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Trading Water: Using Tradable Permits to Promote Conservation and Efficient Allocation of an Increasingly Scarce Resource

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TRADING WATER: USING TRADABLE PERMITS TO PROMOTE CONSERVATION AND EFFICIENT ALLOCATION OF AN INCREASINGLY SCARCE RESOURCE

ABSTRACT

Growing populations and changing climate patterns are causing water shortages in areas that have not previously experienced such water scarcity. Governments are forced to implement short-term ad hoc measures to address shortages because they have not implemented long-term conservation and efficient-use policies. Permanent policies that conserve and more efficiently allocate water resources should be implemented to prevent, or more effectively manage, water shortages.

This Comment argues that a free-market system for water-use rights should be implemented to address and prevent water shortages. A water market system would require that secure property rights be attached to water use and that those rights be freely tradable. Current water-rights regimes used in the United States are not sufficient to support such a market system because current regimes do not grant secure property rights in water use, and it is unclear to what extent water-use rights can be transferred. Therefore, a market system under the current water-rights regimes would not be able to maximize its potential to promote efficient allocation of water resources.

This Comment argues that tradable permits for water use should be used as the currency of a water market system. A water use permit would secure for its holder a right to a certain level of water use and would be freely tradable. The aggregate level of sustainable water withdrawal and consumption would be determined by the state, and the water-use permits would be distributed to current users at no cost. The amount of use allowed by the permit would be based on each user's current and historical water use. The permits could then be traded in a market, encouraging efficient use, conservation, and the highest economic allocation of water resources.

INTRODUCTION

Due to growing demand from expanding populations and industry and an increasing frequency of drought conditions, water shortages in the United States have been increasing.[1] Some commentators believe that global warming has contributed to more frequent drought conditions, a trend they believe will continue to worsen.[2] To ensure water is available for basic needs, policy makers have implemented temporary conservation measures such as water rationing,[3] and restrictions on watering lawns, filling swimming pools, and washing cars.[4]

In 2009 as California appeared to be facing its third drought year in a row, the state considered managing the shortage by implementing rationing policies that would reduce users' water access by up to twenty percent.[5] The U.S. Bureau of Reclamation, a water provider in California,[6] planned to cut off water for agricultural use in the Central Valley region of the state and cut the water allotment for municipalities and industrial users in half.[7] One irrigation specialist at a commercial farm that also used its own wells and pipelines said

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[1] *See* Joseph W. Dellapenna, *Interstate Struggles over Rivers: The Southeastern States and the Struggle over the 'Hooch*, 12 N.Y.U. ENVTL. L.J. 828, 828 (2005) [hereinafter Dellapenna, *Interstate Struggles*] (noting that the southeastern U.S. region experienced the worst drought in its recorded history in the 1980s and still worse drought conditions at the beginning of the 21st century); 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, 10 (2002) [hereinafter Dellapenna, *Water Allocation*] (stating that in the eastern half of the United States, growing demand and erratic climate patterns have caused more frequent shortages); Felicity Barringer, *Signs of Another California Drought Year*, N.Y. TIMES, Jan. 2, 2009, at A15 ("California, just finished with its second consecutive year of drought, might well be facing a third."); *see also* Janet C. Neuman, *Federal Water Policy: An Idea Whose Time Will (Finally) Come*, 20 VA. ENVTL. L.J. 107, 110–11 (2001) (noting that the problem is exacerbated by the fact that population is growing fastest in areas with less water).

[2] *E.g.*, Joseph W. Dellapenna, *Regulated Riparianism*, *in* 1 WATERS AND WATER RIGHTS § 9.01, at 9-10, 9-11 (Robert E. Beck & Amy K. Kelly eds., repl. vol. ed. 2007) [hereinafter Dellapenna, *Regulated Riparianism*] (noting that climate change is predicted to cause increasing frequency of both droughts and floods); Noah D. Hall, Bret B. Stuntz & Robert H. Abrams, *Climate Change and Freshwater Resources*, 22 NAT. RESOURCES & ENV'T 30 (2008) (noting that scientists predict climate change will have an adverse impact on water resources).

[3] *See, e.g.*, Barringer, *supra* note 1 (reporting that California may impose water rationing).

[4] *See, e.g.*, Stacy Shelton & John C. Perry, *Only Toughest Ban Reduced Water Use*, ATLANTA J.-CONST., Feb. 24, 2008, at D1 (reporting on water conservation measures implemented in Georgia during drought conditions).

[5] Ari B. Bloomekatz, *U.S. Plans to Tighten Tap for Farmers*, L.A. TIMES, Feb. 21, 2009, at B3.

[6] The U.S. Bureau of Reclamation operates dams and reservoirs in the western United States and sells water in the wholesale market and to agricultural users. U.S. Bureau of Reclamation: About Us, http://www.usbr.gov/main/about/ (last visited Mar. 24, 2010).

[7] Bloomekatz, *supra* note 5.

that, under the drought conditions, he would be happy if the farm received one-sixth of the agricultural water it received under normal conditions.[8]

It is apparent that in future times of drought and water shortage, temporary conservation measures will not be sufficient to preserve adequate water resources, particularly in areas of continuing population growth.[9] Compounding the problem, population growth often takes place in areas that do not have adequate water resources to begin with.[10] Thus, more permanent measures will be required to solve the water shortage problem.[11] This Comment argues that a more effective and permanent water conservation strategy for state governments would be (1) to cap or limit water use at a predetermined sustainable level; (2) to allocate among existing users tradable or transferable withdrawal permits that grant property rights in water use and that collectively permit aggregate water use no greater than the predetermined cap; and (3) to facilitate a free market for the trading of such water-use permits. These permits would give their holders the right to use a certain amount of water by withdrawing it from a water source.[12]

A cap on the total level of water use would enable policy makers to ensure that water resources are maintained at a sustainable level.[13] The initial

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[8] *Id.*

[9] *See* Hall, Stuntz & Abrams, *supra* note 2, at 34 ("[W]e must reform water law and policy to emphasize conservation and efficient, environmentally sound allocation."); Olen Paul Matthews & Michael Pease, *The Commerce Clause, Interstate Compacts, and Marketing Water Across State Boundaries*, 46 NAT. RESOURCES J. 601, 603 (2006) (arguing that conservation and more efficient allocation are the solutions to inadequate water supply); *see also* Stacy Shelton, *Atlanta Water Supply Precarious; Without Conservation, Future Looks Glum*, ATLANTA J.- CONST., June 27, 2005, at E1 (citing district water plans, reporting that water shortages are projected in north Georgia, which includes Atlanta, unless there are "aggressive conservation measures and new lakes to store water").

