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TRACKING BAD STUFF FROM THE HUDSON

Date: 11 May 2003

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By Todd B. Bates, Environmental Writer, Asbury Park Press, 5/11/03

Every day, billions of gallons of water contaminated with chemicals and other pollutants flow around Sandy Hook into the Atlantic Ocean.

The so-called Hudson River plume includes toxic metals, nutrients that serve as algae fertilizers, sediment, fecal bacteria and trash from the vast New York-New Jersey Harbor area.

Last week, Rutgers University scientists equipped with high-tech devices began a five-year study to track the plume and learn how nutrients and chemicals accumulate in microscopic plankton. Chemicals in plankton can build up in the marine food chain and wind up on dinner plates.

The plume, which is miles wide and visible in satellite images, tends to hug the Jersey Shore and has been detected off Cape May, according to experts.

"I think it's incredible," Tanya Podchaski, an environmental science teacher at Bernards High School, said of the study. She and three students were among those who went on a pilot research cruise Wednesday. "It's good to know how the ecosystem is affected by us," she said.

The study, called the "Lagrangian Transport and Transformation Experiment" (LATTE), involve tracking the plume with a harmless fluorescent red dye and scientific devices. The study's results are expected to figure in New York City's future plans for sewage disposal, according to a Rutgers statement.

The word Lagrangian comes from the name Joseph-Louis Lagrange, an 18th-century French mathematician who developed formulas to study the motion of fluids while following their flow, according to the statement.

"Essentially, we'll be tagging a piece of the ocean and following it," said Robert J. Chant, professor of physical oceanography at Rutgers' Institute of Marine and Coastal Sciences and the study's principal investigator, in the statement.

LATTE is an apt acronym for the study because caffeine is one of the chemicals to be monitored in the Hudson River plume. Caffeine passes through sewage treatment plants unchanged. The Hudson plume includes the flow from the Raritan, Passaic and Hackensack rivers and other tributaries.

TEST RUN

Wednesday's inaugural voyage - from Staten Island to about 30 miles south of the tip of Sandy Hook - was aimed at surveying the plume and testing systems to be used when dye is first used next May.

The red dye will quickly disperse and become invisible to the eye, but the scientists' equipment is expected to detect it for up to 100 miles, according to the Rutgers statement.

The testing will allow scientists to produce computer images of the Hudson River plume as they cruise. A comprehensive model of the plume will evolve during testing, and work is expected to be completed by 2008.

Researchers will use a variety of equipment and testing methods to determine how nitrogen, lead, cadmium, mercury and other substances are transported at different depths and under different conditions, Chant said.

Metals and chemicals in the plume are present mostly in trace amounts.

Ocean currents, turbulence, temperature, wind and the Earth's rotation all have an effect on where river water goes and how fast it mixes with ocean water, according to Chant.

"In the end, we'll undoubtedly have the most sophisticated model of what the Hudson River really does as it mixes with the ocean," he said.

WHERE IT COMES FROM

Nutrients, such as nitrogen, enter New York-New Jersey Harbor from many sources, including more than 100 sewage treatment plants, 700 combined sewer overflows, thousands of stormwater outfalls, 11 major rivers - including the Hudson, Raritan and Connecticut rivers - coastal runoff and rainfall, according to a U.S. Environmental Protection Agency Web site.

Nitrogen, a component of all living things, is a fertilizer for algae, or phytoplankton, which are generally one-celled plants.

Phytoplankton are at the base of the marine food chain. Zooplankton, tiny animals, eat phytoplankton, and small fish eat zooplankton, and so on.

Pollutants in tidal waters, sediments, fish and shellfish in the harbor area have decreased dramatically overall since the early 1970s, according to a recent report.

But much remains to be done to reduce pollution and improve conditions in the estuary, which includes Raritan and Sandy Hook bays, and protect human health, according to the 2002 report by the Hudson River Foundation, New York City.

Estuaries, where the fresh water of rivers meets the salt water of

bays and the ocean, are nurseries for fish, shellfish and other marine life.

BATTLING POLLUTION

The New York-New Jersey Harbor Estuary Program is implementing a 20-year plan, adopted in 1997, to reduce pollution, keep the \$20 billion-a-year Port of New York and New Jersey open to shipping, and protect nature in a region with more than 20 million people.

The blueprint covers the harbor estuary and the New York Bight - the vast body of ocean water between Cape May and Montauk Point, Long Island. The bight is about twice the size of New Jersey and stretches to the edge of the Continental Shelf.

