



MESSAGE FROM THE PRESIDENT

This month I would like to introduce this issue's "Deep Blue" profile on field operations. Although we are often recognized for our scientific and engineering work, it is our ability to collect reliable field data that provides the foundation for our success. We offer a variety of field service operations to our clients, under conditions that can be difficult. Doing almost anything in the marine environment is a serious challenge. It demands proficiency, versatility and, frankly, ingenuity. Anyone who works in the ocean knows it is an extraordinarily difficult place to perform even the simplest tasks effectively. The physical conditions of wind, waves, and salt water present challenges, and the destructive power of the ocean makes the continued operation and maintenance of ocean systems problematic. Often, the remote locales in which we work present unique tests.

At Woods Hole Group, we are proud of the members of our field teams. They train, study, and work to the highest safety and quality standards so that we can deliver data to our customers and to our scientists and engineers. That data has to be right the first time, often in real-time, and we can't afford errors. Not when our customers include NOAA's real-time PORTS systems on which vessel pilots depend to make safe navigation decisions in the Narragansett, Chesapeake, New York and Delaware Bays. Or, when a drilling platform off the coast of Africa or Indonesia needs to know what is happening below at that precise moment, not days or weeks later. Collecting these data in the water means that we must have both the instruments and the people who know how to use them in one of the most hostile environments on the planet.

We are proud that collecting high quality data in a safe manner is one of the things that we do best. In this issue we dedicate some time to our field teams, those intrepid and skilled team members who spend their entire life in, around, and under the water deploying, servicing, and demobilizing instrumentation for our clients. Whether they are working on oil rigs, ships, small boats, diving, climbing meteorological towers, or even in remote locations in the desert, they work in challenging weather conditions and bring home the data.

We are very proud of these members of the Woods Hole Group organization, including the field staff in our Falmouth, Delaware, Houston, and Saudi offices. And, kudos also go to our other scientists and engineers who routinely spend time in the field to make sure the models and designs work in the real world. We want our clients and partners to share in these congratulations and thanks for a job well done.

Salut!

Dennis Aubrey, President

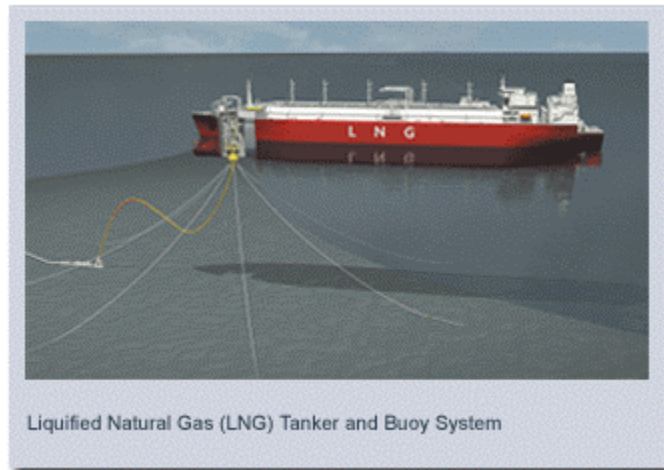
GLOBAL PERSPECTIVES

News from our Environmental Assessment & Remediation team spotlighting our global projects and programs.

Energy Projects Drive Improvements in Environmental Impact Assessment

Rapid growth in energy production and transmission sectors has increased the need for offshore fuel ports and pipelines. Rising fuel prices in recent years have increased the demand for non-traditional sources, including renewable energy sources (e.g. wind, wave, current), as well as more creative supply and delivery methods, such as Liquefied Natural Gas (LNG). In New England alone there are several proposals for LNG ports and gas pipelines. Increased scrutiny and heightened publicity of these projects is driving increased efficiency in the review process, and a more thorough assessment of potential impacts.

