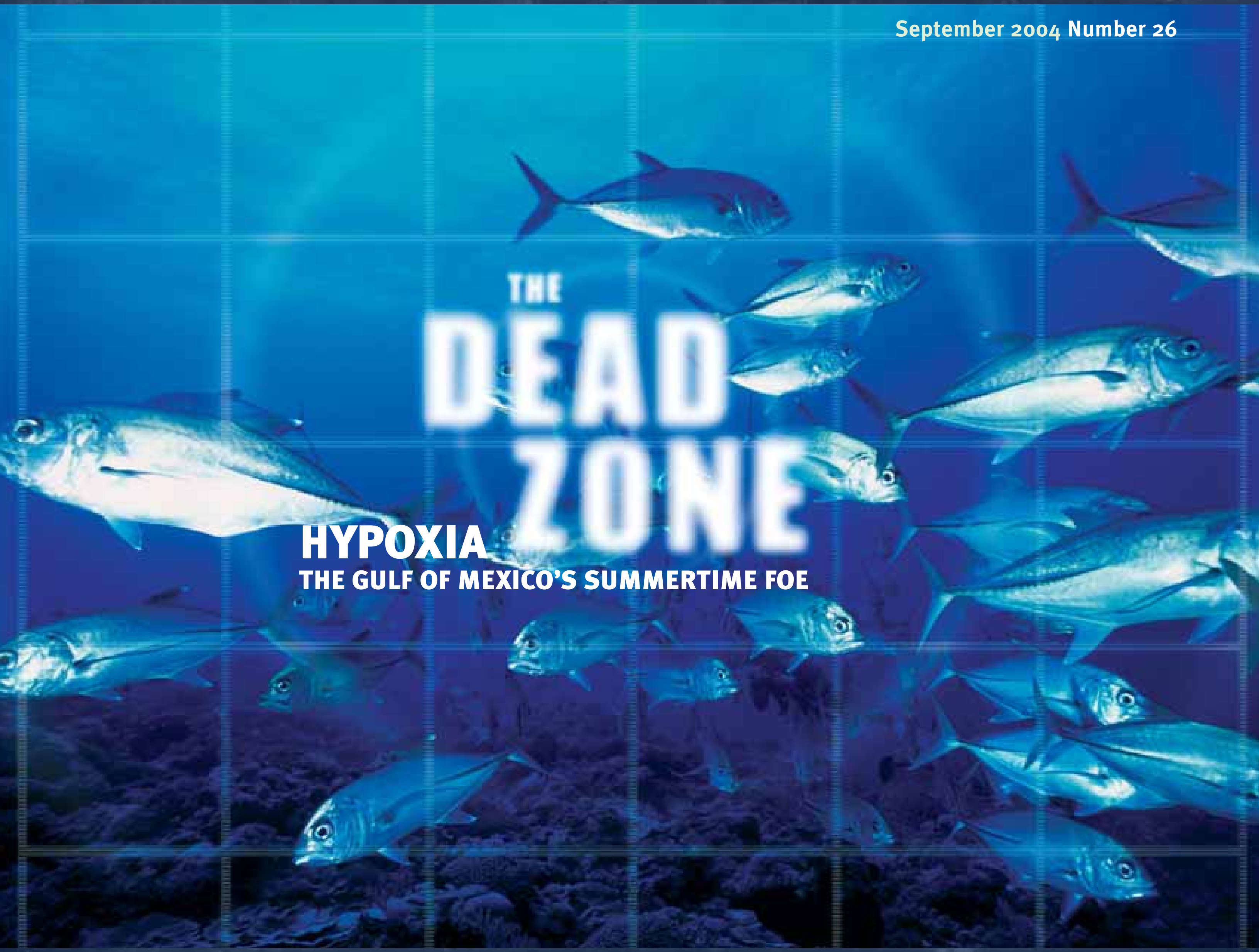
WaterMarks

Louisiana Coastal Wetlands Planning, Protection and Restoration News

September 2004 Number 26



More Nitrogen Upstream, Fewer Filters Downstream

Caernarvon: A Case Study

***WaterMarks* Interview:** John Day, LSU

www.lacoast.gov

September 2004 Number 26

WaterMarks

Louisiana Coastal Wetlands Planning, Protection and Restoration News

WaterMarks is published three times a year by the Louisiana Coastal Wetlands Conservation and Restoration Task Force to communicate news and issues of interest related to the Coastal Wetlands Planning, Protection and Restoration Act of 1990. This legislation funds wetlands enhancement projects nationwide, designating approximately $50 million annually for work in Louisiana. The state contributes 15 percent of the total cost of the project.

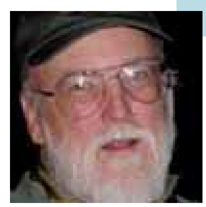
Please address all questions, comments and changes of address to:

James D. Addison
WaterMarks Editor
New Orleans District
US Army Corps of Engineers
P.O. Box 60267
New Orleans, LA 70160-0267
(504) 862-2201
e-mail:
James.Addison@mvn.usace.army.mil

About the Cover

Blue Runners, a common Gulf species, have the ability to escape from waters with low oxygen content. Other organisms in the Gulf are not so fortunate.

Contents



Special thanks to Doug Daigle, Mississippi River Basin Alliance; Dugan Sabins, Louisiana State Hypoxia Committee; Ken Teague, U.S. Environmental Protection Agency; and Robert Twilley, Louisiana State University, for their assistance with this issue of WaterMarks.

For more information about Louisiana's coastal wetlands and the efforts planned and under way to ensure their survival, check out these sites on the web:

www.lacoast.gov **www.btnep.org** **www.saveLAwetlands.org**

Subscribe

To receive *WaterMarks*, e-mail James.Addison@mvn.usace.army.mil
For current meetings, events, and other news concerning Louisiana's coastal wetlands, subscribe to the Breaux Act Newsflash, our e-mail newsletter, at:

www.lacoast.gov/newsletter.htm

September 2004 Number 26

HYPOXIA

The Gulf of Mexico's Summertime Foe

Each summer the richly productive bottom waters off Louisiana's coast are transformed from a region of teeming marine life into a vast area known as the "Dead Zone," which can encompass up to 8,500 square miles. Within this zone, the water near the bottom is hypoxic — nearly depleted of oxygen. The organisms living there must either escape or die of suffocation. Its effects are not yet fully defined, but the cause of this phenomenon is clear. Simply stated, the Gulf of Mexico is suffering from too much of a good thing.

The Gulf owes its great productivity to abundant nutrients such as nitrogen, phosphorus and silica, which enhance the growth of marine life. Nutrients encourage the growth of algae, a basic element of the Gulf food chain. More algae mean more plankton, more shrimp and more fish. But algal production is a good thing only up to a point. The volume of nutrients now delivered to the Gulf is causing algae to grow too fast, with deadly consequences for these waters.