[10] *See* Stephen E. Draper, *The Unintended Consequences of Tradable Property Rights to Water*, 20 NAT. RESOURCES & ENV'T 49 (2005) ("Increasingly in the United States, commercial activities and growing population centers have developed in areas with scarce water resources."); Neuman, *supra* note 1, at 110–11.

[11] *Supra* note 9 and accompanying text.

[12] The distinction should be made between the right to *withdraw* water, which would be attached to the permits this Comment proposes, and the possession or ownership rights of particular water from a particular source. This distinction is important because a *withdrawal* right can be transferred to a different location that has a different water source. *See* Tom Tietenberg, *Tradable Permits in Principle and Practice*, 14 PENN ST. ENVTL. L. REV. 251, 266 (2006) (a tradable permit system does not "privatiz[e] the resource;" it "privatizes the right to access the resource"); *see also* James L. Huffman, *Water Marketing in Western Prior Appropriation States: A Model for the East*, 21 GA. ST. U. L. REV. 429, 439 (2004) (explaining that water's physical properties makes "it impossible, with some exceptions, to actually possess the same water for an extended period," but that this "is not necessarily an insurmountable obstacle to water marketing"). For a further discussion of transferring a tradable permit for water use to a location other than where the permit was initially allocated, see *infra* Part II.A.2.

[13] *See* Tietenberg, *supra* note 12, at 265 (describing the basic attributes of a cap-and-trade system).

allocation of water-use rights would be based on existing levels of actual use, not the level of use that would attach through current water-rights laws.[14] By then allowing water-use permits to be bought and sold in a market environment, water could be allocated more efficiently because the holder of a permit would have an incentive to sell it in the market to a user who values it more highly.[15]

Although there are economic benefits to a market system, there are also problems that may arise in such a system, particularly when applied to a precious resource such as water. Criticisms of water markets include concerns that states may be unable to prevent water from being transferred and used out-of-state,[16] that smaller agricultural users and consumers may not be able to afford to participate in the market,[17] and that transaction costs associated with implementing and facilitating the system will erode any gains that might have been attainable.[18]

Any change in water rights law would need to be implemented by the states.[19] The federal government has implemented legislation addressing specific issues related to water resources;[20] however, state law governs water

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[14] See *infra* Part I for a discussion of current water-rights regimes. For a discussion of the system proposed by this Comment, see *infra* Part III.

[15] *See generally* Huffman, *supra* note 12, at 432 ("[A] well functioning market is the most effective and efficient institution to allocate scarce resources."); Jonathan Remy Nash & Richard L. Revesz, *Markets and Geography: Designing Marketable Permit Schemes to Control Local and Regional Pollutants*, 28 ECOLOGY L.Q. 569, 572 (2001) (describing emission permit trading systems as reducing "aggregate emissions to the chosen aggregate level for the least cost" when there is an active market); Janet C. Neuman, *Have* We *Got a* Deal *for* You*: Can the East Borrow from the Western Water Marketing Experience?*, 21 GA. ST. U. L. REV. 449, 497 (2004) ("Subjecting water to market forces such as price signals can promote more efficient water use . . . ."); Richard B. Stewart, *Panel I: Liberty, Property, and Environmental Ethics*, 21 ECOLOGY L.Q. 411, 414 (1994) ("The advantages of . . . tradable permits are quite clear in economic terms."); Barton H. Thompson, Jr., *What Good Is Economics?*, 27 ENVIRONS ENVTL. L. & POL'Y J. 175, 176–77 (2003) (arguing for and describing benefits of applying economic theory to environmental regulation). *But see* Draper, *supra* note 10, at 49 (noting that imposing economics on water allocation may have "unintended consequences that outweigh its benefits").

[16] *See, e.g.*, Draper, *supra* note 10, at 53.

[17] *See, e.g.*, Wilson Barmeyer, Note, *The Problem of Reallocation in a Regulated Riparian System: Examining the Law in Georgia*, 40 GA. L. REV. 207, 237–38 (2005) (noting the possibility of "inequitable allocation of water dependant on economic wealth").

[18] *See, e.g.*, Draper, *supra* note 10, at 51–52 (discussing transaction costs and externalities). For a discussion of the criticisms of a market for water, see *infra* Part II.B.

[19] *See* Huffman, *supra* note 12, at 442 (noting the possibility of a federal water rights law, but that "it would be very disruptive to shift from the well-established state water rights regimes").

[20] *See* Neuman, *supra* note 1, at 107–08, 113 (noting that federal legislation has addressed "water supply, pollution, dams, hydropower development, navigation, flood control, fisheries, and research" and that the federal government spends more than ten billion dollars annually on water programs).

rights.[21] Although implementation of a tradable permit market for water at the federal level could impose a uniform system across all the states, such a change in the existing law would introduce issues of federalism that are beyond the scope of this Comment.[22] Instead, this Comment focuses on a structure of a market for tradable permits that could be implemented and tailored as needed by each state to conserve and efficiently allocate its water resources.

In addition to arguing that a cap-and-trade system for allocating water use should be implemented to address water shortages, this Comment demonstrates why the two current water-rights systems—riparian rights in the East and prior appropriation in the West—and their regulated variations cannot support such a system.[23] Property rights in water use and the extent to which water-use rights can be transferred—characteristics that are essential for a robust and efficient permit trading market—are uncertain in both riparian rights and prior appropriation systems.[24] Therefore, this Comment argues that a new water-rights system that provides for water-use permits that have vested property rights and that are freely tradable is necessary for a market system that maximizes its potential to conserve and efficiently allocate water resources.

Part I of this Comment discusses the water-rights regimes currently used in the United States. Part II discusses the various design considerations and structures of tradable permit systems, how tradable permit systems have been used in other contexts,[25] and how they might be used in a water-market system. Part III proposes and describes a market system that uses as its currency tradable permits for water withdrawal and that attempts to minimize the risks associated with water markets, while maintaining the gains in conservation and economic efficiency promoted by such a system.

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[21] *See* Zach Willey & Tom Graff, *Federal Water Policy in the United States—An Agenda for Economic and Environmental Reform*, 13 COLUM. J. ENVTL. L. 325, 347 (1988) ("State water laws have established rights to use water under appropriative, riparian, correlative, and other conditions.").

[22] *See* Neuman, *supra* note 1, at 114–16 (arguing for a federal water-use policy but stating that "a major political barrier preventing the development of a rational, federal water policy is the tension of federalism itself"). For a discussion of why a federal water use policy is a good idea, see Neuman, *supra* note 1.

[23] *See infra* Parts I.A.3 & I.B.2.

[24] *See, e.g.*, Huffman, *supra* note 12, at 443 ("One cannot overemphasize the importance of secure, well-defined, and enforceable property rights. The rights must be exclusive, universal, and transferable."). For a discussion of the why both systems are inadequate for a water-market system, see *infra* Parts I.A.3 and I.B.2.

