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NAVIGATING MURKY WATERS: STATE-LEVEL STRATEGIES FOR WETLAND PRESERVATION AND TILE DRAINAGE REGULATION AFTER SACKETT V. EPA

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by

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ABSTRACT

Navigating Murky Waters: State-Level Strategies for Wetland Preservation and Tile Drainage Regulation after *Sackett v. EPA*

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Wetlands are some of the world's most valuable ecosystems, serving as provisioners of species habitat, carbon sequestration, flood mitigation, water quality purification, and other ecosystem services. Human development has resulted in substantial wetland loss the world over. In the 1970s, the United States Congress passed the Clean Water Act, giving the EPA broad authority over wetland protection. However, in the summer of 2023, the United States Supreme Court decided *Sackett v. EPA*, limiting the EPA's jurisdiction over wetlands to those indistinguishably connected to generally recognized "Waters of the United States" and removing federal protection for millions of acres of wetlands, particularly in the Midwest. Tile drainage is one of the greatest contributors to wetland loss in agricultural areas. Though Congress has routinely enacted Swampbuster provisions which provide that producers who drain wetlands for agricultural purposes are ineligible for many USDA benefits, the Government Accountability Office found the enforcement of these provisions in the Dakotas, Minnesota, and Iowa is lacking. With federal protection limited, state protection becomes remarkably important. This study analyzed state approaches to wetland protection and tile drainage, serving as a foundation for understanding the true threat to wetlands the nation over in the wake of *Sackett* and cross-state collaboration in wetland protection policy development.

KEYWORDS: Sackett, EPA, Wetlands, Tile Drainage, Regulation, Protection

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INTRODUCTION

In the summer of 2023, the United States Supreme Court released its decision in *Sackett v. Environmental Protection Agency*, a case centered around the regulatory authority the Environmental Protection Agency (EPA) has over different types of wetlands. In a 5-4 ruling, the Court greatly restricted the EPA's authority, providing that wetlands not deemed to have a continuous surface connection with other water bodies more traditionally considered to fall under the definition of the term "waters of the United States," such as lakes, streams, rivers, and oceans, were not protected by the Clean Water Act (Sackett, 2023).

Many environmental advocates immediately criticized this decision, with many expressing grave concern about the removal of protections for millions of acres of wetlands (Devine, 2023). Wetlands are widely recognized as some of the most productive and valuable ecosystems across the globe (Goldstein & Dellasalla, 2020). They provide critical habitat for many species (Environmental, 2006; Cohen et al., 2024; Cameron & Sadd, 2019; Mitchell et al., 2023; Environmental *How do wetlands*, 2024; Ballard et al., 2021; James & Herbert, 2024). They serve as effective, natural means of carbon sequestration (Adhikari et al., 2009). They provide recreational and aesthetic enjoyment, filter pollutants from drinking water, and assist in flood mitigation (Adair, 2023; Cynthia & Handley, 2007; Knox et al., 2008). As such, the removal of Clean Water Act protections for millions of acres of wetlands has concerned many environmentalists.

Though the Farm Bill has "Swampbuster" provisions which provide that farmers who alter wetlands for agricultural purposes are largely ineligible for United States

Department of Agriculture (USDA) benefits, a Government Accountability Office (GAO) report found these provisions were not being adequately enforced in the prairie pothole states of Iowa, Minnesota, North Dakota, and South Dakota (Government, 2021). Many of the wetlands in these states are not granted protection under *Sackett's* reinterpretation of "waters of the United States," and agricultural producers face heavy economic incentives to drain these wetlands via the implementation of tile drainage (*How agricultural*, 2018; Climate Change, 2023). Wetland removal and the implementation of tile drainage in these states is likely to have incredible impacts on not only regional water quality but also water quality throughout the rest of the Mississippi River and the Gulf of Mexico (Rabotyagov et al., 2014). Wetlands in other states could face similar threats with the rollback of protections (Sorg, 2023; Livingston, 2023; *Indiana's*, n.d.). Thus, the ecosystem services wetlands provide across the nation are at risk.

However, it is within each state's power to enact stricter wetland protections than provided by the federal government. For this research project, it was assumed that state wetland protections would vary between states. Thus, to assess the risks posed to wetlands across the nation, it is necessary to analyze state policies and regulations. This project does just that in the immediate wake of the *Sackett* decision. I hope this analysis can facilitate cross-state policy sharing, collaboration, and innovation that fosters greater protections for wetlands and environmental regulations of tile drainage across the nation when federal action falls short. This analysis is limited but provides the foundation for cross-state policy collaboration and additional research.

LITERATURE REVIEW

WETLANDS AND TILE DRAINAGE

While many definitions exist, literature and government regulations primarily define wetlands as areas of land where the soil is either wet or flooded for part or all of the year, meaning wetlands can vary from Florida's everglades and marshes to playas and prairie potholes (Environmental *What is*, n.d.; Environmental *How Wetlands*, n.d.; National Park, 2022; Cherry, 2011). Such an expansive definition covers many different types of water bodies and covers many different geographic areas. The EPA has developed four general categories into which they categorize wetlands: marshes, swamps, bogs, and fens. Table 1 defines these general categories.

Table 1: Wetland category definitions

Marshes	Land "…frequently or continually inundated with water, characterized by emergent soft-stemmed vegetation adapted to saturated soil conditions.."
Swamps	"…[A]ny wetland dominated by woody plants. Swamps are characterized by saturated soils during the growing season and standing water during certain times of the year."
Bogs	"[Bogs] are characterized by spongy peat deposits, acidic waters and a floor covered by a thick carpet of sphagnum moss. Bogs receive all or most of their water from precipitation rather than from runoff, groundwater or streams."
Fens	"Fens are peat-forming wetlands that receive nutrients from sources other than precipitation: usually from upslope sources through drainage from surrounding mineral soils and from groundwater movement. Fens differ from bogs because they are less acidic and have higher nutrient levels. These systems are often covered by grasses, sedges, rushes and wildflowers."

The EPA has further sub-categorized wetlands. It splits marshes into either tidal or nontidal marshes. “Tidal (coastal) marshes occur along coastlines and are influenced by tides and often by freshwater from runoff, rivers, or ground water” (Environmental, 2001). “Nontidal (inland) marshes are dominated by herbaceous plants and frequently occur in poorly drained depressions, floodplains, and shallow water areas along the edges of lakes and rivers… [including] Great Lakes coastal marshes, the prairie pothole region, and the Florida Everglades” (Environmental, 2001). It has further identified subcategories for nontidal marshes—Table 2.

Table 2: Subcategories for nontidal marsh wetlands

Freshwater Marshes	“Freshwater marshes are characterized by periodic or permanent shallow water, little or no peat deposition, and mineral soils. They typically derive most of their water from surface waters, including floodwater and runoff, but do receive ground water inputs.”
Wet Meadows	“Wet meadows commonly occur in poorly drained areas such as shallow lake basins, low-lying depressions, and the land between shallow marshes and upland areas. Precipitation serves as their primary water supply, so they are often dry in the summer.”
Wet Prairies	“Wet prairies are similar to wet meadows but remain saturated longer. Wet prairies may receive water from intermittent streams as well as ground water and precipitation.”
Prairie Potholes	“Prairie potholes develop when snowmelt and rain fill the pockmarks left on the landscape by glaciers. Ground water input is also important.”
Playas	“Playas are small basins that collect rainfall and runoff from the surrounding land. These low-lying areas are found in the Southern High Plains of the United States.”
Vernal Pools	“Vernal pools have either bedrock or a hard clay layer in the soil that helps keep water in the pool. They are covered by shallow water for variable periods from winter to spring, but may be completely dry for most of the summer and fall.”

Research has shown that wetlands are one of the most valuable geographic features on earth (Das et al., 2022; Doratoaj et al., 2022; Moreno-Mateos et al., 2012;

Snyder, 2019). Costanza et al.'s 1997 study, which valued the biosphere and its component ecosystems, valued wetlands at 4.9 trillion U.S. dollars—roughly $8.92 trillion in 2023 ("CPI" 2024). Part of the reason they are so valuable is that they are some of the most productive ecosystems on the planet. Their productivity is akin to coral reefs and rain forests (Goldstein & DellaSalla, 2020; Environmental *Why*, n.d.). But research has illuminated wetlands are valuable for many more reasons.

Wetlands provide habitat to countless species. According to the EPA (2006), wetland habitat is critical for a vast majority of fish and shellfish species, with over 75 percent of commercially harvested fish and shellfish species in the United States relying upon wetlands during their life cycle. The U.S. fishing industry is a multi-billion-dollar industry. Agriculture is an even larger, trillion-dollar industry that critically relies upon pollination by bees and other species ("Ag and Food" 2024, "Why is Pollination" 2024). In fact, according to the USDA, the value of the ecological services provided by pollinators in the U.S. alone is estimated around $200 billion (Randall, 2020). Cohen et al. (2024) determined that bumblebee populations are closely tied to wetland prevalence, with wetland edge habitat being especially critical for bumblebees, particularly in agricultural landscapes like the Northern Great Plains. Yet bumblebee populations worldwide have largely been declining, partly because of habitat loss from landscape conversion to agriculture (Cohen et al., 2024; Cameron & Sadd, 2019).

Previous research also suggests wetlands are important habitat for migrating bird species, particularly waterfowl like ducks. Two recent studies conducted in the Northern Great Plains found that many duck species heavily rely on wetlands. Ballard et al. (2021) found the quantity and quality of wetlands can impact duck migration success and

breeding events—a sentiment supported by the organization Ducks Unlimited (James & Herbert, 2024). Both studies found semi-permanent potholes were particularly important (Ballard et al. 2021, Mitchell et al. 2023).

Species reliance upon wetlands for habitat extends well beyond bumblebees and ducks. According to the EPA, "[w]etlands can be thought of as 'biological supermarkets'" because "[t]hey provide great volumes of food that attract many animal species" (Environmental *How do wetlands*, n.d.). Some other species reliant upon wetlands include the beaver, muskrat, black bear, raccoon, meadow vole, and many bird species (Watershed, n.d.).

Since so many species rely upon wetlands, there is grave concern about the biodiversity implications of wetland loss. Sice et al. (2016) expressed concern that the loss of wetlands in the Argentinian Paraná River Delta, largely due to pasture conversion and forestry, could have detrimental effects on the region's biodiversity. Quesnelle (2014) conducted a meta-analysis of ninety different studies on the effect of wetland loss on wetland species. The study revealed species with lower reproductive rates, such as birds and mammals, are quite susceptible to wetland loss. Overall, research has demonstrated the critical importance of wetlands for a wide range of species, from ocean fish to black bears and ducks. Thus, wetland loss is concerning for its biodiversity implications.

Wetlands provide flood control services, too. Cynthia and Handley (2007) illustrated this in their study of the La Crosse, Wisconsin area around the 2001 spring flooding event. Relying upon satellite imagery and field observations, they determined the extent to which the La Crosse River Marsh assisted in flood water retention. While

roughly 6,000 acre-feet was retained by the marsh, they suggested this could be substantial locally. Extrapolated across the river basin with many other such wetland areas, wetlands could play a critical role in flood mitigation (Cynthia & Handley, 2007)). Similarly, Al-Attabi et al.'s (2023) analysis of Hurricane Ike outlined the importance of coastal wetlands. They found that, had there been no wetlands, the hurricane's damages would have increased by roughly 13 percent, or $934 million. This emphasizes the important role coastal wetlands play in mitigating flood damage. As such, another concern with wetland loss is the enhancement of flood risk, a risk expected to increase as global temperatures rise due to human activity ("Climate," 2023).