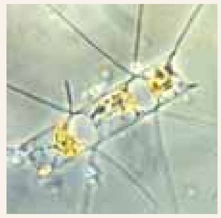
continued on page 4

Grey Snappers, like all other Gulf species, prefer water with abundant oxygen and food. The Dead Zone provides neither.

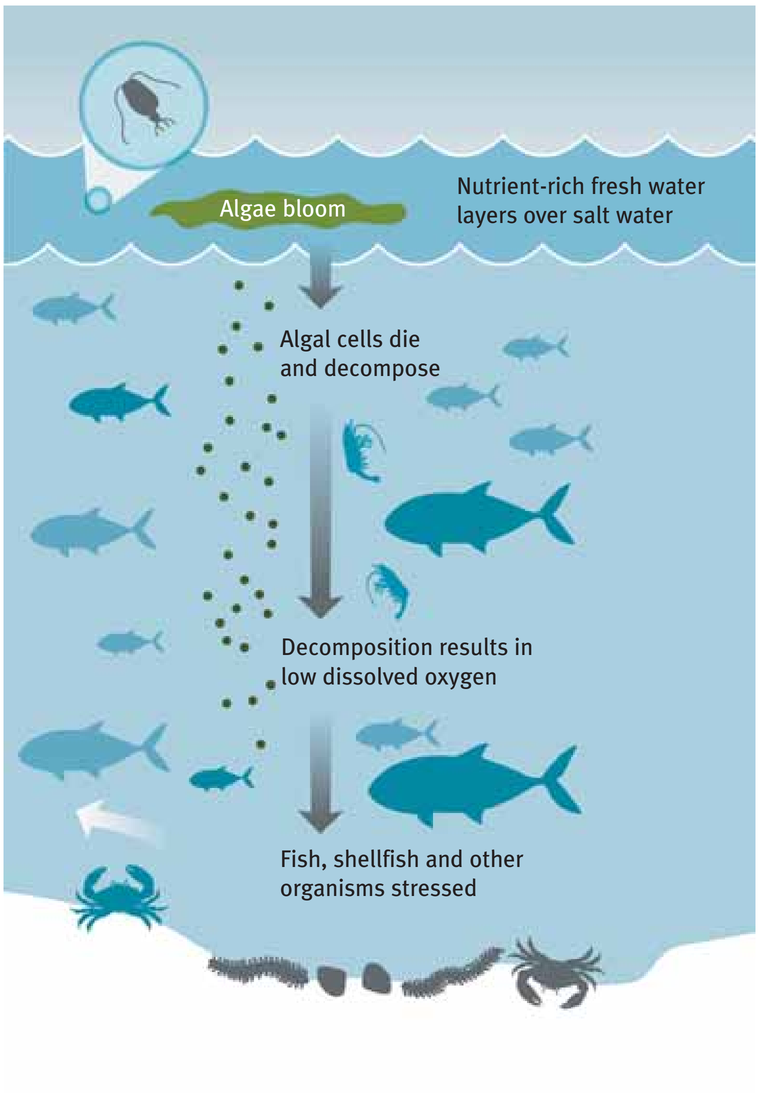
Photo by: NOAA

Algal Bloom or Red Tide?

A "bloom" occurs when algae begin to rapidly reproduce, forming billions of algal cells in surface waters, sometimes turning the waters a distinctive green. However, many types of algae, such as dinoflagellates, can produce toxins that poison the waters and kill almost all nearby organisms, producing a "red tide." Even fish cannot always escape fast enough to survive this deadly menace.



Chaetoceros, a red-tide organism



In a marine system with two distinct water layers, over-production by algae may cause hypoxia, disrupting bottom communities and causing mobile organisms to leave the area. Modified from National Center for Appropriate Technology, www.ncat.org/nutrients/hypoxia/hypoxia1.htm.

Hypoxic Waters

Algal cells flourish in the well-lit surface waters of the Gulf each spring and summer, drifting to the bottom after death. Also, the algae are eaten by marine animals, which then produce fecal matter that also drops to the bottom. There, the accumulated organic matter begins to decompose.

This slow decay uses oxygen, depleting the oxygen living organisms at the bottom need. Eventually, unless the oxygen is replaced, the bottom waters become hypoxic—having less than two milligrams of dissolved oxygen per liter.

Summertime Stratification

During most of the year, oxygen-rich water reaches the bottom and decomposition rates are normal. However, in spring and summer, when the algae bloom, the surface and bottom waters of the Gulf stratify into two layers. Warm, fresh and less dense water from the Mississippi and Atchafalaya rivers spreads out on the surface of the deeper and colder Gulf water. Calm winds and warm sunshine prevent the layers from mixing thoroughly. The hypoxia begins at the bottom, climbs toward the surface and spreads throughout the summer months. The lower waters may not receive fresh oxygen from May until September.

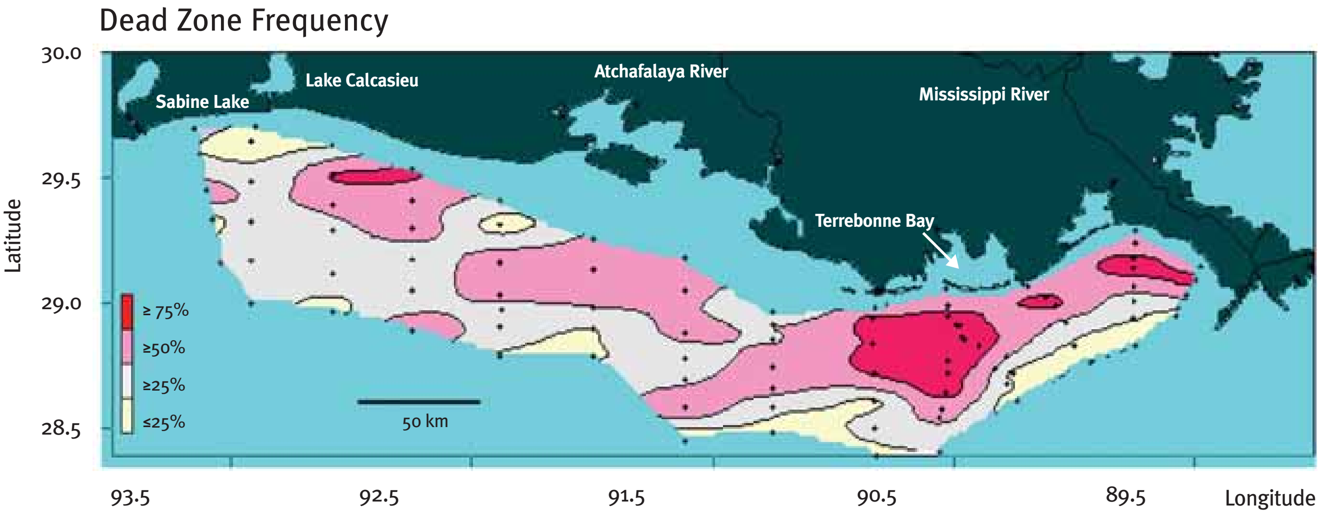
The coming of autumn brings tropical storms, hurricanes, cold fronts and cooler water flowing into the Gulf. These mix the Gulf waters and replenish oxygen at the bottom once more.