[25] Tradable permits have been used to limit pollution and regulate use of common resources such as habitats and fisheries. James Salzman & J.B. Ruhl, *Currencies and the Commodification of Environmental Law*, 53 STAN. L. REV. 607, 616 (2000).

I. CURRENT WATER-LAW REGIMES AND WHY THEY WOULD NOT SUPPORT A WATER-MARKET SYSTEM

This Part explores current water-law regimes used in the United States and explains why they would not adequately support a tradable permit water-market system. Section A discusses the historical common law riparian rights system generally used in the eastern states and explains how that system has been modified by state legislatures into its current form. Section B discusses the prior appropriation system generally used in the western states.

A. Riparian Systems and Their Regulated Progeny

This section discusses common law riparian rights and how those common law rights systems have been modified by state legislatures. It also discusses why neither common law riparian rights nor their legislatively-modified variations would adequately support a market for tradable water-use permits.

1. Common Law Riparian Rights

Common law riparian rights establish and govern the rights of water users to access and consume water resources.[26] The riparian rights doctrine developed in the eastern part of the United States, and its application has generally been limited to that area.[27] Riparian rights are a common property system, which means that for the most part users are given discretion to decide how they use the resource.[28] The doctrine is based on the theory that land appurtenant to a body of water has a "bundle of rights" associated with that physical proximity.[29] For purposes of this Comment, the most important of these is the right to use and consume water because it results in depletion of the resource.[30] Common consumptive uses include irrigation, household distribution through public utilities, and industrial processing.[31]

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[26] Dellapenna, *Water Allocation*, *supra* note 1, at 11.

[27] *See id.* at 9 (noting that riparian rights developed east of Kansas City, where water was abundant, and appropriative rights were used west of Kansas City, where water was more scarce).

[28] *Id.*

[29] Joseph W. Dellapenna, *Introduction to Riparian Rights*, *in* 1 WATERS AND WATER RIGHTS, *supra* note 2, § 6.01(a), at 6-7 [hereinafter Dellapenna, *Introduction to Riparian Rights*]; *see also* RESTATEMENT (SECOND) OF TORTS § 843 (1979) ("The term 'riparian land' . . . means a tract of land that borders on a watercourse or lake, whether or not it includes a part of the bed of the watercourse or lake.").

[30] *See* Dellapenna, *Introduction to Riparian Rights*, *supra* note 29, § 6.01(a)(4), at 6-70 ("Consumptive uses create interferences with competing uses that are permanent."). The bundle of rights also includes, but is not necessarily limited to, the right to access the water, the right to build a pier, the right to accretions (sedimentary deposits), and the right to "own the subsoil of nonnavigable streams and other 'private' waters."

When common law riparian rights developed in the early nineteenth century,[32] there was no apparent shortage of water in eastern states, and therefore no apparent need to restrict water use.[33] Thus, under what is generally known as the reasonable use standard, a riparian land owner has the right to unlimited reasonable use of a water source, subject only to the reasonable use rights that other riparian users have to the same body of water.[34] Under this rule, the only consideration is whether a use interferes with another riparian's[35] right to reasonable use of the source; the effect that a use has on the body of water itself is not relevant.[36] Under the rule adopted by the *Restatement (Second) of Torts*, the reasonableness of the use is determined by consideration of a number of factors including the purpose, social value, and economic value of the use.[37] Traditional reasonable-use common law holds that a non riparian use[38] of a water source that affects a riparian use in any way is per se unreasonable.[39] Courts in most riparian states still apply this strict common law rule to nonriparian use.[40]

Id. § 6.01(a), at 6-8. Courts make a distinction between uses which are consumptive and those that are not consumptive. As Dellapenna notes that "[a]mong the most common non-consumptive uses recognized by the law have been navigation, fishing, hunting, and swimming." *Id.* § 6.01(a)(3), at 6-60, 6-61.

[31] *See id.* § 6.01(a)(4), at 6-69, 6-70. Other consumptive uses include animal husbandry, mineral mining, and steam-generated power. *Id.*

[32] *See* Dellapenna, *Water Allocation*, *supra* note 1, at 11 n.12 (noting that *Tyler v. Wilkinson*, 24 F. Cas. 472 (C.C.D.R.I. 1827) (No. 14,312), is "often cited as the first true riparian rights case").

[33] *See id.* at 9.

[34] *See* RESTATEMENT (SECOND) OF TORTS § 850 (1979) ("A riparian proprietor is subject to liability for making an unreasonable use of the water of a watercourse or lake that causes harm to another riparian proprietor's reasonable use of water or his land."); Joseph W. Dellapenna, *The Right to Consume Water Under "Pure" Riparian Rights*, *in* 1 WATERS AND WATER RIGHTS, *supra* note 2, § 7.02(d), at 7-48 [hereinafter Dellapenna, *Right to Consume*] (describing the reasonable-use theory of riparian rights).

[35] Riparian refers to an owner of riparian land. BLACK'S LAW DICTIONARY 1352 (8th ed. 2004).

[36] *See* Dellapenna, *Right to Consume*, *supra* note 34, § 7.02(d), at 7-49 (noting that courts will find liability where another riparian suffers "unreasonable injury").

[37] RESTATEMENT (SECOND) OF TORTS § 850A (1979). In addition, the *Restatement* lists the following factors: level of harm caused by the use, the ability of one of the users to avoid the harm, the ability of each user to meet their needs using less water, the protection of existing economic value in the use, and the fairness of causing the harmful user to bear the loss from fewer use rights. *Id.*; *cf.* Dellapenna, *Water Allocation*, *supra* note 1, at 15 n.36 (explaining that many cases only consider economic factors: "These [non-economic] principles figure prominently in the *Restatement (Second)* even if they do not figure prominently in the cases.").

[38] According the *Restatement (Second) of Torts*, "[n]onriparian uses are those made neither on nor in connection with the use of riparian land, and include irrigation of nonriparian land and use in manufacturing on nonriparian land, even though the land belongs to the owner of riparian land. They also include the diversion and sale of water for consumption by nonriparian customers of water companies and inhabitants of cities." RESTATEMENT (SECOND) OF TORTS § 855 cmt. a (1979).

