

MODERNIZING AGRICULTURAL DRAINAGE LAW IN IOWA

SEPTEMBER 2020

Iowa Environmental Council
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Modernizing Agricultural Drainage Law in Iowa

Executive Summary

The majority of Iowa's cropland has embedded underground piping known as tile drains. Through a combination of surface ditches and tile drainage, the state has lost 99 percent of the wetlands that once existed in the north central part of the state where wetlands were once prevalent. Surface ditch construction is controlled by thousands of local drainage districts, which allow private agricultural tile drains to empty into the ditches. The tile drains carry high concentrations of nitrate to surface waters. As a result, nitrate concentrations in Iowa rivers and streams have dramatically increased.

Iowa adopted laws governing drainage over a century ago. Despite much greater knowledge about the impacts of drainage, the law has changed little. It only considers the benefits of removing water from the land while ignoring potential costs and problems. It does not address the implications of widespread installation of agricultural tile drainage. Landowners and drainage districts do not have obligations to mitigate the downstream problems resulting from the drainage.

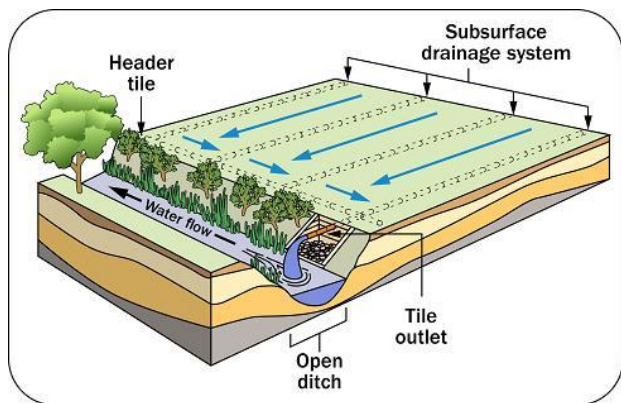


Figure 1. The agricultural drainage system.¹

There are other approaches to removing water from row crop fields that also account for the consequences of drainage systems. Several states in the Midwest region require ongoing oversight through permits after drainage is installed. Others require landowners benefitting from drainage to maintain management practices that reduce externalized impacts. Taking a broader perspective, Manitoba and the Netherlands address concerns regarding ecosystem protections and flooding in their drainage decision-making, taking a holistic view rather than focusing only on the benefits of draining land for agricultural production.

Cover photo and rear cover photo credit: NRCS/SWCS photo by Lynn Betts.

¹ S. Vander Veen, "Operating and Maintaining a Tile Drainage System," (Dec. 2010) available at <http://www.omafra.gov.on.ca/english/engineer/facts/10-091.htm>.

The examples from the region and around the world provide a blueprint for Iowa. Iowa could achieve multiple benefits by updating its drainage code to address future drainage installation and management of existing drainage. It could adopt standards applied in other states, address tile drainage problems, and require recordkeeping that facilitates progress evaluation. These updates to the state code would allow Iowa to mitigate the unintended consequences of drainage while maintaining a productive agricultural system – just as its neighbors already do. This is increasingly important in the context of a changing climate, with more frequent severe storms and increased precipitation. Because Iowa has nearly 50 percent more land tile-drained than any other state and contributes the largest share of nutrients to the Gulf of Mexico, modernizing Iowa’s drainage code could have significant downstream benefits.

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Agricultural Drainage

Iowa historically had a wet landscape. For more than a century, Iowans have removed water from the land by constructing ditches and installing underground piping. The piping is known as tile drainage because it was originally made of clay tile.³

Modern-day tile drains are made of perforated plastic piping buried in the soil of a field. Tile drains lower the water table in a field and typically discharge into a surface ditch, which allows the water to reach natural rivers and streams. This drainage system has resulted in a new hydrologic landscape, particularly in the north-central portion of the state known as the Des Moines Lobe

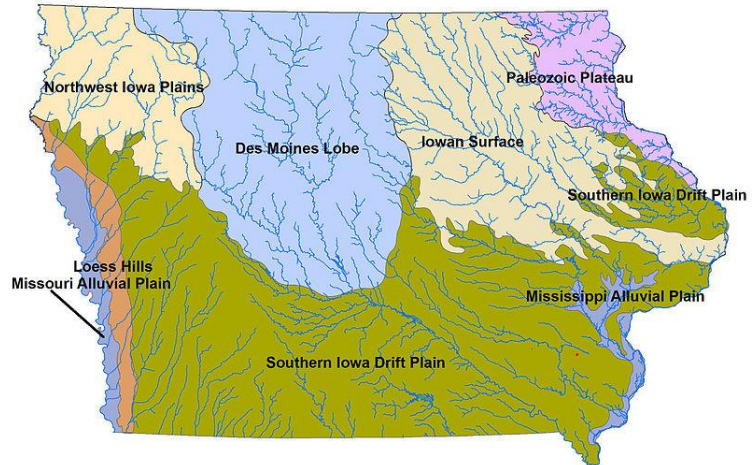


Figure 2. Iowa landform features.²

and shown in Figure 2. The Des Moines Lobe is a landform from the last glaciation that contained widespread areas of poor surface drainage, resulting in wetlands.⁴ Iowa once had approximately 5300 square miles of wetlands in the Des Moines Lobe, or 44 percent of its total area;⁵ today it is close to 50 square miles – a loss of 99 percent.⁶ With a lower water table, crop yields and survival improve in the Des Moines Lobe's fertile soil.⁷

² "Landforms of Iowa," Wikimedia Commons, by user Billwhittaker.

³ Miller, B.A., W.G. Crumpton and A.G. van der Valk. 2009. Spatial distribution of historical wetland classes on the Des Moines Lobe, Iowa. *Wetlands* 29(4):1146–1152.

⁴ Prior, J. *Landforms of Iowa*. University of Iowa Press (1991) at 45-47.

⁵ Eilers, Lawrence, and Dean Roosa, *The Vascular Plants of Iowa*, University of Iowa Press, available at <http://uipress.lib.uiowa.edu/vpi/iowaFlora.aspx> (last visited July 23, 2020).

⁶ *Id.*; Dahl, T.E. 2014. Status and trends of prairie wetlands in the United States 1997 to 2009. U.S. Department of the Interior; Fish and Wildlife Service, Ecological Services, Washington, D.C. (67 pages). Available at <https://www.fws.gov/wetlands/documents/Status-and-Trends-of-Prairie-Wetlands-in-the-United-States-1997-to-2009.pdf>.

⁷ "Understanding the Economics of Tile Drainage," Iowa State University Extension and Outreach, available at <https://www.extension.iastate.edu/agdm/wholefarm/html/c2-90.html> (last visited July 23, 2020).

The development of the drainage system (which includes both ditches and tile drains) has had significant side effects. Tile drainage increases the proportion of rainfall that reaches streams and rivers.⁸ It also carries water-soluble nitrate out of the soil profile before it is used by crops.⁹ Drainage increases water movement on the larger landscape, and generally increases the power of streams and rivers to erode the landscape.¹⁰ It does this in a changing environment, where the state faces more extreme variations and overall increasing precipitation.¹¹

Nitrate loading has dramatically increased in the Mississippi River Basin¹² and tile drainage is a primary delivery mechanism in Iowa.¹³ Surface ditches have created an artificial stream system that conveys this water to larger streams and rivers. Iowa is now responsible for contributing an average of 55 percent of the nitrate load in the Missouri River watershed and 45 percent of the nitrate load in the Upper Mississippi watershed.¹⁴

Iowa laws governing drainage reflect the historic priority of removing water from the land to maximize the usable land at a local scale. The code focuses on the surface ditches and almost entirely ignores private tile drainage. Many sections of the code governing drainage have not been updated for decades and do not address the downstream impacts of drainage. Iowa has an opportunity to improve the conservation practices on existing tile drainage and to require better practices when new tile drainage is installed.

⁸ Keith E. Schilling, Philip W. Gassman, Antonio Arenas-Amado, Christopher S. Jones and Jeff Arnold, Quantifying the contribution of tile drainage to basin-scale water yield using analytical and numerical models, *Science of The Total Environment*, 10.1016/j.scitotenv.2018.11.340, 657, (297-309), (2019).

⁹ Qi, Z., M. J. Helmers, R. D. Christianson, and C. H. Pederson. 2011. Nitrate-Nitrogen Losses through Subsurface Drainage under Various Agricultural Land Covers. *J. Environ. Qual.* 40:1578-1585. doi:10.2134/jeq2011.0151. See also Ikenberry, C. D., M. L. Soupier, K. E. Schilling, C. S. Jones, and A. Seeman. 2014. Nitrate-Nitrogen Export: Magnitude and Patterns from Drainage Districts to Downstream River Basins. *J. Environ. Qual.* 43:2024-2033. doi:10.2134/jeq2014.05.0242.

¹⁰ Schottler, S., et al., "Twentieth century agricultural drainage creates more erosive rivers," *Hydrological Processes*. 28(4):1951–1961, Feb. 2014.

¹¹ "Climate Change," Iowa Department of Natural Resources, last visited July 23, 2020, available at <https://www.iowadnr.gov/conservation/climate-change>; Donnelle Eller, "What a difference one degree makes: Iowa is getting hotter, bringing more frequent and intense storms," *Des Moines Register*, Aug. 9, 2018.

¹² "Nitrogen in the Mississippi Basin Estimating Sources and Predicting Flux to the Gulf of Mexico," U.S. Geological Survey Fact Sheet 135-00 (2000), at 2, available at <https://pubs.usgs.gov/fs/2000/0135/report.pdf> (last visited July 23, 2020).

¹³ Jones CS, Nielsen JK, Schilling KE, Weber LJ (2018) Iowa stream nitrate and the Gulf of Mexico. *PLoS ONE* 13(4): e0195930. Available at <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0195930>. See David MB, Drinkwater LE, McIsaac GF. Sources of nitrate yields in the Mississippi River Basin. *Journal of Environmental Quality*. 2010 Sep 1;39(5):1657–67. pmid:21043271.

¹⁴ *Id.*

Practices that can improve water quality are not new, but their implementation is limited. The Natural Resources Conservation Service (NRCS) developed management practices to reduce the environmental impacts of drainage and works with landowners to implement them.¹⁵

Additional experts have identified practices that would provide pollution reduction benefits in Iowa.¹⁶ Implementation of these practices specific to drainage – such as controlled tile drainage that temporarily raises the water table – are not reported as consistently as other management practices. Compared to the reporting for installation of other agricultural practices,¹⁷ drainage lags behind. Watershed-based approaches to address hydrologic changes have included upstream water retention, primarily through wetland restorations.¹⁸ Retaining water upstream restores hydrology, reducing peak flows and associated flooding.¹⁹ These are not widespread in Iowa.²⁰

Iowa is not the only state with outdated drainage laws, but other states have made updates reflecting modern values and approaches. This paper reviews the agricultural drainage requirements in other jurisdictions that protect water quality and provide multiple benefits. IEC reviewed the laws of ten states, one Canadian province, and one nation. This paper analyzes the requirements of those jurisdictions to determine what may be feasible to implement in Iowa. Additional detail of the methodology is in Appendix 3: Comparison Methodology.

¹⁵ “Conservation Practices,” Natural Resources Conservation Service, available at https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/technical/cp/ncps/?cid=nrcs143_026849.

¹⁶ See “Ag-Drainage BMPs,” Emmons & Olivier Resources, available at <https://www.eorinc.com/resources/Ag-BMPs.html>; *Iowa Nutrient Reduction Strategy: A science and technology-based framework to assess and reduce nutrients to Iowa waters and the Gulf of Mexico*, May 2013 (Rev. Dec. 2017), available at http://www.nutrientstrategy.iastate.edu/sites/default/files/documents/2017%20INRS%20Complete_Revised%20017_12_11.pdf. See also Castellano, M.J., S.V. Archontoulis, M.J. Helmers, H.J. Poffenbarger and J. Six. 2019. “Sustainable Intensification of Agricultural Drainage.” *Nature Sustainability* 2: 914–921. doi: 10.1038/s41893-019-0393-0.