Life in the Dead Zone

During the summer months of low oxygen, while fish and other mobile animals can escape the developing Dead Zone, bottom dwellers that are attached to the ocean floor are doomed as the normal bottom ecosystem collapses. Significantly, when the autumn mixing brings oxygen levels back to normal, the bottom communities do not have the chance to revive. Instead, the area tends to be re-colonized by only a few short-lived species (such as polychaete worms)

Measuring and Monitoring the Dead Zone

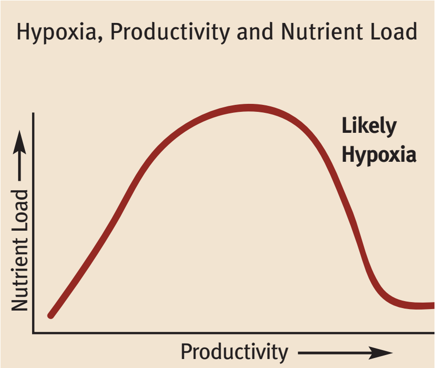
The Dead Zone may reach from the Gulf floor to the surface, but most often stretches upward from five to 30 meters. It occurs over a changing area and set a record in 2002 when it covered 8,500 square miles. The zone forms primarily in the summer when the Gulf waters are calmer and the waters stratify easily. From spring to early fall, scientists monitor its movement with oxygen sampling equipment at various depths. Transects of the coastal waters map the extent of the zone.



The location of mid-summer hypoxic waters off the Louisiana coast can be predicted using data collected in prior years (1985–1999). Courtesy Nancy Rabalais, Louisiana Universities Marine Consortium.

that can establish themselves in the aftermath of the Dead Zone. Larger, longer-lived species (such as gastropods, bivalves, starfish, brittle stars and sea anemones) vanished from this part of the Gulf 30-40 years ago. These new bottom communities fall far short of the normal ecosystems in diversity, abundance or biomass. Ken Teague of the U.S. Environmental Protection Agency describes it as "the seasonal elimination of a vast area of productive habitat. In the Dead Zone, the original bottom communities were lost a long time ago."

Often, the fish and shrimp that escape the Dead Zone during the spring and summer congregate at its edges. These concentrations have caused many Louisiana shrimpers to leave their normal fishing areas to make a good catch. Other fishermen who take their catches from the uppermost waters may not be affected unless the Dead Zone reaches the very top of the water column. In the rare cases when this happens, the water does not have a different appearance; it's merely devoid of life.



As nutrients in an ecosystem increase so does productivity. But when too many nutrients cause over-production, decomposing organic matter may begin to use up the available oxygen. In stratified waters, this can result in hypoxia.

Is This So Bad?

Large hypoxic zones that occur at the mouths of rivers are not unusual. They can be found in Long Island Sound, Chesapeake Bay, the Baltic Sea and the Black Sea. However, the Gulf hypoxic zone is among the largest, in some years covering an area comparable to New Jersey.

Because research on the Dead Zone is still relatively recent, scientists studying the Gulf know only the most fundamental facts about it. They can prove it exists and know when and why it will form. But they understand only some of its effects on ecosystems. For example, while the catch of brown shrimp declined during the years of greatest hypoxia (1992-1997), scientists are not certain that the Dead Zone caused it.

Still, although little is known at present, the Gulf's fish and shrimp ecosystems show signs of stress. The Dead Zone is a prime suspect for:

- increasing mortality
- acting as a barrier to migration
- reducing suitable habitat
- increasing predation
- altering food resources
- disrupting life cycles, particularly spawning and early life stages

No one yet knows if the Dead Zone is a serious threat to coastal fishery and recreation industries. Will there be a point at which the enormous load of nutrients carried to the Gulf causes the ecosystem to collapse? Only time will tell. **WM**

Does the Dead Zone Mean Dead Fish?

Massive fish kills in the Gulf are usually associated with red tides, not the Dead Zone, as fish can usually avoid the hypoxic zone and survive. Only when the oxygen-depleted waters are pushed onshore into bays and lagoons do fish become trapped. At its present size, the Dead Zone does not commonly reach shore.

More Nitrogen Upstream, Fewer Filters Downstream

Scientists have found clues to the causes of the Dead Zone in both the Gulf and Mississippi River watershed. By examining sediment cores taken offshore of Louisiana, they report that abundant nutrients and algal deposition, with resulting oxygen depletion, were rare occurrences in the first half of the 20th century. This is consistent with the fact that it was only after 1970 that the hypoxia phenomenon became increasingly common. The researchers also see clues in several dramatic changes across the 1.2 million-square-mile Mississippi drainage basin. These involve the landscape, agricultural and industrial practices, and changes in the Mississippi itself.

The immense watershed of the Mississippi River system drains approximately 1.2 million square miles, covering parts of 31 states and two Canadian provinces.

First, during the last century, the Mississippi River was constrained with levees to control flooding. Nutrient-rich waters, which were previously spread by floods and natural diversions into filtering buffer zones throughout the floodplains of the vast river basin, now flow directly to the Mississippi delta with the nutrient load intact.

