THIRSTING FOR CHANGE: HOW THE GROWTH OF THE BIOFUEL INDUSTRY CAN STIMULATE ADVANCEMENTS IN WATER LAW

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Biofuels, which have the potential to decrease domestic dependence on foreign oil, are not a problem-free solution. One substantial yet little-discussed problem that increased biofuel production presents is a related increase in water consumption. Given that many local water sources across the United States are already stressed by overconsumption, and many more will likely become stressed in the future, increased biofuel production poses a substantial threat to small-scale local water users in prime biofuel states, particularly in the Midwest. This Note examines current state and federal water laws and the ways in which they are inadequate to resolve the conflicts over water use that will arise between the biofuel industry and small-scale local water users.

This Note begins by explaining the process of producing biofuel, focusing on ethanol, and highlighting the crucial role water plays within this process. Next, the author provides an overview of the fundamental principles of water law, including the rules that determine the amount of water that can be used, where and how the water can be used, and the extent to which pollutants can be discharged into water sources. The author also evaluates the current state of water use in the U.S., highlighting mounting water shortages due to overconsumption.

Increased production of biofuels implicates water laws because biorefineries will be diverting or pumping large amounts of surface water or groundwater while industrial biofuel-crop farmers will be using greater amounts of water to produce larger yields. These increased uses will inevitably clash with existing small-scale local water users. The reasonable use rule, used by most Midwestern states, will be inadequate to resolve these conflicts. Similarly, the Federal Clean Water Act is limited in its ability to resolve conflicts over water quality. To address these inadequacies in current water law, the author proposes a three-fold approach. State and federal legislatures need to reform the theoretical underpinnings of water law to emphasize sustainability. Legislatures and courts should begin this lengthy process immediately by modifying the reasonable use rule and the Federal Clean Water Act as they are applied. Lastly, there is a need for societal change; communities need to demand effective water manage-

ment and must shift their focus to conservation of existing water sources. Ultimately, the push to increase biofuel production could be the impetus for much-needed reform of federal and state water laws.

> When sustainability becomes our beacon, as one day it must, we shall wonder how we could have so thoroughly embraced a legal system that pays so much attention to the individual owner and the present and so little to the community and the future.
>
> —Eric T. Freyfogle[1]

I. INTRODUCTION

Biofuels have been touted as *the* solution—the solution to dependence on foreign oil, the solution for reducing air pollution, and the solution for strengthening the economies of rural communities.[2] Bolstered by surging public and governmental support, the biofuel industry is rapidly expanding.[3] Despite its proclaimed benefits, critics have questioned the practicality of biofuel as an alternative fuel source.[4] One key source of criticism that has not been widely addressed targets the large amount of water that biofuel production consumes.[5] In this era of increasing water demand and growing water shortages, the rapid expansion of a water-consuming industry raises fundamental questions about the adequacy of existing water laws to manage the inevitable challenges—particularly in the Midwest, where expansion is most rapid.[6] If we embrace this opportunity to learn from these challenges, however, they

1. Eric T. Freyfogle, *Ownership and Ecology*, 43 CASE W. RES. L. REV. 1269, 1282 (1993).

2. *See, e.g.*, IOWA CORN, IOWA'S ETHANOL AND E85 FACTS 2 (2008), http://www.iowacorn.org/User/Docs/Iowa's%20Ethanol%20facts-%2091608.pdf (listing multiple benefits of ethanol); Am. Coal. for Ethanol, Ethanol 101, http://www.ethanol.org/index.php?id=34&parentid=8 (last visited Feb. 14, 2009) (explaining the economic, agricultural, and energy independence benefits of ethanol); Nat'l Corn Growers Ass'n, Ethanol Basics: What Ethanol Is and What It Does, http://www.ethanolfacts.com/ETHL2007/ebasics.html (last visited Feb. 14, 2009).

3. In an effort to capture the scope of the industry's substantial growth rate, the Renewable Fuels Association selected "From Niche to Nation" as an appropriate theme for its 2006 Ethanol Industry Outlook. RENEWABLE FUELS ASS'N, FROM NICHE TO NATION: ETHANOL INDUSTRY OUTLOOK 2006 (2006), http://www.ethanolrfa.org/objects/pdf/outlook/outlook_2006.pdf; *see also* John W. Schoen, *Is There Enough Corn for Bush Ethanol Plan?*, MSNBC, Jan. 24, 2007, http://www.msnbc.msn.com/id/16792220/.

4. *See* Monica Davey, *In Farm Belt, Ethanol Plants Hit Resistance*, N.Y. TIMES, Nov. 13, 2007, at A1, *available at* http://www.nytimes.com/2007/11/13/us/13nimby.html; Clifford Krauss, *Ethanol's Boom Stalling as Glut Depresses Prices*, N.Y. TIMES, Sept. 30, 2007, at A1, *available at* http://www.nytimes.com/2007/09/30/business/30ethanol.html.

5. *See* COMM. ON WATER IMPLICATIONS OF BIOFUELS PROD. IN U.S., NAT'L RES. COUNCIL, WATER IMPLICATIONS OF BIOFUELS PRODUCTION IN THE UNITED STATES 19–24 (2008) [hereinafter NRC, IMPLICATIONS]; *see also* Randolph E. Schmid, *Ethanol Push Could Threaten Water Supplies*, GLOBE & MAIL, Oct. 10, 2007, http://www.theglobeandmail.com/servlet/story/RTGAM.20071010.wethanol1010/BNStory/Science/home (based on National Research Council report).

6. States in which the most substantial expansions are occurring include Iowa, Minnesota, Indiana, Ohio, and Illinois. RENEWABLE FUELS ASS'N, CHANGING THE CLIMATE: ETHANOL INDUSTRY OUTLOOK 2008 5 (2008), http://www.ethanolrfa.org/objects/pdf/outlook/RFA_Outlook_2008.pdf.

could provide the impetus for much-needed reform in our current water law systems.

This Note explores the possible conflicts over water quantity and water quality that are likely to arise as more biorefineries are built and more lands are devoted to growing fuel crops. It considers the problems farmers and biofuel producers will encounter as they expand their activities. It also considers the plight of other water users, particularly small-scale water users living in rural towns and cities, who legitimately view the biofuel boom as a danger to their current activities and future prospects. Finally, this Note considers biofuel expansion from the perspective of conservation interests—concerns about its effects on water tables, aquatic life, and public uses of lakes and rivers. From all of these perspectives, current water law is deficient and in great need of change.

Some of the change needed could occur through relatively modest revisions in the terms and enforcement of current law. Other needed change would entail more significant revisions, if not a full reformulation of how water is allocated and water-use disputes are resolved. Wide-ranging change is likely to occur only if American society understands its water systems in more ecological ways and if it recognizes how human welfare ultimately depends on well-functioning hydrologic systems. Therefore, significant legal change is likely to depend upon significant cultural change.

Part II of this Note provides an overview of the integral role that water plays in the biofuel production process. It also introduces the basic principles of water law that govern both water quantity and water quality. Part III examines the types of water conflicts that might arise between and among existing local water users and the biofuel industry, specifically the biorefineries and farmers. As it explores these conflicts, Part III illustrates the inadequacies of current water law, particularly the reasonable use rules of riparian rights and groundwater law, as well as the applicable pollution-control provisions of the Federal Clean Water Act. Part IV identifies possibilities for improving current water law to promote the highest and best uses of water flows and to facilitate water planning, while also keeping water systems ecologically sound for future generations.

II. BACKGROUND

The connection between biofuels and water law may appear tenuous upon initial consideration. Because of water's vital role in producing biofuels, however, the biofuel industry will inevitably confront various water laws. To foster a better understanding of the extent to which the biofuel industry consumes water and how water laws might apply to limit this water use, Section A of this Part explains what biofuels are and how they are produced. It focuses on how water is used within the bio-

fuel production process and on the amount of water required to support biorefineries and crop growers. Section B reviews the fundamental elements of the laws governing water use, including the riparian rights doctrine for surface water and the reasonable use rule for groundwater allocation. It also reviews the most relevant provisions of the Federal Clean Water Act that govern water quality. Finally, Section C stresses the gravity of the problem that a growing biofuel industry presents by discussing potential water crises that are looming in all areas of the United States.

A. Biofuel Basics: Producing the Fuel and the Crops That Provide It

Biofuels are liquid fuels used for transportation purposes.[7] They can power cars, trucks, buses, snowmobiles, and even commercial aircraft.[8] Biofuels have gained social prominence in the United States because they are created from renewable sources and thus make possible a transition away from nonrenewable fossil fuels.[9]

Biofuels are derived from biomass, biological materials taken from a wide variety of sources including corn, soybeans, woody crops such as poplar and willow, perennial grasses like switchgrass, and even algae, vegetable oil, and municipal waste.[10] The various types of biofuel include ethanol, biodiesel, and methanol.[11] Ethanol is made from corn or from cellulosic waste materials, such as corn stalks or wheat straw.[12] Though production of biodiesel from soybeans is increasing,[13] the main biofuel currently produced in the United States is corn-based ethanol.[14] Because of the dominance of corn-based ethanol in the U.S. biofuel market, the duration of this Note will focus solely on this form of biofuel.

7. *See* NRC, IMPLICATIONS, *supra* note 5, at 1.

8. *Virgin Atlantic Flies Biofuel Jet*, USA TODAY.COM, Feb. 24, 2008, http://www.usatoday.com/travel/flights/2008-02-24-biofueljet_N.htm; Renewable Fuels Ass'n, Ethanol Facts: Engine Performance, http://www.ethanolrfa.org/resource/facts/engine/ (last visited Feb. 14, 2009).

9. NRC, IMPLICATIONS, *supra* note 5, at 7.

10. *Id.*; *see also* RANDY SCHNEPF, AGRICULTURE-BASED RENEWABLE ENERGY PRODUCTION CRS-4 (2005), http://www.ncseonline.org/NLE/CRSreports/05Jan/RL32712.pdf.

11. SCHNEPF, *supra* note 10, at CRS-4. Biodiesel can be made from animal fat or vegetable oil, such as soybean oil. *Id.* at CRS-15.

12. NRC, IMPLICATIONS, *supra* note 5, at 13; SCHNEPF, *supra* note 10, at CRS-5 to -6, CRS-11. Cellulosic ethanol, or ethanol that is made from cellulosic materials, is currently in its infancy. It is not yet produced on a large scale, with production occurring only in pilot plants at present. Therefore, not much is known about the potential environmental effects of large scale, nationwide cellulosic ethanol production. NRC, IMPLICATIONS, *supra* note 5, at 7, 11–13.

13. As of February 2009, Biodiesel Magazine lists thirteen new biodiesel plants under construction in the United States. Biodiesel Magazine, Plant List (Under Construction), http://www.biodieselmagazine.com/plant-list.jsp?country=USA&view=construction (last visited Feb. 14, 2009).

14. COMM. ON WATER IMPLICATIONS OF BIOFUELS PROD. IN U.S., NAT'L RES. COUNCIL, REPORT IN BRIEF: WATER IMPLICATIONS OF BIOFUELS PRODUCTION IN THE UNITED STATES 1 (2007), *available at* http://dels.nas.edu/dels/rpt_briefs/biofuels_brief_final.pdf [hereinafter NRC, REPORT IN BRIEF].

In 2006, the United States produced 4.9 billion gallons of corn-based ethanol.[15] The Bush Administration subsequently called for ethanol production to reach 35 billion gallons by 2017 and 60 billion gallons by 2030.[16] These goals have set the stage for substantial growth in the ethanol industry, which is comprised of two main components—biorefineries and biomass.[17]

1. Biorefineries: The Conversion of Crops to Fuel

To meet the demand for increased ethanol output, the ethanol industry is rapidly expanding the number of biorefineries in operation. As of January 2008, there were between 130 and 140 ethanol plants located in the United States, and sixty-one refineries under construction or expanding.[18] The majority of existing, as well as newly constructed, ethanol biorefineries are located in rural areas of largely agricultural midwestern states, including Iowa, Nebraska, Minnesota, Illinois, and Indiana.[19]

Biorefineries make corn ethanol in a multistep process that converts the starch in corn into sugars and the sugars into ethanol.[20] Water is an essential element flowing in and out of the production process; it is used for extracting ethanol from the corn, as well as for heating and cooling.[21] The water evaporated in drying stillage, or leftover solids, and the steam emitted through the cooling towers are both consumptive uses of water that prevent water from returning to the watershed from which it was originally taken.[22] Waste water created during the ethanol production process consists of brine effluent, or salt discharge, which is produced

15. NRC, IMPLICATIONS, *supra* note 5, at 9.

16. President George W. Bush, State of the Union Address (Jan. 23, 2007), *available at* http://www.americanrhetoric.com/speeches/stateoftheunion2007.htm; *see also* NRC, REPORT IN BRIEF, *supra* note 14, at 1; Schoen, *supra* note 3.

17. NRC, IMPLICATIONS, *supra* note 5, at 13–15, 19–23.

18. *See* RENEWABLE FUELS ASS'N, *supra* note 6, at 2–3.

19. *See id.*; *see also* Renewable Fuels Ass'n, Biorefinery Locations, http://www.ethanolrfa.org/industry/locations/ (last visited Feb. 14, 2009) (showing locations of both existing biorefineries and those under construction).

20. The corn is mixed with water early on to create a mash, which forms the base for the remaining steps of the process. This mash is combined with enzymes and cooked to break down the starch into sugars. It is then cooled, transferred to fermenters, and mixed with yeast to produce ethanol and carbon dioxide. After fermentation, the alcohol-ethanol mixture is transferred to distillers where the ethanol is separated from the leftover solids, or "stillage." The stillage is processed and sold for other uses including livestock feed. The remaining ethanol is dehydrated to produce pure ethanol, mixed with a denaturant, or substance that will render it undrinkable, such as gasoline, and finally shipped out. *See, e.g.*, NRC, IMPLICATIONS, *supra* note 5, at 13–14; Renewable Fuels Ass'n, *How Ethanol Is Made*, http://www.ethanolrfa.org/resource/made/ (last visited Feb. 14, 2009).

For a "tour" of an ethanol plant and a step-by-step view of the ethanol-making process, see Am. Coal. for Ethanol, The Dry Mill Ethanol Process: A Step-by-Step Interactive Tour, http://www.ethanol.org/index.php?id=73&parentid=73 (last visited Feb. 14, 2009).

