NOAA UNDERSEA RESEARCH PROGRAM (NURP)

Why does NOAA need scientific diving and NURP?

OSHA defines Scientific diving as diving by employees whose sole purpose for diving is to perform scientific research tasks (29 CFR 1910.402). This definition is important for risk management in the workplace, but does not address why ocean scientists must dive to do their work. The simplest way to explain this need is to pose a simple rhetorical question-- would a forest ecologist only study forests from above the canopy? Scientific diving is needed now more than ever for NOAA, the federal agency primarily responsible for managing ocean resources, and understanding the ocean's role in commerce, coastal hazards and climate change. Slowly the nation has come to realize, for example, that fish stocks will continue to collapse if we continue to ignore the health of fish habitats. Blindly dropping sampling gear from surface ships does not provide required knowledge, and continues to degrade the ecosystem we seek to conserve.

NOAA Scientific Diving Programs:

NOAA has had a dive program since it was conceived in 1970. In the 1970s, the Manned Undersea Science and Technology (MUST) office was located at NOAA headquarters and attempted to serve NOAA dive operations around the world. In 1980, the National Research Council's report, "*The OceanLab Concept,*" recommended that MUST be reorganized into: 1) NOAA Dive Program; and 2) regional program designed to integrate NOAA with the extramural dive community and industry.

The mission of the **NOAA Dive Program** in Seattle, WA, is to train, certify, and equip scientists, engineers and technicians to perform a variety of underwater tasks in support of NOAA's mission. Most (>60%) of their reported dives address operational objectives (Figure 1).

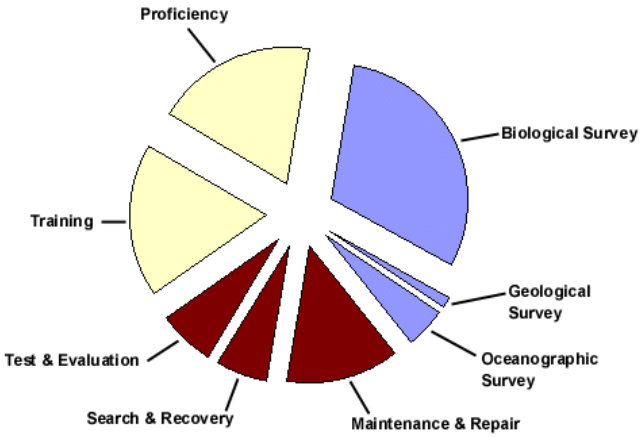


Figure 1. From NOAA dive Program, breakdown of 15,000 dives per year reported by NOAA divers; about 30% are for scientific research.

The **NOAA Undersea Research Program (NURP),** initiated in 1981, consists of regional centers of scientific diving expertise located around the nation (Figure 2). NURP's mission is to increase knowledge essential for wise use of oceanic, coastal, and large lake resources through advanced undersea research, sampling, observation, experimentation and education.

NURP Performance and Role:

NURP doubles the number of science dives that address NOAA research needs; over 10,000 dives per year (Table 1) include a thousand per year using advanced technologies such as robots, research subs, and the *Aquarius* undersea lab not supported by NDP (Figure 3); over 80% of these dives are for scientific research, including exploration, experimentation and monitoring. Most of these projects were selected by peer review, which helps ensure the desired outcomes of meritorious science and publications, and applied management products.

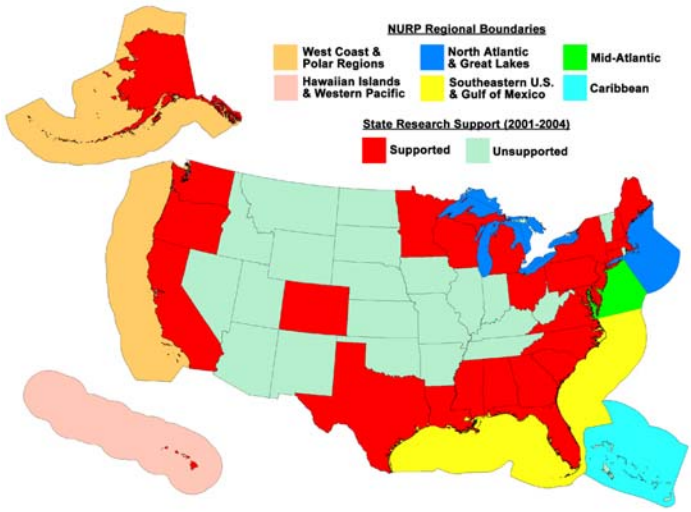
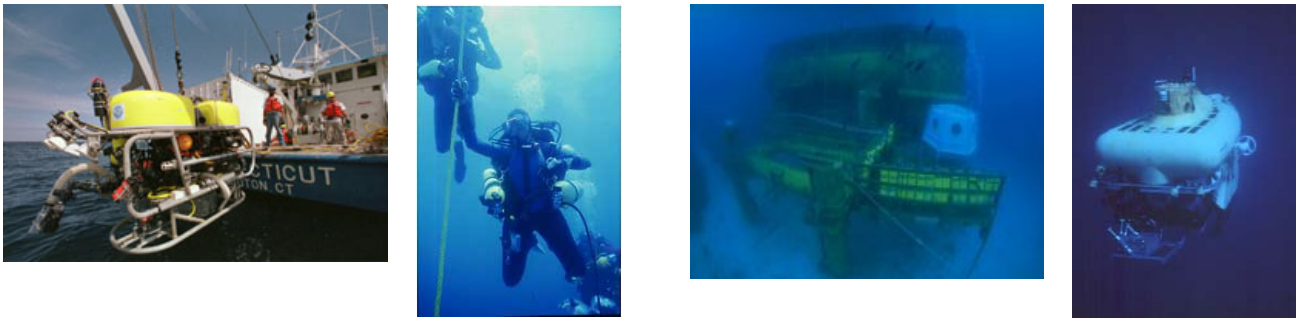