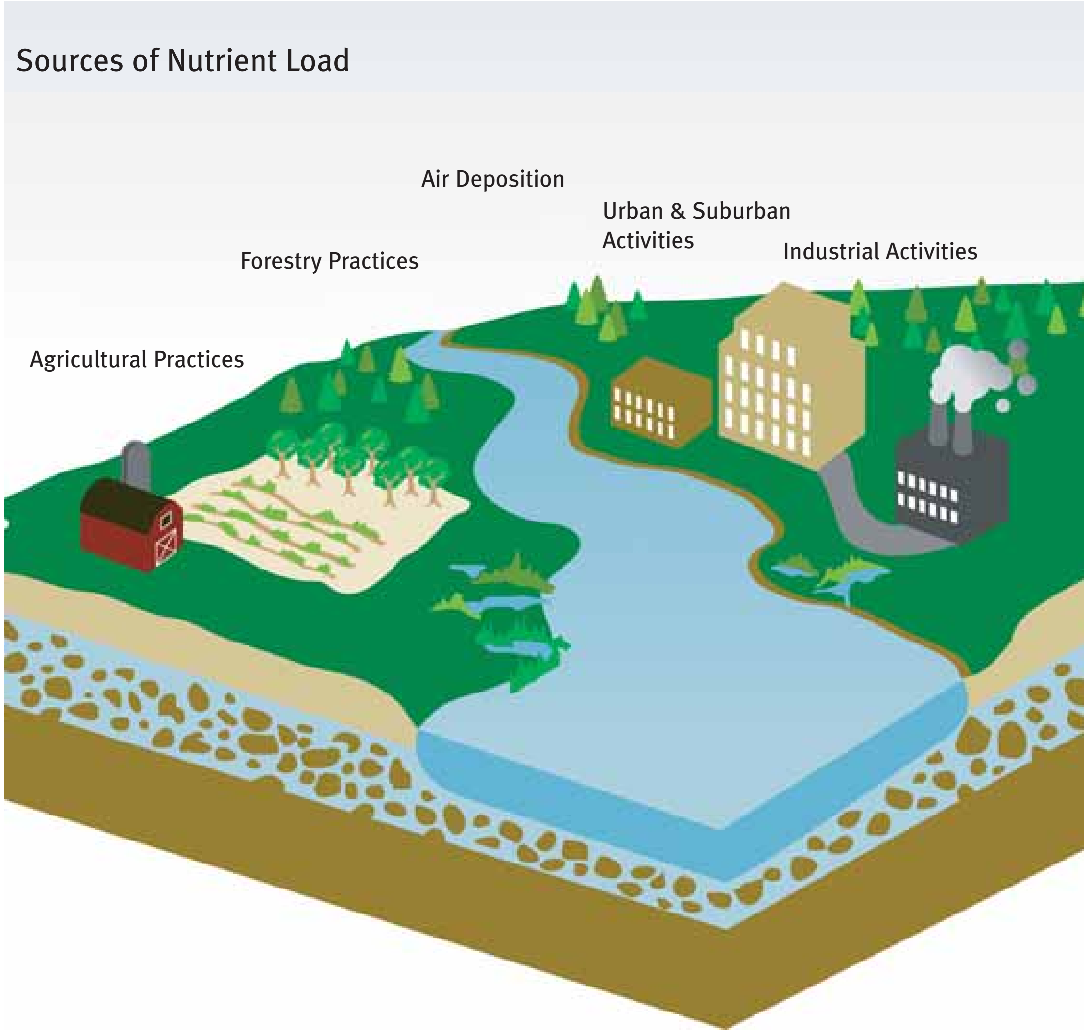
Second, between 1950 and 1996, there was a major increase in the use of nitrogen fertilizer for agriculture. During the same time, the nitrate load in the Mississippi River also increased nearly three-fold. While a small percentage of that increase is attributed to sources such as treated municipal and industrial effluents, livestock operations, atmospheric sources and runoff from urban areas, scientists say an estimated 90 percent of the increased nitrates have come from agricultural runoff—water draining from fertilized fields.

Finally, the upstream landscape was significantly altered, primarily in 1875-1925 and again in 1945-1960, by the destruction of riverside forests and wetlands and by greatly improving drainage efficiency using ditches, buried drainage tiles and/or culverts. In Ohio, Indiana, Illinois and Iowa, for example, 80 percent of their wetlands are gone. These critical buffers once helped to convert fertilizer nitrate into plant matter and atmospheric nitrogen. The loss of the forests and wetlands has effectively eliminated the basin's capacity to filter out nutrients entering the river system.

"The extensive installment of underground tile drainage systems on farmlands across the upper Midwest allows fields to dry more quickly during the spring thaw, but also to flush out fertilizer and pesticides into creeks and streams that connect with the river," says Doug Daigle of the Mississippi River Basin Alliance. The improved drainage also causes organic matter in the soil to oxidize more readily, releasing even more nitrogen.

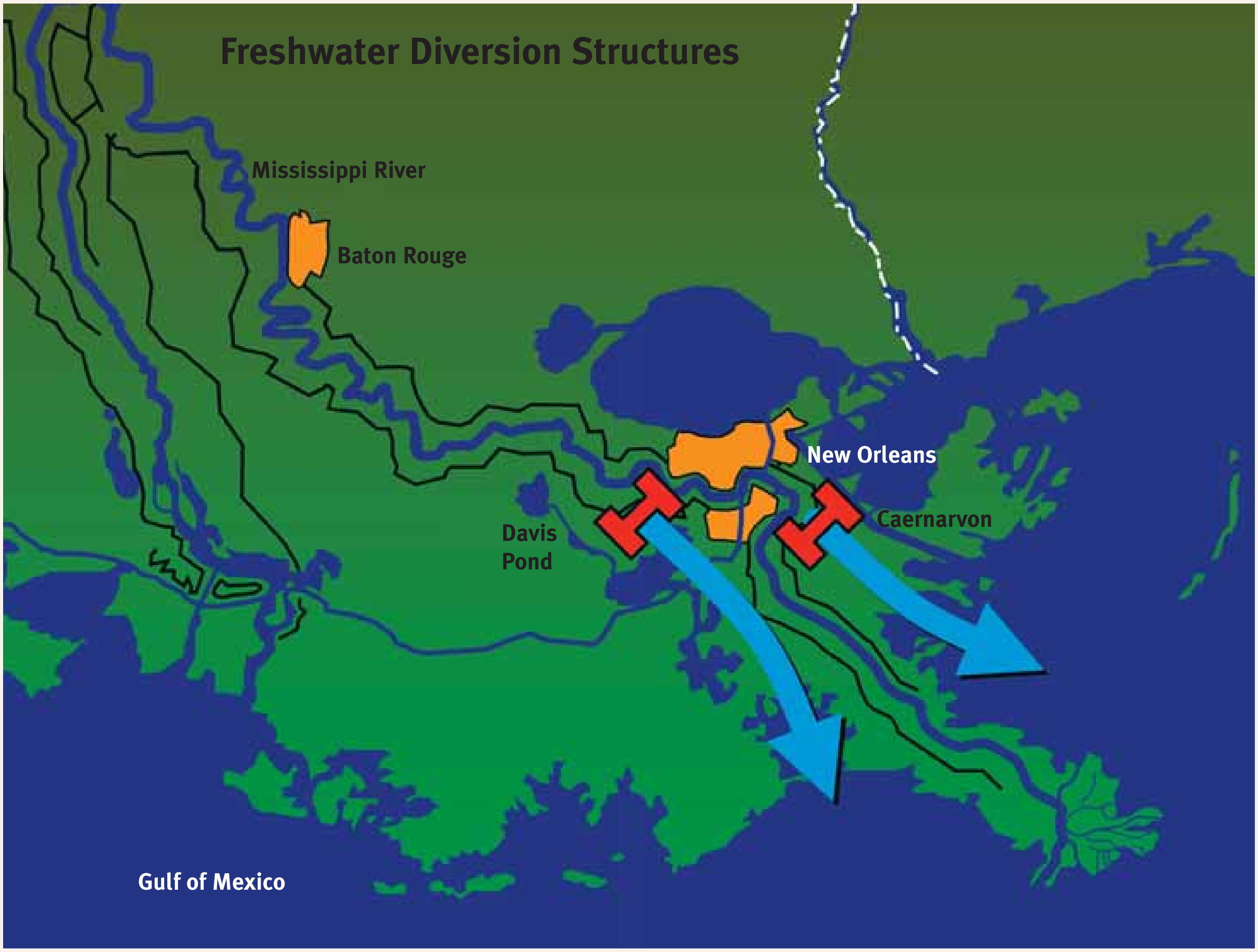
By the time the river reaches the delta, its nutrient load is overwhelming. Unfortunately, the last bastion of major wetlands available on the river system has been dramatically diminished by decades of coastal erosion from both man-made and natural causes. The river has been leveed for flood protection and navigation, ensuring that the delta wetlands have no contact with Mississippi River water. Because the wetlands no longer receive inputs of sediment and nutrients from the river, they are subsiding rapidly and being converted to open water bays and lakes. This subsidence and erosion are exacerbated by the navigation channels and oil and gas canals that have been cut through the wetlands.

