF program manager, Rett Newton, catches the fixed-wing unoccupied aircraft system that is used to collect aerial imagery during flights over the Reserve.

The facility's program manager, Rett Newton, and lead engineer, Julian Dale, developed the project and worked with the high school students to carry out the study over the course of the semester. "Our goal through the project was to allow students to better understand current drone technologies, see first-hand the scope of the marine debris problem at the local level, and review best practices of communities that have had success reducing marine debris," says Newton.

Students locate debris and mark GPS locations using an app on their smartphones.

The first phase involved learning how to analyze high resolution aerial imagery collected by the drone during flights over the study area, which was Bulkhead Shoal, the westernmost portion of the Reserve. Students stitched together the imagery and created a map to locate areas where debris was present. To ground-truth the data, the class visited the island and matched up areas on the map to actual locations on-site. In areas where debris was prevalent, GPS points were taken so they could easily re-locate the trash during the cleanup. After data collection and analysis was complete, the students revisited the study area to remove the trash. In just under an hour, they managed to fill 10 large bags with trash.

By incorporating an actual cleanup into their project, the students gained a better understanding of just how difficult it is to remove debris from coastal and estuarine environments. Thanks to their efforts, the nesting shorebirds that use this portion of the site aren't as likely to become entangled in derelict fishing gear or ingest small plastics. Visitors to the area will be greeted by far fewer plastic bottles, pieces of styrofoam, glass, and other forms of debris littering the shoreline.

"While it was only a small amount of trash that we collected compared to how much there is all over the world, we made a difference in our area," says Kalea Bevins, a student in the AP environmental science class and recent graduate. "It's important to do these trash clean ups to keep our environment thriving. Without a healthy environment, everyone suffers."

This message and the students' findings were presented to Town and County Commissioners, scientists from the Rachel Carson Reserve and Duke University, and the Coordinator of the N.C. Marine Debris Symposium. Projects like this contribute to the Reserve's long-term management of marine debris. The more Reserve staff and local decision-makers understand this dynamic issue, the better informed marine debris prevention and management efforts will be in the future.

Students removed over 10 large bags of marine debris from the Rachel Carson Reserve (photo by Duke Marine Lab USF)