[39] Dellapenna, *Right to Consume*, *supra* note 34, § 7.02(d)(1), at 7-54. As will be discussed in Parts II and III of this Comment, a tradable permit water-market system is not viable unless nonriparian use is allowed

Since common law riparian rights accrue to the rights-holder through ownership of land that is appurtenant to the water source,[41] in the early development of common law riparian rights, the rights were often transferable only as an attachment to the appurtenant land.[42] Over time, however, exceptions to that common law rule developed.[43] Some courts have allowed transfer of riparian rights to a nonriparian user apart from the appurtenant land, but the alienability of the rights often depends upon whether the contemplated use is consumptive or non-consumptive.[44] As Professor Dellapenna notes, grants by riparians allowed by a state would bind the grantor, but "the extent to which the grant conveys rights [to the grantee] against any riparians other than the grantor is far from clear."[45] This uncertainty demonstrates the difficulty in determining what standard of "reasonable use" should attach to a transfer of rights from a riparian user on appurtenant land to a nonriparian user.[46]

2. Regulated Riparianism

Legislative modifications of riparian rights are commonly referred to as regulated riparianism,[47] and they are generally intended to address water supply shortages.[48] Commentators have concluded that common law riparian rights without any legislative modification are not well suited to allocate water during water shortages because the system is limited in its ability to restrict use, and disputes among users require the expense, time, and uncertainty of

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to occur. *See id.* § 7.04, at 7-108 ("There is . . . no reason to believe that the economically most productive use of water from a particular waterbody will always lie on contiguous land.").

[40] *Id.* § 7.02(d)(1), at 7-54, 7-55. The *Restatement (Second) of Torts* and courts in New Hampshire, Vermont, and Georgia have rejected the common law rule that nonriparian use is per se unreasonable. *Id.* Some states have passed legislation that may be interpreted to overrule the common law rule, but, as Professor Dellapenna concludes, the question is often not directly addressed and, therefore, the status of the common law rule is uncertain in many states. Dellapenna, *Regulated Riparianism*, *supra* note 2, § 9.03(a)(2), at 9-70 (discussing these legislative modifications in various states).

[41] *See* Dellapenna, *Right to Consume*, *supra* note 34, § 7.01, at 7-2 (noting that the "basic concept of riparian rights" is that each land owner next to the water has equal rights to the other appurtenant land owners).

[42] *Id.* § 7.04, at 7-107.

[43] *See generally id.* at 7-108 (explaining that every state has, to varying degrees, loosened the restriction on alienability of riparian rights).

[44] *Id.* § 7.04(a)(3), at 7-117.

[45] *Id.*

[46] Dellapenna, *Water Allocation*, *supra* note 1, at 17–18 (noting the uncertainty as to whose level of "reasonable use" is acquired by a non-riparian user).

[47] *E.g.*, Dellapenna, *Regulated Riparianism*, *supra* note 2, § 9.01, at 9-17 & n.51.

[48] *See generally id.* at 9-15 (discussing the conditions that led to development of regulated riparianism).

litigation to resolve.[49] Dellapenna has concluded that nineteen of thirty-one eastern states have implemented "comprehensive regulated riparian[ism]."[50]

The most common feature of regulated riparianism is a permit requirement for certain types and manners of use.[51] Common uses that trigger permit requirements are (1) withdrawals over a certain amount,[52] (2) withdrawals from certain sources,[53] and (3) inter-basin transfers of water.[54] It is not entirely clear whether regulated riparianism relaxes restrictions on water rights transfers to nonriparians because the statutes often do not directly address the issue.[55] Dellapenna has suggested that the best interpretation in such cases may be that the legislatures implicitly intended to leave the common law rule in place.[56]

Regulated riparian statues also tend to exempt certain water users, often weakening the statute's intended effect.[57] Common explicit permit exemptions in regulated riparian statutes include agricultural use,[58] domestic use,[59] and uses that were already established when the permit system was implemented.[60] Groundwater is often regulated within the same system as surface water, extending the reach of the regulations to more consumptive uses.[61] Most

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[49] *See id.* § 9.01, at 9-12, 9-13, § 9.03, at 9-52 (summarizing criticisms of common law riparian rights as an allocation system during water shortages).

[50] *Id.* § 9.03, at 9-54 (citing statutes in Alabama, Arkansas, Connecticut, Delaware, Florida, Georgia, Iowa, Kentucky, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, New Jersey, New York, North Carolina, Virginia, and Wisconsin).

[51] *See id.* § 9.03(a), at 9-62 ("Easily the most significant innovation under regulated riparianism, the feature that most sharply sets it apart from traditional riparian rights, is that direct users of water must have a permit from a state administrative agency in order to be entitled to use water.").

[52] *See, e.g.*, GA. CODE. ANN. § 12-5-96 (2009) (requiring permit for groundwater withdrawals greater than 100,000 gallons per day).

[53] *See* Dellapenna, *Regulated Riparianism*, *supra* note 2, § 9.03, at 9-53 (citing 615 ILL. COMP. STAT. 50/1–50/14 (2009) (requiring permits for withdrawals from Lake Michigan)).

[54] *See id.* (citing S.C. CODE ANN. 49-21-10 to -80 (2009)).

[55] *Id.* § 9.03(a)(2), at 9-70.

[56] *Id.*

[57] *See id.* § 9.03(a)(3) (discussing exemptions from permit requirement in regulated riparian systems).

[58] *See id.*, at 9-76, 9-77 (citing statues exempting agricultural use to varying extents in Kentucky, Maryland, Georgia, Michigan, Iowa, Maryland, and Minnesota).

[59] *See id.*, at 9-75 (citing statutes explicitly exempting domestic use in Florida, Hawaii, Kentucky, Maryland, Minnesota, and Mississippi, and statutes that permit withdrawal amounts so large as to effectively exempt domestic use in Alabama, Connecticut, Delaware, Georgia, Iowa, Michigan, and Wisconsin).

[60] *See id.*, at 9-77 ("Most of the statutes either exempt at least some uses established on the effective date of the statute from the permit requirement or guarantees an initial permit to established uses.").

[61] *Id.* § 9.03(a)(1), at 9-66 (noting that "fourteen of the nineteen regulated riparian states" have included ground water in their regulated riparianism laws).

states, however, exclude from the permitting system "diffuse"[62] water bodies by (1) expressly excluding them, (2) expressly applying the scheme to only certain water bodies, (3) exempting lakes and ponds, (4) exempting water bodies contained on the property of a single owner, or (5) exempting regulation of diffuse water bodies except in times of shortage.[63] Dellapenna notes that these exemptions largely benefit agricultural uses and that "they obviously impair the administering agency's ability to undertake effective management in the face of system-wide shortages."[64] Government subsidies, which can increase agricultural water use, exacerbate the problem.[65] The permit exemptions mentioned above are often based more on political preferences than any societal benefits rationale, so they "undermine the entire scheme of regulating uses in the public interest."[66]

Regulated riparian systems that exempt agricultural users adversely affect policy makers' ability to effectively regulate water use in the aggregate because agricultural use comprises such a large portion of consumptive uses.[67] One of the best examples of this problem is the set of exemptions for agricultural use in Georgia's regulation system.[68] The Ground-water Use Act of 1972[69] and the Georgia Water Quality Control Act,[70] which was first passed in 1964, both require certain water users to obtain permits from the state before using water resources. The basic requirement of the two laws is that any user withdrawing more than 100,000 gallons per day of water from a ground or surface source must first obtain a permit.[71] Agricultural users face less

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[62] Diffuse water can generally be described as surface water that is not part of a defined water body. *See, e.g.*, HAW. REV. STAT. § 174C-3 (2009) (describing diffused surface water as "water occurring upon the surface of the ground other than in contained water bodies"); *Court Reports*, 11 U. DENV. WATER L. REV. 445, 466 (2008) (describing diffuse surface waters as "waters from rain or melting snows flowing over land and not part of a defined watercourse").