21. NRC, IMPLICATIONS, *supra* note 5, at 13.

22. *Id.* at 14.

when cooling towers are cleaned out and when water is purified for use in the production process.[23]

Effluent from processing stillage and distillers' grains is high in biochemical oxygen demand (BOD), which consumes large amounts of oxygen from water while it decomposes and robs other aquatic life of the oxygen it needs to live.[24] Effluent from biorefineries also tends to be warm, and heat, which is considered a pollutant under the Clean Water Act,[25] can be detrimental to river and stream inhabitants by reducing the water's capacity to absorb oxygen.[26]

Biorefineries currently consume about four gallons of water for every one gallon of ethanol produced.[27] To put this in perspective, a plant that produces 100 million gallons of ethanol per year would consume about 1.1 million gallons of water per day from local surface or groundwater sources.[28] This level of water consumption is equivalent to the daily water supply for a town of five thousand people.[29] Such consumption has the potential to substantially alter local, and even regional, water supplies, because the primary impact of a biorefinery's water use will be felt in the areas surrounding the plant's location.[30] With such sizable demands on local water supplies, new biorefineries could cause a veritable crisis as construction expands into the more arid western states, such as California and New Mexico, that are already experiencing severe water shortages.[31]

2. Feedstock: Producing Crops to Meet a Growing Demand

Increased ethanol production will inevitably require increased crop production. Presently, one bushel of corn produces 2.7 gallons of ethanol,[32] and one acre of corn produces about five hundred gallons of etha-

23. *Id.* at 51.

24. *Id.*; *see also* William L. Andreen, *Water Quality Today: Has the Clean Water Act Been a Success?*, 55 ALA. L. REV. 537, 555–56 (2004).

25. 33 U.S.C. § 1362(6) (2006) (defining "pollutant" as including "chemical wastes, biological materials, radioactive materials, [and] heat").

26. RAPHAEL G. KAZMANN, MODERN HYDROLOGY 130–31 (2d ed. 1972); *see also* Andreen, *supra* note 24, at 560–61.

27. NRC, IMPLICATIONS, *supra* note 5, at 46. *But see* NAT'L CORN GROWERS ASS'N, TRUTHS ABOUT WATER USE, CORN AND ETHANOL 1 (2007), http://www.ncga.com/files/GetTheFactsOnWaterUse.pdf (stating that ethanol production requires three gallons of water per gallon of ethanol). It must be noted that due to the development of more advanced technology, the water requirements of biorefineries are decreasing as efficiency of use increases. NRC, IMPLICATIONS, *supra* note 5, at 45–46.

28. NRC, IMPLICATIONS, *supra* note 5, at 46.

29. *Id.* at 51.

30. *See id.*

31. RENEWABLE FUELS ASS'N, *supra* note 3, at 2. The Ogallala aquifer is already overtapped and the water levels have decreased dramatically. NRC, IMPLICATIONS, *supra* note 5, at 19. As for surface water, Colorado river reservoirs are at their lowest levels in forty years. *Id.*

32. NRC, IMPLICATIONS, *supra* note 5, at 51. *But see* Iowa Renewable Fuels Ass'n, Ethanol Facts, http://www.iowarfa.org/ethanol_facts.php (last visited Feb. 14, 2009) (stating that one bushel of corn produces 2.8 gallons of ethanol).

nol.[33] To meet the goal of adding 30 billion more gallons of ethanol to the United States's total output, the country's farmers will need to drastically increase crop production.[34] To grow these additional crops, farmers will convert existing fields to biomass production, which means fields used to grow soybeans will be converted to corn production.[35] Fallow cropland and pasture will be tilled and planted with additional biomass crops, and fields currently part of conservation reserve programs will be withdrawn from conservation and put into crop production, stimulating the full array of environmental harms that croplands typically produce, including soil erosion, loss of wildlife habitat, chemical runoff, and distorted water flows.[36]

Crops consume water in two ways: by using water for growth and by giving off water through transpiration, a process by which a plant's leaves release water into the atmosphere.[37] This water is not returned to the local water source.[38] One acre of corn can emit three to four thousand gallons of water per day.[39] Crops can be either irrigated or rain-fed;[40] most crops in the Midwest are rain-fed, though irrigation is not unheard of.[41] When crops are irrigated, farmers draw the water from surface or groundwater sources, depending on the availability of sources in a particular region.[42] Rain-fed crops will have a less significant impact on local water sources than irrigated crops because rain-fed crops take water as it enters an area's water system rather than drawing it from existing water sources.[43]

By converting land into new cornfields, farmers will alter the functioning of the water sources in the areas surrounding those new cornfields. "[C]hanges in one part of the agricultural water cycle . . . due to

33. Multiplying the average number of gallons of ethanol produced per bushel of corn (2.7) by the average number of bushels of corn per acre (175) yields 472.5 gallons of ethanol produced per acre of corn. *See* IOWA CORN, *supra* note 2.

34. The entire 2004 corn crop would produce only about 20.3 billion gasoline equivalent gallons of ethanol. SCHNEPF, *supra* note 10, at CRS-9. In 2004, slightly more than 73 million acres of corn were raised. *Id.* It would take approximately 140 million acres, however, to produce enough ethanol to substitute for 50 percent of the United States' gasoline imports, which constitutes only 27 percent of the total gasoline consumption in the United States as of 2004. *Id.*; *see also* NRC, REPORT IN BRIEF, *supra* note 14, at 2.

35. NRC, IMPLICATIONS, *supra* note 5, at 19.

36. *Id.* at 30, 33; *see also* Schoen, *supra* note 3 ("We think there is also another 20 to 30 million acres that could be put into production that would provide enough corn for another 15 billion gallons . . . .").

37. NRC, IMPLICATIONS, *supra* note 5, at 11–13.

38. *Id.* at 12. By not returning to the local water source, that amount of water is no longer available for use in the particular region from which it was consumed, thereby limiting the amount of water available for other uses. Most water, however, returns to the local water source through evaporation from the soil, runoff, and seepage into underground aquifers. *Id.*

39. NRC, IMPLICATIONS, *supra* note 5, at 12. In contrast, a single oak tree can give off approximately 40,000 gallons of water per year. *Id.*

40. *Id.* at 11.

41. *Id.* at 12.

42. *Id.* at 11–12.

43. *See id.*

conversion of one type of vegetation or management practice to another will have inevitable impacts—for better or for worse—on the groundwater resource base and streamflow."[44] Therefore, increasing the number of acres devoted to growing corn would result in more water loss through the process of evaporation and transpiration, or evapotranspiration, in a region. As a result, less rainwater would be available to recharge streams and aquifers, thus lowering their levels.

Water requirements for the same crop vary by region across the United States due to regional differences in rainfall amounts and other climactic conditions.[45] For instance, corn generally requires less water than soybeans in the West, but in the Midwest, corn requires *more* water than soybeans.[46] As a result, the impact on the local water supply will depend on the type of crop that is replaced and the biofuel crop replacing it. If a less thirsty crop, such as soybeans, is replaced by a thirstier crop, such as corn, more water will be consumed from the local water supply.[47] The same effect will occur if the less thirsty prairie grasses in fallow fields and conservation lands are replaced by thirstier corn crops.[48] In short, water sources can decline even when farmers do not irrigate.

The amount of water used to produce corn for ethanol is much higher than that used to produce the ethanol itself. One bushel of corn requires anywhere from 2,100 to 3,900 gallons of water per bushel, which translates into approximately 778 to 1,445 gallons of water per one gallon of ethanol,[49] or nearly 600,000 gallons per acre per year.[50] With millions of additional acres of corn needed to meet increased demand, expanded crop production has the potential to extensively impact local and regional water supplies.[51]

An increase in crop production, which includes cultivating fallow land and converting existing crops into corn, will also have a marked impact on water quality. Industrial farm methods make extensive use of chemical fertilizers—mostly anhydrous ammonia, herbicides, and other pesticides.[52] Chemical usage rates vary considerably among crops and locales, as do the rates at which these chemicals exit farm fields and enter water supplies.[53] Standard methods used to grow corn are particularly chemically intensive.[54] Nitrogen, an especially important fertilizer for

44. *Id.* at 23.
45. *Id.* at 21.
46. *Id.* at 20–21.
47. *Id.* at 21.
48. *Id.*
49. *Id.* at 51.
50. Note that millions of acres of corn are necessary to meet output demands, though the majority of these acres will be rain-fed as opposed to irrigated. *Id.*
51. *Id.* at 51 ("[I]rrigated agriculture can generate regional-scale problems. If, however, the agriculture is rainfed, water for the biorefinery may be the primary source of groundwater or surface water extraction in the area.").
52. *See id.* at 27.
53. *Id.*
54. *See id.*

corn, is converted into nitrate in the soil through the process of nitrification.[55] Nitrate is extremely soluble and seeps into groundwater sources, including wells used for drinking water.[56] It also enters surface waters through runoff or through the soil.[57]

Increased use of chemical fertilizers will invariably increase the amount of fertilizers that enter streams and rivers through surface water runoff.[58] Like the effluent from stillage and distillers' grains, fertilizers increase the BOD in water and deprive aquatic life of oxygen.[59] Nutrient loading already generates substantial harms, including, in the case of midwestern agriculture, the hypoxic, or "dead zone," in the Gulf of Mexico. The "dead zone" is an area covering thousands of square miles in which no living thing can survive due to the extremely low oxygen levels created by runoff entering the Mississippi River and flowing into the Gulf.[60] The "dead zone" provides an extreme example of the damage that fertilizers can cause when they enter our streams and rivers.

An increase in the acreage of land used for biomass production will also result in increased soil erosion and sedimentation of rivers.[61] Converting land from conservation reserve programs to crop land will add substantially to the further sedimentation of rivers because the lands in reserve are generally more prone to erosion.[62] In reserve, these lands actually help to reduce water pollution by filtering out pollutants and slowing the speed with which runoff enters rivers.[63] When put into production, however, these lands will not only unleash the pollutants they previously filtered out, but they will also add to pollution as new sources of fertilizer, pesticide, and soil runoff.[64] Sediment clogs streams, fills reservoirs, and worsens the habitat value of aquatic systems.[65] From the point of view of the farmer, erosion represents a loss of valuable fertility.[66] In sum, the biofuel industry is poised to generate substantial environmental harms, particularly harms to the quantity and quality of water sources on local, national, and global scales.

55. *See id.*; ROBERT E. RICKLEFS, THE ECONOMY OF NATURE 151–53 (5th ed. 2007).

56. *See* NCR, IMPLICATIONS, *supra* note 5, at 27.

57. *Id.* For a further description of the characteristics of nitrogen as a fertilizer and the problems it poses, see Margaret Rosso Grossman, *Nitrates from Agriculture in Europe: The EC Nitrates Directive and Its Implementation in England*, 27 B.C. ENVTL. AFF. L. REV. 567, 571–73 (2000).

58. NRC, IMPLICATIONS, *supra* note 5, at 27, 29–30; Grossman, *supra* note 57, at 571–73.

59. NRC, IMPLICATIONS, *supra* note 5, at 30; Grossman, *supra* note 57, at 579–81.

60. NRC, IMPLICATIONS, *supra* note 5, at 30; Grossman, *supra* note 57, at 579–81.

61. NRC, IMPLICATIONS, *supra* note 5, at 30.

62. *Id.*

63. *Id.*; *see also* FARM SERV. AGENCY, USDA, CONSERVATION RESERVE PROGRAM: SUMMARY AND ENROLLMENT STATISTICS FY 2006 5–6 (2007), http://www.fsa.usda.gov/Internet/FSA_File/06rpt.pdf.

64. NRC, IMPLICATIONS, *supra* note 5, at 27, 30.

65. *Id.* at 30.

66. *Id.*

B. Awash with Variation: The Fundamental Principles of Water Law

Water use in the United States is governed by an assortment of use rights and limitations pertaining to surface water, groundwater, and water pollution.[67] Some laws vary by state; others are federally mandated and thus more uniform among the states.[68] In general, the various laws address the amount of water that can be used, where and how water can be used, and how much pollution can be dumped into the water.[69] Before turning to these bodies of law, Section 1 considers the hydrologic cycle and how rivers, streams, and aquifers operate physically. Section 2 relates the basic principles governing permissible uses of surface water and groundwater, and Section 3 explains the fundamental elements of the Federal Clean Water Act.

1. The Hydrologic Cycle: Recognizing the Interconnectedness of Surface Water and Groundwater

All water sources are interconnected via the "hydrologic cycle," the process by which water moves from the atmosphere to the earth and back to the atmosphere through precipitation and evaporation.[70] Each source of water, such as surface water, groundwater, or precipitation, constitutes just one point within this endless cycle.[71] Through this cycle, groundwater levels impact surface water levels and vice versa. For example, overpumping an aquifer can lower the water table level, which in turn can reduce levels of water in streams and rivers because underlying groundwater supports water flow in many streams and rivers.[72] Also, reduced surface water levels allow less water to enter the ground, impeding aquifer recharge.[73] Ultimately, this process of systematically depleting water levels depicts a hydrologic cycle that has fallen out of balance, with

67. RICHARD R. POWELL, POWELL ON REAL PROPERTY § 65.02[2] (Michael Allan Wolf ed., 2008).

68. *See id.* § 65.02[1].

69. *See id.* § 65.03[1].

70. KAZMANN, *supra* note 26, at 3–4; *see also* ROBERT GLENNON, WATER FOLLIES: GROUNDWATER PUMPING AND THE FATE OF AMERICA'S FRESH WATERS 40 (2002) (diagram of the hydrological cycle); Teresa N. Lukas, *When the Well Runs Dry: A Proposal for Change in the Common Law of Ground Water Rights in Massachusetts*, 10 B.C. ENVTL. AFF. L. REV. 445, 448–49 (1982).

71. A. DAN TARLOCK, LAW OF WATER RIGHTS AND RESOURCES § 2.1 (Lisa A. Feining ed., 2007).

72. GLENNON, *supra* note 70, at 35–50; *see also* KAZMANN, *supra* note 26, at 170–77; Lukas, *supra* note 70, at 450.

73. KAZMANN, *supra* note 26, at 170–72; *accord* Wendy B. Davis, *Reasonable Use Has Become the Common Enemy: An Overview of the Standards Applied to Diffused Surface Water and the Resulting Depletion of Aquifers*, 9 ALB. L. ENVTL. OUTLOOK J. 1, 1–8 (2004). Rainwater that flows over the ground is termed "diffuse surface waters." Diffuse surface waters also include melted snow and springs. Pavement and buildings both divert diffuse surface water from its natural path as it flows over the ground and prevent it from entering the ground. Gutters and sewers collect diffuse surface waters and inhibit their otherwise slow seepage into the ground by speeding them toward creeks and rivers, contributing to floods along the way. *Id.*

water flowing out at a faster rate than it flows in.[74] In many parts of the country, humans have altered the hydrologic cycle materially through their water use practices.[75] Water tables in many aquifers are lower than they were decades ago and continue to decline.[76] Water flows in rivers are much lower than they have been historically.[77] Meanwhile, human actions have increased water runoff in many areas, causing or exacerbating floods.[78]

Despite the very real interconnection between surface water and groundwater, the law addresses each source separately.[79] This separation initially arose due to a lack of scientific understanding regarding the nature of groundwater.[80] Today, scientific knowledge about aquifers has greatly advanced; groundwater is no longer the mystery it once was.[81] The law, though, has been slow to evolve beyond its established policy of separate treatment.[82] Therefore, it remains necessary to discuss surface water and groundwater separately in this Note.

