

When the Well Runs Dry: Why Water-Rich States Need to Prepare for Climate Change and Protect Their Groundwater

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WHEN THE WELL RUNS DRY: WHY WATER-RICH STATES NEED TO PREPARE FOR CLIMATE CHANGE AND PROTECT THEIR GROUNDWATER

DANIELLE TAKACS*

The ultimate test of man's conscience may be his willingness to sacrifice something today for future generations whose words of thanks will not be heard.

—Gaylord Nelson¹

INTRODUCTION

It may seem surprising to see such concern over groundwater usage in a state like Wisconsin. While known for its dairy and cheese production, Wisconsin is first in the nation for producing snap beans and cranberries.² Agriculture contributes \$88.3 billion annually to Wisconsin's economy alone.³ In addition to bordering two of the Great Lakes, Lake Michigan and Lake Superior, Wisconsin boasts that it is home to about 15,000 lakes.⁴ And this does not include the numerous rivers and streams throughout the state.⁵ These facts alone may make Wisconsin seem an unlikely place for disputes over groundwater, as water seems to be an abundant resource. When one thinks about water issues in the United States, it is easier to think of the problems faced by western states like Arizona or California.⁶ But it seems now that groundwater issues plague more than just the

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¹ *Quotations about the Environment*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/history/quotations-about-environment> [<https://perma.cc/8GHX-SFAG>] (last updated May 3, 2018).

² *Wisconsin Agricultural Statistics*, WIS. DEP'T OF AGRIC., TRADE AND CONSUMER PROT., <https://datcp.wi.gov/Pages/Publications/WIAgStatistics.aspx> [<https://perma.cc/9GGF-MU8U>] (last updated June 1, 2018).

³ *Id.*

⁴ *Lakes*, WIS. DEP'T OF NAT. RES., <http://dnr.wi.gov/lakes/> [<https://perma.cc/GQF8-WG5R>] (last updated Sept. 27, 2016).

⁵ *River facts*, WIS. DEP'T OF NAT. RES., <https://dnr.wi.gov/topic/rivers/riverfacts.html> [<https://perma.cc/U72K-GTBY>] (last updated Dec. 30, 2016).

⁶ See Anna North, *California's Big Groundwater Problem*, N.Y. TIMES (July 22, 2015), <https://takingnote.blogs.nytimes.com/2015/07/22/californias-big-groundwater-problem/> [<https://perma.cc/62AU-5V7T>]; Karen Smith, *35 years later, Arizona still pumps too much water*, AZCENTRAL (Mar. 5, 2015), <https://www.azcentral.com/story/opinion/op-ed/2015/03/05/arizona-groundwater-management/24464443/> [<https://perma.cc/4N33-8GJV>].

western part of the country. South Carolina, Virginia, and even Michigan are just a few states with growing concerns about the usage and quantity of their groundwater supply.⁷ Their concerns are not unfounded. A combination of increasing temperatures and an increase in agricultural production threatens to deplete groundwater sources worldwide.⁸ Groundwater depletion threatens food production, damages wetlands, causes land subsidence, and may add to sea level rise.⁹ Unsustainable use of groundwater is a serious issue, so even states ripe with water should be concerned about their supplies.

The seriousness of unsustainable groundwater use is illustrated by a recent Wisconsin legislative act. Wisconsin Senate Bill 76 came into effect on June 1, 2017, upon receiving Governor Scott Walker's signature, becoming 2017 Wisconsin Act 10.¹⁰ Wisconsin Act 10 amended previous language pertaining to high-capacity wells and the approval these wells need to obtain from the Wisconsin Department of Natural Resources ("DNR").¹¹ Specifically, the act amended section 281.34(2) through section 281.34(2g) and states that if a high-capacity well has already been approved, the owner of the well does not need to obtain additional approval when making repairs on the well, constructing a new well to replace the existing one, reconstructing the well, or transferring the land upon which the well exists.¹²

Before this act, the state legislature obviously believed DNR approval was necessary during the repair, replacement, or sale of high-capacity wells.¹³ What has changed? It has been noted that high-capacity

⁷ Sammy Fretwell, *Mega-farms gulp groundwater for 2nd straight year in central SC*, THE STATE (Oct. 28, 2017), <https://www.thestate.com/news/politics-government/article181460071.html> [<https://perma.cc/WM4R-5VKS>]; Keith Matheny, *Businesses using trillions of gallons of Michigan groundwater*, DETROIT FREE PRESS (Apr. 22, 2017), <https://www.freep.com/story/news/local/michigan/2017/04/22/nestle-great-lakes-water-michigan/100741306/> [<https://perma.cc/S89R-FFMV>]; David Ress & Austin Bagues, *Groundwater drain a big-dollar dilemma*, DAILY PRESS (Oct. 10, 2015), <http://www.dailypress.com/news/science/dp-ews-water-20151011-story.html> [<https://perma.cc/7S8J-VZK4>].

⁸ Cheryl Katz, *As Groundwater Dwindles, a Global Food Shock Looms*, NAT'L GEOGRAPHIC (Dec. 22, 2016), <https://news.nationalgeographic.com/2016/12/groundwater-depletion-global-food-supply/> [<https://perma.cc/XL6H-ZACU>].

⁹ *Id.*

¹⁰ Jason Stein, *Gov. Scott Walker signs bills to loosen Wisconsin well rules*, MILWAUKEE J. SENTINEL (June 1, 2017), <https://www.jsonline.com/story/news/politics/2017/06/01/gov-scott-walker-sign-bill-loosen-wisconsin-well-rules/361499001/> [<https://perma.cc/KYE4-QS5P>]; see also WIS. STAT. § 281.34(2g) (2017) (illustrating the changes made by Wisconsin Act 10).

¹¹ S.B. 76, 103rd Legis. Sess., Reg. Sess. (Wis. 2017).

¹² WIS. STAT. § 281.34(2g) (2017).

¹³ See WIS. STAT. § 281.11 (1995).

well permits, unlike other state permits, never expire.¹⁴ Regardless of the reasons for this change in law, it is a mistake to think that this law will be sustainable for Wisconsin in the future as climate change occurs.

Wisconsin Act 10 is a scaling back of groundwater regulation, yet states considered to be “water-rich” should not loosen or deregulate the management of their groundwater sources; rather, they should adopt legislation to protect groundwater from the effects of climate change. States and local governments should maintain the authority to regulate the quantity of groundwater supplies with flexibility and adopt policies that focus on long-term sustainable water use. This Note briefly discusses the mechanisms of groundwater and the threats climate change poses. Next, this Note examines current groundwater regulations in the water-rich states of Wisconsin and Michigan and the consequences of deregulation of groundwater. Finally, this Note discusses what potential groundwater regulations should look like in a future with climate change.

I. BACKGROUND ON GROUNDWATER

A. *What Is Groundwater?*

Groundwater is the water found underground in the spaces between soil particles and fractures in rock and is stored in geologic formations called aquifers.¹⁵ Figure 1, as seen below, is a basic illustration of groundwater. Groundwater supplies are recharged by rainfall and snow-melt that migrate down through soil and rock.¹⁶ In general, groundwater can be obtained naturally via a spring or as discharge into a lake or stream.¹⁷ Wells drilled into the aquifer can also be used to extract water.¹⁸ The amount of water being pumped and the material that is being drilled through determines the kind of well used.¹⁹ For example, according to the Wisconsin DNR, a high-capacity well “is a well that has the capacity to

¹⁴ *Scott Walker signs bill easing regulations on high cap wells*, WIS. ST. J. (June 2, 2017), http://host.madison.com/wsj/news/local/govt-and-politics/scott-walker-signs-bill-easing-regulations-on-high-cap-wells/article_874f87d0-0f97-5457-8000-ee47dfe8b5a1.html [<https://perma.cc/8AUU-TAUK>].

¹⁵ *What is Groundwater?*, THE GROUNDWATER FOUND., <http://www.groundwater.org/get-informed/basics/groundwater.html> [<https://perma.cc/W3TG-7MDF>] (last visited Nov. 17, 2018).

