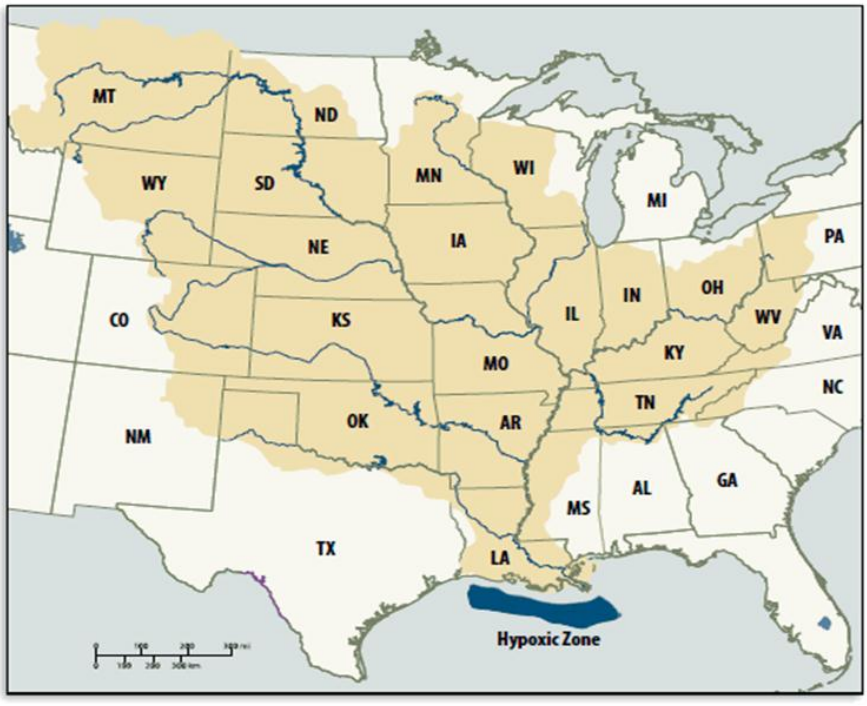
U.S. ENVIRONMENTAL PROTECTION AGENCY

OFFICE OF INSPECTOR GENERAL

Nutrient Pollution: EPA Needs to Work With States to Develop Strategies for Monitoring the Impact of State Activities on the Gulf of Mexico Hypoxic Zone

Report No. 14-P-0348 **September 3, 2014**



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Abbreviations

CWA	Clean Water Act
EPA	U.S. Environmental Protection Agency
GMPO	Gulf of Mexico Program Office
MARB	Mississippi-Atchafalaya River Basin
NPDES	National Pollutant Discharge Elimination System
USGS	United States Geological Survey

Cover image: The Mississippi-Atchafalaya River Basin and the hypoxic zone in the Gulf of Mexico (Map courtesy of the Mississippi River Gulf of Mexico Watershed Nutrient Task Force).

U.S. Environmental Protection Agency
Office of Inspector General

14-P-0348
September 3, 2014

At a Glance

Why We Did This Review

We sought to determine steps the U.S. Environmental Protection Agency (EPA) and states in the Mississippi River Watershed are taking to reduce nutrients that contribute to the Gulf of Mexico hypoxic zone.

Hypoxia is the term used to describe an area with low oxygen, which results in conditions adverse to most aquatic life. The hypoxic zone in the Gulf of Mexico forms every summer as a result of excess nutrients that flow from the 31 states and two Canadian provinces of the Mississippi-Atchafalaya River Basin (MARB), and seasonal stratification of gulf waters**.** The 5-year average size of the hypoxic zone is largely unchanged since 1994, at approximately 15,000 square kilometers. According to the United States Geological Survey, agricultural sources contribute more than 70 percent of the nutrients that enter the Gulf of Mexico, and an estimated 11.6 million metric tons of nitrogen are added to the MARB each year.

This report addresses the following EPA goals or cross-agency strategies:

- *Protecting America's waters.*
- *Launching a new era of state, tribal, local and international partnerships.*

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The full report is at: www.epa.gov/oig/reports/2014/20140903-14-P-0348.pdf

Nutrient Pollution: EPA Needs to Work With States to Develop Strategies for Monitoring the Impact of State Activities on the Gulf of Mexico Hypoxic Zone

What We Found

The EPA is working to reduce the size of the Gulf of Mexico hypoxic zone principally by encouraging states to develop and implement nutrient reduction strategies. This approach has some promising aspects that may result in positive effects to local waterways. States have developed partnerships and have identified priority watersheds.

The EPA lacks necessary data to determine the impact of state nutrient reduction strategies on the Gulf of Mexico hypoxic zone.

At the time of our review in early 2014, most of the MARB states had not completed nutrient reduction strategies. In addition, few of the states in our sample had committed to specific reduction targets or timelines. Some states have expressed concern over their limited ability to monitor water quality and measure the progress of the strategies. Without this information, the EPA will be unable to determine the level of progress toward achieving basin-wide pollution reduction goals.

Recommendation and Planned Agency Corrective Actions

We recommend that the Assistant Administrator for Water work with state and federal Task Force members in the Mississippi River Watershed to develop and enhance monitoring and assessment systems that will track the environmental results of state nutrient reduction activities, including their contribution to reducing the size of the Gulf of Mexico hypoxic zone.

The Office of Water agreed with our recommendation and presented acceptable corrective actions that address it. This recommendation is resolved based on the EPA's response and a subsequent meeting to discuss the Office of Water comments.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

THE INSPECTOR GENERAL

September 3, 2014

MEMORANDUM

SUBJECT: Nutrient Pollution: EPA Needs to Work With States to Develop Strategies for Monitoring the Impact of State Activities on the Gulf of Mexico Hypoxic Zone
Report No. 14-P-0348

FROM: Arthur A. Elkins Jr.

