

Drain Tiling, the Hidden Accelerator of Water Pollution

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STORY AT-A-GLANCE

- › Industrial agriculture is a primary source of water pollution and toxic algae growth that result in huge dead zones where all aquatic life is suffocated
- › With the high levels of spring and summer rains seen in many parts of the Midwest this year, NOAA estimates the summer 2019 dead zone in the Gulf of Mexico will reach roughly 7,829 square miles, which is about the size of Massachusetts
- › The speed of agricultural runoff is largely dictated by poor soil conditions that prevent water retention, but artificial drainage also appears to play a decisive role, adding to the problem by speeding up the runoff
- › In recent years, there's been a significant uptick in the practice, and it's not entirely known just how much of our farmland is being artificially drained into our waterways
- › According to one research engineer, drainage tiles double the speed at which nitrates enter waterways

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I've written many articles discussing how industrial agriculture is a primary source of water pollution and toxic algae growth that result in huge dead zones where all aquatic life is suffocated.¹ There are 18 major river basins² in the continental U.S., with the largest belonging to rivers that feed the Mississippi River,³ currently the fifth-most polluted river in the world.⁴

A July 2, 2019, presentation⁵ in The Wall Street Journal offers an in-depth look at how agricultural expansion is driving the Mississippi River's demise. You can scroll through fact boxes for each section of the river, starting in the north and moving all the way down to the Gulf.

Where the Mississippi River runs through Iowa, The Wall Street Journal points to artificial tile drainage being a major problem. It's believed a majority of Iowa's farmland has artificial drainage that increases the speed at which excess nutrients are delivered into the river, and ultimately the Gulf, which the Mississippi River empties into.

Dead Zone in Gulf of Mexico Keeps Growing

Whatever enters a waterway upstream will travel downstream, and this includes runoff from agricultural lands. As explained by the U.S. Environmental Protection Agency:⁶

"Farmers apply nutrients on their fields in the form of chemical fertilizers and animal manure ... [W]hen nitrogen and phosphorus are not fully utilized by the growing plants, they can be lost from the farm fields and negatively impact air and downstream water quality."

With the high levels of spring and summer rains seen in many parts of the Midwest this year, the National Oceanic and Atmospheric Administration estimates⁷ the summer 2019 dead zone in the Gulf of Mexico will reach roughly 7,829 miles, which is about the size of Massachusetts, and bigger than the 5,770 square-mile, five-year average size.

According to The New Food Economy,⁸ Independence Day festivities had to be canceled in many Mississippi beach areas as toxic algae had taken over, making water play too risky a venture. The algae bloom also killed all the oysters in one of the state's harvesting regions.⁹

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The speed of agricultural runoff is largely dictated by poor soil conditions that prevent water retention, but artificial drainage also appears to play a decisive role, adding to the problem by speeding up the runoff. As noted by Carleton College in Minnesota, tile drainage “provides an expressway by which water on the fields is drained away ...”¹⁰

Drain tiling is a relatively unknown agricultural strategy, despite having been done for decades. In a nutshell, it involves installing a network of subsurface drainage tubes 2 to 4 feet below ground to siphon off excess water. As explained by Mike Winslow, staff scientist with the Lake Champlain Committee:¹¹

“Groundwater flows through the pipes rather than the soil, because the pipes offer a pathway of least resistance. As a result, the groundwater table is lowered to the depth of the pipes thus ensuring that a crop’s roots won’t become water logged, and that fields drain earlier in the spring. The pipes are usually oriented to discharge into a nearby stream, though in some cases, the discharge may just be to an area lower in elevation.”

According to the Des Moines Register, about half of Iowa’s cropland would be unsuitable for farming were it not for drain tiling,¹² as the water table is too close to the soil surface.

By lowering the water table, crops are able to develop deeper root systems, which augments growth. Chris Jones, a research engineer with The University of Iowa, cites research suggesting drain tiling can increase crop yields by 30% or more.¹³

According to the Des Moines Register,¹⁴ much of subterranean drainage in the U.S. was installed during the 1920s through 1940s. However, in recent years, there’s been a significant uptick in the practice, and it’s not entirely known just how much of our farmland is being artificially drained into our waterways.

As reported by the Twin Cities Pioneer Press,¹⁵ the Bois de Sioux Watershed District approved 2.9 miles of drain tile to be installed in 1999. Ten years later, in 2009, permits had risen to 779.3 miles, and in 2011, permits for 1,558.3 miles were handed out.

“While tiling data aren’t nearly as precise elsewhere, the surge is beyond dispute,” Pioneer Press notes,¹⁶ adding that, “In some places, grassy areas that once harbored wildlife are being plowed under and tilled to plant corn and soybeans.”