2. Water Quantity: Legal Principles Pertaining to Surface Water and Groundwater Consumption

The allocation of surface water and groundwater rights varies by state. Regarding surface water, the midwestern and eastern states, which have more plentiful water supplies, follow the riparian rights doctrine, whereas the more arid western states follow the doctrine of prior appropriation.[83] This Note focuses on the riparian rights doctrine because it is applied in a majority of the primary biofuel producing states.[84] Allocation methods for groundwater rights are less clearly discernable than for surface water rights. The main biofuel producing states all embrace a version of the reasonable use rule, which is considered here.[85] Increasingly, the reasonable use rule is incorporated into state groundwater

74. GLENNON, *supra* note 70, at 35–50 (describing in more specific terms the depletion of water sources).

75. *See id.* at 44–50 (describing how groundwater pumping affects the hydrologic cycle).

76. *See id.* at 46.

77. *Id.*

78. *See* Maria Newman, *New Jersey Moves to Restrict Building Near Waterways*, N.Y. TIMES, Jan. 6, 2004, at B5 (noting the connection between urban development and flooding).

79. POWELL, *supra* note 67, § 65.01[1][a]; TARLOCK, *supra* note 71, § 2.4; Christine A. Klein, *On Integrity: Some Considerations for Water Law*, 56 ALA. L. REV. 1009, 1059 (2005).

80. Klein, *supra* note 79, at 1059–60. Until the beginning of the twentieth century, the depths of groundwater hydrology had not been explored. Groundwater was viewed, at least by courts, as an enigma, a water source with indeterminate boundaries. With scientific and technological developments, groundwater has shed its cloak of mystery as its depths have been calculated and surveyed, though courts have neglected to keep pace with such developments. *Id.*

81. *Id.* at 1061.

82. POWELL, *supra* note 67, § 65.01[1][a].

83. *Id.* § 65.04[1].

84. Among these states are Illinois, Indiana, Iowa, and Minnesota. RENEWABLE FUELS ASS'N, *supra* note 6, at 4.

85. POWELL, *supra* note 67, § 65.06[4][b].

codes with varying degrees of complexity.[86] A small number of states apply the correlative rights approach, which is essentially a variation on reasonable use, or adhere to the older "absolute ownership" approach.[87] Several of the midwestern biofuel boom states have adopted statutes providing for a nearly comprehensive regulatory system to govern the allocation and management of all water resources within the state; such a system is often referred to as "regulated riparianism" and is considered at the close of this Section.

a. Surface Water: Riparian Rights and the Rule of Reasonable Use

Riparian rights are water rights based on one's ownership of land that physically touches or is bounded by a water course, such as a stream, river, or lake.[88] According to this doctrine, the ownership of the land parcel implicitly carries with it the right to make use of the adjacent waterway, and only landowners have consumptive water rights.[89] Limits on water use under the riparian rights doctrine can be rooted in common law, state statutes, the Restatement (Second) of Torts, or a combination of these sources.[90]

The riparian rights doctrine places limits on where an owner of riparian land can use the water. Originally, the doctrine allowed for water use only on the riparian tract, or the particular land parcel that directly touches the water.[91] Finding this rule overly restrictive, many states have modified it to enable water use off the riparian tract provided the use does not harm any other riparian users.[92] This modification expands possible uses but means that off-tract water uses are precarious; at any time a new downstream riparian use could begin, and the new user could challenge the upstream off-tract uses.[93] Recognizing this problem, some states have further relaxed the place-of-use rule either by statute or by judicial ruling.[94] In these states, off-tract uses have become permissible provided the uses are reasonable.[95]

86. *Id.*

87. *Id.* § 65.04[1].

88. *Id.*; TARLOCK, *supra* note 71, § 3.8.

89. Joseph W. Dellapenna, *Introduction to Riparian Rights*, *in* WATER AND WATER RIGHTS § 6.01(a)(1), at 6-8 to -9 (Robert E. Beck & Amy K. Kelly eds., 2007).

90. *See* TARLOCK, *supra* note 71, §§ 3.60, 3.69, 3.89.

91. *See id.* § 3.8; Joseph W. Dellapenna, *The Right to Consume Water Under "Pure" Riparian Rights*, *in* WATERS AND WATER RIGHTS, *supra* note 89, § 7.02(a), at 7-18 [hereinafter Dellapenna, *Consumer Rights*].

92. TARLOCK, *supra* note 71, §§ 3.50–.51; *see also* Elliot v. Fitchburg R.R., 64 Mass. (10 Cush.) 191 (1852) (permitting use of the riparian tract to allow a nonriparian use by a railroad that was diverting water from the stream to obtain water for its steam engines).

93. *See* Stratton v. Mt. Hermon Boys' Sch., 103 N.E. 87, 88 (Mass. 1913).

94. *See, e.g.*, Price v. High Shoals Mfg. Co., 64 S.E. 87, 88 (Ga. 1909).

95. *See, e.g.*, Pyle v. Gilbert, 265 S.E.2d 584, 586 (Ga. 1980) (holding that off-tract uses were permissible provided the uses were reasonable).

The common law of riparian rights also requires that all riparian water uses take place within the original watershed, or the expanse of land that drains into a particular watercourse.[96] Courts developed this in-watershed restriction to protect downstream riparian landowners who depend on the return flow from other in-watershed water uses to sustain the flow of the original watercourse.[97] The in-watershed restriction, however, is currently being eroded. In recent decades, lawmakers have relaxed this place-of-use limit through statutes to facilitate valuable water uses elsewhere.[98] The reformulation of riparian rights set forth in the Restatement (Second) of Torts dispenses with the in-watershed requirement because such a rule restricts development and prevents otherwise reasonable uses of water.[99] Several states provide permits for water uses outside of the watershed.[100] Some states expressly allow cities to transport water from one watershed to another.[101] These new rules allow a greater range of water uses to take place, but at the same time they increase competition for water and increase the chance that a water use by one person will harm downstream water users and degrade a stream's ecological functioning.[102]

The riparian rights doctrine also limits *how* riparian landowners can use water. This limitation is embodied in the reasonable use rule,[103] which provides that a riparian owner can use the water for any lawful purpose as long as the use is reasonable given all circumstances, includ-

96. POWELL, *supra* note 67, § 65.06[2][d]; *see also Stratton*, 103 N.E. at 88 ("[U]se by a riparian owner . . . must be within the watershed of the stream . . . . This is implied in the term 'riparian' . . . . A brook or river . . . is inseparably connected with its watershed and owes the volume of current to its area."). This restriction is based on the conception that water taken outside the watershed of the original water course will not return to the original water course but will flow into the watercourse supported by the watershed in which the use occurred. POWELL, *supra* note 67, § 65.06[2][d].

97. POWELL, *supra* note 67, § 65.06[2][d]; *see also Stratton*, 103 N.E. at 88 (explaining that diversion of a water course "defeats the reasonable and natural expectations of the owners lower down" on the water course).

98. Dellapenna, *Consumer Rights*, *supra* note 91, § 7.02(a)(2).

99. RESTATEMENT (SECOND) OF TORTS § 855 cmt. b (1979).

100. *See, e.g.*, 615 ILL. COMP. STAT. 5/18 (2006) (providing for permits for any individual or industrial diversion of water from a public water source for nonriparian use).

101. North Carolina v. Hudson, 731 F. Supp. 1261, 1273 (E.D.N.C. 1990).

102. Dellapenna, *Consumer Rights*, *supra* note 91, § 7.02(a)(2), at 7-31 to -32.

103. POWELL, *supra* note 67, § 65.06[4][a]; TARLOCK, *supra* note 71, § 3.60; Dellapenna, *Consumer Rights*, *supra* note 91, § 7.02(d), at 7-48 to -50. The reasonable use rule developed out of the natural flow theory, which provided that a riparian landowner could use the water for "domestic uses" such as drinking, bathing, cooking or livestock, but any other uses could not disrupt a watercourse's natural, undiminished flow. In an effort to establish a more flexible standard that allowed for more intensive industrial water uses, courts developed the reasonable use rule. *See* ERIC T. FREYFOGLE, NATURAL RESOURCES LAW: PRIVATE RIGHTS AND COLLECTIVE GOVERNANCE 118–19 (2007); POWELL, *supra* note 67, § 65.06[4][a]; TARLOCK, *supra* note 71, §§ 3.55, 3.58. *Merritt v. Parker*, an early New Jersey decision, applied the natural flow theory and clearly set forth its basic principles: "*Aqua currit, et debet currere*, is the language of the law. The water flows in its natural channel, and ought always to be permitted to run there, so that all, through whose land it pursues its natural course, may continue to enjoy the privilege of using it for their own purposes." 1 N.J.L. 526, 530 (Sup. Ct. 1795).

ing the effects on competing water users.[104] To determine whether a use is reasonable, courts generally balance the benefit of the contested water use with the injury to other riparian owners, taking into account the relative efficiency of water uses and any possibilities for reducing the conflict by changing practices.[105]

The Restatement (Second) of Torts provides a standardized reasonable use rule, along with a detailed analytical process for determining the reasonableness of a water use.[106] According to the Restatement, the factors that courts should consider when determining reasonableness include, among others, "suitability of the use to the watercourse or lake," "economic value of the use," "social value of the use," and "the practicality of avoiding the harm by adjusting the use or method of use of one proprietor or the other."[107] This determination is broadly based and incorporates the interests of the riparian whose use is contested, the interests of any riparian user that is harmed, and the interests of society.[108]

Nearly all states have established some type of codification for their water allocation and use rights systems, some far more extensive than others.[109] The basic rule of reasonable use continues to govern in conjunction with these statutory systems.[110] Within these statutory systems, many states have established permit requirements by which they regulate water right allocation.[111] At common law, riparian rights did not vary

104. Justice Shaw relied on the reasonable use rule in *Elliot v. Fitchburg Railroad*, a case upholding a diversion of water by a railroad company. He stated in the opinion that

> each proprietor has a right to a just and reasonable use of [flowing water], as it passes through his land; and so long as it is not wholly obstructed or diverted, or no larger appropriation of the water running through it is made than a just and reasonable use, it cannot be said to be wrongful or injurious to a proprietor lower down.

64 Mass. (10 Cush.) 191, 193 (1852). The more contemporary Georgia case *Pyle v. Gilbert* also provides a clear explanation of the reasonable use rule: "Each riparian proprietor is entitled to a reasonable use of the water, for domestic, agricultural and manufacturing purposes; provided, that in making such use, he does not work a material injury to the other proprietors." 265 S.E.2d 584, 586 (Ga. 1980) (quoting Hendrick v. Cook, 4 Ga. 241, 245 (1848)); *see also* POWELL, *supra* note 67, § 65.06[4][b]; TARLOCK, *supra* note 71, § 3.60.

105. POWELL, *supra* note 67, § 65.06[4][b] (listing the variety of factors courts consider in determining reasonableness); TARLOCK, *supra* note 71, § 3.60; *see also* Mich. Citizens for Water Conservation v. Nestle Waters N. Am., Inc., 709 N.W.2d 174, 194–95 (Mich. Ct. App. 2005), *aff'd in part, rev'd in part*, 737 N.W.2d 447 (Mich. 2007); Thompson v. Enz, 154 N.W.2d 473, 484 (Mich. 1967) ("[I]n determining whether a use is reasonable we must consider what the use is for . . . the extent of the injury to the one proprietor and of the benefit to the other." (quoting People v. Hulbert, 91 N.W. 211, 217 (1902))); Matthew N. Miller, Case Note, Spear T Ranch, Inc. v. Knaub *and the Pitfalls of Litigious Water Management*, 60 ARK. L. REV. 591, 599, 603 (2007) (stating that a determination of reasonableness for surface waters entails balancing between uses, whereas groundwater makes a reasonableness determination in the abstract).

106. RESTATEMENT (SECOND) OF TORTS §§ 850–850A (1979).

107. *Id.*; *see also Pyle*, 265 S.E.2d at 589 ("The Restatement relies on two principles: that riparian rights are property rights and as such could normally be transferred, and that water law should be utilitarian and allow the best use of the water.").

108. RESTATEMENT (SECOND) OF TORTS § 850 cmt. b.

109. 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, 11 (2002).

110. Dellapenna, *supra* note 109, at 12.

111. POWELL, *supra* note 67, § 65.06 nn.6–7.

based on the date when a riparian owner initiated a use.[112] The shift toward permit schemes has indirectly affected this rule by emphasizing priority in time when various water uses clash; when two water uses are both reasonable, the one earlier in time is likely to gain protection.[113]

b. Groundwater: The Many Methods of Regulation

Groundwater provides 51 percent of all drinking water for the total population of the United States.[114] It supplies 99 percent of all drinking water for the rural population of the United States.[115] Our dependence on groundwater highlights the significance of the doctrines governing its use. As in the case of surface water, it is beneficial to begin with a brief overview of groundwater hydrology to facilitate a more thorough understanding of the legal principles governing groundwater use rights.

Groundwater is held in aquifers, or underground formations of permeable material such as rock or clay.[116] Permeability reflects the ease with which water can be transmitted through the miniscule spaces in a particular material.[117] Precipitation replenishes aquifers as it penetrates the earth's surface and percolates through rock or soil by the force of gravity.[118] The water slowly percolates into the "zone of saturation," the level at which the soil or rock is completely saturated with water.[119] The top level of this "zone" is referred to as the water table.[120] When the water table lies below the bottom of a stream, the stream can also recharge the aquifer.[121] An aquifer stores significantly more water than the amount that replenishes it each year.[122] Therefore, a maximum with-

112. *Id.* at 11.

113. Joseph W. Dellapenna, *Regulated Riparianism*, *in* WATERS AND WATER RIGHTS, *supra* note 89, § 9.03(b)(3) [hereinafter Dellapenna, *Regulated Riparianism*].

114. Groundwater Found., How Much Do We Depend on Groundwater?, http://www.groundwater.org/gi/depend.html (last visited Feb. 14, 2009) (citing statistics from 2005 United States Geological Survey).

115. *Id.*

116. KAZMANN, *supra* note 26, at 158; *see also* Lukas, *supra* note 70, at 449; GROUNDWATER FOUND., GROUNDWATER BASICS (2007), http://www.groundwater.org/gi/docs/GWBASICS2.pdf. *Higday v. Nickolaus* provides a less scientific but very tangible illustration of an aquifer: "[S]trata of porous rock, gravel and soil through which water, without apparent or definite channel, filtrates, oozes and percolates as it falls. This water . . . has been trapped by an underlying stratum of impervious limestone so that the saturated soil has become a huge aquifer or underground reservoir." 469 S.W.2d 859, 861 (Mo. Ct. App. 1971).

117. KAZMANN, *supra* note 26, at 163–68. Permeability varies depending on the type of rock, sandstone and limestone yielding the highest amounts of water to wells and silts and clay yielding the least. *Id.*

118. *Id.* at 167; Lukas, *supra* note 70, at 449.