¹⁷ See USDA National Agricultural Statistics Service, *2017 Census of Agriculture*. Complete data available at www.nass.usda.gov/AgCensus; 2017-2018 Annual Progress Report of the Iowa Nutrient Reduction Strategy, March 2019, available at http://www.nutrientstrategy.iastate.edu/sites/default/files/documents/NRS2018AnnualReportDocs/INRS_2018_AnnualReport_PartOne_Final_R20190304_WithSummary.pdf (quantifying changes in acreage of conservation practices such as cover crops and conservation tillage).

¹⁸ “Flood Mitigation Practices,” Iowa Watershed Approach, available at <https://iowawatershedapproach.org/programs/constructed-watershed-projects/>.

¹⁹ *Iowa Nutrient Reduction Strategy: A science and technology-based framework to assess and reduce nutrients to Iowa waters and the Gulf of Mexico*, May 2013 (Rev. Dec. 2017), § 2.4 at 5, available at http://www.nutrientstrategy.iastate.edu/sites/default/files/documents/2017%20INRS%20Complete_Revised%20017_12_11.pdf.

²⁰ “The Slow Reality of the NRS,” Iowa Environmental Council (2019), available at <https://www.iaenvironment.org/newsroom/water-and-land-news/iec-analysis-the-slow-reality-of-the-nrs>.

Iowa Drainage Law

The Iowa Constitution and state law address the authorities of drainage districts. The Iowa Constitution provides that the legislature may “vest the proper authorities with power to construct and maintain levees, drains and ditches and to keep in repair all drains, ditches, and levees heretofore constructed under the laws of the state.”²¹ The Iowa legislature used this authority to adopt Chapter 468 of the Iowa Code, which governs drainage and levee districts. The regulatory structure and approach have not changed for at least a century.²² Sections of the statute have remained unchanged for decades, despite a reorganization of drainage law in 1989 – which moved, but did not amend, many provisions from decades earlier.²³

The law presumes that drainage is a public benefit.²⁴ Iowa allows two or more landowners to petition to form a drainage district. The district relies on an engineer (typically the county engineer) to determine the value of benefits and damages that individual landowners would receive from a new drainage system, which primarily measures the value of additional agricultural production. The area of the drainage system may be larger than the area owned by the petitioning landowners. As long as the benefits exceed the costs, the drainage district constructs the drainage system and assigns the costs through a tax levy. The district maintains the drainage system until there is either further drainage expansion (an “improvement”), a reassessment of the benefits and damages, or a request from sufficient landowners to dissolve the district.

Because of the presumption that drained land is more valuable than undrained, the only considerations for the drainage district are the economic benefits of dry land. The law does not account for effects that may lead to downstream flooding. It affords no consideration to environmental benefits or costs. It does not require a particular standard of care from the landowners benefitting from a ditch. Only willful damage to the system results in a penalty under the statute.²⁵

²¹ IOWA CONST. Art. 1, § 18.

²² See IOWA CODE §§4777-4935 (1919); IOWA CODE chs. 455-468 (1950); IOWA CODE ch. 468 (2019) (containing similar language regarding, e.g., establishing a district, assessing costs and damages, petitioning for drainage, engineer reports, appraisers, common outlets, reclassification, and drainage through land of others).

²³ *Cf., e.g.*, IOWA CODE §§ 455.1, 455.5, 455.7 (1950), IOWA CODE §§ 468.1, 468.4, 468.6 (2019) (containing identical language). See 1989 IOWA LAWS ch. 126, sec. 2 (describing recodification).

²⁴ IOWA CODE § 468.2(1) (2019).

²⁵ IOWA CODE § 468.148 (2019).

An unusual aspect of Iowa law is the degree of legal protection afforded to drainage districts. In 1968, Iowa limited the immunity of all local governments to lawsuits – except drainage districts.²⁶ The Iowa Supreme Court recently held that drainage districts are immune from suits regarding damages that result from drainage because of the districts’ narrow constitutional directive and the ongoing immunity provided in statute.²⁷ In addition, drainage districts are exempt from the Department of Natural Resources requirement to obtain a permit to drain a protected wetland.²⁸

Current Drainage Practices

There are no comprehensive records of drainage installed over the last century, much of which may be less effective at draining land today. The amount of agricultural tile drainage installed each year is not recorded, but experts estimate that much of the Des Moines Lobe, covering the north-central portion of the state, is now tile-drained.³⁰ An estimated 14 million of 24 million cropped acres in Iowa are drained by tile, representing an 11 percent increase

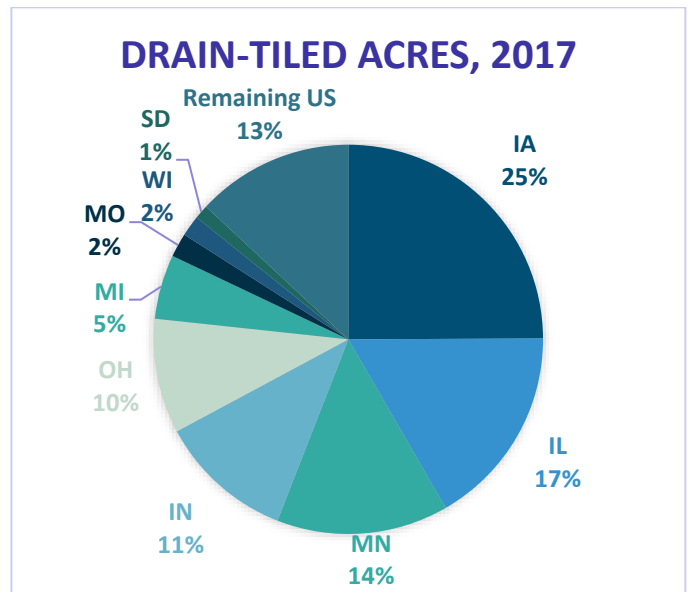


Figure 3. Drain-tiled acres by state, 2017.²⁹

²⁶ James W. Hudson, “Observations of a Drainage Law Attorney,” in *Iowa Drainage Law Manual*, Center for Transportation Research and Education (2005) at 6; see IOWA CODE § 670.11 (restricting retroactivity of reduced immunity for certain governmental subdivisions).

²⁷ See *Board of Water Works Trustees of the City of Des Moines, Iowa v. Sac Cty. Bd. of Supervisors, as Trustee of Drainage Dist. 32, 42, 65, 79, 81, 83, 86, et al.*, No. 16-0076, 890 N.W.2d 50 (Iowa 2017).

²⁸ IOWA CODE § 456B.13 (2019).

²⁹ USDA National Agricultural Statistics Service, *2017 Census of Agriculture*, Vol. 1, ch. 2, table 41. Complete data available at www.nass.usda.gov/AgCensus.

³⁰ Jaynes, D.B. and James, D.E. The Extent of Farm Drainage in the United States. In Final Program and Abstracts at 50, Soil and Water Conserv. Soc. 2007 Internat. Conf., 21-25 Jul. 2007, Tampa, FL. Available at <http://www.ars.usda.gov/SP2UserFiles/Place/50301500/TheExtentofFarmDrainageintheUnitedStates.pdf> (accessed 3 July 2019).

from 2012 to 2017.³¹ The tile drainage increase was driven by the area drained on farms larger than 200 acres; drained acres on smaller farms actually declined.³²

Based on agricultural census data, drainage is widespread across the country, with a national survey reporting over 55 million acres of tile-drained land.³³ As shown in Figure 3, Iowa has a quarter of the tile-drained land in the country and nearly 50 percent more than any other state.³⁴ Tile-drained land increased nationally by 14 percent from 2012 to 2017.

To address excess nutrients in its surface waters, in 2013 Iowa adopted a Nutrient Reduction Strategy (NRS) focused on nitrogen and phosphorus loading.³⁵ The Strategy is now official state policy.³⁶ The NRS includes scenarios quantifying the number of conservation practices that would be needed to cumulatively achieve reduction goals. The NRS did not set deadlines, require implementation of any practices, or include associated funding to incentivize the practices.

The Iowa Department of Natural Resources (IDNR) and Iowa Department of Agriculture and Land Stewardship (IDALS) report annually on the implementation of conservation practices identified in the NRS.³⁷ The state has tracked the installation of conservation practices since 2013. For one scenario, the current pace shows full adoption of conservation practices will take another 93 to 31,103 years.³⁸ This falls far short of the goals set by a national task force to

³¹USDA National Agricultural Statistics Service, *2017 Census of Agriculture*. Complete data available at www.nass.usda.gov/AgCensus at Iowa 18, 41.

³² *Id.*

³³ *Id.*

³⁴ *Id.*

³⁵ Iowa Nutrient Reduction Strategy: A science and technology-based framework to assess and reduce nutrients to Iowa waters and the Gulf of Mexico, May 2013 (Rev. Dec. 2017), available at http://www.nutrientstrategy.iastate.edu/sites/default/files/documents/2017%20INRS%20Complete_Revised%20017_12_11.pdf.

³⁶ IOWA CODE § 455B.177 (2019).

³⁷ See 2017-2018 Annual Progress Report of the Iowa Nutrient Reduction Strategy, March 2019, available at http://www.nutrientstrategy.iastate.edu/sites/default/files/documents/NRS2018AnnualReportDocs/INRS_2018_AnnualReport_PartOne_Final_R20190304_WithSummary.pdf.

³⁸ "The Slow Reality of the NRS," Iowa Environmental Council (2019), available at <https://www.iaenvironment.org/newsroom/water-and-land-news/iec-analysis-the-slow-reality-of-the-nrs>.

address excess nutrients.³⁹ Moreover, the state does not track loss of existing conservation practices, so the net change in adoption is unclear.⁴⁰

Reporting on adoption of drainage conservation practices in other states is not readily available; states often report on inputs (i.e., conservation spending) or increases rather than cumulative outcomes (total number or area of practices installed).⁴¹ Several states identified drainage-related conservation as useful practices and set adoption targets in state nutrient reduction strategies,⁴² but none of the states reported widespread adoption. The lack of reporting and implementation reflects the inadequacy of nutrient reduction strategies as a solution to nutrient pollution, as previously identified by the Iowa Environmental Council with other environmental groups.⁴³

³⁹ *Gulf Hypoxia Action Plan 2008*, Mississippi River/Gulf of Mexico Watershed Nutrient Task Force (2008) (setting reduction target date of 2035).

⁴⁰ Secchi, S., & McDonald, M. (2019). The state of water quality strategies in the Mississippi River Basin: Is cooperative federalism working?. *The Science of the total environment*, 677, 241-249. doi: 10.1016/j.scitotenv.2019.04.381.

⁴¹ See, e.g., *Illinois Nutrient Loss Reduction Strategy Biennial Report 2015-17*, State of Illinois (2017), at 15-21 (describing funding and outreach efforts); *Missouri Nutrient Loss Reduction Strategy 2018 Update*, Missouri Department of Natural Resources (2018) at 2 (identifying pilot projects for bioreactors and saturated buffers); *Wisconsin's Nutrient Reduction Strategy 2015-16*, Wisconsin Department of Natural Resources (2017), at 31 (describing increases in buffers), 32-33 (describing expenditures and acres with any conservation practice).

⁴² See *Illinois Nutrient Loss Reduction Strategy Biennial Report 2015-17*, State of Illinois (2017), at 22-28 (identifying wetlands, buffers, and bioreactors); *Indiana's State Nutrient Reduction Strategy*, Indiana Department of Agriculture and Department of Environmental Management (2018), at 57 (buffers) and 102 (wetland treatment); *The Minnesota Nutrient Reduction Strategy*, State of Minnesota (2014), at 5-24 (controlled drainage, bioreactors) and 5-33 (buffers, wetlands).

⁴³ *Decades of Delay*, Mississippi River Collaborative, (2016) at 27, available at <http://www.msrivercollab.org/wp-content/uploads/Decades-of-Delay-MRC-Nov-2016.pdf>.