Increased efficiency of review has been prompted by the tight timelines on which these projects run. There is strong regional demand for energy, and there is competition between the applicants that demands a tight schedule. Review of these projects falls under the Deepwater Port Act, which requires completion of an Environmental Impact Statement (EIS) within 333 days of submission of a Project Application by a proponent. Because the review process is relatively fast, Special Review Procedures have been established. Under the Special Review Procedure, the Massachusetts Executive Office of Environmental Affairs (EOEA), the lead federal agency (U.S. Coast Guard) and the Massachusetts Environmental Policy Act (MEPA) Office are able to conduct a coordinated review allowing a single document to serve simultaneously as both the EIS under the National Environmental Policy Act (NEPA) and the Environmental Impact Report (EIR) under MEPA. This has greatly increased efficiency in that there is one overall review rather than separate processes.



Along with increased efficiency of review, the heightened attention to energy projects also is driving a more thorough assessment of potential impacts. Potential environmental impacts on marine resources, including noise-related impacts on threatened and endangered marine mammals, disruption of benthic habitat, and impacts on already stressed commercial fish populations are of concern and need to be assessed in a complete and thorough fashion. For example, underwater noise caused by generators can affect the endangered Right Whale; construction of gas pipelines can disrupt migration patterns for lobster and other mobile species; and seawater uptake

can cause entrainment of fish eggs and larvae. Short-term construction impacts need to be assessed and monitored as well. Close cooperation and clear communication with representatives

from natural resource protection agencies and the public is the key to addressing such concerns. Increasingly thorough review, including a review of the latest research on marine resources at risk and likelihood of impact, provides decision-makers and the public with the information needed to make informed decisions on whether to permit these projects.

Thorough review and competition associated with these projects is also promoting improvements in technology aimed at reducing environmental impacts. For example, a recently proposed LNG deepwater port project included a retrofit of LNG tanker cooling systems such that seawater uptake and discharge can be reduced by 95%. This greatly reduces entrainment of fish eggs and larvae, and minimizes thermal discharge to marine waters.

Woods Hole Group scientists have worked on a number of energy transmission projects including the HubLine Gas Transmission Pipeline and a proposed LNG Deepwater Port and pipeline. In both instances, a thorough and unbiased project review was prepared within an extremely tight timeframe. Project success was achieved with sound science and close partnering with stakeholders and A&E partners.



Heidi J. Clark, Ph.D., Environmental Scientist

Ms. Clark is an environmental scientist with extensive experience in coastal ecology, environmental assessment, and habitat restoration. She has twelve years experience in environmental science and consulting, with projects ranging from environmental damage assessment to seagrass restoration to dune revegetation. Ms. Clark remains active in coastal scientific research as well. Ms. Clark has MFS and Ph.D. degrees from Yale University.

BREAKING WAVES

News from our Coastal Science, Engineering & Planning team
spotlighting the coastal zone.

Salt Marsh Restoration Best Practices

The restoration of salt marshes and tidal wetlands has become increasingly more active over the past decade. The importance of tidal wetlands extends far beyond the geographical boundaries of the wetland. For instance, tidal wetlands provide habitat for a wide variety of floral and faunal species, a nursery for many wildlife species, and a food source that forms the first link in a complex food chain. If the foundation of the food chain is removed, then a range of fish species will suffer, from creek minnows through saltwater commercial and sport fish.

Wetlands also naturally absorb nutrients and pollutants, and help improve overall water quality. Waterfowl nest and forage in wetlands, and diverse ecosystems from shellfish through mammals find refuge in wetland environments.

As the tragedy of Hurricane Katrina demonstrated, the erosion of our national wetland environment also exacerbates flooding and damage to infrastructure. The loss of nearly a football field sized wetland every half hour in Louisiana not only results in loss of valuable habitat and fisheries commerce, but it also reduces the desperately needed natural flood protection buffer.



Aerial photo of a restored salt marsh.

Restoration of wetlands is important to the scientific community and to the public as well.