Dennis J. Suszkowski, science director at the Hudson River Foundation, a nonprofit science and environmental research organization, said "as far as I can tell, there hasn't been a whole lot of interest in looking at the plume" from the estuary in recent years.

Researchers have not looked at whether limiting the amount of nutrients in the Hudson River plume would result in "basically...clear water along the coast for bathing," he said.

Algae populations in the ocean occasionally explode as a result of sunlight, an abundance of nutrients and other conditions - clouding and discoloring the water.

Algae help produce the dissolved oxygen in the water. But when algae sink to the bottom and decompose, oxygen levels drop, threatening shellfish and other sea creatures that aren't very mobile.

Suszkowski said he's "thrilled" that the Rutgers-led study is being done.

"We've just been spared some of these...algal blooms and potential effects to the Shore, and if one happens, everybody's going to be looking around and pointing fingers and no one's (been) out there collecting useful information," he said.

MAJOR FISH KILL

There has not been a "really big incident" since a 1976 fish kill off the Jersey Shore, he said.

A massive bloom of algae stripped bottom waters of oxygen in 1976, killing millions of clams, sea scallops, lobsters and bottom-dwelling fish in a huge area from Long Island to Maryland. The disaster caused economic losses estimated at \$573 million.

Scientists concluded it was essentially a natural and rare event, aggravated, however, by people's large contribution of nutrients into the ocean.

Even if scientists don't know the causes of future blooms, the new

study will provide "some idea" where blooms will go, he said.

According to the Rutgers statement, the university will receive \$2.2 million of a \$4.2 million National Science Foundation grant for the study.

The rest will be distributed equally among researchers at Columbia University, the University of Massachusetts-Boston, the University of Florida-Gainesville, California Polytechnic Institute and the Florida Environmental Research Institute.

Besides the shipboard LATTE studies, scientists will use the institute's New Jersey Shelf Observing System, a satellite-networked array of submerged monitors, autonomous under-water gliders and radar systems. The system offers real-time monitoring of ocean conditions.

LOOKING AT PCBs

Although metals will be a focus of the study, a few samples will be analyzed for polychlorinated biphenyls, Chant said.

PCBs are suspected human carcinogens and can cause developmental problems and other health effects. They accumulate in the fatty tissues of all animals and people.

Since the 1980s, average PCB levels in striped bass have dropped more than 70 percent in northern New Jersey coastal waters, and PCB levels in blue-fish have declined almost 40 percent, according to the state.

But New Jersey issued new, more protective health advisories this year for 12 species of PCB-contaminated fish, including bluefish and striped bass - two of the most popular species to reel in and eat. The new advisories also apply to blue crabs.

"If there's a PCB signal out there (in the plume) that's kind of interesting, we can pursue that," Chant said.

On Wednesday morning, the Rosemary Miller, a 95-foot ship out of Miller's Launch Inc., Staten Island, pulled away from the dock for the initial cruise.

At about 8:30 a.m., men lowered an instrument into the ocean off the tip of Sandy Hook to check the water's salt content, temperature, total suspended matter, current speed and oxygen.

The process would be repeated about 60 times that day, Chant wrote in an email message.

Researchers also collected samples of ocean water to be checked for zooplankton and phytoplankton, among other research efforts.

Winds on Tuesday and Wednesday were primarily from the south, resulting in the plume spreading offshore, according to Chant.

The plume was barely detectable about 30 miles south of Sandy Hook, he said.

If the winds had been northerly, the plume probably would have hugged the coast more tightly and "its signature would be apparent much further down the coast," he said.

SURPRISING DISCOVERY

Several years ago, Rutgers researchers detected the plume in the ocean off Tuckerton, said Scott M. Glenn, a professor of physical oceanography at the Rutgers institute, said of the plume.

"We were quite surprised," he said.

It was "like it had just come out of" New York-New Jersey Harbor, he said, and finding the plume there was "part of the reason we want to pursue this study."

Scientists, according to Glenn, know a lot about the ocean in the vicinity of an institute underwater observatory that is about three miles southeast of Little Egg Inlet.

The ocean there is "so pristine, a more natural environment," he said. "That was the focus of our studies for many, many years."

The Hudson plume is "quite important," Glenn said. "This is where the stuff (from New York City) comes out and mixes" with the ocean.

"It's the start of another five-year program at Rutgers, so it's pretty cool to be here," he said.

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[Top](#)