NOAA REPORT

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UNCW

Diving on Aquarius in the Florida Keys.

Aquanauts Return to *Aquarius*

Public Invited On Virtual Visits

—By Jana Goldman

Jules Verne would envy the scientists aboard *Aquarius*. After all, while Verne, a talented and visionary writer, could only imagine what it would be like to live and work under the sea, the scientists who participate in the annual missions aboard the underwater laboratory *Aquarius* know exactly what it's like.

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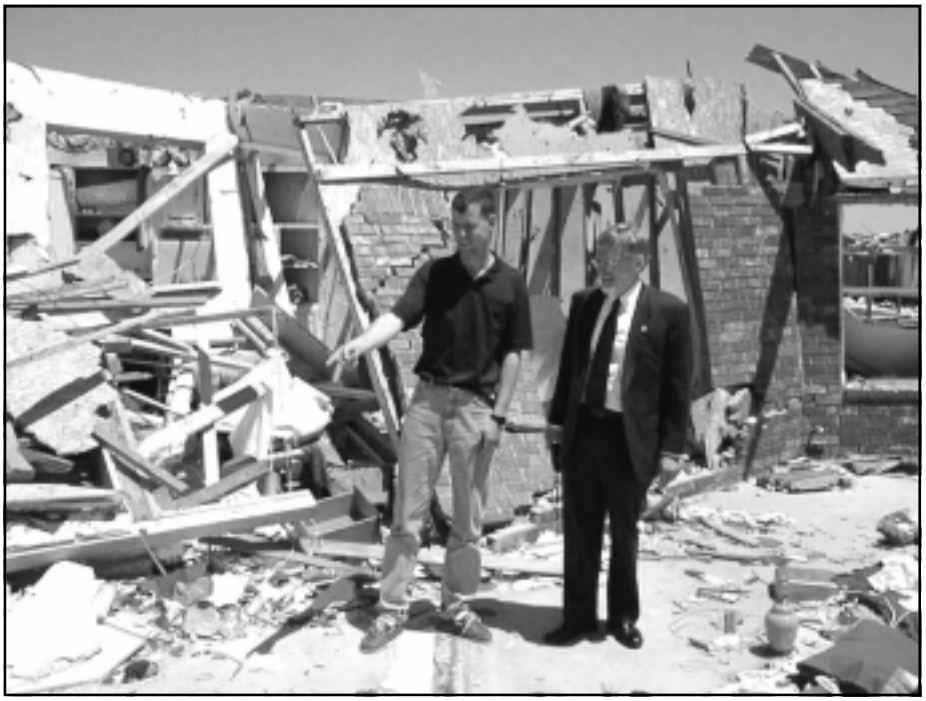
Early Tornado Warnings Saved Lives on the Plains



Joseph Schaefer/NOAA

Two adults, two children, a cat and a dog narrowly escaped death when a tornado destroyed this house in Moore, Okla. Air Force Capt. John Millhouse (left), who works with NOAA in Norman, Okla., tells NOAA Administrator D. James Baker how his family survived.

—By Keli Tarp

The value of early warnings and the benefits of new technology installed during the National Weather Service modernization were vividly illustrated May 3 in Oklahoma and Kansas, as violent tornadoes ripped through the Plains, killing 48 people. Researchers believe it could have been much worse.

Severe weather outlooks issued earlier that day by the Storm Prediction Center and the Weather Service Forecast office in Norman Okla., put everyone on alert.

Later that day in a 10-hour period, forecasters in Norman issued 116 county warnings over NOAA Weather Radio, ham radio and local television and radio stations. Preliminary records show 52 tornadoes hit southwestern and central Oklahoma during that time.

The Wichita, Kansas, forecast office issued seven county warnings that same evening.

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Administrator Views Damage

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In a May 13 visit to the tornado-stricken area, NOAA Administrator D. James Baker said, "It is fair to say that the intense effort to modernize the National Weather Service paid off in this single event. All the elements worked. Everyone should be really proud of the front line or support function they did to make this happen."

Damage from a total of 66 tornadoes throughout Oklahoma was incredible.

One tornado peaked at F5, the highest rating on the Fujita wind damage scale. It stayed on the ground for almost an hour and a half, destroying thousands of homes and businesses in a 38-mile path through the communities of Moore, south Oklahoma City, Midwest City and Del City.