119. *See* KAZMANN, *supra* note 26, at 167.

120. *Id.*; Lukas, *supra* note 70, at 449. Beneath the zone of saturation lies a layer of impermeable rock or clay that holds the water in place. *Id.*

121. KAZMANN, *supra* note 26, at 167–68. Such streams are called "influent streams" and are generally located in arid regions. In more humid regions, most streams are "effluent streams" and are fed water from underlying aquifers. Still, naturally effluent streams can become influent streams if the water table is lowered by pumping of groundwater. *Id.*

122. *Id.* at 304.

drawal rate, or safe yield, must be established to prevent depletion of aquifers through withdrawal at a rate faster than its recharge rate.[123]

Over time, five distinct doctrines governing the allocation and use of groundwater have developed: the absolute ownership rule, the reasonable use rule, the correlative rights rule, the Restatement rule, and the prior appropriation rule.[124] This Section will discuss only the first four doctrines because the prior appropriation rule is not used in any of the prime biofuel states.

The absolute ownership rule provides that a landowner has an unrestricted right to extract an unlimited amount of the groundwater underlying her land.[125] The only instance in which liability may result is if harm to another groundwater user is caused by malice or waste.[126] Plainly, the doctrine makes no attempt to resolve conflicts. It might just as well be called the "no-ownership rule" because a landowner has no ability to complain when her water source is drained by a neighbor.[127]

The reasonable use rule[128] is essentially the same as the reasonable use rule for surface water in its requirement that a landowner use groundwater only in a reasonable manner.[129] Under the reasonable use rule for groundwater, the water must be used on the overlying land.[130] This place-of-use limit, akin to similar limits in riparian rights law, has not been much relaxed. Many states allow off-tract uses so long as they do not disrupt other groundwater uses that do take place on the overlying tract.[131] This arrangement broadens possible uses but, as with the similar riparian rights rule, leaves water users in a precarious position. An off-tract use could be ended at any time by a newly initiated on-tract

123. *Id.* at 192; *see also* Lukas, *supra* note 70, at 450.

124. *See* POWELL, *supra* note 67, § 65.08[3][b]; *see also* Lukas, *supra* note 70, at 469–500 (discussing the various doctrines that have developed over time).

125. POWELL, *supra* note 67, § 65.08[3][b][i]; Dellapenna, *supra* note 109, at 41; Lukas, *supra* note 70, at 469. The Missouri case *Higday v. Nickolaus* sets forth the rule clearly: "Under the English common law rule, percolating waters constitute part and parcel of the land in which they are found and belong absolutely to the owner of such land who may without liability withdraw any quantity of water for any purpose even though the result is to drain all water from beneath adjoining lands." 469 S.W.2d 859, 865 (Mo. Ct. App. 1971).

126. POWELL, *supra* note 67, § 65.08[3][b][i]; Dellapenna, *supra* note 109, at 41–42; Lukas, *supra* note 70, at 469.

127. POWELL, *supra* note 67, § 65.08[3][b][i].

128. This rule is also known as the American rule. It developed out of judicial efforts to infuse the absolute rule with some limitations. Lukas, *supra* note 70, at 483–84. The landowner can still use unlimited amounts of water, so long as the use does not unreasonably injure other water users. Dellapenna, *supra* note 109, at 44; *see also Higday*, 469 S.W.2d at 866.

129. Dellapenna, *supra* note 109, at 44. *But see* Lukas, *supra* note 70, at 485 (explaining that the reasonable use rule for surface water and groundwater are very different, as the standards for defining reasonableness differ substantially).

130. Dellapenna, *supra* note 109, at 44; *see also Higday*, 469 S.W.2d at 866 ("[U]nder the rule of reasonable use an overlying owner, including a municipality, may not withdraw percolating water and transport it for sale or other use away from the land from which it was taken *if the result is to impair the supply of an adjoining landowner*." (emphasis added)).

131. *See* Alison M. Gregory, *Groundwater and Its Future: Competing Interests and Burgeoning Markets*, 11 STAN. ENVTL. L.J. 229, 242 (1992) (discussing that California allows off-tract uses of groundwater under prior appropriation).

groundwater use. Courts traditionally assess reasonableness in the abstract, in terms of type of use and overall efficiency,[132] and many courts still follow this method today.[133]

Under the correlative rights rule, which originated in response to water shortages in California, all landowners over the same aquifer have an equal right to use a reasonable, fair share of the water in the aquifer.[134] When the water users encounter a shortage, the water supply is distributed among all water users, allocating to each "a fair and just proportion."[135] In operation, this rule is a variation of reasonable use; it differs only in its greater adherence to a fair-share allocation rather than a more flexible allocation.

A select few jurisdictions have adopted the Restatement rule, including Wisconsin, Michigan, and Ohio.[136] The rule establishes liability for interference with another water user's rights in three situations: when a water user's withdrawal causes the water level in the aquifer to fall, resulting in harm; when a proprietor withdraws an excessive amount of water; and when a withdrawal has an adverse effect on surface water and causes harm to a user of the surface water.[137] To determine liability, the Restatement rule incorporates the reasonable use principles applied under the riparian rights doctrine governing surface water.[138] Contrary to the correlative rights rule and the reasonable use rule, the Restatement rule does not require that the water be used on the land overlying the aquifer.[139] In essence, all of these rules are variations on the same basic objective, protecting the interests of all groundwater users sharing a single resource, but they fail to identify clear, safe yields.

c. Regulated Riparianism: Permits Within Reason

Some states have statutory schemes governing specific instances of water use. For instance, Illinois has adopted statutory schemes governing groundwater use and withdrawal of water from Lake Michigan.[140] Several key biofuel states, however, have adopted relatively comprehen-

132. *See, e.g.*, *Higday*, 469 S.W.2d at 866.

133. Dellapenna, *supra* note 109, at 44 n.10.

134. POWELL, *supra* note 67, § 65.08[3][b][iii]; Lukas, *supra* note 70, at 486–87.

135. Lukas, *supra* note 70, at 487–88. What exactly constitutes a "fair and just proportion" varies by state. In California, each user's average pumping rate is reduced by a fixed percentage, whereas in eastern states, a fair proportion is determined by the principle of "comparative reasonableness," which allocates sufficient water to meet a user's reasonable needs compared to other users' needs. Lukas, *supra* note 70, at 488. Other courts allocate water based on the percentage of land a user owns in comparison to other landowners over the same aquifer. POWELL, *supra* note 67, § 65.08[3][b][iii].

136. POWELL, *supra* note 67, § 65.08[3][b][iv].

137. *Id.* § 65.08[3][b][iv]; *see also* Lukas, *supra* note 70, at 493–94.

138. RESTATEMENT (SECOND) OF TORTS § 858(2) (1979).

139. Lukas, *supra* note 70, at 494.

140. 525 ILL. COMP. STAT. 45/1 to /7 (2006) (Illinois groundwater statute); 615 ILL. COMP. STAT. 50/1.2, 50/14 (2006) (permits required for withdrawing water from Lake Michigan). Indiana has similar statutory provisions. *See* IND. CODE § 14-25-4-1 to -4-21 (2003) (Indiana groundwater statute); IND. CODE § 14-25-1-11 (2003) (Indiana statute governing withdrawals from Lake Michigan).

sive statutory schemes to regulate water allocation and use within the state.[141] Under regulated riparian rights statutes, most direct users of water must obtain a permit from the appropriate state administrative agency that is responsible for managing the regulated riparian system.[142] States vary, however, with respect to the types of water users and uses that require permits. Iowa requires permits for "diverting, storing or withdrawing water from any surface or groundwater source," essentially establishing a broad requirement covering most types of water use.[143] Minnesota has adopted a broad permit provision, requiring that "the state, a person, partnership, or association, private or public corporation, county, municipality, or other political subdivision of the state" obtain a permit before engaging in any type of water use or appropriation.[144]

Though regulated riparianism provides a more structured method for allocating water resources and enables states to more closely monitor water use, it is still governed by the principle of reasonableness.[145] Permit applications are evaluated on whether the proposed use is reasonable.[146] Reasonableness is generally determined by considering social policy and the effects of the proposed use on other permitted water uses.[147] Most statutes do not explicitly define "reasonable," but many provide a list of use preferences or a list of factors to weigh, similar to that of the Restatement, that guides the administering agency in its determination of reasonableness.[148]

Regulated riparian statutes specify whether a water user must obtain a permit and, if so, what is required to satisfy the permit's terms.[149] Most regulated riparian rights statutes exempt certain uses from permit requirements or provide reduced requirements for specified uses.[150] Many statutes set domestic uses as the highest preferred use and exempt such uses from the permit requirement.[151] Many states also explicitly exempt agricultural uses from the permit requirement; others implicitly exempt agricultural uses through domestic and small-user exemptions.[152]

141. Dellapenna, *Regulated Riparianism*, *supra* note 113, § 9.03, at 9-52 to -53. Those regulated riparian rights states include Iowa, Minnesota, Wisconsin, and Michigan. *Id.* § 9.03, at 9-54.

142. *Id.* § 9.03.

143. IOWA CODE ANN. § 455B.268 (2008).

144. MINN. STAT. ANN. § 103G.271 (2008).

145. "The concept of 'reasonable' . . . is the central and pervasive criterion for most decisions under all regulated riparian statutes except for several that substitute the concept of 'beneficial' or 'reasonable-beneficial' for at least some decisions." Dellapenna, *Regulated Riparianism*, *supra* note 113, § 9.03(b), at 9-146.

146. *Id.* § 9.03(a), at 9-63. Some states employ the term "beneficial" or another similar term such as "equitable" instead of "reasonable." *Id.* § 9.03(b)(2), at 9-153 to -154.

147. *Id.* § 9.03(b)(1), at 9-147. Though regulated riparianism incorporates the concept of "reasonable use," the actual application of that standard under regulated riparianism is different than under common law riparian rights. *See id.* § 9.03(a), at 9-63.

148. *Id.* § 9.03(b), at 9-148 to -151.

149. *Id.* § 9.03(a), at 9-62.

150. *Id.* § 9.03(a)(3), at 9-72 to -78.

151. *Id.*

152. *Id.*

Permits generally require water users to monitor and record their water use levels[153] and may require water to be used in a specific location; they may also limit the uses of the water and the quantity of water that can be used.[154]

When administering and enforcing permits, administering agencies generally have broad discretion.[155] To enforce permits, administering agencies can select from a broad range of formal and informal penalties.[156] Common enforcement methods include civil injunctions, fines, or revocation or suspension of the permit.[157] Very few statutes provide for citizen suits as a form of enforcement.[158] Most statutes authorize the administering agency to modify permit terms in times of shortage.[159] Administering agencies can also transfer use rights to other users by refusing to renew permits upon expiration and by modifying permit terms to reduce the amount of water allocated.[160] Most statutes do not include provisions regarding the transfer of water rights between individual users.[161] Many statutes also provide for protection of minimum stream flows; however, the methods for determining such protection vary and the administering agency is generally given wide discretion in implementing this protection.[162]

3. Water Quality: The Federal Clean Water Act and Its Implications

The stated objective of the Federal Clean Water Act (CWA) is to "restore and maintain the chemical, physical, and biological integrity of the nation's waters."[163] To implement this objective, the CWA differentiates between "point" and "nonpoint" sources of pollution. The point source category generally includes pipes, ditches, or other forms of conveying effluent that are clearly traceable to a particular source, which is usually industrial.[164] The point source category does not include agricultural runoff, or drainage.[165] The nonpoint source category, as its name suggests, includes everything that is not a point source.[166] It encompasses

153. *See id.* § 9.03, at 9-52.
154. *Id.* § 9.03(a)(5)(B), at 9-105.
155. *Id.* § 9.03(a)(5)(B), at 9-113.
156. *Id.* § 9.03(a)(5)(B), at 9-105.
157. *Id.* § 9.03(a)(5)(B), at 9-105 to -108.
158. As of 2007, only two regulated riparian states provide for citizen suits. *Id.* § 9.03(a)(5)(B), at 9-115.
159. *Id.* § 9.03(d), at 9-166 to -167.
160. *Id.* § 9.03(d), at 9-167 to -168.
161. Iowa does address such transfers, limiting them to transfers appurtenant with the land. *Id.* § 9.03(d), at 9-169.
162. *Id.* § 9.05(b), at 9-219, 9-228.
163. 33 U.S.C. § 1251(a) (2006).
164. *See id.* § 1362(14).
165. *Id.*
166. *See id.*

runoff from agricultural fields, forests, and streets, as well as runoff from other land-use activities.[167]

For point sources, the CWA sets forth technology-based effluent limitations that polluters must meet.[168] To implement these limitations, the CWA provides for a permit system called the National Pollutant Discharge Elimination System (NPDES).[169] Because biorefineries qualify as point sources, they are required to obtain NPDES permits to regulate the content of their effluent.[170]

Under the NPDES system, states are able to implement their own permit systems,[171] provided they meet the federal standards established under the CWA.[172] If the United States Environmental Protection Agency (EPA) determines that a state's standards are inadequate, it has the authority to implement its own permit system, overriding that of the state.[173] Still, a state can provide for more stringent requirements under its own permitting program.[174]

To enforce the requirements imposed by the permits, the EPA can bring an enforcement action against a violator through a variety of methods, including administrative compliance orders, administrative penalties, injunctive relief in civil suits, and criminal penalties.[175] Additionally, the CWA includes a citizen-suit provision, which enables members of the public to act as private attorneys general by suing to enforce federal law.[176]

For added enforcement of the CWA's objectives and to deal with nonpoint sources of pollution, Congress enacted sections 208 and 319.[177] These provisions require states to develop plans to restrict nonpoint pollution and otherwise engage in planning and regulating as needed to achieve water quality standards.[178] Section 319 requires states to develop

167. *See* Shawn J. Johnson, Case Note, *It All Comes Out in the Wash:* Sierra Club v. Meiburg*: Nonpoint Source Pollution Continues Unabated as the Eleventh Circuit Refuses to Permit Implementation of Total Maximum Daily Loads Through Citizen Suits*, 57 ARK. L. REV. 349, 357 n.83 (2004).

168. 33 U.S.C. § 1311(b)(2)(A), (C)–(D), (F) (2006). These standards include best practicable control technology for general point sources, best available technology for dischargers of toxic substances, and best conventional technology for publicly owned treatment works. *Id.*; *see also* Johnson, *supra* note 167, at 358.

169. 33 U.S.C. § 1342 (2006).

170. NRC, IMPLICATIONS, *supra* note 5, at 51; *see also* 33 U.S.C. § 1342. Generally, the water quality aspects that the permits address include total dissolved solids (TDS), acidity, iron, residual chlorine, and total suspended solids. NRC, IMPLICATIONS, *supra* note 5, at 51. Several permit violations have been reported for ethanol facilities in Iowa and Minnesota. *Id.* (stating that permit violations were for excessive discharge of total dissolved solids). For a more detailed description of pollutants that degrade water quality, see Andreen, *supra* note 24, at 554–61.

