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Land of 9,999 Lakes? White Bear Lake's Water Crisis and How Colorado Can Help

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INTRODUCTION

White Bear Lake, the third largest lake in Minnesota's Twin Cities Metro Area (Metro Area) is drying up.[1] Or, at least, its lake levels have seen a recent and precipitous decline, one that has generated intense controversy and litigation between the White Bear Lake Restoration Association and the White Bear Lake Homeowners Association (both hereinafter referred to as "Plaintiffs") and the Minnesota Department of Natural Resources (DNR).[2] Under the Minnesota Environmental Rights Act (MERA)[3] and the Public Trust Doctrine, the Plaintiffs alleged that authorizations for increased groundwater appropriation by the DNR have impaired White Bear Lake and its underlying aquifer, the Prairie du Chien-Jordan, and have harmed the local economy, the lake's natural beauty, and lakefront property values.[4] The Plaintiffs claimed that dramatic

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1. PERRY M. JONES ET AL., U.S. GEOLOGICAL SURVEY, GROUNDWATER AND SURFACE-WATER INTERACTIONS NEAR WHITE BEAR LAKE, MINNESOTA, THROUGH 2011 at 5 (2013) [hereinafter USGS 2013].

2. Complaint at 23–24, White Bear Lake Restoration Ass'n v. Minn. Dep't of Nat. Res., No. 62-CV-13-2414 (D. Minn. Apr. 10, 2013); *see also* John Brewer, *White Bear Lake Lawsuit Faults DNR for Water Woes*, PIONEER PRESS (Nov. 26, 2012, 11:01 PM), http://www.twincities.com/2012/11/26/white-bear-lake-lawsuit-faults-dnr-for-water-woes/.

3. MINN. STAT. §§ 116B.01–.13 (2016). MERA provides a civil right of action to citizens in Minnesota to enjoin activity that would pollute, impair, or destroy natural resources. MINN. STAT. § 116B.03.

4. Complaint, *supra* note 2, at 1–9.

increases to water appropriations from the Prairie du Chien-Jordan by neighboring municipalities over three decades resulted in direct and substantial impacts on White Bear Lake's depleted water levels.[5] Although the parties stipulated to a stay of litigation pending remedial action by the DNR,[6] as of this writing the matter returned to court and is now awaiting judgment.[7]

This lawsuit and the facts surrounding it would appear commonplace in the western United States, but not in a state so rich in water resources that it has been nicknamed the "Land of 10,000 Lakes."[8] White Bear Lake's depletion—as well as current plans for augmentation projects to restore the lake's levels that may cost the state more than $50 million—have revealed certain weaknesses in Minnesota's administrative regime for managing the state's groundwater resources.[9] Although Minnesota is not remotely at risk of running out of water, this Note will suggest that the White Bear Lake water crisis can be used by the state as a clarion call for reforms to its groundwater management. This Note will consider how groundwater management in Colorado may inform Minnesota at this critical juncture. To

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5. *Id.* at 14–15. DNR maintains that the wide range of water levels experienced by the lake over time indicate that low levels are a normal phenomenon. *See* BARB NARAMORE, MINN. DEP'T NAT. RES., FINDINGS OF FACT AND ORDER: WHITE BEAR LAKE PROTECTIVE ELEVATION WHITE BEAR LAKE, RAMSEY AND WASHINGTON COUNTIES 8–9 (Jason Moeckel & Julie Ekman eds., Dec. 21, 2016), http://files.dnr.state.mn.us/waters/gwmp/wbl_protective-elevation_fof.pdf.

6. Settlement Agreement, *White Bear Lake Restoration Ass'n*, No. 62-CV-13-2414 (D. Minn. Dec. 9, 2014).

7. Minn. Jud. Branch, Register of Actions: Case No. 62-CV-13-2414, http://pa.courts.state.mn.us/CaseDetail.aspx?CaseID=1616050696.

8. As many Minnesotans would clarify, Minnesota actually has closer to 12,000 lakes; 11,842 to be precise. *See Lakes, Rivers, and Wetlands Facts*, MINN. DEP'T NAT. RESOURCES http://www.dnr.state.mn.us/faq/mnfacts/water.html (last visited Apr. 3, 2017).

9. MINN. DEP'T OF NAT. RES., REPORT TO THE MINNESOTA STATE LEGISLATURE: CONCEPT COST REPORT FOR AUGMENTATION OF WHITE BEAR LAKE WITH SURFACE WATER 2 (2016), http://files.dnr.state.mn.us/waters/gwmp/augmentation-cost-report_012916.pdf; *see also* Matt Sepic, *Moving Water to White Bear Lake Could Cost as Much as $48 Million*, MPR NEWS (Apr. 14, 2017), https://www.mprnews.org/story/2017/04/14/moving-water-to-white-bear-lake-could-cost-48-million ("A proposal from the firm SEH Design Build would cost as much as $48 million. It involves constructing a five mile long, 24-inch wide pipe between White Bear and Lake Vadnais—which itself is connected to the Mississippi River via other lakes and existing pipes.").

conclude, this Note will recommend that more robust permitting, groundwater tracking and inventorying, and a centralized groundwater authority following Colorado's model can help to ensure that Minnesota's resources are secure for future generations.

Part I of this Note will serve as a brief primer on groundwater, examine the regulatory and administrative means by which Minnesota and Colorado manage their groundwater resources, and more thoroughly describe White Bear Lake's recent crisis. Part II will analyze how Minnesota's groundwater regime may have helped to create the White Bear Lake water crisis and how lessons from Colorado could have prevented it. Part III will explore ways for Minnesota to adopt aspects of Colorado's groundwater management in order to avoid over-appropriation and recommend alternatives to augmentation to replenish White Bear Lake.

I. BACKGROUND

First, a brief groundwater primer may be helpful before discussing White Bear Lake's current predicament and the regulatory structures designed to administer water resources in Minnesota and Colorado.[10] The ways in which groundwater moves through and is stored in geologic media is important to understanding the difficulties inherent in the effective management and regulation of this unseen yet vital resource, as well as discussing why the issues facing White Bear Lake may not be normal fluctuations.[11] Second, the ways in which Minnesota and Colorado administer their groundwater resources will be described. Finally, the factors that may have caused White Bear Lake's low water levels will be addressed, as well as the litigation and settlement agreement.

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10. *See generally* LARRY W. MAYS, GROUND AND SURFACE WATER HYDROLOGY (2012) (providing balanced coverage of ground and surface water hydrology). A detailed overview of the science of groundwater, geologic structures, and hydrogeologic systems, however, is well beyond the scope of this Note.

11. *But cf.* NARAMORE, *supra* note 5, at 8 (noting the wide range of water levels experienced by the lake over time and that "[l]arge swings in lake levels are not unique to White Bear Lake").

A. GROUNDWATER 101

Groundwater pools in water-bearing formations of the earth's crust which act as conduits of transmission and as reservoirs for the storage of water.[12] Water penetrates these formations by seeping in either through permeable media via the ground surface or through the beds of surface waters, and this infiltration creates vast underground reservoirs capable of storing enormous amounts of water.[13] Despite the high volume of storage, however, the flow rate into these reservoirs is often extremely slow and largely depends on the permeability of the media above, along with a number of other factors.[14]

Almost all groundwater starts as surface water and plays a crucial role in the hydrologic cycle.[15] The hydrologic cycle begins when water rises through evaporation from the earth's surface and falls as precipitation, which then moves over the ground as runoff. [16] This runoff eventually penetrates the soil and rests in the "saturated zone" of the water table[17] through a process called infiltration, or ends up in surface waters.[18] Through further movement, over periods of time dictated by the porosity of the geologic media, the water finally ends up in an aquifer and yields water to the surface through an area of discharge, such as a lake,

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12. MAYS, *supra* note 10, at 5.

13. *Id.* at 5–6; *see also* ENVTL. PROT. AGENCY, A GROUND-WATER PROTECTION STRATEGY FOR THE ENVIRONMENTAL PROTECTION AGENCY 10 (1984) ("[T]he volume of ground water to be found within one-half mile of the surface [of the United States] is estimated to be more than four times that of the Great Lakes.").

14. MAYS, *supra* note 10, at 6–7. Indeed, for human purposes, some aquifers replenish so slowly that they in effect do not replenish at all. *See, e.g.*, Brad Plummer, *Where the World's Running out of Water, in One Map*, WASH. POST (Aug. 10, 2012), https://www.washingtonpost.com/news/wonk/wp/2012/08/10/where-the-worlds-running-out-of-water-in-one-map/ (explaining that many aquifers are being drained faster than they can replenish).

15. MAYS, supra note 10, at 7.

16. *Id.* at 3–4.

17. "Water beneath the land surface occurs in two principal zones: the unsaturated zone and the saturated zone beneath it." *Groundwater Basics*, MINN. DEP'T NAT. RESOURCES, http://www.dnr.state.mn.us/groundwater/aquifers.html (last visited Apr. 2, 2017). "The top of the saturated zone is the water table. Below the water table, the water pressure is great enough to allow water to enter wells, thus permitting groundwater to be withdrawn for use." *Id.* "The depth to the water table . . . can range from zero when it is at land surface . . . to hundreds or even thousands of feet deep." *Id.*

18. MAYS, *supra* note 10, at 7.

spring, well, or river.[19] Although there are a number of geologic structures as well as hydrologic and human-influenced systems, for the purposes of this Note the most important structures are aquifers and their interactions with surface water bodies. Aquifers and their confining beds comprise a complex interconnected underground system in which water is moved, stored, and filtered or cleansed of contaminants, and they act as enormous reservoirs and as gates for the groundwater system; as surface water comes into contact with an aquifer it either continues moving through capillary action, gravity, or molecular attraction, or it ceases movement and is stored. [20]

Groundwater is extracted for a variety of purposes in the United States, but one of the most common uses is for potable drinking water. [21] The United States Geological Survey (USGS) reported that, in 2010, "[m]ore than 98 percent of the water withdrawals for self-supplied domestic use[22] [in the United States] were from groundwater" while "[a]bout 63 percent of public-supply withdrawals were from surface water sources . . . for domestic, industrial, commercial, and other purposes."[23] The USGS study reported that in Minnesota approximately nineteen percent of total daily withdrawals were from groundwater.[24] But that number in isolation understates the importance of groundwater in Minnesota, where it has steadily overtaken surface water as the primary means of supply

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19. *Id.* The process by which surface water enters the groundwater system is known as "recharge." There are several classifications for geologic media and extensive studies on their porosity. This Note, however, will be focused on dolostone (rock that consists of dolomite), sandstone, and limestone, all of which exhibit relatively low porosity but otherwise have good aquifer properties. *See, e.g.*, *id.* at 29, tbl.2.2.1.

20. MINN. DEP'T OF HEALTH, ENVTL. HEALTH DIV., WELL OWNER'S HANDBOOK: A CONSUMER'S GUIDE TO WATER WELLS IN MINNESOTA 4–5 (4th ed. 2014), http://www.health.state.mn.us/divs/eh/wells/construction/handbook.pdf

21. NANCY L. BARBER, U.S. GEOLOGICAL SURVEY, SUMMARY OF ESTIMATED WATER USE IN THE UNITED STATES IN 2010 1 (2014) [hereinafter USGS 2010 SUMMARY]. Groundwater supply for other categories includes: irrigation (43%); livestock (60%); aquaculture (19%); self-supplied industrial (18%); mining (73%). *Id.* at 1–2.

22. *Id.* Meaning those residences not connected to public-supply systems.

23. *Id.*

24. MOLLY A. MAUPIN ET AL., U.S. GEOLOGICAL SURVEY, ESTIMATED USE OF WATER IN THE UNITED STATES IN 2010, at 9 (2014), https://pubs.usgs.gov/circ/1405/pdf/circ1405.pdf. Groundwater comprised 736 of a total 3,830 million gallons per day used in Minnesota.

for municipal use over the past sixty years.[25] The Minnesota Pollution Control Agency (MPCA) has estimated that "[g]roundwater supplies drinking water to about 75 percent of all Minnesotans and almost all of the water used to irrigate the state's crops."[26] A recent study found that "[n]early two-thirds of total groundwater use [in the Metro Area] was for water-supply systems (64%), including municipal and other public and private potable water supplies"[27] and "[t]he annual average of the reported groundwater use in the [Metro Area] over the five-year period 2008 through 2012 was 29.0 billion gallons."[28]

B. GROUNDWATER IN MINNESOTA AND COLORADO

Minnesota, like most of the eastern United States, utilizes a "riparian" system to regulate its water resources.[29] Under a riparian system, "the right to use water is tied to the ownership

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25. METRO. COUNCIL, MINN. TWIN CITIES METROPOLITAN AREA, MINNESOTA GROUNDWATER DIGEST (2013) [hereinafter GROUNDWATER DIGEST], https://metrocouncil.org/Wastewater-Water/Publications-And-Resources/Groundwater-Digest,-Twin-Cities-Metropolitan-Area,.aspx (showing a shift from approximately 85% surface water usage in the Metro Area between 1941 and 1950 to a recent 25% value); *see also* MINN. ENVTL. QUALITY BD., BEYOND THE STATUS QUO: 2015 EQB WATER POLICY REPORT 6 (2015) [hereinafter MN WATER POLICY REPORT], https://www.eqb.state.mn.us/sites/default/files/documents/WaterReport_091515_v2_0.pdf (reporting that "groundwater use [in Minnesota] has increased 35% over the past 25 years" and that "[t]his trend may not be sustainable"; further indicating that in 2011, 53% of groundwater in Minnesota was used for public water supply systems, approximately 137.5 billion gallons).

