



# Clean Water in the Upper Mississippi River Basin: Economic Importance, Threats, and Opportunities

**Water is one of our nation's priceless resources**, essential to life itself. Healthy ecosystems and a robust economy depend on plentiful, clean water — and unlike almost all other resources, water has no substitute. It's why businesses in all sectors support protecting clean water — whether as a direct component of their operations or simply to keep their communities and employees healthy. And in the Upper Mississippi River Basin (UMRB), clean water is big business. **American Sustainable Business Council (ASBC)** has worked tirelessly to support legislation protecting and improving our clean water supplies. Business leaders and other concerned Americans can add their voices to our vital effort at <https://cleanwatersbasin.asbcouncil.org/>.

## The Upper Mississippi River: Supporting a Vibrant Economy

The UMRB covers approximately 189,000 square miles in Illinois, Iowa, Minnesota, Missouri, and Wisconsin; including the Upper Mississippi River (UMR) and the many rivers, streams, and other bodies of water that feed into it. From its headwaters in Minnesota to its confluence with the Ohio River in southern Illinois, the UMR covers nearly 1,300 miles and contains a series of locks and dams making a significant portion navigable. Each day, over seven billion gallons of water are extracted from the UMR, most of it used as cooling water in energy production along the river.<sup>1</sup> The UMR corridor, made up of 133 counties on or adjacent to the UMR, contributes over \$345 billion in annual economic activity and supports over 1.86 million jobs in the manufacturing, tourism, recreation, agriculture, commercial navigation and energy sectors.<sup>2</sup>

The health and navigability of the UMR is crucial to the region's economic prosperity because numerous sectors depend on the basin's clean water for extractive and non-extractive uses. Millions of tourists from all over the world visit the state parks, national historic landmarks, interpretive centers, and scenic outlooks in the river basin, bringing \$20.6 billion to the local economy and supporting more than 358,000 jobs.<sup>3</sup> Recreation in the UMRB contributes \$4 billion to the region's economy through wildlife watching, hunting, fishing, camping, boating, cycling and hiking in two million acres of protected conservation land in counties along the river.<sup>4</sup>



Agriculture is a \$25-billion industry in the UMR corridor that supports 136,000 jobs. More than 20.7 million acres in the UMRB are covered by farms, over 70% of which is cropland or pasture.<sup>5</sup> Water drawn from the basin for irrigation and livestock must be clean to ensure that food being grown is not contaminated with pathogens that can transmit diseases to farmworkers and consumers.<sup>6</sup> Historically, flooding in Mississippi River corridor has deposited the rich soil that has made agriculture so successful in the region, but dams and levees have disrupted this process.<sup>7</sup> Balancing such variables remains a challenge.

Clean water is also essential to the food and beverage industry in the region. The thriving craft beer industry relies on a steady supply of clean water, as any changes in water supply can threaten the quality of their final product's flavor, aroma, and other factors.<sup>8</sup> Minnesota's more than 150 breweries produce

<sup>1</sup> <http://www.umrba.org/facts.htm>

<sup>2</sup> <http://www.umrba.org/umr-econ-profile.pdf>

<sup>3</sup> Ibid.

<sup>4</sup> Ibid.

<sup>5</sup> Ibid.

<sup>6</sup> <https://www.ncbi.nlm.nih.gov/pubmed/15633699>

<sup>7</sup> <https://scholarworks.uvm.edu/cgi/viewcontent.cgi?article=1002&context=casfac>

<sup>8</sup> [https://www.nrdc.org/sites/default/files/media-uploads/brewers\\_letter\\_opposing\\_dirty\\_water\\_rule\\_-\\_march\\_2019.pdf](https://www.nrdc.org/sites/default/files/media-uploads/brewers_letter_opposing_dirty_water_rule_-_march_2019.pdf)



*The UMR corridor contributes over \$345 billion in annual economic activity and supports over 1.86 million jobs.*

over 600,000 barrels of craft beer for a total of \$2 billion in annual revenue. In Illinois, breweries produce 385,874 barrels of craft beer generating \$2.6 billion in economic impact each year.<sup>9</sup>

A clean, healthy river significantly enhances property values and supports a thriving riverfront economy.<sup>10</sup> Cities along the Upper Mississippi River have continued revitalizing downtown areas to attract new business and promote economic growth. For example, the Minneapolis Parks Foundation, a philanthropic partner of the Minneapolis Park and Recreation Board, is moving forward with RiverFirst, to “transform the Upper Mississippi Riverfront into a regional economic engine and world-class cultural and recreational destination.”<sup>11</sup>

Manufacturing companies in the UMR corridor — including steel manufacturers, chemical companies, paper mills, cement production facilities, and oil refineries — make up the region’s largest sector, bringing in \$282.5 billion in annual revenue and providing 49 percent of the area’s jobs. Nearly every step in the manufacturing process requires water, whether to transport goods, to

clean and rinse products, or to include as a product ingredient.<sup>12</sup> For these industries, clean water is crucial to minimize damaging or contaminating equipment, protect or boost the quality of the end product, and reduce the cost of water and wastewater treatment.<sup>13</sup> Because these operations rely so heavily on dependable supplies of clean water, manufacturers have a profound interest in protecting the health and quality of the river basin.