171. 33 U.S.C. § 1342(b).

172. *Id.* § 1342(c). Most states have implemented their own permit systems. Andreen, *supra* note 24, at 549.

173. 33 U.S.C. § 1342(c)(3).

174. *Id.* § 1370; s*ee also* Andreen, *supra* note 24, at 549.

175. 33 U.S.C. § 1319 (2006).

176. *Id.* § 1365(a).

177. *Id.* §§ 1288, 1313.

178. *Id.*

special plans to deal with waterway sections that continue to violate water quality standards, through a system of "total maximum daily load[s]."[179] Under this section, states are responsible for identifying particular water courses or portions of water courses for which existing standards under the CWA are not "stringent" enough to meet specified water quality standards.[180] States are required to determine a total maximum load of pollutants that can be discharged into the particular stream segment without violating the standards.[181] States are then required to submit a report including all of the identified stream segments and their corresponding total maximum daily loads (TMDL) to the EPA.[182] States are obligated to prepare their TMDL calculations and develop plans, but they apparently face no penalties if they do not enforce the plans or fail to bring the polluted sections into compliance.[183] Given that it is inapplicable to nonpoint sources of pollution, it is questionable whether the CWA actually accomplishes its stated purpose.[184]

The CWA obviously applies to surface water, but what about groundwater? Courts have generally conceded that groundwater is not within the scope of the CWA if the groundwater source is isolated from any surface water source.[185] Courts are split as to whether the CWA applies to groundwater sources that are hydrologically connected to a surface water source.[186] Groundwater pollution is thus largely uncontrolled.[187]

179. *Id.* § 1313(d); *see also* Johnson, *supra* note 167, at 361–65.

180. 33 U.S.C. § 1313(d)(1)(A). Essentially, these are portions of rivers and streams that fail to meet specified water quality standards despite the state's implementation of existing water quality standards and controls, such as NPDES permits. *See* Andreen, *supra* note 24, at 551.

181. 33 U.S.C. § 1313(d)(1)(C). The Act also provides that states are responsible for establishing total maximum thermal loads for waters that are unable to meet thermal regulations. *Id.* § 1313(d)(1)(D). This requirement may be particularly applicable to biorefineries because they may expel heated waste water.

182. *Id.* § 1313(d)(1)(D)(2). Once the load calculations are made, states are supposed to impose further cutbacks on point-source polluters and further curtail nonpoint sources to reduce pollution loading to the maximum possible level. *Id.*

183. Judicial determination that the TMDLs are merely advisory has substantially mitigated the force of the TMDL requirements. *See* Johnson, *supra* note 167, at 366–69 (explaining that the Ninth Circuit and the Eleventh Circuit have both held that implementation of TMDL provisions is voluntary on the part of the states).

184. *See* discussion *infra* Part III.B. This Note proffers the opinion that the provisions of the CWA as implemented do not accomplish the Act's stated objective. *See* Johnson, *supra* note 167, at 368 (asserting that the CWA does not meet its stated goal because of the Act's failure to require implementation of TMDL provisions as applied).

185. David S. Baron, *Water Quality Standards for Rivers and Lakes: Emerging Issues*, 27 ARIZ. ST. L.J. 559, 566 (1995).

186. *Id.*

187. Except for the provisions of the Safe Drinking Water Act that protect groundwater wells from pollution sources near wellheads. 42 U.S.C. § 300h-7 (2006).

C. Overused and Under-Replenished: The Current State of Water Use

The United States currently faces mounting water shortages, or more accurately, depletion of water sources due to overconsumption.[188] Constant high levels of groundwater pumping are quickly depleting the water levels in the Ogallala High Plains Aquifer that underlies Wyoming, Colorado, New Mexico, South Dakota, Nebraska, Kansas, Oklahoma, and Texas.[189] Average water levels in the aquifer have fallen 11.9 feet, which reflects a 6 percent reduction in the average water level.[190] Texas alone has seen a 27 percent decrease in water volume.[191] In the Floridian Aquifer, a severe reduction in water levels due to overpumping has resulted in saltwater contamination and land subsidence.[192]

As water levels fall, tensions are beginning to rise over use rights of surface water in rivers, streams, and depleted reservoirs.[193] Severe drought in Georgia that has caused the near-total drainage of the reservoir Lake Lanier highlights the stark conflicts that depleted water supplies can create.[194] Interstate squabbles arise because one state's reservoir water is needed to support stream flows in a neighboring state; conflicts with endangered species occur because water is needed to support a species' habitat; and conflict develops between state governments and the federal government as state and local governments attempt to stop federally mandated water uses within a drought-ridden state.[195]

The conflict in Georgia lends validity to the prediction that the United States is entering an age of what has been termed "water wars," and that the battle is moving toward the Great Lakes region, which contains nearly 20 percent of the world's fresh surface water.[196] The water levels of the Great Lakes is reaching historic lows, and with more and more well water supplies becoming contaminated, water shortages for the Great Lakes region have been predicted to occur in about ten

188. *See* GLENNON, *supra* note 70, at 58–69 (discussing how overuse resulting from development and degradation of land surrounding a river causes a reduced water supply as opposed to merely "inadequate" supplies in nature).

189. *Id.* at 24–34; *see also* Klein, *supra* note 79, at 1057.

190. Klein, *supra* note 79, at 1057; *see also* GLENNON, *supra* note 70, at 32 ("The country cannot sustain even the current levels of groundwater use, never mind the projected increases in groundwater consumption . . . . As much as half of the remaining water [in the Ogallala] is too deep in the aquifer to justify the costs of recovery or is of poor quality.").

191. Klein, *supra* note 79, at 1057.

192. Davis, *supra* note 73, at 32–33.

193. *Georgia's Governor Declares Drought Emergency*, MSNBC, Oct. 20, 2007, http://www.msnbc.msn.com/id/21393296/.

194. *Id.*

195. *Id.* (highlighting all of these conflicts).

196. Tim Jones, *Great Lakes Key Front in Water Wars: Western, Southern States Covet Midwest Resource*, CHI. TRIB., Oct. 28, 2007, at C1 ("[P]otentially huge battles are looming in the Great Lakes region. . . . Call them water wars, with the Great Lakes states hunkering down to protect what they see as theirs. . . . [T]he Great Lakes are the natural-resource equivalent of the fat pension fund, and some politicians are eager to raid it.").

years.[197] As a result of these impending water wars, observers predict that the eastern states will be facing increasing challenges to their established water allocation regimes.[198] As a consumer of large amounts of water, the expanding midwestern biofuel industry is poised to become one of the major fronts in these water wars.

III. ANALYSIS

Under this looming threat of water wars, the biofuel industry is poised to exacerbate the strain on our water sources. Some power plants are already facing the prospect of having to reduce production or shut down completely because they do not have enough water to support operations;[199] biorefineries may soon find themselves in the same situation. As more biorefineries are constructed and crop production swells to supply the heightened capacity for fuel production, conflicts over water quantity and quality will inevitably result between existing, small-scale local water users and the biofuel industry, specifically the biorefineries and agricultural operations that grow biofuel crops.[200] These impending conflicts would not pose a serious danger to the stability of water sources and the rights of riparian water users if water laws actively managed water sources to prevent conflicts and adequately resolved disputes when they did arise.[201] In their current form, however, water laws are unable to adequately address the threat that an expanding biofuel industry poses for the water sources of the Midwest.

This Section discusses the legal conflicts that could arise in response to the increased consumption rates that the expanding biofuel industry will impose on the water sources of many communities across the United States. Section A evaluates possible conflicts over water quantity subject to resolution under the reasonable use rule, and Section B examines potential conflicts over water quality likely to arise under the CWA. Both

197. *Id*. *See generally* DIANE RAINES WARD, WATER WARS: DROUGHT, FLOOD, FOLLY, AND THE POLITICS OF THIRST (2002) (describing water conflicts across the world with implicit parallels to America's own water predicaments that foreshadow increasing difficulties and even violence in attempts to assert control over water sources). In the chapter titled "The Wars," Ward describes the nature of one water conflict in the Middle East: "Syrian MIG fighters shot a Turkish survey plane out of Turkish skies, killing five people. Everyone seemed to believe that the incident had been meant as a warning over the Ataturk Dam. . . . [T]he Turks were unmoved: they announced that Syria and Iraq had better start storing water since they were about to stop the flow of the Euphrates to fill Ataturk's vast reservoir." *Id.* at 173. Note that these countries are clustered together as neighbors and are about the size of some individual states in the United States; they share rivers between them just as states in the U.S. do.

198. Kenneth S. Gould, *An Introduction to Water Rights in the Twenty-First Century: The Challenges Move East*, 25 U. ARK. LITTLE ROCK L. REV. 3, 4 (2002).

199. *Drought Could Shut Down Nuclear Power Plants*, MSNBC, Jan. 23, 2008, http://www.msnbc.msn.com/id/22804065/.

200. NRC, IMPLICATIONS, *supra* note 5, at 22 ("Water is also used for drinking water and cooling thermoelectric plants, in addition to nonconsumptive uses such as hydropower, fish habitat, and recreation. Conflicts are common.").

201. Gould, *supra* note 198, at 87.

sections illustrate how the reasonable use rule and the CWA fail to adequately resolve these conflicts, highlighting the need for serious reform of our water laws and overall water policy.

A. Rethinking Reasonableness: The Inevitable Inadequacy of the Reasonable Use Rule in Resolving Water Quantity Disputes

As water supplies grow ever more strained in the face of high demand, many of the conflicts that arise will involve the quantity of available water. This Section discusses the types of conflicts likely to arise over water quantity and the shortcomings of the reasonable use rule to sufficiently resolve them. The ultimate question underlying these various conflicts is whether using such large quantities of water for these purposes is reasonable.

1. The Fight for a Right to Water: Potential Conflicts on the Horizon

When a biorefinery is constructed or corn production for ethanol increases in a particular geographical area, the rights of existing water users are cast into a precarious state of uncertainty. This state of uncertainty arises from the constant threat of infringement that the new larger consumers pose to the existing water users' rights. Lawsuits will invariably result between these competing water users, regardless of whether they are users of surface water, groundwater, or both. Current water laws, however, provide little remedy to protect these existing water users' rights or to prevent these conflicts from initially arising.

a. Surface Water Conflicts

One possible conflict could involve a downstream riparian surface water user suing an upstream biorefinery that is diverting large amounts of surface water from the same stream or river to support its ethanol operations. The downstream water user may be left with insufficient amounts of water for her purposes, such as farming or even recreation. Applying the reasonable use rule, a court would engage in a balancing analysis to determine the reasonableness of the biorefinery's use.[202] The odds are stacked against the downstream user because of the utility of the biorefinery's use, its high economic value, and the substantial loss that would result from enjoining the use.[203] Additionally, because the biorefinery will likely be one of many large water users along a river, the downstream user may encounter difficulty presenting sufficient evidence to establish the amount of water that the biorefinery actually used or that

202. Dellapenna, *Consumer Rights*, *supra* note 91, § 7.02(d).

203. *See* Dellapenna, *supra* note 109, at 17 ("Furthermore, the balancing process generally strongly favors large users over smaller users. The economic value of the water to the large user usually will outweigh the economic loss of the small user.").

the biorefinery's use caused the lowered water levels.[204] Therefore, the biorefinery, as well as the similarly situated industrial farmer, will generally prevail over the smaller-scale water user. As a result, the smaller-scale water user will have no choice but to accept and accommodate the biorefinery's or industrial farmer's use and associated alterations in flow.

Some minimal protection does exist for the downstream user, however. If the downstream user is sufficiently harmed or if the impaired uses are domestic in nature, such as for drinking water, household, or livestock purposes, the downstream user would prevail because most courts hold that "natural uses" are superior to any other use.[205] The court may place some restrictions on the biorefinery's use, such as limiting it to lower withdrawals during dry months.[206] Despite such protections, the downstream, smaller-scale user will generally lose out to the biorefinery's more intensive and "socially valuable" use.[207]

A regulated riparian system may also provide some protection for the downstream water user. Given its broad discretion, the administering agency will likely have the ability to restrict the biorefinery's or the industrial farmer's water use or even revoke the permit if the downstream user is harmed. The administering agency may also bring an enforcement action against the biorefinery or industrial farm, resulting in a fine, injunction, or even revocation of the water use permit.[208] Therefore, under a regulated riparian system, the biofuel industry potentially has much to lose. In exercising its wide discretion, however, the state administering agency may decide not to pursue strict enforcement actions against the biorefinery or the industrial farm. Additionally, because permit systems rest on the principle of reasonableness,[209] a biorefinery or industrial farm could still prevail in a dispute with a smaller water user for the same reasons discussed above; after a balancing analysis, the biorefinery's or farm's use will be considered reasonable and will be upheld. Also, statutory exceptions for agricultural water uses may likely destroy any potential protection smaller users may have against the industrial farms.[210] In sum, though a regulated riparian system may provide some

204. *See* Eberhard Lake Ass'n v. Walters, No. 234586, 2002 WL 31956960, at *3 (Mich. Ct. App. Dec. 20, 2002) (holding that plaintiffs failed to present evidence that defendant's water use for irrigation caused lowered lake levels and granting defendant's summary judgment motion).

205. *See* Kundel Farms v. Vir-Jo Farms, Inc., 467 N.W.2d 291, 295 (Iowa Ct. App. 1991) ("Vir-Jo's natural use of the stream to water his livestock takes precedence [over Kundel's artificial use to make a wetland for hunting purposes]."); TARLOCK, *supra* note 71, §§ 3.58–.59 (stating that cities cannot claim the benefit of the domestic use preference).

206. *See* Dellapenna, *supra* note 109, at 14–15 (referring to an Arkansas Supreme Court case, *Harris v. Brooks*, in which the court applied the reasonable use rule and held that one water user must stop pumping water out of a lake for irrigation purposes when the water level in the lake reached a judicially specified low point).

207. *See* Dellapenna, *supra* note 109, at 17.

208. Dellapenna, *Regulated Riparianism*, *supra* note 113, § 9.03(a)(5)(B), at 9-105 to -108.

209. *Id.* § 9.03(b), at 9-146.

210. *Id.* § 9.03(a)(3), at 9-72 to -78.

protection for a smaller, downstream water user, the protections are not certain and are subject to being rendered nonexistent.

An even more difficult situation would arise if the downstream riparian user was another industry, such as a power plant or a municipality. With two large and socially significant users opposing one another for the same water source, and with both considered reasonable, how should a court determine whose rights prevail? In this situation, the biorefinery may be the losing party because the court may determine that the municipality's or power plant's use is of a higher utility, would result in a more substantial adverse impact if enjoined, and serves a more substantial purpose—supplying communities with electricity and water for domestic uses. Therefore, even the biorefinery's use rights are susceptible to being infringed upon by more intensive or socially significant users.