TO: Kenneth J. Kopocis, Deputy Assistant Administrator
Office of Water

This is our report on the subject evaluation conducted by the Office of Inspector General (OIG) of the U.S. Environmental Protection Agency (EPA). This report contains findings that describe the problems the OIG has identified and corrective actions the OIG recommends. This report represents the opinion of the OIG and does not necessarily represent the final EPA position. Final determinations on matters in this report will be made by EPA managers in accordance with established audit resolution procedures.

The EPA office having primary responsibility for implementing the audit recommendations included in this report is the Office of Water.

Action Required

In accordance with EPA Manual 2750, you are required to provide a written response to this report within 60 calendar days. You should include planned corrective actions and completion dates for all unresolved recommendations. Your response will be posted on the OIG's public website, along with our memorandum commenting on your response. Your response should be provided as an Adobe PDF file that complies with the accessibility requirements of Section 508 of the Rehabilitation Act of 1973, as amended. The final response should not contain data that you do not want to be released to the public; if your response contains such data, you should identify the data for redaction or removal along with corresponding justification.

We will post this report to our website at http://www.epa.gov/oig.

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Chapter 1
Introduction

Purpose

The purpose of this review was to determine the steps the U.S. Environmental Protection Agency (EPA) and states in the Mississippi River Watershed are taking to reduce nutrients that contribute to the Gulf of Mexico hypoxic zone.

Background

Nutrient pollution, or excess concentrations of nitrogen and phosphorous, of the nation's waters is one of America's most widespread, costly and challenging environmental problems. According to the EPA, half of the streams in the United States have medium to high levels of nitrogen and phosphorous. Nutrient pollution comes from a combination of sources, including agriculture, municipalities and industrial activities. High concentrations of nutrients in surface water stimulate an overproduction of algae. As the algae die off, the decomposition process consumes dissolved oxygen from the water column, creating conditions adverse to most aquatic life. Hypoxia is the term used to describe an area with very low oxygen. Ultimately, hypoxia causes a severe decrease in marine life and may affect species that rely on marine organisms for food.

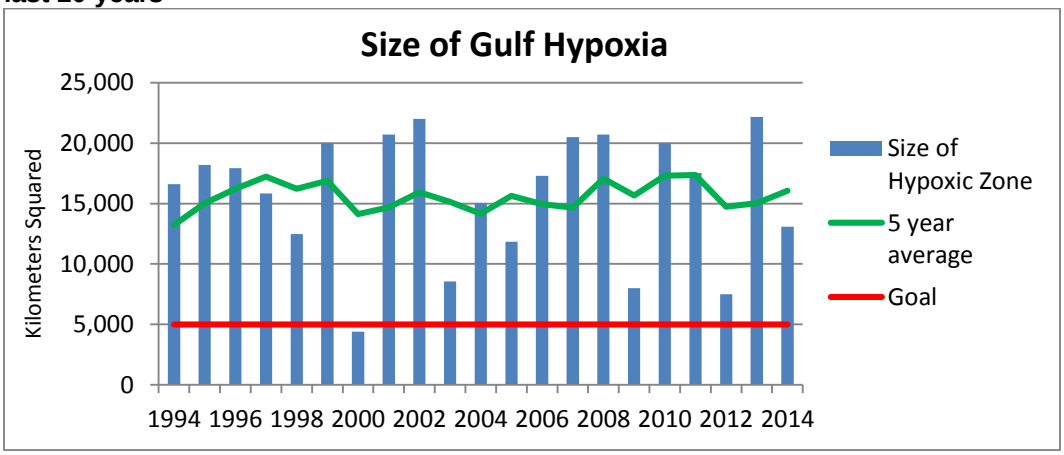
In addition to damaging marine life, hypoxia is a threat to human health. A harmful algal bloom in Lake Erie in August 2014 shut down the local water treatment facility, which left nearly 500,000 people in Toledo, Ohio without access to safe drinking water. According to a water notice issued by the City of Toledo, the algal toxins may cause adverse health effects. Symptoms range from diarrhea, vomiting, nausea, and numbness, to liver damage. According to the Ohio Lake Erie Phosphorous Task Force, the hazardous algal bloom is due to phosphorous from the Maumee River, which drains agricultural lands in Ohio and Indiana before discharging into Lake Erie. The EPA considers effluent from sewage treatment plants as a source of excess nutrients. While the most recent instance, this is not the first time that nutrient pollution affected drinking water sources. For example, In May, 2013 the Des Moines Iowa Water Works struggled to clean nitrates from water it supplies to its customers as a result of polluted runoff from farms.

Hypoxia is also a significant problem on America's Gulf Coast. The northern Gulf of Mexico hypoxic zone refers to an area along the Louisiana and Texas coasts and below the mouth of the Mississippi River. This hypoxic zone was first observed in 1972. It is the largest area of hypoxia in the United States and the second largest in the world. The long-term average size of the hypoxic zone is approximately 15,000 square kilometers (or 5,791miles) or roughly the size of Connecticut.

The hypoxic zone forms every summer as a result of excess nutrients that flow from the 31 states and two Canadian provinces of the Mississippi-Atchafalaya River Basin (MARB). According to the United States Geological Survey (USGS), agricultural sources contribute more than 70 percent of the nutrients that enter the Gulf of Mexico. The USGS also estimates that 11.6 million metric tons of nitrogen are added to the MARB each year; over half is from commercial fertilizer used for agriculture. The influx of nutrients and the resulting hypoxic zone negatively impact the Gulf's seafood industry, which produces one-third of the nation's seafood. The National Oceanic and Atmospheric Administration estimates the fishery resources of the Gulf are among the most valuable in the United States, generating $2.8 billion annually. Further, hypoxia leads to habitat loss, a decrease in biodiversity, and the alteration of the function and structure of the coastal ecosystem.