So, how can salt marshes and tidal wetlands be restored? The following steps should be followed when completing a wetlands restoration project:

1. Identify project site(s) and stakeholders
2. Select project goals and restoration objectives
3. Define project success criteria
4. Complete a feasibility study
5. Complete an engineering design using the Ecological Engineering process
6. Obtain applicable permits
7. Public outreach
8. Complete the construction
9. Conduct post construction monitoring using the Adaptive Management process

While these steps may seem daunting, the complexity depends on the scale of the project. A small-scale restoration project that will enhance a relatively small section of marsh may combine several steps; however, a successful large-scale project will most likely require all the steps defined above. A few key steps are discussed below, centered on a representative large-scale wetlands restoration project.

Establishing project goals and restoration objectives is crucial. The goals should be simple and straightforward. The most common mistake in restoration projects is setting extremely complex or



unreasonable goals and objectives. Designs also can vary widely if the goal is to restore vegetation, fisheries habitat, avian foraging area, and/or floor protection capacity. For instance, tide gates may be used to encourage ponding for waterfowl habitat restoration; however, the same tide gate may retain freshwater and create conditions not optimized for restoration of desirable species such as *Spartina alterniflora*.

Another key step in the restoration process is to define a criterion by which project success can be judged. Success criteria should be composed of quantifiable parameters and not vague statements or concepts. An example of a good success criterion would be “The

restoration project will restore the site hydrology so that it will support colonization by *Spartina alterniflora*, and reduce *Phragmites* coverage to less than 10% of the site acreage.” This statement is measurable and can be quantified.

Completing a feasibility study is an important step in the planning phase of the project because it helps ensure the project can be completed and/or helps develop the initial project cost estimates. The scope of the feasibility study should be scaled appropriately for the size and complexity of the restoration project. Often, feasibility studies in tidal systems include a hydrodynamic numerical model to determine/quantify the desired tidal hydraulics within the site that will support desirable marsh plain vegetation. Additionally, the feasibility study should include a site inventory of vegetation, identify stakeholders, confirm availability of the site, and define conceptual design alternatives.

Developing the engineering design should involve the application of Ecological Engineering. Ecological Engineering is a straightforward concept that says nature is a better designer of restoration projects than engineers, regulators, or ecologists. Ecological Engineering emphasizes natural self-design over complex engineering and extensive construction. In a wetlands restoration project, it is usually not possible to know all the details required to complete a detailed engineering design that will result in a fully function wetland immediately after construction. Therefore, the application of Ecological Engineering calls for an appropriate level of design to allow nature to

complete the initial restoration design process. An example of this is the excavation of marsh channels. An application of Ecological Engineering would call for the design and construction of a primary and secondary channel system, while allowing the tertiary and smaller channels to evolve naturally where and to the size, elevation, and slope that the marsh plain dictates. The advantage of applying Ecological Engineering is that the resulting design is better suited for restoring the ecology of the wetland system, and it usually costs less because less construction is required.



The modification of a wetland often involves changing the landscape. Change is often viewed with skepticism and/or uneasiness by the regulatory community and the stakeholders. Therefore, an effective public outreach program is essential for restoration projects. This allows the project proponent to reach out to the stakeholders and cooperatively define the scope of a restoration project. Public or local neighborhood meetings can often speed the project along by gaining support for the project. Involving the public in the design process also can ensure the project meets the community expectations.

Adaptive Management is a monitoring process that evaluates the progress of the restoration against the goals and objectives set forth in the earlier steps. Monitoring data are evaluated by the Adaptive Management Team to determine if it is necessary to intervene in the restoration project. Sometimes a project will require a nudge to return it to its restoration pathway. This nudge may involve more aggressive invasive species eradication, or slight modifications to topography or hydraulic designs.

When possible, such flexibility should be included in the design and permitting processes as part of an adaptive management provision.



