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FOREWORD: THE SUSTAINABILITY OF MINNESOTA'S WATER RESOURCES

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Minnesota is unique among the United States, serving as the headwaters of three of the largest water systems in North America and having more surface water resources than any other of the lower forty-eight states. The Great Lakes flow east from Minnesota to the St. Lawrence Seaway and on to the Atlantic Ocean, the Mississippi River flows south from Minnesota to the Gulf of Mexico, and the Red River of the North flows north from Minnesota to Hudson Bay. The vast amount of Minnesota's surface water starts as precipitation, falling in relatively pristine condition onto land and water surfaces. From there it flows to rivers, streams, and lakes, or infiltrates the soil and helps recharge aquifers. Along the way it picks up contaminants from the land to varying degrees. Thus, Minnesota has a unique responsibility to provide stewardship for these national and international water resources.

Minnesota has vast surface waters within its boundaries—more than 12,000 lakes of over ten acres surface area and more than 100,000 miles of streams.¹ Wetlands comprise about one-sixth of the total area of the state.² Minnesota also has considerable groundwater reserves, although a full accounting of these resources has not yet been completed.

Minnesota is also unique in its commitment to restoring and protecting its water resources. In 2008, the citizens of Minnesota voted to amend the state constitution to create four dedicated funds from an increase in the state sales tax of three-eighths of one

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1. MINN. POLLUTION CONTROL AGENCY, REPORT TO THE CONGRESS OF THE UNITED STATES, WATER YEARS 2008–2009, at 9 (2010), *available at* <http://www.pca.state.mn.us/index.php/view-document.html?gid=5968>.

2. *Id.* at 5.

percent over twenty-five years.³ The Clean Water Fund receives a third of these monies, amounting to approximately \$150–180 million every two years.⁴ This fund supports, enhances, and accelerates programs that assess, restore, and protect surface water and groundwater for all uses. It does so through legislative appropriations to a number of state agencies,⁵ distributing more than half of the funds to on-the-ground projects at the watershed scale.⁶

The State of Minnesota has defined sustainable water use as “when the use does not harm ecosystems, degrade water quality, or compromise the ability of future generations to meet their own needs.”⁷ To meet this aspirational objective, the state must achieve success across all the components that make up sustainability—a healthy environment, a healthy economy, and a healthy and resilient society. Thus, achieving sustainable water resources requires a system of management and governance that provides for clean, sufficient water resources at the intersection of maintaining a strong economy and providing public health and well-being.

Furthermore, water resources are a complicated system. They include groundwater and surface water, both quantity and quality considerations, and their use by both people as well as ecosystems. They are linked to external drivers of change, such as demographic changes in age and geographic distribution, land use changes, energy generation and consumption, and the short- and long-term changes in climate. For example, an increase in net population will increase energy consumption, change land use, and increase water use, thus putting a combination of stresses on the overall resource. In addition, there are multiple issues affecting water resources,

3. *About the Funds*, MINNESOTA’S LEGACY, <http://www.legacy.leg.mn/about-funds> (last visited Dec. 21, 2012).

4. MINN. POLLUTION CONTROL AGENCY ET AL., CLEAN WATER FUND REPORT CARD (2012), *available at* http://www.legacy.leg.mn/sites/default/files/resources/2012%20Clean%20Water%20Fund%20Report%20Card_web%20version.pdf.

5. Direct recipients of the Clean Water Fund include the Minnesota Pollution Control Agency, the Minnesota Department of Natural Resources, the Minnesota Department of Agriculture, the Minnesota Department of Health, the Minnesota Board of Water and Soil Resources, the Metropolitan Council, the Minnesota Public Facilities Authority, and the University of Minnesota. *See Clean Water Fund*, MINNESOTA’S LEGACY, <http://www.legacy.leg.mn/funds/clean-water-fund> (last visited Dec. 21, 2012).

6. *See* CLEAN WATER COUNCIL, BIENNIAL REPORT 8 (2010), *available at* <http://www.pca.state.mn.us/index.php/view-document.html?gid=14944>.

7. Act of May 22, 2009, ch. 172, art. 2, § 30, 2009 Minn. Laws 2446, 2487.

which are interrelated. Excess phosphorus and nitrates from agriculture and urban storm-water runoff may cause decreases in water quality, render drinking water unsafe, affect food webs in lakes and rivers, and require improved technologies and infrastructure to remove them from wastewater.

How is water used in Minnesota? Surface water is used for 79% of all uses, and groundwater is used for 21% of all uses.⁸ The largest use of water (approximately 60%) is for cooling thermoelectric plants, including coal-fired, natural gas, and nuclear power plants.⁹ This once-through cooling water is considered a non-consumptive use, and if one only considers consumptive uses, surface water and groundwater are used in similar amounts. Dominant consumptive uses of water are for public water supplies, mining, and irrigation.¹⁰ The main consumptive uses of surface water are for mining, public water supplies, industry, and aquaculture.¹¹ The main uses of groundwater are for public water supplies, irrigation, private domestic water supplies, livestock, industry, and aquaculture.¹² While the quantities of surface water and groundwater that are used for various sectors are well known, and the quantity and flows of surface waters are well known, the quantities and subsurface flows and recharge rates of groundwater supplies are not well known.