Another reason wetlands have such great value is because they assist in combatting rising atmospheric greenhouse gas levels. According to Adhikari et al. (2009), wetland characteristics lend to substantial organic matter accumulation in their soil and sediment, thus making them excellent carbon sinks. It has been estimated that wetlands, despite comprising roughly five percent of the earth's land area, account for 20 to 25 percent of the planet's soil organic carbon (Adhikari et al., 2009).

Wetlands are effective at trapping eroded soil particles and retaining a substantial portion of key nutrients like nitrogen and phosphorus as well (Widney et al., 2018; Knox et al., 2008; "Watershed"). Knox et al. (2008) conducted a study on two wetlands in the agricultural Sierra Nevada foothills of Northern California, looking at the difference in nutrient capture and water quality improvement caused by a degraded and non-degraded wetland. The study found the non-degraded wetland reduced suspended sediments by 67 percent, nitrate by 60 percent, and *Escherichia coli* by 68 percent. The degraded wetland also provided some nutrient and sediment management, though it was substantially

diminished (Knox et al. 2008). A study of the Congaree Bottomland Hardwood Swamp in South Carolina found that such nutrient and sediment management by the wetland area is equivalent to roughly $5 million. Similarly, the EPA cites another study finding that a 2,500-acre Georgia wetland provides roughly $1 million annually in pollution abatement. The trapping of suspended soil particles can be quite valuable as sediment suspension can contribute to the blockage of waterways and affect egg development for fish and amphibians ("Watershed").

These are only some of the ecosystem services provided by wetlands, with other valuable services including facilitating groundwater recharge and providing recreational and aesthetic value to humans ("Watershed"; Adair, 2023). Though it is now recognized that wetlands provide a substantial number of valuable services, human development has destroyed much of the world's wetlands and threatens many wetlands today.

HISTORICAL LOSS AND PRESENT WETLAND THREATS

Fluet-Chouniard et al. (2022) have estimated more than a fifth of the world's wetlands have been lost since 1700. The reasons for this are varied, but the primary cause is human development. Globally, drainage of wetlands for agriculture has been the primary driver of loss, with its accounting for over 80 percent of wetland loss. The loss of wetlands is not evenly distributed across the globe, though. Fluet-Chouinard et al. estimated the heavily industrialized countries and regions of the "United States, Europe, Central Asia, India, China, Japan and Southeast Asia" have all lost more than half of their wetlands. The United States has seen the greatest overall loss, accounting for over 15 percent of global wetland disappearance (Fluet-Chouinard et al., 2022).

Iowa has experienced substantial wetland loss. According to the Iowa Department of Natural Resource's 2016 Wetland Program Plan developed for the EPA, 90 to 95 percent of the state's wetlands have been drained or are no longer considered fully functional. Much of the drainage was done to enhance crop yields across Iowa, and it was incentivized by the United States Congress (Iowa Department, 2016). Such extensive drainage has had devastating consequences on a large portion of the state's environmental health. According to the Iowa Department of Natural Resources (2016), wetland loss coupled with extensive removal of prairie and forest habitats has resulted in substantial biodiversity loss across the state.

Most of Iowa's wetlands have been drained for agricultural practices. This is primarily done through the implementation of a tile-drainage system. As explained in a tile drainage resource developed by the University of Minnesota Extension (2018), tile drainage involves the placement of a perforated pipe at a gradient in the soil. The perforations allow for the collection of excess water—for crop growth—from the crop root zone that, once in the pipe, is transferred, via gravity, out of the area. Considering crop production, the benefits of this are many-fold. It lowers the water table and provides greater soil aeration, which facilitates the drying and warming of the soil, particularly in the spring. This can enable producers to get into the field earlier, increasing growing season length. It also reduces soil compaction and generally makes the field environment more conducive to crop emergence and growth. Lastly, "drainage greatly reduces the risk of crop water stress from ill-timed or excessive rainfall" (*How agriculture*, 2018).

With all these benefits, many farmers are interested in tile drainage. In South Dakota, between 2012 and 2017, tile-drained acreage increased by 68 percent, up to

658,711 acres (Bly, 2020). While a great increase in a matter of only five years, it perhaps becomes easier to understand why this is so when one considers the impacts of climate change on the state and the economic incentives facing producers. According to the EPA (2016), winter and spring precipitation in South Dakota is likely to increase, making it harder for farmers to promptly get into the fields. One such instance of this is the especially wet spring of 2019. Due to the saturated farmlands and fields, nearly four million acres of cropland went unplanted in South Dakota (McManus, 2020). If more of these four million acres had tile drainage systems installed, farmers would have been able to get into their fields sooner than they did. South Dakota was not the only state affected by this wetter spring weather. Across the Midwest, roughly 11.4 million acres of land intended to be planted with corn went unplanted. This had an incredible economic impact on the state and region. English et al. (2021) project this resulted in the loss of more than six billion dollars in revenue from crop sales. Thus, the economic incentives exist for producers, particularly in the Midwest, to install tile drainage.

There is an uncaptured externality associated with tile drainage implementation in agricultural fields, though. Many agricultural operations apply fertilizer to their fields to enhance crop yields. The primary nutrients in these fertilizers are nitrogen, phosphorus, and potassium (*Agriculture*, 2024). However, the nutrients are not confined to the fields to which they are applied. Many leave the field via runoff and erosion, ultimately ending up in waterways (Hart et al., 2004). While producers often apply nitrogen and phosphorus to fields because they are the limiting nutrients for plant growth in agricultural operations, they also tend to be the limiting nutrients for plant growth in water bodies. Nitrogenic compounds like nitrate and nitrite are the limiting nutrients for plant growth in

most oceanic ecosystems; phosphates are the limiting nutrients for plant growth in most freshwater ecosystems, like lakes and streams (Howarth & Marino, 2006; Schindler et al., 2004).

The increase in these limiting nutrients turns can result in the eutrophication of aquatic ecosystems. The increase in the limiting nutrient's availability enhances the growth of all types of plants, including algae on the water surface. This is potentially problematic for at least two reasons: First, these algae can be toxic to humans and animals who encounter them (Centers, 2022). Second, if there is substantial algal and general plant growth, to the point the algae "blooms," it can cover the surface of the water. When it does so, sunlight is blocked from reaching below the water's surface. This results in the death of the other aquatic plants. When these plants die, they are broken down by aquatic microorganisms. Their decomposition results in the reduction of dissolved oxygen levels. The death and subsequent breakdown of the algae further reduces oxygen availability. If oxygen levels become low enough, it can result in the death of other aquatic organisms, such as fish, and their subsequent decomposition further perpetuates this positive feedback cycle (Smith & Schindler, 2009).

Much as tile drainage enhances the flow of water out of agricultural fields, it similarly enhances the export of critical nutrients like phosphorus and nitrogen to water bodies as they either attach to soil particles that are transported along with the water—phosphorus—or dissolve in the transported water—nitrogen (Miller, n.d.). Across the United States and the globe, this has resulted in many waterbodies facing excessive nutrient loading and, subsequently, eutrophication. A few such waterbodies include the Gulf of Mexico, the Chesapeake Bay, and the Great Lakes (Smith et al., 2019; Boehm,

2020; Harrigan, 2015). This has great economic consequences. Smith et al. (2019) evaluated the cost of Lake Erie eutrophication. They found that, for Canada alone, the cost was well over a quarter of a billion dollars, with the tourism industry being impacted the most. Boehm (2020) estimated the cost of the Gulf of Mexico's "Dead Zone" on the region's fishing economy alone is roughly 2.4 billion dollars annually.

The economic impact can be just as, if not more, cumbersome at the local level. The rural community of Mitchell, South Dakota has struggled with the effects of agricultural runoff and, consequently, eutrophication. This community of roughly 15,000 people has a 671-acre human-made lake on the edge of city limits that used to serve as the primary drinking water source for the community. The water quality issues necessitated a change in the water source (Myers, 1997). Due to large nutrient accumulation in the lake, for the community to appropriately address its water quality issues, it must undertake a 25-million-dollar dredging project to remove phosphorus-laden sediment from the lake bed (Fosness, 2023, May 1). Additionally, for the dredging project to be successful long-term, the community is considering encouraging less nutrient-runoff-inducing agricultural and urban lawn care management practices in Lake Mitchell's extensive 350,000-acre watershed and developing a 35-acre wetland-type ecosystem at the lake's inlet—projected to cost well over half-a-million dollars (Fosness, 2023, July 21; Myers, 1997). Addressing the lake's water quality issues is an incredible economic burden on this small community, and it is just one of many communities facing similar struggles.

Mitchell's wetland development project, however, illustrates how wetlands can serve as a partial solution to this type of water quality issue. Because wetlands hold water

in place for a long time, they allow soil particles suspended in the water to settle to the bottom of the wetland. Here, the nutrients are utilized by wetland vegetation, and floating vegetation like algae can take up nutrients suspended in the water. Additionally, nitrates can be converted into atmospheric nitrogen by wetland soil microbes, removing the nutrients from the water. Rabotyagov et al. (2014) determined that, for every acre of wetland restored along the southern portion of the Mississippi River, roughly $900 to $1,900 is generated for nitrate mitigation alone. However, naturally existing wetlands are not a panacea for the water quality issues posed by fertilizer application. Wetlands, like most natural systems, have a natural balance and limit to the amount of nutrients they can absorb, and nutrients often cycle within and into and out of wetlands (Miller, n.d.). However, the drainage and removal of wetlands reduce the nutrients stored in them, facilitating increased nutrient loads throughout global waterways and subsequent eutrophication concerns.

The artificial creation or management of wetlands provides a unique means of getting around the natural limitations of wetland nutrient capture and transformation. The natural course of nutrient uptake by wetland vegetation is enabled, but instead of letting the vegetation die, decompose, and subsequently reintroduce its captured nutrients into the water where they can be transported into lakes, streams, and oceans, the plants are harvested and removed from the wetlands (Kasak et al, 2020). Using constructed wetlands has been shown to be quite effective as well. Kamily et al. (2022) found one type of constructed wetland can remove, on average, 65 percent of total phosphorus, while a different type of constructed wetland removed, on average, 68 percent of nitrogen. These values were enhanced when nutrient removal facilitating practices were

accompanied by the constructed wetlands, such as artificial aeration and varying plant species in the wetlands. Just shy of 90 percent of such nutrients were removed with the implementation of these practices.

Wetland construction has also been employed as a means of complying with the Clean Water Act's Section 404 requirements (Ruhl & Salman, 2022). In the administration of the Act, the Army Corps of Engineers required one requesting a permit to develop a wetland to show there was no reasonable alternative besides affecting the wetland and that the development would minimize the impact on the wetland to the greatest extent possible. If such conditions were met, then the developer could be granted the permit only if other wetlands were restored or created to compensate for the loss of wetlands being developed.

This policy led to the rise of a tactic called "mitigation banking," originally developed by state highway departments—road development often impacts wetlands. To more easily attain the standards imposed by Section 404, these highway departments developed "wetland mitigation banks." Essentially, they would often buy inexpensive land to develop wetlands on to offset the wetlands impacted by their road construction activities (Ruhl & Salman, 2022). This had great benefits for developers, making it easier to obtain Section 404 permits. The subsequent wetland market that developed became quite large, with Ruhl and Salman (2022) estimating nearly one billion dollars was being exchanged annually in the wetland mitigation market.

There has been criticism of this practice. With the distance between the development site and the mitigation banking site often being quite large, environmental organizations question the ability of the wetland development to be truly compensated by

wetland mitigation banking (Ruhl & Salman, 2022). In other words, some suggest an acre of wetland in one place may be less valuable in terms of the ecosystem services it provides—flood mitigation, wildlife habitat, water filtration, etc.—than an acre of wetland at another site. Furthermore, some suggest the quality of the constructed or restored wetlands could be quite poor as neither the developer nor the banker may truly care about the quality of the wetlands they bank, with the only entity performing a sort of quality control being the Army Corps of Engineers. In other words, the assurance of the quality of the wetlands in a mitigation bank depends on regulation and enforcement by a federal government entity, and the locational change of the wetland can itself reduce the functionality and value of the wetland. Finally, the distance between the development site and the mitigation bank may span urban and rural areas, compromising some of the ecosystem services that wetlands might provide, such as recreational and aesthetic enjoyment by people (Ruhl & Salman, 2022).