In Oklahoma alone, more than 2,600 homes and businesses were destroyed, and 8,000 buildings were damaged.

Further north in Kansas, an F4 tornado traveled 17 miles through Wichita and Haysville killing six people, totally destroying 1,109 buildings and damaging 8,500 others.

"With the amount of damage, we can estimate based on a long historical record that without warnings hundreds more lives would have been lost; 700 direct fatalities could have occurred," said Harold Brooks, research meteorologist at NOAA's National Severe Storms Laboratory in Norman.

Joseph Schaefer/NOAA

Administrator Baker (left) and Air Force Capt. John Millhouse view what's left of Millhouse's Moore, Okla., home and neighborhood after a tornado struck May 3.

Joseph Schaefer/NOAA

Capt. John Millhouse shows the hallway which sheltered him and his family from the tornado that destroyed the rest of their house. Pictured from the left: Russell Schneider, chief of the Storm Prediction Center's Science Support Branch, Administrator Baker, National Weather Service Deputy Director John Jones and Millhouse.

Families Heeded Warnings, Took Cover

After hearing National Weather Service tornado warnings on a local television station, Darrell Turner, along with 34 family members and neighbors, sought shelter in his brother's storm cellar in Grady County, southwest of Oklahoma City. Winds from the F5 tornado pulled the door off the cellar and destroyed their house. Yet everyone inside survived. In the same community, eleven others lost their lives.

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Air Force Capt. John Millhouse, who works at the NEXRAD Operational Support Facility in Norman, had about thirty minutes warning that a tornado was possible. He sought shelter with his wife and two children, ages 6 and 2, and their cat and dog in a center hallway of their home in Moore. When the tornado passed, the only walls remaining were those around them, but all were safe. Colleagues later helped him clean up debris and haul salvageable belongings to storage.

NOAA volunteers also delivered a 1-ton pickup truck loaded with bagged and labeled items to a tornado relief center in Moore on May 5.

Warning Tools Worked

Among the primary tools used by forecasters to "see" the rotating winds was the WSR-88D Doppler radar, which was developed by the National Severe Storms Laboratory. The NEXRAD Operational Support Facility installed the network and provides continuing technical assistance.

Another important warning tool was the Automated Weather Interactive Processing System workstation, a network of computers integrating weather information for forecasters developed by NOAA's Forecast Systems Laboratory in Boulder, Colo.

The outbreak allowed forecasters in Norman to test the abilities of another NEXRAD radar-based tool, a prototype of the Warning Decision Support System developed by the National Severe Storms Laboratory. "The WDSS played an important part in our warning operation and allowed us to assess the intensity of these circulations," said Dave Andra, science operations officer with the Norman forecast office. "We hope the enhancements in the WDSS will make their way into AWIPS in the future."

According to Dennis McCarthy, meteorologist in charge at the Norman forecast office, the radar worked superbly. "This radar system did what it was designed to do under very extreme circumstances," he said.

James Belville, Director of the NEXRAD Operational Support Facility, said, "The National Weather Service modernization effort was designed to provide forecasters with a superior level of technology to make it easier for them to issue very accurate warnings, which is exactly what happened during this event."

Weather Service Southern Region Director William Proenza praised the efforts of all of the forecast offices. "There are a lot of people who owe their lives to these National Weather Service professionals. Their skill and professionalism during this event epitomize the traits evident at all our forecast offices throughout the United States."

Forecasters and researchers in Norman have also learned several safety-related lessons from the massive tornado outbreak. The event confirmed that highway overpasses do not provide good shelter during a tornado. In fact, they're one of the worst places to be, according to warning coordination meteorologist James Purpura. He said many people may believe that getting under an overpass is safe because of a frequently seen 1991 video shot by a Kansas television crew. They sought shelter under an overpass and kept their camera going as the tornado moved nearby. But that storm did not have winds as strong as the May 3 outbreak, he said, when several people who sought shelter under highway overpasses died, and many others were injured.

"One of the problems with an 'under the girder' kind of shelter is that it can create a wind tunnel effect," Purpura added. "The winds may become stronger and more focused underneath it. These stronger winds carry a tremendous amount of debris—the main killer during tornadoes."

Another lesson learned is that teaching tornado safety makes a difference.

"Many people who lived in one of the worst hit areas did what they had learned from tornado preparedness efforts," McCarthy said.