Drain Tiling Doubles Speed of Pollution Delivery

While drain tiling may be an attractive option, allowing farmers to grow crops on less than ideal land, the practice has serious ramifications for the environment as it dramatically increases the speed at which nutrient runoff enters our rivers and streams.

Since the water is shuttled out through pipes, higher amounts of nutrients also enter the waterways, as it’s no longer being filtered through soil along the way. Rainwater that used to make its way into aquifers or simply evaporate is also being routed into our waterways instead.¹⁷ As reported by Des Moines Register:¹⁸

“Drainage tiles have cut in half the average time it takes nitrates to enter Iowa waterways, Keith Schilling, a research engineer at the University of Iowa, said.

That flow is even more dramatically accelerated in heavily tilled areas. ‘The tiles in particular short-circuit a lot of the natural processing that would go on as groundwater would slowly move through the system,’ he said.

That means the water misses the cleansing that would naturally occur through trees, shrubs and grasses in riparian buffers along streams. Or it could percolate through soil, potentially to the aquifer. Without it, experts say, it leads to higher concentration of nitrates in the river and waterways.”

Speaking about conditions at Lake Champlain, situated on New York’s Adirondack Coast, Winslow notes:¹⁹

“Tiling was seen as a way to increase the social and economic well-being of the region. Today, that has shifted and more researchers are exploring the effects of tiling on the ecosystem and nutrient loading to our waters. There is no question

that the water discharged to streams via tiles carries nutrients which contribute to algae blooms.

Tile drains increase the discharge of nitrogen, which moves quickly through groundwater. However, nitrogen is usually considered secondary to phosphorus in promoting Lake Champlain algae blooms. Unlike nitrogen, phosphorus is not mobile in groundwater.

Instead, most of it attaches to soil particles. On the other hand, dissolved phosphorus, which is more easily taken up by algae than sediment-bound phosphorus, can be found in tile drainage. It is not clear however, whether tiling leads to an increase in phosphorus discharge ...

In addition to nutrients, tiling changes the overall hydrology of the landscape. Historically, tiling has been used to drain wetlands, reducing the water storage capacity of the land. Water reaches stream courses more quickly from tiled fields, potentially exacerbating flooding and erosive stream flows."

There's No Data on Environmental Effects

Similar concerns are echoed by experts in Minnesota. Tom Kalahar, a conservation technician for the Renville County Soil and Water Conservation District, spoke with Twin Cities Pioneer Press, saying the Minnesota River is being treated "like a large drainage ditch." Pioneer Press reports:²⁰

"I find it fairly alarming and hypocritical of federal and state governments to put all the emphasis on clean water and flood management and then continue to ignore the 800-pound gorilla in the room," Kalahar added, referring to tiling.

'To me, it tells us we're nowhere near any serious change in water management in the state of Minnesota' ... Despite all the tiling going on, no one knows exactly how much is taking place in new areas, how much simply replaces or upgrades old systems, how much allows grasslands to be cultivated, or how much actually destroys or degrades wetlands, potholes and sloughs.

'Is there data? No,' Kalahar said. 'Everybody should be shocked by that ... It's one of the best-kept secrets in the world ... There is very little data being gathered. It's the hidden infrastructure that the public doesn't have a clue about. No government agency wants to regulate tiling because (regulation) is politically unpopular with the ag community.'

There is evidence suggesting environmental harm is definitely being sped up by tiling, though. Aside from the fact that nitrate levels are rising and dead zones are growing, Pioneer Press²¹ cites research by Shawn Schottler that looked at how artificial drainage affects riverbank erosion and sediment levels in the Minnesota River.

His findings reveal an increase in both, and at an unnatural rate. According to Schottler, artificial drainage (in which he also includes runoff from parking lots, roads and yards) is “not the only driver, but it's the major driver” of erosion and sedimentation.

Iowa Lawsuit Goes Nowhere

March 2015, board trustees of the Des Moines Water Works sued three county boards that supervise several drainage districts over the high level of nitrates ushered by drainage tiles into the Raccoon River, which supplies drinking water to central Iowa residents. The utility sought “money damages and other remedies to recover its costs to remove nitrates from Raccoon River water.”²²

Two years later, the District Court for the Northern District of Iowa ruled against the utility, dismissing all of its claims. According to a March 17, 2017 press release by Des Moines Water Works:²³

“The ruling states that drainage districts have no authority to redress Des Moines Water Works' harm, thus the utility has no standing to sue the drainage districts.