While mitigation banking may have its flaws and be an imperfect system, it appears fair to suggest that the development of some wetlands, even if subpar to the ones lost, is better than simply losing wetlands and not having them replaced in any sense. The Supreme Court's recent *Sackett* ruling creates such a dynamic. With Section 404 requirements limited to only wetlands "indistinguishable" from other, more commonly understood waters of the United States, fewer wetlands require such mitigation by the federal government if developed (Teegarden, 2023).

The consequences of excess nutrients in waterbodies do not stop at eutrophication. As mentioned above, one of the greatest consequences of Iowa's implementation of tile drainage and destruction of wetlands is its effect on the state's

water quality. While excess nutrients facilitate eutrophication, the presence of excess nitrogen alone can make water unsafe for human consumption. Excess nitrates in water consumed by infants can result in infant methemoglobinemia—a condition where the blood's hemoglobin is converted to methemoglobin, which is less effective at tissue oxygenation. As a result, hypoxia—low levels of oxygen in body tissues—and cyanosis—the skin, lips, and nail beds becoming bluish due to oxygen shortage—can occur (Ward et al, 2018; Johnson, 2019; *What is cyanosis*, n.d.; *Hypoxia*, 2022). As a result of cyanosis, this condition is sometimes colloquially referred to as "blue baby syndrome" (*Infant*, 2023). Other health consequences for the broader population are associated with excess nitrates in drinking water as well. Ward et al. (2018) studied the health effects of nitrate consumption via drinking water and found strong relationships between nitrate consumption and "colorectal cancer, thyroid disease, and neural tube defects," with other adverse health effects also being potentially related, though with weaker relationships.

Regarding the Iowa discussion above, these health effects were of great concern to the Des Moines Water Works utility, which filed a lawsuit against three drainage districts in northwest Iowa. The utility sought monetary compensation for the operation of technology that removes nitrates from drinking water for Des Moines citizens. The utility claims it spent $633,000 to operate the technology in 2016 and $1.2 million in 2015, largely to comply with federal drinking water standards aimed at addressing the health concerns posited above (Elmer, 2017). However, the lawsuit was ultimately dismissed in 2017 by a federal court. The court found that, though excess nitrates may be entering the waterways which ultimately supply the Des Moines area from lands located

within these drainage districts, these districts were not themselves the appropriate entities to sue for tort damages. Instead, the court determined this was a political question best handled by the Iowa legislature, not the judicial system (Board, 2017). Now, the Des Moines Water Works utility is expecting to spend 15 million dollars to double the size of its current nitrate treatment facility to handle the increased concentration of nitrates it has been receiving because of upstream nutrient runoff (Elmer, 2017).

Overall, increases in tile-drained acreage and wetland loss raise serious concerns ranging from the potential implications on biodiversity to the impacts on water quality and human health. The federal government has at least partly recognized this. In the 1985 Farm Bill, Congress enacted what are commonly known as “Swampbuster” provisions. Essentially, these provisions heavily discourage the drainage or alteration of wetlands by farmers and producers for agricultural purposes. The provisions provide that if producers plant crops on converted wetlands or otherwise modify a wetland to make the land viable for agricultural production, then the producers are ineligible for some USDA benefits. These benefits include but are not limited to, “commodity support payments, disaster payments, farm loans, and conservation program payments” (Stubbs, 2016). In the 2014 Farm Bill, crop insurance premium subsidies were added to the list of potential benefits that could be lost. Noncompliance may even result in producers having to pay back current and former USDA benefits they received. Some activities were exempted from these provisions, such as the conversion of an artificial wetland.

Congress did allow for an alternative to losing program benefits for those who violate the Swampbuster provisions. If one engages in “wetland mitigation," whereby one restores an altered wetland, enhances an already existing wetland, or creates a new

wetland to the extent that the equivalent value and functions of the lost wetland are mitigated, one can maintain their eligibility. One note of particular interest underscoring the seriousness with which Congress legislated concerning this issue is that the loss of USDA benefits applies to both current and future producers associated with the wetland (Natural Resources, n.d.; Stubbs, 2016).

Despite the intentions of Congress, it appears the Swampbuster provisions are not being effectively enforced across the United States, including in the important prairie pothole region of Iowa, South Dakota, North Dakota, and Minnesota. From 2019-2021, upon the request of the United States Senate Committee on Agriculture, Nutrition, and Forestry, the United States Government Accountability Office (GAO) reviewed the USDA's enforcement of wetland compliance provisions in the prairie pothole region. It did so by reviewing "relevant legislation, regulations, manuals, and other national- and state-level guidance… NRCS's [Natural Resources Conservation Service] intentional evaluations of the prairie pothole states' implementation of wetland determination procedures for 2013-2017, quality control reviews of wetland determinations in the four states for 2017-2019…," and more (Government, 2021).

In its findings, the GAO notes the NRCS only evaluates roughly one percent of land tracts subject to wetland compliance provisions. The GAO suggests this is because of the over one million tracts of land subject to these provisions in the prairie pothole states, and because of staffing and resource limitations. The GAO suggests the NRCS has not been as effective as possible with its sampling method. It points out the NRCS does not use a risk-based approach to determine which tracts to evaluate. It also claims the NRCS has not even followed its manual. Considering other USDA agencies conduct risk-

based assessments and that the data the NRCS has could enable the development of a model that allows for a more risk-based sample to be developed that could better detect violating farms, the GAO suggests the NRCS should modify its sampling procedures (Government, 2021).

Further, the GAO claims that NRCS officials in these states do not report all potential violations they notice. According to the GAO, "reports [of potential violations] may be initiated by NRCS officials, neighboring farmers, officials from other agencies, and concerned citizens. When NRCS finds violations, it provides information to [the Farm Services Agency] FSA…" to determine USDA benefits eligibility (Government, 2021). However, the GAO provides that while such potential violations used to be reported by NRCS field officials, they have not recently. NRCS officials said they would only report such a violation if it was on a tract for which they were already conducting a wetland determination. As such, many potential violations were overlooked, including those noticed "while driving between farms; on tracts adjacent to those where they are providing technical assistance; or while reviewing aerial imagery for other conservation programs…" (Government, 2021). NRCS officials' justifications for this included that they feel the NRCS is not responsible for enforcing wetland compliance provisions. The GAO also found the NRCS headquarters and state offices have even encouraged such officials to not report potential violations, but rather encourage the farmers to update their wetland certification forms, all in the effort of providing "good customer service to farmers" and ensuring "farmers maintain their eligibility for farm program benefits" (Government, 2021). As put by the GAO:

> When NRCS officials do not report potential violations they observe, NRCS is not efficiently using its limited resources available for detection of violations. By

> ensuring that NRCS instructs its state and field offices to consistently report any potential violations they observe, USDA could better use its available resources to ensure farm program benefits are provided only to farmers who comply with wetland conservation provisions (2021, p. 37).

After all, that is the intention of the Swampbuster provisions.

The enforcement problems do not stop with the NRCS. When farmers are determined to have violated the wetland provisions, their case is sent to the FSA for determination of benefits consequences. In this process, producers can be granted a good-faith waiver if it is determined they acted in good faith and did not intend to violate the wetland protection provisions. If granted, a producer remains eligible for USDA benefits. The FSA, however, appears to be quite liberal with their granting of such waivers, with the GAO reporting that, over eight years, 81% of cases from North and South Dakota that went to the FSA were granted waivers. The FSA's decision-making process in this regard is, at least partly, informed by the recommendations of local county committees that review these cases. However, the GAO notes this promotes a potential conflict of interest as these committees are made up of fellow farmers who may be reluctant to impose such a large financial penalty on their neighbor, despite what the law says. The GAO's review of 69 such waivers from North and South Dakota found that, while some were granted for just reasons, some were not. Roughly a fifth of waivers were granted to farmers who had a history of wetland violations, in direct conflict with guidance on granting such waivers. Furthermore, some waivers were granted for unsubstantiated claims, such as that the farmer did not benefit from the alteration of the wetland (Government, 2021). Despite Congress' intentions in implementing and expanding the violation penalties of the Swampbuster provisions, the executive branch has faltered in its enforcement responsibilities in perhaps the most important region for such enforcement in the nation.

However, a recent Supreme Court case calls into question the relevance and significance of this now barely-more-than-two-year-old report.

SACKETT V. EPA

In the Supreme Court's 2022-2023 term, it heard the case *Sackett v. Environmental Protection Agency* (2023). The petitioners in this case were Michael and Chantell Sackett, who purchased a property near a lake in Idaho and filled the property with dirt to lay the foundation for a home. However, the EPA determined their lot contained wetlands and their actions violated the Clean Water Act, which provides that the discharging of pollutants, including dirt, into the waters of the United States is illegal. The Sacketts were ordered to remove the dirt and restore the wetlands. The EPA ordered this because it determined the wetlands the Sacketts filled were considered waters of the United States, primarily because the wetlands "were near a ditch that fed into a creek, which fed into Priest Lake, a navigable, intrastate lake" (Sackett, 1). The Sacketts challenged this determination, suing the EPA and claiming the wetlands they filled were not waters of the United States.

The question posed by this case was whether the wetlands on the Sackett's property were waters of the United States protected by the Clean Water Act and, thus, under the jurisdiction of the EPA. In his majority opinion, Justice Alito proclaims the EPA determined the wetlands were waters of the United States because their interpretation of waters of the United States held that all waters that could affect interstate or foreign commerce, including wetlands adjacent to those waters, were included. The term adjacent was used expansively, including wetlands neighboring these waters, not

just those adjacent or contiguous to the waters. Adjacent was also interpreted to mean wetlands that had "a significant nexus" to these waters, which was said to exist when the wetlands, "'…either alone or in combination with [similarly situated lands] in the region, [significantly affect] the chemical, physical, and biological integrity' of those waters." The Sackett's wetlands were considered to fall under the Clean Water Act's protections because of their significant nexus to Priest Lake. Alito describes this determination as the wetlands being adjacent to a tributary on the other side of a road which feeds into a creek that runs into Priest Lake. Similarly, he claims the EPA lumped the Sackett's wetlands into a nearby wetland complex that, when taken together, significantly affect the lake's ecology. Alito takes issue with this determination.

Alito's majority opinion claims the significant nexus test grants the EPA authority over almost all the nation's waters and wetlands. He suggests this imposes a threat on many landowners, with them being at risk of "criminal prosecution or onerous civil penalties" for "mundane activities" such as moving dirt on their property to enable them to build structures. In true textualist fashion, Alito turns to the text of the Clean Water Act to determine if this is in line with the Act's text.

First, Alito determines the term "Waters" applies only to "relatively permanent, standing or continuously flowing bodies of water… that are described in ordinary parlance as 'streams, oceans, rivers, and lakes.'" He clarifies this does not pertain to "lands," whether wet or not. He criticizes the EPA's argument that wetlands fall under the definition of "waters" on account of the presence of water being crucial for a wetland. He suggests such an argument could be extended to puddles. He does not purport to exclude all wetlands from the Clean Water Act's protection, but he does proclaim

wetlands cannot be considered "waters" if they are separated from "traditional navigable waters," regardless of their proximity to these waters. Instead, Alito proclaims wetlands that may be under the jurisdiction of the Clean Water Act must meet two standards. First, they must be adjacent to a body of water that constitutes waters of the United States—in other words, "a relatively permanent body of water connected to traditional interstate navigable waters." Second, the wetland must have "a continuous surface connection with that water, making it difficult to determine where the 'water' ends and the 'wetland' begins."