[63] *See* Dellapenna, *Regulated Riparianism*, *supra* note 2, § 9.03(a)(1), at 9-67 (describing various state laws with respect to diffuse surface waters).

[64] *Id.* at 9-69.

[65] Willey & Graff, *supra* note 21, at 326.

[66] Dellapenna, *supra* note 2, § 9.03(a)(3), at 9-80 ("To exempt such activities . . . serves little purpose other than capitulation to the political strength of the groups exempted.").

[67] *See* Dellapenna, *Interstate Struggles*, *supra* note 1, at 838 (labeling irrigation as "generally the most heavily consumptive use of water").

[68] *See* Dellapenna, *Water Allocation*, *supra* note 1, at 72 (noting that agricultural exemptions in Georgia "go far beyond the exclusions of certain uses in other regulated riparian states").

[69] GA. CODE ANN. §§ 12-5-90 to -107 (2009). As the name suggests, this law applies to use of ground water.

[70] GA. CODE ANN. §§ 12-5-20 to -53 (2009). This law applies to use of surface water.

[71] GA. CODE ANN. §§ 12-5-31(a)(1)(A), 12-5-96(a)(1) (2009). *See also* Dellapenna, *Water Allocation*, *supra* note 1, at 68–70 (describing the provisions of each statute).

stringent requirements under the statutes.[72] Both laws provide that a withdrawal permit up to the operating capacity of a farm shall be issued for any farm that used the water source prior to July 1, 1988, and applied for the permit prior to July 1, 1991.[73] Under both statutes, farm-use permits applied for before April 20, 2006, or which are not within the Flint River basin,[74] have no expiration; permits applied for on or after April 20, 2006, for a farm within the Flint River basin have a twenty-five-year term, but they are renewable at the original withdrawal capacity unless the "original capacity would have unreasonable adverse effects upon other water uses."[75] Under this regulation scheme, policy makers in Georgia are limited in their ability to implement conservation measures targeted at agricultural use.[76] The permits that grant agricultural-use rights are not determined by actual use, and they have either no expiration dates or expiration dates that are long-term.[77] Thus, the policy makers have few options to regulate one of the largest categories of water use in the state.[78] This is particularly problematic in times of drought, during which the need to conserve water is the greatest and the relative level of agricultural use increases because of greater irrigation requirements.[79]

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[72] *See* GA. CODE ANN. §§ 12-5-31(a)(3), 12-5-105(a) (2009).

[73] GA. CODE ANN. §§ 12-5-31(a)(3), 12-5-105(a) (2009).

[74] The Flint River flows through southwest Georgia. According to the River Basin Center at the University of Georgia, "[t]he Flint River is approximately 350 miles long and drains an area of 8,460 square miles." Gretchen Loeffler & Judy L. Meyer, River Basin Ctr., *Chattahoochee-Flint River Basin*, http://www.rivercenter.uga.edu/education/k12resources/basinsofga2.htm.

[75] GA. CODE ANN. §§ 12-5-31(a)(3), 12-5-105(b)(1) (2009). The permits may be transferred to subsequent owners of the property, subject only to notification of the transfer to the state. *Id.* Changes in the use or withdrawal capacity of the water permit must be applied for and approved by the state. *Id.*

[76] *See* Barmeyer, *supra* note 17, at 216 ("[The exemptions] impair the state's ability to manage its water resources effectively.").

[77] GA. CODE ANN. §§ 12-5-31(a)(3), 12-5-105(b)(1) (2009).

[78] *See* JULIA L. FANNING, U.S. GEOLOGICAL SURVEY, WATER USE IN GEORGIA, 2000; AND TRENDS, 1950-2000 (2003), *available at* http://cms.ce.gatech.edu/gwri/uploads/proceedings/2003/Fanning.pdf (noting that irrigation use accounts for almost seventeen percent of water use from all sources, and fifty-one percent of groundwater use in Georgia); Dellapenna, *Water Allocation*, *supra* note 1, at 72 ("Farm uses remain far and away the largest use of water in Georgia.").

[79] *See* FANNING, *supra* note 78 (noting that more irrigation is required during droughts); Hall, Stuntz & Abrams, *supra* note 2, at 33 (noting that demand for irrigation water will increase in areas where drier conditions are expected).

3. Why Neither Riparianism nor Regulated Riparianism Can Support a Tradable Permit Market for Water

The most significant fundamental requirement for a successful and efficient water market is that water-use rights also be secure property rights.[80] It is unlikely that buyers would be willing to participate in a market for rights if those rights are not fully secure from forfeiture or interference by third parties.[81] Because common law riparian rights and current regulated riparian systems have uncertain property rights,[82] these systems cannot adequately support a market for tradable water permits.[83]

Common law riparian rights are not sufficiently clear to support a market system that uses tradable permits as its currency.[84] Because a riparian's rights are based on the reasonable-use doctrine,[85] those rights, in the amount and type of use allowed, may change and evolve over time if the needs and uses of other riparians change.[86] This unstable balance of reasonableness among users makes the riparian rights of competing users subject to change based on factors that are out of the user's control.[87] This problem would likely be magnified in a market system because riparian users would want to sell as many of their riparian rights as possible, and it would be unclear how much of the shared

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[80] *See* Barmeyer, *supra* note 17, at 230 ("Clearly defined property rights are a prerequisite to any system of water rights trading through a market."); Joseph W. Dellapenna, *The Importance of Getting Names Right: The Myth of Markets for Water*, 25 WM. & MARY ENVTL. L. & POL'Y REV. 317, 327 (2000) ("[M]ost fundamental to the functioning of markets are the laws that define the property rights that form the 'objects' of the market's transactions . . . ."); Daniel C. Esty, *Toward Optimal Environmental Governance*, 74 N.Y.U. L. REV. 1495, 1533–34 (1999) (discussing tradable permits in fisheries, stating that "governments must provide legal structures to ensure that those with property rights are able to vindicate them"); Huffman, *supra* note 12, at 443 ("One cannot overemphasize the importance of secure, well-defined, and enforceable property rights. The rights must be exclusive, universal, and transferable.").

[81] Barmeyer, *supra* note 17, at 230; Tietenberg, *supra* note 13, at 267 ("Confiscation of rights or simply insecure rights could undermine the entire [market trading] process.").