How Iowa Compares

To evaluate Iowa’s drainage governance, this paper compares Iowa requirements against those of nine other states, the Canadian province of Manitoba, and water management districts in the Netherlands as shown in Figure 4. These jurisdictions were identified based on the similarity of landscape and cropping patterns as well as advice from state drainage experts as described in Appendix 3: Comparison Methodology.

This paper addresses several aspects of drainage law with potential environmental impacts:

- how drainage districts are created, which affects the expansion of artificial drainage systems;
- the criteria for installing, improving, and maintaining drainage, which determines the potential for unintended consequences; and
- what is expected of the landowners who are subject to the district’s requirements.

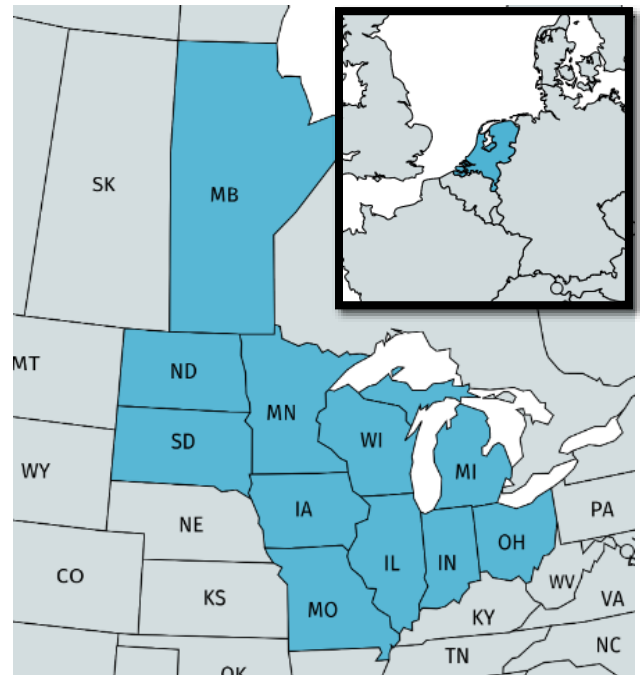


Figure 4. The report compares Iowa, South Dakota, North Dakota, Minnesota, Wisconsin, Michigan, Ohio, Indiana, Illinois, Missouri, Manitoba, and the Netherlands.

Collectively, these structural elements determine whether the drainage system fulfills the potential for larger societal benefits or narrowly focuses on maximizing yield from agriculturally productive land. As noted above, Iowa’s drainage laws have not substantially changed for decades and have a narrow focus that does not address societal benefits or costs.

Drainage Authorities

The local authorities controlling drainage decisions hold considerable power in shaping the hydrology of a state. Their governing structure, powers, and obligations help determine whether negative effect of drainage are mitigated.

Iowa

Iowa has more than three thousand small drainage districts that control the flow of water across a large swath of the state.⁴⁴ They range in size from less than a square mile to more than 150 square miles.⁴⁵ Each drainage district oversees a drainage system – typically a surface ditch – that outlets into an existing waterbody. The drainage districts determine when and how drainage systems are installed, maintained, and removed.

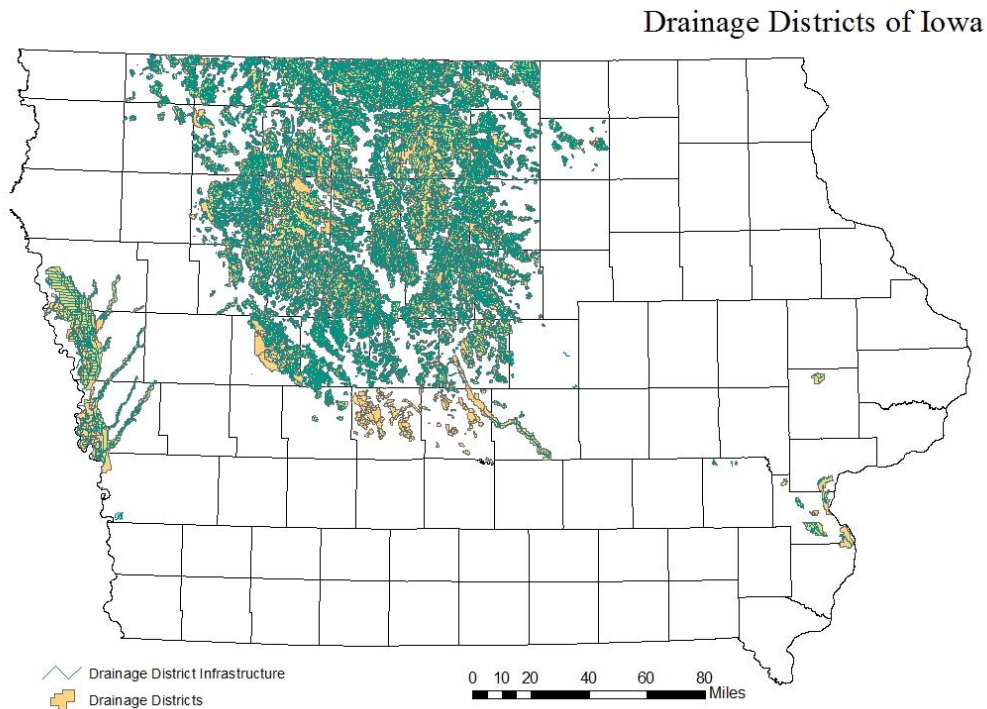


Figure 5. Map of Iowa drainage districts and their infrastructure.⁴⁶

This control over the district’s hydrology is governed by three or five board members of the district.⁴⁷ The district board members must be members of the county board of supervisors.⁴⁸ After construction is completed the district’s landowners can petition to elect trustees who

⁴⁴ Garvin, S, Burkart, M, and D Osterberg. “Drainage Districts and Nitrate Pollution in the Des Moines Lobe and Mississippi River Basin,” Iowa Policy Project (2017), available at https://www.iowapolicyproject.org/2017docs/171010-drainage_districts.pdf.

⁴⁵ “Drainage Districts in Iowa,” Iowa Geodata, available at <https://geodata.iowa.gov/dataset/drainage-districts-iowa> (last visited July 23, 2020).

⁴⁶ *Id.*

⁴⁷ IOWA CODE § 468.3 (2019).

⁴⁸ *Id.*

own land and reside in the district.⁴⁹ In coordination with the engineer of the district, the drainage board determines the benefits and costs to be assessed to each landowner within the district. Decisions by the drainage district can be appealed to the county district court.⁵⁰

*Other States*⁵¹

Most states in the Midwest use a structure similar to Iowa's, but at a county scale. States vary in the degree of overlap between board members of the county and drainage district. In some cases, such as Ohio and South Dakota, the drainage authority directly overlaps with the county board.⁵²

Minnesota has a variety of drainage district authorities, including counties and watershed-based authorities called watershed districts.⁵³ Minnesota's watershed districts have authority to levy assessments like a drainage district and adopt ordinances, including permit requirements.⁵⁴ Because drainage districts in other states are often associated with counties, Iowa is unusual for having so many districts.

In contrast, Manitoba has a single minister who oversees the drainage of the province,⁵⁵ and the Netherlands have regional Water Boards that govern on a watershed-type scale.⁵⁶

Standards and Requirements for Installing Drainage

State law can either facilitate or restrict the ability to consider multiple benefits before installing a new drainage system. The larger policy direction provided by a state legislature – or lack of direction, if it fails to act – can play a major role in shaping local decisions.

⁴⁹ IOWA CODE § 468.506 (2019).

⁵⁰ IOWA CODE § 468.83 (2019).

⁵¹ For simplicity, headings use "states" as a shorthand for the states, Manitoba, and the Netherlands, which were evaluated for this paper.

⁵² OHIO REV. CODE § 6131.02 (2019); S.D. CODIFIED LAWS § 46A-10A-02 (2019).

⁵³ MINN. STAT. §§ 103E.005, subd. 9; 103E.235; 103D.625 (2019).

⁵⁴ MINN. STAT. §§ 103D.335, 103D.345 (2019).

⁵⁵ C.C.S.M. § W80(5) (R.S.M. 1988, c. W80).

⁵⁶ Many areas of the Netherlands are enclosed or separated by dikes, which function as a watershed boundary.

Iowa

Iowa law allows two or more landowners to file a petition for a new drainage system.⁵⁷ The county board of supervisors then appoints an engineer, who files a report describing the proposed drainage system, defining the system boundaries, and the calculating costs to install the system.⁵⁸ The board decides whether to proceed based on the benefit-cost analysis of the proposal. If the benefits exceed the costs, and the board finds the project promotes “public health, convenience, welfare, benefit, or utility,” the project can proceed to a hearing.⁵⁹ If the board approves the project, it assesses the landowners who benefit from the project to cover the construction costs and awards damages to landowners harmed by the project, such as those who will lose land to the area occupied by a ditch.⁶⁰

Unlike several states in the Midwest, Iowa affirmatively exempts drainage districts from permits related to draining wetlands.⁶¹ Wetlands in drainage districts are not considered “protected wetlands” subject to permitting and mitigation requirements under state law.⁶² This limitation reduces the protections for wetlands and increases the likelihood of wetland losses, because not all wetlands are subject to federal protections under the Clean Water Act.⁶³

Other States

Midwest states other than North Dakota use a process similar to Iowa’s when initiating a drainage district. North Dakota requires water resource districts to operate statewide, so no petition is necessary.⁶⁴ Unlike Iowa, a number of states set a higher threshold to initiate a drainage system, with several states requiring a majority of the landowners or a fraction based on land ownership area.⁶⁵

⁵⁷ IOWA CODE § 468.6 (2019).

⁵⁸ *Id.*; IOWA CODE § 468.12 (2019).

⁵⁹ IOWA CODE § 468.22 (2019).

⁶⁰ IOWA CODE § 468.28 (2019).

⁶¹ IOWA CODE § 456B.13 (2019).

⁶² *Id.*; IOWA CODE § 456B.1 (2019).

⁶³ The Clean Water Act requires permits for dredge and fill projects under section 404, but not all waters are “navigable waters” subject to federal jurisdiction. 33 U.S.C. §§ 1344, 1362(7); 40 C.F.R. § 122.2.

⁶⁴ N.D. CENT. CODE § 61-16-05 (2019).

⁶⁵ MINN. STAT. § 103E.212 (2019); WIS. STAT. § 88.27 (2019); S.D. CODIFIED LAWS § 46A-10A-58 (2019).

Some states provide third-party viewers or surveyors to assess the benefits and damages to properties.⁶⁶ Other states rely on the drainage board itself to evaluate the costs, even though the board may not consist of experts.⁶⁷

States conduct a similar economic benefit-cost analysis when evaluating benefits. Because Manitoba has a single drainage minister responsible for the program, there is no petition process. The Netherlands delegates authority to establish water authorities to the states, and water authorities have been established to cover the whole country.⁶⁸

Defining the Benefits and Costs of Drainage

Historically, drainage was presumed to be a public benefit because of increased agricultural productivity in many states. Many states have revised their laws to expand the scope of costs and benefits to consider, including habitat, water quality, and flooding, as summarized in Table 1.

Table 1. Additional Considerations for Drainage Installation

Iowa	Illinois	Indiana	Minnesota	North Dakota	Ohio	South Dakota	Wisconsin
None	Trees, fish, wildlife habitat, erosion, pollution	A private drain connection is not allowed if it would pollute	Alternatives to promote beneficial uses, reduce erosion, or improve water quality; effects on fish, wildlife, water quality, groundwater; overall environmental impact	Erosion, impact on waters with fish/wildlife value	Protection of environmentally significant areas and alternative plans to protect those areas; engineer must submit plans to conservancy district for comment	Drainage is to fulfill environmental management; any other controls/ordinances	Cumulative effect on temperature and water level of lakes, streams, or groundwater systems.

⁶⁶ MINN. STAT. § 103E.305 (2019); MO. REV. STAT. § 243.050 (2019).

⁶⁷ OHIO REV. CODE § 6131.21 (2019); S.D. CODIFIED LAWS § 46A-10A-55 (2019); MICH. COMP. LAWS § 280.72(5) (2019).