26. SHARON KROENING, MINN. POLLUTION CONTROL AGENCY, SUMMARY: CONDITION OF MINNESOTA'S GROUNDWATER (2013).

27. MINN. DEP'T OF NAT. RES., MARCH 28, 2014 N&E METRO GWMA UPDATE (2014), http://files.dnr.state.mn.us/waters/gwmp/area-ne/avg-groundwater-use.pdf.

28. *Id.*; *see also* MN WATER POLICY REPORT, *supra* note 25, at 7 (graphing groundwater and surface water usage in Minnesota between 1950 and 2014).

29. MINN. DEP'T OF NAT. RES., WATER LAWS IN MINNESOTA: QUESTIONS AND ANSWERS ABOUT MINNESOTA WATER LAWS 1 (2010), http://files.dnr.state.mn.us/publications/waters/water_law_questions_and_answers.pdf. In fact, Minnesota's water management may more accurately be characterized as "regulated riparianism," a version of riparianism that modifies traditional common law rules with a permit system. *See, e.g.*, CHRISTINE A. KLEIN, FEDERICO CHEEVER & BRET C. BIRDSONG, NATURAL RESOURCES LAW: A PLACE-BASED BOOK OF PROBLEMS AND CASES 893–902 (3d ed. 2013) (detailing regulated riparianism).

of riparian land, property that abuts a natural watercourse."[30] Riparian landowners are "entitled to make reasonable use of the waters that abut their property, subject to the reasonable use of other riparians."[31] The riparian doctrine tends to be concerned with managing surface water use, and in Minnesota the principles of riparianism do not necessarily apply to groundwater appropriation, which is regulated in terms of sustainable use.[32]

In stark contrast Colorado has, since before statehood, utilized a system of water allocation known as the doctrine of "prior appropriation" in order to strictly monitor sparse and heavily contested water resources and ensure that the property rights of senior appropriators are always protected.[33] In fact, the doctrine is written into the state constitution and has often been referred to as the "Colorado Doctrine."[34] Under Colorado's constitutional prior appropriation, "the first appropriator of water has a senior right to that [volume of] water, and that right must be satisfied before any subsequent rights junior to that

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30. KLEIN ET AL., *supra* note 29, at 866 (emphasis omitted); *see also* WATER LAWS IN MINNESOTA, *supra* note 29.

31. KLEIN ET AL., *supra* note 29, at 867.

32. MINN. STAT. § 103G.287, subdiv. 5 (2015) ("The commissioner may issue water-use permits for appropriation from groundwater only if the commissioner determines that the groundwater use is sustainable to supply the needs of future generations and the proposed use will not harm ecosystems, degrade water, or reduce water levels beyond the reach of public water supply and private domestic wells . . . .").

33. Early histories of the Union Colony in the territory that would become Greeley, Colorado detail some of the heated exchanges between colonists, some very nearly coming to violence over first possession of water rights: "Then the meeting got ugly. Someone stood up and yelled, 'Every man to his tent! To his rifle and cartridges!'" Thomas V. Cech, *Integration of Surface Water and Groundwater Rights: Colorado's Experience*, *in* WATER POLICY AND PLANNING IN A VARIABLE AND CHANGING CLIMATE 347, 350 (Kathleen A. Miller et al. eds., 2016) (quoting DAVID BOYD, A HISTORY: GREELEY AND THE UNION COLONY OF COLORADO 120 (1890)).

34. COLO. CONST. art. XVI, § 6 ("The right to divert the unappropriated waters of any natural stream to beneficial uses shall never be denied. Priority of appropriation shall give the better right as between those using the water for the same purpose."); *see generally* DAVID SCHORR, THE COLORADO DOCTRINE: WATER RIGHTS, CORPORATIONS, AND DISTRIBUTIVE JUSTICE ON THE AMERICAN FRONTIER (2012) (describing the history of Colorado's prior appropriation doctrine).

right can receive water."[35] Although prior appropriation has led to complex issues of ownership and allocation and no dearth of lawsuits, it has also resulted in methodical water management that all but tracks every drop of water.[36] Four recognized categories of groundwater in Colorado—tributary, designated, non-tributary, and Denver Basin—inform Colorado's application of its prior appropriation doctrine to groundwater.[37]

1. Minnesota's Groundwater Scheme

Minnesota is split into six groundwater provinces with different hydrogeologic characteristics.[38] The Metro Province is comprised of primarily sand and sandy and clayey glacial drift over sandstone, limestone, and dolostone aquifers, materials which provide good aquifer properties.[39] The province covers the entirety of a number of densely populated counties, including

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35. COLO. DEP'T OF NAT. RES., DIV. OF WATER RES., GUIDE TO COLORADO WELL PERMITS, WATER RIGHTS, AND WATER ADMINISTRATION 1 (2012) [hereinafter GUIDE TO COLORADO WELL PERMITS]; *see also* COLO. CONST. art. XVI, § 6; Cech, *supra* note 33, at 356 (describing "draconian" well-pumping curtailments during the 2006 drought which ensured senior rights at the expense of junior rights). Colorado's constitution presents an absolute "first in time, first in right" mandate. *Compare* COLO. CONST. art. XVI, § 6 ("Priority of appropriation shall give the better right as between those using water for the same purpose."), *with* IDAHO CONST. art. XV, § 5 ("[S]uch priority of right shall be subject to such reasonable limitations as to the quantity of water used and times of use as the legislature . . . may by law prescribe.").

36. *See, e.g.*, Kansas v. Colorado, 514 U.S. 673, 684 (1995) (holding that Kansas failed to adduce sufficient evidence to prove that Colorado's winter storage program materially depleted usable flows of the Arkansas River, thus violating the Arkansas River Compact); *see also* People v. Emmert, 597 P.2d 1025, 1026, 1028 (Colo. 1979) (en banc) (holding that rafters committed third-degree criminal trespass by floating over private riverbed property, and that the Colorado constitution only protects public rights to appropriation, not recreation).

37. Colo. Ground Water Comm'n v. North Kiowa-Bijou Groundwater Mgmt. Dist., 77 P.3d 62, 69–74 (Colo. 2003) (describing Colorado's groundwater classifications); *see also* discussion *infra* Section II.B.

38. *Groundwater Provinces*, MINN. DEP'T NAT. RESOURCES [hereinafter *Groundwater Provinces*], http://dnr.state.mn.us/groundwater/provinces/index.html (last visited Nov. 30, 2016). However—at least according to the DNR's website—the data for these provinces is not particularly robust and may be out of date. *See* Evan Drivas, *Selected Aquifer Parameters for Ground Water Provinces*, MINN. DEP'T NAT. RESOURCES (2004), http://files.dnr.state.mn.us/natural_resources/water/groundwater/provinces/prov_geohydro_parameters.pdf.

39. *Groundwater Provinces*, *supra* note 38.

Ramsey, Washington, Anoka, and almost all of Hennepin County.[40] Three primary aquifers underlying the Twin Cities and the surrounding areas are used for municipal drinking water.[41] The most heavily pumped and abundant of these three aquifers, and the one this Note is most concerned with, is the Prairie du Chien-Jordan aquifer which lies under Washington County and Ramsey County.[42] It has a pumping capacity that averages 1,270 gallons per minute, and is connected to and replenishes a number of protected surface waters, including White Bear Lake.[43]

To administer the state's groundwater resources, Minnesota has devised a complex administrative structure.[44] State law splits groundwater management between several agencies which each handle a portion of groundwater monitoring and "[i]t takes the concerted effort of all these agencies, along with local and federal partners, to build a comprehensive picture of the status of the state's groundwater resources."[45] The agencies with authority to manage Minnesota's groundwater include the Board of Water and Soil Resources (BWSR),[46] the MPCA, the Minnesota Department of Agriculture (MDA), the Minnesota Department of Health (MDH), and the Waters Division of the DNR.[47] These agencies play different roles—from pesticide use to well boring—and partner with other actors from the local level

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40. *Id.*

41. GROUNDWATER DIGEST, *supra* note 25. These include the Prairie Du Chien-Jordan, Tunnel City-Wonewoc, and Mt. Simon-Hinckley. *Id.*

42. Two of the five largest counties in the state. *See, e.g.*, *Our Estimates*, MINN. STATE DEMOGRAPHIC CTR. DEP'T OF ADMIN. (2016), https://mn.gov/admin/demography/data-by-topic/population-data/our-estimates/ (reporting that "[i]n 2015, the five largest counties by population were Hennepin (1,221,703 residents), Ramsey (533,677), Dakota (414,490), Anoka (344,838), and Washington (251,015)").

43. GROUNDWATER DIGEST, *supra* note 25.

44. MINN. STAT. § 103A–I (2016).

45. MINN. POLLUTION CONTROL AGENCY & MINN. DEP'T OF AGRIC., APPENDIX B: 2015 GROUNDWATER MONITORING STATUS REPORT 1 (2015) [hereinafter GROUNDWATER MONITORING STATUS REPORT], https://www.eqb.state.mn.us/sites/default/files/documents/App%20B%202015%20Groundwater%20Monitoring%20Status%20Report.pdf; *see also* MINN. STAT. § 103A.204 (2016) (listing the agencies responsible for Minnesota's groundwater resources).

46. MINN. STAT. § 103B.255, subdiv. 8–9 (2016) (giving BWSR final review authority over groundwater management plans).

47. GROUNDWATER MONITORING STATUS REPORT, *supra* note 45.

to cities, counties, and statewide boards and commissions to manage water resources.[48] Among these actors are the Environmental Quality Board (EQB), Metropolitan Council, and Groundwater Management Areas (GWMA).[49]

For the purposes of groundwater quantity and appropriation, much of the responsibility lies with the DNR, which conducts high-volume water appropriation permitting, monitors groundwater levels and hydrogeologic sensitivity, and conducts environmental review of high-volume water uses and projects impacting public waters.[50] The MDH's Well Management Program works with the DNR to ensure that new wells and borings are constructed properly and unused wells are safely sealed.[51] DNR well boring permits are only required for wells that will withdraw more than 10,000 gallons of water per day, or 1 million gallons per year, and exemptions for water appropriation permits include, *inter alia*, domestic uses serving less than 25 persons for general residential purposes and reuse of water already authorized by a permit (*e.g.* water purchased from a municipal water system).[52] Municipal high-volume wells have increased their appropriations significantly since the 1980s and, because the majority of Minnesota relies on groundwater for everyday use, steady increases to population have created

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48. *Id.*

49. The Environmental Quality Board is made up of nine agency heads and five citizen members and is intended to provide leadership and coordination across agencies for a variety of environmental issues. Notably, the Board's most recent "Environment and Energy Report Card" does not mention White Bear Lake, but it does discuss the importance of groundwater. ENVTL. QUALITY BD., 2017 ENVIRONMENT AND ENERGY REPORT CARD (2017), https://www.eqb.state.mn.us/2017-environment-and-energy-report-card; *see About the Environmental Quality Board*, MINN. ENVTL. QUALITY BD., https://www.eqb.state.mn.us/content/about-environmental-quality-board (last visited Jan. 6, 2017); *see also Groundwater Management Areas (GWMAs)*, MINN. DEP'T NAT. RESOURCES [hereinafter *Groundwater Management Areas*], http://webcache.googleusercontent.com/search?q=cache:http://www.dnr.state.mn.us/gwmp/areas.html (last visited Apr. 15, 2017).

50. GROUNDWATER MONITORING STATUS REPORT, *supra* note 45, at 7–8.

51. *Wells and Borings*, MINN. DEP'T HEALTH, http://www.health.state.mn.us/divs/eh/wells/index.html (last visited Jan. 26, 2017).

