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Group photo of students discussing a class on the porch at the marine lab, Beaufort, NC.

SIDEBAR

## The Duke Professional Master of Environmental Management: An Exemplary Program Responsive to Workforce Needs

By Patrick Halpin and Andy Read

Professional master's degree programs provide powerful pathways for preparing individuals to work in the fields of environmental science, conservation, and management. Such programs are typically very focused two-year degrees that fill a niche; they are distinct from other types of graduate education because they equip students with the multidisciplinary skill set required to work at the interface of science and management.

To give readers a concrete example of a successful professional education program, we describe our work at Duke University and briefly discuss program outcomes and elements not present in standard academic programs that we consider essential for the success of professional education efforts.

CEM Student Alex Aines studying juvenile lemon sharks, Bahamas Research Permit MAF/FIS/17. *Photo courtesy of Alex Aines (student)*



### Duke's Programs

For more than 25 years, the Nicholas School of the Environment at Duke University has been one of the leaders in the development of such programs, awarding the master of environmental management (MEM) degree in seven specialty areas at the intersection of science and management (<https://nicholas.duke.edu/programs/masters/mem>). The Nicholas School's overall goal is to graduate students who have a solid framework of professional knowledge and excellent problem-solving skills so that they are ready to tackle real-world applications.

The coastal environmental management (CEM) track, with its focus on the complex interactions between people and ocean, is one of the MEM program's most successful and long-standing specialties. The CEM curriculum includes courses and practical training in marine science, policy, economics, communications, and analytical tools. Coursework is designed to give students a scientifically rigorous understanding of physical and biological processes along coastal and ocean environments. Students also develop professional skills and learn how to use analytical tools to assess how human activities affect—and are affected by—this vital environment.

The track's sequence is unique because students spend their first year on Duke's main campus in Durham, North Carolina, and their second year at the Duke University Marine Laboratory (DUML) in Beaufort, North Carolina. The laboratory provides an ideal setting for the study of natural and social sciences in the marine environment, and allows our students to interact directly with coastal stakeholders and policymakers. Students also enjoy small class sizes, a low faculty-student ratio, and access to world-class marine research facilities.

During their first year on the Durham campus, students take core courses in ecology, natural resource economics, environmental policy, and methodological skills such as GIS, remote sensing, and statistics. To develop a full toolbox of skills, many complete additional certificate programs in other disciplinary areas within the university such as community-based management or entrepreneurship.

During their second year at DUML, students complete a capstone individual or group master's project and take courses specific to the coastal and marine environment. These courses include marine conservation biology, fisheries management, marine protected area management, coastal zone and community-based management, water quality management and coastal processes, and global change.

In their practical capstone work, students explore specific problems in their areas of concentration, often working with client organizations. Projects can take many forms, from traditional research leading to publishable peer-reviewed papers to more real-world efforts resulting in the production of policy white papers, training materials, coastal management plans, communications videos, or even citizen science mobile apps. A central tenet of our approach is to allow students to explore and use new and innovative media in their projects.

To further prepare these new professionals for careers in coastal management, we encourage our students to pursue internships during the summer between their first and second years. These opportunities may take a variety of forms, but the goal is to expose students to organizations and activities in their areas of interest and outside of the academic setting. These internships provide direct work experience and important networking opportunities.

In addition to the important role that faculty and alumni play in identifying new fields of study and emerging opportunities, the Nicholas School operates a dedicated Career and Professional Development Center with three full-time staff to help our graduates achieve their career goals.

### Outcomes and Best Practices

The CEM track has been one of the strongest and most consistent in Duke's MEM program, with a record of graduating approximately 25 new professionals each year. Our graduates pursue a diverse array of career paths and tackle a variety of issues such as climate change, ocean acidification, fisheries management, conservation of endangered and protected species, and marine spatial planning, to name a just a few. About 10% of our graduates go on to pursue PhDs. Most work in industry, in federal or state government agencies, or in the nonprofit sector. Examples of alumni profiles can be found <https://nicholas.duke.edu/alumni/alumni-profiles>.

The program's success is due to a combination of (1) high demand for graduates in the fields of marine and coastal management, and (2) our dynamic and adaptive approach to a professional education

program that recognizes the different needs of individual students while maintaining high standards in the quality of both formal coursework and technical skill development.

Key elements that we recommend to others as essential for a successful professional program (but that are typically missing in traditional MS programs) are:

- Have faculty who actively work in the fields of ocean sciences, coastal management, and marine conservation and who engage in issues that are relevant to the target agencies that hire master's level professionals
- Make a commitment to provide students with meaningful internships and research experiences
- Provide direct support for job placement and career development
- Develop a strong pool of active alumni who can help mentor and assist new graduates with opportunities in the field.

The future trajectory for professional education in the field of coastal and marine management is very positive but requires the maintenance of responsive programs that anticipate future needs in the field. Successful programs will also need to provide opportunities for professionals to continue their education and skills development. Most importantly, graduates of these programs will continue to demonstrate their value through their actions, deeds, and accomplishments. That is the true measure of success in professional education.

### AUTHORS

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(ABOVE) CEM students studying short-finned pilot whales off Cape Hatteras on Duke Marine Laboratory's Research Vessel *Richard T. Barber*. Photo taken by Danielle Waples under NOAA Scientific Permit 16185

(LEFT) CEM student Erin Burke (left) collecting data on the effects of acoustic alarms on fish catches for her MP in 2004. The fisherman is Dave Swanner from Hatteras. Erin now works as a biologist for the Massachusetts Division of Marine Fisheries.