Restoring wetlands is an extremely valuable endeavor that helps not only the ecosystem but often the overall economy. Even restoring a small wetland of less than an acre can be significant when considered in a landscape perspective. If 10 or 20 small wetlands restoration projects are completed within the same watershed, the combination of those projects may have a significant beneficial impact on the watershed.



Lee Weishar, Ph.D., Senior Coastal Engineer/Professional Wetland Scientist

Dr. Weishar has over 20 years of experience in coastal engineering and wetland/marsh restoration. Dr. Weishar specializes in the integration of biological, ecological, and hydraulic data to develop wetland restoration designs and to ensure that the design will meet the restoration objectives. Additionally, Dr. Weishar specializes in evaluating the potential impacts of proposed restoration projects on existing wetlands and adjacent transitional, buffer, and upland areas.

THE DEEP BLUE

News from our Oceanography & Measurement Systems team
spotlighting the open seas, ports and harbors.

Days in the Life of a Field Oceanographer

They say a bad day in the field is better than a good day in the office, but for the marauding band of field oceanographers at Woods Hole Group bad days in the field are averted by diligent planning and honed expertise. Good days in the office are splashed into the schedule here and there to process and deliver the treasure troves of data collected in the field, write a report, or prepare for the



next foray. This past busy summer field season started off with a bang just before the 4th of July. For us, Independence Day would mean independence from the job for a day or so in between rocketing off to the next locale. The Holiday was a welcome break between a week of work installing two real-time current measurement systems on the Maumee and Cuyahoga Rivers for the National Oceanic & Atmospheric Administration (NOAA) Great Lakes system and a day of dangling from a 180 foot tall meteorological data collection tower on a shallow shoal in Nantucket Sound at the proposed site of the first offshore wind farm in the U.S. I had a scant 16 hours of office time to show off pictures

of the horizontal ADCP deployment systems that will aid the shipping interests in and out of the Great Lakes, catch up on some QA/QC and reporting for the Narragansett Bay Physical Oceanographic Real-Time System (PORTS[®]), and prepare for the replacement of some wind sensors on the tower to end the week. I got back just in time on Friday to get the marching orders for the next major field endeavor, a much anticipated kickoff to a two month mooring program in God's country; the Penobscot River and Bay Tidal Current Measurement Program for NOAA.

It seemed as though I had just returned from the pre-deployment equipment configuration and planning meeting at NOAA's Field Operations Division headquarters in Chesapeake, VA. Now it was time to set the miniature SUBS moorings free and let the trawl resistant bottom mounts settle in to their murky nests at the bottom of the swift moving Penobscot River. For this mission, the crew operated like a well-oiled machine; railroad wheel anchors and thick lengths of chain were ushered about the deck, acoustic releases and pop-up buoys were assembled and tested while ADCPs were meticulously tested and calibrated amongst inquisitive on-looking tourists along the docks in Castine. The deployment went smooth, but the thought of getting everything back would keep us all in suspense until August. Another Monday was here and I had another 16 hours to download from the Penobscot, catch up on some paperwork and mobilize for



3 days of diving and maintenance for the Narragansett Bay PORTS®. It was time for the underwater inspection and maintenance of the bottom mounted current meters and our annual biofouling massacre. The job isn't always glamorous, donning our SCUBA gear and armed with an assortment of scrapers and scouring pads we clear away the mussels, hydroids, and algae encrusting our equipment and move on to the next station. Eventually we dry off and work our way around the shores of Narragansett Bay servicing the land based tide stations. I'm enjoying this time on dry land for now, because on Monday it's off to the oil patch we call the Gulf of Mexico.

The long, steamy days on the 800-foot drillship Discoverer Spirit quickly blur together as we play part electrician part oceanographer, part roughneck and part information technologist. This is a world that Darwin would respect, as only the strong survive out here. The rig is bustling and the currents are strong. With miles of drill pipe hanging from the derrick and piercing the water surface in the moon pool, the day shift has come and gone and just when the drillers need it the most we deliver the first current profile. Now they have the information they need to plan their drift and stab the hole as the currents whisk the ship along.