Even if the wetlands of Louisiana existed at their greatest natural capacity and were still connected to the river, it is not likely that they could adequately filter the nutrient load the river now carries. Ironically, the Louisiana coastal marshes are starving for the very nutrients that flow by unimpeded—nutrients that move out to sea to cause a surfeit of algal growth and hypoxia in the Gulf. WM



The nitrate load in the Mississippi River has increased to three times what it was prior to 1950. While a variety of causes account for a small percent of the increase, scientists say an estimated 90 percent of the jump is due to nitrates from agricultural and urban runoff.

Can Wetlands Restoration Revitalize OFFSHORE WATERS?



Freshwater diversions (also known as reintroductions) can use at least part of the nutrient load carried by the Mississippi River. The two largest diversions are Davis Pond and Caernarvon.

According to the National Science and Technology Council's *"Integrated Assessment of Hypoxia in the Northern Gulf of Mexico,"* the river now carries more than 1.6 million metric tons of nitrate each year. The abundance of nitrogen, as well as phosphorus, carbon and silica, that feeds the algae in the Gulf induces the seasonal appearance of hypoxia after the spring runoff.

It will be necessary to reduce the current nitrogen load by 40 percent in order to return to pre-1970 levels. But even a 20 or 30 percent reduction would result in a 15 to 50 percent increase in oxygen concentrations, which could have a significant positive effect on the marine ecosystems.

How can this reduction be brought about? There are two concurrent and complementary sets of strategies proposed in the Hypoxia Integrated Assessment by the Committee on Environment and Natural Resources. The first calls for reducing the nitrogen loading to the river and its tributaries. By altering farm management practices, the agriculture industry could reduce the river's nitrate load by 0.9 to 1.4 million metric tons a year. Some of these methods include:

- using crop rotation practices that employ perennials on 10 percent of farmland, effectively reducing the nitrate load by 0.5 million metric tons annually
- offering incentives to reduce the use of agricultural fertilizer through a nitrogen-credit system similar to the carbon-credit system applied to carbon-emitting industries
- replacing aging tile drainage systems with up-to-date systems that allow water drained off fields to be retained and reused
- employing comprehensive nutrient waste management for livestock operations such as dairies
- applying precise nutrient application on fields, pinpointing only those areas in need of fertilizer

Doug Daigle of the Mississippi River Basin Alliance notes that "prairie perennials don't require annual plowing or massive fertilizer inputs, and have much deeper root systems that hold soil and water together for longer periods." He also points out that advanced tiling systems "help farmers in times of drought, as well as reducing the flushing of nitrates into waterways."

The second proposed set of strategies to reduce nitrates involves restoring wetlands throughout the Mississippi drainage basin. In their studies, John Day of Louisiana State University and William Mitsch of Ohio State University are calling for the restoration of five million acres of wetlands and 19 million acres of riverside forest or grasslands in the Midwest—or 3 percent of the current farmland in the basin. Restoration of these natural filtering systems could reduce the Mississippi's nitrate load by 0.6 million metric tons per year, they say.

Can Louisiana's Wetlands Help?

Some experts believe that Louisiana's wetlands can play a part in reducing Gulf hypoxia. But there is a lack of consensus among wetlands scientists on two issues. While some experts do not believe that Louisiana's wetlands are effective nitrogen removers, others are concerned that the hypoxia problem will be transferred from the Gulf into the estuaries if river-water reintroductions are used to move nutrient-rich waters into the delta system.

Ken Teague of the U.S. Environmental Protection Agency notes, however, that the wetlands restoration projects currently built or planned were not designed to improve the Mississippi's water quality. In order to accomplish that, the flow of water through reintroductions and other restoration projects must be modified (see *Caernarvon: A Case Study,* page 10).

If water moves through the wetlands too quickly, there is little time for nutrient uptake. Therefore, projects that flush water through the system need to be designed to maximize retention time. Robert Twilley of Louisiana State University points out that the benefits of using reintroductions to restore the health of the wetlands should outweigh the risks of excessive production in the estuaries, most of which are too shallow to become stratified. He says, "We need to be prudent in our use of reintroduced water and not let the receiving basins retain the nutrient-rich water for too long. We also need to recognize that some reintroductions will be in areas whose landscapes are no longer adapted to high flow, not having witnessed natural flows in the last hundred years. However, it is very important that we remain open-minded to the responsible use of reintroductions and learn how to adaptively manage the risk of over-production."