⁶⁸ See Bulletin of Acts, Orders and Decrees (Stb) 1999, 276 (Water Boards Act) Title I, ch. 1, Art. 2 (July 1, 2018).

Iowa

Iowa law allows drainage districts to focus on the removal of water when considering a petition for new drainage.⁶⁹ Although not explicit, this serves to maximize available agricultural land without accounting for downstream effects, even if they could be quantified. For example, it does not provide any consideration of water quality in the receiving ditch or stream.⁷⁰

Other States

Many other states have developed additional considerations to minimize negative effects and capture potential benefits of drainage installation. For example, several states address coordination with local watershed plans or similar programs.⁷¹ This allows evaluation of drainage impacts at a larger scale, which may address downstream flooding concerns or the value of ecosystem services.

Various state laws require considering a number of environmental and public health impacts:

- Illinois requires consideration of “trees, fish, wildlife habitat, erosion, [and] pollution.”⁷²
- Minnesota requires consideration of multipurpose water management criteria,⁷³ “changes necessary to minimize or mitigate adverse impact on the environment,”⁷⁴ and alternative approaches to promote environmental aims.⁷⁵
- Indiana prohibits private drain connections to the system if they would cause pollution.⁷⁶
- Wisconsin allows drainage if it “will not materially injure or impair fish habitat or wildlife habitat or scenic beauty or the conservation of natural resources or other public rights or interests.”⁷⁷ The state also considers the cumulative effect on temperature and water level of lakes, streams, or groundwater systems.⁷⁸

⁶⁹ IOWA CODE § 468.2 (2019) (stating that protecting agricultural lands from overflow “shall be presumed to be a public benefit”).

⁷⁰ IOWA CODE § 468.2 (2019) (allowing approval based on “public health, convenience, welfare, benefit, or utility”).

⁷¹ See MINN. STAT. 103E.015, subd. 1 (2019); OHIO REV. CODE § 6131.03 (2019); S.D. CODIFIED LAWS § 46A-10A-47 (2019).

⁷² 70 ILL. COMP. STAT. 605/4-15.1 (2019).

⁷³ MINN. STAT. § 103E.341 (2019).

⁷⁴ MINN. STAT. § 103E.261 (2019).

⁷⁵ MINN. STAT. § 103E.015, subd. 1 (2019).

⁷⁶ IND. CODE § 36-9-27-23 (2019).

⁷⁷ WIS. STAT. §§ 88.32, 88.34 (2019).

⁷⁸ *Id.* at 88.32 (2019).

- Ohio requires protection of environmentally significant areas, and alternative plans must be considered to protect them.⁷⁹ The engineer must submit plans to the conservancy district⁸⁰ for comment before the system is installed.⁸¹
- South Dakota requires consistency with county-wide drainage plans and other controls.⁸² The drainage project should fulfill environmental management goals.⁸³
- North Dakota prohibits drainage causing flooding.⁸⁴ In addition to adverse hydrologic effects downstream, the district must consider impacts on waters with fish and wildlife values⁸⁵ and alternative approaches (both structural and non-structural).⁸⁶
- Manitoba requires submitting sufficient information to ensure protection and maintenance of aquatic ecosystems and stream flow.⁸⁷
- The Netherlands requires an integrated water management system that accounts for environmental considerations.⁸⁸

Ongoing Oversight of Drainage Projects

A drainage district’s work does not end upon installation of a ditch or tile line. Natural degradation and impacts from land use will require ongoing maintenance for an artificial drainage system to provide the benefits originally calculated to justify the project. Permits ensure landowners act responsibly and minimize downstream impacts. Several states require this, as shown in Table 2.

Table 2. Permitting Requirements.

Iowa	Minnesota	North Dakota	South Dakota	Manitoba	Netherlands
None	Required by many watershed districts	Permit required to drain 80+ acre watershed	Board or commission may require permits; violation is misdemeanor	Licenses only issued if they would not harm the aquatic ecosystem	Permits for water control structures

⁷⁹ OHIO REV. CODE § 6131.12 (2019).

⁸⁰ Conservancy districts have the goal of regulating water flow and reducing erosion. OHIO REV. CODE § 6101.04 (2019).

⁸¹ OHIO REV. CODE § 6131.14 (2019).

⁸² S.D. CODIFIED LAWS § 46A-10A-47 (2019).

⁸³ S.D. CODIFIED LAWS § 46A-10A-17 (2019).

⁸⁴ N.D. CENT. CODE § 61-32-03 (2019).

⁸⁵ N.D. ADMIN. CODE § 89-02-01-09.2 (2019).

⁸⁶ N.D. CENT. CODE § 61-16.1-37 (2019).

⁸⁷ C.C.S.M. § W80(9.1)(1) (R.S.M. 1988, c. W80).

⁸⁸ Bulletin of Acts, Orders and Decrees (Stb) 2009, 107 (Water Act) Ch. 2, §§ 1, 3.

Iowa

After a drainage district is established and the drainage system is constructed, the district maintains an ongoing responsibility to maintain the system. This includes removing accumulated silt and debris, repairing damage, and other work to keep the system operating as intended.⁸⁹ The law only requires giving notice to the landowners in the district if the work will exceed \$50,000. If the board determines that it is “necessary or desirable” to expand the capacity of the system, it can appoint an engineer to investigate. Like the maintenance notification threshold, expansions only require notice if estimated costs exceed \$50,000.⁹⁰

Because land use and the landscape can change over time, state law allows landowners to petition the board to reevaluate the costs and benefits in a process called “reclassification.” The board must also reclassify land if improvements exceed 25 percent of the original assessment.⁹¹

Other States

Iowa’s approach to maintenance is consistent with other U.S. states. Generally, states allow maintenance that restores the drainage system to its original capacity without requiring significant administrative processes. Ohio requires the county engineer to set benchmarks to show the location of the original ditch, which facilitates future maintenance work and ensures that repeated “restoration” of capacity will not lead to increased capacity over time.⁹² Michigan and Missouri take a somewhat different approach, treating repairs like improvements to the system.⁹³

Unlike Iowa, states often require or allow a petition process to trigger improvements.⁹⁴ The petition process ensures some degree of landowner buy-in and generally involves more procedural steps than a board-initiated action. The criteria for approving an improvement generally rely on a benefit-cost analysis similar to the creation of a new system.

⁸⁹ IOWA CODE § 468.126 (2019).

⁹⁰ *Id.*

⁹¹ IOWA CODE § 468.131 (2019).

⁹² OHIO REV. CODE § 6131.14.

⁹³ MICH. COMP. LAWS § 280.191 (2019); MO. REV. STAT. § 243.220 (2019).

⁹⁴ MINN. STAT. §103E.215 (2019); IND. CODE § 36-9-27-35 (2019); WIS. STAT. § 88.71 (2019); OHIO REV. CODE § 6131.04 (2019); S.D. CODIFIED LAWS § 46A-10A-83 (2019); MICH. COMP. LAWS § 280.191 (2019).

Improvements to the drainage system are the most common trigger to reassess the landowner payment structure.⁹⁵ Other triggers include a change in the levy being assessed,⁹⁶ new information or reports,⁹⁷ or a board acting on its own motion.⁹⁸ These reclassifications, or reassessments of benefits and costs, can provide an opportunity to reevaluate the impact of the drainage system and the obligations of landowners.

North Dakota requires a permit to drain 80 or more acres.⁹⁹ This requirement resulted from an interpretation by the North Dakota Attorney General, who found that tile drainage had the potential to drain protected waters of the state.¹⁰⁰ The permitting process also requires an investigation of downstream flooding and acquisition of any needed flowage easements that would allow increased flow of water on the property (which may cause temporary flooding).¹⁰¹

South Dakota authorizes local boards to require permits for installation and operation of a drainage system, but there is no statewide requirement.¹⁰² If a local board does choose to require a permit, the permit is enforceable with criminal penalties.¹⁰³ The violator is also subject to a fine of up to \$1,000 per day.¹⁰⁴

Nearly half of watershed districts in Minnesota require permits for tile lines that drain greater than a threshold number of acres or of a minimum diameter.¹⁰⁵ Similarly, Manitoba has a licensing system for water diversions and water control structures.¹⁰⁶ The Netherlands requires permits for all water control structures as part of its integrated water management.¹⁰⁷ Permits

⁹⁵ MINN. STAT. §§ 103E.351, 103E.215 (2019); IND. CODE § 36-9-27-51 (2019); WIS. STAT. § 88.46 (2019); S.D. CODIFIED LAWS § 46A-10A-87 (2019); MICH. COMP. LAWS § 280.193 (2019).

⁹⁶ 70 ILL. COMP. STAT. 605/3-21 (2019).

⁹⁷ IND. CODE § 36-9-27-39 (2019); OHIO REV. CODE § 6137.11 (2019).

⁹⁸ WIS. ADMIN. CODE ATPC § 48.06(2) (2019); S.D. CODIFIED LAWS § 46A-10A-87 (2019); N.D. CENT. CODE § 61-16.1-26 (2019).

⁹⁹ N.D. CENT. CODE § 61-32-03 (2019); North Dakota Attorney General Letter 2008-L-14 (2008).

¹⁰⁰ North Dakota Attorney General Letter 2008-L-14 (2008).

¹⁰¹ N.D. CENT. CODE § 61-32-03 (2019).

¹⁰² S.D. CODIFIED LAWS § 46A-10A-30 (2019).

¹⁰³ *Id.*

¹⁰⁴ *Id.*

¹⁰⁵ "Tile Drainage Rules: A Review of MN Watershed District Rules," Scott County Soil & Water Conservation District (2017), available at <https://scottcountymn.gov/AgendaCenter/ViewFile/Agenda/06262017-516> (last visited July 23, 2020).

¹⁰⁶ C.C.S.M. § W80(5)(1) (R.S.M. 1988, c. W80).

¹⁰⁷ Bulletin of Acts, Orders and Decrees (Stb) 2009, 107 (Water Act) Ch. 2, §§ 1, 3.

give the drainage authority more oversight than in other jurisdictions, where the private tile or other drainage system may only be identified at the point where it empties into a publicly administered drainage system.

Landowner Obligations

Landowners within a drainage system receive cumulative benefits. To justify those benefits, and to reduce ongoing maintenance costs, some jurisdictions impose ongoing requirements on landowners as summarized in Table 3.

Table 3. Requirements Applicable to Landowners.

Iowa	Minnesota	North Dakota	Ohio	South Dakota	Wisconsin	Manitoba
None	Riparian buffers with perennial vegetation	Permit required to drain 80+ acre watershed	Comply with prohibition against nuisance conditions	Board or commission may require permits; violation is misdemeanor	Maintain vegetative buffer on corridors, implement erosion control practices to minimize erosion - Board may require NRCS practices (or risk being disconnected); notify Board of action increasing erosion; 20 foot buffer, or wider if necessary.	Licenses only issued if they would not harm the aquatic ecosystem

Iowa

Iowa does not impose obligations on landowners beyond the property assessments levied to construct and maintain the drainage system. The only prohibition is against willful damage to the system.¹⁰⁸ The state has adopted the NRS, which identifies scenarios to achieve reductions.¹⁰⁹ Several of these include installation of bioreactors and suggests controlled-discharge drainage systems (also known as “conservation drainage”), but those are voluntary measures and are rarely implemented.¹¹⁰

¹⁰⁸ IOWA CODE § 468.148 (2019).

¹⁰⁹ Iowa Nutrient Reduction Strategy: A science and technology-based framework to assess and reduce nutrients to Iowa waters and the Gulf of Mexico, May 2013 (Rev. Dec. 2017), available at http://www.nutrientstrategy.iastate.edu/sites/default/files/documents/2017%20INRS%20Complete_Revised%2017_12_11.pdf.

¹¹⁰ “The Slow Reality of the NRS,” Iowa Environmental Council (2019), available at <https://www.iaenvironment.org/newsroom/water-and-land-news/iec-analysis-the-slow-reality-of-the-nrs>.