The benefits of clean water to businesses across the river basin cannot be overstated. Waters from the UMRB launched the region’s economy and are crucial to its ongoing revitalization. All businesses need a healthy workforce, healthy customers and an uncontaminated supply chain to survive. Reliably available, clean water will stimulate growth and opportunities for a variety of sectors in every community dependent on the river basin.

### Threats to the Upper Mississippi River Basin

Despite the necessity of clean water for the region’s economy, human activity across the river basin poses a variety of threats to water quality.<sup>14</sup> The conversion of the region’s landscape for human use interacts with, and exacerbates, all the threats discussed in this report. The destruction of forests, prairies, and wetlands for agriculture and paved surfaces alters the flow and filtration of water throughout the basin, allowing more pollution to enter the river and increasing the risk of flood.<sup>15</sup> As a positive alternative, a report recent found that restoring and protecting 200,000 acres in the headwaters of the Mississippi River in Minnesota would create about \$130 million in direct benefits by reducing water treatment costs, preserving property values, reducing flood damages and retaining tourism revenue and jobs.<sup>16</sup>

### Runoff

Runoff water is rain and snowmelt not immediately absorbed and filtered by the ground that instead seeps into streams, ponds, rivers, lakes and oceans. As this water flows over surfaces, it picks up substances that contaminate the waterways it enters. The loss of natural biomes to human development exacerbates runoff pollution — the forests, grasslands and wetlands that store and purify water are giving way to farming and housing, which alter runoff patterns and deliver more runoff into water-

<sup>9</sup> <https://www.brewersassociation.org/statistics/by-state/?state=MN>; <https://www.brewersassociation.org/statistics/by-state/?state=IL>  
<sup>10</sup> <https://www.usnews.com/news/cities/articles/2018-10-02/rust-belt-cities-turn-to-riverfront-development-for-economic-boost>;  
<https://www.glc.org/work/blue-economy/GLRI-economic-impact/case-studies>  
<sup>11</sup> <https://mplsparksfoundation.org/riverfirst/>; <https://mplsparksfoundation.org/2019/01/14/riverfirst-in-the-news/>  
<sup>12</sup> [http://www.allianceforwaterefficiency.org/Manufacturing\\_Introduction.aspx](http://www.allianceforwaterefficiency.org/Manufacturing_Introduction.aspx)  
<sup>13</sup> <https://www.pca.state.mn.us/sites/default/files/wq-rule4-06f.pdf>; <https://www.naturalproductsinsider.com/regulatory/understanding-importance-clean-water-manufacturing-natural-products>  
<sup>14</sup> [http://dels.nas.edu/resources/static-assets/materials-based-on-reports/reports-in-brief/miss\\_river\\_cwa\\_final.pdf](http://dels.nas.edu/resources/static-assets/materials-based-on-reports/reports-in-brief/miss_river_cwa_final.pdf); <http://americaswatershed.org/report-card/the-basins/upper-mississippi-river/>  
<sup>15</sup> <http://stateoftheriver.com/state-of-the-river-report/>  
<sup>16</sup> [https://www.nature.org/content/dam/tnc/nature/en/documents/Business\\_Case\\_for\\_Protecting\\_the\\_Mississippi\\_2019.pdf](https://www.nature.org/content/dam/tnc/nature/en/documents/Business_Case_for_Protecting_the_Mississippi_2019.pdf)

ways.<sup>17</sup> Surface water runoff from agricultural land, urban areas, and industrial zones can carry high levels of nutrients and chemicals that degrade water quality.