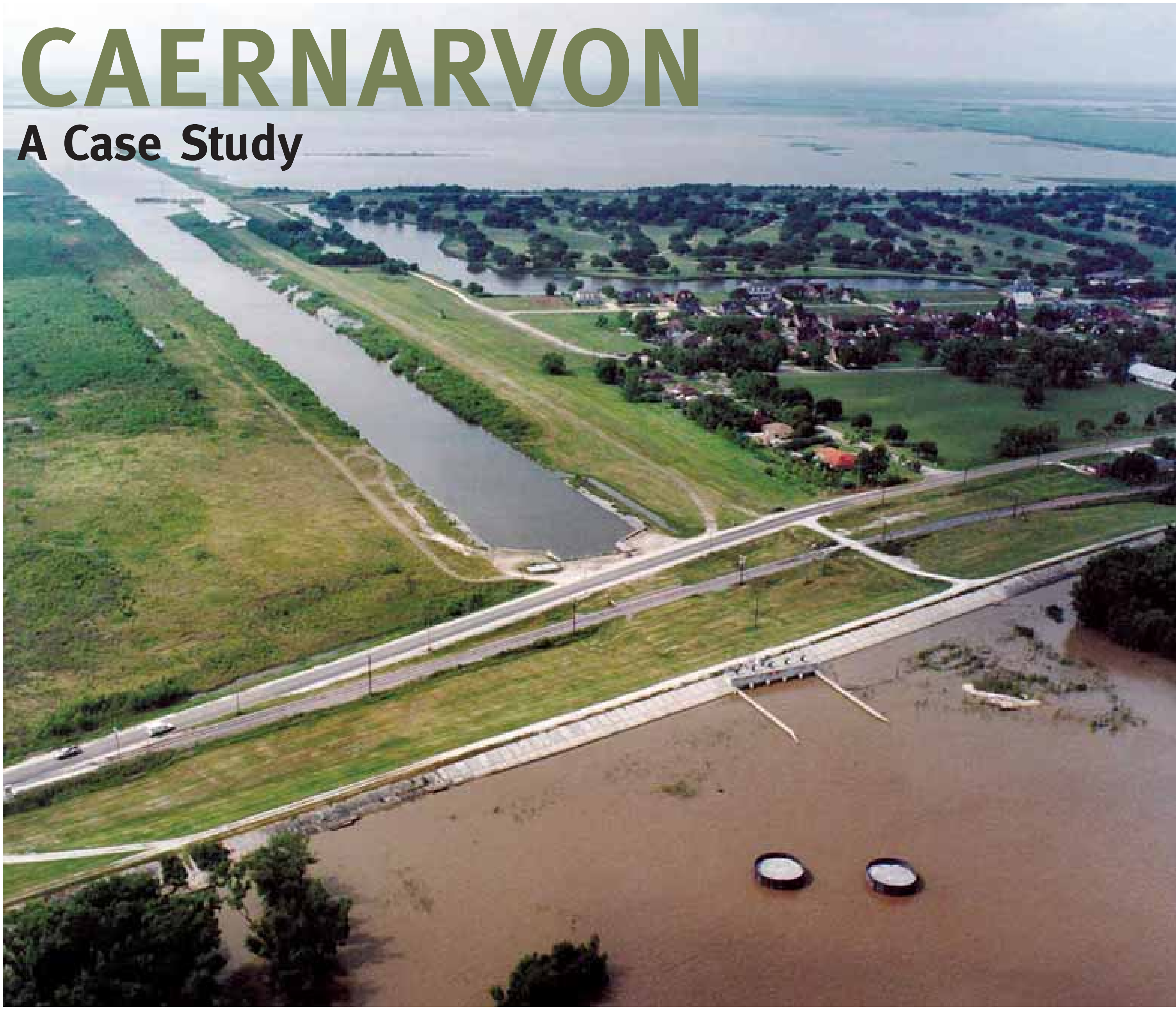
If a reintroduction of water flow can be modified to further increase nitrogen uptake, then the reintroductions will not only reduce the nutrient load, but their ability to meet their goal of restoring wetlands will also be enhanced. Significantly, as wetlands are restored, their filtering capacity increases, as does their ability to utilize more nutrients that would otherwise reach the Gulf.

Nevertheless, if Louisiana receives the full load of nutrients shed into the Mississippi system, its wetlands cannot absorb this tremendous burden. According to Mitsch and Day, even if all Louisiana reintroductions were opened to full capacity, sending 13 percent of the river flow over 1.2 million acres, it is estimated that only 5 to 10 percent of the total reduction needed could be achieved.

Reducing the river's nutrient load to acceptable levels will require coordinated efforts over the entire drainage basin. Until that is achieved, hypoxia, and its implied threat to Louisiana's fisheries, will continue to visit the Gulf coast each summer. **WM**

CAERNARVON

A Case Study



The Caernarvon diversion, downstream from New Orleans, has been operating since 1991 with the goal of enhancing fish and wildlife habitat, especially for oysters, by diverting fresh water, nutrients and a relatively small amount of sediment into the Breton Sound estuary. The project was designed to create an optimum salinity gradient across the marshes between the Mississippi River and the Mississippi River-Gulf Outlet, utilizing a flow schedule characterized by periods of moderate to low flow and designed to re-establish the salinity levels known previously in the Breton Sound estuary.

The Caernarvon diversion has been moving Mississippi River water through wetland marshes since 1991.

Beginning in 2001, John Day of Louisiana State University and a group of colleagues began a study known as PULSES. The study tested the hypothesis that the flow of water through a reintroduction should mimic the natural seasonal flooding of the river system. In other words, periods of high discharge (pulses) should be followed by little to no flow.

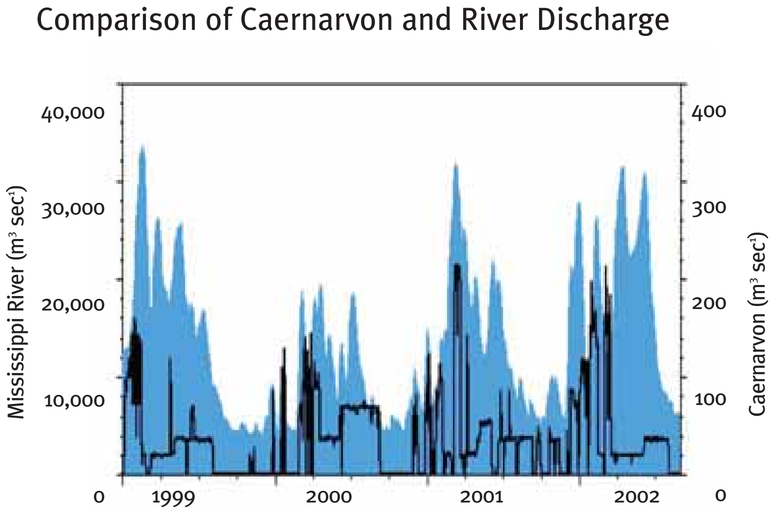
Working in cooperation with the Caernarvon project managers, the reintroduction schedule was modified to include times of greatly increased flow. Before and after each pulse, samples measuring sedimentation, nutrient uptake, chlorophyll and salinity were gathered. The resulting data clearly demonstrated that pulses have a major beneficial effect on the marshes.

- During times of high flow, the nutrient-rich and sediment-laden waters overflowed the channels and spread out, enriching wide areas of marsh.
- River water remained in the marsh for a longer period of time than during previous flows, allowing nutrient uptake to occur.
- Chlorophyll content increased, indicating that the introduced nutrients led to increased algal growth.

Other non-PULSES data collected at Caernarvon indicate that an excessive inflow of nutrient-rich fresh water and accompanying low salinities might harm oyster beds or shrimp populations and stimulate excess algal growth in the estuary. Nevertheless, the PULSES findings were so strongly positive that Caernarvon managers have adopted a temporary pulsed-flow management schedule before the PULSES study has been completed.