Other States

Minnesota has required buffers along drainage systems after a redetermination of benefits since 1977,¹¹¹ and in 1989 the state adopted a rule requiring buffers to be incorporated into local shoreland ordinances.¹¹² The state recently codified a variation of that rule into statute.¹¹³ The buffer law allows flexibility in determining the width of the buffer but requires some degree of permanent vegetation along all surface waterways. By the end of 2018, the state had achieved 96 percent compliance with the law.¹¹⁴

Wisconsin also requires vegetative buffers¹¹⁵ and pairs them with erosion control practices.¹¹⁶ The drainage district board may monitor drainage water for sediment.¹¹⁷ The board may even require implementation of NRCS practices, and it has the authority to disconnect a noncompliant landowner from the public drainage system.¹¹⁸ The board can assess landowners for construction costs that result from the landowner's failure to adopt erosion control practices.¹¹⁹ Landowners must notify the board of any action that would increase erosion into the drainage system.¹²⁰

Ohio requires landowners to comply with the state's narrative prohibition against nuisance conditions.¹²¹ The county engineer has a duty to identify violations of the narrative standard and notify the county board of health, which will pursue the violation.¹²²

¹¹¹ 1977 Minn. Laws ch. 135, § 9.

¹¹² Minn. R. 6120.3300, subp. 7 (2019).

¹¹³ 2015 Minn. Laws 1st Sp. Sess. ch. 4, § 79; MINN. STAT. § 103F.48 (2019).

¹¹⁴ "Minnesota Buffer Law," Minnesota Board of Water and Soil Resources, last accessed June 27, 2019, available at <https://bwsr.state.mn.us/minnesota-buffer-law>.

¹¹⁵ WIS. ADMIN. CODE ATCP § 48.24, 48.30 (2019).

¹¹⁶ WIS. ADMIN. CODE ATCP § 48.30 (2019).

¹¹⁷ *Id.*

¹¹⁸ *Id.*

¹¹⁹ *Id.*

¹²⁰ *Id.* at § 48.40.

¹²¹ OHIO REV. CODE § 6111.04 (2019).

¹²² OHIO REV. CODE § 6137.14 (2019).

Data Collection and Record Management

Records for drainage systems are not always available to interested landowners, and historical records are often absent. The advent of electronic geographic information systems provides an opportunity to update recordkeeping requirements and utilize drainage system information for larger-scale benefits.

Iowa

Iowa provides several requirements for drainage record development and retention. The records of drainage systems must be retained as permanent records of the district.¹²³ Districts may reach agreements regarding drainage outside the district boundaries, but such agreements must include records of the existing and planned tile lines.¹²⁴ In addition, drainage records may be recorded on the title to the land upon request.¹²⁵ Iowa's localized approach means there is no centralized repository of drainage documentation, and tiled areas outside of official districts are not subject to any recordkeeping requirements. Iowa has digitized some drainage district records, but the data are not actively maintained.¹²⁶

Other States

Iowa's approach of allowing the district to retain records is consistent with nearly all other Midwest states.¹²⁷ Only North Dakota and Manitoba, with their mandatory permit systems, do not explicitly require the district to maintain the records from the drainage project. Manitoba does require maps and anticipated effects of the drainage project to be filed as a part of the permit application.¹²⁸

¹²³ IOWA CODE § 468.173 (2019).

¹²⁴ IOWA CODE § 468.187 (2019).

¹²⁵ IOWA CODE § 468.627 (2019).

¹²⁶ See "What's Happenin'" Iowa Geological Survey's Geographic Information Systems Section Newsletter (April 2006), available at https://programs.iowadnr.gov/nrgislibx/newsletters/2006-04_GIS_Newsletter.pdf.

¹²⁷ See 70 ILL. COMP. STAT. 605/4-33.1 (2019); MINN. STAT. § 103E.101 (2019); IND. CODE § 36-9-27-30 (2019); WIS. STAT. § 88.19 (2019); WIS. ADMIN. CODE ATCP § 48.46 (2019); OHIO REV. CODE § 6131.57 (2019); S.D. CODIFIED LAWS 46A-10A-31 (2019); MICH. COMP. LAWS §§ 280.30, 280.131 (2019); MO. REV. STAT. §§ 242.040, 242.050, 242.110 (2019).

¹²⁸ Water Rights Regulation, Man. Reg. 126/87 § 4(2) (Can.).

South Dakota allows recording existing drainage rights as an alternative to obtaining a local permit, if the local board requires them.¹²⁹ Any future updates to the system would still require a permit.¹³⁰

Minnesota has undertaken a drainage records modernization effort to make existing records electronic.¹³¹ The effort includes guidelines for recordkeeping, templates to generate standardized GIS data, and state-funded cost-share to assist in the effort.¹³² To date, a dozen grant recipients have begun modernizing their records.¹³³

Special Requirements for Tile Drainage

Tile drainage may have different effects from surface drainage through ditches. Iowa has far more tile drainage than any other state but few of the protections adopted by other states as shown in Table 4. The alternatives from its neighbors could provide a way for Iowa to balance agricultural and other interests.

Table 4. Tile Drainage Permitting Requirements.

Iowa	Minnesota	North Dakota	South Dakota	Manitoba	Netherlands
None	Required by many watershed districts	Permit required to drain 80+ acre watershed	Board or commission may require permits; violation is misdemeanor	Licenses only issued if they would not harm the aquatic ecosystem	Permits for water control structures

Iowa

Iowa law generally treats the drainage system as a single system without differentiating between subsurface tile drainage and surface drainage. Tile is rarely mentioned in the statute. It is referenced for issues such as switching from tile to surface drainage, replacing tile outlets, and removing obstructions.¹³⁴

¹²⁹ S.D. CODIFIED LAWS § 46A-10A-31 (2019).

¹³⁰ *Id.* at 46A-10A-30.

¹³¹ See “Drainage Records Modernization,” Minn. Board of Water and Soil Resources, available at <https://bwsr.state.mn.us/drainage-records-modernization> (last accessed July 23, 2020).

¹³² *Id.*

¹³³ Tom Gile, Minnesota Board of Water and Soil Resources, personal communication (Aug. 19, 2019).

¹³⁴ IOWA CODE §§ 468.126(1)(b), 468.126(3), 468.138 (2019).

Other States

States generally treat tile in the same way as Iowa. As discussed above, North Dakota and South Dakota have permitting systems in their statutes to address tile drainage. Minnesota has several watershed districts that regulate tile drain installation. Other Midwest states have not developed additional requirements to address changes to hydrology, pollution, or other downstream impacts specific to tile drainage.

Some states have tile-specific requirements addressing information collection and materials standards. Illinois allows counties with a population of more than 250,000 people to require recording of tile maps.¹³⁵ Minnesota requires any tile installed by a drainage authority to meet the specification standards of the American Society for Testing Materials.¹³⁶

Recommended Policies for Iowa

Incorporating aspects of drainage governance from other jurisdictions could help Iowa reduce local and downstream impacts while maintaining its highly productive agriculture industry. The changes proposed next are derived from existing law in other agricultural states.

Drainage District Authorities

- **Allow drainage district funds to be used for buffers along ditches.** Existing law allows purchasing settling basins, which could be expanded. Buffers reduce erosion and sedimentation of ditches, reducing long-term maintenance costs while improving water quality. Minnesota and Wisconsin both require vegetative buffers.
- **Allow the drainage board to require installation of best management practices.** Installing BMPs such as buffers may allow the board to reduce maintenance costs for the district and achieve other benefits at the same time. Giving the board the power to require installation of BMPs puts the decision-making at a local level and could help the state achieve the goals of the NRS. This is consistent with the requirements in Wisconsin.
- **Protect wetlands within drainage districts.** Wetlands in drainage districts currently have fewer protections than other wetlands. Iowa has lost nearly all of its wetlands in the Des

¹³⁵ 70 ILL. COMP. STAT. 605/2-13 (2019).

¹³⁶ MINN. STAT. § 103E.285, subd. 7 (2019).

Moines lobe, which exacerbates localized and downstream flooding. Other states, such as Minnesota, do not exempt wetlands in the area controlled by drainage districts.

Environmental Protection

- **Require consideration of environmental concerns and BMPs.** Broaden the definition of “public benefit or utility” to include water quality, flood mitigation, and other benefits, as many other states have done. During ditch creation, repair, improvement, and reclassification, engineering reports should evaluate potential BMPs such as drainage water management, saturated buffers, and two-stage ditches.
- **Remove sales tax exemption from drain tile and apply it toward externalized costs.** Drain tile is currently exempt from sales taxes if used for agricultural production. This change would generate additional revenue that could be assigned to fund best management practices and offset the externalized costs of drainage.
- **Require landowners to notify the board of action that increase erosion.** Notification of changes to the landscape will help the board plan maintenance and improvement work. This is consistent with a requirement in Wisconsin.
- **Require compliance with water quality standards.** If drainage contributes to downstream impairments, there may be no remedy for the downstream landowners. Ohio requires compliance with water quality standards.

Oversight

- **Require recordkeeping of private drainage.** Records of drainage systems provides clarity to owners and potential buyers of land. Neighboring drainage may affect private landowners or the hydrologic calculations made by a public drainage district.
- **Require permits for draining large areas of land.** Permitting can protect downstream landowners, prevent drawdown of the water table, and help meet water quality goals. This is consistent with requirements in North Dakota, South Dakota, parts of Minnesota, and Manitoba.

None of the jurisdictions reviewed addressed potential implications of climate change, even though the loss of wetlands through drainage may exacerbate the effects of more frequent or

severe storms. Restoring wetlands to improve hydrologic function and water retention would be consistent with Iowa's Nutrient Reduction Strategy.¹³⁷

Recommended Management Practices in Iowa

Management practices to reduce the downstream impacts of tile drainage have already been developed and are incorporated into the NRCS manuals. Many of these could be used in Iowa, often in combination, to achieve significant pollution reductions. Emmons & Olivier Resources recently developed a guide to best management practices to address potential pollution from agricultural drainage in Iowa.¹³⁸ The guide identifies appropriate NRCS practices and where they can be used on the landscape, including:

- **Drainage water management**, also called **conservation drainage** (NRCS practice 554): this practice involves installation of a gate structure at the edge of a field to change the depth of water retained in the field. By retaining more water in the field during summer and winter, infiltration and denitrification can increase.
- **Denitrifying bioreactors** (605): a denitrifying bioreactor adds a buried chamber filled with a carbon source (such as wood chips) between the edge of a field and a surface water. The carbon source allows denitrification of tile water flowing through it, reducing the nitrogen that reaches the surface water.
- **Saturated buffers** (604): unlike a typical buffer, a saturated buffer focuses on treating subsurface flow. The flow is distributed through vegetation, usually parallel to an adjacent surface water, to increase nitrogen uptake before reaching surface water.
- **Created or restored wetlands** (657 or 658): wetlands can provide numerous benefits, including habitat and denitrification. Creating or restoring a wetland requires suitable geography and can achieve very significant nitrogen reductions.
- **Two-stage ditches** (582): Unlike a typical trapezoidal ditch design, a two-stage ditch provides a wider channel at the bottom with "benches" – slightly higher ground that acts as a small floodplain to allow sediment to settle at high flows. The approach can reduce nitrogen, phosphorus, and sediment transport downstream.
- **Lined waterways** (468): lining a waterway with a non-erodible material can reduce erosion at key points in a drainage system. It does not provide the same habitat benefits or nitrogen reductions as other approaches.

¹³⁷ Iowa Nutrient Reduction Strategy: A science and technology-based framework to assess and reduce nutrients to Iowa waters and the Gulf of Mexico, May 2013 (Rev. Dec. 2017), § 2.4 at 5, available at http://www.nutrientstrategy.iastate.edu/sites/default/files/documents/2017%20INRS%20Complete_Revised%2017_12_11.pdf.

¹³⁸ See "Ag-Drainage BMPs," Emmons & Olivier Resources, available at <https://www.eorinc.com/resources/Ag-BMPs.html>.