¹⁶ *Id.*

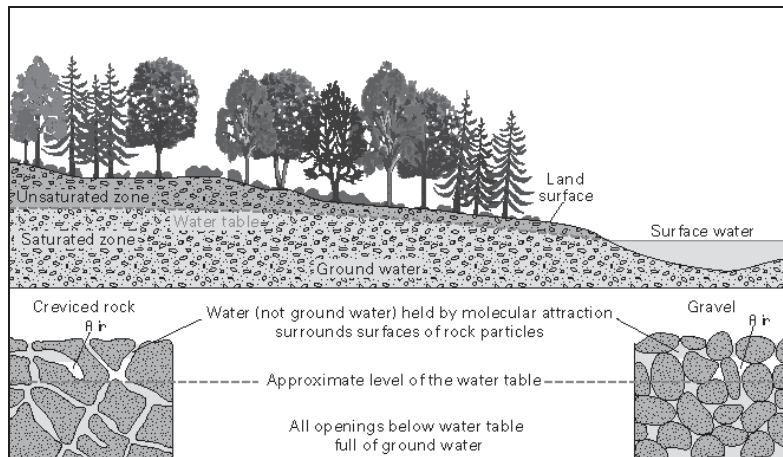
¹⁷ *Id.*

¹⁸ *Id.*

¹⁹ *What is a Well?*, THE GROUNDWATER FOUND., <http://www.groundwater.org/get-informed/basics/wells.html> [<https://perma.cc/9CXW-2EH4>] (last visited Nov. 17, 2018).

withdraw more than 100,000 gallons per day, or a well that, together with all other wells on the same property, has a capacity of more than 100,000 gallons per day.”²⁰ Agriculture, industries, and municipalities all utilize high-capacity wells to obtain groundwater.²¹ As groundwater is available at most places on Earth, it is one of the most widely available natural resources.²² Moreover, in arid and semiarid regions, it may be the only dependable source of water.²³ While groundwater quantity issues seem most pressing in dry, arid areas where populations heavily rely on groundwater as their main supply of water, this analysis focuses on two U.S. states, Wisconsin and Michigan, that would not typically be characterized as “dry.” This analysis examines the characteristics that make Michigan and Wisconsin “water-rich,” and how these characteristics affect their groundwater supplies.²⁴

Figure 1²⁵



²⁰ *High capacity wells*, WIS. DEP'T OF NAT. RES., <http://dnr.wi.gov/topic/Wells/HighCap/> [<https://perma.cc/A79W-LDVX>] (last updated Oct. 5, 2017).

²¹ See Heather Stanek, *High-capacity wells draw concern*, REEDSBURG TIMES-PRESS (June 27, 2017), https://www.wiscnews.com/reedsburgtimespress/news/local/high-capacity-wells-draw-concern/article_a24c7553-d9bb-5a23-960b-0ffb80bc5e3.html [<https://perma.cc/UQ4F-R8CS>].

²² Ralph C. Heath, *Ground-water Regions of the United States*, U.S. GEOLOGICAL SURVEY 1, 1 (1983), <https://pubs.usgs.gov/wsp/wsp2242/pdf/wsp2242.pdf> [<https://perma.cc/GTZ8-DCZC>].

²³ *Id.*

²⁴ See *infra* note 44 (discussing a possible definition of “water-rich”).

²⁵ *Aquifers and Groundwater*, U.S. GEOLOGICAL SURVEY WATER SCI. SCH., <https://water.usgs.gov/edu/earthgwaquifer.html> [<https://perma.cc/A5L4-TT72>] (last updated Mar. 20, 2018).

B. *Climate Change and Groundwater*

According to the Intergovernmental Panel on Climate Change, climate change “refers to any change in climate over time, whether due to natural variability or as a result of human activity.”²⁶ A changing climate impacts human health, agriculture, and infrastructure, among other things.²⁷ Naturally, the planet’s water resources are not immune to climate change.²⁸ As air temperatures increase, water temperatures will also increase, resulting in increased rates of evaporation, among other effects.²⁹ An increase in air temperature also changes precipitation patterns across the country.³⁰ Some regions of the country will experience an increase in precipitation while others will see a decrease.³¹ For example, it is predicted that the Great Plains region will experience increased flooding and droughts, impacting the region’s agriculture.³² The western mountains in the U.S. are predicted to see decreases in snowpack, earlier snow-melt, and a reduction in summertime flows.³³ Changing precipitation patterns, amounts, and intensity will affect the storage and rate of recharge of groundwater.³⁴ As these changes happen, water-rich states should have protections in place to sustain their groundwater.

C. *Groundwater Depletion: Threats from Climate Change*

As noted above, groundwater supplies are not static and are recharged via rainfall and snow-melt.³⁵ When the rate of groundwater recharge is less than the rate of withdrawal, groundwater depletion

²⁶ *Climate Change 2001: Impacts, Adaptation and Vulnerability*, INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE 1, 984 (2001), https://library.harvard.edu/collections/ipcc/docs/27_WGIITAR_FINAL.pdf [<https://perma.cc/6STG-CZY>].

²⁷ *How climate change plunders the planet*, ENVTL. DEF. FUND, <https://www.edf.org/climate/how-climate-change-plunders-planet> [<https://perma.cc/L4NG-25DZ>] (last visited Nov. 17, 2018).

²⁸ *Climate Impacts on Water Resources*, U.S. ENVTL. PROT. AGENCY, https://19january2017snapshot.epa.gov/climate-impacts/climate-impacts-water-resources_.html [<https://perma.cc/VAE7-LPNZ>] (last updated Dec. 21, 2017).

²⁹ *The Effect of Climate Change on Water Resources and Programs*, U.S. ENVTL. PROT. AGENCY WATERSHED ACAD. WEB 1, 10–11, https://cfpub.epa.gov/watertrain/pdf/modules/climate_change_module.pdf [<https://perma.cc/7XSP-CBVE>].

³⁰ *Id.* at 11–12.

³¹ *Id.* at 12.

³² *Id.* at 13.

³³ *Id.*

³⁴ See R.D. Singh & C.P. Kumar, *Impact of Climate Change on Groundwater Resources*, NAT’L INST. OF HYDROLOGY (2010), https://www.researchgate.net/publication/215973855_Impact_of_Climate_Change_on_Groundwater_Resources [<https://perma.cc/P5F8-WYXX>].

³⁵ See THE GROUNDWATER FOUND., *supra* note 15.

occurs.³⁶ Groundwater depletion is defined by the United States Geological Survey (“USGS”) as “long-term water-level declines caused by sustained groundwater pumping.”³⁷ As precipitation patterns shift due to climate change, those reliant on groundwater may face challenges sustaining groundwater levels in their wells.³⁸ During times of drought, for example, groundwater levels are especially prone to a severe decrease due to lack of precipitation.³⁹

Groundwater levels in a well can also decrease if nearby wells are drawing too much water.⁴⁰ As droughts become more severe and reliance on groundwater sources increases, the threats climate change pose on groundwater will become more severe unless action is taken.⁴¹ To borrow an analogy from the USGS, groundwater is like money in your bank account: “[i]f you withdraw money at a faster rate than you deposit new money you will eventually start having account-supply problems.”⁴² This principle also applies to groundwater. The problems groundwater depletion causes include wells drying up, an increase in pumping costs, lowering of the water table, reduction of water in lakes and rivers, and land subsidence.⁴³ An examination of water-rich states’ current groundwater regulation is needed to understand if they are suited for an age of climate change. The management of the groundwater supply is an important duty and one that will only become more vital as climate change takes its toll.

II. GROUNDWATER IN WATER-RICH STATES: WISCONSIN AND MICHIGAN

This argument will repeatedly refer to Wisconsin and Michigan as “water-rich,” but this term first needs to be defined. Using data from the

³⁶ *Groundwater depletion*, U.S. GEOLOGICAL SURVEY WATER SCI. SCH., <https://water.usgs.gov/edu/gwdepletion.html> [<https://perma.cc/2ZZN-SGG2>] (last updated Dec. 9, 2016).

³⁷ *Id.*

³⁸ *Id.*

³⁹ See THE GROUNDWATER FOUND., *supra* note 15.

⁴⁰ *Drought and Overpumping and Groundwater Decline*, U.S. GEOLOGICAL SURVEY WATER SCI. SCH., <https://water.usgs.gov/edu/droughtandgw.html> [<https://perma.cc/YGG7-YS5E>] (last updated Dec. 9, 2016). There are other more scientific factors that come into play when determining if a well will go dry, such as well depth, the type of aquifer, the amount of pumping and recharge, and, of course, precipitation factors. Unfortunately, this Note will not go into more scientific detail.