The 5-year average size of the hypoxic zone is largely unchanged since 1994 at 15,000 square kilometers (See Figure 1), with no sustained headway toward a 5,000 square kilometer goal set in 2001 by the Mississippi River/Gulf of Mexico Watershed Nutrient Task Force (Task Force) [1]. In 2007, the EPA's Science Advisory Board (SAB) reported that the goal was not achievable by 2015. To reduce the size of the hypoxic zone, the SAB recommended that nitrogen and phosphorous flux (or "loads") in rivers and streams in the MARB be reduced by 45 percent. In the 2008 *Action Plan*, the Task Force agreed with the SAB's conclusion regarding the 2015 goal, as well as acknowledging that the 45 percent reduction may be necessary.

Figure 1: Five-year average size of hypoxic zone substantially unchanged over the last 20 years



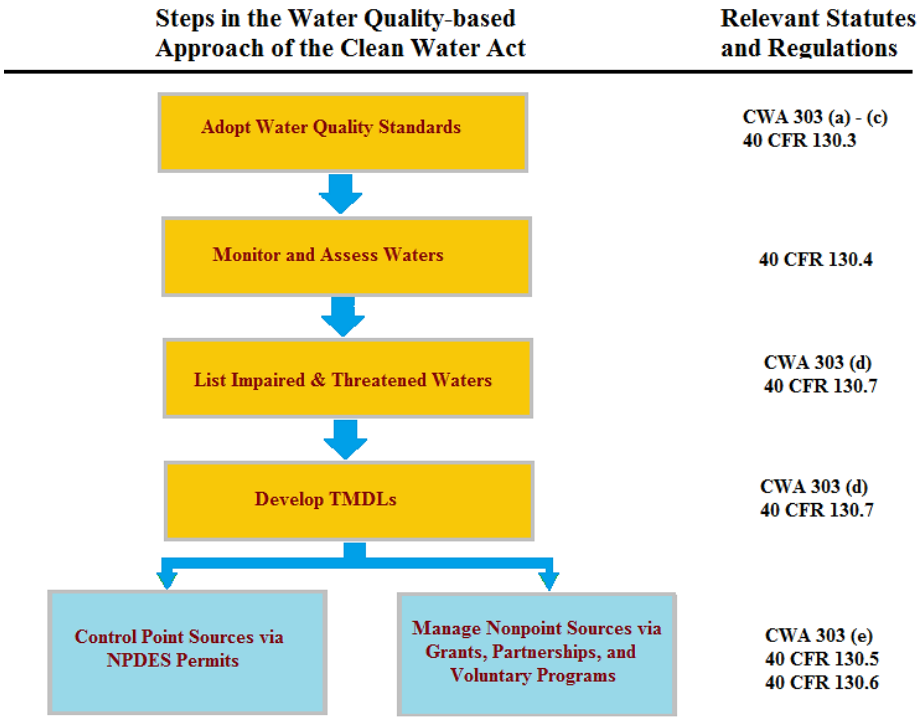
Source: OIG analysis of data from the Louisiana Universities Marine Consortium.

[1] The federal members are the U.S. Army Corps of Engineers, U.S. Department of Agriculture, U.S. Department of the Interior, National Oceanic and Atmospheric Administration, and the EPA. State members are Arkansas, Illinois, Indiana, Iowa, Kentucky, Louisiana, Minnesota, Mississippi, Missouri, Ohio, Tennessee and Wisconsin.

The Clean Water Act

The Clean Water Act (CWA) sets a national goal that all waters of the United States be fishable and swimmable. The process for achieving this goal involves multiple steps. These steps include establishing water quality standards, conducting monitoring, identifying "impaired waters," and developing a total maximum daily load (TMDL) (see Figure 2). The EPA and states can control point sources of pollution through issuing National Pollutant Discharge Elimination System (NPDES) permits. The states may obtain authority from the EPA to issue NPDES permits directly to facilities. To date, 46 states have obtained full or partial NPDES program authority.

Figure 2: Improving water quality through the CWA



Source: Adapted from EPA training module, *Understanding TMDLs.*

CWA Section 303(c)(2)(A) requires states to establish designated uses for waterbodies and adopt water quality criteria that are protective of those uses. Consideration for use and value for waterbodies includes public water supplies, propagation of fish and wildlife, recreation, agricultural, industry, and navigation. Under Section 303(d), states are required to develop lists of impaired waters. The EPA describes these waters as "too polluted or otherwise degraded to meet the water quality standards set by states."

The law requires that the states establish priority rankings and develop a TMDL for these waters. A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still safely meet water quality standards. CWA

Section 402, NPDES, regulates industrial, municipal and other point sources that discharge into waters of the United States. Facilities must obtain permits if their discharges go directly to surface waters. In contrast to the NPDES permit program, which includes regulatory controls over point sources, there are no required regulatory controls of nonpoint source discharges in the CWA.

EPA's Approach to Reduce the Gulf of Mexico Hypoxic Zone

The EPA's approach to reduce the Gulf hypoxic zone is based upon the Task Force states developing and implementing nutrient reduction strategies. The Task Force first encouraged this in the *2008 Action Plan* where it noted that "no single approach to nutrient reduction would be effective in every state." In 2011, the EPA published a memo entitled *Working in Partnership with States to Address Phosphorus and Nitrogen Pollution through Use of a Framework for State Nutrient Reductions* (the Nutrient Framework memo), which is a state-based strategy to reduce nutrient pollution nationwide. The EPA is assisting states in developing these strategies.