- **Lined outlets** (468): lining the outlet of a tile line or surface ditch can prevent localized erosion, with the side effect of reduced phosphorus loading.
- **Riparian buffers** (390): vegetated buffers along surface waterways provide a variety of benefits, including beneficial habitat, reduced nutrient loading, and reduced erosion. The width of the buffer needed depends on the local landscape; states have required between 20 and 50 feet.
- **Blind inlets** (620): some existing tile drainage relies on a surface pipe to quickly move water, but this can also move pollutants and sediment. A blind inlet provides initial filtration to reduce the sediment entering the tile system.
- **Grassed waterways** (412): watercourses within a field can easily erode and form rills or gullies. Maintaining permanent vegetation such as grass can slow water flow and reduce the erosion from those locations.
- **Filter strips** (393): like a grassed waterway or riparian buffer, a filter strip can reduce erosion and pollution by passing surface runoff through a vegetated area. The strip may be integrated into a field to address sheet flow, not just sited adjacent to a waterway.
- **Side-inlet drainage structures** (410): the point where a tile line enters a surface water may be prone to erosion, so stabilizing the area can improve water quality by reducing the water's erosive power.

Iowa's NRS provided several scenarios by which the state could achieve major reductions in nutrient loading.¹³⁹ Several of the scenarios included improvements to reduce pollution from tile drainage systems, such as controlled drainage, bioreactors, and wetland restoration.¹⁴⁰ If widely adopted, these practices could have a major impact on water quality across the state. Unfortunately, the practices are not widely adopted: there has been little progress in achieving the implementation goals to address drainage concerns.¹⁴¹ Several of the statutory recommendations in the previous section would facilitate incorporation of the best management practices during the installation or expansion of new drainage systems.

¹³⁹ Iowa Nutrient Reduction Strategy: A science and technology-based framework to assess and reduce nutrients to Iowa waters and the Gulf of Mexico, May 2013 (Rev. Dec. 2017), Exec. Summary at 4, available at http://www.nutrientstrategy.iastate.edu/sites/default/files/documents/2017%20INRS%20Complete_Revised%20017_12_11.pdf.

¹⁴⁰ *Id.*

¹⁴¹ "The Slow Reality of the NRS," Iowa Environmental Council (2019), available at <https://www.iaenvironment.org/newsroom/water-and-land-news/iec-analysis-the-slow-reality-of-the-nrs>.

Appendix 1: Comparison Charts

Table 1: Additional Considerations for Drainage Installation

Iowa	Illinois	Indiana	Minnesota	North Dakota	Ohio	South Dakota	Wisconsin	Manitoba
None	Trees, fish, wildlife habitat, erosion, pollution	A private drain connection is not allowed if it would pollute.	Alternatives to promote other beneficial uses, reduce erosion, or improve water quality; effects on fish, wildlife, water quality, groundwater, overall environmental impact	Erosion, impact on waters with fish/wildlife value	Protection of environmentally significant areas and alternative plans to protect those areas; engineer must submit plans to conservancy district for comment	Drainage is to fulfill environmental management; any other controls/ordinances	Cumulative effect on temperature and water level of lakes, streams, or groundwater systems.	Aquatic ecosystem protection, stream flow

Table 3: Permitting Requirements

Iowa	Minnesota	North Dakota	South Dakota	Manitoba	Netherlands
None	Required by many watershed districts	Permit required to drain 80+ ac watershed	Board or commission may require permits; violation is misdemeanor	Licenses only issued if they would not harm the aquatic ecosystem	Permits for water control structures

Table 3: Requirements Applicable to Landowners

Iowa	Minnesota	North Dakota	Ohio	South Dakota	Wisconsin	Manitoba
None	Riparian buffers with perennial vegetation	Permit required to drain 80+ ac watershed	Must comply with prohibition against nuisance conditions	Board or commission may require permits; violation is misdemeanor	Maintain vegetative buffer on corridors, implement erosion control practices to minimize erosion - Board may require NRCS practices (at risk of being disconnected); notify Board of action increasing erosion. 20 foot buffer, or wider if necessary.	Licenses only issued if they would not harm the aquatic ecosystem

Appendix 2: Examples of State Drainage Law Requirements

The excerpts below provide examples of statute and rule language that states have adopted to reduce the negative side effects of drainage. The examples are grouped to address installation, ongoing operations (i.e., permits and landowner obligations), documentation, and requirements specific to tile drainage.

Considerations Before Installation

Multiple considerations – MINN. STAT. § 103E.015 (2019).

CONSIDERATIONS BEFORE DRAINAGE WORK IS DONE.

Subdivision 1. Environmental, land use, and multipurpose water management criteria. Before establishing a drainage project, the drainage authority must consider each of the following criteria:

- (1) private and public benefits and costs of the proposed drainage project;
- (2) alternative measures, including measures identified in applicable state-approved and locally adopted water management plans, to:
 - (i) conserve, allocate, and use drainage waters for agriculture, stream flow augmentation, or other beneficial uses;
 - (ii) reduce downstream peak flows and flooding;
 - (iii) provide adequate drainage system capacity;
 - (iv) reduce erosion and sedimentation; and
 - (v) protect or improve water quality;
- (3) the present and anticipated land use within the drainage project or system, including compatibility of the project with local land use plans;
- (4) current and potential flooding characteristics of property in the drainage project or system and downstream for 5-, 10-, 25-, and 50-year flood events, including adequacy of the outlet for the drainage project;
- (5) the effects of the proposed drainage project on wetlands;
- (6) the effects of the proposed drainage project on water quality;
- (7) the effects of the proposed drainage project on fish and wildlife resources;
- (8) the effects of the proposed drainage project on shallow groundwater availability, distribution, and use; and
- (9) the overall environmental impact of all the above criteria.

Adverse effects – N.D. ADMIN. CODE § 89-02-01-09.2 (2019).

Evaluation of applications - Factors considered. All applications to drain, must consider the following factors:

1. The water volume proposed to be drained and its impact upon the watercourse into which it will be drained.
2. Adverse effects that may occur to downstream landowners. This factor is limited to the project's hydrologic effects, such as erosion, flood duration, sustained flows impacts, and downstream water control device operation impacts.
3. The engineering design and other physical aspects of the drain.
4. The project's impact on flooding problems in the project watershed.
5. The project's impact on ponds, sloughs, streams, or lakes having recognized fish and wildlife values.
6. The project's impact on agricultural lands.
7. Whether easements are required.

Environmentally significant areas - OHIO REV. CODE § 6131.12 (2019).

Grant of petition. If the board of county commissioners finds that a proposed improvement is necessary and that it will be conducive to the public welfare, and if the board is reasonably certain that the cost thereof will be less than the benefits, it may grant the prayer of the petition. When deciding whether to grant the prayer of the petition, the board shall give consideration to the protection of environmentally significant areas when those areas could be adversely affected by the construction of the proposed improvement and, if necessary, to alternative plans providing for that protection as well as for construction of the proposed improvement.

Landowner Requirements**Vegetative buffers – MINN. STAT. § 103F.48, Subd. 3 (2019).**

Riparian protection; requirements on public waters and public drainage systems.

(a) Except as provided in paragraph (b), landowners owning property adjacent to a water body identified and mapped on a buffer-protection map must maintain a buffer to protect the state's water resources as follows:

(1) for all public waters, the more restrictive of:

(i) a 50-foot average width, 30-foot minimum width, continuous buffer of perennially rooted vegetation; or

(ii) the state shoreland standards and criteria adopted by the commissioner under section 103F.211; and

(2) for public drainage systems established under chapter 103E, a 16.5-foot minimum width continuous buffer as provided in section 103E.021, subdivision 1. The buffer vegetation shall not impede future maintenance of the ditch.

Wetland fills and nuisance conditions – OHIO REV. CODE § 6137.14 (2019).

Inspection for violations by county engineer.

The county engineer, in inspecting drainage channels, shall note any and all apparent violations of sections 6111.01 to 6111.04 of the Revised Code [relating to wetland filling and nuisance conditions], as such sections refer to the pollution of drainage channels. Whenever it appears to the county engineer, after investigation, that there has been a violation of section 6111.04 of the Revised Code, the county engineer shall give written notice to the county board of health, setting forth any thing or act done or omitted to be done or claimed to be in violation of such section. The county board of health shall immediately pursue the alleged violation to its legal conclusion.

Soil erosion – WIS. ADMIN. CODE ATCP 48.30 (2019).

Controlling soil erosion and runoff.

(5) PRIVATE DRAINS. (a) Private drains that transport water to district drains, whether from agricultural or nonagricultural lands, shall be designed, constructed and maintained to prevent soil erosion, and to minimize the movement of suspended solids into district drains. A county drainage board may require that private drains carrying water from nonagricultural lands be designed according to a stormwater management plan, and equipped with facilities such as settling ponds or detention basins to minimize excessive discharges of water or suspended solids into district drains.

(b) If a private drain does not comply with par. (a), the county drainage board may do any of the following:

1. Refuse to permit any connection between the private drain and the district drain.
2. Order that the private drain be modified to comply with par. (a).
3. Order that the private drain be disconnected from the district drain.
4. Pursuant to s. ATCP 48.02 (4), assess the owner of the private drain for construction costs incurred by the drainage district because the private drain does not comply with par. (a).

(6) EROSION CONTROL PRACTICES ON DRAINED LANDS. (a) An owner of land in a drainage district shall implement appropriate erosion control practices on that land to minimize soil erosion and the movement of suspended solids into district drains. A county drainage board may require a landowner to implement erosion control practices recommended by the United States department of agriculture natural resources conservation service, the county land conservation department or an engineer approved by the department.

(b) If a landowner fails to implement erosion control practices required by a county drainage board under par. (a), the county drainage board may do any of the following:

1. Refuse to permit any connection between the landowner's private drain and the district drain.
2. Order the landowner to comply with par. (a).
3. Order that the landowner's private drain be disconnected from the district drain.
4. Pursuant to s. ATCP 48.02 (4), assess the landowner for construction costs incurred by the drainage district because of the landowner's failure to implement erosion control practices required by the county drainage board under par. (a)

Drainage Permits

Overall permit requirement – District Rules, Red Lake Watershed District (Minn.), §§1-2 (2015).

1. POLICY. The District permit requirement is not intended to delay or inhibit development. Rather permits are needed so that the managers are kept informed of planned projects, can advise and in some cases provide assistance, and can ensure that land disturbing activity and development occurs in an orderly manner and in accordance with the overall plan for the District. All interpretations of these rules and permit decisions under these rules will incorporate and be consistent with District purposes set forth in Minnesota Statutes section 103D.201.
2. PERMIT REQUIREMENT. Any person or agency of the State of Minnesota or political subdivision undertaking an activity for which a permit is required by the District rules must first submit a permit application. The application must be submitted on the form provided by the District or the substantial equivalent, and must include all exhibits required by the applicable District rule(s). Application forms are available on the District web site at: www.redlakewatershed.org

Ability to require permits – S.D. CODIFIED LAWS § 46A-10A-30 (2019).

Permit system for drainage--Fee--Modification of drain or use of unrecorded right—Drainage without permit as misdemeanor--Civil penalty.

Any board or commission under the provisions of this chapter and chapter 46A-11 may adopt a permit system for drainage. The permit system shall be prospective in nature. Permits shall be granted consistent with the principles outlined in § 46A-10A-20. The fee for a permit shall be established by the permitting authority, based on the administrative costs of regulating drainage activities, may not exceed one hundred dollars, and shall be paid only once. However, permitted drainage that is enlarged, rerouted, or otherwise modified requires a new permit. Any vested drainage right not recorded under the provisions of § 46A-10A-31 requires a permit for its use if a permit system has been established in the county where it exists. Any person or the person's contractor draining water without a permit, if a permit is required under the provisions of this section, is guilty of

a Class 1 misdemeanor. In addition to or in lieu of any criminal penalty, a court may assess against any person violating the provisions of this section a civil penalty not to exceed one thousand dollars per each day of violation. A permit system is an official control.

Documentation Requirements

MINN. STAT. § 103E.101 (2019). DRAINAGE PROCEEDING AND CONSTRUCTION RECORDS.

Subdivision 1. Public records. All maps, plats, charts, drawings, plans, specifications, and other documents that have been filed, received in evidence, or used in connection with a drainage proceeding or construction are subject to the provisions on public records in section 15.17.