Figure 2. NURP is a system of regional centers around the country that supports scientists from around the world; not shown are headquarters in Silver Spring, MD, and the National Institute for Undersea Science and Technology (NIUST) at the University of Mississippi.

Table 1. Five-year (2000-2004) summary of NURP dive operations, projects and publications

Subs	*ROVs*	*SCUBA*	*Participants*	*Institutions*	*Projects*	*Publications*
837	*1529*	*56943*	*4320*	*1029*	*539*	*516*

The challenge is to direct this research engine such that dives with NOAA partners or extramural partners are addressing NOAA's most critical science needs. NURP is part of the Ecosystem Goal program, specifically located in the Ecosystem Research Program (ERP) sub-goal for strategic planning and reporting purposes. A glance at their most current (2007) performance measures demonstrates the need for scientific diving approaches (Table 2).



A B C D

Figure 3. Examples of advanced dive technologies developed by and available only through NURP; A) NAGL's Kraken ROV; B) technical diving to 300 ft.; C) Aquarius Undersea Lab; D) Hawaii center's Pisces submersible.

Through a directed review process and close cooperation with the NURP headquarters and NOAA partners, all the projects supported by NURP address the agency's mission, and in ways that no other program can do better than NURP.

Table 2. NOAA Ecosystem Research Program goal team performance measures as of November 2005, and examples of NURP roles and responses.

#	Performance Measure	NURP Response
1	% of U.S. Large Marine Ecosystems with integrated environmental and socioeconomic predictive models that address the priority information needs identified by regional managers.	Ecological (conceptual and mathematical) models developed, e.g., for fish stocks and recruitment, coral reef health, and beach erosion processes
2	Percent of U.S. Large Marine Ecosystems with science-based warning systems that decrease human health risks.	Development of observatories and sensors to detect water quality change
3	Return on investment from the discovery and application of new sustainable coastal, ocean, and Great Lakes products.	Discovery and description of gas hydrate resources and ecosystems; discovery of new bioactive compounds/potential bioproducts from the sea (e.g., for treatment of arthritis and cancer)
4	Annual number of coastal, marine, and Great Lakes ecological characterizations that meet management needs.	Diving is critical component of habitat mapping projects around the nation, with emphasis on marine managed areas
5	Cumulative number of coastal, marine, and Great Lakes issue-based forecast capabilities developed and used for management.	Ecological (conceptual and mathematical) predictive models developed, e.g., for fish stocks and recruitment, coral reef health, and beach erosion processes
6	Percentage of tools, technologies, and information services that are used by NOAA partners/customers to improve ecosystem-based management.	Undersea technologies are required as part of ecosystem approach; NURP centers work closely with NOAA Fisheries and Fishery Management Councils
7	Cost per site characterization (Efficiency measure).	NURP partnership with academia and industry reduces cost of NOAA science while increasing productivity (e.g., publication rate is 10 times higher per dollar than federal government)
8	Percent of grants awarded on time.	NURP Centers share work load involved in over 100 undersea research projects each year, including contracts, accounting, operations, and reporting
9	Percentage of ERP rated as "Effective" by comprehensive external review of research, outreach, and education performance.	Peer review used to select all extramural research projects NURP pays for; each center is reviewed by a site visit team every 5 years, with grant continuation at stake
10	Number of protected species designated as threatened, endangered or depleted with stable or increasing population levels.	NURP has contributed critical stock and ecological data on many protected species, e.g., most productive coral reef program in NOAA
11	NOAA safety incident rate.	Dive accident rate (all incidents have been undeserved) is same as all other types of diving, despite higher risk of deeper average dive depths, longer bottom times, and use of more advanced technologies.