52. *See* MINN. STAT. § 103G.287, subdiv. 5 (2016); *see also Water Use Permits*, MINN. DEP'T NAT. RESOURCES, http://www.dnr.state.mn.us/waters/watermgmt_section/appropriations/permits.html (last visited Apr. 3, 2017).

potentially unsustainable strains on the state's groundwater resources.[53]

2. Colorado's Groundwater Management Scheme

Until the late 1960s, water appropriation from wells did not have to follow the same strict system of prior appropriation that applied to surface water rights in Colorado.[54] Severe droughts and better drilling and pumping technology led many farmers to drill wells into tributary aquifers, which in turn reduced the flow of the tributary systems and harmed surface water rights.[55] To address this proliferation of wells and the water crisis facing the state, the Colorado General Assembly created a Groundwater Commission in 1957 to establish critical districts that "have approached, reached or exceeded the normal annual rate of replenishment."[56] However, because landowners could opt out of the critical districts, and because the State Engineer had no authority to regulate groundwater outside of critical districts, well construction continued unabated.[57] This led the General Assembly to broaden the authority of the Groundwater Commission through the Groundwater Management Act of 1965 (Groundwater Act).[58] The Groundwater Act directed the Groundwater Commission to create mandatory "designated basins" and enforce a modified system of prior appropriation within those critical areas.[59] The Groundwater Act also required

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53. MN WATER POLICY REPORT, *supra* note 25, at 6 ("Minnesota is not yet in crisis, but we see warning signs in some areas where groundwater supply is at risk of depletion. Overuse of groundwater can also harm surface waters that depend on it, such as trout streams and wetlands.").

54. *See, e.g.*, Gregory J. Hobbs, Jr., *Protecting Prior Appropriation Water Rights through Integrating Tributary Groundwater: Colorado's Experience*, 47 IDAHO L. REV. 5, 12 (2010) (providing a fairly succinct history of Colorado's groundwater management scheme).

55. *Id.*

56. *Id.* (quoting 1957 Colo. Sess. Laws 863–73).

57. *Id.* Many appropriators likewise ignored the fact that a well permit did not confer a water right and still required adjudication and continued pumping. *Id.*

58. *Id.*

59. *Id.* The act, like the 1957 one before it, provided that construction permits from the State Engineer "shall not have the effect of granting nor conferring a ground water right upon the user." *Id.* (quoting 1965 Colo. Sess. Laws 1246–68).

that all new wells throughout the state obtain a construction permit from the State Engineer.[60]

Colorado also passed the Water Rights Determination and Administration Act of 1969 (Water Rights Act) in order to more comprehensively enforce surface and groundwater rights in response to continued tension between ground and surface water users.[61] The Water Rights Act brought tributary irrigation wells under the same system of prior appropriation as surface waters and "created seven water divisions based upon the drainage patterns of various rivers in Colorado."[62] Each water division is staffed with a water court judge,[63] an engineer appointed by the State Engineer, a court referee appointed by the water judge, and a clerk assigned by the district court.[64] Water judges approve all augmentation plans, which are designed to protect existing water rights by replacing water that is used by junior rights; these are typically required in areas that suffer from water shortages during all or part of the year.[65]

One of the defining aspects of Colorado's groundwater management is its classification system for different sources of groundwater, carefully organized by region, use, and even by

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60. *Id*

61. Cech, *supra* note 33, at 351–52. Cech describes that surface water irrigators became irritated with groundwater well-users, because although those who held surface water rights had to wait their turn due to prior appropriation, well-users "could simply flip a switch to pump water from beneath their land." *Id.* at 352. Cech also notes increasing awareness of the relationship between surface and groundwater "[a]s early as 1954 [led] Colorado state senator Ranger Rogers [to] accuse[] well pumpers of 'robbing' surface water from the South Platte River." *Id.* (internal citation omitted).

62. *Water Courts*, COLO. JUD. BRANCH, https://www.courts.state.co.us /Courts/Water/Index.cfm (last visited Mar. 27, 2017).

63. A water court judge is a district court judge appointed by the Colorado Supreme Court who has jurisdiction over litigation regarding water rights, the use and administration of water within the district, and other matters within the division's jurisdiction. *Id.*

64. *Id.*

65. *See* GUIDE TO COLORADO WELL PERMITS, *supra* note 35, at 12, 16 (defining what an augmentation plan is and explaining the difficult process of obtaining individual water rights in Colorado). Augmentation in Colorado can take different forms and need not necessarily be a system of pipes and pumps like the project proposed for White Bear Lake. *Id.* The projects are generally used to replace water used by a junior water right in order to preserve senior rights during a "call" for water in times of shortage. *Id.*

aquifer.[66] First, tributary waters are hydraulically connected to the surface waters of a stream and administered by the State Engineer;[67] tributary water rights are determined by state water courts.[68] Because tributary groundwater can reduce available surface water and prevent appropriators from diverting their allotted volumes in order of priority, it is treated as if it were surface water, subject to prior appropriation under article XVI, sections 5 and 6 of the Colorado Constitution.[69] Second, nontributary groundwater is allocated based on overlying land ownership.[70] These rights or permits are determined by the amount of recoverable water that lies beneath the owner's land rather than by prior appropriation, and average withdrawals per year cannot exceed one percent of the total underlying aquifer's capacity.[71] Any landowner seeking to obtain a usage right for nontributary water must seek either a decree from a water court for a right to withdraw a quantity of water, or apply to the State Engineer for a well permit.[72]

Third, designated groundwater is located within a specially designated groundwater basin outside of the Denver Basin aquifers.[73] These waters are under the sole adjudicatory and

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66. RALF TOPPER ET AL., COLORADO GEOLOGICAL SURVEY, GROUND WATER ATLAS OF COLORADO 85–86 (2003).

67. COLO. REV. STAT. § 37-92-102(1)(a) (2016); *see* GUIDE TO COLORADO WELL PERMITS, *supra* note 35, at 18–19.

68. *See, e.g.*, Simpson v. Bijou Irrigation Co., 69 P.3d 50, 60 (Colo. 2003).

69. COLO. CONST. art. XVI, §§ 5–6; *see also* COLO. REV. STAT. § 37-92-102 (2016). "All ground water in Colorado, but not Denver Basin groundwater . . . is presumed to be tributary absent clear and convincing evidence to the contrary." Colo. Ground Water Comm'n v. North Kiowa-Bijou Groundwater Mgmt. Dist., 77 P.3d 62, 70 (Colo. 2003).

70. COLO. REV. STAT. § 37-90-103(10.5) (2016) (defining nontributary groundwater as "ground water, located outside the boundaries of any designated groundwater basins . . . the withdrawal of which will not, within one hundred years of continuous withdrawal, deplete the flow of a natural stream . . . at an annual rate greater than one-tenth of one percent of the annual rate of withdrawal"); *see also North Kiowa-Bijou*, 77 P.3d at 70 (describing distinctions between Colorado's groundwater classifications).

71. COLO. REV. STAT. § 37-90-137(4) (2016).

72. § 37-90-137(4), (6).

73. § 37-90-103(6)(a). Groundwater basins are established by the Groundwater Commission and are located in the eastern portion of the state. There are currently eight designated basins with thirteen groundwater management districts within the basins. *See* GUIDE TO COLORADO WELL PERMITS, *supra* note 35, at 6.

regulatory authority of the Groundwater Commission and are allocated according to a modified system of prior appropriation.[74] The Groundwater Commission has the sole authority to grant or change water rights that involve designated groundwater; water courts elsewhere in the state do not have any permitting authority within designated basins, but can provide recommendations to the Commission.[75] Finally, Denver Basin water underlies a large region that stretches from Greeley in the north to Colorado Springs in the south, and from the front-range hogback in the west to Limon in the east.[76] The four underlying, stratified aquifers are collectively known as the Denver Basin, though each aquifer is geologically isolated from the other three.[77] The depth to which a landowner drills determines which of the aquifers provides the water.[78]

Although not covered comprehensively here, these aspects of Colorado's regime for managing groundwater present an organized system focused on managing scarcity and protecting rights. To be sure, all water rights in Colorado are highly litigated, and water courts (as well as the state's Supreme Court) have no shortage of matters to attend to.[79] In spite of this,

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74. § 37-90-102(1). For a more comprehensive history of the enabling Ground Water Management Act, see William Fronczak, *Designated Ground Water: Colorado's Unique Way of Administering Its Underground Resources*, 7 U. DENV. WATER L. REV. 111 (2003).

75. *See* GUIDE TO COLORADO WELL PERMITS, *supra* note 35.

76. TOPPER ET AL., *supra* note 66.

77. *Id.* In order of depth from shallowest to deepest: the Dawson, Denver, Arapahoe, and Laramie-Fox Hills aquifers.

78. *Id.*

79. *See, e.g.*, Empire Lodge Homeowners' Ass'n v. Moyer, 39 P.3d 1139, 1159–60 (Colo. 2001) (en banc) (ruling that all members of augmentation plans must obtain a water court-approved decree to operate). This suit was in response to a record-breaking drought, which caused senior water right holders to challenge the legal authority of the State Engineer to approve annual augmentation plans. *Id.*; *see also, e.g.*, Kobobel v. State Dep't of Nat. Res., 249 P.3d 1127, 1132, 1139 (Colo. 2011) (en banc) (ruling that water courts have exclusive jurisdiction over well owners' claims and that State Engineer curtailment orders do not constitute a taking as well owners' rights to pump water had always been subject to senior rights holders); High Plains A&M v. SE Colo. Water Conservancy Dist., 120 P.3d 710, 718 (Colo. 2005) (en banc) (holding that (1) all waters within Colorado belong to the public; (2) use rights to water may be obtained by public entities and private persons in accordance with applicable laws; and (3) use rights to waters of a natural stream, including tributary groundwater, become property rights when appropriators put the water to actual beneficial use).

however, Colorado has managed a sparse resource in a growing state with admirable precision, and it has served as a model for other states.[80]

C. WHITE BEAR LAKE: FLUCTUATING LAKE LEVELS AND LITIGATION

White Bear Lake lies in the "gently rolling, glaciated landscape" between Ramsey and Washington counties, "in the northeastern part of the [Metro Area] . . . [, and] is the third largest lake in the [Metro Area]."[81] Located along the lakeshore are the cities of White Bear Lake, Birchwood, Mahtomedi, and Dellwood, along with the township of White Bear Lake.[82] There are a number of "residential and commercial properties . . . and small municipal and private beaches [along the lake shoreline, and] . . . [t]he lake is used extensively for recreation, including fishing, boating, and swimming."[83] While "White Bear Lake is one of the largest and deepest lakes in the northeastern part of the Metro Area, [] its watershed is relatively small . . . compared to most lakes in Minnesota"—a characteristic that has been shown to contribute to "large water-level fluctuations."[84] Further, White Bear Lake's status as a "closed-basin lake with no major natural surface-water inlets or outlets" exacerbates water-level fluctuations caused by its small watershed to lake

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80. *See, e.g.*, Joe Murphy, *Chart: Colorado is the Second-Fastest Growing State in the U.S.*, DENV. POST (July 7, 2016, 4:23 PM), http://www.denverpost.com/2016/07/07/colorado-second-population-growth-2015/; *see also, e.g.*, 2014 Cal. Stat. 10720–10720.9 (California Sustainable Groundwater Management Act).

81. USGS 2013, *supra* note 1, at 5.

82. *Id.* White Bear Lake alone has a population of around 23,769, according to the 2010 census. U.S. CENSUS BUREAU, 2010 CENSUS (2010), http://www.census.gov/2010census/.