There has been much criticism of the Supreme Court's ruling (Bomboy, 2023). Environmental advocates have proclaimed the ruling removes protections for countless wetlands, which, as discussed above, provide immense ecological and economic value even if not directly connected to other bodies of water. Furthermore, such advocates criticize the decision's lack of consideration of the effect the removal of the wetlands can have on other bodies of water, noting that water moves in many ways beyond simple surface movement—such as groundwater movement (Turrentine, 2023). Further, they claim this ruling goes against the intentions of Congress in its original passage of the Clean Water Act, which was to "'restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (Devine, 2023). Severe criticism has not been limited to environmental advocacy organizations, though. In her dissent, Justice Kagan forcefully criticizes the majority opinion and its reasoning, even purporting that the majority opinion appoints the Supreme Court as "…the national decision-maker on environmental policy"—something she describes as a "vice."

Regardless of the debate surrounding the correctness of the Supreme Court's ruling, it is clear the Court stripped protections for many of the nation's wetlands under the Clean Water Act. Some environmental advocates claim at least half of the nation's 110 million acres of wetlands previously protected under the Clean Water Act now lack such protection, including many of the wetlands across the prairie pothole region not connected to waters that would grant them Clean Water Act protections under the Supreme Court's new ruling (Devine, 2023). While such wetlands are technically still protected from agricultural destruction under the Swampbuster provisions discussed above—*Sackett v. EPA* did not address nor impact the Swampbuster provisions—with the lack of appropriate enforcement by the USDA and NRCS of the Swampbuster provisions in the prairie pothole region, wetlands in these states are at particular risk. However, the lack of enforcement of the Swampbuster provisions could exist in other states across the nation, and the Clean Water Act strips protections for many wetlands outside of the prairie pothole region as well. Thus, it appears fair to claim the United States' wetlands are at an increased risk of being lost or having their functions impaired in the wake of the *Sackett v. EPA* ruling.

Despite the removal or lack of adequate enforcement of federal wetland protections, states may enact and enforce separate laws and regulations that go beyond federal protections for wetlands. Some states enacted more stringent protections for wetlands after the Supreme Court case *Rapanos v. United States* was decided. This case limited protections for wetlands before *Sackett v. EPA—Sackett* built off the decision in *Rapanos* (Sackett, 2023; Olmstead & Fleck, 2023). This project aims to address relevant

questions in the wake of the *Sackett* case and the weak Swampbuster provisions enforcement revelations.

RESEARCH QUESTION

With the Supreme Court's curtailing of Clean Water Act protections for wetlands and the USDA's poor enforcement of Swampbuster provisions, knowing how states are filling gaps in wetland and tile drainage regulation, if at all, is crucially important, particularly considering the environmental, economic, and human health impacts of tile drainage and wetland alteration and destruction. This research project set out to answer two questions: What is the status of state wetland protections in the immediate aftermath of *Sackett v. EPA*? What environmentally related tile drainage regulations do states have?

I expected to find notable variation in state approaches to tile drainage regulation and wetland protection. Regarding tile drainage, this is supported by the effects of eutrophication on local waterways and the economic benefits tile drainage can confer on agricultural economies. Considering the advocacy of organizations like Ducks Unlimited on wetland protection and the general unifying effect wildlife conservation has, I expect more states would have wetland protections beyond simple reliance on federal regulations. However, recognizing environmentalism generally correlates with more progressive political affiliations, I expect a state's political history will impact the extent of its regulations against tile drainage and protections for wetlands. Also, for coastal states, I expect that some states will recognize the value wetlands provide—such as from oceanic storms—while other states will value the development of such areas due to ocean-front land being so heavily valued and sought-after.

By providing a thorough investigations of current regulations, this analysis can serve as a guide to state development of more intensive wetland protections and tile

drainage regulations in the wake of the Supreme Court's *Sackett v. EPA* ruling. This analysis aims to identify unique and innovative policies that states have taken to address these matters with the hope that could be adopted by others, inspire further innovation, or highlight areas needing critique. It can also identify gaps in wetland protection created by the constraining of Clean Water Act protections.

METHODS

To acquire a broad understanding of state approaches to wetland protection and tile drainage regulation, I utilized a two-stage research design. I engaged in purposive sampling to select five states to develop my questioning framework that was then applied to all fifty states. I selected South Dakota, Iowa, Minnesota, California, and Florida as I expected them to differ in interesting ways that would allow me to identify all the potential variables of interest. I selected South Dakota because of the GAO's report critiquing federal officials' enforcement of Swampbuster provisions in the state. Similarly, I selected Iowa because of the water quality issues that have plagued the state due to its extensive tile drainage. With these states both comprising the prairie pothole region but having somewhat similar political compositions and history, I then selected Minnesota on account of its considerably more progressive political composition, both now and historically. I also selected California on account of its similarly progressive present and historical political history, its extensive geographic diversity, its reputation for water scarcity, and its being a coastal state. Finally, I selected Florida due to its extensive Everglades, its more moderate political history, and its extensive coastline. In my analysis of these states, I canvassed relevant regulations by searching specifically for all legislation and regulations related to wetlands and tile drainage.

A wide range of approaches to tile drainage regulation and wetland protection were revealed. I used the initial sample of regulations to create a coding scheme to be used for all states, which included both binary and more qualitative metrics—see Table 3. My research for all states evaluated codified law and relevant state program websites,

when appropriate. States' administrative rules and case law were not extensively evaluated due to research constraints.

Table 3: Variable and research metrics

Variable	Research Question	Variable Type
Drainage Oversight Board	Do state statutes allow for the creation of an oversight board that regulates tile drainage activities, such as drainage districts?	Binary
Drainage Oversight Board Required	Are drainage oversight boards required to be established to evaluate all proposed drainage projects in the state, or is it voluntary for local jurisdictions to establish such boards?	Binary
Water Quality or General Environmental Considerations	Is there policy requiring drainage project permitting to consider impacts on water quality or the environment more broadly?	Binary
Soil Considerations	Is there policy requiring drainage project permitting to consider impacts on soil health?	Binary
Wildlife Considerations	Is there policy requiring drainage project permitting to consider impacts on wildlife?	Binary
Natural Resources Considerations	Is there policy requiring drainage project permitting to consider impacts on natural resources?	Binary
Wetland Program Plan	Is there an EPA wetland program plan or other wetland conservation plan/requirement?	Binary
No Net Loss	Is there a no net loss goal for wetlands?	Binary
Wetland Conservation Program	Are there any state-level wetland conservation programs that are not just state-level federal programs?	Binary
What State Wetland Conservation Programs	If there are state-level wetland conservation programs, what types of programs does the state have?	Qualitative

High Impact Wetland Development or Enhanced Protection	Is there a program, plan, or policy in place to develop or confer heightened protection on high-impact or priority wetlands?	Binary
Type of Development, Recognition, or Enhanced Protection for High Impact Wetlands	If the state has a program, plan, or policy in place to develop or confer heightened protection on high-impact or priority wetlands, what are they?	Qualitative
State Wetland Conservation, Protection, or Mitigation Codified	Are there statutory provisions providing for wetland conservation, protection, or mitigation?	Binary
Definition of "Waters of the State" or Related Term	How is "Waters of the State" or a related term defined?	Qualitative

The results of this state-by-state analysis were compiled and then analyzed to elucidate general trends, themes, and points of interest.

FINDINGS

WATERS OF THE STATE AND RELATED TERMS

To first understand the importance of the findings for the rest of the analysis, it is important to look at the states' definitions for terms similar to "waters of the state." This, at least partly, prescribes which waterbodies are under the jurisdiction of the state. Court interpretations of these definitions and further analysis of statutes may be necessary to fully garner the extent of a state's jurisdiction over waterbodies in its boundaries, but a look at state definitions of waters of the state, or related terms, is effective in garnering a general understanding of states' jurisdictional authority.

All states were found to have jurisdiction over at least some wetlands. 76 percent of states were found to have jurisdiction over all forms of wetlands, including isolated wetlands that may be located entirely on private property. Florida, for instance, defines "Waters of the State" as "any and all water on or beneath the surface of the ground or in the atmosphere, including natural or artificial watercourses, lakes, ponds, or diffused surface water and water percolating, standing, or flowing beneath the surface of the ground, as well as all coastal waters within the jurisdiction of the state." Delaware, Idaho, and Indiana are three states where it is unclear whether they have jurisdiction over all types of wetlands. Nine states do not appear to have jurisdiction over all forms of wetlands: Alabama, Georgia, Iowa, Maine, Minnesota, Missouri, New Hampshire, Tennessee, and Vermont. Each state but New Hampshire and Minnesota exclude at least some waterbodies located entirely on private property. Iowa, for instance, defines "waters of this state" as "any navigable waters within the territorial limits of this state, and the

marginal river areas adjacent to this state, exempting only farm ponds and privately owned lakes." New Hampshire is unique in that it provides public waters must be at least 10 acres large. Minnesota is unique because it provides "surface waters that are not confined but are spread and diffused over the land" are not waters of the state.

Simply because a state does not grant itself jurisdiction over all wetlands in its definition of waters of the state—or a related term—does not mean that it does not have jurisdiction granted to it elsewhere. Minnesota, for instance, appears to have jurisdiction over all wetlands on account of the Wetlands Conservation Act of 1991 (Minnesota, n.d.). However, ensuring that states have jurisdiction over all wetlands, including those confined to private land, is important in the wake of the Supreme Court's ruling. Many of those wetlands excluded by these states in their definitions of waters of the state terms are at great risk as they also lost federal protections.

TILE DRAINAGE, GENERAL

Building off this jurisdictional knowledge, attention then turns to jurisdiction over tile drainage and considerations of the impacts of tile drainage on wetlands. The analysis revealed that, despite many states having drainage oversight boards, very few states regulate tile drainage regarding its impact on water quality, soil health, wildlife, natural resources, and the environment more generally. Table 4 outlines the binary findings for each state regarding tile drainage regulation. Of note are Florida, Maine, and Minnesota, which have the most comprehensive regulations of tile drainage. Many states appear to have little to no regulation on tile drainage: Alaska, Arizona, Arkansas, Colorado,

Georgia, Hawaii, Idaho, Massachusetts, New Hampshire, New Jersey, New Mexico, Pennsylvania, and Rhode Island.