### Nutrient Pollution

For the UMRB in particular, nitrogen and phosphorus runoff from agriculture is the biggest source of pollution.<sup>18</sup> High concentrations of these nutrients in runoff water stimulate the growth of algae. The excess of algae and the increase in aquatic life that results use up dissolved oxygen in the water. Many aquatic species cannot survive when oxygen levels plummet, resulting in massive die-offs of fish and other wildlife. These algal blooms can also be toxic to humans, leading to reduced recreational use and revenues, along with increased water treatment costs in the area.<sup>19</sup>

About 50 percent of streams in the UMRB have high nitrogen levels and about 23 percent have high phosphorus levels.<sup>20</sup> As a result, algal blooms are very common in the Upper Mississippi and its tributaries.<sup>21</sup> In Iowa and Minnesota, it is even common for beaches to close during the summer due to algal blooms.<sup>22</sup> This nutrient pollution does significant damage downstream: most nitrogen running into the Gulf of Mexico originates in the UMRB. Every summer, nutrient runoff from the Mississippi River causes a dead zone to form in the Gulf of Mexico that has reached sizes large enough to cover the entire state of New Jersey.<sup>23</sup> The Gulf area supplies more than half of the nation's shrimp and oysters, and if this nutrient runoff isn't reduced at the source, the seafood industry and coastal businesses will be drastically impaired.<sup>24</sup> It's estimated that these industries already lose tens of millions of dollars because of damage from nutrient pollution.<sup>25</sup>

Nutrient pollution also inflicts significant economic damage on other sectors. Every year, excess nutrients in waterways cause \$1 billion in losses in the U.S. tourism industry, mainly through reduction of fishing and boating activities.<sup>26</sup> Value of property near water with high nutrient pollution can drop by as much as \$85,000. Nitrogen pollution can also give drinking water a foul

*“Clean water is mission critical for my organic baby food business and many others. Up and down the Mississippi River Basin and across the country, even businesses that don't depend deeply on clean water for their core business, need clean water for their employees at work and at home.”*

- Ashley Rossi,  
Founder and CEO,  
Tiny Human Food, Naperville, IL.

taste and odor and pose serious health risks.<sup>27</sup> Federal law mandates drinking water providers keep nitrogen below levels known to increase the chance of 'blue baby syndrome,' a condition in newborns where lack of oxygen causes sickness and sometimes death. However, studies show that long-term exposure even to lower levels of nitrogen in drinking water may increase rates of birth defects and cancer.<sup>28</sup> A USDA study estimates that the cost to all public and private sources of removing nitrogen from U.S. drinking water is over \$4.8 billion per year.<sup>29</sup> In Minnesota, the need to use nitrogen-removal systems caused water supply costs to rise from 5–10 cents per 1000 gallons to over \$4 per 1000 gallons.<sup>30</sup>

### Agricultural Practices

Agricultural practices may also have detrimental impacts on water quality in the area. Elevated levels of nutrients, bacteria from animal feces, soil erosion, and pesticide usage all must be monitored as threats to the UMR and its tributaries.

Nitrogen and phosphorus are naturally present in soils, but most farms also apply fertilizers containing these nutrients. Studies show that increases in the concentration of row-crop soy and corn agriculture in an area leads to more nutrient pollution in nearby waterways.<sup>32</sup> Overproduction and poor soil and water management

<sup>17</sup> <http://www.startribune.com/interactive-the-urgent-threats-facing-the-mississippi-river/393294531/>

<sup>18</sup> <http://stateoftheriver.com/state-of-the-river-report/>

<sup>19</sup> <https://ojs.grinnell.edu/index.php/tillers/article/view/33>

<sup>20</sup> [https://www.epa.gov/sites/production/files/2015-03/documents/epa-marb-fact-sheet-112911\\_508.pdf](https://www.epa.gov/sites/production/files/2015-03/documents/epa-marb-fact-sheet-112911_508.pdf)

<sup>21</sup> <https://www.noaa.gov/media-release/gulf-of-mexico-dead-zone-is-largest-ever-measured>

<sup>22</sup> <https://www.waltonfamilyfoundation.org/stories/k-12-education/river-at-risk-the-mississippi>

<sup>23</sup> <https://www.ers.usda.gov/amber-waves/2018/september/cost-effective-strategies-for-reducing-cropland-nutrient-deliveries-to-the-gulf-of-mexico/>

<sup>24</sup> <https://serc.carleton.edu/microbelife/topics/deadzone/index.html>

<sup>25</sup> <https://www.epa.gov/nutrientpollution/effects-economy>

<sup>26</sup> <http://www2.epa.gov/nutrientpollution/effects-economy>; <https://economyths.org/2015/11/11/myth-treat-it-to-beat-it-water-pollution-that-is/>

<sup>27</sup> <https://www.epa.gov/sites/production/files/2015-04/documents/nutrient-economics-report-2015.pdf>

<sup>28</sup> <https://e360.yale.edu/features/in-the-heart-of-the-corn-belt-an-uphill-battle-for-clean-water-iowa>

<sup>29</sup> [https://www.ers.usda.gov/webdocs/publications/44918/6767\\_err127.pdf?v=41056](https://www.ers.usda.gov/webdocs/publications/44918/6767_err127.pdf?v=41056)