The Task Force is directed by a federal co-chair and a state co-chair. The current co-chairs are EPA (represented by the Assistant Administrator of the Office of Water) and the State of Iowa (represented by Iowa's Secretary of Agriculture). Established in 1997, the Task Force's role is to provide executive-level direction and support for coordinating the actions of participating organizations' work on nutrient management within the Mississippi River/Gulf of Mexico Watershed.[2] The Task Force members are involved in a variety of activities aimed at reducing nitrogen and phosphorus pollution to the Gulf of Mexico. Some of these activities include monitoring, modeling, outreach and education, and financial and technical assistance.

The Task Force issued *Action Plans* in 2001 and 2008. Each of these plans laid out 11 actions needed for reducing and controlling hypoxia in the Gulf of Mexico. The 2008 Action Plan called upon each of the 12 Task Force-member states to develop nutrient reduction strategies by the end of 2013. Promoting state adoption of these strategies is a key component of the Task Force's approach for decreasing the size of the hypoxic zone. Action Item #1 in the 2008 Action Plan states:

*"*Complete and implement comprehensive nitrogen and phosphorus reduction strategies for states within the Mississippi/Atchafalaya River Basin encompassing watersheds with significant contributions of nitrogen and phosphorus to the surface waters of the Mississippi/Atchafalaya River Basin, and ultimately to the Gulf of Mexico." [3]

[2] Charter of the Mississippi River/Gulf of Mexico Watershed Nutrient Task Force, May 1998.
[3] Mississippi River/Gulf of Mexico Watershed Nutrient Task Force *Gulf Hypoxia Action Plan 2008, page 32.*

The Task Force issued *Reassessment 2013: Assessing Progress Made Since 2008*, which reports details on state program developments since implementing the 2008 Action Plan. That same year the Task Force also released *Looking Forward: The Strategy of Federal Members of the Hypoxia Task Force.* The primary objective of this strategy "is to provide focused and effective support for the development, refinement, and implementation of state nutrient reduction strategies." The report describes federal efforts to support the state strategies. These efforts include providing additional scientific and technical assistance, expanding education and outreach on nutrient pollution, and working with landowners to foster voluntary conservation commitments.

In 2011, the EPA's Office of Water released a memorandum[4] reaffirming EPA's commitment to partnering with states to accelerate reduction of nitrogen and phosphorous loadings in the nation's waterways. The Office of Water established a series of recommended elements of a framework to reduce nutrient pollution through state nutrient reduction strategies. The strategies encourage collaboration between multiple levels of stakeholders including state and federal environmental and agricultural agencies and private landowners to achieve nutrient reductions in local waterways. Currently, this eight element approach for developing state nutrient reduction strategies is a major part of the Task Force's strategy for reducing the Gulf hypoxic zone. States are encouraged to use this framework to develop and implement their individual reduction strategies.[5]

Eight Framework Elements

1. Prioritize watersheds on a statewide basis for nitrogen and phosphorus loading reductions.
2. Set watershed load reduction goals based upon best available information.
3. Ensure effectiveness of point source permits in targeted/priority sub-watersheds for: wastewater treatment facilities, Concentrated Animal Feeding Operations and urban stormwater sources.
4. Agricultural Areas.
5. Storm water and Septic systems.
6. Accountability and verification measures
7. Annual public reporting of implementation activities and biannual reporting of load reductions and environmental impacts associated with each management activity in targeted watersheds.
8. Develop work plan and schedule for numeric criteria development.

Responsible Office

The EPA's Office of Water is responsible for implementing the CWA. It manages EPA programs to achieve the CWA goal that the nation's waters should be fishable and swimmable. The Office of Water provides guidance, specifies scientific methods and data collection requirements, performs oversight and facilitates communication. The office helps the states and tribes to build capacity, and water programs can be delegated to them for implementation. The effort to reduce nutrients nationally is a priority for the Office of Water.

[4] *Working in Partnership with States to Address Phosphorus and Nitrogen Pollution through Use of a Framework for State Nutrient Reductions*, EPA Office of Water, March 16, 2011.

[5] Refer to EPA's Mississippi River Gulf of Mexico Watershed Nutrient Task Force Website for links to state nutrient reduction strategies (http://water.epa.gov/type/watersheds/named/msbasin/nutrient_strategies.cfm).

Scope and Methodology

We interviewed staff and managers from the EPA's Office of Water, EPA Regions 5 and 7, the Gulf of Mexico Program and Chesapeake Bay Program Office. We also interviewed staff and managers from the environmental and agricultural departments in Illinois, Indiana, Iowa, and Missouri. These states account for roughly 48 percent of the nitrogen and 43 percent of the phosphorus load in the Mississippi River Watershed. Additionally, we interviewed staff from the USGS, and other individuals knowledgeable about the hypoxia issue. We reviewed final state nutrient reduction strategies for Iowa and Ohio, and draft strategies for Illinois, Indiana, Kentucky, Louisiana, Minnesota, Mississippi, Missouri and Wisconsin (Arkansas and Tennessee had no public documents available for review) to determine how states plan to reduce nitrogen and phosphorus loadings flowing into waterways. To further our understanding of large watershed management programs, we reviewed more than 20 studies conducted by leading scientists, academic researchers and government officials studying watershed restoration programs.