After one helicopter ride, one car ride, one bus ride, one airplane ride, another car ride, its home at last. No day in the office this time though, it's a day of R and R before kicking off a two-week long beach survey on Nantucket Island. This means an early start to hit the office and gather up the first load of equipment before racing off to the airport and the puddle jumper that will serve as my means of commuting to the Island over the next two weeks. GPS in hand, 4-wheel drive at the ready, and sunscreen lathered, the beach is ours for the surveying. After collecting 50 topographic profiles my waterlogged rodman and I have conquered the beach, and the next step is the bathymetry survey. We rig the boat and steam for the coastline around the corner from our safe haven at the marina, its like glass, a perfect day and a testament to diligent planning. After a week of navigating the waters offshore we finish the survey and clamor into the laid back airport in the nick of time and commandeer a plane just for our gear: boxes, tripods, and survey rods.



It was just over a month since my adventure began in Toledo, then Castine, on to New Orleans and the Bayou, back up to Narragansett Bay, Rhode Island and I was leaving Nantucket to plant my feet back in Falmouth for a few days? hours? who knows? Four and a half weeks, five states, 4,500 miles, 4 water bodies...forget it say most, but the dedicated, qualified, field oceanographers at Woods Hole Group say "*Follow the Leader in Marine Environmental Solutions*"...catch us if you can!



Carl Johnsen, Field Oceanographer

Mr. Johnsen's experience spans 11 years performing deployment and maintenance of real-time oceanographic measurement systems. Mr. Johnsen is the operational leader for the operation and maintenance contract for the NOAA Narragansett Bay PORTS®, and assists with the operation and maintenance of the Chesapeake Bay and Delaware River and Bay PORTS®. Mr. Johnsen installed and maintains real-time oceanographic systems on offshore oil and gas exploration and production platforms in Indonesia, Singapore, Brazil, and numerous locations in the Gulf of Mexico.

HOUSTON SPOTLIGHT

Dave Szabo reports on our Houston operations...

In the last few months business has been picking up both in the number of active projects and bids submitted for new projects. We have submitted Gulf proposals for a real time ADCP system on an exploratory rig and for a motion monitoring systems on a floating production system – both in the Gulf of Mexico. In addition proposals have been submitted for various projects in Indonesia, Venezuela, Colombia and near Gibraltar.

Work is underway on a platform based measurement system in Trinidad, which will provide meteorological, wave and current profile data in real time. The field portion of our project for EJIP (Eddy Joint Industry Project) in the Gulf of Mexico is completed and the preliminary results were presented to the project's technical committee in October. Our evaluation of a 3D current forecast model for two industry clients in cooperation with a PhD candidate at TAMU was successfully completed in September. We've also recently decommissioned a real-time, deep water metocean system and the gear (including a 38 kHz ADCP) is available for a new installation.

NEWSROOM

CONFERENCES

WOODS HOLE GROUP SCIENTISTS & ENGINEERS ON THE CONFERENCE CIRCUIT

Dr. Lee Weishar and **Robert Hamilton, Jr.** attended and hosted a booth at The 3rd National Conference on Coastal and Estuarine Habitat Restoration hosted by Restore America's Estuaries (RAE). The conference was held in New Orleans, LA, December 9-13, 2006. Dr. Weishar, a Senior Coastal Engineer and Professional Wetland Scientist at Woods Hole Group, made a presentation, *The Engineering Approach and Challenges to the Delaware Bay Restorations*, and chaired a session entitled *The Effects of Wetland Restoration Within the Mississippi River Basin on the Lower Mississippi and Mississippi River Delta: A Landscape Approach*.