However, with an F5 tornado, even doing the right thing may not be enough. "It is very unfortunate that some people just didn't have the type of shelter needed to survive this magnitude of storm—such as a reinforced safe room or underground facility," McCarthy added.

A Silver Lining

One silver lining to the event may be the scientific observations of the tornadic storms by a joint University of Oklahoma-National Severe Storms Laboratory research team studying how tornadoes form. May 3 just happened to be the first day of field operations for VORTEX '99, the Verification of the Rotation of Tornadoes Experiment, headed by lab researcher Erik Rasmussen and associate professor of meteorology Jerry Straka.

The team intercepted two supercell thunderstorms, recorded temperature data, dew points, atmospheric pressure and wind speed and direction, all linked with precise Global Positioning System information, in regions around the tornadoes that had not been well sampled in previous years of field operations.

The storms may have given scientists the best glimpse yet at how twisters form, Rasmussen said, providing hope for even more accurate forecasts in the future.

Focus On...

Rear Adm. Evelyn Fields: Breaking Ground (Again)

—By Dane Konop

As a rear admiral, upper half, Evelyn J. Fields is at the pinnacle of her career, and once again a ground breaker—the first woman and first African-American to head the NOAA Corps, the smallest of the seven uniformed services.

"I didn't set out to be a ground breaker, but certainly that is what happened," she explained in her modest, cozy office in NOAA's Silver Spring Metro Center a week after her confirmation by the U.S. Senate. "But just about every job I've been in has been ground breaking because when you're one of the first women to come into a work situation—that's going to happen automatically," she says.

In her freshman year at Norfolk State University, she was one of only four or five women math majors. In 1972, as a civilian cartographer, she was one of only two women working on nautical charts at the Atlantic Marine Center. In 1973, she was the first African-American woman commissioned an officer in the NOAA Corps. In 1989, she was the first woman commanding officer of a NOAA ship—the 170-foot *McArthur*.

Although several Coast Guard women had operated smaller coastal vessels that returned to port each day, the then Lt. Cdr. Fields was the first U.S. woman commissioned officer with a true sea command, as *McArthur* spent extended periods at sea in the Gulf of Mexico and the Atlantic and Pacific Oceans.

Fields' late father was a civilian employee at the Norfolk, Va., Naval Shipyard. Her mother, who still lives in Norfolk, was a teacher. All five of their children graduated from college, and all chose careers in public service. Her three brothers are retired Army officers. Her sister is a divinity school graduate and teacher.

The eldest and a self-described "tom boy" growing up, Rear Admiral Fields credits competition with her brothers, and their friends, with teaching her to operate in a "mans" world. "I never thought there was anything I couldn't do. I might not have been real good at everything, but I never thought I couldn't do something.

"Generally what I tell kids when I talk to them—and I do a lot of talking to kids at schools and in groups—is that the entire world is open to them to do anything they want to do as far as a career is concerned. It's just a matter of them deciding that they want to do something—and then doing it!

"I tell students, 'Look at me. One day I was sitting in a classroom just like you're sitting there now.' And I say, 'I am not a genius. I had to study just like you do. I enjoyed my class work, and I studied. As long as you study and do the best you can, you'll find that usually you'll succeed.'"

She insists, "It's very basic guidance. Keep your nose to the grindstone, and it will pay off. But you do have to take opportunities when they come down the road. You can't be afraid of the opportunities. You can't be thinking, 'No, I can't do that.'"

J.C. Brown for DOC
Rear Admiral Evelyn J. Fields.

Fields says, "My response is always, 'Sounds good. If somebody else can do it, I can do it.' Give it a shot! See what happens."

Fields practiced what she now preaches, developing a keen sensitivity to opportunity.

"I have maybe a Type A personality and this real strong sense that once I start something, I don't really want to not get it done, and done correctly. I think this is what helped me move up into the various positions I've had," she says.

She never even set out to be a cartographer, let alone the head of a corps of chart makers. In grade school, Fields says, "I enjoyed math and was fairly good at it. It's organized and you have to think logically about the solutions. I enjoy the challenge of trying to unravel the puzzle." She credits Mrs. Wyatt, her fourth and fifth grade teacher at Liberty Park Elementary School in Norfolk, with sparking her interest in math

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and science. But although she was introduced to maps as a Girl Scout, "I wasn't even aware of the field of cartography until I actually started looking for jobs and ended up working for NOAA. At the time I thought I wanted to stay in the Norfolk area, so I looked for jobs there."