⁴¹ Jason J. Gurdak et al., *Effects of Climate Variability and Change on Groundwater Resources of the United States*, U.S. GEOLOGICAL SURVEY, OFFICE OF GLOB. CHANGE (Fact Sheet 2009–3074, Sept. 2009), <https://pubs.usgs.gov/fs/2009/3074/pdf/FS09-3074.pdf> [<https://perma.cc/Q347-H56K>].

⁴² *Groundwater depletion*, *supra* note 36.

⁴³ *Id.*

USGS, water-rich states can be defined as states whose percentage water area (or the area of each state covered by water) is greater than 11 percent.⁴⁴ For example, Michigan has a percentage water area of 41.5 percent, while Wisconsin's percentage water area is 17.3 percent.⁴⁵ Wisconsin and Michigan receive 34.49 inches and 31.73 inches of rain on average per year, respectively.⁴⁶ Compared to states like New Mexico, with an average of 14.21 inches of rain a year, and California, with an average of 18.51 inches per year, Wisconsin and Michigan are comparatively wetter states.⁴⁷ The more abundant rainfall in these states also contributes to the rate of groundwater recharge.⁴⁸ Most importantly, these water-rich states are perceived as being immune from the stresses of climate change, a notion this argument refutes.⁴⁹

Groundwater plays a vital role in both of these water-rich states. In Wisconsin, about two-thirds of its citizens obtain their drinking water from groundwater.⁵⁰ Industries and agriculture also rely on groundwater as a primary source of water.⁵¹ In 2016, approximately 200 billion gallons of groundwater were withdrawn in the state of Wisconsin.⁵² Municipal public water supplies and agricultural irrigation are the two largest withdrawers of groundwater, with ninety-four billion gallons and eighty-one

⁴⁴ See Caitlin Dempsey, *Which States Have the Highest Percentage of Water Area?*, GEO-LOUNGE (Nov. 10, 2015), <https://www.geolounge.com/which-states-have-the-highest-percentage-of-water-area/> [<https://perma.cc/72YD-3J7F>].

⁴⁵ *Id.*

⁴⁶ *Climate Michigan—Lansing*, U.S. CLIMATE DATA, <https://www.usclimatedata.com/climate/michigan/united-states/3192> [<https://perma.cc/A9TF-QXQD>] (last visited Nov. 17, 2018); *Climate Wisconsin—Milwaukee*, U.S. CLIMATE DATA, <https://www.usclimatedata.com/climate/wisconsin/united-states/3219> [<https://perma.cc/4PH8-YTFY>] (last visited Nov. 17, 2018).

⁴⁷ *Climate California—Sacramento*, U.S. CLIMATE DATA, <https://www.usclimatedata.com/climate/california/united-states/3174> [<https://perma.cc/4GR2-XGZB>] (last visited Nov. 17, 2018); *Climate New Mexico—Santa Fe*, U.S. CLIMATE DATA, <https://www.usclimatedata.com/climate/new-mexico/united-states/3201> [<https://perma.cc/FC28-DVLF>] (last visited Nov. 17, 2018). It should also be noted that while this Note focuses on only Wisconsin and Michigan, other U.S. states may be considered “water-rich” under the definition provided above, meaning those states face similar groundwater issues.

⁴⁸ See *Drought and Overpumping and Groundwater Decline*, *supra* note 40.

⁴⁹ See, e.g., Brad Plumer & Nadja Popovich, *As Climate Changes, Southern States Will Suffer More Than Others*, N.Y. TIMES (June 29, 2017), <https://www.nytimes.com/interactive/2017/06/29/climate/southern-states-worse-climate-effects.html> [<https://perma.cc/VA98-Y3QX>].

⁵⁰ *Groundwater*, WIS. DEP'T OF NAT. RES., <http://dnr.wi.gov/topic/groundwater/> [<https://perma.cc/GPW9-Y8T3>] (last updated June 8, 2017).

⁵¹ *Id.*

⁵² *Groundwater Quantity*, WIS. DEP'T OF NAT. RES., <http://dnr.wi.gov/topic/groundwater/GCC/gwquantity.html> [<https://perma.cc/VH9L-VXA6>] (last updated Jan. 18, 2018).

billion gallons drawn in 2015 respectively.⁵³ In Michigan, about 45 percent of citizens rely on groundwater for drinking and other uses.⁵⁴ The total groundwater use for the state of Michigan is 700 million gallons per day.⁵⁵ For irrigation, approximately 100 million gallons of water are drawn daily from groundwater.⁵⁶ By comparison, Michigan industries withdraw approximately 180 million gallons of groundwater daily.⁵⁷ As the statistics from these water-rich states illustrate, groundwater is a vital resource for not only individuals, but industry as well. While these states are water-rich, the groundwater used by these states is not insignificant. Yet as industry continues and crops are grown, the threats of climate change on groundwater will become more and more evident as this vital resource is strained. Stronger groundwater protections will be needed.

III. CURRENT GROUNDWATER REGULATION IN WATER-RICH STATES

A. *Wisconsin*

In 1983, Wisconsin enacted Act 410 Chapter 160 Groundwater Protection Standards.⁵⁸ While the purpose of the chapter was mainly to curtail the amount of polluting substances in groundwater, the legislature realized prior to 1983 there were no numeric standards in groundwater regulatory programs.⁵⁹ Groundwater quantity issues were addressed later in 2003 through Wisconsin Act 310.⁶⁰ Act 310 required high-capacity

⁵³ *Wisconsin Water Use 2016 Withdrawal Summary*, WIS. DEP'T OF NAT. RES., 1, 5 (2016), <http://dnr.wi.gov/topic/WaterUse/documents/WithdrawalReportDetail.pdf> [<https://perma.cc/94Z5-W9DE>].

⁵⁴ *Groundwater Statistics*, MICH. DEP'T OF ENVTL. QUALITY, http://www.michigan.gov/documents/deq/deq-wd-gws-wcu-groundwaterstatistics_270606_7.pdf [<https://perma.cc/2LU6-9JAH>] (last updated Jan. 2018).

⁵⁵ *Id.*

⁵⁶ *Id.*

⁵⁷ *Id.*

⁵⁸ WIS. STAT. § 160.21 (1983). While this Note focuses on more recent legislation relating to groundwater, Wisconsin's relationship with groundwater regulation is not a new phenomenon. Since the creation of the Wisconsin Geological and Natural History Survey ("WGNHS") in 1897, the State has invested time and resources to inventorying and researching the natural resources of the state. Groundwater and other geologic studies have been performed by the WGNHS since 1897, identifying valuable water resources in the state. Groundwater monitoring began across the state in 1946, relaying information about the use and pumping of groundwater has affected its supply. *Wisconsin Geological Natural History Survey* (Oct. 16, 2015), <https://wgnhs.uwex.edu/wp-content/uploads/2012/07/wgnhs-about-us.pdf> [<https://perma.cc/574R-ZXJW>].

⁵⁹ WIS. STAT. § 160.001 (1983).

⁶⁰ Wis. Assemb. B. 926, 2003 96th Legis. Sess. (Wis. 2003).

wells to be subject to approval by the DNR, established the means for the DNR to create groundwater protection areas, and formed a groundwater advisory committee.⁶¹ Wisconsin Act 227, enacted in 2007, legally binds Wisconsin to the Great Lakes–St. Lawrence River Basin Water Resources Compact.⁶² This Act prohibits water withdrawals of 100,000 gallons of water in a thirty-day period from the Great Lakes Basin without a permit.⁶³ The Act also sets up a statewide water conservation and efficiency program that, among other measures, includes the “[p]romotion of environmentally sound and economically feasible water conservation measures through a voluntary statewide program.”⁶⁴

Wisconsin’s statutory provisions may seem robust enough to protect the State’s groundwater resources, yet the 2003 Wisconsin Act 310 does not include any language about climate change.⁶⁵ A reference to climate change does, however, appear in Wisconsin Act 227, which states that:

The parties in cooperation with the provinces shall collectively conduct within the basin, on a lake watershed and St. Lawrence River basin basis, a periodic assessment of the cumulative impacts of withdrawals, diversions, and consumptive uses from the waters of the basin This assessment shall . . . [g]ive substantive consideration to *climate change* or other significant threats to basin waters and take into account the current state of scientific knowledge⁶⁶

While this provision does mandate that Wisconsin and other states party to the Great Lakes–St. Lawrence River Basin Water Resources Compact take into account climate change’s effect on water in the basin, the provisions here are broad and apply to every water source in the basin, not just groundwater.⁶⁷ The lack of specific provisions pertaining to the protection of groundwater in light of the effects of climate change illustrate that Wisconsin’s statutory provisions are no longer adequate to protect groundwater.