We conducted this performance audit from February 2013 to June 2014 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Prior Audit Coverage

EPA OIG Report No. 09-P-0223, *EPA Needs to Accelerate Adoption of Numeric Nutrient Water Quality Standards*, August 26, 2009:

This report evaluated the effectiveness of the EPA's actions to establish nutrient water quality standards in waters covered by the CWA. The OIG found that states had not been motivated to create these standards because implementing them is costly and often unpopular with various constituencies. Additionally, the EPA has not held the states accountable for milestone commitments nor had the agency adequately, until recently, used its CWA authority to promulgate water quality standards for States. The OIG recommended that the EPA select significant waters of national value which need numeric nutrient water quality standards to meet the requirements of the CWA, and set numeric water quality standards to meet CWA requirements for those waters. In addition, the OIG recommended establishing EPA and state accountability for adopting numeric nutrient standards for the rest of the Nation's waters; and metrics to gauge progress made by the States. The agency agreed with some but not all of the recommendations.

EPA OIG Report No. 13-P-0271, *Improved Internal Controls Needed in the Gulf of Mexico Program Office,* May 30, 2013:

The purpose of this audit was to determine whether the EPA's Gulf of Mexico Program Office (GMPO) had established effective internal controls over program operations. The OIG found that two of GMPO's performance measures are unrealistic in that they do not reflect what the office was set up to achieve. The two unrealistic measures involve the size of the hypoxic zone and the National Coastal Condition Report Index. Further, one strategic objective (environmental education) is not being measured. This occurred because GMPO had not performed an assessment of its strategic objectives and performance measures, as required by government-wide internal control standards. The OIG recommended that GMPO conduct a risk assessment of its strategic objectives and measures, and work with the Office of Water to adjust those measures to accurately reflect GMPO's mission. The OIG also recommended that GMPO complete actions to establish an office Web content review process. The agency agreed with almost all of the recommendations.

EPA OIG Report No. 08-P-0199, *EPA Needs to Better Report Chesapeake Bay Challenges -- A Summary Report,* July 14, 2008:

This report summarized several evaluations conducted by the OIG in response to a congressional request. The OIG found that despite many noteworthy accomplishments by the Chesapeake Bay partners, the Bay remains degraded and new challenges are also emerging. Bay partners need to address uncontrolled land development, limited implementation of agricultural conservation, practices, and limited control over air emissions affecting Bay water quality. The EPA does not have the resources, tools, or authorities to fully address all of these challenges. Farm policies, local land development decisions, and individual life styles have huge impacts on the amount of pollution being discharged to the Bay.

The OIG recommended that the EPA Administrator improve reporting to Congress and the public on the actual state of the Chesapeake Bay and actions necessary to improve its health. We also recommended that the Administrator develop a strategy to further engage local governments and watershed organizations to capitalize on their resources, tools, authorities, and information to advance the mission of the Chesapeake Bay, and provide the Chesapeake Bay Program Office with the opportunity to comment on proposed rulemaking related to pertinent air issues. The EPA concurred with all of the recommendations in this report.

Chapter 2
State Strategies Need Measurement Systems

Reducing nutrients in the MARB is a significant challenge to the EPA and states. The EPA's current approach to addressing hypoxia in the Gulf of Mexico is centered on individual state strategies to achieve long-lasting nutrient reductions. This could provide state environmental and agriculture agencies the potential opportunity to better collaborate and identify priority watersheds within their state. However, the focus of the state-driven strategies is on improving local water quality rather than reducing the size of the Gulf hypoxic zone. As of February 2014 most of the Task Force states had not completed their strategies. Further, our review of draft and completed strategies indicates that few states are committing to specific nutrient reduction targets or timelines. Additionally, regional staff and state managers agree that monitoring is a challenge. However, without water quality monitoring data, the EPA will be unable to determine the impact of state nutrient reduction strategies on reaching basin-wide nutrient reduction goals.

Reducing Nutrients in the MARB Is a Significant Challenge

Achieving reductions in nutrients that contribute to the Gulf of Mexico hypoxic zone poses a significant challenge to the EPA and states. This challenge is due to the vast size of the Mississippi River Watershed, the lack of CWA regulatory authority over nonpoint source pollution, and competing environmental priorities:

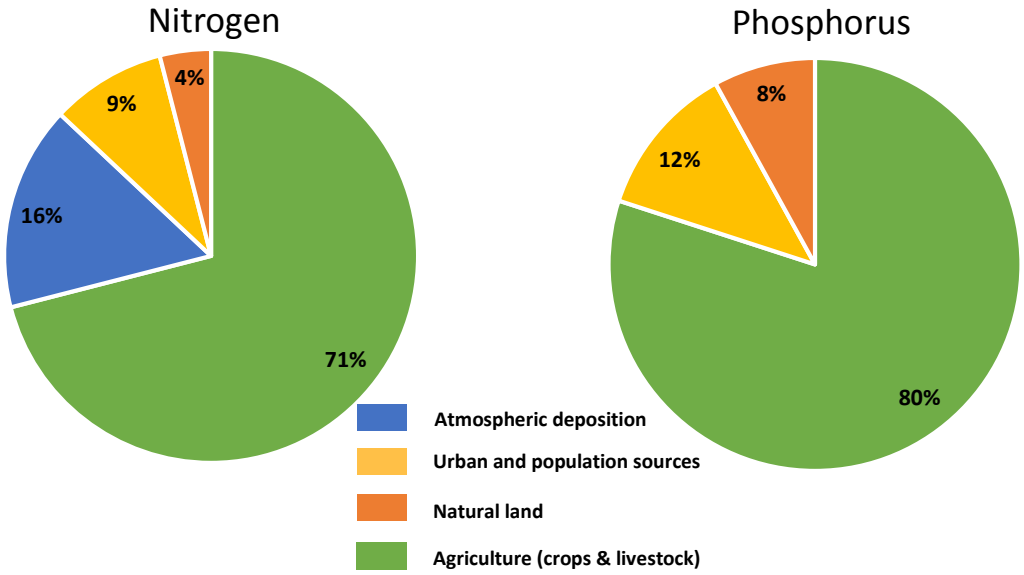
Size of the MARB watershed: The MARB is the third largest watershed in the world. It covers 41 percent of the contiguous United States with over 1.2 million square miles. The 1.18 million farms in the MARB cover approximately 843,000 square miles of the watershed.