In 1972, NOAA was just beginning to expand the charting program at the Atlantic Marine Center in Norfolk, "and like many programs at the time," she says, "they were fairly well male-populated and they were beginning to look not only for women but for minorities also. So I applied, and got the job."

Fields came in at the ground floor of the computer-revolution in nautical charting.

"They were just beginning to use computers," she recalls. "But what they had done was computerize the hand process." Like many beginner cartographers, one of the first things she did was sort through the data "to make sure you have all the pieces you're supposed to have, and that nothing got left out," she says. "Women weren't on our ships yet, but I did go out on the shore-based parties, living out of hotels, going out for data collection every day at 7 a.m., working out on the launches all day."

She worked as a cartographer for a year and a half, but was soon ready for a new challenge.

"I had actually started looking for another job when the officers that were working in the office told me the Corps was taking women. They suggested that I apply for the position; so I did. It was different. It was something that was not the norm. And from my point of view, the challenge of it was important."

Over the years, she kept her own nose to the grindstone, she says.

Like other officers, she rotated from ship to shore assignments, and moved up through the ranks.

Along the way she served as operations officer of the NOAA Ships *Mt. Mitchell* and *Peirce*, and as executive officer on *Rainier*, conducting hydrographic survey operations, fisheries investigations and oceanographic research.

Ashore, she served as a hydrographic exchange officer with Canada, graduated from the Armed Forces Staff College and counseled other NOAA officers on selecting new assignments.

She credits a Department of Commerce Science and Technology Fellowship with giving her policy-making and program management experience, in both the executive and legislative branches of government. More recently, she was the administrative officer for the National Geodetic Survey and chief of hydrographic surveys.

Just prior to her current position, Fields was Deputy Assistant Administrator for the National Ocean Service. During her watch, NOAA's hydrographic survey ships substantially increased their data acquisition capabilities, while at the same time there was an increase in survey operations contracted out to the private sector. The average time spent updating charts dropped from 47 to four weeks, and chart production doubled.

Since taking over the Corps, Admiral Fields' home routine has not changed from that of Captain Fields. She's single, never married and lives alone in Gaithersburg, Md. She doesn't have a pet because she is often traveling. She does enjoy puttering around in her garden. She doesn't think her professional achievements have come at the expense of her personal life.

"Certainly moving around the country doesn't help," she says. "I've enjoyed what I've been doing. It's just never gotten down to where I sit and lament, 'Oh, had I not done this, I would have a husband and family.' I won't say I never thought about it; that's just

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NOAA

In 1989, Fields became the first woman commanding officer of a NOAA Ship, the 175-foot McArthur (in background).

Fields

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not been one of those things that have been a major focus, one way or the other."

That's not to say she has ruled out marriage. "The opportunity just never presented itself," she explains. "Needless to say I'm quite independent minded. And I like me. I don't want anybody to think I'm not satisfied with the personal side of my life. Because if some nice guy comes along—great!"

Being the head of the NOAA Corps is demanding. The long hours the job requires, she says, are a given. "I don't think you get to this point in your career without putting in long hours, but not to just put in long hours. I'd like to think they are productive hours," she says.

For pleasure, Fields likes getting together with friends, reading (she recently finished *The Perfect Storm)*, and enjoys most pop music ("songs I know the words to"), as well as country and classical music.

Her Real Passion

But her "real passion" is aerobics set to music, attending a jazzercise class in Gaithersburg at least three to four times a week. "I've been doing this now for seventeen years," Fields says. "It is a natural part of my life because it provides that relief from stress that if I didn't have jazzercise, I'd have to release the stress someplace else."

Fields says there is no one thing in particular in her work experience that has prepared her for her current job as top officer in an elite corps of scientists, engineers and mathematicians. "I think it's a little bit of everything: Having command and having some understanding of what goes on at sea. What our folks on our ships are facing is important. And I'm looking forward to learning more about our aircraft projects. I've had the opportunity to move around, to meet an awful lot of folks. I know where to go to get the information I need," Fields explains.

The Future of the Corps

As to the future of the NOAA Corps, and its recent past, including a proposal to eliminate the Corps, Fields says, "At this point, disestablishment of the Corps is behind us.

"My predecessor has done a fine job at getting our costs down and reducing the excesses in the system. So I think we are indeed very cost effective. I think the officers have always been cost-effective," Fields says, "but we have also been successful in making our platforms more valuable. So there doesn't appear to be a reason that we shouldn't continue to operate the platforms because we can cost-effectively operate them."