⁶¹ *Id.*

⁶² S.B. 1, 2007 Spec. Sess. (Wis. 2007).

⁶³ *Id.*

⁶⁴ *Id.*

⁶⁵ See Wis. Assemb. B. 926, *supra* note 60.

⁶⁶ Wis. S.B. 1 (emphasis added).

⁶⁷ *Id.*

Statutes, however, are not the only source of Wisconsin's groundwater regulation. In 2011, the Wisconsin Supreme Court case *Lake Beulah Management District v. State Department of Natural Resources* affirmed the Wisconsin DNR's power to determine the impacts that high-capacity wells have on the environment in light of the scientific evidence.⁶⁸ In this case, the Wisconsin DNR issued a permit for a municipal Well No.7 for the Village of East Troy in 2003.⁶⁹ The Lake Beulah Management District ("LBMD") along with the Lake Beulah Protective and Improvement Association ("LBPIA") challenged the issuance of the permit because it did not take into account the well's impact on Lake Beulah.⁷⁰ The LBMD and LBPIA were concerned about the potential impact of the well on the lake and the surrounding environment.⁷¹ The LBMD and LBPIA petitioned for judicial review of the permit, arguing that under the public trust doctrine the DNR needed to review evidence of potential harm to the lake before issuing the permit.⁷²

The Wisconsin Supreme Court found that, in light of the language in Subchapter II of Chapter 281, the DNR has the duty and authority to consider environmental harms when issuing high-capacity well permits.⁷³ "[W]hen presented with sufficient concrete, scientific evidence of potential harm to the waters of the state," the DNR must consider this potential harm when examining a proposed high-capacity well.⁷⁴ Thus, this case reaffirmed the DNR's role and authority in regulating wells and managing the groundwater resources of the State of Wisconsin.

While this case reaffirmed the role of the DNR in regulating high-capacity wells, the court also stated:

The DNR's general duty certainly does not require the DNR to investigate the potential environmental harm of every high capacity well permit application or to undertake a formal environmental review for every application. Such an interpretation would be inconsistent with the

⁶⁸ *Lake Beulah Mgmt. Dist. v. Dep't of Nat. Res.*, 799 N.W.2d 73, 76 (2011).

⁶⁹ *Id.* at 78.

⁷⁰ *Id.* It should be noted that the controversial Well No.7 was located a mere 1200 feet from Lake Beulah.

⁷¹ *Id.* at 78–79. The LBMD's and LBPIA's 2003 challenges to the permit were unsuccessful, but delayed the construction of Well No. 7. A permit was issued in 2005 for Well No. 7, and this is the permit subject to the challenge in this case.

⁷² *Id.* at 79.

⁷³ *Lake Beulah*, 799 N.W.2d at 88.

⁷⁴ *Id.*

legislature's decision to mandate that level of environmental review for only certain high capacity wells.⁷⁵

This belief was perhaps appropriate a few years ago, but it can no longer be sustained in a time of climate change, in which water resources will continue to become more precious.⁷⁶ As agriculture is a large user of high-capacity wells in Wisconsin, the DNR should have control to conduct an environmental review of all high-capacity wells in existence.⁷⁷ To do otherwise would be absurd.

When Wisconsin Act 10 came into effect in 2017, it caused great controversy. Examining the text of Wisconsin Act 10, the creation of section 281.34(2g) added 460 words, some of which removed DNR oversight in the repairing, replacement, and sale of high-capacity wells.⁷⁸ Opponents of Wisconsin Act 10 saw it as a curtailment of DNR oversight and a detriment to the groundwater supply of the state.⁷⁹ For example, a letter from the Town of Rome urging the Wisconsin legislature to vote “no” expressed dismay at section 281.34(2g) by stating a “[p]eriodic review of high capacity well permits is essential to protect our waters. Unlimited permits are unprecedented in Wisconsin and pose a serious and immediate danger to our waterways and our residents.”⁸⁰ Opponents further pointed to the Little Plover River, a six-mile river that first dried up in 2005, as an example of how wells affect streams and rivers.⁸¹ Supporters of Act 10 saw it as a pro-farming measure, as vegetable and dairy farming are major industries in Wisconsin.⁸² The agricultural industry and dairy farmers supported the Act, as it allowed farmers to keep up the water supply needed for their crops or animals without interruption.⁸³ Nevertheless, the bill passed and has been signed.⁸⁴ It is now the law in Wisconsin, one

⁷⁵ *Id.* (emphasis added).

⁷⁶ See Katz, *supra* note 8.

⁷⁷ See Scott Walker signs bill easing regulations on high cap wells, *supra* note 14.

⁷⁸ WIS. STAT. § 281.34(2g) (2017).

⁷⁹ See Legislative Council Public Hearing Materials for S.B.76 at 25 (Wis. 2017) (statement of Sen. Mark Miller & Rep. Cory Mason), https://docs.legis.wisconsin.gov/misc/lc/hearing_testimony_and_materials/2017/sb76/sb0076_2017_03_15.pdf [<https://perma.cc/Q8RJ-95LT>].

⁸⁰ *Id.* at 26–27 (statements from the Town of Rome).

⁸¹ See Kate Prengaman, *Saving the 'endangered' Little Plover River*, WISCONSINWATCH.ORG (July 21, 2013), <http://wisconsinwatch.org/2013/07/saving-the-endangered-little-plover-river/> [<https://perma.cc/53AC-U3X3>].

⁸² Stein, *supra* note 10.

⁸³ See Legislative Council Public Hearing Materials for S.B.76, *supra* note 79, at 7 (statement from the Dairy Business Association).

⁸⁴ See generally WIS. STAT. § 281.34(2g) (2017).

that removes DNR oversight and is not protective of groundwater resources. Hopefully, other water-rich states fare better.

B. Michigan

In 2006, Michigan enacted legislation to amend Act 451 of 1994, which is part of Chapter 324: Natural Resources and Environmental Protection.⁸⁵ The amendment added section 32723 to the Michigan Compiled Laws (“MCL”), which provided details about water withdrawal permits.⁸⁶ The Department of Environmental Quality (“DEQ”) is the agency responsible for overseeing water withdrawal permits.⁸⁷ Section 1 of MCL 324.32723 mandates when a person must obtain a water withdrawal permit:

- (a) A person who proposes to develop withdrawal capacity to make a new withdrawal of more than 2,000,000 gallons of water per day from the waters of the state to supply a common distribution system.
- (b) A person who proposes to develop increased withdrawal capacity beyond baseline capacity of more than 2,000,000 gallons of water per day from the waters of the state to supply a common distribution system.
- (c) A person who proposes to develop withdrawal capacity to make a new or increased large quantity withdrawal of more than 1,000,000 gallons of water per day from the waters of the state to supply a common distribution system that a site-specific review has determined is a zone C withdrawal.
- (d) A person who proposes to develop a new or increased withdrawal capacity that will result in an intrabasin transfer of more than 100,000 gallons per day average over any 90-day period.⁸⁸

Section 6 of MCL 324.32723 outlines the conditions that must be met before a water withdrawal permit will be issued.⁸⁹ Some of the

⁸⁵ S. B. 850, 93rd Legis., Reg. Sess. (Mich. 2006).

⁸⁶ MICH. COMP. LAWS § 324.32723 (2006).

⁸⁷ *Id.* § 324.32701(1)(n) (2006).

⁸⁸ *Id.* § 324.32723(1)(a)–(d) (2006).