83. USGS 2013, *supra* note 1.

84. *Id.* at 7. The lake covers approximately 2400 acres, while its watershed covers only around 4700 acres (a ratio of about 2:1 watershed to lake). *Id.* The survey also stated that "[l]arge water-level fluctuations take place in White Bear Lake because of the relatively small watershed for the lake and its status as a closed-basin lake." *Id.* (citing MINN. DEP'T OF NAT. RES., LAKE-GROUND WATER INTERACTION STUDY AT WHITE BEAR LAKE, MINNESOTA: REPORT TO THE LEGISLATIVE COMMITTEE ON MINNESOTA RESOURCES 11 (1998) [hereinafter DNR REPORT 1998], http://files.dnr.state.mn.us/publications/waters/wbl_98.pdf). The survey further states that lakes in Minnesota with ratios less than 5 typically have ranges of water-level fluctuations between 5 and 10 feet. *Id.*

ratio.[85] "At water levels below [924.76 feet above NAVD 88], water leaves White Bear Lake as discharge to surrounding aquifers or evaporation from the lake surface."[86]

White Bear Lake's water level has historically fluctuated a great deal and been augmented by pumping water through four wells drawing water from aquifers beneath the Prairie du Chien-Jordan.[87] Over the years augmentation for the lake has typically coincided with periods of drought or low precipitation and, although augmentation has increased lake levels in the short term, the long-term effects of augmentation have been described as "having a half-life of one year."[88] For decades it seemed that precipitation was primarily what maintained lake levels.[89] However, by 2003, precipitation amounts that historically had been adequate became insufficient to sustain White Bear Lake.[90]

Five years before this, in a 1998 report, the DNR not only recognized that groundwater and White Bear Lake's water levels were linked, but also suggested that augmentation at White Bear Lake may have even been increasing water loss from the lake to ground water by as much as eighty-six percent.[91] Old

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85. USGS 2013*, supra* note 1, at 7.

86. *Id.* "NAVD 88" is an abbreviation of "North American Vertical Datum of 1988," which is used as a consistent "zero elevation" in the National Spatial Reference System for determining heights relative to it and is the official vertical datum for the continental United States and Alaska. *Vertical Datums*, NAT'L OCEANIC & ATMOSPHERIC ADMIN., https://www.ngs.noaa.gov/datums/vertical/ (last visited Apr. 12, 2017).

87. USGS 2013*, supra* note 1, at 4, fig.2C (graphing water level elevations for White Bear Lake between 1978 and 2011); *see also* DNR REPORT 1998, *supra* note 84, at 20; *id.* at 7, fig.1 (showing recorded water levels for White Bear Lake between 1901 and the 1990s). Between the early 1900s and 1977, water was pumped into the lake from other sources through augmentation during low periods, and there are detailed records of augmentation going back as far as 1924. *See, e.g.*, NARAMORE, *supra* note 5, at 2 (reporting that between 1942 and 2016 White Bear Lake's water levels have fluctuated within a 7.86 foot range). White Bear Lake's historic low was 918.84 ft. in January 2013. *Id.* at 2. Relatively high water levels were recorded in 1999 and 2003. *See id.*

88. DNR REPORT 1998, *supra* note 84, at 82.

89. *See id.* at 18 (figure showing White Bear Lake's water elevation and annual precipitation).

90. *See id*. at 82.

91. *Id.* at 10. DNR noted that augmentation water may have been lost due to pumping-induced increased loss rate to aquifers beneath the Prairie du Chien-Jordan, in addition to the remaining water dissipating relatively quickly. *Id.* at 82.

assumptions about the lake's levels were not holding up in the face of new evidence. Nevertheless, the DNR allowed high-volume groundwater appropriations to continue unabated,[92] despite a number of unrelated—but persuasive—reports that linked lake level fluctuations with local groundwater systems in the northeastern Metro Area,[93] the DNR's own report recognizing links between groundwater and White Bear Lake's levels,[94] and studies across multiple decades which documented fluctuations in groundwater levels and flow in the Prairie du Chien-Jordan.[95]

The populations in the municipalities on and near White Bear Lake likewise increased by an average of thirty-nine percent between 2000 and 2010.[96] To keep pace with population

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92. Complaint, *supra* note 2, at 18 ("For example, since 1980, annual groundwater withdrawals by high-capacity wells near White Bear Lake more than doubled to a peak of nearly 6 billion gallons of water appropriated in 2008.").

93. *See, e.g.*, USGS 2013, *supra* note 1, at 62–63; *see also id.* at 13 (citing R.G. BROWN, U.S. GEOLOGICAL SURVEY, HYDROLOGIC FACTORS AFFECTING LAKE-LEVEL FLUCTUATIONS IN BIG MARINE LAKE, WASHINGTON COUNTY, MINNESOTA: U.S. GEOLOGICAL SURVEY WATER-RESOURCES INVESTIGATIONS REPORT 85-4176 at 23 (1985) (indicating that lake level fluctuations in the closed-basin lake were controlled primarily by groundwater discharge to and seepage from the lake)); JAMES F. RUHL, QUALITY OF GROUND WATER AROUND VADNAIS LAKE AND IN LAMBERT CREEK WATERSHED, AND INTERACTION OF GROUND WATER WITH VADNAIS LAKE, RAMSEY COUNTY, MINNESOTA, U.S. GEOLOGICAL SURVEY WATER-RESOURCES INVESTIGATIONS REPORT 94-4062, at 30–31 (1994), https://pubs.usgs.gov/wri/1994/4062/report.pdf (determining that groundwater inflow and lake-water discharge to aquifers presented a small percentage of the lake's water budget); R.G. Brown, *Errors in Estimating Ground-Water Components of Hydrologic and Phosphorus Budgets of Lakes*, *in* SELECTED PAPERS IN THE HYDROLOGIC SCIENCES 1986, at 53–64 (Seymour Subitzsky ed., 1986) (indicating a net groundwater inflow to Square Lake, Eagle Point Lake, and Lake Elmo in Washington County during all seasons); T. Winter & H. Pfannkuch, *Hydrogeology of a Drift-Filled Bedrock Valley near Lino Lakes, Anoka County, Minnesota*, 4 J. RES. U.S. GEOLOGICAL SURVEY 267–76 (1976), https://pubs.usgs.gov/journal/1976/vol4issue3/report.pdf (characterizing hydrologic interconnections between lakes and lateral groundwater flow in the Anoka Sand Plain and patterns of groundwater flow near Lino Lakes).

94. DNR REPORT 1998, *supra* note 84, at 84.

95. *See, e.g.*, USGS 2013, *supra* note 1, at 13 (listing nine studies prior to 1998 that documented changes in groundwater levels and flow in the Prairie du Chien-Jordan aquifer along with one study from 2009).

96. Complaint, *supra* note 2, at 13 (citing U.S. CENSUS BUREAU, 2010 POPULATION FINDER, http://www.census.gov/popfinder/ (select "Minnesota" from the "Select State" dropdown menu, then click "Display")); *see also*

demands, municipalities applied for and received increases for their appropriation permits, and annual per capita groundwater usage increased from seventy-eight gallons per person per day to ninety-two gallons per person per day.[97] Between 2000 and 2012, the DNR authorized on average a ninety-eight percent increase in municipal water appropriations permits for cities around White Bear Lake, to a peak of a nearly six billion gallon increase in 2008.[98] In 2010 Minnesota saw one of its wettest years in twenty years, while 2011 was recorded as one of its driest.[99] White Bear Lake's water levels once again dropped precipitously.[100] Finally, in 2013, the Plaintiffs filed suit against the DNR.[101]

II. ANALYSIS

In their complaint, Plaintiffs alleged that authorizations by the DNR and the DNR Commissioner which increased appropriations around White Bear Lake violated or were likely to violate Minnesota environmental quality standards in violation of MERA and the Public Trust Doctrine.[102] Relying on a 2013 USGS study that found a link between White Bear Lake's levels and groundwater withdrawals, the Plaintiffs alleged that DNR's authorizations had a direct and substantial material

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Demographics: Population, MINN. COMPASS, http://www.mncompass.org/demographics/population#1-5011-g (last visited Jan. 6, 2017) (showing an increase of about one million people statewide between 1990 and 2010).

97. USGS 2013, *supra* note 1, at 31–32 ("[Between 1980 and 2010,] the annual per capita municipal groundwater withdrawals from all aquifers increased from 77 gal per person per day in 1980 to 92 gal per person per day in 2010 . . . . Most of the groundwater withdrawals in the study area were from the Prairie du Chien-Jordan aquifer.").

98. Complaint, *supra* note 2, at 24.

99. NOAA NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION, CLIMATE AT A GLANCE: U.S. TIMES SERIES, *Precipitation*, https://www.ncdc.noaa.gov/cag/time-series/us/21/0/pcp/ytd/12/1990-2016?base_prd=true&firstbaseyear=1901&lastbaseyear=2000 (last visited Jan. 6, 2017) (parameter set to "Precipitation"; time scale to "Year-to-Date"; month to "December"; start year to "1990"; end year to "2016"; state/region to "Minnesota"; climate division/city to "Statewide"). NOAA's 2010 precipitation data shows a +7.46 inch departure from the 25.98 inch mean; 2011 shows a -1.63 inch departure from the mean. *Id.*

100. NARAMORE, *supra* note 5, at 2.

101. Complaint, *supra* note 2, at 33.

102. *Id.* at 22.

impact on the depletion of water levels in both White Bear Lake and the Prairie du Chien Jordan aquifer.[103] The dramatic increase in water pumping between 1980 and 2010, they claimed, resulted in the closure of the popular White Bear Lake County Park beach, harm to homeowners who had either been forced to move their docks hundreds of feet or lose access to the lake entirely, reduced boating activity, increased non-aquatic vegetation on exposed lakebeds, and decreased ability for the Prairie du Chien Jordan to provide for future needs.[104]

In an order denying summary judgment for both the Plaintiffs and the DNR, Judge Margaret Marrinan noted DNR's admission that "the increase in groundwater pumping in the area is probably to blame for making the low lake levels worse."[105] Judge Marrinan—appearing persuaded by the Plaintiff's evidence—likewise noted that DNR "made its permitting decisions on an individual basis and without considering the cumulative effect of groundwater withdrawals related to other permits in the area."[106] Judge Marrinan further stated that "there is no genuine question of material fact as to the status of both the lake bed as well as its surface water: they are both public trust assets."[107] However, in the end, the court concluded that a lack of scientific certainty as to the causes of White Bear Lake's decline justified continuing on to trial.[108]

With the DNR still denying any wrongoing, on December 9, 2014, the parties entered into a lengthy settlement agreement and stipulated to a thirty-six month stay of litigation with periodic status updates during which time the DNR was to begin work on remedying White Bear Lake's crisis.[109] For its part the DNR denied that it violated MERA or the Public Trust Doctrine

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103. *Id.*

104. Complaint, *supra* note 2, at 24. At time of drafting White Bear Lake County Park beach is still closed. *See, e.g.*, NARAMORE, *supra* note 5, at 14; *see also Ramsey County Beach to Remain Closed*, WHITE BEAR PRESS (June 8, 2016), http://www.presspubs.com/white_bear/news/article_06244d3e-2d85-11e6-967a-0fa2c5cf39a8.html.

105. Summary Judgment Order, White Bear Lake Restoration Ass'n v. Minn. Dep't of Nat. Res., No. 62-CV-13-2414, at 8 (D. Minn. Aug. 29, 2014) (citation omitted).

106. *Id.* at 9.

107. *Id.* at 15.

108. *Id.* at 10.

109. Settlement Agreement, *supra* note 6, at 2–3.

but recognized that the state has a responsibility to reduce reliance on groundwater resources in the Metro Area.[110] In the settlement DNR agreed to set a protective elevation for White Bear Lake by November 1, 2016, and to consider this, as well as the cumulative impact of existing wells on White Bear Lake and underlying aquifers, for new and existing groundwater permits.[111] Despite DNR's compliance in setting a protective elevation at 922.0 feet, however, the protective elevation has since been challenged in court.[112]

The settlement further required that the DNR support approval by the Minnesota Legislature for funding the feasibility and design of a "Northeast Metro Project" (Metro Project) to connect multiple Northeast Metro communities to raw or treated water purchased from the St. Paul Regional Water Service by August 1, 2016.[113] The plan was meant to allow Northeast Metro communities to switch from groundwater to surface water sources over the course of multiple years.[114] However, growing concerns over the effectiveness of the Metro Plan from a number of parties outside of the litigation led the 2015 Legislature to direct the DNR to prepare estimates on the cost of a separate project to augment White Bear Lake with water taken from the

110. Settlement Agreement, *supra* note 6, at 2–3.

111. *See DNR Sets Protective Elevation for White Bear Lake*, MINN. DEP'T OF NAT. RESOURCES, http://news.dnr.state.mn.us/2016/12/21/dnr-sets-protective-elevation-for-white-bear-lake/; *see also, e.g.*, NARAMORE, *supra* note 5, at 3. The protective elevation and cumulative impact of existing wells must be considered when DNR (a) evaluates new permit applications for groundwater and (b) reviews, modifies, suspends, and/or terminates existing groundwater appropriation permits, public water supply plans, and water demand reduction measures. *Id.*

112. Debra Neutkens, *DNR in More Hot Water over White Bear Lake Issue*, WHITE BEAR PRESS (Feb. 22, 2017), http://www.presspubs.com/white_bear/news/article_5b537ae0-f919-11e6-8710-9336739beed5.html.