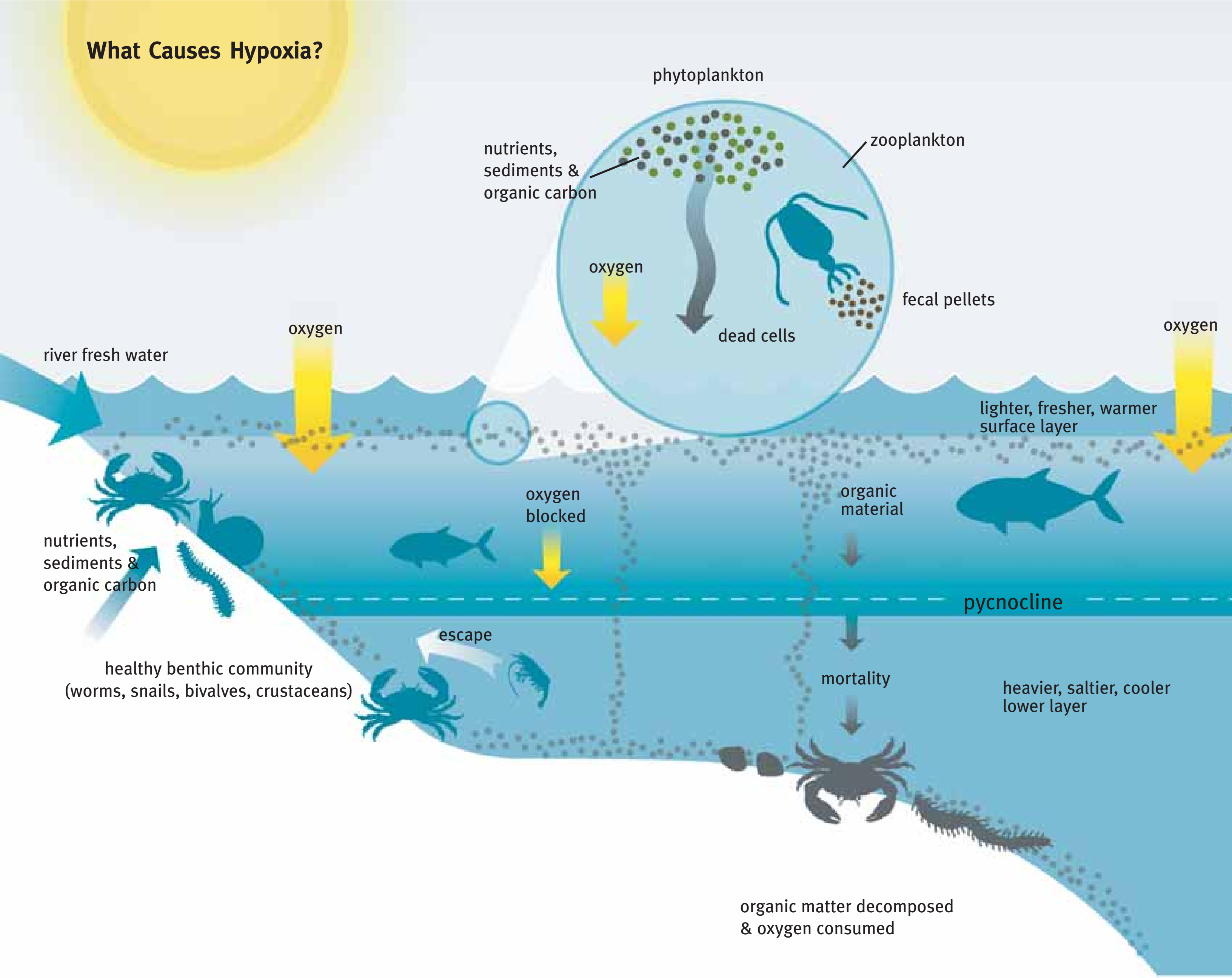
The sediments and nutrients that are prevented from reaching the Gulf by the Caernarvon reintroduction now bolster marsh ecosystems instead of contributing to the nutrient load offshore. If the pulsing flow pattern employed at Caernarvon is used as a model for other reintroductions along the Mississippi, coastal wetlands and the Gulf will both benefit. **WM**

The rate of water flow through the Caernarvon structure can be adjusted to optimize benefits to the marshes.



The PULSES study modeled the Caernarvon discharge (black) on the natural pattern of Mississippi River discharge (blue). The large pulses early in 2001 and 2002 reflect this approach. (Modified from Day et al., 2003)

What lies ahead for the DEAD ZONE?



When production increases in an ecosystem, organic matter, such as algal cells and fecal pellets, increases. This situation can lead to hypoxia when decaying bottom organic matter depletes oxygen and water stratification blocks oxygen replenishment. Upwelling oxygen-rich water or destruction of the stratification can alleviate this problem. Courtesy of the U.S. Environmental Protection Agency.

It is clear that, unless the nutrient load entering the northern Gulf is reduced, destructive hypoxia will appear each summer. However, three fundamental issues remain for scientists and regional stakeholders to address:

- What are the best ways to improve the Mississippi's water quality and reduce the river's nutrient load?
- What future effect will the Dead Zone have on Gulf fisheries?
- Can all partners in the watershed cooperate to improve the quality of the water in the Mississippi?

Reducing the Nutrient Load

A national task force, the Mississippi River—Gulf of Mexico Watershed Nutrient Task Force (the Hypoxia Task Force), has devised an action plan (www.epa.gov/msbasin, click on Challenges) to mitigate hypoxia in the northern Gulf of Mexico. Its goals include:

- develop a budget proposal
- establish subbasin committees
- determine research and nutrient-reduction strategies
- expand monitoring programs in the basin and the Gulf
- complete a reconnaissance study
- identify nutrient point sources
- begin wetland/buffer restoration projects
- implement best management practices

Among subsequent initiatives launched by universities and basin stakeholders, William Mitsch of Ohio State University and John Day of Louisiana State University have developed a watershed-wide plan to improve the water quality of the Mississippi, reduce its nutrient load and diminish the effects of hypoxia.

The recently completed $150,000 study, funded by the state of Louisiana and the U.S. Army Corps of Engineers, complements the goals of the Task Force action plan. It documents the loss of extensive water-filtering buffer zones along the Mississippi and its tributaries and recommends an ambitious plan to restore tens of millions of riverside wetland and forest acres at a cost of tens of billions of dollars.

Despite the enormity of this cost, when compared to the $8 billion needed to restore 1.4 million acres in the Florida Everglades, this restoration plan actually costs substantially less per acre. Besides restoring buffer zones, the plan also advocates establishing a nitrogen-credit system with incentives for the agricultural industry to reduce its application of nitrogen-based fertilizers.

Under the current Farm Bill, the Farm Security and Rural Investment Act of 2002, two important Department of Agriculture conservation strategies are already being implemented. Marginal wet croplands are being taken out of production and converted to wetlands by the Natural Resources Conservation Program, and the Farm Service Agency has worked to cover thousands of acres of easily eroded land with grass or trees, producing riverside buffer zones.

Future Fisheries

Better research is essential to predicting the long-reaching effects hypoxia may have on Gulf ecosystems and Louisiana fisheries. Revised research strategies are now exploring the consequences of the Dead Zone by gathering fisheries data in new ways. Instead of relating catch data to the port where the catch arrives, some fishing vessels have been equipped with global-positioning transponders that record the exact location where the catch is actually made. These "trip-ticket" data should prove invaluable in determining the health and forecasting the future of the Gulf fisheries.

Watershed Cooperation

The national Hypoxia Task Force supports establishing subbasin committees to coordinate research and actions to reduce nutrients. For example, Louisiana has joined Arkansas, Mississippi, Missouri and Tennessee in the Lower Mississippi Subbasin Committee. This group is identifying demonstration watersheds where the best management practices for nutrient reduction can be developed and showcased.