⁸⁹ *Id.* § 324.32723(6) (2006).

conditions include: returning withdrawn water to the watershed; ensuring the withdrawal has no adverse impacts; ensuring the withdrawal meets all local, state, regional and federal laws and agreements; and ensuring the withdrawal “does not violate public or private rights and limitations imposed by Michigan water law or other Michigan common law duties.”⁹⁰ A 2008 amendment to MCL 324.32723 added section 8, which strengthens the permitting application process by requiring the Michigan DEQ to review the effect of the withdrawal on rivers and streams.⁹¹

While Michigan should be applauded for enacting pro-water legislation, 2008 was the last time the Michigan legislature enacted protective groundwater measures. Ten years ago may not seem like a long time and may feel recent in terms of legislation, but climate change does not wait for anybody. Nowhere in MCL 324.32723 does the statute mention “climate change.”⁹² However, MCL 324.34201, which codifies Michigan’s ratification of the Great Lakes–St. Lawrence River Basin Water Resources Compact, does state that “[c]onservation programs need to adjust to new demands and the potential impacts of cumulative effects and *climate*.”⁹³ Since the Great Lakes–St. Lawrence River Basin Water Resources Compact, which was ratified by Michigan in 2008, applies to surface waters as well as to groundwater, it may be a suitable means of regulating groundwater in an era of climate change.⁹⁴

There is much language in the Compact that encourages the development of conservation measures to protect the water resources of the basin.⁹⁵ These measures are, however, broad and focused on every water resource, giving no special attention to groundwater in particular.⁹⁶ Also, nowhere in MCL 324.32723 or MCL 324.34201 is there a mention of drought or any extreme climate events that may affect groundwater resources.⁹⁷ Drought, for example, is only mentioned in a statute relating to the Interstate Disaster Compact, in which drought is simply listed among

⁹⁰ *Id.* § 324.32723(6)(f) (2006).

⁹¹ *Id.* § 324.32723(8) (2006).

⁹² *See* MICH. COMP. LAWS § 324.32723.

⁹³ MICH. COMP. LAWS § 324.34201(4.2)(5) (emphasis added). For more information about the Great Lakes–St. Lawrence River Basin Water Resources Compact, see *Great Lakes Agreement*, GREAT LAKES–ST. LAWRENCE RIVER BASIN WATER RES. COUNCIL, <http://www.glscompactcouncil.org/Agreements.aspx> [https://perma.cc/JHA9-ZRGA] (last visited Nov. 17, 2018).

⁹⁴ MICH. COMP. LAWS § 324.34201(2.1).

⁹⁵ *See id.* § 324.34201(4.2).

⁹⁶ *See id.* § 324.34201(1.2).

⁹⁷ *See* MICH. COMP. LAWS §§ 324.32723, 324.34201.

other events categorized as emergencies or disasters,⁹⁸ and in MCL 324.32710, which pertains to duties of the DEQ.⁹⁹ The lack of specific provisions pertaining to groundwater and the lack of provisions explicitly concerning climate change illustrate that, overall, Michigan's groundwater legislation is outdated and ill-suited for an era of climate change.

In Michigan, the common law doctrine of reasonable use also plays a role in shaping the water rights of the state. The reasonable use doctrine allows for groundwater to be used in a manner which does not unreasonably interfere with the neighbor's reasonable use of the groundwater, decrease the neighboring land's value, or unreasonably damage the quality of groundwater.¹⁰⁰ The case *Schenk v. City of Ann Arbor* sets out a general definition of reasonable use and applies it to wells and subsurface waters. The court in *Schenk* stated the reasonable use doctrine:

[D]oes not prevent the proper user by any landowner of the percolating waters subjacent to his soil in agriculture, manufacturing, irrigation, or otherwise, nor does it prevent any reasonable development of his land. . . . although the underground water of neighboring proprietors may thus be interfered with or diverted; but it does prevent the withdrawal of underground waters for distribution or sale for uses not connected with any beneficial ownership or enjoyment of the land whence they are taken, if it results therefrom that the owner of adjacent or neighboring land is interfered with in his right to the reasonable user of subsurface water upon his land, or if his wells, springs, or streams are thereby materially diminished in flow, or his land is rendered so arid as to be less valuable¹⁰¹

In *Thompson v. Enz*, the Michigan Supreme Court listed out several factors to consider when determining whether the use of water is reasonable.¹⁰² Such factors include the "size, character and natural state"¹⁰³

⁹⁸ MICH. COMP. LAWS § 30.261(1).

⁹⁹ MICH. COMP. LAWS § 324.32710(3)(c).

¹⁰⁰ David P. Lusch, *An Overview of Existing Water Law in Michigan Related to Irrigation Water Use and Riparian Considerations*, INST. OF WATER RESEARCH MICH. STATE UNIV. 1, 2 (2011), https://www.canr.msu.edu/uploads/235/67987/lyndon/Michigan_Water_Law.pdf [<https://perma.cc/F4MR-26KN>].

¹⁰¹ *Schenk v. City of Ann Arbor*, 163 N.W. 109, 112 (Mich. 1917).

¹⁰² *Thompson v. Enz*, 54 N.W.2d 473, 484–85 (Mich. 1967) (concurring opinion).

¹⁰³ *Id.* at 484.

of the water source, the use of water and its effect on quality and quantity,¹⁰⁴ and the “consequential effects, including the benefits obtained and the detriment suffered, on the correlative rights and interests of other riparian proprietors and also on the interests of the State, including fishing, navigation, and conservation.”¹⁰⁵

On its face, the common law of Michigan may seem to have the strength and authority to manage groundwater resources.¹⁰⁶ Yet relying on common law in light of climate change is not feasible. The cases above established principles in an era where scientific knowledge about groundwater and climate change was limited. One has to wonder if relying on antiquated judge-made law is really the best way to handle precious subsurface waters as the threats from climate change become more evident and more threatening.¹⁰⁷ Thus, there needs to be a new regime of laws and regulations to deal with climate change and groundwater.

IV. GROUNDWATER REGULATION IN A FUTURE WITH CLIMATE CHANGE

A. *The Roles of Regulation*

Regulation can help mitigate groundwater depletion issues in a future with climate change. A groundwater withdrawal permit can provide information to the regulating body about where the withdrawal will be occurring, the source of the water, the maximum withdrawal, and the pumping capacity of the well.¹⁰⁸ Those who obtain a permit may also be required to report annually to the regulating body and include information about the amount and rate of water withdrawn and the uses of the water.¹⁰⁹ This reporting will give the regulating body a means of

¹⁰⁴ *Id.*

¹⁰⁵ *Id.* at 485.

¹⁰⁶ For an application of modern usage of the reasonable use rule, see *Mich. Citizens for Water Conservation v. Nestle Waters N. Am. Inc.*, 709 N.W.2d 174 (2005).

¹⁰⁷ See Paul P. Murphy, *In less than 3 Months, a major international city will likely run out of water*, CNN (Jan. 31, 2018), <https://www.cnn.com/2018/01/24/africa/cape-town-water-crisis-trnd/index.html> [<https://perma.cc/F8A2-U6BM>]. While this article does not specifically focus on groundwater, the truth is that climate change is here and already affecting people in our ever expanding world today. The thought of climate change creating such scarcity of water may seem remote to those in the U.S. since the problem is in Africa, but this article illustrates the need to be proactive and protect the water we have so the future does not look like this.

¹⁰⁸ *Water Withdrawal Permit Application Instructions*, MICH. DEP'T OF ENVTL QUALITY (Oct. 2013), http://www.michigan.gov/documents/deq/deq-wrd-swas-wateruse-permitapp_606183_7.pdf [<https://perma.cc/XC2Y-TAJM>].

¹⁰⁹ MICH. COMP. LAWS § 324.32707.

tracking the largest users of groundwater and enable it to monitor the amount of groundwater being withdrawn.¹¹⁰ The data collected will also be a vital tool for the study of climate change and how it relates to groundwater usage.¹¹¹ While businesses may decry all the regulations and permits needed to use the water resources of a state, regulations are needed to ensure the sustainable use of this precious and rapidly disappearing resource.