113. Settlement Agreement, *supra* note 6, at 4. This plan involves connecting the municipalities of White Bear Lake, White Bear Township, Vadnais Heights, Mahtomedi, Shoreview, and North St. Paul ("Phase I Communities") to raw or treated water purchased from the St. Paul Regional Water Service, and subsequently connect the municipalities of Centerville, Circle Pines, Columbus, Forest Lake, Hugo, Lexington, and Lino Lakes as well ("Phase II Communities"). *Id.*

114. *Id.*

Mississippi through either Sucker Lake or East Vadnais Lake.[115] Although in opposition to the proposed augmentation plans, the DNR estimated that the Sucker Lake alternative would cost the state $67 million, while the East Vadnais alternative could cost $55 million, with additional costs for phosphorus treatment (between $23 and $44 million), and annual operations and maintenance (between $900,000 and $4.1 million each year).[116] In contrast, Phase I of the Metro Project has been projected to cost as much as $155 million.[117]

Ultimately, the 2016 Legislature was unable to fund the Metro Project feasibility study by the August 1, 2016 deadline stipulated to in the parties' settlement agreement due to opposition from all six of the Phase I communities and a "difficult legislative dynamic" brought on by the augmentation alternative.[118] Months of delay in a crucial follow-up to the 2013 USGS study, to be used by engineers and scientists to evaluate the impacts of augmentation, has further exacerbated efforts to avoid trial.[119] Despite good faith efforts by DNR, many issues

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115. *See White Bear Lake Augmentation*, MINN. DEP'T OF NAT. RESOURCES, http://www.dnr.state.mn.us/gwmp/wbl-report/index.html (last visited Jan. 6, 2017).

116. Technical Memorandum from Donald Lutch, Prof'l Eng'r, Minn. Bd. of Architecture, Eng'g, Land Surveying, Landscape Architecture, Geoscience and Interior Design, to Sam Paske, Assistant Gen. Manager, Envtl. Quality Assurance Metro. Council Envtl. Servs. (Jan. 15, 2016) (published in MINN. DEP'T OF NAT. RES., REPORT TO THE MINNESOTA STATE LEGISLATURE: CONCEPT COST REPORT FOR AUGMENTATION OF WHITE BEAR LAKE WITH SURFACE WATER—APPENDICES app. N (2016), http://files.dnr.state.mn.us/waters/gwmp/augmentation-cost-report_012916.pdf); *see* Debra Neutkens, *Timeline Short for Augmentation Design-Build Proposals*, WHITE BEAR PRESS (Jan. 25, 2017), http://www.presspubs.com/white_bear/news/article_ae74085e-e319-11e6-9347-8b4566047be7.html (noting that when asked whether DNR supports augmentation, DNR official Jason Moeckel responded: "The department's position is we have not supported augmentation to White Bear Lake.").

117. METRO. COUNCIL, FEASIBILITY ASSESSMENT OF APPROACHES TO WATER SUSTAINABILITY IN THE NORTHEAST METRO—SUMMARY 8 (2014).

118. *See* Debra Neutkens, *Judge Gets Update in White Bear Lake Lawsuit Case as Attorneys Prepare for Trial*, WHITE BEAR PRESS (Sept. 14, 2016), http://www.presspubs.com/white_bear/news/article_9b20b2d4-7a91-11e6-9fdd-eb7e56c5f69e.html ("'It created a difficult legislative dynamic,' [Assistant Commissioner] Naramore said."); *see also* Settlement Agreement, *supra* note 6, at 5.

119. Technical Memorandum from Jessica Daignault, Project Eng'r, Short Elliott Hendrickson, Inc., to Sam Paske, Assistant Gen. Manager, Envtl. Quality Assurance Metro. Council Envtl. Servs. (Jan. 20, 2016) (published in

underlying the litigation have remained the same, tensions between White Bear Lake and the DNR continue to run high. The parties have returned to court, with the Plaintiffs alleging that "[a]n oblivious state government was behind the slow-motion disaster that struck White Bear Lake" and the DNR responding that Plaintiffs simply want "a 'big hammer to knock on heads [rather than] a cooperative path of doing science, making plans and executing them.'"[120]

White Bear Lake's water crisis could have been avoided—and can still be fixed—by adhering to a more comprehensive groundwater program like that of Colorado. First, Minnesota can mandate that all groundwater withdrawals across the state be systematically inventoried, tracked, and permitted for added resilience and more efficient resource management. Second, Minnesota can effectuate this statewide inventory and permitting scheme by starting with the identification and classification of critical groundwater resources and then expanding, similar to Colorado's designated basins. Finally, in order to maximize the efficiency of a comprehensive groundwater inventory and classification scheme, Minnesota can designate a single authority like Colorado's Groundwater Commission to administer the state's groundwater supply.

A. TRACKING AND PERMITTING

Although individual domestic usage is not exceedingly high (White Bear Lake's reported daily per capita household usage between 2008 and 2012 averaged 65.6 gallons, while White Bear Township averaged 88.2), the lack of permitting for low-volume wells means that individual wellheads and withdrawals outside of municipal systems are not comprehensively permitted or

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MINN. DEP'T OF NAT. RES., REPORT TO THE MINNESOTA STATE LEGISLATURE: CONCEPT COST REPORT FOR AUGMENTATION OF WHITE BEAR LAKE WITH SURFACE WATER – APPENDICES app. A (2016), http://files.dnr.state.mn.us/waters/gwmp/augmentation-cost-report-appendices_012916.pdf); *see also* Debra Neutkens, *Experts Tell Court: Multiple Factors Impact White Bear Lake Level*, WHITE BEAR PRESS (Mar. 29, 2017), http://www.presspubs.com/white_bear/news/article_cb7de2f4-13f6-11e7-825a-ffcc3c30aba6.html (explaining that the delayed USGS study was provided prior to its publication for purposes of the litigation).

120. David Peterson, *Was State to Blame in White Bear Lake's Decline?*, STAR TRIB. (Mar. 7, 2017, 9:43 AM), http://www.startribune.com/was-state-to-blame-in-white-bear-lake-s-decline/415524014/.

managed by the DNR.[121] Instead, BWSR, a small board of twenty members, has been entrusted with comprehensive local water management pursuant to Minn. Stat. § 103B.255, which includes action through Minnesota's ninety Soil and Water Conservation Districts and, in turn, management by the counties, cities, townships, watershed districts, and water management organizations therein.[122] Through local organizations and private landowners, BWSR coordinates soil and water conservation programs and use planning, implements local water management, and helps to resolve water policy conflicts.[123]

Counties like Ramsey and Washington work with a number of organizations and committees, along with BWSR, DNR, the Metropolitan Council, and municipalities to draft plans for managing groundwater.[124] However, because these plans are not required by statute, some of them have not been revised in many years. Ramsey County's groundwater management plan, for instance, was developed in 1995, and although updates were proposed in 2009 (which the county board declined to submit to BWSR for approval), the groundwater management plan has not been changed since it was first adopted.[125] Meant to aid municipalities in organizing and managing their local resources, there is some question about just how useful these plans are; in the draft for the rejected 2009 update, the Ramsey Conservation

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121. MINN. DEP'T OF NAT. RES., TWIN CITIES PER CAPITA RESIDENTIAL WATER USE, https://assets.documentcloud.org/documents/1214272/minnesota-metro-cities-water-use.pdf (last visited June 13, 2017). It is worth noting that although DNR does currently track some daily water usage, the data is only for cities with populations over 10,000.

122. MINN. STAT. § 103B.255 (2016).

123. *Id.* § 103B.101; *see also* BD. WATER & SOIL RESOURCES, *About the Board of Water and Soil Resources*, http://www.bwsr.state.mn.us/aboutbwsr/index.html (last visited Apr. 17, 2017).

124. MINN. STAT. § 103B.255 subdiv. 1 ("A metropolitan county may prepare and adopt groundwater plans in accordance with this section."). This statute provides a mechanism for counties to organize priorities, build local capacity, and address issues of groundwater management and protection; *see also* RAMSEY CONSERVATION DIST., RAMSEY COUNTY GROUNDWATER PROTECTION PLAN: 2010, at 42–44 (2009), https://www.ramseycounty.us/sites/default/files/2010%20groundwater%20plan%20update%20conservation.pdf.

125. *See Metro Groundwater Planning*, MINN. BD. WATER & SOIL RESOURCES, http://www.bwsr.state.mn.us/planning/groundwater.html (last visited Dec. 4, 2016); s*ee also* RAMSEY CONSERVATION DIST., *supra* note 124.

District admitted that "[b]ecause we currently lack sufficient groundwater resource monitoring, not enough is known about the ongoing status of our groundwater. The greatest risk to Ramsey County's groundwater is from all that we do not know about this vulnerable asset."[126]

The DNR does maintain a cooperative groundwater monitoring map that details the location and depth of wells in addition to the aquifer type.[127] Many of these wells are tracked fairly closely and the data is current.[128] This monitoring data is not necessarily linked with other groundwater data; for instance, although the DNR does link MDH well data on its cooperative groundwater monitoring map,[129] the MPCA maintains an entirely separate groundwater site inventory.[130] This is not in itself damning, and the separate agencies have different reasons to monitor groundwater that do not necessarily lend themselves to joint maps or inventories. However, Minnesota has no single source that collects and presents agency data and it has only very recently begun to comprehensively study important groundwater and surface water interactions.[131] DNR even admits that there is a "lack of data on actual withdrawal rates, withdrawal points vs. precipitation and consumption locations, and measured variation in aquifer levels and recharge rates across Minnesota."[132]

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126. RAMSEY CONSERVATION DIST., *supra* note 124, at 8.

127. *Cooperative Groundwater Monitoring*, MINN. DEP'T NAT. RESOURCES, http://www.dnr.state.mn.us/waters/cgm/index.html (last visited Apr. 4, 2017).

128. *See, e.g.*, *Minnesota Department of Health Unique Well Number: 225647*, MINN. DEP'T NAT. RESOURCES, http://www.dnr.state.mn.us/waters/cgm/site.html?id=225647 (last visited Apr. 3, 2017).

129. *Id.*

130. *EDA: Groundwater Data*, MINN. POLLUTION CONTROL AGENCY, https://www.pca.state.mn.us/quick-links/eda-groundwater-data (last visited Apr. 6, 2017) (click on "Map-based search" then "Use the map-based search tool" on the next page for an interactive well site map).

131. *E.g.*, PERRY M. JONES ET AL., U.S. GEOLOGICAL SURVEY, STATISTICAL ANALYSIS OF LAKE LEVELS AND FIELD STUDY OF GROUNDWATER AND SURFACE-WATER EXCHANGES IN THE NORTHEAST TWIN CITIES METROPOLITAN AREA, MINNESOTA, 2002 THROUGH 2015 (2016), https://pubs.usgs.gov/sir/2016/5139/a/sir20165139A (hereinafter STATISTICAL ANALYSIS OF LAKE LEVELS).

132. *Hydrology - Water Withdrawal*, MINN. DEP'T NAT. RESOURCES, http://www.dnr.state.mn.us/whaf/about/scores/hydrology/waterwithdraw.html (last visited Apr. 4, 2017).

Colorado, in contrast, has placed almost the entirety of its groundwater and surface water data on a single website.[133] This source contains up-to-date news, rulemaking notifications, real-time streamflow, detailed information on well permitting and groundwater levels, and a number of mapping and tracking resources.[134] Colorado also provides detailed geophysical records of all wells penetrating aquifers,[135] and even provides full data on the more than 165,000 water rights within the state, including locations, case numbers for water court adjudications, and detailed comments.[136] All of this information, consolidated in one place and constantly updated, allows Colorado to efficiently track, inventory, and monitor every drop of water and administer its scarce resources.

While impressive, Colorado's system is the result of decades of scarcity, necessity, and strict constitutional doctrine. It is possible that a similar amount of detail would not be entirely necessary for Minnesota's riparian system. Likewise, White Bear Lake's water crisis does not represent a *per se* failing of a groundwater scheme that has worked for Minnesota since it was founded. Sharing Colorado's strict attitude towards tracking, permitting, and inventorying groundwater, however, likely would have allowed Minnesota to quickly identify the reason for White Bear Lake's declining levels and allowed for an immediate change to appropriations from the Prairie du Chien Jordan.[137]

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133. COLO. DEP'T NAT. RESOURCES, http://water.state.co.us/Home/Pages/default.aspx. (last visited Apr. 4, 2017).

134. *Id.*; *see also Data Search*, COLO. DEP'T NAT. RESOURCES http://water.state.co.us/DataMaps/Pages/default.aspx.