What happens when the biorefinery's water use conflicts with the use of one of the large industrial farms that supplies it with corn? Because biorefineries are sprouting up in rural areas across the Midwest, such a conflict is not beyond the realm of possibility. Should less corn or less ethanol be produced? Or should both be required to reduce production to accommodate one another's water use? The answers to these questions will ultimately depend upon which factors the courts decide to weigh more heavily in the balancing analysis. Courts may decide that the farmer's use of water for irrigation during dry summer months is unreasonable. Alternatively, courts may decide that biorefineries should reduce operations during the dry summer months to accommodate the need for irrigation of its feedstock. Such a potential conflict demonstrates that a depleted water supply could thwart the federal government's policy of increasing ethanol production.

b. Groundwater Conflicts

Another possible conflict could involve a small-scale groundwater user suing a biorefinery for pumping excessive amounts of water and interfering with the first user's ability to pump from her own well.[211] Under the absolute use rule, the biorefinery would prevail over the small-scale groundwater user because any user can consume an unlimited amount of water, regardless of harm caused to other users.[212] Under the reasonable use rule, the biorefinery would also prevail. Because it is employing the water to produce a highly demanded and socially beneficial product, the biorefinery's use would qualify as reasonable. If the biorefinery transports the pumped water to the plant, however, it is subject to having its

211. The industrial farmer or the biorefinery likely would install a much stronger and deeper pump, which could create a "cone of depression" that may draw the water level below the level of the smaller user's pump. *See* GLENNON, *supra* note 70, at 45–47.

212. *See id.* at 30–31.

use enjoined.[213] An Alabama court found that even a municipality's use of water was unreasonable when the municipality transported the pumped water by pipeline fifteen miles into the city.[214] Therefore, unless the pumped water is being transported to the biorefinery, the small-scale groundwater user will be faced with either drilling a deeper well or finding a new water source.

A small-scale groundwater user would likely encounter the same result if she sued an industrial farm that was pumping excessive amounts of water to irrigate its crops. The farm's use would be considered reasonable, as courts have generally held that farming is a reasonable use of water.[215] Therefore, unless it was transporting water from a pump offsite, an industrial farm's groundwater use for irrigation would prevail. As stated above, the small-scale user would again be faced with drilling a deeper well or finding an alternative water source.

Yet another possible conflict could arise between a surface water user whose use rights are infringed upon by a biorefinery or an industrial farm pumping large amounts of groundwater and adversely affecting the hydrologically connected flow of a river. Alternatively, a groundwater user may sue a biorefinery that is diverting a large volume of surface water from a river that is hydrologically connected to the aquifer, thus inhibiting the aquifer's recharge. In either of these situations, the legal separation of surface and groundwater law may result in rejection of the complaining water user's claims; a court may conclude that because of the separate legal treatment, such a claim cannot be brought. In jurisdictions that apply the reasonable use rule to both surface water and groundwater, however, a court may be willing to permit a suit involving both types of water sources, relying on the basic underlying principles of reasonable use to resolve the dispute.[216] Generally, in both a suit brought by a surface water user against a groundwater user and vice versa, the biorefinery and the industrial farm would likely prevail, because their uses would be deemed reasonable and would outweigh the competing use in the balancing analysis. The small-scale user would thus be forced to accept and accommodate the biorefinery's or industrial farm's water use and its effects.

Nevertheless, *Michigan Citizens for Water Conservation v. Nestle* indicates that some minimal remedy may be available under the reason-

213. *See* Pyle v. Gilbert, 265 S.E.2d 584, 586 (Ga. 1980); TARLOCK, *supra* note 71, § 3.51. Some state groundwater statutes may provide a greater degree of protection for small-scale groundwater users. *See, e.g.*, 525 ILL. COMP. STAT. 45/4(g) (2006).

214. Kimberly T. Lisenby, Commentary, *Rights to Groundwater in Alabama and the Reasonable Use Doctrine: An Assessment of* Martin v. City of Linden, 48 ALA. L. REV. 1045, 1054–57 (1997).

215. *Pyle*, 265 S.E.2d at 587 ("The use of water for agricultural purposes was recognized as a reasonable use along with domestic use in the first reported Georgia case on riparian rights.").

216. The Michigan appellate court adopted the reasonable use rule's balancing test to resolve disputes between surface water users and groundwater users. Mich. Citizens for Water Conservation v. Nestle Waters N. Am., Inc., 709 N.W.2d 174, 201–02 (Mich. Ct. App. 2005), *aff'd in part, rev'd in part*, 737 N.W.2d 447 (Mich. 2007).

able use rule.[217] In *Nestle*, the plaintiffs, citizens who used a stream for recreation, sued Nestle for adversely impacting water levels in the stream through its intensive groundwater pumping from an aquifer hydrologically connected to the stream.[218] Applying the reasonable use balancing analysis, the court found both uses to be reasonable and determined that Nestle could continue its pumping, but at a reduced rate.[219] Whether this remedy had a beneficial effect on the stream's level is unknown. Therefore, although a surface or groundwater user may not be able to secure complete protection of her use rights, some minimal protection is possible. Whether this protection is actually beneficial is another question that remains to be answered.

The Restatement rule for groundwater may provide some remedy for the surface water user against a biorefinery or industrial agriculture operation whose groundwater use is adversely affecting surface water levels. The Restatement provides that a groundwater user is subject to liability for interfering with another's water use when "the withdrawal of the groundwater has a direct and substantial effect upon a watercourse or lake and unreasonably causes harm" to the surface water user.[220] The Nebraska Supreme Court adopted the Restatement rule in a case in which a surface water user, Spear T Ranch, sued a groundwater user.[221] The groundwater user's pumping had reduced the flow of water in a creek that Spear T used for irrigation and livestock purposes.[222] Because of the separation of surface water and groundwater law under Nebraska law, the court opted to adopt the Restatement rule, enabling Spear T to proceed with its case, which it otherwise would have been unable to do.[223] Other courts seeking an alternative to separate surface water and groundwater law may follow the Nebraska court's lead and adopt the Restatement rule as a bridge between surface water and groundwater laws.[224]

Despite this potential for liability under the Restatement rule, a court will still need to determine actual liability, as well as a remedy, by weighing the various factors used for evaluating reasonableness.[225] As a result, though a court may find liability, it will grant a limited remedy, if any, due to the high social and economic value of the biorefinery or in-

217. *Nestle*, 709 N.W.2d at 202–08.

218. *Id.* at 184–86.

219. *Id.* at 201, 205–07.

220. RESTATEMENT (SECOND) OF TORTS § 858(1)(c) illus.5 (1979) (explaining that a city is subject to liability to a downstream surface water user if it drills a well and lowers the water table of an aquifer underlying a river, so that the water level in the river is reduced).

221. Spear T Ranch, Inc. v. Knaub, 691 N.W.2d 116, 132 (Neb. 2005); *see also* Miller, *supra* note 105, at 596.

222. *Spear T Ranch*, 691 N.W.2d at 124.

223. *Id.* at 125, 127–32.

224. *But see* Miller, *supra* note 105, at 597 (arguing that the *Spear T* decision will actually lead to an overall increase in water usage, as the surface water user will turn to groundwater as an alternative source).

225. *See* RESTATEMENT (SECOND) OF TORTS § 850 cmt. a.

dustrial farm's use, as well as the significant purpose of the use in creating a product that is in high demand. The court may further find that the surface water user may more easily be able to adjust her use or more easily find an alternative water source. Therefore, despite the potential liability due to the adverse effects of its intensive water use, the biorefinery or farm will likely prevail over the surface water user and will continue its intensive pumping to the detriment of hydrologically connected water sources.

Intensive water use could also create conflicts between a biorefinery or an industrial farmer and environmental groups. These groups could bring suit against a biorefinery or industrial farmer under the Endangered Species Act (ESA) for adversely impacting wildlife habitats by reducing stream flows.[226] Section 9 of the ESA addresses harm to endangered species caused by significant habitat reduction.[227] The environmental groups would have to overcome several hurdles to succeed in their suit; for instance, they would have to establish standing[228] and prove that the habitat modification would result in actual injury or death to the wildlife. Additionally, the biorefinery or industrial farmer could avoid such a suit by obtaining an "incidental take permit," allowing actions that would modify a habitat provided mitigation efforts are taken.[229] Therefore, a biorefinery or industrial farmer may be required to reduce or cease water use in the face of competing water demands of neighboring endangered species.

2. Inadequacies of the Reasonable Use Rule

The likely outcomes of the potential conflicts explored above illustrate the inadequacy of our riparian rights system of water law based on the reasonable use rule to resolve such impending disputes. Ultimately, as these hypothetical outcomes show, the balancing analysis used to determine reasonableness generally favors the large, more intensive water user.[230] As a result, small-scale users face uncertainty and a lack of secu-

226. 16 U.S.C. § 1540(g) (2006) (providing that "any person" can bring suit to enforce the provisions of the ESA pursuant to specified methods). In some instances, even the animals themselves may be able to bring suit. *See* Loggerhead Turtle v. County Council of Volusia County, Fla., 148 F.3d 1231, 1253 (11th Cir. 1998) (finding that turtles have standing and can function as parties to the suit).

227. *See* 16 U.S.C. § 1538(a)(1)(B) (2006) (making it unlawful to "take" any listed endangered species); Babbitt v. Sweet Home Chapter of Cmtys. for a Great Or., 515 U.S. 687, 708 (1995) (holding that "harm" includes habitat degradation or modification that kills or injures wildlife); 50 C.F.R. § 17.3 (2008).

228. *See* Lujan v. Defenders of Wildlife, 504 U.S. 555, 560–61 (1992).

229. 16 U.S.C. § 1539(a)(1)(B) (2006). In *Loggerhead Turtle*, however, the Eleventh Circuit found that an incidental take permit was not sufficient to authorize its actions that harmed sea turtles. *Loggerhead Turtle*, 148 F.3d at 1258.

230. Critics have challenged the reasonable use rule for its failure to provide protection from large local users that can claim a reasonable and beneficial use. *See* Dellapenna, *supra* note 109, at 17; Lukas, *supra* note 70, at 484; *see also* Dellapenna, *Consumer Rights*, *supra* note 91, § 7.05(a), at 7-170. Several small-scale water users could aggregate their claims but still will not likely be successful against the larger water user. *Id.* If the smaller-scale user did prevail in the balancing analysis, however, the

rity in their water rights, and often an inadequate remedy. Additionally, a small-scale local water user who brings suit cannot predict with certainty which factors the court will weigh most heavily in its determination of reasonableness.[231] For groundwater, critics have pointed out that for all practical purposes, the reasonable use rule is no different than the absolute ownership rule in its failure to protect water users.[232]

Furthermore, the reasonable use rule does not provide a method for prospective protection of water rights.[233] Because it lacks the ability to prospectively protect water rights, the reasonable use rule also fails to provide a method for managing water rights in times of severe drought, when a large number of water users along the same water course are in conflict over a limited supply.[234] Due to its inability to manage our common water sources, the reasonable use rule essentially perpetuates a tragedy of the commons situation,[235] but contrary to Hardin's version, our current tragedy is a result of resource use in conjunction with private land ownership.[236]

This is not to say that the reasonable use rule must necessarily be dispensed with in order to establish a more effective water rights scheme. Despite its multiple inadequacies, the reasonable use rule is not an inflexible, permanent standard. The determination of what is "reasonable" can change over time as courts respond to changing social perceptions of which water uses are and are not acceptable.[237] This concept underscores the fact that the question of reasonableness is essentially a normative decision. Instead of asking what factors into a determination of reasonableness, perhaps we should be asking what *should* factor into a determi-

biorefinery or large scale agricultural operation would be required to drastically reduce or stop their water use, which would slow or even cease ethanol production and have negative repercussions for society. Therefore, on both sides, the balancing analysis leads to adverse results.

231. According to Dellapenna, a major "weakness" of the riparian rights system is "the vagueness and unpredictability of the criteria of decision in any conflict over water." Dellapenna, *supra* note 109, at 16.

232. *Id.* at 44; Lukas, *supra* note 70, at 484 ("[T]he groundwater rule does not assess the reasonableness of a particular interference, but rather categorizes uses as either reasonable per se or unreasonable per se. The rule is essentially the rule of absolute ownership with exceptions for wasteful and off-site use.").

233. Dellapenna, *supra* note 109, at 16.

234. *See id.* at 17; Miller, *supra* note 105, at 593 ("[L]itigation is a poor vehicle to develop an equitable and sustainable water resource management system.").

235. *See* Dellapenna, *supra* note 109, at 44.

236. Garrett Hardin, *The Tragedy of the Commons*, 162 SCIENCE 1243, 1244 (1968). According to Hardin, the phrase "tragedy of the commons" describes the degradation that results when many people share a common resource. Hardin proposed that dividing the common among individual private owners would solve the problem. *But see* ERIC T. FREYFOGLE, *The Lure of Privatization*, *in* THE LAND WE SHARE: PRIVATE PROPERTY AND THE COMMON GOOD 157, 157–78 (2003) (arguing that privatization does not provide sufficient incentive to use land responsibly).

237. Robert E. Beck, *The Legal Regimes*, *in* WATERS AND WATER RIGHTS, *supra* note 89, § 4.01; *see also* FREYFOGLE, *supra* note 103, at 279–85 (stating that ideas about reasonableness do change over time and excerpting Jeremiah Smith, *Reasonable Use of One's Own Property as a Justification for Damage to a Neighbor*, 17 COLUM. L. REV. 383 (1917), which supports the notion that "reasonableness" is not a "hard and fast rule"); Dellapenna, *supra* note 109, at 16 (arguing that the changeable quality of "reasonableness" is not beneficial because it generates uncertainty and a lack of clarity).

nation of reasonableness. By reevaluating the substance of the rule, courts could adopt a modified concept of reasonableness to more adequately resolve conflicts.

B. Questioning Quality: The Limitations of the Federal Clean Water Act in Resolving Conflicts over Water Quality

In addition to conflicts regarding water quantity, conflicts regarding water quality are also likely to arise as a result of the construction of new biorefineries and the expansion of biofuel crop production. Aside from providing a minimal amount of regulation and the possibility of enforcing water quality standards, the CWA will do very little to resolve these conflicts because of its limited scope as applied.[238] This Section discusses the major threats that expanded biofuel production poses to water quality and illustrates the major inadequacies of the CWA through its inability to adequately address and dispel these threats. In essence, the CWA is an empty shell of a statute, because it falls far short of addressing the biggest problems that expanding biofuel production will cause for the quality of our water sources.