The NOAA Corps is looking to bring on an acoustically quiet fisheries ship, Fields says. "But I do believe that the existing vessels are well maintained, and there's plenty of service life in them," she says.

Fields foresees little change in the Corps' mission. "The mission I see is that we are providing safe and efficient platforms for the programs to collect the data that they need for NOAA's mission. I see the officers as providing a flexible and technically competent work force that understands the science and also the operational side of the house."

The Corps did downsize from an all time high of 419 officers to the current 230. But, Fields explains, "we've not been able to control where those cuts took place and where the technical expertise has left or has been maintained, or where's it's needed. So what we're in the business of doing right now is trying to replace those areas that we think we have the biggest need to support the programs.

"One of those areas would be the hydrographic program, where the officers are not just the ship drivers but they're also the scientists. They are the data collectors. They are the chief scientists. They are the scientific party, in addition to being the ship driver. I think that's where we may initially need to ensure that we are providing the needed support to the programs," she says.

Fields does not consider herself lucky, but does believe she is the right person in the right place at the right time.

"I think that it really is ability. And hard work! I think I have prepared myself to do the job. And I am fortunate that the organization feels that I am the right person to do the job," she says. "Obviously, I'm thrilled that Dr. Baker and the Secretary selected me.

"I'll work as hard at this as I've worked at everything else I've done."

NOAA recently recruited and trained its first class of new officers in four years. Would she encourage today's college graduates to consider a career as a NOAA Corps officer, as she did? Her answer is immediate: "Absolutely! This for me has been fun and exciting. Had I actually sat down 27 years ago to lay out a plan for what I wanted to be, and what kinds of things I wanted to do, I couldn't have laid it out any better. I've worked for a very good organization and it's been very good for me. I'm one of those people who are excited to get up and come to work in the morning." She reminds, "It's knowing the things we do at NOAA are important to the next generation.

For anybody interested in the environment, interested in the environmental sciences, NOAA is an excellent place."

3000 Attend Town Meeting on Sustainable Development

60,000 Link to the Event

—By Bracken Hendricks

Over 3,000 delegates from around the country, representing a cross section of America, gathered in Detroit, Mich., for the National Town Meeting for a Sustainable America May 2-5. They were joined by over 60,000 remote participants, linked to the meeting by satellite and the Internet from over 100 concurrent event sites around America.

The forum explored ways sustainable development can link the goals of social equity, economic prosperity and environmental integrity to find long term strategies for solving the problems associated with growth.

Speakers included Vice President Al Gore, Secretary of Commerce William M. Daley, NOAA Administrator D. James Baker, EPA Administrator Carol Browner, Secretary of Transportation Rodney Slater, Secretary of Agriculture Dan Glickman and Small Business Administration Administrator Aida Alvarez.

They were joined by members of Congress, state and local government, industry chief executive officers, and representatives of nonprofit organizations and environmental advocacy groups in calling for a new cooperative approach to resolving old development conflicts and ensuring an enduring future that brings development into balance with the limits of the natural environment.

The Vice President urged citizens to cultivate a sense of energy, urgency and possibility in every community. "I believe that refocusing communities across the country on ways to sustain property while improving quality of life is one of the greatest challenges we face as a nation. If we're going to meet that challenge, we need your voice and we need your leadership," Gore said.

Echoing the town meeting's theme of "Building Partnerships, Crossing Boundaries and Making Commitments," Gore outlined an action agenda that counters the causes of urban sprawl by rebuilding inner cities and by investing in people and communities through education and environmentally sound infrastructure. He also proposed improvements in environmental protection and increased public land acquisition

"First, I will do all I can to make the federal government a better partner in creating livable communities across America. Second, I will carry this message across the country, to create a new prosperity for all Americans," the Vice President said.

The event was the ceremonial culmination of six years of work by the President's Council on Sustainable Development. The council, an innovative, 30-member advisory body drawn from industry, government and the advocacy community, has served as a leading voice for sustainable development within the Clinton Administration and in national and international policy discussions. The council addresses issues ranging from clean industrial production to community development, environmental management, global climate change and international trade.

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Public Can "Visit" Aquarius on the World Wide Web

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And now, thanks to technology, anyone with access to the Internet can experience it, too.