Looking at the language of Wisconsin and Michigan statutes, it is clear that the role of regulating groundwater (and all water) resources is a duty of the state. For example, in Wisconsin Statute 281.11, the statement of policy and purpose explains that “[t]he department [DNR] shall serve as the central unit of state government to protect, maintain and improve the quality and management of the waters of the state, ground and surface, public and private.”¹¹² Section 324.3103(1) of Michigan’s Natural Resource and Environmental Protection Act says something similar: “The [DEQ] shall protect and conserve the water resources of the state and shall have control of the pollution of surface or underground waters of the state and the Great Lakes”¹¹³ As noted earlier, one of the largest users of groundwater in these states is agriculture.¹¹⁴ It is not likely that the main goal of large-scale agriculture is to be stewards of the water resources of the state; while many businesses promise that part of their mission is to be good “stewards” of the resources they use, the goal of business is profit.¹¹⁵ This is not to imply that large industry or agriculture are malicious, but rather to say they are not the proper stewards to manage a state’s water resources. State and local governments

¹¹⁰ See Charles J. Taylor & William M. Alley, *U.S. Geological Survey Circular 1217: Ground-Water-Level Monitoring and the Importance of Long-Term Water-Level Data*, U.S. GEOLOGICAL SURVEY 7 (2001), https://pubs.usgs.gov/circ/circ1217/pdf/circ1217_final.pdf [<https://perma.cc/M2AN-3JQ2>].

¹¹¹ Having more metrics on water usage will be useful in studying climate change and in coming up with solutions to groundwater quantity issues. While advances in the study of climate change have occurred in the last few decades, more research has been done on surface waters than on groundwater. Gurdak et al., *supra* note 41.

¹¹² WIS. STAT. § 281.11.

¹¹³ MICH. COMP. LAWS § 324.3103(1).

¹¹⁴ See *Wisconsin Water Use 2016 Withdrawal Summary*, *supra* note 53; *Groundwater Statistics*, *supra* note 54.

¹¹⁵ See *About Us & Our History*, BOERSEN FARMS, <http://www.boersenfarms.com/about-us.htm> [<https://perma.cc/59V8-DGAD>] (last visited Nov. 17, 2018); *Facts About Michigan Agriculture*, MICH. DEP’T OF AGRIC. AND RURAL DEV., <http://www.michigan.gov/mdard/0,4610,7-125-1572-7775--,00.html> [<https://perma.cc/BJG7-LFBK>] (last visited Nov. 17, 2018) (talking about the benefits of large agriculture in terms of monetary means).

should not relax regulations on groundwater resources in water-rich states to appease powerful lobbies who are interested in short-term profits as opposed to long-term sustainability. State and local governments, via statutes or ordinances, have the authority to keep water users in compliance through enforcing and implementing punitive measures.¹¹⁶

Furthermore, state and local governments are in the best position to create the changes to legislation that affect how groundwater is withdrawn and managed. State and local officials may be familiar with the communities affected by groundwater withdrawal, understand the economic impacts at stake, and in general may simply care more about how water in their state is being used.¹¹⁷ State and local officials may also have cultivated relationships with various industry advocates, users of groundwater, and scientists who study groundwater.¹¹⁸ As discussed further below, having these relationships will be vital when a new regime of laws regarding groundwater regulation is created. Once the importance of their role in managing groundwater is understood and accepted, states and local governments should develop new laws to sustain the groundwater of their states in an era of climate change.

V. “CLIMATE-PROOFING” LAWS NEEDED IN WATER-RICH STATES

As noted above, the laws of Michigan and Wisconsin are either antiquated or too lax to regulate groundwater supplies in a time of climate change. A new regime of laws are needed in water-rich states if groundwater is to be managed properly going forward in the future. Thus, water-rich states must adopt “climate-proofing” laws to protect their groundwater resources. In general, climate-proofing laws focus on the sustainability of a resource while explicitly factoring in the effects of climate change.¹¹⁹ While climate change is a threat to be taken seriously, development of these climate-proofing laws should be seen as a chance

¹¹⁶ See, e.g., MIDDLEVILLE, MICH., CODE OF ORDINANCES § 70-1(i) (2017).

¹¹⁷ See Legislative Council Public Hearing Materials for S.B.76, *supra* note 79.

¹¹⁸ See Cameron Wake, *How One State Bridged the Cultural Divide on Climate Change to Prepare for a Stormier Future*, THE CONVERSATION (Feb. 6, 2018), <http://theconversation.com/how-one-state-bridged-the-cultural-divide-on-climate-change-to-prepare-for-a-stormier-future-88898> [<https://perma.cc/9A2S-LDDL>] (stating that even though climate change is a deeply politically divisive issue, bringing scientists and local legislators together can lead to the creation of legislation that takes into account climate change).

¹¹⁹ Timothy Green et al., *Beneath the surface of global change: impacts of climate change on groundwater*, 405 J. OF HYDROLOGY 532, 552 (2011).

to be innovative and proactive.¹²⁰ As our understanding of climate change grows and technology advances, this new-found knowledge should be utilized. It would be a mistake to ignore all the science that helps us understand climate change; integrating it into groundwater laws can help this resource be used more sustainably. While climate-proofing laws cannot reduce all the risks climate change poses, it will give water-rich states a chance to minimize risks and have contingency plans available to deal with groundwater shortages.¹²¹ It is better than having nothing.

Furthermore, scientists, engineers, policy advocates, industry-members, and law-makers should all be brought to the table during the climate-proofing process. Multiple viewpoints will be needed in order to effectively enact these new laws. A co-management scheme will be needed. According to Emma L. Tompkin's article, a co-management scheme is one where "resource stakeholders work together with a government agency to undertake some aspect of resource management."¹²² This system works best by fostering coordination between groups in which working alone as individuals with their own interests would not suffice to achieve a common goal.¹²³ In the case of managing groundwater, a co-management system will bring together the various users of groundwater to work out how best to allocate groundwater in a time of climate change. Having open channels of communication between the different users will ensure that their voices are heard and everyone's needs can be accommodated. This Section introduced climate-proofing laws and discussed the process by which these new laws should be developed. Now I turn to what specific elements climate-proofing laws should have in order to ensure water-rich states can protect their groundwater resources.

¹²⁰ *Id.*

¹²¹ See Pavel Kabat et al., *Climate proofing the Netherlands*, 438 NATURE 283, 283 (2005). The Netherlands is interesting and different from the United States in that the Dutch government has widely accepted climate change and willingly expended money and resources to climate-proof. *Id.* Kabat states that 60 percent of the Netherlands is below sea level and likely to experience harm from climate change in the near future, and that is why their government is so ready to address climate change. *Id.* However, many areas of the U.S. are already experiencing the consequences of sea level rise, and the U.S. still has difficulty accepting climate change and being able to mitigate its effects. *Id.* See, e.g., Stephen Nash, *Virginia's leaders have a serious case of the slows on climate change*, WASHINGTON POST (Sept. 22, 2017), https://www.washingtonpost.com/opinions/virginias-leaders-have-a-serious-case-of-the-slows-on-climate-change/2017/09/22/e644cb4c-9278-11e7-8754-d478688d23b4_story.html?utm_term=.18a7bb6dc6b9 [<https://perma.cc/2NK8-2UP7>].

¹²² Emma L. Tompkins & W. Neil Adgar, *Does Adaptive Management of Natural Resources Enhance Resilience to Climate Change?*, ECOLOGY & SOC'Y (Oct. 15, 2004), <https://www.ecologyandsociety.org/vol9/iss2/art10/manuscript.html> [<https://perma.cc/7Y78-CJNQ>].

¹²³ *Id.*

VI. WHAT CLIMATE-PROOFING LAW SHOULD LOOK LIKE

Future groundwater regulations need to be three things: adaptive, flexible, and focused on sustainability. Adaptation requires an adjustment to climate change: adjusting to the changes and learning to live with them.¹²⁴ In terms of groundwater, climate-proofing laws need to accept the possibility that changes in rainfall and snow-melt will not be able to sustain a viable rate of recharge.¹²⁵ These laws need to adapt now to a world in which groundwater will not be as abundant and attempt to set limits on groundwater withdrawal before the supply is overdrawn.¹²⁶ Climate-proofing groundwater laws in water-rich states will require a more rigorous permitting scheme, better monitoring of groundwater sources, and harsher penalties for those who violate the terms of their permits to ensure regulations are adaptable to climate change.¹²⁷

Adaptability also contains an element of long-term planning, as “the unpredictability of climate change effects and especially of those impacts’ interactions and feedback loops counsels governments and other decision makers to consider a wide range of possible futures when planning adaptation strategies.”¹²⁸ While it may seem like a daunting prospect to consider various scenarios and potential outcomes, the best thing states and local governments can do is to be prepared for whatever climate change brings their way. Some years may bring abundant rainfall, while other years may see increasing heat waves and severe droughts. Looking to long-term climate trend predictions can guide state and local actors in developing these climate-proofing laws; there will always be a need for water now and in the future. Groundwater is too important a resource to leave it unprotected whatever the scenario, so it should be protected now.