Limited regulatory authority over the most significant source of pollutants: Most of the nitrogen and phosphorus that contribute to the hypoxic zone come from activities that are largely unregulated by the CWA. The USGS estimates that agricultural sources contribute more than 70 percent of the nitrogen and phosphorus delivered to the Gulf (see Figure 3).

Competing public policy priorities: The 2005 Energy Policy Act established the country's first renewable fuel mandate. This mandate was intended to reduce energy imports but it also leads to more land being put into corn production. This increases the amount of nutrients applied to the soil. A 2008 study predicted that meeting the U.S. goal of 15-36 billion gallons of renewable fuels by 2022 would increase the dissolved inorganic nitrogen load to the MARB by between 10 and

34 percent.[6] The article states, "Examination of extreme mitigation options shows that expanding corn-based ethanol production would make the already difficult challenges of reducing nitrogen export to the Gulf of Mexico and the extent of hypoxia practically impossible without large shifts in food production and agricultural management."

Figure 3: Sources of nutrients released into the Gulf of Mexico



Source: OIG analysis of USGS data: http://water.usgs.gov/nawqa/sparrow/gulf_findings/primary_sources.html.

State Nutrient Reduction Strategies Have Been Slow to Develop and Are Missing Essential Components

The 12 states in the Mississippi-Atchafalaya River Basin with significant nutrient contributions (also known as the 12 "Task Force states") have been slow to develop strategies despite the 2008 Task Force goal of strategy completion by no later than 2013. Only two states, Iowa and Ohio, have a final strategy. To date, only three states—Iowa, Minnesota and Wisconsin—had set nutrient reduction goals. Of these three states, only Minnesota has a timeframe for meeting these goals. Without both goals and timeframes, we believe the EPA and the states will be unlikely to determine if these strategies are reducing nutrients in the MARB.

The EPA encouraged these 12 states to develop methods to track progress toward achieving nutrient reduction goals, but these states have been reluctant to commit to this. The OIG reviewed EPA regional comments on four state strategies that

[6] Donner, Simon D., and Christopher J. Kucharik. "Corn-based ethanol production compromises goal of reducing nitrogen export by the Mississippi River." *Proceedings of the National Academy of Sciences* 105.11 (2008): 4513-4518.

were available (Iowa, Minnesota, Ohio, and Wisconsin). The EPA regional staff requested that states:

- Develop a timeframe for activities included in the strategy.
- Plan for measuring progress of the strategy.
- Request further analysis and support for determining the effectiveness of best management practices.

Our review of both draft and completed strategies indicates that most do not include nutrient reduction goals or timeframes to achieve nutrient reductions (see Table 1).

Table 1: Status of state nutrient reduction strategies in Task Force states

Task Force State	Final Strategy (Y/N)	Nutrient Reduction Goal	Timeframe for achieving reduction goal
Arkansas	State has not reported when it will produce a draft or final		
Illinois	N	None	None
Indiana	N	None	None
Iowa	Y	45% N and P Reduction	None
Kentucky	N	None	None
Louisiana	N	None	None
Minnesota	N	20% N Reduction; 35% P Reduction	By 2025
Mississippi	N	None	None
Missouri	N	None	None
Ohio	Y	None	None
Tennessee	State has not reported when it will produce a draft or final		
Wisconsin	N	45% P Reduction Only	None

Source: OIG analysis of Task Force states Nutrient Reduction Strategies from the EPA website: http://water.epa.gov/type/watersheds/named/msbasin/nutrient_strategies.cfm.

Of the 12 Task Force states, only Iowa and Minnesota established nitrogen and phosphorus reduction goals. Wisconsin only has phosphorus reduction goals. The other states do not have nutrient reduction goals. Minnesota's draft strategy is the only one with a timeframe for achieving nutrient reductions. By 2025, the state set reduction goals of 20 percent for nitrogen and 35 percent for phosphorous. While this is a positive step, Minnesota accounts for just 2.9 percent of nitrogen and 2 percent of phosphorus discharged to the Gulf of Mexico according to the USGS. The other 11 Task Force states contribute approximately 80 percent of the nitrogen and phosphorus reaching the Gulf of Mexico. Most of these states do not have nutrient reduction goals, and therefore have no timeframe for achieving nutrient reductions. Iowa and Wisconsin have goals, but do not have a timeframe for achieving these goals.

The state and regional personnel we interviewed expressed a concern about their ability to monitor water quality and to a lesser extent, measure the progress of the strategies. They cited various reasons, including financial and technical constraints. Measurement and verification methods are complicated because

several factors need to be considered when determining the success of the state strategies.

One important factor, according to USGS, is tracking changes in land management practices such as farm field drainage systems and conservation practices. Both the USGS and The National Academies have expressed the concern that currently there is no clear way to track this and therefore no way to determine the effectiveness of specific management practices in reducing nutrient loadings. Additionally, it is often difficult to draw a causal link between changes in land management practices and the resulting nutrient load because there is often a lag time. It could take years or even decades for the effects to be fully realized.

Table 2 contains a summary of the status of monitoring and establishing milestones, according to state officials we interviewed. These four states account for roughly 48 percent of nitrogen and 43 percent of phosphorus flowing into the Gulf of Mexico.