Table 4: State-by-state tile drainage regulation approaches

State	Drainage Oversight Board	Drainage Oversight Board Required	Water Quality or General environmental considerations	Soil Considerations	Wildlife Considerations	Natural Resources Considerations
Alabama	Yes	No	No	No	No	No
Alaska	No	No	No	No	No	No
Arizona	No	No	No	No	No	No
Arkansas	No	No	No	No	No	No
California	Yes	No	Yes	Yes	No	No
Colorado	No	No	No	No	No	No
Connecticut	Yes	No	Yes	Yes	Yes	Yes
Delaware	No	No	Yes	Yes	Yes	No
Florida	Yes	Yes	Yes	Yes	Yes	No
Georgia	No	No	No	No	No	No
Hawaii	No	No	No	No	No	No
Idaho	No	No	No	No	No	No
Illinois	Yes	No	No	No	No	No
Indiana	Yes	No	No	No	No	No
Iowa	Yes	No	No	No	No	No
Kansas	Yes	No	No	No	No	No
Kentucky	Yes	No	Yes	No	No	No
Louisiana	Yes	No	No	No	No	No
Maine	Yes	No	Yes	Yes	Yes	Yes
Maryland	Yes	No	Yes	Yes	No	No
Massachusetts	No	No	No	No	No	No
Michigan	Yes	No	No	No	No	No
Minnesota	Yes	Yes	Yes	Yes	Yes	Yes
Mississippi	Yes	No	No	No	No	No
Missouri	Yes	No	No	No	No	No
Montana	Yes	No	No	No	No	No
Nebraska	Yes	No	No	No	No	No
Nevada	Yes	No	No	No	No	No
New Hampshire	No	No	No	No	No	No

New Jersey	No	No	No	No	No	No
New Mexico	No	No	No	No	No	No
New York	Yes	No	No	No	No	No
North Carolina	Yes	No	No	No	No	No
North Dakota	Yes	No	No	No	No	No
Ohio	Yes	No	No	No	No	No
Oklahoma	Yes	No	No	No	No	No
Oregon	Yes	No	No	No	No	No
Pennsylvania	No	No	No	No	No	No
Rhode Island	No	No	No	No	No	No
South Carolina	Yes	No	No	No	No	No
South Dakota	Yes	No	No	No	No	No
Tennessee	Yes	No	No	No	No	No
Texas	Yes	No	No	No	No	No
Utah	Yes	No	No	No	No	No
Vermont	No	No	Yes	No	No	No
Virginia	Yes	No	Yes	Yes	No	No
Washington	Yes	No	No	No	No	No
West Virginia	Yes	No	No	No	No	No
Wisconsin	Yes	No	Yes	No	Yes	Yes
Wyoming	Yes	No	No	No	No	No

TILE DRAINAGE REGULATION

This analysis found that 70 percent of states—35—have statutes that allow for the creation of some form of drainage oversight board regulating tile drainage activities, like drainage districts, while 30 percent—15—do not—Figure 1.

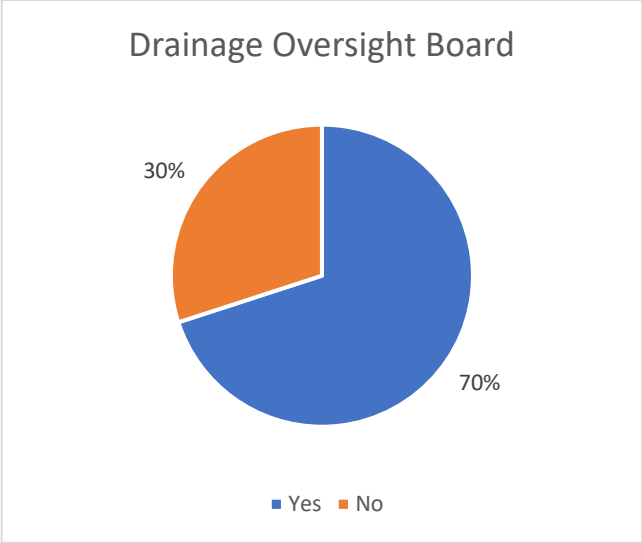

Figure 1: Drainage districts

The ability to create a drainage oversight board does not mean that one will be created. My analysis found that only two states—Florida and Minnesota—require such drainage oversight boards to oversee all drainage projects in the state—Figure 2. This could be a potential avenue for policy development for many states, as not requiring drainage oversight boards could mean that some drainage activities see little to no regulatory oversight despite their potential impact on the environment.

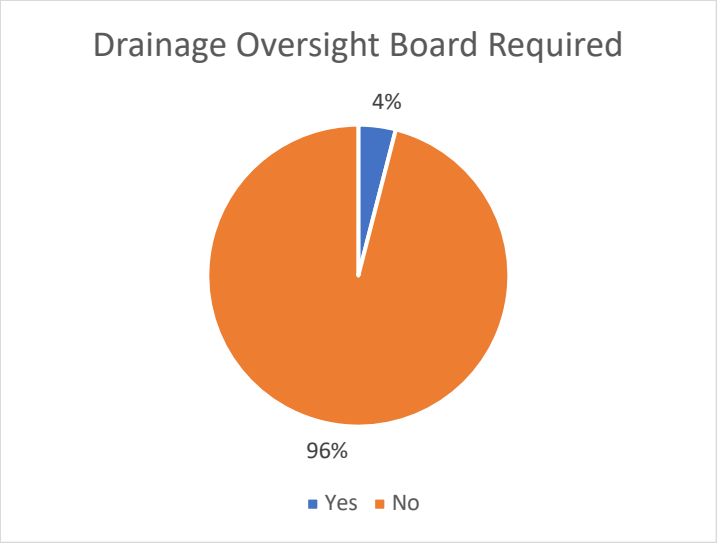

Figure 2: Drainage oversight board required

While most states have some form of drainage oversight board regulating some drainage activities in the state, they take many different shapes and forms. Most were established many decades ago, and, unless the policy surrounding them has been updated, they tend to serve the same intentions as they did many decades ago. In many states, these intentions include the management of urban flood water and sewage drains (The Drain, 1956). In some states they were expressly created to drain water off agricultural lands. As the Iowa code states, "The drainage of surface waters from agricultural lands and all other lands, including state-owned lakes and wetlands, or the protection of such lands from overflow shall be presumed to be a public benefit and conducive to the public health, conveniences, and welfare" (Levee, 2024).

Many states have not had drainage districts' duties amended to regulate tile drainage regarding their environmental impact. Only 22 percent of states regulate tile drainage concerning its impact on water quality or the general environment—Figure 3. 16 percent of states regulate tile drainage based on its impact on soil health, 12 percent based

on its impact on wildlife, and eight percent on its impact on natural resources—Figures 4, 5, and 6, respectively.

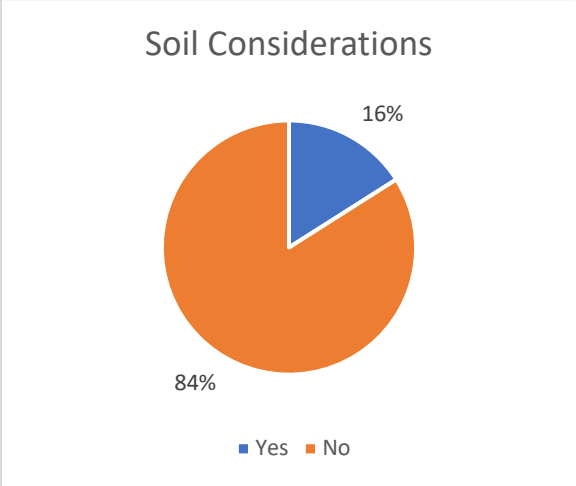

Figure 3: Water quality or general environmental considerations

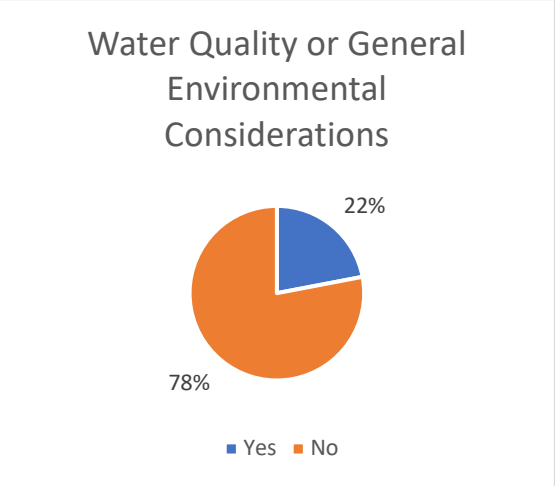

Figure 4: Soil considerations

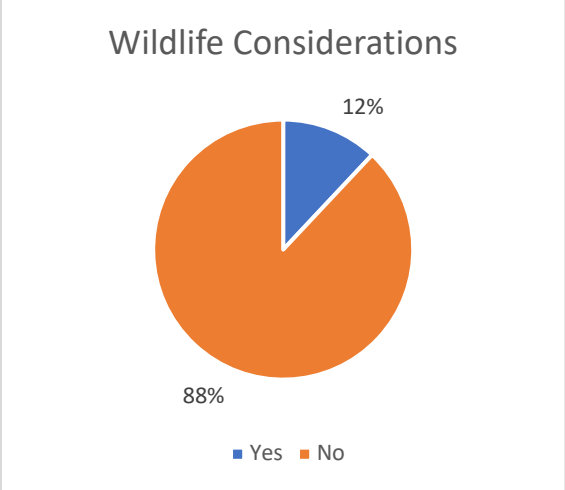

Figure 5: Wildlife considerations

Figure 6: Natural resources considerations

One state that stood out in its regulation of drainage activities regarding its impact on environmental factors was Minnesota. Despite Minnesota's drainage law originally being created for the express purpose of draining water from agricultural lands, as evidenced by its 1858 title "An Act to Regulate and Encourage the Drainage of Lands," the code has been modified to provide that those with drainage authority over a drainage

project must consider a variety of factors before such a drainage project can be approved. These factors include, but are not limited to, the private and public costs and benefits; alternative measures to the proposed project to conserve water, mitigate flood risks, improve water quality, and reduce erosion; the project's effects on wetlands; the project's effects on water quality; the project's effects on fish and other wildlife; and the project's general overall environmental impact (Consideration, 2023). Such extensive considerations of the proposed impact of tile drainage projects on the environment could serve as a model for other states, particularly states with similar environmental conditions as Minnesota, including South Dakota, North Dakota, and Iowa, none of which have any sort of similar environmental considerations for drainage projects.

One may question why states such as California do not have similar tile drainage regulations. The research revealed the answer to this is a matter of climate and geography. While California does have tile drainage, particularly in the San Joaquin Valley, they utilize tile drainage in this valley to combat poor subsurface drainage and the accumulation of salts in the roots of crops, a consequence of water importation to this valley for agricultural production and the soil's composition, not because of the presence of pre-existing wetlands (*Agricultural*, n.d.). Additionally, most of the state's wetlands have already been lost, partly because of agricultural drainage, but also because of urban development and groundwater withdrawal (Dahl & Allord, n.d.). The research done for this project did not indicate California's existing wetlands are threatened by agricultural drainage or in need of greater regulatory protection.

WETLAND PROTECTION, GENERAL

Nationwide, the research found that states appear to be much more involved in wetland protection than tile drainage regulation. Table 5 provides a high-level overview of the results of the research conducted on each state regarding wetland protection factors.