OHIO REV. CODE § 6131.14 (2019).

...The county engineer shall set proper construction stakes and shall note the intersection of the line of the improvement with the apparent land boundaries of separate owners, township and county lines, natural landmarks, road crossings, or other lines or marks. The engineer shall take and note any necessary levels off the line of the improvement to determine the area of the land subject to drainage.

WIS. STAT. § 88.19(4) (2019).

(b) The secretary of the drainage board and the county zoning administrator shall maintain in perpetuity any records consisting of an order creating or altering the boundaries of a district, maps or descriptions of the boundaries of a district, profiles and cross sections of any drains and an order levying original or supplemental assessments for costs.

Tile Drainage

Materials specifications – MINN. STAT. § 103E.285 (2019).

Subd. 7. Drain tile; specifications. Specifications for drain tile must be given that comply with the requirements of the American Society for Testing Materials standard specifications for drain tile, except where the engineer requires tile of a special, higher quality for certain tile depths or soil conditions.

Permit for tile drainage – N.D. CENT. CODE § 61-32-03.1.

Permit to drain subsurface waters required - Permit form - Penalty.

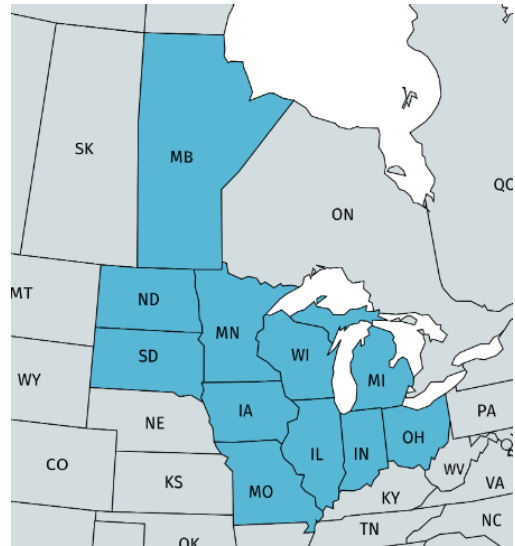
1. a. Installation of a subsurface water management system comprising eighty acres [32.37 hectares] of land area or more requires a permit. The watershed area drained by a subsurface water management system may not be used to determine whether the system requires a permit under this section.
- b. Subsurface water management systems that use surface intakes must be permitted exclusively under this section if the system will have a drainage coefficient of three-eighths of an inch [0.95 centimeters] or less. Subsurface water management systems that use surface intakes must be permitted exclusively under section 61-32-03 if the system will have a drainage coefficient exceeding three-eighths of an inch [0.95 centimeters].
- c. Installation of a subsurface water management system comprising less than eighty acres [32.37 hectares] of land area does not require a permit.

Appendix 3: Comparison Methodology

This paper compares the drainage governance and requirements of ten states, one Canadian province, and the Netherlands. These were selected based on literature and census estimates of tile drainage by state,¹⁴² conversations with drainage experts in several states, and use of land for intensive agricultural production.

The jurisdictions evaluated include:

- Iowa
- Minnesota
- Illinois
- Ohio
- Indiana
- South Dakota
- North Dakota
- Michigan
- Missouri
- Wisconsin
- Manitoba, Canada
- The Netherlands



The U.S. states above include nine of the top ten states by tile-drained area according to the USDA 2017 Census of Agriculture. It excludes New York (ninth most tile drainage) and includes North Dakota (third-largest area drained by ditches).¹⁴³

The laws in each jurisdiction were considered in conjunction with available secondary sources that provided interpretation and advice on implementation.

The process of comparing each jurisdiction involved an evaluation of laws in the following categories:

- Authority for oversight
- Oversight structure
- Drainage district creation
- Drainage district dissolution/termination

¹⁴² See, e.g., Jaynes, D.B. and James, D.E. The Extent of Farm Drainage in the United States. In Final Program and Abstracts at p.50, Soil and Water Conserv. Soc. 2007 Internat. Conf., 21-25 Jul. 2007, Tampa, FL. Available at <http://www.ars.usda.gov/SP2UserFiles/Place/50301500/TheExtentofFarmDrainageintheUnitedStates.pdf> (accessed 3 July 2019); USDA National Agricultural Statistics Service, *2017 Census of Agriculture*, Vol. 1, ch. 2, table 41. Complete data available at www.nass.usda.gov/AgCensus.

¹⁴³ USDA National Agricultural Statistics Service, *2017 Census of Agriculture*, Vol. 1, ch. 2, table 41. Complete data available at www.nass.usda.gov/AgCensus.

- Drainage district liability
- Data collection requirements
- Drainage installation standards and criteria
- Considerations in assessment of benefits
- Maintenance and ongoing oversight
- Improvements to existing drainage
- Reassessment of benefits
- Explicit requirements of landowners within the district
- Additional requirement specific to tile drainage

Each category contained specific items for comparison. These items were compared to Iowa law and qualitatively evaluated to determine whether Iowa would benefit from their incorporation.

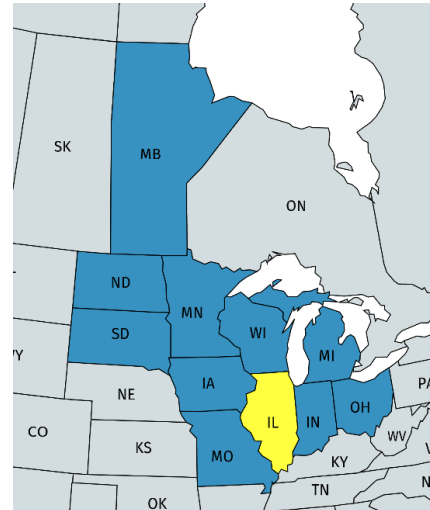
Appendix 4: State Summary Pages

The following pages summarize the status of drainage laws in each of the Midwest states evaluated by this analysis. The summary includes strengths and opportunities in terms of environmental impacts resulting from drainage.

Illinois

Overview

Illinois regulates drainage similar to most other states, resulting from an overhaul of drainage rules in 1965 that consolidated different acts regulating drainage. The overhaul included requirements for the state to involve state district courts to an unusual degree. Unlike other states, state judges determine the benefits and the levy collected by the district. Because the court determines levies, improvement actions also proceed through the district court. Other oversight is conducted by appointed commissioners, though there is a process to transition from appointed to elected commissioners. Like Iowa, Illinois has many districts – approximately 850.



Illinois uses the typical cost-benefit calculation common among Midwestern states, but imposes an overarching requirement to consider environmental values when making decisions. The law does not provide details to implement the requirement.

Counties in Illinois with large populations have a special authority to require recording of tile maps. This requirement may facilitate better planning for urban development.

Strengths

- The overarching requirement to consider environmental concerns gives drainage commissioners the ability to take environmentally protective actions.
- Court oversight provides an impartial decision-maker for drainage decisions, which may facilitate better environmental outcomes.

Opportunities for Improvement

- The consideration of environmental concerns does not set a clear standard or benchmark for implementation, which makes it difficult to enforce.
- Drainage authorities have broad discretion when conducting repairs, which are not clearly defined in the state code.
- The lack of control or oversight for commissioner elections allows a small number of people to influence drainage decisions. This is mitigated by the court oversight for levies.

- The state has no regulatory structure for tile drainage or associated water pollution.
- The state does not require landowners to meet minimum standards.

Informational Resources

Illinois Drainage Law, University of Illinois at Urbana-Champaign (1997).

A Citizen's Guide to Illinois Agricultural Drainage Practices and Law, Prairie Rivers Network (2008).

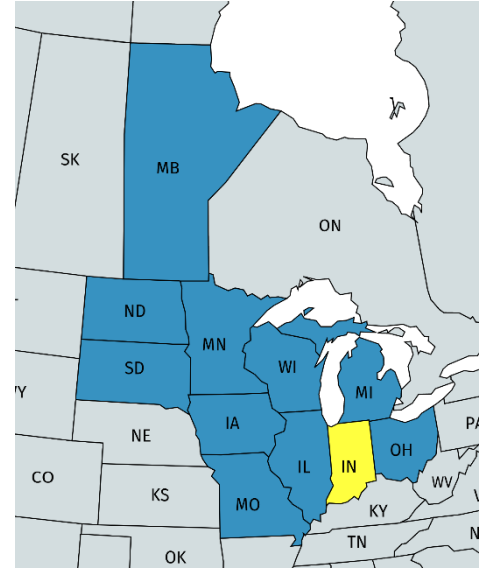
Indiana

Overview

County-based drainage boards have significant oversight in Indiana, with landowners having fewer options to petition for changes than some states.

The purposes of drainage include unusual components, such as benefitting a highway or draining a school area. The statute does not directly address environmental concerns, though flood damage and “other factors” can be considered when calculating damages.

Indiana restricts connecting a private drain to the public drainage system if it would contribute to pollution of the receiving waters. Separately, the state Department of Natural Resources is expressly prohibited from imposing permit conditions to obtain conservation easements or plant trees during ditch reconstruction or improvement. Among the states reviewed, these restrictions are unique to Indiana.



Strengths

- Prohibiting drain connections that would contribute to pollution appears to be a powerful tool to limit the water quality impacts of tile drainage.
- The vague “other factors” could allow consideration of environmental impacts.

Opportunities for Improvement

- Restricting state permit conditions during ditch maintenance or improvement precludes actions at a prime opportunity for water quality benefits.
- Boards are not presently required to account for environmental impacts before installation.
- The state has no regulatory structure in place for tile drainage or associated water pollution.
- The state does not require landowners to meet minimum standards.

Informational Resources

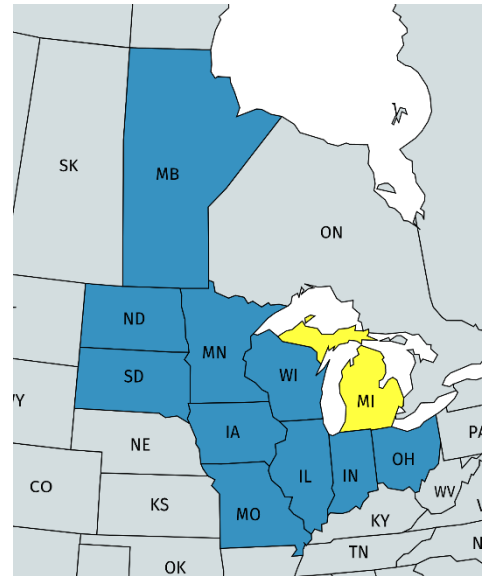
Indiana Drainage Handbook, Christopher B. Burke Engineering (1999).

Michigan

Overview

Michigan relies on an act from 1956 to regulate its drainage, with an unusual option to combine the drainage oversight with a county road commission or public works commissioner.

The considerations before installing drainage focus on the typical cost-benefit analysis, but also include consideration of whether drainage is “practical.” The calculation of benefits during reassessment considers flood reduction and use of water, but there are essentially no other environmental considerations in the law. Like other states, this reflects the vintage of the statute – with limited amendments since 1956, most of the law predates the sweeping environmental laws of the past fifty years.



In stark contrast to Iowa, Michigan drainage districts are not immune from suit; state law actually suggests that the county supervisors may use funds to purchase insurance to cover the liability of drainage districts.

Strengths

- Michigan’s county-based system provides for a manageable number of districts and ensures statewide coverage.
- The benefit calculation for drainage installation accounts for flood reduction and water usage.

Opportunities for Improvement

- Boards are not required to account for environmental impacts before installation.
- The state has no regulatory structure in place for tile drainage or associated water pollution.
- The state does not require landowners to meet minimum standards.

