Iowa’s Nutrient Problem –
Iowa is the Major Contributor to the Dead Zone in the Gulf of Mexico

For many years the media have been reporting on Iowa’s nutrient reduction strategy and the dead zone in the Gulf of Mexico off the coast of Texas and Louisiana.

The dead zone, also called hypoxic zone, is an area that is so depleted of oxygen that fish and other marine animals are not able to live in the water. The northern Gulf of Mexico has the largest area affected by hypoxia in the United States. In 2017, the dead zone in the Gulf of Mexico, covered an area the size of New Jersey. Nutrients – nitrogen and phosphorus – are the culprits, beginning a cycle of spurring the growth of algae and leading to a decomposition process that uses the oxygen in the water and leaves less oxygen available for the marine life.

Iowa Nitrogen and Phosphorus Pollution Contributes to the Dead Zone in the Gulf of Mexico

The water in Iowa’s streams and rivers eventually flows into the Mississippi River and the Gulf of Mexico. Consequently the nitrogen and phosphorus pollution from Iowa’s waters is a direct contributor to the dead zone in the Gulf of Mexico.

A major study, released in the spring of 2018, titled “Iowa stream nitrate and the Gulf of Mexico” by Christopher S. Jones, Jacob K. Nielsen, Keith E. Shilling, and Larry J. Weber lays out the contribution Iowa makes to the dead zone in the Gulf of Mexico. To summarize the results of the study:

- Three major watershed basins drain into the Gulf of Mexico – Mississippi-Atchafalaya Basin, Upper Mississippi River Basin, and the Missouri River Basin.
- The hypoxia is driven by nitrogen and nitrates.
- Iowa contributes an average of 29% of the nitrate load to the Upper Mississippi Basin.
- Iowa contributes an average of 45% of the nitrate load to the Missouri River Basin.
- Iowa contributes an average of 55% of the nitrate load to the Mississippi-Atchafalaya Basin.
- Since 1999, nitrate loads in the Iowa-inclusive basins have increased.
- The increases in nitrate loads do not appear to be driven by changes in discharge and cropping intensity unique to Iowa.

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2 Keeley Belva, “Gulf of Mexico ‘dead zone’ is the largest ever measured”, Media Release, National Oceanic and Atmospheric Administration, August 2, 2017
• The 5-year running annual average of Iowa nitrate loading has been above the 2003 level for ten consecutive years.
• The goals of reducing the dead zone in the Gulf of Mexico will be very difficult to achieve if nitrate retention cannot be improved in Iowa.3

Further, most of the nutrient pollution comes from Iowa’s farmland:
• Ninety-two percent of the nitrogen and eighty percent of the phosphorus in Iowa’s waters originates from non-point sources,4 which includes runoff from farm fields and lawns.
• The remaining eight percent of the nitrogen and twenty percent of the phosphorus comes from sewage treatment plants and industries that are directly discharging into rivers and streams.5
• Ninety percent of the nitrates in Iowa’s waters come from Iowa’s crop land
• Seventy-two percent of Iowa’s landmass is dedicated to crops.6

A comparison of the water flowing off Iowa’s landscape into the three basins affecting the dead zone in the Gulf of Mexico indicates that Iowa is a relatively small contributor to the overall quantities of water flowing into the major water basins.7 At the same time the contribution to the nitrate-nitrogen load is significantly higher than the lower levels of water flowing into the basin and the overall land area in the basin.

3 Christopher S. Jones, Jacob K. Nielsen, Keith E. Shilling, and Larry J. Weber, “Iowa stream nitrate and the Gulf of Mexico”, PLOS One, April 12, 2018, abstract. Available at http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0195930
And
Marie-Pier Hebert, Vincent Fugere, and Andrew Gonzalez, “The overlooked impact of rising glyphosate use on phosphorus loading in agricultural watersheds”, Frontiers in Ecology and the Environment, December 5, 2018
And
Christopher S. Jones, Chad W. Drake, Claire E. Hurby, Keith E. Schilling, Calvin F. Wolter, “Livestock manure driving stream nitrate”, Royal Swedish Academy of Sciences, December 19, 2018
And
7 Christopher S. Jones, Jacob K. Nielsen, Keith E. Shilling, and Larry J. Weber, “Iowa stream nitrate and the Gulf of Mexico”, PLOS One, April 12, 2018, page 2.
<table>
<thead>
<tr>
<th>River basin</th>
<th>Iowa’s contribution to water in the basin</th>
<th>Iowa’s contribution to the nitrate-nitrogen load in the basin</th>
<th>Iowa’s land area in the basin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mississippi-Atchafalaya River Basin</td>
<td>5.9%</td>
<td>29%</td>
<td>4.5%</td>
</tr>
<tr>
<td>Upper Mississippi River Basin</td>
<td>21.0%</td>
<td>45%</td>
<td>21.0%</td>
</tr>
<tr>
<td>Missouri River Basin</td>
<td>12.0%</td>
<td>55%</td>
<td>3.3%</td>
</tr>
</tbody>
</table>

Clearly Iowa is playing an outsized role in contributing to the dead zone in the Gulf of Mexico.