Since the ruling concluded Des Moines Water Works could not bring this lawsuit, the ruling does not address whether agricultural drainage tile is a 'point source' as defined by the Clean Water Act.

The ruling also states Des Moines Water Works cannot assert claims based on the Iowa and United States Constitutions against drainage districts ... While many in the agriculture community took issue with the lawsuit, nobody objected to the facts that we presented in the case ...

In fact, Chief Justice Cady of the Iowa Supreme Court recognized in his opinion on January 27, that: 'One of the fundamental principles of law is for remedies to be available when we discover wrongs. Pollution of our streams is a wrong, irrespective of its source or its cause.'"

Regenerative, Grass Fed, Biodynamic Agriculture Is the Answer

Regenerative farming reduces soil erosion and topsoil destruction²⁴ while improving fertility and biodiversity.²⁵ The process significantly diminishes water demand,²⁶ thus reducing the need for irrigation. Regenerative farming also eliminates the need for synthetic fertilizers, thereby protecting our waterways from toxic pollution and algal blooms.

It seems like an exercise in madness to keep spending time and money on strategies such as drain tiling just to be able to continue the status quo of industrial farming, rather than doing something completely different that will actually permanently solve a whole host of environmental problems.

Farmers install artificial drainage to protect profits, but evidence shows regenerative strategies will do that as well – without harming the environment in the process.

At some point, we must realize that our current food system is unsustainable and will lead to the destruction of mankind rather than nourish and sustain a growing population. Industry wide changes are perhaps most effectively driven by consumer demand, though, and demand has certainly been a driving force in rise of organics and grass fed beef.

There's no doubt choosing **biodynamically grown food** is a positive solution that can improve fertilizer runoff and the environment as a whole. The use of regenerative

agriculture techniques like cover crops and no-till farming, which improve soil health and reduce runoff and the need for chemical fertilizers and herbicides, which then benefits waterways, has become a more or less essential long-term survival strategy.

Where to Find Environmentally Friendly Food

If you live in the U.S., the following resources can help you find farm fresh foods locally. While many grocery stores now carry organic foods, it's preferable to source them from local growers whenever possible, as many organic foods sold in grocery stores are imported.

Also remember to choose organic, grass fed/pasture-raised beef, poultry and dairy, in addition to organic or biodynamic produce, as [concentrated animal feeding operations](#) are yet another major source of environmental pollution.

[Demeter USA](#) – Demeter-USA.org provides a directory of certified Biodynamic farms and brands.

[American Grassfed Association \(AGA\)](#) – The goal of the American Grassfed Association is to promote the grass fed industry through government relations, research, concept marketing and public education.

Their website also allows you to search for AGA approved producers certified according to strict standards that include being raised on a diet of 100% forage; raised on pasture and never confined to a feedlot; never treated with antibiotics or hormones; and born and raised on American family farms.

[EatWild.com](#) – EatWild.com provides lists of farmers known to produce raw dairy products as well as grass fed beef and other farm-fresh produce (although not all are certified organic). Here you can also find information about local farmers markets, as well as local stores and restaurants that sell grass fed products.

Weston A. Price Foundation – Weston A. Price has local chapters in most states, and many of them are connected with buying clubs in which you can easily purchase organic foods, including grass fed raw dairy products like milk and butter.

Grassfed Exchange – The Grassfed Exchange has a listing of producers selling organic and grass fed meats across the U.S.

Local Harvest – This website will help you find farmers markets, family farms and other sources of sustainably grown food in your area where you can buy produce, grass fed meats and many other goodies.

Farmers Markets – A national listing of farmers markets.

Eat Well Guide: Wholesome Food from Healthy Animals – The Eat Well Guide is a free online directory of sustainably raised meat, poultry, dairy and eggs from farms, stores, restaurants, inns, hotels and online outlets in the United States and Canada.

Community Involved in Sustaining Agriculture (CISA) – CISA is dedicated to sustaining agriculture and promoting the products of small farms.

The Cornucopia Institute – The Cornucopia Institute maintains web-based tools rating all certified organic brands of eggs, dairy products and other commodities, based on their ethical sourcing and authentic farming practices separating CAFO "organic" production from authentic organic practices.

RealMilk.com – If you're still unsure of where to find raw milk, check out Raw-Milk-Facts.com and RealMilk.com. They can tell you what the status is for legality in your state, and provide a listing of raw dairy farms in your area. The Farm to Consumer Legal Defense Fund²⁷ also provides a [state-by-state review of raw milk laws](#).²⁸ In California, **Raw Farm**, formerly Organic Pastures, is licensed to sell raw dairy products.

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