Informational Resources

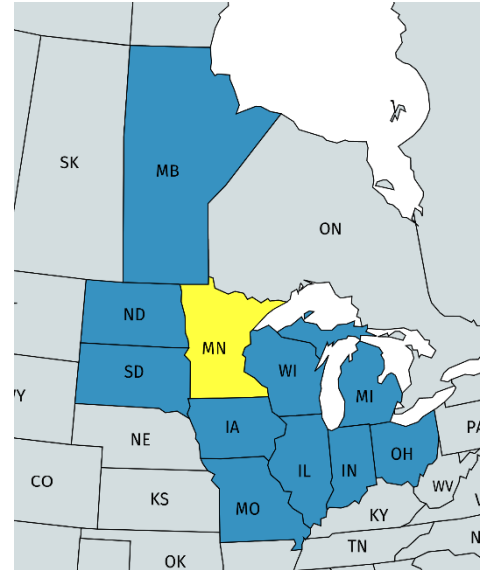
MDOT Drainage Manual, Michigan Department of Transportation and TetraTech MPS (2006).

Minnesota

Overview

Minnesota has several environmental considerations in its state law and authorizes local permitting of drainage. Nearly half of local governments overseeing drainage require permits or similar approval to proceed. Some drainage authorities are watershed-based districts, which encourages a more holistic view of hydrology and environmental impacts.

The state has updated its drainage law primarily through a stakeholder work group that typically provides consensus recommendations to the legislature. The legislature has traditionally adopted the recommendations. These changes have moved the state toward consideration of multiple benefits.



The state recently adopted and implemented a riparian buffer statute applicable to surface waters of the state, including ditches. The buffer requirement was first adopted in rule decades ago. The state found a high rate of compliance in an assessment not long after the law passed. The buffer requirement reduces soil loss, but does not directly address nitrate loading via tile drainage.

Strengths

- Environmental issues must be considered before installation.
- Buffers are required for ditches.
- Local permits track tile drainage in some portions of the state.
- Efforts to review and update drainage law are coordinated through the Drainage Work Group.
- A comprehensive drainage manual guides practices on the ground, including identified BMPs.
- Drainage record modernization efforts will digitize records.

Opportunities for Improvement

- Environmental concerns are “considered,” but environmental harm may not prevent drainage installation.
- Baseline conservation expectations do not reach nutrient reduction goals.
- Drainage record modernization effort has not yet achieved a comprehensive assessment.

Informational Resources

Minnesota Public Drainage Manual, State of Minnesota (2016).

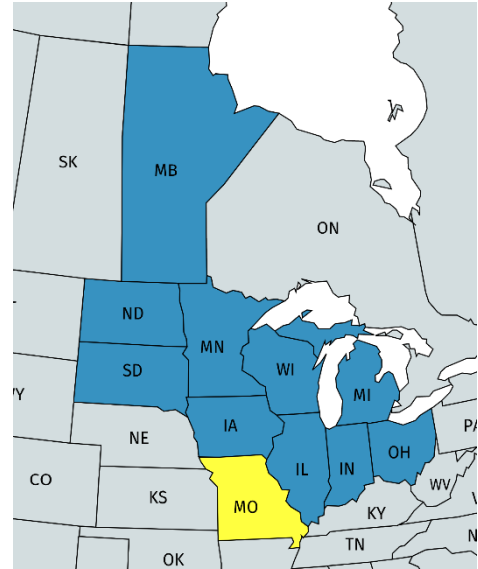
Missouri

Overview

Missouri drainage law is spread across multiple chapters and has not undergone the type of consolidation and review that other states have undertaken. The basis for the law comes from a 1939 act, and sections have never been amended.

Drainage districts in Missouri are administered directly by county boards of supervisors. Districts can be court-ordered or the result of a petition from a single landowner. The installation standards do not address environmental or flooding concerns.

Improvements can trigger newspaper notices that additional funds will be needed, but do not incorporate any environmental considerations.



Strengths

- Direct oversight by county boards provides accountability to constituents.

Opportunities for Improvement

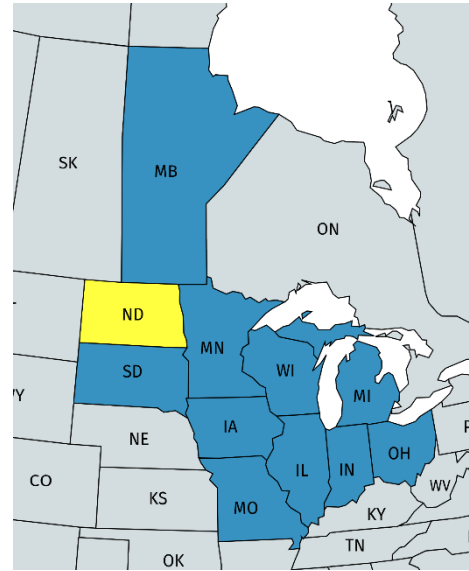
- Boards are not required to account for environmental impacts before installation or in the benefit-cost analysis.
- The state has no regulatory structure in place for tile drainage or associated water pollution.
- The state does not require landowners to meet minimum standards.

North Dakota

Overview

North Dakota has Water Resource Districts statewide, with more districts than counties. The districts are governed by board members appointed by county commissioners.

The standards for installing drainage in North Dakota include a host of considerations, with emphasis on avoiding flooding. The districts must also consider adverse hydrologic effects (including erosion) and fish and wildlife values. In addition, the districts must consider non-structural alternatives to constructing a proposed drainage system.



One of the unique aspects of North Dakota is the requirement to obtain a permit before draining an area of 80 acres or more. This requirement results from an opinion by the North Dakota Attorney General, who affirmed a state engineer determination that drainage system of that magnitude may result in draining surface waters of the state. Drainage of surface waters requires a permit under North Dakota law.

Strengths

- A permit requirement for drainage projects of 80 acres or more provides state-level oversight of new drainage systems.
- Districts must consider fish and wildlife before constructing a new drainage system.

Opportunities for Improvement

- There is no direct consideration of water quality impacts.
- Landowners have no obligation to maintain best management practices.

Informational Resources

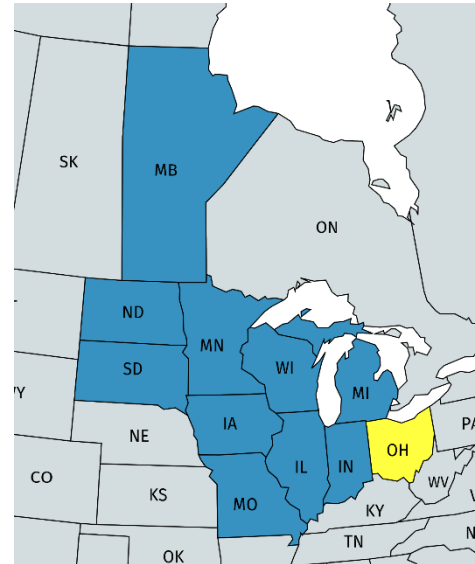
Wayne Stenehjem, North Dakota Attorney General Letter Opinion 2008-L-14 (Oct. 1, 2008).

Ohio

Overview

Ohio drainage is controlled by county commissioners, rather than a separate unit of government. The commissioners must consider protection of environmentally significant areas and alternative plans to protect those areas before constructing a new drainage system.

Ohio law deems ditches created by a district to be a public watercourse, which carries implications for water quality standards and state oversight. The county engineer must report any nuisance conditions in the ditches and the county board of health must pursue the violations causing the nuisance conditions.



A requirement unique to Ohio is setting physical benchmarks in a ditch to show the original location. This maintains the engineered flow by preventing “maintenance” or “repair” efforts from resulting in larger, wider ditches over time.

Strengths

- Commissioners must consider environmentally significant areas before construction.
- Ditches are public watercourses.
- Nuisance conditions can be enforced via county engineer inspections.
- Physical benchmarks mark ditch locations, preventing unauthorized expansion over time.

Opportunities for Improvement

- Landowners have no obligation to maintain best management practices beyond prevention of nuisance conditions.

Informational Resources

Ohio Drainage Manual (2009 Draft), Ohio Department of Natural Resources (2009).

Ohio County Commissioner Handbook (ch. 29, Drainage), County Commissioners Association of Ohio (1994).

South Dakota

Overview

The South Dakota constitution declares draining of agricultural lands to be a public purpose, creating an extremely strong presumption in favor of drainage. Drainage installed in South Dakota must be consistent with a county-wide drainage plan that promotes “physical, economic, and environmental management” within the county. This provides a more holistic look than suggested by the constitutional language.

Like Iowa, drainage can be overseen by a drainage commission (which must include at least one county commissioner) or trustees. Unlike Iowa, the commission is not immune from lawsuit and may be liable for downstream damages such as flooding.

South Dakota allows local drainage authorities to require permits, but does not mandate permitting statewide. Violation of a permit is considered a misdemeanor with a civil penalty of up to \$1,000 per day.

Strengths

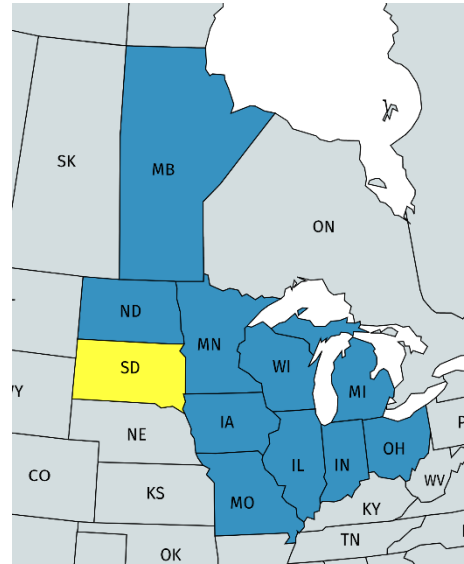
- The permit program provides oversight and has a strong deterrent for noncompliance.
- Drainage installation must be consistent with environmental management and county-level plans.

Opportunities for Improvement

- Landowners have no obligation to maintain best management practices.
- Permits are not required statewide.

Informational Resources

A Review of South Dakota Drainage Law, South Dakota Office of Attorney General Natural Resources Division (2005).

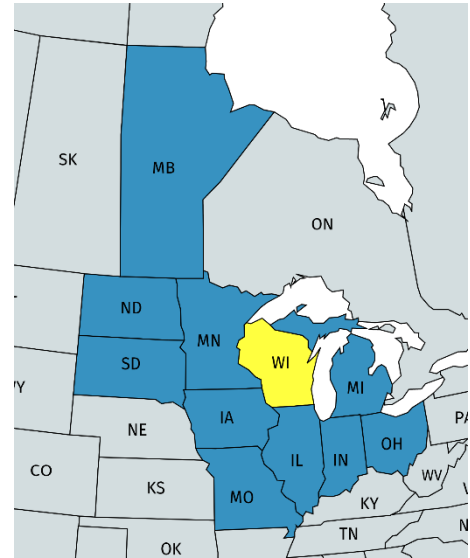


Wisconsin

Overview

Unlike other states, Wisconsin has court-appointed board members for its 176 drainage districts. The district is immune from negligence liability, but not from nuisance lawsuits.

To construct a new drainage system, the district must determine costs are less than 75 percent of the benefits, a smaller ratio than other states. In addition, the drainage must not impair fish or wildlife habitat, natural resources, scenic beauty, or public rights or interests. The district must also evaluate the effects on temperature and water level in lakes, streams, and groundwater. After installation, the drainage system must minimize erosion and runoff by maintaining vegetative cover.



Wisconsin imposes more landowner requirements than other states: ditches require a 20-foot buffer, or wider if necessary to protect water quality; the district board may require adoption of NRCS practices; and landowners must notify the board of actions they take that increase erosion.

Strengths

- Wisconsin requires more complete evaluation of environmental and hydrologic impacts than other states, ranging from habitat to water levels.
- Landowners have clear obligations to minimize erosion and notify the district if erosion will increase.
- Wisconsin requires buffers to protect water quality, which aids in the goal of minimizing erosion.
- Districts have authority to require best management practices of landowners.

Opportunities for Improvement

- Wisconsin does not have a drainage permit program.

Informational Resources

County Drainage Board Handbook, Department of Agriculture, Trade & Consumer Protection (2018).
Facilities Development Manual, ch. 13 (Drainage), Wisconsin Department of Transportation (2018).



About

The primary author of this paper is Michael Schmidt, Staff Attorney with the Iowa Environmental Council. IEC extends a special thanks to the McKnight Foundation for providing funding for this effort.



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