Table 5: State-by-state approaches to wetland conservation and protection

State	Wetland Program Plan	No Net Loss	Voluntary State Wetland Conservation Program	High Impact Wetland Development or Enhanced Protection	State Wetland Conservation, Protection, or Mitigation Codified
Alabama	Yes	No	No	No	Yes
Alaska	Yes	No	No	No	No
Arizona	No	No	No	No	No
Arkansas	No	No	Yes	Yes	No
California	Yes	Yes	Yes	Yes	Yes
Colorado	No	No	Yes	No	No
Connecticut	Yes	No	No	No	Yes
Delaware	Yes	Yes	Yes	Yes	Yes
Florida	Yes	No	Yes	No	Yes
Georgia	No	No	No	No	Yes
Hawaii	Yes	No	Yes	Yes	No
Idaho	Yes	No	No	No	No
Illinois	Yes	Yes	No	Yes	Yes
Indiana	Yes	Yes	Yes	Yes	Yes
Iowa	Yes	Yes	Yes	No	Yes
Kansas	Yes	Yes	Yes	Yes	No
Kentucky	Yes	No	No	No	No
Louisiana	No	Yes	Yes	No	No
Maine	Yes	Yes	Yes	Yes	Yes
Maryland	Yes	Yes	Yes	Yes	Yes
Massachusetts	Yes	Yes	Yes	No	Yes
Michigan	Yes	Yes	Yes	Yes	Yes
Minnesota	Yes	Yes	Yes	Yes	Yes
Mississippi	No	Yes	No	No	Yes

Missouri	No	No	Yes	No	No
Montana	No	Yes	Yes	No	No
Nebraska	Yes	Yes	Yes	No	No
Nevada	Yes	No	Yes	No	No
New Hampshire	Yes	No	Yes	Yes	Yes
New Jersey	Yes	Yes	No	No	Yes
New Mexico	Yes	Yes	Yes	No	No
New York	No	No	No	No	Yes
North Carolina	Yes	No	No	No	No
North Dakota	Yes	No	Yes	No	No
Ohio	No	Yes	Yes	Yes	Yes
Oklahoma	Yes	No	No	Yes	No
Oregon	Yes	Yes	No	Yes	Yes
Pennsylvania	No	Yes	Yes	Yes	Yes
Rhode Island	No	Yes	No	No	Yes
South Carolina	No	No	No	No	No
South Dakota	No	No	Yes	No	No
Tennessee	Yes	Yes	Yes	No	Yes
Texas	No	Yes	Yes	No	No
Utah	Yes	No	No	No	No
Vermont	Yes	Yes	No	No	Yes
Virginia	Yes	Yes	Yes	Yes	Yes
Washington	Yes	Yes	No	Yes	Yes
West Virginia	Yes	Yes	No	No	Yes
Wisconsin	No	Yes	Yes	Yes	Yes
Wyoming	Yes	Yes	No	Yes	Yes

WETLAND PROGRAM PLANS

Wetland Program Plans are voluntary documents states can develop, outlining how they plan to use and manage their wetland resources for approximately the next three to six years. These plans are developed in collaboration with the EPA's regional offices, and those approved are published. These plans can be a good way of orienting the state's priorities when it comes to wetland conservation, protection, and development. It can also

allow for collaboration between the states and other organizations looking to engage in wetland development, such as local governments, nonprofit organizations, and universities (*Developing*, 2024). The research revealed that 68 percent of states have Wetland Program Plans—Figure 7.

For those states without such a plan, looking into developing one may be a good way to begin or enhance a state's wetland conservation efforts, particularly because of the value that can come from planning out how a state plans to address threats to wetlands.

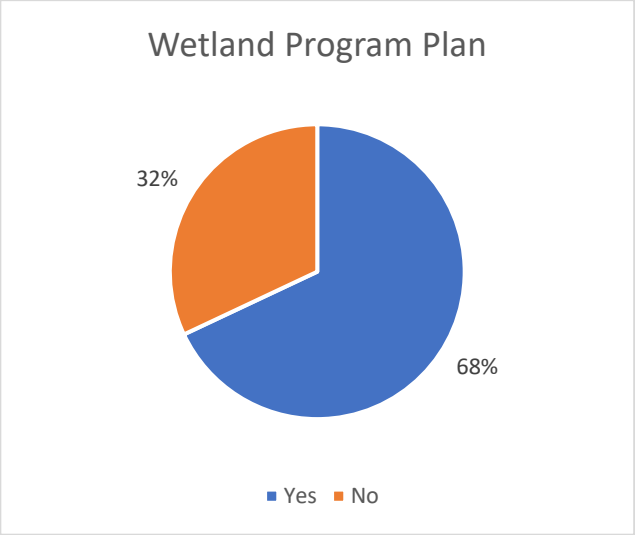

Figure 7: Wetland program plan

NO NET LOSS POLICIES

Though the Army Corps of Engineers may still enforce no net loss policies for wetlands considered "Waters of the United States," states can ensure that such policies extend to all wetlands. While potentially an imperfect wetland protection policy, something may be better than nothing. A majority (58%) of states were identified as having no net loss of wetland policies—Figure 8. Notable states particularly impacted by the recent *Sackett v. EPA* ruling without such policies include, but are not limited to,

South Dakota, North Dakota, and Missouri. These and other states might want to consider implementing their own no net loss of wetlands policies.

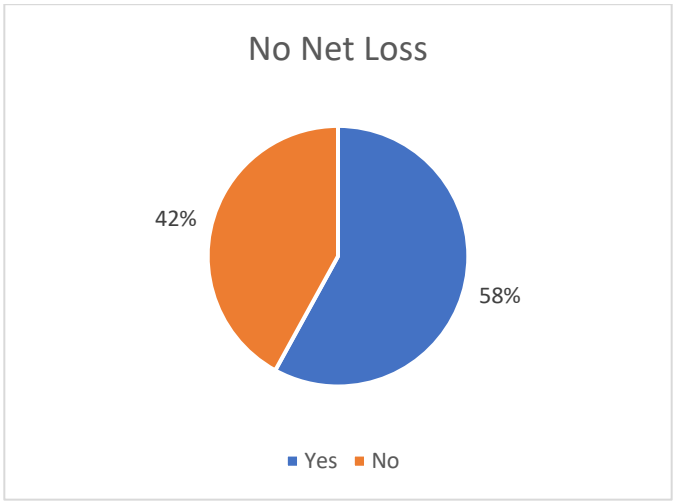

Figure 8: No net loss

VOLUNTARY STATE WETLAND CONSERVATION PROGRAMS

The results discussed so far has focused on negative inducements to wetland conservation and protection and tile drainage. However, positive inducements can also be effective. Currently, the federal government has many incentives for landowners to engage in wetland development, restoration, and protection. States can also incentivize landowners to restore and develop wetlands. For instance, Arkansas has the Wetland & Riparian Zones Tax Credit Program, which provides a tax credit against the state income tax for those who engage in projects approved by the state's department of agriculture aimed at developing, restoring, or conserving wetlands and riparian areas (*Wetland & riparian*, n.d.). Another state with such incentives is Ohio, which operates the H2Ohio Wetland Grant Program. As the name suggests, this is a state-level grant providing reimbursements of up-to-100 percent of project costs for efforts aimed at nutrient

reduction and water quality improvements, including the creation of wetlands and wetland enhancement (*H2Ohio*, n.d.). Overall, only 58 percent of states were identified as having some form of wetland conservation incentive program beyond those offered by the federal government—Figure 9. States without such programs may want to consider creating or expanding their wetland protection or enhancement incentive programs as a way of helping to combat wetland deterioration and loss, particularly since such voluntary measures are generally more politically neutral than negative inducements.

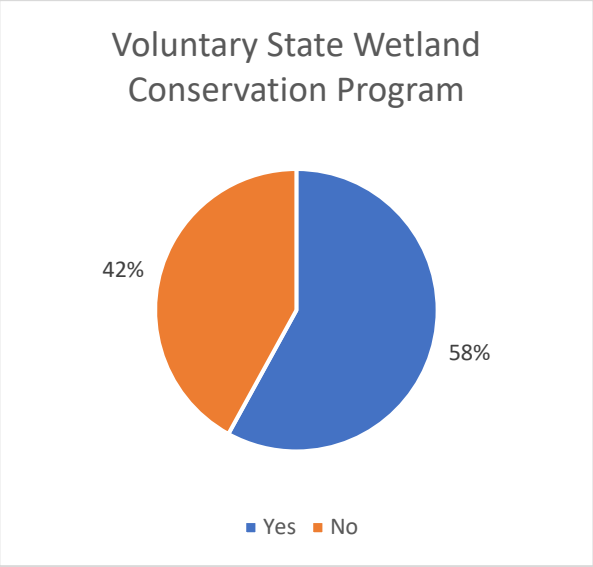

Figure 9: Voluntary state wetland conservation program

HIGH-IMPACT WETLAND DEVELOPMENT AND PROTECTION

40 percent of states have a program in place focused on the development or enhanced protection of priority wetlands—Figure 10. High-impact or priority wetlands are determined based on the presence of the following factors: unique habitat for flora or fauna, rare wetland types, ecological importance, threat of development, important impact on surface water systems, water supply criticality, and flood mitigation capacities

(*EPA Priority*, 2023). High-impact wetland development and conservation can allow a state to better use its limited resources where they are most cost-effective when it comes to restoring wetlands and securing wetland ecosystem services. This can be conducted through state action alone—states develop, restore, or conserve high-priority wetlands on state land. Or, it could be conducted in another incentive-like manner, providing greater incentives for the development of high-impact wetlands on private land to landowners. With only 40 percent of states engaging in such efforts, however, there is a great opportunity for expansion across the nation.

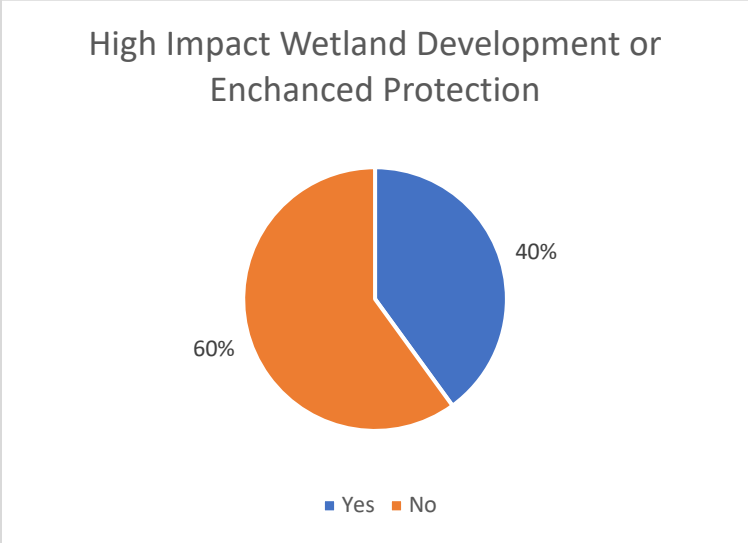

Figure 10: High impact wetland development or enhanced protection

WETLAND CONSERVATION AND PROTECTION POLICY CODIFICATION

States may also have their own, separate policies providing for wetland regulation and protection. These can counter the removal of federal protections for wetlands after *Sackett* and ensure wetland protection. Minnesota, for instance, passed the Wetland Conservation Act of 1991 to ensure the protection of wetlands not protected under existing statutes and programs to ensure the state achieved its goal of no net wetland

loss—such wetlands include the prairie pothole wetlands (Seltzer, 2002). Similarly, Oregon has a law from 1967 called the Removal Fill Act which regulates wetlands and waterways as well. It provides that anyone desiring to remove or fill wetland materials must first obtain a permit from the state. When federal protections were still in place—pre-*Sackett*—those looking to engage in such activities would have to receive both a federal and a state permit. Regardless of what happens with federal regulations, people must still secure a state permit to remove or fill wetland materials in Oregon. This led Bill Ryan, Deputy Director of the Oregon Department of State Lands, to proclaim shortly after the *Sackett* decision, "Oregon actually has a very robust state program and state laws that protect wetlands and waterways, independent of the federal Clean Water Act… Relative to the rest of the country, Oregon is actually in really good shape" (Ewald, 2023). Not all states have such regulations codified. This analysis found 58% of states have some form of wetland protection or conservation policy codified in their statutes—Figure 11. This does not include state management of Clean Water Act Section 401 or 404 permits (Permit program, 2023; Overview, 2023). States without such policies may want to consider looking to states like Minnesota and Oregon and enacting policies akin to theirs. Some notable states without such separate wetland conservation policies whose wetlands are expected to be impacted by the narrowing of federal wetland protections include South Dakota, North Dakota, and Montana.

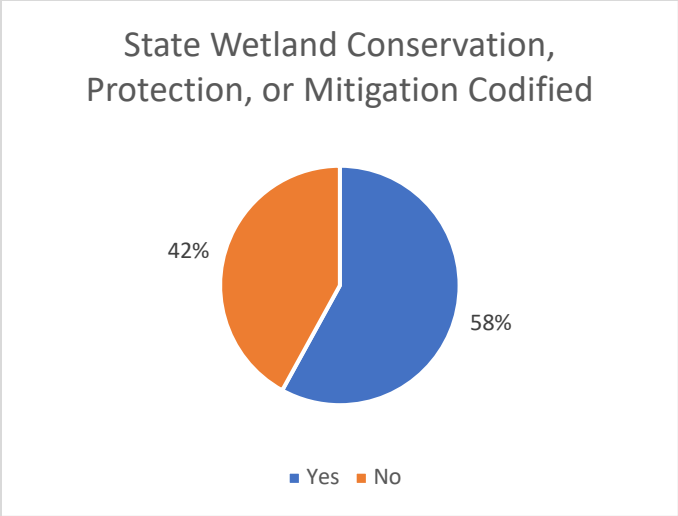

Figure 11: State wetland conservation, protection, or mitigation codified?