In addition, Dr. Weishar organized three sessions:

- *Where Is the Beneficial Use of Dredged Material (BUDM) for Estuarine Habitat Restoration Going? Successes, Challenges, Lessons Learned, and Future Needs*
- *Tidal Wetland Restoration on the West Coast of the United States - Learning from the Bolsa Chica Wetland Restoration Project*
- Expert Panel - Lessons Learned in Designing and Constructing Large-scale Wetlands Restoration Projects.

Dr. David Aubrey and **Safi Taher** attended the Offshore Arabia Conference & Exhibition at the Dubai International Exhibition & Convention Centre on December 17-19, 2006 where Woods Hole Group Middle East hosted a booth. This conference promotes sustainable growth in energy, environment and advanced technologies. Visit the [conference website](#) for more information.

Dave Szabo attended the annual meeting of the HYCOM Consortium in Tallahassee, FL in November. The HYCOM consortium is a multi-institutional effort funded by the National Ocean Partnership Program (NOPP), as part of the U. S. Global Ocean Data Assimilation Experiment (GODAE), to develop and evaluate a data-assimilative hybrid isopycnal-sigma-pressure (generalized) coordinate ocean model (called HYbrid Coordinate Ocean Model or HYCOM). Details are available at the [HYCOM Consortium website](#).

Bruce Magnell and **Dave Szabo** attended a workshop on deep ocean current measurement programs in Mexico City, Mexico. They were invited by IMP (Instituto Mexicano del Petroleo) who organized and hosted the meeting on behalf of PEMEX (Petróleos Mexicanos) the national oil company of Mexico.



Robert Hamilton, Jr. recently participated in the Ocean Innovation Conference in St. John's Newfoundland as an invited speaker. Ocean Innovation brings together industry, government and academic representatives to develop new business and collaborative activities. Mr. Hamilton's presentation, *Using Real-Time Environmental Measurements for Maritime Emergency Management*, discussed using environmental data for the prevention of maritime emergency situations. For more information, please visit the [Ocean Innovation conference website](#).



Kirk Bosma, Stephen O'Malley and **Dr. Lee Weishar** presented papers titled *Implementation of Advanced Modeling Techniques for Coastal Engineering Alternatives Assessment*, *Elements of Effective Operational Coastal Observing Systems*, and *The Development of Creek Bank Morphology within a Restored Marsh*, as well as hosted a booth, at The American Shore and Beach Preservation Association (ASBPA) Fall Conference in Long Branch, NJ.

Robert Hamilton and **Dave Szabo** attended a meeting of the Metocean Committee of the International Association of Oil and Gas Producers (OGP) in Camden, Maine in October. Mr. Hamilton made a presentation entitled *Applications of modern coastal engineering models to oil industry projects in the near shore environment*.

Ron Williams, Sr. Scientist with Woods Hole Group Middle East, was invited to participate in a Marine Conservation Forum of the World Wildlife Fund, held in Abu Dhabi, UAE, from September 11-14. The focus of the working group was to make recommendations for protection and monitoring of the regions coral reefs and sea turtles. Over 100 participants from the 6 Gulf countries, Iran, Yemen and several Red Sea countries were in attendance. Recent satellite and ground truthing has shown a recovery of coral reefs in the Gulf since the 1998 coral bleaching low temperatures and extreme low tides.



Dr. Bruce Magnell, Dr. Leonid Ivanov, and **Robert Catalano** of Woods Hole Group along with Len Fagan of Cape Wind Associates, LLC completed a paper titled *Characteristics of the Atmospheric Boundary Layer in Nantucket Sound* which was presented during Oceans '06 MTS/IEEE-Boston Conference Proceedings at the Hynes Convention Center in Boston, MA in September 2006. In addition, **Dr. Bruce Magnell** and **Bruce Andrews** of Woods Hole Group presented a tutorial of an adapted version of the USGS *ADCPTools* software package, which adds new deep-water data processing tools to the original software and is designed to be a work-in-process, so that other users may join with Woods Hole Group to use, maintain, and improve the software. [Email us](#) to request copies of the presentations.