<sup>30</sup> <https://www.epa.gov/nutrientpollution/effects-economy>

***“Nutrient loading is one of the greatest threats to our business lines on the river because it compromises water quality, impedes manufacturing, and depresses the tourism and recreation industries that account for the second-largest economy on the waterway.”***<sup>31</sup>

– 2018 Mississippi River Cities & Towns Initiative, comprised of mayors of cities along the Mississippi River

techniques in the UMRB have left soil highly susceptible to erosion and unable to hold water.<sup>33</sup> Runoff from rain and irrigation carries nutrients from fertilizers and soil into nearby surface water. This runoff also leaches into groundwater, where it pollutes aquifers or drains back into surface water.<sup>34</sup>

Improperly managed livestock can also pollute waterways. Animal manure is high in nitrogen and phosphorus, can contain bacteria that is harmful to humans and aquatic animals, and can also carry antibiotics that contribute to the increase in antibiotic-resistant, life-threatening pathogens in humans.<sup>35</sup> Grazing livestock may defecate directly in waterways, and runoff can carry manure pollutants across pastures. While pastures may benefit from nutrients in livestock manure, overstocking and overgrazing of livestock can overload the land,<sup>36</sup> cause soil erosion and compaction, increasing nutrient pollution in runoff and groundwater leaching.<sup>37</sup>

Concentrated Animal Feeding Operations (CAFOs) are a growing threat to clean water, especially in many UMRB states where livestock grazing is decreasing but hog CAFOs are on the rise. Federal law requires larger CAFOs to store and handle waste to prevent unsafe levels of water contamination, but inadequate federal and state implementation allows much of this waste to enter the UMRB.<sup>38</sup> CAFOs store large amounts of animal waste in lagoons, which are prone to accidental spills and leaks.<sup>39</sup> Then they often dispose of the manure by spraying it onto fields, where it is prone to runoff and groundwater leaching, occasionally overloading the fields with wastewater that overflows in surface waters.<sup>40</sup> An Iowa study found that, while manure contributes less than fertilizers to the overall nitrogen in-put in the state’s environment, high concentrations of CAFOs are strongly correlated with higher levels of nitrogen in nearby rivers. This suggests that a disproportionate amount of nutrient pollution from CAFO manure ends up in waterways due to the pervasiveness of poor management practices on CAFOs.<sup>41</sup>

Pesticides are another major contaminant found in waterways as a result of agricultural practices. Like nutrient pollutants, pesticides applied to crops may leach into groundwater and may be carried into local waterways. A study conducted in the Midwest, including each UMRB state, found that half of the sampled streams contained high enough levels of pesticides to profoundly harm aquatic life even after short exposure, including long-term impairment of reproduction and development, or death.<sup>42</sup>

Pesticides in water supplies are typically present at trace levels too low to cause immediate health damage in humans. However, there is serious concern that pesticides have the potential to cause chronic health problems in humans after long-term exposure.<sup>43</sup> There is also concern that exposure to multiple pesticides simultaneously may result in combined effects that lead to more serious health concerns over time.<sup>44</sup>

<sup>31</sup> [https://static1.squarespace.com/static/5845a70859cc6819f2dfdb9e/t/5aa83e44419202c43911af11/1520975429363/Platform+One-Pagers+%282018-02-20T23\\_10\\_28.632%29.pdf](https://static1.squarespace.com/static/5845a70859cc6819f2dfdb9e/t/5aa83e44419202c43911af11/1520975429363/Platform+One-Pagers+%282018-02-20T23_10_28.632%29.pdf)

<sup>32</sup> <http://biogeochemistry.nres.illinois.edu/pdfs/Jacobson%20et%20al%20JEq%202011.pdf>; [https://opensiu.lib.siu.edu/cgi/viewcontent.cgi?article=1002&context=agecon\\_articles](https://opensiu.lib.siu.edu/cgi/viewcontent.cgi?article=1002&context=agecon_articles)

<sup>33</sup> <https://gulfhypoxia.net/the-failure-of-us-farm-policy-its-in-the-snirt/>;

<sup>34</sup> [https://cdn3.ewg.org/sites/default/files/u352/EWG\\_PollutedRunoff.pdf?\\_ga=2.82694550.1696580399.1556923520-1175761568.1556649026](https://cdn3.ewg.org/sites/default/files/u352/EWG_PollutedRunoff.pdf?_ga=2.82694550.1696580399.1556923520-1175761568.1556649026)

<sup>35</sup> <https://www.apha.org/policies-and-advocacy/public-health-policy-statements/policy-database/2014/07/24/11/17/precautionary-moratorium-on-new-concentrated-animal-feed-operations>