135. *Id.* (scroll down to "HydroBase Bulk Export Tools" then click on "Groundwater Wells - Geophysical Logs").

136. *Id.* (scroll down to "HydroBase Bulk Export Tools" then click on "Water Rights - Net Amounts").

137. Applying aspects of western prior appropriation doctrine to eastern riparian states is not necessarily a new concept. *See, e.g.*, George A. Gould, *A Westerner Looks at Eastern Water Law: Reconsideration of Prior Appropriation in the East*, 25 U. ARK. LITTLE ROCK L. REV. 89 (2002). *But see* Joseph W. Dellapenna, *The Law of Water Allocation in the Southeastern States at the Opening of the Twenty-First Century*, 25 U. ARK. LITTLE ROCK L. REV. 9, 31 (2002) ("[A]dding appropriative rights to an economically mature, humid eastern state hitherto committed to riparian rights would add little, if anything, in terms of rational water management at a cost of establishing and maintaining the considerable bureaucratic machinery inherent to modern appropriative rights.")

Inventories for aquifers, along with permitting that tracks small-scale appropriations, would not only have helped prevent White Bear Lake's current predicament, but would in the future make Minnesota more adaptable and resilient to population surges and increasingly warm weather patterns.[138] More comprehensive tracking would also allow Minnesota to identify vulnerable resources and begin to classify and prioritize these areas.

B. CLASSIFICATIONS

Classifying groundwater resources would make the task of tracking and managing them more efficient, and Minnesota has not necessarily been neglectful in this regard. DNR has made recent efforts at more comprehensive groundwater management, including drafting a strategic plan for a groundwater management program.[139] This groundwater management plan has resulted in three regional pilot programs, one of which is already in operation (collectively referred to as "GWMPs").[140] Minnesota has also split the state into groundwater provinces[141] and Watershed Management Districts.[142] These plans are a good first step towards identifying

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138. *See Climate Change Indicators: U.S. and Global Temperature*, ENVTL. PROTECTION AGENCY, http://webcache.googleusercontent.com/search?q=cache:https://www.epa.gov/climate-indicators/climate-change-indicators-us-and-global-temperature#ref1 (last visited Apr. 4, 2017) (showing increasingly warm U.S. and global temperatures).

139. MINN. DEP'T OF NAT. RES., DRAFT STRATEGIC PLAN FOR THE MINNESOTA DEPARTMENT OF NATURAL RESOURCES GROUNDWATER MANAGEMENT PROGRAM (2013), http://files.dnr.state.mn.us/waters/gwmp/gwsp-draftplan.pdf.

140. *See Bonanza Valley Groundwater Management Area*, MINN. DEP'T NAT. RESOURCES, http://www.dnr.state.mn.us/gwmp/area-bv.html (last visited Mar. 28, 2017); *North & East Metro Groundwater Management Area*, MINN. DEP'T NAT. RESOURCES, http://www.dnr.state.mn.us/gwmp/area-ne.html (last visited Mar. 28, 2017); *Straight River Pilot Groundwater Management Area*, MINN. DEP'T NAT. RESOURCES, http://www.dnr.state.mn.us/gwmp/area-sr.html (last visited Mar. 28, 2017).

141. *See* Drivas, *supra* note 38.

142. *See, e.g.*, Ass'n of Minn. Ctys., *Local Government Water Roundtable Comprehensive Water Planning and Management Policy Paper* (Nov. 25, 2013), http://www.bwsr.state.mn.us/planning/1W1P/Final_LGR_Report_11-25-2013.pdf; *see also* MINN. BD. WATER & SOIL RES., ONE WATERSHED, ONE PLAN TRANSITION PLAN (2016), http://www.bwsr.state.mn.us/planning/1W1P/TransitionPlan.pdf [hereinafter BWSR 1W1P].

and classifying critical areas, and there is some indication that the GWMPs are already beginning to work.[143] Minnesota has also made efforts towards more comprehensive aquifer recharge models which, when more thoroughly explored, would greatly assist the state in organizing its resources by replenishment rate and usage.[144]

Although covered briefly above, more details on Colorado's comprehensive groundwater classification scheme provides insight into how separate categories of groundwater allow the state to efficiently identify and track its resources.[145] Different regions and aquifers are given different management criteria to reflect their economic significance, aquifer characteristics, and the importance of groundwater to the region. As an example of this categorization, the importance of the Denver Basin has prompted its own separate statutory guidelines that determine whether groundwater within the Basin is tributary, nontributary, or "not nontributary."[146] Nontributary groundwater within the Denver Basin is considered (and statutorily mandated to be) less hydraulically connected to surface water,[147] and so is given a relaxed standard that is offset by a mandate that users relinquish two percent of withdrawn water back into the stream system in order to prevent harm to surface water rights.[148] Because a large portion of the eastern half of the Basin lies within designated basins, careful attention

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143. *DNR Update for the N&E Metro GWMA Project*, MINN. DEP'T NAT. RESOURCES (Nov. 10, 2016), https://content.govdelivery.com/accounts/MNDNR/bulletins/176712f#permit ("A total of 61 DNR water appropriation permit actions took place [from May 1, 2016 to November 1, 2016]. Roughly two-thirds were permits for temporary appropriations. Of the 11 new individual permits, seven were the result of compliance efforts.").

144. ERIK A. SMITH & STEPHEN M. WESTENBROEK, U.S. GEOLOGICAL SURVEY, POTENTIAL GROUNDWATER RECHARGE FOR THE STATE OF MINNESOTA USING THE SOIL-WATER-BALANCE MODEL, 1996–2010 (2015), https://pubs.usgs.gov/sir/2015/5038/pdf/sir2015-5038.pdf. It is interesting to note that this survey was conducted in cooperation with the MPCA, not the DNR.

145. *See* discussion *supra* Subsection I.B.2.

146. COLO. REV. STAT. § 37-90-103(10.7) (2016). That is not a typo; this resource is referred to in the statute as "not nontributary" water.

147. That is, the legislature has mandated that Denver Basin aquifers must be considered to have water pressure lower than artesian conditions (or conditions under which the hydrostatic pressure of groundwater forces it to overflow or discharge) in order to avoid injury to surface water rights. *See* Park County Sportsmen's Ranch LLP v. Bargas, 986 P.2d 262 (Colo. 1999) (en banc).

148. COLO. REV. STAT. § 37-90-137(9)(b) (2016).

is paid to whether a landowner is drawing from one of the four Denver Basin aquifers or from a designated water basin aquifer.[149] Finally, "not nontributary groundwater" is Denver Basin water withdrawn outside of a designated basin that is partially tributary because its hydraulic characteristics are not consistent with Denver Basin nontributary water; this is administered on the basis of land ownership (rather than prior appropriation) as if it were nontributary, provided its use is augmented.[150]

Once again, Colorado's system for classifying waters is based on years of trial and error and specific regional concerns, but the format can serve as a useful framework for Minnesota. Colorado's designations allow it to prioritize certain areas like designated basins and grant exceptions to usual appropriation rules. Narrow classifications like "not nontributary" recognize the differences between different aquifers within the same region and allow for much more fine-tuned and precise appropriation management. Closed-basin lakes in Minnesota like White Bear Lake, for instance, could be more carefully monitored following this example, with stricter permitting requirements based on their location and reliance on underlying formations, something the GWMPs already appear to recognize.[151] Other regions in Minnesota separate from White Bear Lake's water crisis could also benefit, particularly agricultural region which are heavily reliant on slowly replenishing groundwater resources.[152]

C. MANAGEMENT AUTHORITY

Colorado's experience shows that tracking and classifying groundwater resources is not enough; there must be some sort of central entity with a mandate and the authority to manage resource quantification and permitting. As discussed above, Minnesota has split its groundwater management between

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149. Colo. Ground Water Comm'n v. North Kiowa-Bijou Groundwater Mgmt. Dist., 77 P.3d 62, 72–74 (Colo. 2003).

150. § 37-90-103(10.5).

151. *See, e.g.*, *DNR Update for the N&E Metro GWMA Project*, *supra* note 143.

152. *See, e.g.*, SMITH & WESTENBROEK, *supra* note 144, at 84 fig. 3–15 (showing that western Minnesota's mean annual potential recharge rate is relatively low).

multiple agencies with responsibilities ranging from ambient groundwater quality monitoring to regional water supply planning.[153] These actors all play critical roles, and their split authority is not necessarily detrimental for *quality* monitoring; Colorado likewise splits its quantity and quality programs and still relies on its departments of health and agriculture. The issue in Minnesota, as White Bear Lake indicates, appears to lie with appropriations and supply planning.

Minnesota's statutory and bureaucratic scheme for administering its groundwater supply is byzantine enough that, in a memo of recommendations from the Lake Level Resolution Committee for White Bear Lake to the White Bear Lake Conservation District Board in April of 2013, the Committee began its assessment by stating that

> [o]ne of the greatest unknowns for the options to restore the lake level for White Bear Lake includes the regulatory process, approval process, funding options, etc. There are many local, regional and statewide stakeholders for each of the options to restore the lake level for White Bear Lake. However, it is currently unclear who has authority to approve each of these options as well as who has the authority to approve the funding for these options. Therefore, the regulatory, funding and approval processes may be the single largest unknown at this time as well as the longest timeline for restoring the lake level for White Bear Lake.[154]

As an illustration of Minnesota's fragmented authority, the USGS study requested by the Minnesota Legislature to assist in evaluating augmentation programs was a joint effort by the USGS, MDH, and Metropolitan Council; the DNR appears to have taken no part in the field statistical studies to assess groundwater and surface water exchanges in the northeast Metro Area.[155] The recent USGS survey to establish potential groundwater recharge rates in Minnesota was conducted in cooperation with the MPCA,[156] while BWSR's groundwater management plans appear to have been unsuccessful in rallying regional and municipal actors to manage their own groundwater

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153. *See* discussion *supra* Subsection I.B.1.

154. Memorandum from the Lake Level Resolution Comm. to the White Bear Lake Conservation Dist. Bd. (Apr. 16, 2013) (on file at http://wblcd.net/pdf/LLRC/LLRCt_20130410.pdf).

155. STATISTICAL ANALYSIS OF LAKE LEVELS, *supra* note 131, at 75. It may also be the case that the White Bear Lake litigation had something to do with DNR not being a part of this study.

156. SMITH & WESTENBROEK, *supra* note 144.

resources.[157] Indeed, the Metropolitan Council—not the DNR—is tasked with conducting regional water supply planning in the Metro Area using information from the MPCA, MDA, MDH, and DNR.[158]

Groundwater management in Colorado takes place under the clear authority of the State Engineer, Groundwater Commission, and water courts.[159] While these three entities do not individually have absolute authority over all groundwater in Colorado, they each have well-established roles with the State Engineer at the center.[160] The State Engineer's office has exclusive authority over water rights, stream flow, water use, dam safety, database maintenance, and appropriations outside of designated basins.[161] Although not tasked with managing designated basins, the State Engineer still plays a critical role in heading the Groundwater Commission.[162] Nine positions within the Groundwater Commission are appointed by the governor, while the remaining three include the Executive Director of the Colorado DNR, the Director of the Colorado Water Conservation Board, and the State Engineer, who carries out and enforces all of the Commission's decisions, orders, and policies.[163] Water courts are, likewise, staffed with a division engineer appointed by the State Engineer and adjudicate issues relating to groundwater and surface water appropriation.[164]

A clear mandate to administer groundwater supplies for a single regulatory authority may have helped prevent White Bear Lake's current predicament, combined with more comprehensive permitting focused on the hydrogeologic character of the region. Much of what Colorado does may already be mandated by another of Minnesota's progressive environmental statutes, the Minnesota Environmental Protection Act (MEPA), which requires the state to use "all practicable means . . . to improve and coordinate state plans" in order to "fulfill the responsibilities

157. *See* discussion *supra* Section II.A.
158. GROUNDWATER MONITORING STATUS REPORT, *supra* note 45.
159. GUIDE TO COLORADO WELL PERMITS, *supra* note 35, at 1–2.
160. *Id.*
161. *Id.*
162. *Id.* at 2.
163. *Id.* at 5–6.
164. *Water Courts*, COLO. JUD. BRANCH (2016), https://www.courts.state.co.us/Courts/Water/Index.cfm.

of each generation as trustee of the environment for succeeding generations."[165] It is possible that more comprehensive and centralized management can be deemed an improvement to current state plans and serve the interests of future generations. The question would be how many changes Minnesota is willing to make in order to more effectively manage its groundwater. In the end, these comparisons are primarily useful going forward, not as a means of quickly fixing White Bear Lake's water levels. White Bear Lake's water crisis certainly could have occurred in Colorado, but at every step the administrative authorities would have known who was appropriating how much water and when, and would have had clear authority and a mandate to take action.