1. Protecting Quality Interests: Potential Conflicts over Water Quality

As more biorefineries are brought online and more fields are cultivated, new sources of wastewater and contaminants will be added to the existing load of pollutants that enter our local and regional water sources, degrading the quality of water in communities housing biorefineries and croplands, as well as in communities far downstream and in other states. To protect the quality of their water supplies, existing local water users can attempt to sue biorefineries or industrial agriculture operations under the CWA or nuisance law.[239]

a. Conflicts Arising Under the Federal Clean Water Act[240]

With the added pollutants that biofuel plants and expanding croplands contribute to water sources, water users may encounter contaminated surface waters due to increased salt content or excessive nutrients, such as nitrates.[241] For the same reasons, groundwater users may also encounter contamination of their well water.[242] To address such declines in

238. MARK A. RYAN, THE CLEAN WATER ACT HANDBOOK 6 (2003).

239. *See, e.g.*, Envtl. Def. Fund, Inc. v. Costle, 657 F.2d 275 (D.C. Cir. 1981).

240. This Section focuses solely on the CWA. State clean water statutes vary on their exact provisions for enforcement.

241. *See* discussion regarding pollutants emitted by biorefineries and agricultural operations *supra* Part II.A.

242. In *Silent Spring*, Rachel Carson relates the story of a town in which residents suffered from well water contamination. Farmers in the town contracted illnesses with no logical cause. Livestock also became ill. The source of the contamination was finally found to be a chemical manufacturing

water quality, the CWA provides for state and federal enforcement as well as limited citizen enforcement of its provisions.[243]

If a biorefinery violates the conditions of its NPDES permit, the state environmental agency or the EPA can issue an administrative order for compliance and can bring an enforcement action against it.[244] Still, it is likely that the government will not react very promptly, if it reacts at all, to enforce the permit provisions.[245] The government's policy of promoting increased biofuel production provides further reason to suspect lax enforcement. Additionally, the government has several methods for avoiding enforcement by simply avoiding violations, including modifying the permit provisions to allow for a higher amount of pollutants to be discharged, moving monitoring points farther downstream to allow the pollutants to become more diluted, or enlarging the "mixing zone," or portion of the river or stream in which no monitoring is done to allow for the effluent to fully mix with the existing waters, thereby diluting the effluent.[246]

Despite a lack of effective government action, citizens affected by a biorefinery's violations may enforce compliance by bringing their own suits under the CWA.[247] Citizens taking such action must surmount several procedural hurdles,[248] which, more often than not, they will be unable to do. One major hurdle is establishing standing.[249] Under the first element required for standing, the citizen or citizen group bringing suit must show "injury in fact" that is "concrete and particularized" and "actual or imminent."[250] This requirement will not be overly burdensome for a citizen whose well was contaminated or whose surface water source has been polluted to the point that it is no longer safe for livestock to drink, for example. This requirement will, however, prevent suits for general pollution of a local river or stream that does not impact the com-

plant several miles away from the town. The plant stored waste water in pools dug into the ground around the plant. The various chemicals in the pools had combined over time to form a dangerous chemical compound used as a weed killer. The chemicals seeped down and traveled through the groundwater into the town's wells over a period of seven to eight years. RACHEL CARSON, SILENT SPRING 42–44 (Mariner 2002) (1968).

243. 33 U.S.C. §§ 1319, 1365 (2006).

244. *Id.* § 1319.

245. Government monitoring can be a difficult task and can often produce inaccurate results. Also, government enforcement policy has moved toward establishing cooperative relationships between the government and polluters and relies more on voluntary reporting procedures, as opposed to prior deterrence models which threatened violators with large fines. *See* DAVID M. DRIESEN & ROBERT W. ADLER, ENVIRONMENTAL LAW: A CONCEPTUAL AND PRACTICAL APPROACH 587–95, 607 (2007).

246. W. Henry Graddy, *Let Us Hope for Smart Fish: A Clean Water Act Practitioner's Search for Ratchet Down*, 10 J. NAT. RESOURCES ENVTL. L. 161, 178–82 (1995).

247. 33 U.S.C. § 1365(a) (known as the "citizen suit provision").

248. *Id.* § 1365.

249. Lujan v. Defenders of Wildlife, 504 U.S. 555, 560–61 (1992).

250. *Id.*

plaining individual directly. Even if injury exists, the court may decide that it is insufficient to meet the requirement for standing.[251]

The second element of standing requires the citizen-plaintiff to show a causal connection between the previously determined injury and the defendant's challenged conduct.[252] This will be a difficult requirement to meet because the plaintiff must prove that her injury was caused by the pollution emitted by the defendant and not some other source,[253] a nearly impossible task for a water source that has multiple parties that empty pollutants into it. Additionally, the biorefinery could argue that the injury-causing pollution was not solely its fault but the fault of all upstream agricultural operations.

If the citizen-plaintiff is able to establish injury and a causal link, she will have to demonstrate that a favorable decision of the court will provide redress for the injury.[254] Provided that the citizen-plaintiff requests appropriate relief, she will be able to satisfy this element and establish standing. Contrary, then, to the citizen-suit provision's actual language, "any citizen" is not able to bring suit; this phrase instead encompasses only the narrow range of citizens that are able to clear the sizable procedural hurdles to establish standing.[255]

Even if a citizen-plaintiff establishes standing, the suit could be thwarted by other procedural hurdles. The plaintiff will have to satisfy the requirement that the violation be continuing and ongoing, not simply a past violation that has since been remedied.[256] Furthermore, the plaintiff will need to bear the burden of the substantial costs of litigation. The citizen-plaintiff may be able to recover litigation costs, but only if he prevails and the court deems an award of costs appropriate.[257] This leaves the plaintiff with no guarantee, and indeed a very low likelihood, that she will be able to recover costs.[258]

A citizen's suit is also subject to preemption by the government.[259] The citizen-suit provision of the CWA provides that if a suit is brought by the administrator of the EPA or the state and is being "diligently prosecuted,"[260] the government's suit can preempt the citizen's suit.[261] The government's suit will likely proceed more slowly, and the citizen's influence in the suit will be greatly diminished and overshadowed by the

251. Sierra Club v. Morton, 405 U.S. 727, 740 (1971).
252. *Lujan*, 504 U.S. at 560.
253. *See id.*
254. *Id.* at 561.
255. *Id.* at 560–61.
256. Gwaltney of Smithfield, Inc. v. Chesapeake Bay Found., 484 U.S. 49, 56–64 (1987).
257. 33 U.S.C. § 1365(d) (2006).
258. *See id.*
259. *Id.* § 1365(b)(1)(B).
260. There is some question as to what exactly "diligently prosecuted" means. *See* DRIESEN & ADLER, *supra* note 245, at 643.
261. 33 U.S.C. § 1365(b)(1)(B). This provision does, however, permit the citizen-plaintiff to intervene in the government's suit as a matter of right. *Id.*

government's decisions. Through this provision, the government is able to effectively tie the hands of citizens and diminish the impact of the citizen-suit provision.

Before a citizen can file suit, she must provide advance notice of her intention to sue to the polluting biorefinery.[262] The citizen-suit provision of the CWA includes a notice requirement that requires any citizen who plans to file suit to provide notice to the alleged violator, the Administrator of the EPA, and the state sixty days before filing suit.[263] Through this notice requirement, the CWA provides incentive for biorefineries that are in violation of their permit conditions to continue polluting. Within this sixty day period, the state or EPA could choose to file suit, thereby preempting the citizen's own suit and lessening the opportunity for an adequate remedy. Additionally, the polluting biofuel plant can clean up in those sixty days so that it no longer violates its permit. Then, after it has avoided suit, it can return to its old behavior until another suit is threatened. This behavior makes a mockery out of pollution enforcement, turning enforcement efforts into a merry-go-round of enforcement attempts, temporary compliance, and resumed violation, resulting only in increasingly polluted waters.

Though a landowner or water user near a large industrial farm may be harmed by large amounts of agricultural runoff or by pesticides or nitrates seeping into groundwater wells, that landowner has no remedy under the CWA. The CWA does not consider agricultural runoff a point source, and it is therefore not regulated through the NPDES permit system or a state equivalent.[264] The only possible way that the CWA can address agricultural sources of pollution is through its TMDL provision.[265] In *Pronsolino v. Nastri*,[266] the Ninth Circuit determined that the TMDL provision encompasses nonpoint sources of pollution as well as point sources.[267] The Ninth Circuit also noted, however, that it is not mandatory for states to implement the TMDLs.[268] The Eleventh Circuit bolstered that finding by holding that citizens cannot force states to implement TMDLs.[269] Therefore, unless courts in other jurisdictions hold contrary to the Ninth and Eleventh Circuits,[270] a landowner harmed by

262. *Id.* § 1365(b).
263. *Id.* § 1365(b)(1)(A).
264. *Id.* § 1362(14).
265. *Id.* § 1313(d).
266. 291 F.3d 1123 (9th Cir. 2002).
267. *Id.* at 1132–35.
268. *Id.* at 1140 ("[The state] chose both *if* and *how* it would implement the . . . TMDL.").
269. Sierra Club v. Meiburg, 296 F.3d 1021, 1033–34 (11th Cir. 2002); *see also* Johnson, *supra* note 167, at 366–69, 380 ("The Eleventh Circuit Court of Appeals believed so strongly that TMDLs do not include implementation that it did not allow the citizen suit in *Meiburg* to force implementation through the agreed upon consent decree.").
270. It does not appear likely that other courts will hold contrary to the Ninth and Eleventh Circuits; if anything, they are going in the opposite direction and upholding even less force for the TMDLs. One Iowa court recently held that a certain stream segment did not even need to be listed as

pollution from agricultural sources will be unable to obtain any relief under the CWA because he cannot compel the state to implement TMDLs.

b. Conflicts Arising Under Nuisance Law

The Restatement specifically provides for the application of public and private nuisance law to the pollution of surface and groundwaters.[271] Given the many challenges to bringing suit under the CWA, a landowner would likely be more successful pursuing a claim under nuisance law, which provides a less encumbered path to recovery. Also, nuisance law, unlike the CWA,[272] would enable a landowner to bring a claim for harm caused by either a biorefinery or an industrial agricultural operation, provided she is able to meet the necessary elements to establish a claim.[273] A landowner can bring a claim under one of the two existing types of nuisance, each with its own particular requirements and benefits: private nuisance or public nuisance.[274]

Private nuisance is available for harm caused to an individual landowning water user.[275] To establish private nuisance, a landowner-plaintiff would have to demonstrate that she has suffered substantial harm,[276] that the biorefinery or agricultural operation is the direct cause of that harm,[277] and that the imposition of the harm under the circumstances was unreasonable.[278] To determine unreasonableness, private nuisance law incorporates a balancing of interests analysis that weighs the gravity of harm against the utility of the challenged activity.[279] Even though a landowner may be able to meet the substantial harm requirement, she may encounter serious difficulty establishing causation, especially if there are many other sources of pollution along a water course. For instance, if a biorefinery and another industrial water user are dumping wastewater into the same river several miles apart, a landowner located downstream from both of them will likely have difficulty establishing that the biorefinery is the source of her harm. Similarly, a landowner may have difficulty establishing that one particular industrial agriculture operation is the cause of her harm, as opposed to other agricultural operations located in the same area.

Additionally, the landowner will encounter the same difficulty in prevailing under the balancing analysis for a private nuisance claim as

impaired because the impairment to the water was from siltation, not a "pollutant." Thomas v. EPA, No. C06-0115, 2007 WL 4439483, at *8–9 (N.D. Iowa Dec. 17, 2007).

271. RESTATEMENT (SECOND) OF TORTS § 832 (1979).
272. 33 U.S.C. § 1365(a) (2006).
273. RESTATEMENT (SECOND) OF TORTS § 832.
274. *Id.*
275. *See id.* § 821D.
276. *See id.* § 822.
277. *See id.*
278. *See id.* §§ 821D–822; *see also* FREYFOGLE, *supra* note 103, at 276–78.
279. RESTATEMENT (SECOND) OF TORTS § 826.

she would under the reasonable use rule. The high level of utility of both a biorefinery and an agricultural operation that supplies the biorefinery stands a strong chance of outweighing the landowner's harm.[280] Still, if nitrates from a neighboring industrial agriculture operation have contaminated a well used for a landowner's household use, provided causation is established, the gravity of such a harm may be sufficient to outweigh the utility of the agriculture operation's use of fertilizers to grow corn. Therefore, despite the more amenable process for bringing suit, a private nuisance claim will often leave a landowner without adequate redress for impairment to the quality of his water sources.

Public nuisance is available for harm caused to an entire community.[281] A landowning water user has two options for pursuing a public nuisance claim.[282] To recover damages, a landowner must show that she has personally suffered harm different from the harm suffered by other members of the community.[283] To enjoin the actions causing harm, the landowner must establish standing as a representative of the general public in the community that is harmed.[284] To prevail on a public nuisance claim, a landowner must establish "unreasonable interference with a right common to the general public."[285] Provided a landowner is able to meet the appropriate standing requirements, she is likely to prevail on the claim because water pollution poses a threat to the public health of a community, which would seem to unequivocally call for a finding of unreasonableness.[286]

The biorefinery or agricultural operation may be able to defeat the landowner's claim, however, by establishing that any threat its activities pose to the public health is not "significant" enough to substantiate a finding of unreasonableness.[287] The biorefinery or agricultural operation will also likely challenge causation, arguing that other sources of pollution along the same water course are to blame for the harm.[288] If the landowner is able to prevail, an injunction will force a biorefinery or an agricultural operation to cease polluting the community's water sources.[289] Therefore, despite the procedural standing requirements, a landowner stands the best chance for an adequate remedy under public

280. For factors considered in weighing utility versus harm, see *id.* §§ 827–828.

281. *See id.* § 821B.

282. *See id.* § 821C.

283. *Id.*

284. *Id.*

285. *Id.* § 821B.

286. *See id.* § 821B(2)(a) (listing "conduct involv[ing] a significant interference with the public health" as one of the "[c]ircumstances that may sustain a holding that an interference with a public right is unreasonable").

287. *Id.*

288. To avoid difficulties establishing causation, the landowner could potentially sue all significant polluters along a watercourse, including biorefineries, other industries, and industrial agriculture operations. Unfortunately, if the landowner also happens to run a farm, under this theory he too would be implicated in polluting the water source through the run off from his fields.

289. RESTATEMENT (SECOND) OF TORTS § 821B.

nuisance theory. Conversely, public nuisance poses a substantial threat to a biorefinery's or an agriculture operation's use rights.

Water quality is also linked with water quantity, as reduced quantities of water in surface water sources concentrate the pollutants in a water course. Therefore, a landowner can employ the claims for injury due to water quantity outlined in Part III.A to obtain relief for injury due to impaired water quality. As explained above, however, a water user's opportunity to prevail in water quantity claims are also limited.