[82] *See supra* notes 45 & 46 and accompanying text. *See also* Barmeyer, *supra* note 17, at 231 (noting the lack of clear property rights in water withdrawal permits in Georgia).

[83] *See* Hall, Stuntz & Abrams, *supra* note 2, at 35 ("[R]ights in water are less certain than in many other forms of property, making a true market difficult to achieve.").

[84] *See* Neuman, *supra* note 15, at 488 (stating riparian rights are "so poorly defined and open-ended as to discourage investment"); *supra* notes 45 & 46 and accompanying text.

[85] *See supra* notes 34–37 and accompanying text.

[86] *See* Olivia S. Choe, Note, *Appurtenancy Reconceptualized: Managing Water in an Era of Scarcity*, 113 YALE L.J. 1909, 1911 (2004) (describing how this inherent uncertainty in riparian rights has prevented water markets); Hall, Stuntz & Abrams, *supra* note 2, at 35 (stating that litigation over water rights is inefficient because court "rulings may soon be mooted by changed conditions").

[87] *See* Dellapenna, *Water Allocation*, *supra* note 1, at 16 ("If either of the competing uses changes in physical or economic terms, the calculus of reasonableness will change . . . .").

water resource would be allocated to each user. In addition, disputes over common law riparian rights are settled in court based on a number of different factors.[88] Because different factors may be considered or prioritized differently by different courts, riparian rights can be somewhat unpredictable.[89]

A second problem that makes common law riparian rights inadequate for a tradable permit market is that it is unclear whether common law riparian rights are transferable to nonriparian users, and if so, the extent of the rights that can be transferred.[90] If a water market is to function as efficiently as possible, water-use rights must be transferable without regard to where the water will be used.[91] As Professor Dellapenna has noted, "[t]here is . . . no reason to believe that the economically most productive use of water from a particular waterbody will always lie on contiguous land. If riparian rights cannot be transferred, then some water must be used at less than its most efficient use."[92]

Regulated riparian systems are also imperfect for the implementation of markets for tradable water permits. The extent of the property right granted through a water-withdrawal permit is not always clear. For example, the administering state agency imposes a reasonable-use requirement on the permit when there are competing uses.[93] It is also unclear in most regulated riparian systems whether permits can be transferred.[94]

An equally significant problem with regulated riparian systems is certain users often are exempt from the permit system.[95] As discussed above, the exemption of agricultural use from the permit scheme in many states prevents

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[88] *See* RESTATEMENT (SECOND) OF TORTS § 850A (1979) (listing nine factors to be considered to determine reasonableness of use).

[89] Dellapenna, *Water Allocation*, *supra* note 1, at 16 ("Courts, as well as scholars, have considered this [instability] a serious impediment to private investment in water development.").

[90] *See id.* at 17–18, 67 (noting the uncertainty as to whose level of reasonable use is acquired by a non-riparian user); *supra* notes 45 & 46 and accompanying text.

[91] *See* Dellapenna, *Right to Consume*, *supra* note 34, § 7.04, at 7-108 (noting that the most efficient use will not always be on the riparian land).

[92] *Id.*

[93] *See, e.g.*, GA. CODE ANN. § 12-5-31(e), (g) (2009); *see also* Barmeyer, *supra* note 17, at 231 (noting that disputes have occurred when permit holders assert private property rights over groundwater); Neuman, *supra* note 15, at 488 (noting that the problems with common law reasonable use are still present in regulated riparianism; it is just administrative agencies, rather than courts, making the decision).

[94] Dellapenna, *Water Allocation*, *supra* note 1, at 38 ("Usually there is no express provision for the transfer of water rights or permits between potential users."); Neuman, *supra* note 15, at 489. *See supra* notes 55 & 56 and accompanying text.

[95] *See generally* Dellapenna, *supra* note 2, § 9.03(a)(3) (discussing statutory preferences for specific uses of water in various states); *supra* notes 57–66 and accompanying text.

policy makers from meaningfully regulating agricultural uses in states with large farming industries.[96] Farm uses that are exempted from the permit schemes are still governed by common law riparian rights, which introduces the problems associated with that system, as discussed above.[97] For these reasons, riparianism and regulated riparianism can not adequately support a free-market tradable-permit system.

B. Prior Appropriation Systems

This section discusses prior appropriation regimes, including the standard features of common law prior appropriation systems and how the common law has been modified by state legislatures. It also discusses why prior appropriation systems would not adequately support a market for tradable water-use permits .

1. The Prior Appropriation System

The prior appropriation or appropriative rights system of water rights developed in the western states as an alternative to common law riparian rights.[98] The basic principle of prior appropriation can be summarized as the "person who is first in time to appropriate water, is the first in right," meaning the first user to establish a use gains priority to the water source over those who come later.[99] Under the common law rule, priority is established when a user takes a "first step" of appropriating the water by investing time and money

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[96] *See, e.g.*, GA. CODE ANN. §§ 12-5-31(a)(3), 12-5-105(a) (2009) (exempting farm uses from the statutory permit scheme for the withdrawal of surface or ground waters); *supra* notes 57–66 and accompanying text; *see also* Hall, Stuntz & Abrams, *supra* note 2, at 33 ("Irrigation accounts for 39 percent of all U.S. water withdrawals and 81 percent of consumptive water uses.").

[97] Dellapenna, *Water Allocation*, *supra* note 1, at 72–73 (noting this problem specifically in Georgia).

[98] Owen L. Anderson et al., *Introduction and Background*, *in* 2 WATERS AND WATER RIGHTS, *supra* note 2, § 11.01, at 11-4 [hereinafter Anderson et al., *Introduction*]. The doctrine discussed in this subsection has been referred to as both "prior appropriation," *id.*, and "appropriative rights." *E.g.*, Dellapenna, *Water Allocation*, *supra* note 1, at 20.

[99] Owen L. Anderson et al., *Elements of Prior Appropriation*, *in* 2 WATERS AND WATER RIGHTS, *supra* note 2, § 12.01, at 12-3 [hereinafter Anderson et al., *Elements*]. In *Elements of Prior Appropriation*, the authors note that the doctrine has five basic elements: "(1) person; (2) first in time; (3) to appropriate; (4) water; and (5) first in right." *Id.*; *see also* A. Dan Tarlock, *Prior Appropriation: Rule, Principle, or Rhetoric?*, 76 N.D. L. REV. 881, 881 (2000) ("Prior in time, prior in right is the central dogma of western water law."). For a discussion of how the foundational principles of prior appropriation originated in the early days of the American West, see Dellapenna, *Water Allocation*, *supra* note 1, at 20–21.

towards its actual use.[100] When there is a shortage, the "oldest" appropriator has the highest priority use right and a user with junior priority has no right to use any of its allocation until there is enough water to fulfill the allocations of all users ahead of it in the priority line.[101] Some commentators have noted that allocation based on temporal priority, rather than a hierarchy of reasonable or necessary use, promotes waste because there is an incentive to withdraw the maximum amount of water as soon as possible to gain priority.[102] Because junior use rights may be forfeited if there is only enough water to meet the allocation of more senior users, the system is not conducive to transferable rights.[103] Unlike common law riparian rights, common law prior appropriation does not require that the water be used only on riparian land, which might actually facilitate the sale of use rights.[104] However, there are usually restrictions on where the water can be transported and used,[105] which has resulted in a lack of water markets in prior appropriation states even if there may be the potential for them to exist.[106]

Most western states have now codified prior appropriation into the law.[107] Generally, a permit process grants the use rights and establishes priority, with

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[100] Anderson et al., *Elements*, *supra* note 99, § 12.02(b), at 12-8. Courts appear often to have decided disputes over establishment of priority by looking to custom. *See id.* (discussing cases in which first-in-time priority is disputed).