III. ADOPTION AND REASSESSMENT

What can Minnesota learn from Colorado? Although comparing flat, water-rich Minnesota to rocky, dry Colorado may seem like a stretch, the organizational structure that Colorado has adopted to manage scarcity, as well as the mindset behind prior appropriation, may be useful for helping a state with a history of plenty to resolve what appears to be an issue of over-appropriation and better conserve groundwater resources. First, Minnesota can continue efforts to more systematically study groundwater-surface interactions, starting with critical areas like the Metro Area and gradually expanding to important recreational and agricultural areas.[166] Second, Colorado's framework for designated groundwater basins and clear classifications can inform a more targeted utilization of Minnesota's groundwater provinces as well as stronger regional management of groundwater resources in the long term. Third, Colorado's Groundwater Commission can be studied as a template for creating a centralized task force focused on

165. MINN. STAT. § 116D.02, subdiv. 2 (2016).

166. The crisis facing White Bear Lake and suggestions within this Note may be of particular concern for Minnesota's agriculture industry, as almost all of the water used to irrigate crops in Minnesota is pumped groundwater. *See* KROENING, *supra* note 26. While well beyond the scope of this Note, severe subsidence issues in California (*i.e.*, ground sinking due to over-appropriation of groundwater in agricultural areas) may add some urgency to the question of Minnesota's groundwater resources, at least as it pertains to farming. *See generally Land Subsidence in California*, U.S. GEOLOGICAL SURVEY, https://ca.water.usgs.gov/land_subsidence/ (last visited Feb. 22, 2017).

coordinating groundwater management across disparate state and local actors, or as a way of encouraging stricter DNR management. Finally, because Colorado has shown that systems for groundwater management can manage scarce resources, White Bear Lake's augmentation program should be abandoned in favor of more cost-effective and sustainable alternatives. Although augmentation may solve White Bear Lake's groundwater issues in the short term, it is an expensive patchwork fix that will not solve the underlying systemic problem.

A. STATEWIDE GROUNDWATER-SURFACE INTERACTIONS INVENTORY

Colorado has systematically surveyed and classified its most important groundwater resources.[167] In so doing the state has created a system whereby it can legislate appropriators' rights based on geographic region and well depth in order to adequately administer its strict doctrine of prior appropriation.[168] Fortunately, Minnesota does not need to survey its groundwater resources for the sake of recording and enforcing appropriation rights chronologically for strictly economic reasons, but Minnesota should continue to push for surveys and studies that will allow it to better understand how its ground and surface waters interact.[169]

First, additional interaction studies may be able to pinpoint critical areas affected by over-appropriation. The fifty lakes with fluctuation patterns similar to White Bear Lake that the DNR has identified may indeed be affected only by their small watersheds, but that correlation has proven to be only one of the factors contributing to White Bear Lake's current predicament.[170] Even if those lakes similar to White Bear Lake

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167. *See* discussion *supra* Section II.B.

168. *See* Colo. Ground Water Comm'n v. North Kiowa-Bijou Groundwater Mgmt. Dist., 77 P.3d 62, 72–74 (Colo. 2003) (detailing the distinctions between Denver Basin water and designated groundwater within the same geographic region).

169. *But cf.* discussion *supra* Part II (describing how the 2016 legislature was unable to fund the feasibility study in time to keep the DNR in compliance with the legal stay stipulation; this may indicate disagreement or perhaps reluctance to fund these kinds of surveys).

170. *See* NARAMORE, *supra* note 5, at 8.

may not themselves ultimately be considered critical for a variety of economic, ecological, and public health reasons, other areas with known or potential groundwater-surface interactions can be prioritized according to their overall benefit or potential harm to Minnesota interests.[171] Minnesota can classify areas and monitor them based on need similarly to how Colorado designates different basins and aquifers, and the DNR's Groundwater Management Areas promise to do just this.[172]

Second, more thorough knowledge of the interplay between aquifers and surface waters—as well as between separate bodies of surface water that are or may be connected by an aquifer—can assist other agencies in their work. For the MDH, comprehensive surveys can benefit the agency's wellhead permitting by ensuring that wells are sealed off from potential contaminants in connected surface waters.[173] In the case of chemical spills or other pollutants, comprehensive and centralized inventories of groundwater and surface water interactions would improve response time for MPCA's management of accidents or polluters, and help with quarantines or inform cleanup efforts at connected sites that may also become impaired.[174] MDA's agricultural chemical monitoring and assessment programs would gain more insight into how pesticides infiltrate the groundwater system and more information with which to improve best-practices, particularly for correctly utilizing aquifers based on their replenishment rates.[175] Finally, comprehensive groundwater and surface water interaction studies may inform more sustainable augmentation for municipalities that rely on groundwater where siphoning

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171. DNR has already begun this type of systematic analysis with its Groundwater Management Areas, and should continue to do so. *Groundwater Management Areas*, *supra* note 49.

172. *Id.* ("The purpose of the three pilot planning projects is to learn how to effectively create and establish GWMAs in other places facing groundwater management challenges.").

173. *See, e.g.*, *Wells and Borings*, MINN. DEP'T HEALTH, http://www.health.state.mn.us/divs/eh/wells/index.html (last visited Jan. 26, 2017) (describing the MDH's well management program).

174. *See generally Groundwater*, MINN. POLLUTION CONTROL AGENCY, https://www.pca.state.mn.us/water/groundwater (last visited Jan. 26, 2017).

175. *See, e.g.*, *Monitoring & Assessment for Agriculture Chemicals in the Environment*, MINN. DEP'T AGRIC., http://www.mda.state.mn.us/chemicals/pesticides/maace.aspx (last visited Jan. 26, 2017).

water from the Mississippi would be infeasible in the case of an emergency, and ensure that augmentation from surface water would not inadvertently affect other bodies of water.

However, there are a few potential issues. First, these types of studies are generally conducted by the USGS and not the state; there are ever-present manpower, time, and political roadblocks that may prevent more widespread and systematic surveys.[176] Second, Colorado's inventory was driven by economic necessity rather than preventative public policy, and the reforms did not happen overnight.[177] It may be difficult to convince the Minnesota Legislature to fund costly, time-intensive, comprehensive studies. Difficulties for the Minnesota Legislature to authorize funding for a feasibility study by August 1, 2016, even with the threat of trial looming for the DNR, indicates that there could be some reluctance to fund costly studies that do not have an immediate benefit.[178]

B. MORE FULLY UTILIZING MINNESOTA'S GROUNDWATER PROVINCES

Colorado has demonstrated that organization based on aquifer and geographic region is capable of managing large withdrawals by a growing population and sustaining aggressive appropriation policies.[179] Instead of programs designed to administer the doctrine of prior appropriation and its focus on pure economic benefit, Minnesota can continue to develop programs similar to Colorado's designated basins with an eye towards sustainability, climate resilience/adaptation, and public

176. *See, e.g.*, USGS 2013, *supra* note 1. Other state actors like DNR would likely need to assist or take over to undertake the monumental task of recording the state's groundwater and surface water interactions. This may even be necessary, as the current federal political climate has indicated that these types of studies are not a priority. *See, e.g.*, *Trump Plans to Slash EPA's Budget by $1 Billion*, N.Y. DAILY NEWS (Jan. 26, 2017, 5:25 PM), http://www.nydailynews.com/news/politics/trump-plans-slash-epa-budget-1-billion-article-1.2956578.

177. *See, e.g.*, Hobbs, *supra* note 54. *See also* discussion *supra* Subsection I.B.2.

178. *See* discussion *supra* Part II.

179. *See* discussion *supra* Section II.B, on designated groundwater basins and water classifications.

welfare.[180] For Minnesota, the DNR's GWMAs and their corresponding GWMPs look like a promising start.[181]

The DNR has had authority to create GWMAs since 2010, but the department has only recently begun to actually make any progress in carrying out these programs.[182] Despite the delay, the GWMPs are a good first step towards establishing more comprehensive regional management of Minnesota's groundwater resources.[183] Among other things, the North & East Metro Groundwater Management Area Plan (N&E Plan) provides a fourteen-page implementation scheme detailing actions, responsible organizations, units, or individuals, existing or new responsibilities, plan length, and dependencies for five different objectives.[184]

There does appear to be a trend in Minnesota towards identifying and managing resources on a more regional basis.[185] Eighty-one Watershed Management Districts, under the direction of BWSR, are already beginning to implement statewide comprehensive reforms for surface water in order to "align local water planning on major watershed boundaries with state strategies towards prioritized, targeted, and measurable implementation plans."[186] This type of regional organization and scale can be replicated by the DNR or by an independent body for groundwater. Currently Minnesota's GWMPs are roughly

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180. *See* Hobbs, *supra* note 54.

181. *See* sources cited *supra* note 140.

182. MINN. STAT. § 103G.287, subdiv. 4 (2016); *see also* MINN. DEP'T OF NAT. RES., NORTH & EAST METRO GROUNDWATER MANAGEMENT AREA PROJECT SCHEDULE 1 (2016), http://files.dnr.state.mn.us/waters/gwmp/area-ne/schedule-advisory-team-meeting.pdf (showing that "Advisory Team Meeting #1" took place on Oct. 11, 2013).

183. *See* MINN. DEP'T OF NAT. RES., NORTH & EAST METRO GROUNDWATER MANAGEMENT AREA PLAN (2015), http://files.dnr.state.mn.us/waters/gwmp/area-ne/gwma_ne-plan.pdf [hereinafter N&E PLAN].

184. *Id.* at 6-1 to -15. These objectives are: (1) preventing harm to aquifers, ecosystems, and surface waters; (2) reasonable and efficient groundwater use consistent with conservation requirements; (3) protection of water quality; (4) prevention of well interference or water use conflicts; (5) ensuring that all groundwater users have necessary permits to use groundwater. *Id.*

185. *See, e.g.*, ASS'N OF MINN. CTYS., LOCAL GOVERNMENT WATER ROUNDTABLE COMPREHENSIVE WATER PLANNING AND MANAGEMENT POLICY PAPER (2013), http://www.bwsr.state.mn.us/planning/1W1P/Final_LGR_Report 11-25-2013.pdf; BWSR 1W1P, *supra* note 142.

186. *Id.* at 5.

located in three of Minnesota's six groundwater provinces, and could be expanded to encompass all of the groundwater provinces in order to manage resources on the basis of the provinces' unique characteristics as well as thoroughly assess replenishment rates for different aquifers to inform sustainable appropriation.[187]

Recognizing the link between surface and groundwater in the 1960s allowed Colorado to coordinate its regulatory schemes and implement regional programs for managing unique groundwater resources.[188] A major difficulty for Minnesota, however, may simply be the shock of a change from free-form riparianism to a system that more closely and clearly regulates water appropriations. Increasing management and enforcement authority would require more bureaucracy, higher administrative costs, and trigger potentially significant backlash from the public. Although Colorado has had decades to refine its system, it did so in the face of severe water scarcity and the unique backdrop of the American West. Regardless of whether Minnesota moves towards more robust management and enforcement, the state should still make it a goal to have a complete picture of the groundwater resources within each groundwater province and have comprehensive management plans established and administered or overseen by a single body, if possible.[189]

C. CAN (SHOULD?) THE ENVIRONMENTAL QUALITY BOARD STEP FORWARD?

Colorado's Groundwater Commission and Water Courts centralize the administration of Colorado's organized groundwater system that includes groundwater inventories and groundwater classifications based on region and hydrogeology.[190] While other departments in Colorado still have roles to play that are similar to Minnesota's agency interactions,

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187. *Compare Groundwater Provinces*, *supra* note 38, *with Groundwater Management Areas*, *supra* note 49.

188. *See supra* Subsection I.B.2.

189. For instance, Minnesota could implement a structure whereby BWSR remains in charge of the forty-six watershed districts while DNR manages six to ten regional GWMPs. Administration could come in the form of a committee that coordinates efforts between watershed districts and GWMPs.