<sup>36</sup> <https://www.cias.wisc.edu/wp-content/uploads/2008/10/grzgenvweb.pdf>

<sup>37</sup> <https://www.conserve-energy-future.com/causes-effects-solutions-overgrazing.php>

<sup>38</sup> <https://www.iowapolicyproject.org/2018docs/180125-CAFO.pdf>

<sup>39</sup> [https://environmentamerica.org/sites/environment/files/reports/WEB\\_AME\\_Accidents-Report-Jan19.pdf](https://environmentamerica.org/sites/environment/files/reports/WEB_AME_Accidents-Report-Jan19.pdf)

<sup>40</sup> <https://johnsilvius.cedarville.org/2130/pet03.pdf>

<sup>41</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2745718/>

<sup>42</sup> <https://www.usgs.gov/news/pesticides-prevalent-midwestern-streams>

<sup>43</sup> <http://psep.cce.cornell.edu/facts-slides-self/facts/pes-heef-grw85.aspx>

<sup>44</sup> <https://www.safewater.org/fact-sheets-1/2017/1/23/pesticides>

## Spotlight on Agriculture in Iowa

In Iowa, where more than 85 percent of the land is used for agriculture,<sup>45</sup> pollution from the sector threatens people's health and burdens the economy. Iowa struggles with high nitrogen levels in drinking water, and the state's own agriculture sector is to blame. The state contributes about 45 percent of the nitrogen pollution going into the UMRB, about 90 percent coming from cropland.<sup>46</sup> More than 200 of Iowa's community water systems periodically issue "Do Not Drink" orders when nitrogen levels reach above federal mandated limits, and about 12 percent of the private well are also above this limit.<sup>47</sup> In Des Moines, the increasing costs of nitrogen filtration caused water rates to raise between 4 and 10 percent every year over a decade, forcing the water utility to install a new \$2.5 million purification system.<sup>48</sup> Further, studies in Iowa show that drinking water with a nitrogen level at just half the federal limit may be increasing rates of bladder, ovarian, and thyroid cancers and birth defects,<sup>49</sup> and about a quarter of the private drinking wells in the state are above this level.

Iowa's 15,000<sup>50</sup> CAFOs are also a huge affront to clean water. These facilities spray over 10 billion liquid gallons<sup>51</sup> of manure across fields every year and have spilled manure into waterways



an estimated more than 800 times since 2000.<sup>52</sup> Bacteria, nitrogen, and phosphorus from this manure contribute to frequent "swimming not recommended" advisories in Iowa's state park lakes; 37 due to toxic algae outbreaks and 22 due to dangerous levels of E.Coli.<sup>53</sup> Bacteria from animal manure also causes most of the large fish die-offs common in the state, though pesticides are also a frequent cause.<sup>54</sup> In any given year, the state may suffer 100 die-offs,<sup>55</sup> and discharges from a single CAFO can kill hundreds of thousands of fish and cause hundreds of thousands of dollars in damages.<sup>56</sup>

### Urban Runoff

During rainstorms in urban areas, water on roads, sidewalks, and other impervious surfaces runs off into drains instead of being captured in soils. This runoff water picks up contaminants including trash; excess oil; chemicals and salt from roads and sidewalks; fertilizers and pesticides from lawns; and sediment from construction and other surfaces; and runs untreated into rivers, streams, and other water sources.

Urban runoff is also a significant source of phosphorus, and to a lesser extent, nitrogen, in the UMRB.<sup>57</sup> These nutrient pollutants end up in the basin's waters when stormwater passes

over materials such as leaf litter, pet waste and fertilizers on lawns.<sup>58</sup> Salt treatments for snow and ice produce chloride runoff that, in high concentrations, can harm fish and plant life.<sup>59</sup>

### Wastewater Discharge

Approximately 278 facilities — including manufacturing facilities, municipal sewage and other wastewater treatment plants, and powerplants<sup>60</sup> — discharge wastewater directly into the Upper Mississippi River. Reports to the Environmental Protection Agency show that in 2012, industrial facilities — not including

<sup>45</sup> <https://www.agclassroom.org/teacher/stats/iowa.pdf>

<sup>46</sup> <https://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0195930&type=printable>

<sup>47</sup> <https://news.nationalgeographic.com/2017/12/iowa-agriculture-runoff-water-pollution-environment/>

<sup>48</sup> <https://www.usnews.com/news/best-states/iowa/articles/2019-04-22/des-moines-water-utility-improves-nitrate-removal-process>

<sup>49</sup> <https://e360.yale.edu/features/in-the-heart-of-the-corn-belt-an-uphill-battle-for-clean-water-iowa>

<sup>50</sup> <https://www.foodandwaterwatch.org/insight/urgent-case-factory-farm-moratorium-iowa>

<sup>51</sup> <https://www.ehn.org/water-pollution-hog-farming-2504466831.html>

<sup>52</sup> <https://www.iowapolicyproject.org/2018docs/180125-CAFO.pdf>

<sup>53</sup> <https://www.iaenvironment.org/our-work/clean-water-and-land-stewardship/trends%20in%20beach%20advisories>

<sup>54</sup> <https://programs.iowadnr.gov/adbnet/Assessments/Summary/2016>

<sup>55</sup> Ibid.