Climate-proofing groundwater laws should also be flexible, meaning that once they are created, they are not set in stone for a set period

¹²⁴ *Responding to Climate Change*, NASA, <https://climate.nasa.gov/solutions/adaptation-mitigation/> [<https://perma.cc/M74W-ZJEX>] (last updated Feb. 15, 2018).

¹²⁵ See THE GROUNDWATER FOUND., *supra* note 15.

¹²⁶ See Michelle Nijhuis, *Amid Drought, New California Law Will Limit Groundwater Pumping for First Time*, NAT’L GEOGRAPHIC (Sept. 18, 2014), <https://news.nationalgeographic.com/news/2014/09/140917-california-groundwater-law-drought-central-valley-environment-science/> [<https://perma.cc/P4NX-DAHJ>] (illustrating that California waited to regulate its groundwater pumping when it was struck by a terrible drought and the sentiment now may be “too little too late”).

¹²⁷ Since groundwater is withdrawn by municipalities, industries, and individuals alike, penalties should vary based on the type of user, permit, and amount of water withdrawn.

¹²⁸ Robin Kundis Craig, “Stationarity is Dead”—*Long Live Transformation: Five Principles for Climate Change Adaptation Law*, 34 HARV. ENVTL. L. REV. 9, 58–59 (2010).

of time, or unable to be amended without great effort.¹²⁹ Climate change's impacts on groundwater become more understood as scientists learn more; new solutions may become viable well after climate-proofing laws are enacted. In the events of groundwater shortages or droughts that affect both industry and people, no one should be bound by ironclad laws that do nothing to protect them.¹³⁰ Climate-proofing laws should encourage prompt action on behalf of the regulating bodies that manage groundwater to react to changing circumstances. This means new laws should give the state or local agency in charge of managing groundwater the leeway to adopt policies to maintain adequate levels of groundwater for all users. This may sound like a naive and obvious idea, however, there will always be industry pushback.¹³¹ The agriculture lobby, for example, is a powerful one, and one that will not like to see its access to the groundwater supply be limited.¹³²

Woven throughout the ideas of adaptability and flexibility is the notion of sustainability. Since the environmental movement began in the 1970s in the United States, sustainability has been a key word.¹³³ According to the United Nations, sustainability is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."¹³⁴ This concept of sustainability is a strong one in climate-proofing laws. The whole point of enacting climate-proofing laws is to maintain the amount of usable groundwater now and in the future. This is an especially important concept for water-rich states to keep in mind, as they are just that: water-rich. The effects of climate

¹²⁹ See *Flexible*, MERRIAM-WEBSTER DICTIONARY, <https://www.merriam-webster.com/dictionary/flexible> [<https://perma.cc/YJR7-DM5L>] (last updated Dec. 25, 2017) (illustrating that the definition of the word "flexible" includes having the capacity to adapt to changing situations).

¹³⁰ Of course, in the event of a severe water shortage we (hopefully) would not look to our legislatures for swift action. Executive orders or even regulations promulgated by the state agency in charge of groundwater resources may offer a quicker solution to the shortage.

¹³¹ See Abraham Lustgarten, *Drought-Plagued Western States Play Politics with Water*, SCIENTIFIC AMERICAN (July 20, 2015), <https://www.scientificamerican.com/article/drought-plagued-western-states-play-politics-with-water/#> [<https://perma.cc/PX75-8ZDL>] (illustrating that when California attempted to regulate groundwater withdrawals, the large agricultural lobby opposed the new legislation).

¹³² See *Wisconsin Agricultural Statistics*, *supra* note 2.

¹³³ See National Environmental Policy Act of 1969, 42 U.S.C. § 4321 (1969) (stating as its purpose: "To declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man.").

¹³⁴ *Sustainable Development*, THE UNITED NATIONS ECON. COMM'N FOR EUROPE, <https://www.unece.org/sustainable-development/sustainable-development/home.html> [<https://perma.cc/P3JR-KJ2Q>] (last visited Nov. 17, 2018).

change on groundwater resources in Michigan and Wisconsin may not be very apparent now, but they may be in the future. Water-rich states are not immune from the stresses of climate change and need to act.¹³⁵ Implementing sustainable groundwater practices now (rather than when it is too late) will help water-rich states adapt in the face of climate change. In events of low rainfall, extreme heat, or even drought, by having sustainable practices in place via climate-proofing laws, Michigan and Wisconsin will be able to withstand these extreme events.

In addition to these elements described above, climate-proofing laws should be based on hard and concrete facts provided and proven by science. This may seem like an obvious idea, but as the next Section discusses, the politicization of climate change will be a barrier.¹³⁶ There now seems to be a consensus that climate change is very likely caused by human activities.¹³⁷ According to Joseph Romm, “[s]cientists have such high confidence that human activity is the primary driver of recent warming because of several converging lines of evidence, all pointing in the same direction.”¹³⁸ This consensus somehow does not dispel the political animosity surrounding climate change.¹³⁹ But, if the science about climate change is trusted, it can help water-rich states develop plans to protect groundwater resources.¹⁴⁰

These new laws should also take into account how the Earth itself reacts to climate change and implement conservation measures to let the Earth adapt. Ecosystems have the capacity to adapt to changes to their natural systems.¹⁴¹ Climate-proofing laws should implement measures

¹³⁵ See Matheny, *supra* note 7.

¹³⁶ See Pappas, *infra* note 149.

¹³⁷ *Scientific Consensus: Earth's Climate is Warming*, NASA, <https://climate.nasa.gov/scientific-consensus/> [<https://perma.cc/Q7RB-CH7R>] (last updated Feb. 15, 2018).

¹³⁸ JOSEPH ROMM, *CLIMATE CHANGE: WHAT EVERYONE NEEDS TO KNOW* 9–10 (2016).

¹³⁹ See Robinson Meyer, *Trump Doesn't Mention Climate Change in His State of the Union*, *THE ATLANTIC* (Jan. 31, 2018), <https://www.theatlantic.com/science/archive/2018/01/trump-doesnt-mention-climate-change-in-his-state-of-the-union/551930/> [<https://perma.cc/R3AQ-5TSC>]. *But see* Wake, *supra* note 118.

¹⁴⁰ See D. Richard Cameron et al., *Ecosystem management and land conservation can substantially contribute to California's climate mitigation goals*, *PROC. OF THE NAT'L ACAD. OF SCI. OF THE U.S.* (Oct. 5, 2017), <http://www.pnas.org/content/pnas/early/2017/11/07/1707811114.full.pdf> [<https://perma.cc/2TV6-HLJY>] (illustrating that ecosystem and land conservation measures can have an effect on the reduction of greenhouse gases). While this article does not directly relate to groundwater, the fact that science has been used to develop a method to reduce greenhouse gases shows that climate change science can be used to protect groundwater resources.

¹⁴¹ See John W. Williams et al., *Extrinsic and intrinsic forcing of abrupt ecological change: case studies from the late Quaternary*, 99 *J. OF ECOLOGY* 664, 664–65 (2011).

that conserve and preserve open spaces to allow ecosystems to react to climate change in their own way.¹⁴² In terms of groundwater, climate-proofing laws should ensure that rainfall and snow-melt can percolate through the soil and rock and re-enter the aquifer to recharge the source.¹⁴³ Hard surfaces, such as roads and parking lots, should either be removed or be permeable.¹⁴⁴

Climate-proofing laws should also take into account changes in precipitation patterns and how these affect the rate of recharge, although there may be some challenges with this aspect.¹⁴⁵ The Earth has gone through many dramatic and radical changes throughout its history and has proven it has the ability to adapt to climate stresses.¹⁴⁶ Climate-proofing laws, thus, should not hinder the Earth's response to climate change. Climate-proofing laws require humans to think not only of how they can adapt to climate change, but also how the Earth itself adapts. But enacting these kinds of laws will be no easy task for water-rich states.

VII. CHALLENGES TO DEVELOPING CLIMATE-PROOFING LAWS

While enacting climate-proofing laws in water-rich states to protect groundwater is a worthy endeavor that should be undertaken in Michigan and Wisconsin, it will not be without its challenges. For one, there will be political resistance to developing and passing new legislation. The political process is already slow and frustrating,¹⁴⁷ and trying to implement a new scheme of laws will only be compounded by the fact that climate change is involved. The issue of climate change is highly divisive and a politically charged topic. Some believe in the science while

¹⁴² Craig, *supra* note 128, at 52.