Table 2: Status of measures in four key Task Force states

State	Status of monitoring and establishing milestones
Illinois	Relies on data gathered from fertilizer sales to estimate nutrient loadings from agricultural sources. The Bureau of Water Chief stated that Illinois has an overall goal of 45% reductions in phosphorous and nitrogen loadings.
Indiana	While the 45% nutrient reduction goal is not planned for the state strategy, the Chief of the Watershed Assessment Branch stated it is important to conduct baseline monitoring before establishing any reduction goals for Indiana Started including phosphorus monitoring requirements in NPDES permits and Best Available Technology phosphorus limits of 1 mg/L in NPDES permits that discharge up to 40 miles upstream of a lake.
Iowa	While Iowa is committed to the Task Force's 45 percent nutrient reduction goal, the Director of the Iowa Nutrient Research Center voiced concerns about the magnitude of change that is required to reach this goal.
Missouri	The state has not yet established nutrient reduction goals and doesn't have baseline data to gauge progress of reductions. Requires all point sources that discharge more than 100,000 gallons per day to monitor for nutrients.

Source: OIG analysis of state-provided agricultural and environmental information.

While the strategy-based approach shows promise for reducing nutrients and improving local water quality, progress in strategy development has been slow. Additionally, many of the strategies do not include reduction goals and milestones. This will make it difficult to hold states accountable for reductions. The states and regions expressed the need for a well-defined comprehensive monitoring program to measure the progress and efficacy of activities undertaken as part of state strategies.

State Nutrient Reduction Strategies Have Promising Aspects

State nutrient reduction strategies have several promising features and encourage collaboration between environment and agricultural stakeholders. We spoke with environmental and agricultural staff and managers in Illinois, Indiana, Iowa, and Missouri, which as stated above, account for roughly 48 percent of nitrogen and 43 percent of phosphorus flowing into the Gulf of Mexico. Most expressed optimism that their strategies would result in a reduction of nutrient and improvements in local water quality. In addition, these four states have already identified, or have plans to identify priority watersheds. This is consistent with element #1 of the EPA's Nutrient Framework Memo. Representatives from the environmental and agriculture departments in Illinois, Indiana and Iowa stated that they require or have plans to require phosphorus water quality-based limits or technology-based effluent limits in NPDES permits for point sources such as wastewater treatment facilities. An assistant director from the Missouri Department of Natural Resources stated that the state currently requires nutrient monitoring in selected NPDES permits, which could lead to phosphorus and nitrogen limits in the future.

In Iowa, state agencies are collaborating with universities to design and implement the state strategy. The Iowa state legislature provided $1.5 million to establish a nutrient research center with three public universities. The center has funded 10 research projects in 2013-2014 to pursue science-based approaches to areas that include evaluating the performance of current and emerging nutrient management practices, and providing recommendations on implementing the practices and developing new practices. The Director of the Iowa Nutrient Research Center stated that there will be annual reporting on progress and on adoption of practices.

State Strategies' Emphasis on Local Waterways Needs to be Augmented with a Focus on the Larger Watershed

The state environmental and agricultural program managers we interviewed explained that nutrient reduction efforts are currently aimed at improving water quality in local waterways. This is consistent with the Nutrient Framework Memo element #1, *Prioritize watersheds on a statewide basis for nitrogen and phosphorus loading reductions.* While an emphasis on local waters is vital for achieving the nation's clean water goals, there is no assurance that individual state successes will result in the nutrient reductions needed for the watershed as a whole.

In its 2013 Federal strategy, the Task Force stated that the primary priority of the document is "to provide focused and effective support for the development, refinement, and implementation of state nutrient reduction strategies." As we noted in chapter 1, the Task Force's first action item is to develop strategies that reduce nutrients ". . . ultimately to the Gulf of Mexico." To efficiently reduce nutrient

loadings affecting the hypoxic zone, the work of individual states will therefore need to be coordinated. We believe that over the long term, the EPA and its partners on the Task Force will need to promote a watershed-level focus for the state strategies in the MARB.

Conclusions

Reducing the size of the hypoxic zone poses a significant challenge. While the Task Force states are in the process of developing and implementing nutrient reduction strategies, there is no requirement for states to ensure that they will fully implement them and that the practices implemented will achieve the intended watershed-level environmental goal. An ambitious environmental goal such as reducing the size of the hypoxic zone must be addressed by a well-designed and implemented plan that also recognizes the challenges for the EPA and states. This includes a uniform and comprehensive measurement and accountability system for setting goals and tracking progress at the state and watershed level. The EPA and other federal Task Force members need to lead as well as support states in developing a measurement system that includes essential baseline data and tracking progress toward goals using consistent measures.

Recommendation

We recommend the Assistant Administrator for Water:

1. Work with state and federal Task Force members in the Mississippi River Watershed to develop and enhance monitoring and assessment systems that will track the environmental results of state nutrient reduction activities, including their contribution to reducing the size of the Gulf of Mexico hypoxic zone.

Agency Comments and OIG Evaluation

The agency agreed with our recommendation and presented corrective actions that address it. It outlined four activities that will enhance monitoring and systems for tracking environmental results of state nutrient reduction activities. These activities involve (1) improving measures of state reduction strategy performance, (2) reporting changes in nitrogen and phosphorous concentrations in MARB streams and rivers from the National Rivers and Streams Assessment, (3) establishing a shared reporting network of sites with long-term nutrient monitoring and streamflow records to analyze changes in nutrients and sediments over time, and (4) updating the 2008 Action Plan through its involvement in the Gulf Hypoxia Task Force Work Group. And notably, EPA plans to publish the results of these activities in a biennial report to Congress required under the newly enacted *Harmful Algal Bloom and Hypoxia Research Control Amendments Act of 2014*. The first report will be completed in June 2015. Based on the Office of Water official response and a subsequent meeting we held

with them, we consider the proposed corrective actions to be responsive and the recommendation is resolved.