<sup>56</sup> <https://www.foodandwaterwatch.org/insight/urgent-case-factory-farm-moratorium-iowa>

<sup>57</sup> <https://www.pca.state.mn.us/sites/default/files/wq-iw3-12.pdf>; <https://www.pca.state.mn.us/featured/report-nitrogen-surface-water>

<sup>58</sup> <https://www.pca.state.mn.us/sites/default/files/wq-ws4-38b.pdf>

<sup>59</sup> Ibid.

<sup>60</sup> <http://www.umrba.org/facts.htm>



municipal treatment plants — discharged at least 16.9 million pounds of toxic material into the UMRB.<sup>61</sup>

Paper, textile, steel, and chemical manufacturers, among others, use large volumes of water in their production and cleaning processes. They sometimes dump wastewater directly into nearby waterways or store it in pools that accidentally spill or leak on a frequent basis.<sup>62</sup> This wastewater is often contaminated with dioxins and other chemicals that can cause cancer, impair brain development and damage organs; threatening wildlife and ecosystems as well as posing serious threats to human health.<sup>63</sup> By weight, 90 percent of industrial pollution is nitrogen, more than a third coming from slaughterhouses and chicken processing plants. However, a much greater amount of nitrogen comes from agriculture, and industrial pollutants other than nitrogen do more damage in much smaller amounts.<sup>64</sup>

The Clean Water Act regulates discharge of industrial wastewater into most freshwater waterbodies across the country. Its goal is to largely prevent the dire threat of high chemical levels in these waterbodies, but inadequate implementation at both state and federal levels allows industrial water pollution to continue degrading the environment and posing health risks.<sup>65</sup>

One area in the UMRB especially hard-hit by manufacturing pollution was the Castle Rock Flowage in Wisconsin. In 2012, a facility owned by a paper mill near the body of water dumped 560,000 pounds of industrial solvent methanol, a chemical known to cause various reproductive problems in humans.<sup>66</sup>

That same year, another paper mill company dumped into the lake 100 pounds of lead, the dangers of which have long been widely known. Paper mills also contribute to phosphorus overloading, causing algal blooms each summer in Castle Rock and another nearby lake. These blooms take a heavy toll on the tourism and recreation sector, harming restaurants and other area businesses that depend on seasonal tourists.<sup>67</sup>

U.S. municipalities do treat sewage, storm water, and some wastewater received from industrial facilities before discharging it back into water bodies. But when cities are hit with larger storms that overwhelm their combined sewage-stormwater systems, raw sewage is released directly into rivers, carrying bacteria such as E. Coli into nearby waterways.<sup>68</sup> Creating further risk, treatment centers cannot eliminate certain pollutants. For example, because most municipalities do not treat wastewater for phosphorus, human waste is one of the most significant sources of phosphorous in the UMRB.<sup>69</sup> St. Paul, Minnesota's wastewater treatment plant cannot remove bisphenol A (BPA) and other pollutants that can harm aquatic life.<sup>70</sup>

### Coal and Ash Pollution from Power Plants

Every year, coal-burning power plants across the country emit 140 million tons of coal ash that poison the air and waterways.<sup>71</sup> Smokestacks spout ash into the air, and the ash falls to the ground, where it mixes with water from rain and snowmelt runoff. Some of the ash collected by power plants is stored in dry landfills or ponds, which are often lacking in any bottom

<sup>61</sup> [https://wisconsinenvironment.org/sites/environment/files/reports/WI\\_wastingwaterways\\_scrn\\_061814.pdf](https://wisconsinenvironment.org/sites/environment/files/reports/WI_wastingwaterways_scrn_061814.pdf)

<sup>62</sup> Ibid.

<sup>63</sup> Ibid.

<sup>64</sup> Ibid.

<sup>65</sup> Ibid.

<sup>66</sup> Ibid.