¹⁴³ See Brian D. Smerdon, *A synopsis of climate change effects on groundwater recharge*, 555 J. OF HYDROLOGY 125 (2017).

¹⁴⁴ Janny Choy et al., *Recharge: Groundwater's Second Act*, STANFORD WOODS INST. FOR THE ENV'T, <http://waterinthewest.stanford.edu/groundwater/recharge/> [<https://perma.cc/87EH-SBG8>] (last updated Dec. 19, 2014). This article also states that there are artificial means to recharge an aquifer, such as recharge ponds and injection wells, meaning that these methods may also be considered in climate-proofing. *Id.*

¹⁴⁵ See Smerdon, *supra* note 143, at 126.

¹⁴⁶ See *Mass Extinctions*, NAT'L GEOGRAPHIC, <https://www.nationalgeographic.com/science/prehistoric-world/mass-extinction/> [<https://perma.cc/4VU4-R38K>] (last visited Nov. 17, 2018). There have been several mass extinctions on Earth, in which large numbers of plant and animal species died off due to volcanic eruptions, global warming, and anoxic events. *Id.* Yet, despite these mass extinctions and changes to the planet, the Earth has rebounded and allowed various plant and animal species to flourish. *Id.*

¹⁴⁷ See, e.g., David A. Moss, *Fixing What's Wrong with U.S. Politics*, HARV. BUS. REV. (2012), <https://hbr.org/2012/03/fixing-whats-wrong-with-us-politics> [<https://perma.cc/EZV5-Z6VD>].

others do not.¹⁴⁸ Part of developing these climate-proofing laws depends on trusting the science and evidence supporting climate change, yet climate change triggers Democrats and Republicans to entrench deeper into their beliefs.¹⁴⁹ This sentiment seems mind-boggling at times. Change is happening and people are being affected; regardless of the causes (or whether one believes in the causes), a solution is still needed. As stated aptly by Anthony Leiserowitz, the director of the Yale Project on Climate Change Communication, “in the end, the climate system doesn’t care whether you’re a Democrat or a Republican . . . we all will suffer together and in the end, we’ll all have to solve this together.”¹⁵⁰

There is no easy fix to the deep political entrenchment that this argument can suggest, or begin to even comprehend. However, the political pendulum is continually swinging. While the current administration has made it clear that environmental issues are not its top priority,¹⁵¹ the next administration may be more open to the concept of developing climate-proofing laws. Specifically, Michigan and Wisconsin may see a change in political climate that will enable them to enact climate-proofing laws.¹⁵²

Another challenge that will arise when water-rich states attempt to implement climate-proofing laws is trying to move from a property approach to a community-based approach. A property approach in the context of natural resources (which includes groundwater) focuses on individual liberty and the economic efficiency from the use of the resources.¹⁵³ This approach causes individuals to focus on their own circumstances, values, and demand for the resource.¹⁵⁴ A community-based approach, on the other hand, is “a community-led process, based on communities’ priorities, needs, knowledge and capacities, which should empower people to plan for and

¹⁴⁸ See Coral Davenport & Eric Lipton, *How G.O.P. Leaders Came to View Climate Change as Fake Science*, N.Y. TIMES (June 3, 2017), <https://www.nytimes.com/2017/06/03/us/politics/republican-leaders-climate-change.html> [<https://perma.cc/SA6W-XZFK>].

¹⁴⁹ See Stephanie Pappas, *How Climate Science Became Politicized*, LIVESCIENCE (Aug. 2, 2012), <https://www.livescience.com/22069-polarization-climate-science.html> [<https://perma.cc/2N5Z-Z3YT>].

¹⁵⁰ *Id.*

¹⁵¹ See Nadja Popovich et al., *76 Environmental Rules on the Way Out Under Trump*, N.Y. TIMES, <https://www.nytimes.com/interactive/2017/10/05/climate/trump-environment-rules-reversed.html> [<https://perma.cc/8AV9-S8GD>] (last updated Jan. 31, 2018).

¹⁵² In 2016, both Michigan and Wisconsin cast their electoral votes for Trump. The next election could be different. *2016 Presidential Election Results*, 270TOWIN, <https://www.270towin.com/maps/2016-actual-electoral-map> [<https://perma.cc/E9YL-U42F>] (last updated July 20, 2017).

¹⁵³ Jonathan H. Adler, *Taking Property Rights Seriously: The Case of Climate Change*, 26 SOC. PHIL. & POL’Y 296, 299 (2009).

¹⁵⁴ *Id.*

cope with the impacts of climate change.”¹⁵⁵ In the context of groundwater, where there are many different types of users utilizing a source adversely affected by climate change, there is a need to shift away from a highly autonomous property view to a more holistic community-based view. As mentioned above, we are all in this together: the agricultural industry and residents who rely on groundwater will both suffer from groundwater depletion and shortages. This will not be an easy shift, as it will require individual water users to stop focusing solely on themselves and their needs and consider the needs of other water users. As groundwater is the vital, yet unseen water source, it will be difficult for water users to grasp the need to make sacrifices for the greater good.¹⁵⁶ As already noted above, industry backlash is bound to be a response to implementing regulations about groundwater usage.¹⁵⁷ These challenges aside, water-rich states should engage in climate-proofing groundwater laws as soon as possible. Climate change is happening and affecting the groundwater supply. The time to act is now, before it is too late.

CONCLUSION

Water is one of our most precious natural resources. Every single one of the seven billion humans on Earth relies on it for survival. From agriculture to the generation of energy, water sustains us. Climate change is no longer a myth, and indeed, places all around the world are experiencing its effects.¹⁵⁸ Even places where water seems abundant are at risk. Water-rich states such as Wisconsin and Michigan need to take steps to protect their groundwater supply as climate change takes hold. Regulation of groundwater needs to be maintained, not relaxed. State and local agencies need to have the authority to regulate their groundwater and not do what Wisconsin did in 2017. Regulation is important in maintaining adequate levels of groundwater for all users to enjoy and prosper,

¹⁵⁵ Pascal Girot et al., *Integrating Community and Ecosystem-Based Approaches in Climate Change Adaptation Responses*, ECOSYSTEMS & LIVELIHOOD ADAPTATION NETWORK 7 (2012), http://cmsdata.iucn.org/downloads/a_eba_integratedapproach_15_04_12_0.pdf [<https://perma.cc/78DC-3QCK>].

¹⁵⁶ All hope is not lost. The United Nations Development Program has community-based adaption projects in countries such as, but not limited to, Bangladesh, Bolivia, Samoa and Vietnam. See *Community-Based Adaptation Project*, CLIMATE CHANGE ADAPTATION UNITED NATIONS DEV. PROG., <http://www.adaptation-undp.org/projects/spa-community-based-adaptation-project> [<https://perma.cc/AJN4-BT7U>] (last visited Nov. 17, 2018).

¹⁵⁷ See Lustgarten, *supra* note 131.

¹⁵⁸ See Katz, *supra* note 8.

especially in times of drought, heat waves, or other events that create uncertainty about the groundwater supply.

To ensure adequate groundwater supplies in a world with climate change, water-rich states should create climate-proofing laws that are adaptive, flexible, and seek to maintain the sustainable use of groundwater. These new laws will integrate what is known about climate change and its effects on groundwater, and ensure that groundwater is managed appropriately. Climate-proofing laws should not be seen as a burden, but rather as an opportunity to take proactive steps to solve a problem and use new and innovative solutions. Many challenges face the implementation of climate-proofing laws as water-rich states endeavor to enact them. Political unity and changing water users' mindsets are daunting hurdles to the enactment of these progressive laws. Regardless of whether one believes in climate change, groundwater resources should be protected and managed nonetheless. The threats to groundwater are real and alarming. Perhaps we do not understand the value of groundwater since we cannot see it, but if we underestimate the value of the groundwater now, we will only know its value when it is too late.¹⁵⁹

¹⁵⁹ This last sentiment is inspired by this quote: "When the Well's dry, we know the Worth of Water." BENJAMIN FRANKLIN, POOR RICHARD, 1746. AN ALMANACK FOR THE YEAR OF CHRIST 1746 7 (1745).