2. Inadequacies of the CWA

The probable results of attempts to bring enforcement actions under the CWA described in the previous section illustrate its lack of substantive force as applied and its ultimate failure to protect individual rights to clean water as well as the overall quality of water sources. Given that current state and federal policy strongly supports increased biofuel production, swift and effective enforcement action by the government is not likely. As currently applied, the CWA diminishes the impact of enforcement by those who stand to benefit most from it—the individual water users who depend on clean water to survive.[290]

The requirements listed in the citizen-suit provision of the CWA and the related procedural limitations make it inordinately difficult for a citizen to obtain redress for harms caused by a biorefinery or an agricultural operation, let alone make any substantial progress toward protecting water sources. Therefore, success under the CWA's citizen-suit provision is available to a very narrow range of citizens that are actually able to meet all of the requirements, jump through all of the procedural hoops, and avoid preemption. By placing substantial obstacles in the path to citizen enforcement, the CWA essentially favors the polluter at the expense of individual citizens' rights to clean water.

Furthermore, as currently interpreted and applied, the CWA provides no means by which to enforce limits on pollution from nonpoint sources, particularly agricultural runoff.[291] Yet nonpoint sources are the biggest sources of pollution.[292] Because of its failure to enforce TMDLs, the CWA offers a water user harmed by agricultural pollutants such as pesticides and nitrates no remedy.[293] By interpreting TMDLs to lack a mandate for implementation, the life has been sucked out of the TMDL

290. *See* Johnson, *supra* note 167, at 368 ("Hence, the overall aims of the CWA have in large part missed their target.").

291. *See* John H. Davidson, *Factory Fields: Agricultural Practices, Polluted Water and Hypoxic Oceans*, 9 GREAT PLAINS NAT. RESOURCES J. 1, 11 (2004).

292. *Id.*; Johnson, *supra* note 167, at 368.

293. Still, there could be some remedy at the state level for certain kinds of pollution, such as for contamination of groundwater.

provision of the CWA, and as a result, the largest source of pollutants entering our waterways remains unregulated.[294]

A major problem with both the citizen-suit provision of the CWA and nuisance law is that neither provides for preemptive enforcement action; the water user must wait to file suit until she has suffered some actual harm or injury.[295] Therefore, by the time suit is brought, damage has already been done, water quality has already been compromised, and rights to clean water have already been infringed upon. Ultimately, the CWA appears to protect the ability to pollute more than it protects the individual's right to clean water.

IV. RECOMMENDATION AND RESOLUTION

To counteract the inadequacies of our existing system of water laws and better protect the rights of all water users, this Note recommends a three-part approach to modifying water laws in the United States. This approach focuses particularly on the reasonable use rule under the riparian rights doctrine and the CWA. The first part proposes that federal and state legislatures reform the theoretical underpinnings of our water laws. Part two presents practical changes that legislatures can implement now to initiate the process of reform. Finally, the third part of the approach calls for fundamental social change in the way Americans think about water use. All three components are necessarily interrelated and required to effectively implement and sustain the changes necessary to improve our water law system for adequate water management in the United States.

Any legislature or governmental entity—federal, state, or local—can implement the changes described in Section A and Section B. As adverse water conditions are felt on more of a local scale and concerned citizens will prompt local and state legislatures to act, change on the local level will likely precede federal change. This Note recommends that change eventually occur at all levels of government.

A. Theoretically Unsound: Reforming the Foundational Principles of Existing Water Laws

To reform our nation's water laws, whether on a local, state, or federal level, legislatures must finally relate the law to the reality that our

294. *See* Davidson, *supra* note 291, at 22; Johnson, *supra* note 167, at 367–68 (Despite the CWA's provisions for enforcement against point sources, "nonpoint source pollution predominates. Hence, the overall aims of the CWA have in large part missed their target . . . . If neither the EPA nor the states are required to implement major provisions of the CWA, then it is lifeless. Without implementation, it simply will not succeed.").

295. *See* Adkins v. Thomas Solvent Co., 487 N.W.2d 715 (Mich. 1992) (holding that landowners bringing nuisance claim against solvent company could not recover damages for a mere fear that pollution from the solvent company would contaminate their groundwater).

rivers, streams, and aquifers are not abundant, plentiful resources. Any reformed system of water law must take into account the interconnection between surface water and groundwater. Such a basis will become indispensable because as water levels continue to decline, particularly in overpumped aquifers, conflicts between surface water and groundwater users will likely become more prevalent.[296] More broadly, reforms should be based on the nature of the water sources themselves.[297]

Legislatures must ground a reformed system of water law in the principle of sustainability. In this context, sustainability indicates maintaining water levels in all water sources at specified minimum levels sufficient to sustain the level of other hydrologically connected waters for uninterrupted use, as well as to sustain fish and wildlife habitats. The principle should inform all elements of a reformed water law scheme, guiding all elements of water allocation and dispute resolution mechanisms. Each governing body can determine how this principle is ultimately manifested in codified form; however, it must play a dominant role in all water schemes and should not be subject to abrogation.

In implementing the principle of sustainability, legislatures must adopt proactive laws that are able to manage water sources during times of shortage. A reformed system of water law should prevent severe depletion before it occurs and should hold back the tide of litigation that threatens to flood courts in the coming years as the predicted water wars unfold across America. As with sustainability, how governing entities choose to enact a proactive water management scheme depends upon the entity itself and the particular water demands of its location.

Overall, this Note recommends a system that provides a maximum and a minimum withdrawal rate for all water users across a single water source, along with heightened enforcement provisions. A maximum withdrawal rate should function to protect minimum stream flows throughout the year, including during dry, summer months. Minimum withdrawal rates should reflect an absolute bare minimum, essentially enough to protect only domestic water uses. The minimum rate for municipalities should reflect a fraction of average daily uses to provide for only necessary uses, such as drinking water. The minimum rate for industrial water users should also reflect a fraction of the water needed for existing full-functional capacity, which means industries will be forced to reduce operations or find more efficient methods for using water in operation. Most importantly, legislatures must provide for swift and firm enforcement of these withdrawal rates and should not be timid in invoking the minimum withdrawal rate. The minimum withdrawal rate should not provide a safety valve, but should be a tool in the management of depleted water sources. Of course, water users, especially large industri-

296. Furthermore, conflicts in general will likely become more prevalent.

297. See Lukas, *supra* note 70, at 501–02 (providing suggestions for legislation to protect aquifers).

al ones, will not welcome the heightened enforcement or any new scheme that limits their unrestricted water use. Thus, perhaps one of the biggest challenges any legislative body faces is not how to reform the laws, but how to overcome the pressures of large water consumers that will ardently oppose the reform.

With respect to water quality, Congress[298] must regain focus with respect to the CWA and free it from the procedural and interpretive chains that bind it.[299] To reform clean water laws, Congress must focus on nonpoint source pollution and enforcement mechanisms. The most necessary element of a reformed clean water law is a method to address nonpoint source pollution. Congress must implement some mechanism to abate these abundant sources from pouring into waterways. Furthermore, any nonpoint source pollution reforms that Congress implements must address pollution from agricultural runoff. Though its efforts will meet substantial resistance from industrial agriculture, Congress must address this primary source of pollution in water sources.

Congress must also ground a reformed federal clean water statute in a stronger enforcement policy. Congress must give teeth to a reformed CWA and in doing so clearly express its intent that the new act be strictly enforced. Congress must provide for wider and easier citizen enforcement options. Any concerned water user, regardless of injury, should be permitted to bring suit. Also, if it retains the TMDL provision of the existing CWA, Congress must provide for compulsory implementation of these standards, and states should be subject to penalties if they fail to implement them. The threat of the sharp, gnashing fangs of heightened enforcement measures will help to compel compliance on the part of states and polluters.

B. Initial Changes: First Steps Toward Better Law and Better Water

Because reforming the foundational principles of existing water laws will require a substantial amount of time and resources, legislatures and courts should take steps immediately to begin initiating the process of reform. These initial changes will provide for a more adequate resolution of conflicts while more substantial changes are planned and implemented.

Immediate changes should first address some of the reasonable use rule's inadequacies. In light of the growing water shortages throughout the United States, courts should narrow their conception of what actions qualify as reasonable. For instance, courts could decide that in the con-

298. This Note focuses on Congress and the CWA in the following discussion. This is not to say that states should not also take the initiative and reform the grounding principles of their clean water laws. State action could be more effective in this regard because states can address issues of wide local concern and are more familiar with the nature of the water sources within their jurisdiction.

299. Congress might benefit by reading through the current CWA and by reading the original goals it sets forth, goals so far from being met that they are now nearly laughable.

text of current water demands, the use of water withdrawn from conservation reserve programs to irrigate crops is unreasonable. Courts could also evaluate more closely an individual industrial water user's methods of water consumption; if the court decides that an industrial user, such as a biorefinery or manufacturing plant, consumes a higher value of water than the value of its output, its use is inherently unreasonable.[300] Courts could also apply this analysis to industrial farm operations.

Courts or legislatures should also modify the reasonable use rule to take into account the interests of water users beyond the riparian landowners. Whether through judicial determination or statute, courts and legislatures should permit parties who are not riparian landowners but who are interested in the welfare of a water source to maintain a lawsuit against a riparian water user. Restricting the ability to sue under the riparian rights doctrine to a narrow group of self-interested riparian proprietors effectively limits the court's ability to adequately protect water sources. By providing other citizens and environmental groups the power to sue, courts and legislatures will more adequately address the interests of water sources themselves because these interests will be given a voice.

To acknowledge the hydrologic connection between surface water and groundwater, courts should begin to adopt the Restatement rule, which recognizes this connection. As more conflicts between surface water users and groundwater users arise, courts will require some method of adequately resolving them. Unless a court decides to establish its own rule, the Restatement rule appears to provide the simplest method of initiating this reform.

With respect to water quality, Congress should implement some initial changes to the CWA. One aspect of water pollution that Congress must immediately address is nonpoint source pollution. Congress should either amend the existing TMDL provision of the CWA to explicitly require implementation, or amend the CWA to add a wholly new provision that will regulate nonpoint sources. If Congress fails to act, the Supreme Court should act by granting certiorari to the next TMDL-related case that comes along. The legislative history of the provision, as well as its relation to the other provisions of the CWA, should enable the Court to rule that the CWA's TMDL provision does imply a requirement that states implement them.[301] Congress should also provide for added enforcement of the CWA by broadening the citizen-suit provision to mitigate the existing procedural bars on citizen suits.

300. Such an approach would require monetizing water and placing a value on water consumption, however. Though possible, this may not be beneficial in the long run for reasons set forth in Part 3 of this recommendation. Essentially, monetizing water will further commodify the resource and inhibit society's ability to comprehend the intrinsic value of the resource itself.

301. Johnson, *supra* note 167, at 370–75 (recounting the substantial evidence presented in favor of a congressional intent that TMDLs be implemented, including EPA guidance documents and an EPA Policy Memorandum).

C. Community Thinking: Modifying the Social Perception of Water Use

All members of American society share one essential characteristic: to some degree, we all use and benefit from this country's water sources. As a community of water users, we must develop a reformed social perspective regarding water sources and water use based on the need to protect water sources for the future—for the immediate future as well as for the benefit of distant future generations. Faced with sharply decreasing water supplies and threatened with ever greater risks of water contamination, we must act on our concern for the fate of our water sources by demanding effective water management from our legislative representatives. Aldo Leopold advocates that we, as a society, take responsibility for our uses of nature and adopt a land ethic promoting and ensuring the health of the land.[302] We should learn from Leopold's suggestion and enact a land ethic to govern our society's relationship with its water sources. As a community of water users, we must begin thinking like a community to ensure that community resources and community interests are adequately protected.

As part of our reformed social perspective regarding water sources, we should stop seeking ways to bypass our existing water shortages. As a community, citizens and state and local governments must address the problem of water depletion directly. Instead of exploring methods to remove salt from seawater, we should explore options that will enable us to protect and effectively manage our existing local freshwater sources. We can start by reducing our water consumption as individuals. We can call for our government to implement a water recycling program, such as that used in Australia, to purify and reuse all of the water that flows down household drains.[303] Therefore, part of reforming our mindset regarding water use is changing our desire for more into a desire for sufficiency. As biofuels have proven to American society, the answer to our resource needs may lie in our own backyard. Our society simply needs to make the legal and social adjustments necessary to effectively accommodate competing resource uses within our nation's boundaries.

302. ALDO LEOPOLD, *The Land Ethic*, *in* A SAND COUNTY ALMANAC: WITH ESSAYS ON CONSERVATION FROM ROUND RIVER 237, 237–64 (Ballantine 1966) (1949). According to Leopold, "All ethics so far evolved rest upon a single premise: that the individual is a member of a community of interdependent parts . . . . The land ethic simply enlarges the boundaries of the community to include soils, waters, plants, and animals, or collectively: the land." *Id.* at 239. Leopold also advocates that we as a community move away from the "wholly economic self-interest" that governs land use ethics. As one step toward taking responsibility for the health of the land, Leopold argues that farmers should act as proper land stewards. According to Leopold, "[W]e have been too timid, and too anxious for quick success, to tell the farmer the true magnitude of his obligations . . . . In our attempt to make conservation easy, we have made it trivial." *Id.* at 246.

303. JOHN C. RADCLIFFE, AUSTL. ACAD. OF TECHNOLOGICAL SCIS. & ENG'G, WATER RECYCLING IN AUSTRALIA (2004), *available at* http://www.atse.org.au/index.php?sectionid=600.

V. CONCLUSION

Driven by social and political support, the biofuel industry is growing at a rapid rate.[304] Ironically, in our efforts to promote sustainable use of our natural resources by converting from fossil fuels to biofuels, the biofuel industry will contribute to the degradation of a different valuable natural resource that every element of our society depends upon—our water supplies. Because water is an indispensible element in the biofuel production process, water consumption will also increase within the communities and regions housing new biorefineries and expanded agricultural operations. As water levels continue to decrease and pollution levels continue to increase, conflicts will inevitably arise between existing local water users and the local biorefinery, or between local water users and the large-scale industrial agriculture operation. This Note illustrates, however, that our current water laws are not equipped to adequately resolve these conflicts.

To remedy the inadequacies of our water laws, fundamental changes, both immediate and long term, are necessary. State and local legislatures as well as the United States Congress should reevaluate the fundamental principles behind our existing water laws, grounding a reformed water law system in the principle of sustainability. To implement sustainable use, reformed water laws should be proactive in nature and should efficiently manage water sources. Reformed laws should also provide strong enforcement mechanisms and should permit any interested citizen to bring suit. Because all members of society use our nation's water sources, whether biorefinery, industrial agriculture operation, municipality, or town resident, all will benefit from improved water laws. Most importantly, to truly change our system of water laws, Americans should begin to think and act as a community and should develop a social land ethic that will promote responsible water use. Overall, perhaps biofuels really are *the* solution to establishing sustainable use of natural resources, in more ways than originally anticipated.

304. ENERGY QUEST & ECCO CONSULTING, AUSTRALIAN BIOFUEL PRODUCTION CAPACITY GROWING AT A RAPID RATE, BUT KEY DECISIONS STILL TO BE MADE: NEW STUDY (2006), http://energyquest.com.au/reports/biofuelsStudy20061121.pdf.