The Iowa Department of Natural Resources, along with researchers at Iowa State University, undertook a mapping project to identify on-the-ground techniques that have been implemented that reduce nutrients – grassed waterways, ponds, terraces, water and sediment control basins, contour strip cropping, and contour buffer strips and prairie strips. Between 2007 and 2010, airplanes mounted with LIDAR mapping technology were flown across the state. Since this mapping was performed three years before Iowa’s nutrient reduction strategy was published, this work establishes the baseline to evaluate the implementation of nutrient-reducing projects across the state.

Complicating the matter is the number of livestock living in the state. Iowa’s 110 million chickens, turkeys, pigs, and cattle, along with Iowa’s 3.2 million human residents, generate the amount of waste as 168 million people. The livestock manure is applied to farm fields. Ensuring that manure remains on the fields where it can be used by crops and so it is not running off the fields is challenging.

The Nitrate Problem Also Affects Iowa’s Drinking Water

Nitrates are already affecting Iowan’s drinking water sources.

On July 17, 2018, Greenfield, Iowa, residents were told to avoid drinking the city’s water after an algae bloom in its water source - Lake Greenfield. Ultimately testing showed no harmful toxins in the drinking water.

During the summer of 2018, in Iowa City, the University of Iowa Water Plant installed a reverse-osmosis system that will remove nitrates from drinking water. The water plant draws its water from the Iowa River. At times, that water became so high in nitrates that it was diluted with well water.

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8 Press release, "Initial statewide mapping of conservation practices now complete", Iowa Department of Natural Resources, July 21, 2018
Also Rod Boshart, “Iowa takes inventory of conservation practices", *Cedar Rapids Gazette*, August 1, 2018
9 Erin Jordan, “Mapping conservation practices", *Cedar Rapids Gazette*, August 5, 2018
10 Donnelle Eller, “50 Shades of Brown: Iowa ranks No. 1 in, ahem, No. 2, UI researcher calculates”, Des Moines Register, June 10, 2019
11 “Bottled Water Advisory Issued for Greenfield After Water System Potentially Contaminated”, *WHO TV*, July 17, 2018
12 Mike Peterson, “Greenfield water situation improving”, *KMA Radio*, July 20, 2018
13 Julia Poska, “UI Water Plant to target nitrate with reverse osmosis”, *The Daily Iowan*, July 30, 2018
The Des Moines Water Works uses an ion exchange process to remove nitrates from its drinking water.14 The Water Works pulls its drinking water from the Raccoon River and from the Des Moines River, both which periodically reach high levels of nitrates. The Water Works first installed nitrate-removal equipment in the 1990s.15

Policy

It is obvious that Iowans will need to work diligently to reduce the overall contribution of nitrates into the waters flowing to the Gulf of Mexico.

Iowa’s Nutrient Reduction Strategy, published in 2013, aims to reduce Iowa’s contribution of nutrients by 45 percent. Working toward this goal will significantly reduce the dead zone in the Gulf of Mexico. The effort entails:

- Adequate money needs to be available to fund projects to improve water quality in Iowa. Iowa has begun investing in practices that improve the levels of nutrients entering our water bodies, but the levels of investment are not nearly large enough to solve the problem. The projects that would be funded include installing stream buffers, bioreactors, and saturated buffers; planting cover crops; and installing grassed waterways and prairie strips.
- Numerical standards for nutrients for Iowa’s rivers, streams, and lakes should be established, including a reasonable date for each water body to meet the standards.
- Each of the major watersheds and lakes should be regularly monitored for nutrients throughout the year. Iowa needs to expand the network of water quality monitoring sensors. Currently 88 percent of the land in Iowa drains into a location with water quality sensors16; this needs to reach 100 percent.
- Regular updates of the LIDAR maps showing nutrient-reducing techniques should be produced, along with evaluations of the changes on the landscape versus how successful the techniques are in reducing the nutrient contribution by the state.

Taxpayers expect that their taxes will be wisely spent on projects to reduce nutrients. Farmers need to be able to identify practices that effectively reduce those nutrients. Numerical standards provide a target to meet. If you don’t have a measurable target, you don’t know if you are hitting the target or if you need to continue working on improvements. Regular monitoring tells if the targets are being met.

The goal of the national effort to reduce the dead zone in the Gulf of Mexico was to cut the nitrate and phosphorus pollution reaching the Gulf by 45 percent by 2015, with a dead zone of 1,900 square miles. That goal has not been met. Instead, the average size of the dead zone is 5,772 square miles, three times larger than the goal.17

Iowa can and must do better in reducing nutrients.

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14 http://www.dmww.com/water-quality/treatment-process/
15 Clay Masters, “Iowa’s Nasty Water War, Des Moines’ lawsuit against farming counties is about more than just pollution”, Politico Magazine, January 21, 2016
16 “Summary of Progress of the Iowa Nutrient Reduction Strategy, 2017-18 Reporting Period”, Iowa Department of Agriculture and Land Stewardship, Iowa Department of Natural Resources, and Iowa State University College of Agriculture and Life Sciences
17 Erin Jordan, “Treading Water: Unfocused and underfunded, clean water goal falters”, Cedar Rapids Gazette, December 2, 2018