190. *See supra* Section II.B.

there is a clear hierarchy for water quantity monitoring.[191] The State Engineer's role at the head of both the Waters Division of the DNR and the primary permitting authority for the Groundwater Commission makes it so that management of groundwater appropriation is clear and efficient.[192]

While Minnesota does have the EQB, it currently does not appear to have had much to do with managing or resolving White Bear Lake's predicament in particular.[193] Indeed, the EQB seems almost too far removed to act in the same "command and control" capacity as Colorado's State Engineer does.[194] The EQB could increase efforts towards becoming a body for more centralized groundwater management, but it might be more effective to simply create a subcommittee or a different body entirely that is solely tasked with administering the state's groundwater resources.[195] For instance, this type of entity could centralize groundwater expertise by having a member of each department with authority over groundwater: MPCA (contamination), MDA (agricultural use and pesticides), MDH (wellhead and potabilty), and DNR (appropriations and conservation), with industry and private individual contributions to programmatic details, rather than keeping the authority separate as the state does currently.[196]

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191. *See Groundwater Program*, COLO. DEP'T PUB. HEALTH & ENV'T, https://www.colorado.gov/pacific/cdphe/groundwater-program (last visited Jan. 26, 2017) (noting other implementing agencies and their roles in Colorado's groundwater program).

192. *See supra* Section II.A (regarding the Lake Level Resolution Committee's memo to the White Bear Lake Conservation District Board).

193. *See, e.g.*, MN WATER POLICY REPORT, *supra* note 25, at 7–13 (promoting sustainable water use as the Board's number one goal). Although it does not address White Bear Lake specifically, it is likely that the Environmental Quality Board has had some impact on how resolving the lake's water levels has unfolded, but there is no specific reference to this.

194. *See, e.g.*, *EQB at a Glance*, MINN. ENVTL. QUALITY BD., https://www.eqb.state.mn.us/content/eqb-glance (last visited Jan. 26, 2017) (showing concerns over air, water, land, pollution, and energy).

195. *See supra* Section II.C (discussing the Colorado Groundwater Commission).

196. *See, e.g.*, GROUNDWATER MONITORING STATUS REPORT, *supra* note 45. *See generally* MINN. DEP'T OF AGRIC., GROUNDWATER QUALITY MONITORING 2016 ANNUAL WORK PLAN (2016), http://www.mda.state.mn.us/chemicals/pesticides/~/media/Files/chemicals/maace/2016workplangw.pdf; *Groundwater*, MINN. POLLUTION CONTROL AGENCY, https://www.pca.state.mn

Alternatively, the Metropolitan Council could retain and expand its regional role in groundwater planning and management to act as a sort of Groundwater Commission in the Metro Area, with another body taking over management of the rest of the state. The most simple solution, however, would be to consolidate the many disparate aspects of groundwater quantity management into the DNR by expanding its administrative role. Local groundwater management plans—now managed by BWSR, DNR, the Metropolitan Council, municipalities, and counties—can be overseen solely by the DNR. But even straightforward solutions must still grapple with Minnesota's complex regulatory scheme. Administrative authority is so fractured that the act of revising statutes to centralize management could prove to be a Sisyphean task, one that is more trouble than simply strengthening existing mandates and authority.

It does appear to be the case, however, that right now White Bear Lake's low levels are primarily DNR's problem. One could argue that that, for the time being, all that is needed to resolve issues of over-appropriation is for the DNR's Waters Division to continue working to organize and reform its groundwater management policies and move forward with programs to reduce water appropriation and restore lake levels.[197] White Bear Lake may be an isolated incident—certainly is in DNR's view—and DNR is already tasked with managing Minnesota's groundwater supply and availability. But the same unilateral control that Colorado's State Engineer has, along with the benefit of multiple other experts and stakeholders found on the Groundwater Commission, given to a single state entity may be able to more thoroughly and efficiently administer all aspects of Minnesota's groundwater.[198]

D. AUGMENTATION: A SHORT-TERM SOLUTION

Augmentation can make immediate improvements to White Bear Lake's low levels as it did for more than fifty years before

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.us/water/groundwater (last visited Jan. 26, 2017); *Wells and Borings*, *supra* note 173.

197. *See, e.g.*, N&E PLAN, *supra* note 183.

198. *See supra* Section II.C.

the DNR ceased lake augmentation in 1977.[199] Indeed, historic augmentation has pumped tremendous amounts of water into the lake to maintain levels through four augmentation wells; "[w]hen all were in use, the maximum rate of augmentation was 5200 [gallons per minute]."[200] In terms of lake levels, augmentation presents a way to immediately ameliorate the issues that are facing White Bear Lake's recreation, tourism, and shorefront property ownership while more systemic changes are encouraged, though it must be noted again that earlier augmentation was entirely through augmentation *wells* pulling water out of deeper aquifers, not pipes connected to surface waters.[201] Even if siphoning water from the Mississippi can help now, though, an augmentation program is a short-term solution that brings with it a number of long-term issues.[202]

The first pitfall to an augmentation program is cost.[203] Both augmentation alternatives being explored by the DNR involve

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199. NARAMORE, *supra* note 5, at 8; *see also* Debra Neutkens, *White Bear Lake Has Some New Friends*, WHITE BEAR PRESS (Sept. 22, 2015), http://www.presspubs.com/white_bear/news/article_0ef64de8-617c-11e5-8372-8fe4a9798055.html (describing the Friends of White Bear Lake, a nonprofit corporation that intends to "save the lake" through augmentation).

200. DNR REPORT 1998, *supra* note 84, at 19.

201. *Id.* at 20. In the 1998 report the DNR also notes that "[w]ater level measurements indicate that water is flowing from the Prairie du Chien-Jordan aquifer downward into the lower aquifer . . . . The natural separation of the aquifers has been breached by the wells." *Id.* (citing DALE SETTERHOLM, REPORT TO WHITE BEAR LAKE CONSERVATION DISTRICT: LAKE LEVEL CONTROLS AND PUMPING (1993)).

202. *But see Alternative Cost and Augmentation Facts for White Bear Lake*, FRIENDS WHITE BEAR LAKE, http://www.fowbl.org/images/PDF/augmentation_costs.pdf (noting a number of alternatives to the DNR's augmentation plans that make the project more feasible, including a longer but less expensive augmentation route).

203. MINN. DEP'T OF NAT. RES., REPORT TO THE MINNESOTA STATE LEGISLATURE: CONCEPT COST REPORT FOR AUGMENTATION OF WHITE BEAR LAKE WITH SURFACE WATER 17–20 (2016) [hereinafter AUGMENTATION COST REPORT], http://files.dnr.state.mn.us/waters/gwmp/augmentation-cost-report-appendices_012916.pdf (summarizing cost estimates for augmentation alternatives); MINN. DEP'T OF NAT. RES., REPORT TO THE MINNESOTA STATE LEGISLATURE: CONCEPT COST REPORT FOR AUGMENTATION OF WHITE BEAR LAKE WITH SURFACE WATER APPENDICES (Feb. 2016) [hereinafter AUGMENTATION COST REPORT APPENDICES], http://files.dnr.state.mn.us/waters/gwmp/augmentation-cost-report-appendices_012916.pdf (explaining in more detail the number of factors that resulted in DNR's cost estimate for the augmentation program).

not only the up-front capital required to construct approximately four miles of costly new infrastructure, but also maintaining the pumps and tunnels as long as augmentation is required.[204] It is unclear how long augmentation is expected to continue, or what will happen to the project if lake levels are restored through alternative means; it is possible that White Bear Lake's water level crisis could be resolved midway through construction.[205] It is also unclear at this point how long it will take either augmentation alternative to be constructed, as the projects will involve, *inter alia*, grading and restoration, pump and pipework, filtration systems, tunneling, permits and easements.[206] Finally, it is unclear who will even own or pay for the augmentation project.[207]

A further, more concerning cost is the potential to introduce harmful aquatic life, such as zebra mussels, into White Bear Lake or bodies of water along the estimated four mile long pump system.[208] Zebra mussels in particular can affect not only maintenance costs for intake piping and screening equipment, but could also threaten aquatic life in White Bear Lake and cause damage to the ecosystem as zebra mussels out-compete other small aquatic life forms.[209] Even if augmentation restores White Bear Lake's levels it may—ironically—threaten the lake's ability to accommodate recreational fishing.[210]

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204. AUGMENTATION COST REPORT APPENDICES, *supra* note 203, at 1.

205. *Id.* at 21.

206. *Id.* at 17–20.

207. Neutkens, *supra* note 116 ("No one has been designated to own this project or the system. I don't know that the DNR will own it.") (quoting Mr. Jason Moeckel). Mr. Moeckel is the DNR's Division of Ecological and Water Resources Inventory, Monitoring, and Analysis Section Manager. MINN. DEP'T OF NAT. RES., *Ecological and Water Resources Division Contact Information*, http://webcache.googleusercontent.com/search?q=cache:http://www.dnr.state.mn.us/contact/ewr.html (last visited Apr. 15, 2017).

208. *See* AUGMENTATION COST REPORT APPENDICES, *supra* note 203, at app. M.

209. *See generally Zebra Mussel (Dreissena polymorpha)*, MINN. DEP'T NAT. RESOURCES, http://www.dnr.state.mn.us/invasives/aquaticanimals/zebramussel/index.html (last visited Jan. 26, 2017).

210. *Id.*

A second issue is conservation.[211] Even if there may be sufficient capacity to pump billions of gallons of water from the Mississippi into White Bear Lake, the underlying issue remains.[212] The Prairie du Chien Jordan cannot support both White Bear Lake's water levels and municipal water supply needs. Further, as discussed above, doubts as to how efficient augmentation actually is raises the question of whether a project that may lose up to eighty-six percent of augmented water—due simply to the lake's hydrogeologic relation to aquifers beneath—it adequately conserves Minnesota's resources.[213] If augmentation water truly has a half-life of one year as the DNR has stated, and if up to eighty-six percent of augmented water could disappear into the aquifers beneath the Prairie du Chien-Jordan, the two billion gallons that are estimated to be pumped will not only have the practical effect of only 280 million gallons, but that actual effective augmentation water will only help to maintain the lake's levels for two years.[214] Indeed, this type of waste could open the state up to separate MERA liability over a project intended to resolve a MERA claim in the first place, though the actual hydrogeologic effects of pumping water from surface sources rather than aquifers beneath the Prairie du Chien-Jordan will likely prevent similar losses.[215]

Regardless of how effective augmentation could be, all of the above-mentioned costs for construction and maintenance, all of the potential waste, and the risk of introducing invasive species may ultimately come to naught. Programmatic and management reforms like the DNR's N&E Plan may end up restoring lake levels, and if better management and less appropriations show

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211. AUGMENTATION COST REPORT APPENDICES, *supra* note 203, at 9 (estimating that the augmentation program will pump 6000 gallons per minute, or two billion gallons over an eight-month period each year).

212. *Id*. at 5 (explaining that St. Paul Regional Water Services has sufficient excess capacity in its conveyance system to meet the demands of the proposed augmentation systems).

213. DNR REPORT 1998, *supra* note 84, at 82–84.

214. *See* Daignault, *supra* note 119 ("Included as part of this report is the development of costs for two alternative alignments for the augmentation of approximately two (2) billion gallons (BG) per year of water into White Bear Lake (WBL).").

215. The potential liability could arise particularly for "any conduct which materially adversely affects or is likely to materially adversely affect the environment" under the statute's definition of prohibited "Pollution, Impairment, or Destruction." MINN. STAT. § 116B.02, subdiv. 5 (2016).

results while the project is still being built that would only compound the waste.[216] The augmentation projects present a patchwork, reactive solution to a deeper problem and may ultimately show that an "augment first" reaction to groundwater issues is potentially costly and counterproductive. The augmentation projects should be put on hold until DNR and the legislature have a chance to consider more programmatic options and see what the results of the N&E Plan as well as stricter permitting and appropriation management are. Minnesota may need to accept as a reality that—at least in some parts of the state—water uses are not sustainable in the long term and plan accordingly.

IV. CONCLUSION

White Bear Lake's water crisis reveals critical flaws in Minnesota's fragmented groundwater scheme. Faced with evidence that the lake was being depleted by over-appropriation, the DNR continued to allow increases to groundwater withdrawals. The lack of more robust groundwater inventories and well permitting across the board has shown that, while water-rich, Minnesota does not know precisely how much water the state has, or how far appropriations can go before they become unsustainable. By adopting practices from Colorado that are meant to ensure access to scarcity, Minnesota can more adequately prepare for the future and prevent crises like the one facing White Bear Lake before they ever have a chance to materialize. More information about the state's groundwater resources can only serve to increase efficiency, reduce waste, and encourage smarter and more sustainable growth. Centralized authority over these resources could streamline the bureaucratic process for individuals, municipalities, agriculture, industry, and other state actors. White Bear Lake has shown that even water-rich states like Minnesota may need to prepare to treat their precious groundwater resources with the same care as desert states that track every last drop.

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216. N&E PLAN, *supra* note 183.