



NURP Supports NASA Extreme Environment Mission Operations (NEEMO)

Minding The 3 Rs: Protecting Connecticut's Coastal Resources Through Response, Remediation, and Restoration

The NASA Extreme Environment Mission Operations (NEEMO) program is a NOAA-NASA partnership designed to prepare astronauts for long-duration space habitation.

Oil spills and releases of hazardous substances from waste sites can cause many negative and long-term impacts to coastal natural resources. When oil or hazardous substances are released into the environment, wildlife species, fish, and habitat may suffer harm, beaches may be closed, and navigation may be impaired. Dealing with the effects from these releases is a challenging undertaking, but federal trustee agencies, including the National Undersea Research Program's (NURP) Aquarius (see box below), an undersea lab that rests on the Florida Keys National Marine Sanctuary (FKNMS) seafloor 62 feet below the ocean's surface, can help.

Similar in size to the International Space Station (ISS), the living module Aquarius provides the physical isolation, operational complexity, communication networks, and science objectives typical of an outer space mission. Additionally, habitation onboard Aquarius requires an absolute reliance on one's immediate life support systems, posing the potential dangers associated with space habitation. The facility is supported by a 10-meter buoy on the surface that provides power, life support and communications to the



Zvezda, the International Space Station module where astronauts live and work.

Under the protection and restoration of the injured natural resources. Sites and federal laws such as the Oil Pollution Act and the Comprehensive Environmental Response, Compensation, and Liability Act require responsible parties to clean up the environment after a spill or release, and Response agencies like the U. S. Coast Guard and the Environmental Protection Agency and state counterparts manage the cleanup. Natural resource



continued next page



support and communications capabilities.

S. Gephard, CT DEP

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NEEMO missions on board Aquarius

Through NEEMO, MURP has enabled NASA to further develop space flight training procedures; expand crew and mission control communication techniques; and evaluate methods that address the physiological issues and potential medical problems associated with lengthy space missions.

Anthony Dvarskas

Living in *Aquarius* for up to two weeks, astronauts work alongside experts from NURP's National Undersea Research Center at UNC Wilmington to conduct a variety of training and evaluation missions.

Trustees are stewards of the public's natural resources, designated by Congress and charged with protecting and restoring natural resources in the event of an oil spill or release of hazardous substances. NOAA is a trustee for coastal resources such as estuarine and anadromous fish and their habitats, including wetlands, mudflats, and coastal streams.

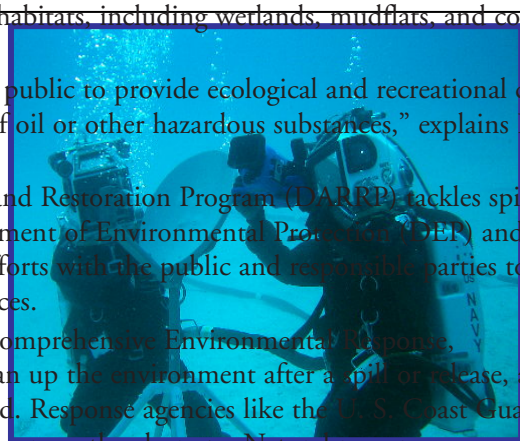
NOAA's trustee authority directs us to work on behalf of the public to provide ecological and recreational compensation for the lost use of natural resources following a release of oil or other hazardous substances," explains Ken Pinkerton, an environmental scientist with NOAA.

In Connecticut, NOAA's Damage Assessment, Remediation, and Restoration Program (DARRP) tackles spills and waste sites with co-trustees including the Connecticut Department of Environmental Protection (DEP) and the U.S. Department of Justice. The trustee also coordinates their efforts with the public and responsible parties to ensure the protection and restoration of the injured natural resources.

State and federal laws such as the Oil Pollution Act and the Comprehensive Environmental Response, Compensation, and Liability Act require responsible parties to clean up the environment after a spill or release, and to restore those natural resources that have been injured. Response agencies like the U.S. Coast Guard offer limited mobility and a slightly negative buoyancy. Water drag notwithstanding, walking underwater in these suits provides an experience



Astronauts simulating gall bladder removal on board *Aquarius*.



Testing the ability to manipulate equipment while wearing EX-14 system diving suits.



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