RECENT WETLAND PROTECTION REMOVAL

Overall, this research highlights that states have taken many different approaches to protect wetlands and regulate tile drainage. This analysis provides a foundation for cross-state collaboration on greater wetland protection and tile drainage regulation policy development. However, it appears some states are actively working to remove wetland protections.

In the summer of 2023, a month after the Supreme Court's decision, North Carolina lawmakers overrode a veto from their state's governor on a bill that prohibits the state from regulating wetlands not considered "waters of the United States," as outlined in *Sackett v. EPA*. According to some estimates, nearly 2.5 million acres of North Carolina wetlands could have lost both state and federal protections in less than two months (Sorg, 2023; Livingston, 2023). Similarly, while many wetlands, including those not protected federally, are regulated by the state of Indiana, a 2021 bill reduced the number of wetlands the state has oversight over—primarily small Class I and Class II

wetlands, particularly those in city boundaries (Garten et al., 2021). State regulatory drawback—or the absence of any state regulation—in the wake of *Sackett* is a further, critical threat to wetlands across the nation.

LIMITATIONS AND FUTURE RESEARCH

While this research highlighted the importance of wetlands and current state approaches to tile drainage regulation and wetland protection, it is limited. This analysis was restricted to information accessible via state government webpages, academic databases, relevant and reliable local reporting, and codified laws. Excluding the analysis of *Sackett v. EPA*, this research did not evaluate case law, particularly at the state level, where interpretations of state statutes and regulations regarding tile drainage and wetlands surely exist. An avenue for building off the research of this project would be to evaluate relevant court rulings and the impacts state courts can have on tile drainage regulation and wetland protection. Similarly, this analysis did not extensively evaluate state administrative rules, which could be another avenue for future research.

Further, this project relied on an assumption that, given the GAO's report on Swampbuster provisions enforcement in the prairie pothole region, there was the possibility of further poor enforcement elsewhere across the United States. While possible, further research should be conducted to determine the true threat to wetlands posed by lack of thorough federal enforcement. Similarly, it appears justified to say the prairie pothole states' wetlands face some of the biggest threats after *Sackett* given the poor enforcement of Swampbuster provisions in the region, the lack of state regulation and protection, and the confluence of climatic and economic pressures, particularly in the Dakotas. These threats are further compounded by their ephemeral nature that make them difficult to consistently see. Another avenue for further study would be to align current

protections with threats to form a better understanding of which wetlands are most at risk across the United States.

Additionally, with this change in federal law being so recent, repeating this analysis in a couple of years and comparing it to the present analysis could be fruitful in determining how wetland protections were affected and the impacts on wetland loss and water quality deterioration, if any. After all, most states are either in the midst of or just out of their first legislative session in the wake of *Sackett*. While conducting this analysis is useful for capturing the present moment and the potential need for further wetland protections and tile drainage regulations at the state level across the nation, analyzing this again to discern what regulatory changes are made could be similarly fruitful.

CONCLUSION

This analysis highlighted the critically important role wetlands play not only in the United States but across the globe. They regulate floods, enhance water quality, provide habitat to countless species of wildlife, act as carbon sinks, and allow for anthropogenic recreational and aesthetic enjoyment. As a result, wetlands provide immense economic value. However, across the globe, particularly in the United States and other similarly developed countries, wetlands have been destroyed in the pursuit of human development. Agriculture in particular has driven the drainage of wetlands to create more arable and productive land.

Widespread tile drainage has been shown to have great environmental and economic consequences in agricultural landscapes. Due to climate change resulting in wetter springs, and with tile drainage providing a plethora of agricultural benefits—such as enabling farmers to plant earlier—there has been an expansion of tile-drained acres, particularly in the Dakotas, that seems destined to continue. This raises concerns for water quality in the Mississippi River basin and the Gulf of Mexico, both in terms of the health consequences associated with excess nitrates in drinking water and the potential for environmental damage.

Research has illustrated the importance of wetlands and the threats posed by tile drainage, and, as a result, government regulations exist at both the federal and state levels. However, despite the intentions of Congress, the enforcement of Swampbuster provisions in the Northern Great Plains has been lackluster, with federal officials often being lenient and exemptions being granted liberally. Similarly, the Clean Water Act's

wetland protections were greatly limited by the Supreme Court in the 2022-2023 term case *Sackett v. EPA*. In this 5-4 case, Justice Alito, writing for the majority, declared Clean Water Act protections extend only to wetlands possessing an indistinguishable surface connection with undisputable waterbodies covered under the term "waters of the United States," such as streams, lakes, rivers, and oceans. While concerning, federalism enables states to adopt their own tile drainage regulations and wetland protections that can cover gaps in federal government regulation.

The research findings showed tile drainage regulations are relatively limited, with only a few states regulating drainage projects based on their impact on water quality, wildlife, soil, and other environmental considerations. Similarly, though drainage oversight boards can play a large role in tile drainage regulation, it was found that these boards often operate with largely the same, sometimes centuries-old, responsibilities they were granted when first legislated into existence—and thus do not consider drainage project impacts on the environment. Minnesota stood out with its tile drainage regulation policies, potentially serving as a guide for other states looking to strengthen their tile drainage regulations.

The landscape was much more evenly split when it came to state wetland protections. 68 percent of states had some form of wetland conservation plan or requirement, such as a wetland program plan through the Environmental Protection Agency. Those 32 percent of states without such plans may find the development of one useful due its process facilitating the alignment of wetland protection priorities, along with other benefits. Further, despite being an imperfect policy, 58 percent of states had a state-level no net loss of wetlands goal. Those states without a formal, enforceable goal

may want to consider adopting one as, despite not being a panacea for wetland protections, having some policy inhibiting the loss of wetlands may be better than nothing. Additionally, 58 percent of states were found to have some form of wetland conservation incentive program that went beyond federal incentive programs. Looking to other states and analyzing their incentive programs and their effectiveness may be beneficial for the establishment of such programs in states without them and for the improvement of programs in states that already have such programs. 40 percent of states had some form of program in place incentivizing or actively resulting in the establishment of high-priority wetlands—so-called for their disproportionate impact on factors such as water quality and wildlife. States without such programs may want to consider the implementation of one as it may enable them to utilize scarce wetland protection resources most cost-effectively. Finally, 58 percent of states were identified as having codified some form of wetland conservation, protection, or mitigation policy that went beyond federal protections, thus affording the state's wetlands greater protection and potential insulation from changes in or lack of adequate enforcement of federal protections. Those without such policies may want to consider implementing one. Hopefully, states will not follow the lead of states like North Carolina that, instead of bolstering their wetland protections in the wake of the *Sackett* ruling, decided to weaken their protections.

Overall, I believe this study is particularly valuable given when it was conducted—in the immediate wake of the *Sackett v. EPA* ruling, which fundamentally altered federal wetland protections. This analysis laid a foundation of understanding of current state approaches to tile drainage regulation and wetland protection, better

illustrating the extent of the threat posed by the constriction of Clean Water Act protections and where state protections and regulations may need to be enhanced to ensure that the value and ecosystem services provided by wetlands are protected and expanded. Without it, many more of the nation's wetlands could be lost, potentially resulting in substantial, negative impacts on the nation's water quality, health, economy, wildlife, and more.

APPENDIX

State	Definition of "Waters of the State" or related term
Alabama	All waters of any river, stream, watercourse, pond, lake, coastal, ground or surface water, wholly or partially within the state, natural or artificial. This does not include waters which are entirely confined and retained completely upon the property of a single individual, partnership or corporation unless such waters are used in interstate commerce.
Alaska	Waters of the state" includes lakes, bays, sounds, ponds, impounding reservoirs, springs, wells, rivers, streams, creeks, estuaries, marshes, inlets, straits, passages, canals, the Pacific Ocean, Gulf of Alaska, Bering Sea and Arctic Ocean, in the territorial limits of the state, and all other bodies of surface or underground water, natural or artificial, public or private, inland or coastal, fresh or salt, which are wholly or partially in or bordering the state or under the jurisdiction of the state.
Arizona	The waters of all sources, flowing in streams, canyons, ravines or other natural channels, or in definite underground channels, whether perennial or intermittent, flood, waste or surplus water, and of lakes, ponds and springs on the surface, belong to the public and are subject to appropriation and beneficial use....."
Arkansas	"Waters of the state" means all streams, lakes, marshes, ponds, watercourses, waterways, wells, springs, irrigation systems, drainage systems, and all other bodies or accumulations of water, surface and underground, natural or artificial, public or private, which are contained within, flow through, or border upon this state or any portion of the state.
California	"Waters of the state" means any surface water or groundwater, including saline waters, within the boundaries of the state.
Colorado	"State waters" means any and all surface and subsurface waters which are contained in or flow in or through this state, but does not include waters in sewage systems, waters in treatment works of disposal systems, waters in potable water distribution systems, and all water withdrawn for use until use and treatment have been completed.
Connecticut	"Waters" means all tidal waters, harbors, estuaries, rivers, brooks, watercourses, waterways, wells, springs, lakes, ponds, marshes, drainage systems and all other surface or underground streams, bodies or accumulations of water, natural or artificial, public or private, which are contained within, flow through or border upon this state or any portion thereof.
Delaware	"Waters of the State" means all the tidal waters under the jurisdiction of the State where the lunar tide regularly ebbs and flows and all nontidal waters under the jurisdiction of this State except for nontidal waters contained in aquacultural facilities registered with the Department of Agriculture.
Florida	"Water" or "waters in the state" means any and all water on or beneath the surface of the ground or in the atmosphere, including natural or artificial watercourses, lakes, ponds, or diffused surface water and water percolating, standing, or flowing beneath the surface of the ground, as well as all coastal waters within the jurisdiction of the state.