[101] Dellapenna, *Water Allocation*, *supra* note 1, at 24 (noting that this principle may result in complete forfeiture of junior rights in times of shortage).

[102] *E.g.*, *id.* at 23–24 ("Appropriators thus live in an environment where it is smart to overirrigate."); Tarlock, *supra* note 99, at 901 ("The strict enforcement of priorities tends to lead to inefficient use practices. The cushion of a senior right combined with the 'use it or lose it' rules, abandonment and forfeiture, create powerful incentives to use the maximum entitlement and to forego investments in water conservation infrastructure.").

[103] *See* Dellapenna, *Water Allocation*, *supra* note 1, at 24–26 ("The recognition and protection of third-party rights precludes true market transactions.").

[104] Anderson et al., *Elements*, *supra* note 99, § 12.02(f), at 12-75.

[105] *Id.* Generally, there are four types of restrictions: (1) restrictions that limit transfer from the water's area of origin; (2) restrictions on moving water out-of-state; (3) treatment of irrigation rights as running with the land; and (4) restrictions on a junior appropriator's ability to change the place of use when the change improves the standing of the junior user. *Id.*

[106] Dellapenna, *Water Allocation*, *supra* note 1, at 25 ("There never has been a market for appropriative rights to any significant extent."); Amy Sinden, *The Tragedy of the Commons and the Myth of a Private Property Solution*, 78 U. COLO. L. REV. 533, 577–78 (2007) ("These property rights did not historically lead to the creation of active markets, however. This was primarily because the rules surrounding transfer made trading so cumbersome that transfers rarely occurred.").

[107] *See* Anderson et al., *Introduction*, *supra* note 98, § 11.01, at 11-4, 11-5 (discussing the historical evolution of the prior appropriation doctrine in the western states). *See, e.g.*, CAL. WATER CODE § 1200 *et seq.* (West 1971).

the first appropriator establishing his standing by registering his use first.[108] Most of these statutes require that an appropriator make "beneficial use" of the water to retain priority rights; the definition of beneficial use varies from state to state.[109] For a use to be beneficial "the end use for the water must be a generally recognized and socially accepted use (abstract benefit) and the water must be put to that use and not 'let run to waste.'"[110] The beneficial use requirement is significant because it has been the basis for courts finding that an issued permit does not grant a vested property right to the water, but rather a right to the water insofar as it is put to a reasonable use.[111]

Finally, prior appropriation users are subject to the "no injury" rule, which holds that senior priority users cannot change the manner in which they use the water if the change will injure junior users.[112] For example, if a junior user depends on the senior user returning water to the source, the junior user would be injured if the senior user allows the water to be used at another location that would not return it to the source.[113] Thus, the no-injury rule would restrict the senior user's ability to sell the rights to water that had previously been returned to its source after use, if the sale would result in the water being used in other locations that would no longer return it to the original source.[114]

2. Why Prior Appropriation Will Not Support a Tradable Permit Market for Water

Common law prior appropriation cannot adequately support a market for tradable permits. First, any user who is not the first appropriator will frequently face some risk that his rights will be surpassed by a higher priority user, particularly in times of shortage.[115] Second, some courts have placed

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[108] Anderson et al., *Elements*, *supra* note 99, § 12.02(b), at 12-6. *E.g.*, CAL. WATER CODE § 1450 (West 1971) (priority established as of the date of the application for appropriation permit). For an assertion that priorities are not actually enforced in prior appropriation states, see Tarlock, *supra* note 99.

[109] Anderson et al., *Elements*, *supra* note 99, § 12.02(c)(2) (surveying beneficial-use statutes from various western states); Tarlock, *supra* note 99, at 882.

[110] Anderson et al., *Elements*, *supra* note 99, § 12.02(c)(2), at 12-26.

[111] *See id.* § 12.02(e), at 12-66, 12-67 (surveying case law addressing the issue and noting that "the most important restriction [on water rights] may be that an appropriator can only acquire the right to water for a beneficial/reasonable use").

[112] Eric L. Garner & Janice L. Weis, *Coping with Shortages: Managing Water in the 1990s and Beyond*, 5 NAT. RESOURCES & ENV'T 26, 29, 62 (1991); *see also* Owen L. Anderson et al., *Reallocation, Transfers and Changes*, *in* 2 WATERS AND WATER RIGHTS, *supra* note 2, § 14.04(c) [hereinafter Anderson et al., *Reallocation*] (discussing the no-injury rule).

[113] *See* Garner & Weis, *supra* note 112, at 62.

[114] *Id.*

[115] Dellapenna, *Water Allocation*, *supra* note 1, at 24.

restrictions on where and how water can be used,[116] which would lessen the efficiency gains of a market system by limiting the number and type of buyers. Third, the beneficial-use requirement, which is now codified in most prior appropriation states, presents a risk because it may result in the forfeiture of the right.[117] Finally, prior appropriation users are subject to the "no injury" rule, which can limit the types and locations of use from a particular water source and therefore can limit the number of potential buyers of that source's water in a market.[118]

Therefore, prior appropriation systems in their current forms are not adequate to support a market for tradable water-use permits because the rights they grant to users, and the transferability of those rights, are uncertain. As discussed above, riparianism and regulated riparianism are also inadequate water-rights systems to support a tradable-permit market.[119] A system that more clearly defines property rights, allows for full alienability of water permits, and brings all water users within the permit system would be more suitable for a tradable water-permit market that more fully meets the goals of conservation and efficient allocation.

II. MARKETS FOR TRADABLE WATER PERMITS

This Part will discuss how tradable-permit systems are structured. Specifically, it will discuss the various characteristics and design features of a tradable-permit system, and how the goals of the systems determine which features are chosen for implementation. It also will address some common criticisms of a free market, tradable-permit system for water.