Appendix A contains the Office of Water's response. We also received technical comments from the Office of Water which are incorporated into the report as appropriate.

Status of Recommendation and Potential Monetary Benefits

RECOMMENDATIONS						POTENTIAL MONETARY BENEFITS (in $000s)	
Rec. No.	Page No.	Subject	Status[1]	Action Official	Planned Completion Date	Claimed Amount	Agreed-To Amount
1	13	Work with state and federal Task Force members in the Mississippi River Watershed to develop and enhance monitoring and assessment systems that will track the environmental results of state nutrient reduction activities, including their contribution to reducing the size of the Gulf of Mexico hypoxic zone.	O	Assistant Administrator for Water	6/30/15		

[1]O = Recommendation is open with agreed-to corrective actions pending.
C = Recommendation is closed with all agreed-to actions completed.
U = Recommendation is unresolved with resolution efforts in progress.

Office of Water Response to Draft Report

July 28, 2014

MEMORANDUM

SUBJECT: Response to Office of Inspector General Draft Report/ Project No. OPE-FY13-0012, "EPA Needs to Work with States to Develop Strategies for Monitoring the Impact of State Activities on the Gulf of Mexico Hypoxic Zone" dated June 30, 2014

FROM: Nancy K. Stoner
Acting Assistant Administrator

TO: Arthur A. Elkins, Jr.
Inspector General

Thank you for the opportunity to respond to the issues and recommendation in the subject audit report. Following is a summary of the Office of Water's overall position, along with its position on the report recommendation. We have provided high-level intended corrective actions and estimated completion dates for that recommendation. For your consideration, we have included a Technical Comments Attachment to supplement the response.

OFFICE OF WATER'S OVERALL POSITION:
The Office of Water concurs with the recommendation detailed in the report.

OFFICE OF WATER'S RESPONSE TO REPORT RECOMMENDATION: (See next page)

Agreements

No.	Recommendation	High-Level Intended Corrective Action(s)	Estimated Completion by Quarter and FY
1	We recommend that the Assistant Administrator for Water work with state and federal Task Force members in the Mississippi River watershed to develop and enhance monitoring and assessment systems that will track the environmental results of state nutrient reduction activities, including their contribution to reducing the size of the Gulf of Mexico hypoxic zone.	**Biennial Report to Congress** The Harmful Algal Bloom and Hypoxia Research Control Amendments Act of 2014 was enacted on June 30, 2014. It requires the Administrator of the Environmental Protection Agency, through the Hypoxia Task Force, to submit a progress report to appropriate congressional committees and the President within 12 months after the Act's enactment and biennially thereafter. The report will describe the progress made by activities directed by the HTF and carried out or funded by the EPA, and the other federal and state members, toward attainment of the goals of the Gulf Hypoxia 2008 Action Plan. For example, it will assess the progress made toward nutrient load reductions, the response of the hypoxic zone, and water quality in the Mississippi/Atchafalaya River Basin. Below are four current corrective action efforts that address the recommendation. The progress report can be used to provide the status of these and future activities aimed at developing and enhancing monitoring and assessment systems, with the goal of tracking the environmental results of state strategy implementation. **Measuring progress on reducing nutrient loads** At the spring 2014 HTF Executive Session, the HTF state and federal members agreed to identify a set of four to six common measures that all HTF states would use in measuring progress in implementing nutrient strategies. This would not preclude states from developing additional measures to track strategy implementation progress. We expect that the process will be completed by the end of the calendar year. **Long term assessment of environmental conditions and trends** The National Rivers and Streams Assessment (NRSA) is a statistically-representative probability-based monitoring survey undertaken every five years by EPA and its state and federal partners. We plan to use data and analysis generated by the NRSA surveys to report on the ecological condition of rivers and streams in the MARB and its sub-basins, including nitrogen	June 30, 2015, and every other year thereafter.

		and phosphorus concentrations. These surveys are conducted every five years to track long-term changes in water quality across the country. A draft of the first NRSA survey was released in 2013, and based on samples that were collected in 2008 and 2009. In 2016, we will report on changes in nitrogen and phosphorous concentrations in MARB streams and rivers at the Basin and sub-basin levels, based on data collected in 2013/2014. More information on NRSA and other National Aquatic Resource surveys can be found on their website: http://water.epa.gov/type/watersheds/monitoring/aquaticsurvey_index.cfm **Gathering existing site-specific monitoring from many Basin sources into a single location** The HTF formed a MARB Monitoring Collaborative in 2012. The United States Geological Survey is leading this effort, with the participation of all HTF states and the EPA. The Collaborative aims to establish a shared reporting network of existing sites with long-term nutrient monitoring and streamflow records. The intent is to use this data to analyze changes in nutrients and sediments over time. **Gulf Hypoxia Task Force Work Group** The HTF formed a work group at the Coordinating Committee level in spring 2013 to make recommendations to revise the Coastal Goal in the 2008 Hypoxia Action Plan and include possible incremental measures for tracking nitrogen and phosphorus load reduction activity in the Basin. The work group will be making final recommendations to the HTF on this issue at the 2014 fall HTF meeting.	

CONTACT INFORMATION

If you have any questions regarding this response, please contact Joe Piotrowski, HTF Coordinating Committee Co-Chair, Office of Water/Office of Wetlands, Oceans, and Watersheds on (215) 814-5715. The alternate contact is Hazel Groman, Hypoxia Team Leader, Office of Wetlands, Oceans and Watersheds/Assessment and Watershed Protection Division. Her phone number is (202) 566-1219.

cc: Michael H. Shapiro
Marilyn Ramos
Chris Orvin

Appendix B

Distribution

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