<sup>67</sup> [https://lacrossetribune.com/community/tomahjournal/news/local/castle-rock-petenwell-lake-algae-blooms-worsening/article\\_eade0c43-d836-50f8-8404-62f12e16c054.html](https://lacrossetribune.com/community/tomahjournal/news/local/castle-rock-petenwell-lake-algae-blooms-worsening/article_eade0c43-d836-50f8-8404-62f12e16c054.html)

<sup>68</sup> <https://www.americanrivers.org/threats-solutions/clean-water/sewage-pollution/>; <http://stateoftheriver.com/state-of-the-river-report/>

<sup>69</sup> <https://www.sciencedaily.com/releases/2011/05/110506093112.htm>

<sup>70</sup> <https://www.mprnews.com/story/2018/12/03/five-gross-things-we-used-to-dump-in-the-mississippi-river-and-what-we-are-dumping-now>

<sup>71</sup> <https://content.sierraclub.org/coal/disposal-ash-waste>

lining to prevent groundwater leaching.<sup>72</sup> To prevent overflowing, these ponds periodically discharge<sup>73</sup> into nearby waterways and are also prone to leaks and spills.<sup>74</sup> Coal ash contains sulfur dioxide and nitrous oxide, which increase the acidity of water and can harm or kill aquatic plants and animals. This contaminated water also contains heavy metals like mercury, chromium, lead, and arsenic that can cause organ failure, cancer, brain development impairment, and death.<sup>75</sup>

In Iowa, all 72 coal power plants store coal in open pits. In the city of Muscatine, residents have found their water is often undrinkable, sometimes even turning black. A local environmental group found that the stretch of the Mississippi River in Muscatine is polluted with aluminum, arsenic and mercury. Many local residents blame upstream coal plants and are demanding better testing and regulations.<sup>76</sup> A 2019 report found that groundwater under the Muscatine plant contains levels of barium, boron, sulfate and thallium that exceed levels safe for humans.<sup>77</sup>

In Illinois, a 2018 study analyzing 24 coal-fired power plants in the state found that 22 have groundwater contaminated with unsafe levels of one or more toxic pollutants.<sup>78</sup> The study reports that, at a plant located on the Mississippi River in Alton, “arsenic in groundwater wells exceeds safe levels by six times, boron exceeds EPA health thresholds by 23 times, molybdenum is nearly nine times safe levels, and sulfate is nearly double EPA’s health threshold.”<sup>79</sup>

### Thermal Pollution from Powerplants

Water is used in nearly every stage of energy production, most commonly as a coolant. In 2013, power plants on the UMR used about 7.1 billion gallons of cooling water per day, more than any other industry in the region.<sup>80</sup> In certain types of power plant cooling systems, once the water makes its way through the plant, it is discharged at a high temperature into rivers or other water sources, causing thermal pollution and threatening organisms living in the waterbody.<sup>81</sup> This heated water can also lower efficiencies at downstream power plants and force them to curtail output, affecting power availability for surrounding residences and commerce.<sup>82</sup>

*“Water is the liquid backbone of the beer skeleton upon which all base recipes originate within beer creation. Superior beer quality is built upon such a foundation.”*<sup>31</sup>

– Keith Guitierrez, CEO,  
7 Hills Brewing Company, Dubuque, IA.

### Taking Action

Despite these threats to the Upper Mississippi River Basin, numerous opportunities exist to improve and protect this vital source of clean water.

★ **Utilize green infrastructure.** Across the region, existing wastewater, storm water, flooding, and drinking water infrastructure is badly outdated. The longer we delay investing in repairs, the higher the cost will be, but supplementing the repairs with green infrastructure implementation can help mitigate these costs. With flooding and water pollution in the UMRB occurring at an increasingly devastating rate, implementing a strategic combination of traditional and green infrastructure is crucial for the economy, environment, and livelihoods of communities.<sup>83</sup> Green water systems infrastructure works with the natural landscape to mitigate effects of disruptive events like floods, while being more cost-effective and resilient than conventional infrastructure.<sup>84</sup> Rather than building new water treatment plants or taller levees, green infrastructure takes a natural approach and allows the land to absorb, clean, and reduce the impacts of excessive water in an area. Green infrastructure options include rooftop gardens, storing and reusing rainwater, restoring wetlands, and building permeable pavement. The green approach improves how stormwater is managed, reduces industry costs, and improves the health of the community and surrounding environment.

<sup>72</sup> <https://www.nrdc.org/sites/default/files/power-plant-cooling-FS.pdf>

<sup>73</sup> <https://www.environmentalintegrity.org/wp-content/uploads/2016/11/Toxic-Wastewater-from-Coal-Plants-2016.08.11-1.pdf>

<sup>74</sup> [https://environmentamerica.org/sites/environment/files/reports/WEB\\_AME\\_Accidents-Report-Jan19.pdf](https://environmentamerica.org/sites/environment/files/reports/WEB_AME_Accidents-Report-Jan19.pdf)

<sup>75</sup> <https://earthjustice.org/features/the-coal-ash-problem>

<sup>76</sup> <http://www.iniwawater.org/story/residents-say-uncontrolled-coal-is-harming-drinking-water-mississippi-river/>

<sup>77</sup> <https://earthjustice.org/sites/default/files/files/National%20Coal%20Ash%20Report%203.4.19.pdf>

<sup>78</sup> <http://www.environmentalintegrity.org/wp-content/uploads/2018/11/IL-Coal-Ash-Contamination-Report.pdf>

<sup>79</sup> Ibid., pg. 4.