In spite of the pride and stewardship that Minnesotans place on their water resources, the quality of Minnesota's water is suffering. Approximately 40% of the state's surface waters are estimated to exceed one or more state and federal water quality standards. Harmful nitrates in both public and private water supplies are increasing over time. And hundreds of unregulated contaminants of emerging concern are found in water, but without sufficient exposure and toxicological information to assess or regulate their risk.

In 2008 the Minnesota Legislature requested that the University of Minnesota Water Resources Center design a twenty-five-year plan for achieving sustainable water management of the state's surface water and groundwater for all uses, and for both

8. DEBORAH L. SWACKHAMER & DAVID FAIRBAIRN, WATER USE IN MINNESOTA 11 (2010), *available at* http://wrc.umn.edu/prod/groups/cfans/@pub/@cfans/@wrc/documents/asset/cfans_asset_434534.pdf.

9. *Id.* at 13.

10. *Id.* at 7.

11. *Id.* at 6.

12. *Id.* at 13.

quality and quantity, which resulted in the *Minnesota Water Sustainability Framework (Sustainability Framework)*.¹³ This bold and far-reaching effort engaged hundreds of water professionals, technical experts, managers, policymakers, and stakeholders and identified the major issues, the solutions for addressing these issues, and the strategies for implementing the solutions. The *Sustainability Framework* identified what is known and what is not known about these issues and presented the impacts of implementing the strategies along with an implementation timeline. The ten “big” issues that were identified included environmental, economic, and social issues:

- Sustainable and clean water supply
- Excess nutrients and other conventional pollutants
- Contaminants of emerging concern
- Land, air, and water connection
- Ecological and hydrologic integrity
- Water-energy nexus
- Water pricing and valuation
- Public water infrastructure needs
- Citizen engagement and education
- Governance and institutions.¹⁴

The articles herein address many of the legal and policy aspects that surround and shape these issues. None of these issues can be addressed without providing a comprehensive policy framework that promotes effective water management and restricts poor practices, while also accounting for a systems perspective.

To begin, Enzler et al. present a comprehensive overview of current water policy in Minnesota and the historical context for the evolution of these policies. Specific policies related to groundwater management, drainage, and wetland protection are discussed. The concept of public waters and riparian and private water rights are provided. They identify the gaps and strengths in the statutes, and they make a case for the need to revise water governance through the lens of sustainability and to account for the interconnectedness of water with other systems (energy, transportation, etc.).

The article by Coleman and Rhees describes how land use affects water quality and quantity, and describes why more

13. UNIV. OF MINN. WATER RES. CTR., MINNESOTA WATER SUSTAINABILITY FRAMEWORK 1–2 (2011), available at http://wrc.umn.edu/prod/groups/cfans/@pub/@cfans/@wrc/documents/asset/cfans_asset_292471.pdf.

14. *Id.* at 25.

integrated planning is needed. This touches on the issues of the land-water connection, and ecological and hydrologic integrity, while underscoring the need for more social engagement and more effective institutional arrangement around water and land planning. They provide a historical context of land and water planning and make recommendations for how more integrated planning could be accomplished.

Enzler's article on the EPA-USDA Water Quality Certification and Certainty program being piloted in Minnesota addresses the issue of agricultural land use and water quality impairments by excess nutrients. She provides a discussion of the Clean Water Act and its gaps in addressing non-point source pollution to provide a context for this program. She reviews the current understanding of the role of agriculture in water quality impairments and discusses voluntary programs and their effectiveness at achieving societal goals. Finally, she identifies components of this new voluntary program that must be addressed for it to be successful.

Finally, Karkkainen presents an article that addresses transboundary and shared international water issues, specifically discussing the Great Lakes and the effectiveness of the United States and Canada's institutional arrangements as a result of the 1909 Boundary Waters Treaty. He provides a discussion of the resource management challenges of the Great Lakes, focusing in particular on water quality and ecosystem management issues. Additionally, he provides a discussion of the Great Lakes Water Resources Compact and its evolution, which focuses on water quantity and water withdrawals from the Great Lakes. He concludes with a discussion of the implications of these laws and policies for the future coordinated management of these international waters.

Water is essential to all life. It is an essential component of Minnesota's agricultural and tourism economies, its North Woods culture, and its citizens' well-being. With increasing pressures on the state's water resources, it is critical to evaluate and improve the policy framework that will protect these waters and place it squarely in the context of sustainable water use. The following papers address several aspects of such a policy framework.