Georgia	“Waters of this state” means any waters within the territorial limits of this state and the marginal sea adjacent to this state and the high seas when navigated as a part of a journey or ride to or from the shore of this state except ponds or lakes not open to the public, whether such ponds or lakes are within the lands of one title or not.
Hawaii	"Water" or "waters of the State" means any and all water on or beneath the surface of the ground, including natural or artificial watercourses, lakes, ponds, or diffused surface water and water percolating, standing, or flowing beneath the surface of the ground.
Idaho	Idaho’s constitution and statutes declare all waters of the state when flowing in their natural channels, including the waters of all natural springs and lakes within the boundaries of the state and groundwaters of the state, to be public waters. Idaho’s constitution and statutes also guarantee the right to appropriate those public waters.
Illinois	"Waters" means all accumulations of water, surface and underground, natural, and artificial, public and private, or parts thereof, which are wholly or partially within, flow through, or border upon the State of Illinois, except that sewers and treatment works are not included except as specially mentioned; provided, that nothing herein contained shall authorize the use of natural or otherwise protected waters as sewers or treatment works except that in-stream aeration under Agency permit is allowable.
Indiana	Sec. 307. "Water of the state", for purposes of IC 14-22, means a lake, reservoir, marsh, waterway, or other water: (1) under public: (A) ownership; (B) jurisdiction; or (C) lease; or (2) that has been used by the public with the acquiescence of any or all riparian owners.
Iowa	"Waters of this state under the jurisdiction of the commission” means any navigable waters within the territorial limits of this state, and the marginal river areas adjacent to this state, exempting only farm ponds and privately owned lakes.
Kansas	"Waters of the state" means all surface and subsurface waters occurring within the borders of the state or forming part of the border between Kansas and one of the adjoining states.
Kentucky	(1) Water occurring in any stream, lake, groundwater, or other body of water in the Commonwealth which may be applied to any useful and beneficial purpose is hereby declared to be a natural resource and public water of the Commonwealth and subject to control or regulation for the public welfare as provided in KRS

	Chapters 146, 149, 151, 262 and 350.029 and 433.750 to 433.757. (2) Diffused surface water which flows vagrantly over the surface of the ground shall not be regarded as public water, and the owner of land on which such water falls or flows shall have the right to its use. Water left standing in natural pools in a natural stream when the natural flow of the stream has ceased, shall not be regarded as public water and the owners of land contiguous to that water shall have the rights to its use.
Louisiana	Waters of the State—both the surface and underground waters within the state of Louisiana including all rivers, streams, lakes, estuaries, ground waters and all other water courses and waters within the confines of the state, and all bordering waters and the Gulf of Mexico
Maine	"Waters of the State" means any and all surface and subsurface waters that are contained within, flow through, or under or border upon this State or any portion of the State, including the marginal and high seas, except such waters as are confined and retained completely upon the property of one person and do not drain into or connect with any other waters of the State, but not excluding waters susceptible to use in interstate or foreign commerce, or whose use, degradation or destruction would affect interstate or foreign commerce.
Maryland	"Waters of the State" includes:(1) Both surface and underground waters within the boundaries of the State subject to its jurisdiction;(2) That portion of the Atlantic Ocean within the boundaries of the State;(3) The Chesapeake Bay and its tributaries;(4) All ponds, lakes, rivers, streams, public ditches, tax ditches, and public drainage systems within the State, other than those designed and used to collect, convey, or dispose of sanitary sewage; and(5) The floodplain of free-flowing waters determined by the Department on the basis of the 100-year flood frequency.
Massachusetts	'Waters" and "waters of the commonwealth", all waters within the jurisdiction of the commonwealth, including, without limitation, rivers, streams, lakes, ponds, springs, impoundments, estuaries, coastal waters and groundwaters.
Michigan	"Waters of the state" means groundwaters, lakes, rivers, and streams and all other watercourses and waters, including the Great Lakes, within the jurisdiction of this state.
Minnesota	“Waters of the state" means surface or underground waters, except surface waters that are not confined but are spread and diffused over the land. Waters of the state includes boundary and inland waters.
Mississippi	“Waters of the state” means all waters within the jurisdiction of this state, including all streams, lakes, ponds, impounding reservoirs, marshes, watercourses, waterways, wells, springs, irrigation systems, drainage systems and all other bodies or accumulations of water, surface and underground, natural or artificial, situated wholly or partly within or bordering upon the state, and such

	coastal waters as are within the jurisdiction of the state, except lakes, ponds or other surface waters which are wholly landlocked and privately owned.
Missouri	"Waters of the state", all waters within the jurisdiction of this state, including all rivers, streams, lakes and other bodies of surface and subsurface water lying within or forming a part of the boundaries of the state which are not entirely confined and located completely upon lands owned, leased or otherwise controlled by a single person or by two or more persons jointly or as tenants in common.
Montana	"State waters" means a body of water, irrigation system, or drainage system, either surface or underground.
Nebraska	“Waters of the state” shall mean all waters within the jurisdiction of this state, including all streams, lakes, ponds, impounding reservoirs, marshes, wetlands, watercourses, waterways, wells, springs, irrigation systems, drainage systems, and all other bodies or accumulations of water, surface or underground, natural or artificial, public or private, situated wholly or partly within or bordering upon the state
Nevada	“Waters of the State” means all waters situated wholly or partly within or bordering upon this State, including but not limited to: 1. All streams, lakes, ponds, impounding reservoirs, marshes, water courses, waterways, wells, springs, irrigation systems and drainage systems; and 2. All bodies or accumulations of water, surface and underground, natural or artificial.
New Hampshire	"Public bodies of water" means public waters as defined in RSA 271:20 and any impoundment of a stream, lake, pond, or tidal or marine waters of 10 acres or more, or any other body of water owned by the state or by a state agency or department. RSA 271:20 - All natural bodies of fresh water situated entirely in the state having an area of 10 acres or more are state-owned public waters, and are held in trust by the state for public use; and no corporation or individual shall have or exercise in any such body of water any rights or privileges not common to all citizens of this state; provided, however, the state retains its existing jurisdiction over those bodies of water located on the borders of the state over which it has exercised such jurisdiction.
New Jersey	“Waters of the State” means, but shall not be limited to, the waters of the Atlantic ocean for three nautical miles eastward from the shores of this State; all navigable and non-navigable, tidal and non-tidal, rivers, bays, streams, and inlets; and any other water within the jurisdiction of the State.

New Mexico	All natural waters flowing in streams and watercourses, whether such be perennial, or torrential, within the limits of the state of New Mexico, belong to the public and are subject to appropriation for beneficial use. A watercourse is hereby defined to be any river, creek, arroyo, canyon, draw or wash, or any other channel having definite banks and bed with visible evidence of the occasional flow of water.
New York	"Waters" shall be construed to include lakes, bays, sounds, ponds, impounding reservoirs, springs, wells, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Atlantic ocean within the territorial limits of the state of New York, and all other bodies of surface or underground water, natural or artificial, inland or coastal, fresh or salt, public or private, which are wholly or partially within or bordering the state or within its jurisdiction.
North Carolina	"Waters" means any stream, river, brook, swamp, lake, sound, tidal estuary, bay, creek, reservoir, waterway, or other body or accumulation of water, whether surface or underground, public or private, or natural or artificial, that is contained in, flows through, or borders upon any portion of this State, including any portion of the Atlantic Ocean over which the State has jurisdiction. (1987, c. 827, s. 152A; 1989, c. 727, s. 218(103); 1989 (Reg. Sess., 1990), c. 1004, s. 19(b); 1991 (Reg. Sess., 1992), c. 1028, s. 1; 1997-443, s. 11A.119(a); 2015-241, s. 14.30(u), (v).)
North Dakota	"Waters of the state" means all waters within the jurisdiction of this state, including all streams, lakes, ponds, impounding reservoirs, marshes, watercourses, waterways, and all other bodies or accumulations of water on or under the surface of the earth, natural or artificial, public or private, situated wholly or partly within or bordering upon the state, except those private waters that do not combine or effect a junction with natural surface or underground waters just defined.
Ohio	"Waters of the state" includes all streams, lakes, ponds, marshes, watercourses, waterways, wells, springs, irrigation systems, drainage systems, and other bodies or accumulations of water, surface and underground, natural or artificial, regardless of the depth of the strata in which underground water is located, that are situated wholly or partly within or bordering upon this state or are within its jurisdiction.
Oklahoma	“Waters of the state” means all streams, lakes, ponds, marshes, watercourses, waterways, wells, springs, irrigation systems, drainage systems, storm sewers and all other bodies or accumulations of water, surface and underground, natural or artificial, public or private, which are contained within, flow through, or border upon this state or any portion thereof, and shall include under all circumstances the waters of the United States which are contained within the boundaries of, flow through or border upon this state or any portion thereof. Provided, waste treatment systems, including treatment ponds or lagoons designed to meet federal and state requirements other than cooling ponds as defined in the Clean Water Act or rules promulgated thereto and prior converted cropland are not waters of the state; and...

Oregon	“Water” or “the waters of the state” include lakes, bays, ponds, impounding reservoirs, springs, wells, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Pacific Ocean within the territorial limits of the State of Oregon and all other bodies of surface or underground waters, natural or artificial, inland or coastal, fresh or salt, public or private (except those private waters which do not combine or effect a junction with natural surface or underground waters), which are wholly or partially within or bordering the state or within its jurisdiction. [Formerly 449.075 and then 468.700; 2003 c.469 §1]
Pennsylvania	Waters of this Commonwealth. Includes all inland, tidal and boundary waters, whether navigable or nonnavigable, under the jurisdiction of the Commonwealth. The term includes ice that forms on these waters.
Rhode Island	“Waters” includes all surface waters including all waters of the territorial sea, tidewaters, all inland waters of any river, stream, brook, pond, or lake, and wetlands, as well as all groundwaters.
South Carolina	"Waters" means lakes, bays, sounds, ponds, impounding reservoirs, springs, wells, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Atlantic Ocean within the territorial limits of the State and all other bodies of surface or underground water, natural or artificial, public or private, inland or coastal, fresh or salt, which are wholly or partially within or bordering the State or within its jurisdiction;
South Dakota	"Waters of this state," any public waters within the territorial limits of this state and all waters which form a common boundary between this state and Minnesota, North Dakota, Montana, Wyoming, Iowa, or Nebraska.
Tennessee	“Waters” means any and all water, public or private, on or beneath the surface of the ground, that are contained within, flow through, or border upon Tennessee or any portion thereof, except those bodies of water confined to and retained within the limits of private property in single ownership that do not combine or effect a junction with natural surface or underground waters; and
Texas	(a) The water of the ordinary flow, underflow, and tides of every flowing river, natural stream, and lake, and of every bay or arm of the Gulf of Mexico, and the storm water, floodwater, and rainwater of every river, natural stream, canyon, ravine, depression, and watershed in the state is the property of the state. (b) Water imported from any source outside the boundaries of the state for use in the state and which is transported through the beds and banks of any navigable stream within the state or by utilizing any facilities owned or operated by the state is the property of the state.
Utah	"Waters of this state" means any stream, lake, pond, marsh, watercourse, waterway, well, spring, irrigation system, drainage system, or other body or accumulation of water whether surface, underground, natural, artificial, public, private, or other water resource of the state which is contained within or flows in or through the state.
Vermont	“Public waters” means navigable waters excepting those waters in private ponds and private preserves as set forth in sections 5204, 5205, 5206, and 5210 of this title.

	"Waters" means any and all rivers, streams, brooks, creeks, lakes, ponds or stored water, and groundwaters, excluding municipal and farm water supplies.
Virginia	State waters means all water, on the surface and under the ground, wholly or partially within or bordering the Commonwealth or within its jurisdiction, including wetlands.
Washington	"Surface waters of the state" means all waters defined as "waters of the United States" in 40 C.F.R. 122.2 that are within the boundaries of the state of Washington. This includes lakes, rivers, ponds, streams, inland waters, wetlands, ocean, bays, estuaries, sounds, and inlets. (27) "Waters of the state" means all waters defined as "surface waters of the state" and all waters defined as "waters of the state" in RCW 90.48.020. RCW 90.48.020 - Wherever the words "waters of the state" shall be used in this chapter, they shall be construed to include lakes, rivers, ponds, streams, inland waters, underground waters, salt waters and all other surface waters and watercourses within the jurisdiction of the state of Washington.
West Virginia	"Water resources", "water" or "waters" means any and all water on or beneath the surface of the ground, whether percolating, standing, diffused or flowing, wholly or partially within this state, or bordering this state and within its jurisdiction, and includes, without limiting the generality of the foregoing, natural or artificial lakes, rivers, streams, creeks, branches, brooks, ponds (except farm ponds, industrial settling basins and ponds and water treatment facilities), impounding reservoirs, springs, wells and watercourses.
Wisconsin	“Waters of the state" includes those portions of Lake Michigan and Lake Superior within the boundaries of this state, and all lakes, bays, rivers, streams, springs, ponds, wells, impounding reservoirs, marshes, watercourses, drainage systems and other surface water or groundwater, natural or artificial, public or private, within this state or its jurisdiction.
Wyoming	“Waters of the state” means all surface and groundwater, including waters associated with wetlands, within Wyoming

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