"*Aquarius 2000* takes underwater habitats to the next level," said Steven Miller, Director of the National Undersea Research Center at the University of North Carolina at Wilmington, which administers the *Aquarius* program. The center is one of six National Undersea Research Programs of NOAA's Office of Oceanic and Atmospheric Research.

"We have new technology and operational protocols to enhance the scientists' ability to work underwater. And now, the public can watch and learn about our program through our homepage; webcams, chat sessions and expedition logs are all available," Miller said.

This year, there are six missions, beginning in June and ending in November. Most will concentrate on coral reefs. One will focus on sponge growth. Another will investigate seaweeds, which many believe are overgrowing the corals.

"Coral reefs are threatened by increasing amounts of pollution, over harvesting of fisheries, diseases of unknown origin and global change," Miller said. "The *Aquarius* program helps scientists better understand our changing ocean and coral reefs."

This year also brings the first cooperative program between NOAA and the Japan Marine Science and Technology Center using saturation diving. In July, two scientists from Japan and an American researcher who speaks Japanese will submerge off the

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Withee Heads Satellite Service
Gregory W. Withee is the new NOAA Assistant Administrator for Satellite and Information Services. As such, he heads the National Environmental Satellite, Data and Information Service, which operates the nation's geostationary and polar-orbiting weather satellites and maintains environmental data used by scientists throughout the world. Withee had been deputy assistant administrator since 1994.

Jones Is Top Fish Enforcer
Dale J. Jones, former Hagerstown, Md., police chief, has been selected to lead the National Marine Fisheries Service's office for law enforcement, responsible for 3.4-million square miles of federal waters.

News Briefs

Stabilizing the Sunken *Monitor*
In June, NOAA and the U.S. Navy complete surveys of the wreck of the Civil War ironclad *Monitor* in the *Monitor* National Marine Sanctuary that will lead to stabilizing the historic vessel's deteriorating hull.

Hurricanes Ahead
According to the first hurricane outlook ever by NOAA, released on May 27, there will be more Atlantic tropical storms, hurricanes and intense hurricanes than usual this year. The increased chances for three or more intense storms may be due to a lingering La Niña. The Atlantic hurricane season normally includes nine to ten tropical storms, of which five to six are hurricanes and two are intense hurricanes. In the Central Pacific, forecasters expect four or five tropical storms—about normal for the region.

Aquarius

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Florida Keys to study coral productivity and growth to better understand the role coral reefs play in the global carbon cycle.

Aquarius is moored 60 feet below the ocean surface at the base of a coral reef wall off Key Largo. Contained within its metal walls are all the comforts of home, along with a well equipped laboratory.

Aquarius is linked to the world above by a buoy that provides life support and communications capabilities, as well as data and video links that allow the onshore mission control to receive information and permit Web users to watch the aquanauts at work.

Below the sea, the scientists become aquanauts, living and working aboard *Aquarius*, surrounded by an ever-changing array of marine life. Often, the living creatures outside the habitat are just as curious about the life inside *Aquarius*.

Aquarius gives scientists an important tool to conduct their research. Being able to actually live and work in the environment they are studying provides them with a special experience only available to a few. *Aquarius* allows scientists to work out on the reef for up to nine hours a day, compared to one hour a day if they worked from the surface.

"Scientists use their *Aquarius* experience to explain what they do, why it's important and how it benefits society," Miller said.

In addition to the Japanese team, *Aquarius* this season will see scientists from the University of South Carolina, the University of Maryland, the Virginia Institute of Marine Science and the University of Hawaii.

To visit *Aquarius* on the Web, go to: http://www.uncwil.edu/nurc/Aquarius.

National Town Hall Meeting

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The town meeting was also sponsored by the Global Environment and Technology Foundation, a not-for-profit consulting firm dedicated to building the infrastructure needed for sustainable development, located in Annandale, Va.

At the town meeting, Secretary Daley unveiled a new commitment by the Economic Development Administration to ensure that combating urban sprawl is a central consideration when the government reviews applications for federal development assistance.

In the closing round table discussion, Baker, an *ex officio* council member, stressed the importance of NOAA research in assembling the sound scientific data that have made possible the critical insights needed for sustainable development.

NOAA has been represented at the staff level in all of the sustainable development task forces. Many NOAA staff members also participated in the organization and planning of the event, and a NOAA display was prominently featured in the exhibition hall.

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