<sup>80</sup> <http://www.umrba.org/umreconprofile.pdf>; <http://www.riveraction.org/umrc/sites/default/files/UMRC2016RaiseTheGrade.pdf>

<sup>81</sup> [https://www.ucsusa.org/clean\\_energy/our-energy-choices/energy-and-water-use/freshwater-use-by-us-power-plants.html#.XFskj1xKg2w](https://www.ucsusa.org/clean_energy/our-energy-choices/energy-and-water-use/freshwater-use-by-us-power-plants.html#.XFskj1xKg2w);  
<https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2015WR017676>

<sup>82</sup> <http://iopscience.iop.org/article/10.1088/1748-9326/aaac85/meta>

<sup>83</sup> <https://www.americanrivers.org/threats-solutions/clean-water/green-infrastructure/what-is-green-infrastructure/>

<sup>84</sup> <https://www.epa.gov/green-infrastructure/what-green-infrastructure>

★ **Implement better agriculture practices.** Better agricultural practices can yield ample food production, improve farmers' incomes, and also conserve the environment. Farmers can adopt a variety of conservation practices that improve soil structure and reduce runoff pollution and ground water leaching. These practices can reduce nitrogen inputs to the UMRB by up to 34 percent, one study indicates.<sup>85</sup> Practices that improve soil quality not only reduce nutrient pollution but can also improve farmers' incomes<sup>86</sup> and reduce damage from extreme weather events like the recent flooding crises.<sup>87</sup> Currently, the region's vast fencerow-to-fencerow farms of corn and soybeans overproduce these crops, depressing prices for farmers while destroying soil and polluting waterways.<sup>88</sup> Farming policy that stems overproduction can increase farmers' incomes and let farmers take land out of production, restoring ecosystems that naturally reduce water pollution.<sup>89</sup> Going further, approaches to farming like regenerative agriculture and agroecology can greatly reduce or eliminate use of fertilizers and pesticides by using a combination of conservation practices and crop choices that work best with the local ecology.<sup>90</sup> One promising approach in

the UMRB is the use perineal grain crops that mimic natural grassland ecosystems.<sup>91</sup>

**Improve industrial pollution management.** Many industries need to improve their management of pollution and transition to using less harmful alternatives. Whether by accident, improper storage, or intentional dumping, water pollution from industrial facilities in the UMRB threatens human and environmental health. Companies must adopt technologies to reduce water pollution, and state governments must hold polluters more accountable, mandate stricter pollution reduction and accident prevention requirements, require better reporting of pollution data, and restrict the unnecessary siting of facilities in high-risk areas.

### Taking Action

Clean water in the Upper Mississippi River Basin is an increasingly threatened, irreplaceably precious resource. Businesses and other stakeholders in the region must urge policymakers to act on these opportunities to ensure clean water and continued economic prosperity. ★

<sup>85</sup> <https://www.usgs.gov/news/new-study-quantifies-benefits-agricultural-conservation-upper-mississippi-river-basin>

<sup>86</sup> [https://www.nwf.org/~media/PDFs/Wildlife/Options-to-Address-Pollution-from-Agricultural-Drainage\\_rev-3-7-16.ashx](https://www.nwf.org/~media/PDFs/Wildlife/Options-to-Address-Pollution-from-Agricultural-Drainage_rev-3-7-16.ashx); <http://sustainableagriculture.net/blog/ics-diversification-report-iowa/>

<sup>87</sup> <https://www.ucsusa.org/food-agriculture/advance-sustainable-agriculture/turning-soils-sponges>

<sup>88</sup> <https://gulfhypoxia.net/the-failure-of-us-farm-policy-its-in-the-snirt/>

<sup>89</sup> <https://foodfirst.org/wp-content/uploads/2018/06/Summer-2018-BackgroundeFinal.pdf>

<sup>90</sup> <https://hal.archives-ouvertes.fr/hal-01234800/document>

<sup>91</sup> <https://www.mcknight.org/news-ideas/how-sustainable-farming-can-lead-to-a-cleaner-mississippi-river/>

The American Sustainable Business Council (ASBC) is a coalition of business organizations and companies advancing market solutions and public policies to support a sustainable economy.