Avoiding new hierarchies, both the national and subbasin committees are utilizing existing organizations, programs and activities to further the goals of the action plan. Within Louisiana, the State Hypoxia Working Group has participants from organizations involved in Breaux Act coastal restoration, along with the Louisiana departments of Environmental Quality and Agriculture and Forestry, the Governor's Office of Coastal Activities and the Mississippi River Basin Alliance.

"We have a unique situation where all of these agencies are working together toward a common goal," said Dugan Sabins of the state committee.

Given the complexity of the hypoxia problem, the vast extent of the watershed involved and the severity of the potential consequences, scientists hope that funding for research and resolution is provided before full recovery is impossible. **WM**

WaterMarks Interview: John Day, LSU

WaterMarks: How big a problem is this Dead Zone? Is hypoxia something that's been around for years and we only just noticed it?

Day: I think this is a very serious problem, a growing problem that will only get much, much worse. Louisiana has two big problems, wetlands loss and hypoxia. They are related, with the potential in the coming decade for us to see catastrophic results.

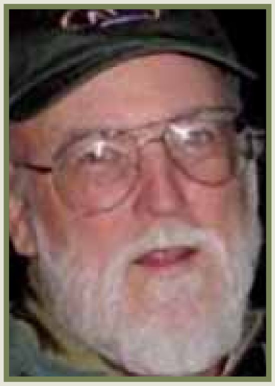
WaterMarks: So far the fisheries, the shrimpers and the recreational fishing industries have not been adversely affected by the Dead Zone. So why is this so important?

Day: There is a growing consensus, a strong expectation that this problem is going to become a critical one. How long will it be before the Dead Zone is so big that the fish simply run out of habitat to escape to? How long will it be before the coast is so fragmented that there is no coast left? We don't know if the problem will just get worse and worse gradually or if we will reach a critical threshold when the entire Louisiana fishery will collapse.

It's wrong to focus on just Louisiana. This is a national problem, a distributed problem and we need a distributed solution. We are all unified by this huge river system; we are all part of the problem; and we can and should be part of the solution. If we can reverse the trend of the last 50 years, reduce the hypoxia, reverse or at least slow the coastal wetlands loss, maybe we will be lucky enough to never find out how big a disaster this might have become.

WaterMarks: Are the farmers to blame for this mess?

Day: It would be a huge mistake to blame farmers for this problem. Nobody ought to be pointing a finger at anyone else. This is our problem in the same way that Louisiana's wetlands loss is our problem, the nation's problem. We were achieving national goals, agricultural production and flood control, as we created these problems. Now we need to make new national goals to solve these problems. We need to work together with the farmers and say "Hey, look, we need you to use only 2 or 3 percent of your farmland to make a first filter for the fertilizer runoff."



This is a win-win solution. The farmer saves money on fertilizer and gets a green area with more birds and other wildlife. A system for creating nitrogen credits in the same way as carbon credits are used to prevent global warming would help even more.

We would all get cleaner local water sources with all the health benefits of that. We would get flood reduction too, because the wetlands absorb the excess rainfall and some of the over-bank waters.

WaterMarks: Is it more important to solve the problem upstream first? How important are the Louisiana wetlands in solving this problem?

Day: Most of the problem is in the upper parts of the basin. Maybe 5 to 10 percent of the problem could be solved in Louisiana but I think it is important for Louisiana to be able to say it is doing its part. The delta wetlands can act as the "polisher" in removing the last bit of excess nitrogen, making the load of the river water that heads out to the Gulf in the range of 0.5 mg/liter, right what it should be.

WaterMarks: Can river-water reintroductions help? How can we be sure we aren't going to make the estuaries hypoxic instead of the Gulf?

Day: Reintroductions are the way to go for this problem. I am not too worried about hypoxia in the estuaries. They are too shallow and mix every day. There is no stratification. The danger to the estuaries is the possibility of algal blooms, possibly toxic ones. But the data at Caernarvon show that it is possible to get a significant drop in nitrogen levels across the area between the reintroduction and the estuary.

WaterMarks: If reintroductions can help, what is the best way to use a reintroduction?

Day: The best way to use a reintroduction is to send the water through in pulses, more water in a little time rather than a moderate flow of water all the time. Pulsing gets more water up and over the marsh surface, causing more sediment to be deposited and more nitrogen to be taken up. Robert Twilley of Louisiana State University has found that denitrification is much more efficient when the water leaves the channels, because the water is warmed by 5 to 10 degrees Celsius. The oyster beds also benefit because the low-salinity water is not constantly in the channels but is out on the marsh. When I began the pulsing study at Caernarvon, the preliminary data were so overwhelmingly positive that the study was not even finished before pulsing was adopted as the best management plan for that reintroduction.

WaterMarks: Does it look like there will be any funding for these projects, or for further research?

DAY: Right now we have piecemeal studies and we are trying to link these all together. I would like to see a large federal, state and private program, an integrated program, stretching from Minnesota down to Louisiana, doing research, buying land for conversion to wetlands, promoting nitrogen credits for farmers. I'm optimistic about it. We have an enormous opportunity to bring all players together in a win-win situation to move us down the road towards solving this problem.

WaterMarks: Don't we already know enough about the causes of the Dead Zone? Why should we do more research?

DAY: To those who say that we don't need any more research, I answer that the research here is not just academic study without practical results. It is done on the ground, meaning that each time a study is done, that wetland becomes part of the solution. Each study tells us more about where a wetland needs to be placed relative to the fertilizer source, how big it needs to be and how the water should flow through it for the best results.

Understanding where the wetlands should be is as important to the solution as knowing that we need them. A wetland that is improperly placed may attract ducks and other wildlife but it doesn't act as a filter for the adjacent farmland.

WaterMarks: Assuming that your big plan goes into effect, how many years might it be before we see any improvement? What is going to be happening during those years?

DAY: We're talking about a bunch of little steps that may need to be spread out over three decades of wetland restoration. But there will be a direct relationship to the hypoxia of the Gulf. Every little bit is going to help. But, just as importantly, the people in the rest of the watershed will be able to say "Hey, there are more birds around, the local drinking water is cleaner, the flooding is not as severe and we spend less money on fertilizer. We helped our neighbors in Louisiana too, and that means we can buy fish and shrimp for dinner!" **WM**

Dr. John Day is a Distinguished Professor in the Department of Oceanography and Coastal Science at Louisiana State University.

WaterMarks

Louisiana Coastal Wetlands Planning, Protection and Restoration News

September 2004 Number 26

Department of the Army
New Orleans District, Corps of Engineers
P.O. Box 60267
New Orleans, Louisiana 70160-0267

Official Business

First Class Mail
Postage and Fees Paid
U.S. Army Corps of Engineers
New Orleans District
Permit No. 80