A. Tradable Permits

This section discusses tradable permit systems. Subsection 1 discusses the typical objectives of a tradable permit system and how the structure of such a system works to achieve those objectives. Subsection 2 discusses the

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[116] Anderson et al., *Elements*, *supra* note 99, § 12.02(f), at 12-75. See *supra* note 105 for specific examples of the types of restrictions that courts have imposed.

[117] *See id.* § 12.02(e), at 12-66 (noting that the extent of property rights in the water is uncertain because of the beneficial-userule); *supra* notes 109–11 and accompanying text (discussing the beneficial-use requirement).

[118] *See* Garner & Weis, *supra* note 112, at 62 ("The no-injury rule thus may prevent water transfers in some instances . . . ."); *supra* notes 112–14 (discussing the no injury rule).

[119] *See supra* Part I.A.3.

considerations that policy makers should take into account in designing an optimal system.

1. Goals and Structure of Tradable Permit Programs

Tradable permits can be used to allocate the amount of a given activity that each participant in that activity may undertake.[120] They are often used either to limit the amount of a common resource that each participant can use or to limit the amount of pollutants that each polluter can emit.[121] Tradable permits have also been used to sustain fisheries[122] and regulate land use.[123] The Environmental Protection Agency has regulated pollution by allowing tradable permits for fuel efficiency standards in vehicles and air pollution emissions, among other things.[124]

Tradable permit schemes have typically been implemented as either a credit-trading or a cap-and-trade system.[125] In a credit-trading program, each participant is allowed to engage in a standardized level of the activity, and if the participant uses or pollutes less than its allowed amount, it gains credit for that amount, which can then be traded with or transferred to a user who needs the surplus to exceed the allowable limit.[126] For example, in a program to reduce environmentally harmful emissions, a polluter who emits less than the limit gains an emission credit that can then be sold to a buyer who can then emit more than the limit.[127]

A cap-and-trade system sets an overall level of use for a society and allows participants to trade use rights. Its implementation involves three steps: (1) determining the total level of acceptable activity; (2) allocating rights among participants to engage in the activity; and (3) permitting and facilitating trading

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120 *See* Jonathan Remy Nash, *Too Much Market? Conflict Between Tradable Pollution Allowances and the "Polluter Pays" Principle*, 24 HARV. ENVTL. L. REV. 465, 483–84 (2000) (describing how governments can use tradable permits to achieve "the socially optimal level of pollution"); Tietenberg, *supra* note 12, at 251 (describing tradable permits as a way to ration "access to the commons").

121 *See* Salzman & Ruhl, *supra* note 25, at 616–17 (describing trading programs that manage pollution); Tietenberg, *supra* note 12, at 251 (describing tradable permits as a method of allocating common resources).

122 Esty, *supra* note 80, at 1533–34 (describing tradable permit systems to regulate fisheries).

123 Salzman & Ruhl, *supra* note 25, at 616.

124 *Id.* at 616 n.14. The legislation authorizing the trading of fuel-efficiency standards was later repealed. *Id.*

125 Tietenberg, *supra* note 12, at 265.

126 *See id.* at 265–66 (noting that activity below the limit "can be certified as surplus"). Tietenberg notes that regulators sometimes have difficulty setting the base level of activity at an appropriate level to avoid "unjustified credits." *Id.* at 266.

127 *See id.* at 265 (citing emission-trading programs as an example of credit trading).

of use permits.[128] The primary goals of a cap-and-trade system are sustainability and achieving the most efficient allocation of the right to engage in the regulated activity.[129] For example, in a cap-and-trade system to regulate pollution, the government would determine the acceptable level of total pollution for the society, and would then allocate the right to pollute among the participants in the polluting activity, with the aggregate of all the participants' pollution rights being equal to the total level of acceptable pollution.[130] A participant in the activity is then given the choice to use its allotted amount, reduce use and sell its unused right, or buy additional rights to increase use.[131]

A primary distinction between the two systems is that one is able to limit total activity, while the other is not.[132] Credit trading does not limit the aggregate amount of the activity because new participants can enter the process and increase the overall level of activity.[133] In a pollution-regulation system, for example, new users can gain tradable credits simply by emitting less of the pollutant than the allowable limit; these new participants and the new credits that they generate would increase the aggregate level of activity.[134] Conversely, in a cap-and-trade program the aggregate level of the activity is defined without regard to the number of participants.[135] New participants must purchase permits from existing users to have the right to engage in the activity, so the overall societal activity level or consumption does not change.[136]

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[128] Nash, *supra* note 120, at 483–85 (identifying and explaining the three steps in implementing a tradable permit system for pollution control).

[129] B. Timothy Heinmiller, *The Politics of "Cap and Trade" Policies*, 47 NAT. RESOURCES J. 445, 445, 447 (2007).

[130] Salzman & Ruhl, *supra* note 25, at 617 (using the regulation of pollutants as an example of a cap-and-trade program with tradable permits).

[131] Sinden, *supra* note 106, at 568 (describing the options of polluters in a cap-and-trade pollution control system).

[132] Heinmiller, *supra* note 129, at 447.

[133] *Id.*

[134] *See id.* (noting that this assumes no additional regulatory action is taken to counteract the additional activity).

[135] *Id.* As the author notes, this difference between the two systems has social implications because in a cap-and-trade system every gain of a right by a participant means that another participant must lose that right. *Id.* As discussed below, this element of the cap-and-trade system has led some critics to argue that poorer and more rural water users would be harmed in a water market because they will be economically outmatched by wealthier users. *See supra* Part II.B.

[136] Heinmiller, *supra* note 129, at 447. (explaining that new users in a cap-and-trade system cause "some or all users [to get] a smaller slice of the resource pie").

Through the market process, cap-and-trade programs using tradable permits as currency aim to allocate resources to their best use.[137] Indeed, in addition to allowing control over the level of an activity for purposes of conservation or environmental protection, tradable permit systems tend to increase economic efficiency.[138] Cap-and-trade systems and credit trading both provide an incentive for participants in the regulated activity to increase their efficiency because doing so will allow them to sell their rights to use or emit for a profit.[139] Those efficiency gains may come from advances in technology and processes that decrease use or allow for more production without increasing resource use.[140] Tradable permit systems should also tend to increase the economic value of the right to engage in the activity.[141]

However, the influence of stakeholders in the system's structure and implementation has the potential to create inefficiencies that negate the benefits of a market system.[142] One commentator cites inefficient alterations to market transfer rules that are implemented to assuage concerns with the initial allocation as an example of such influence.[143] Another commentator

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[137] *See id.* at 445–48 ("In their ideal conception, cap and trade policies combine the policy goals of sustainability and economic efficiency and offer the potential to achieve both simultaneously."); Jonathan Remy Nash, *Trading Species: A New Direction for Habitat Trading Programs*, 32 COLUM. J. ENVTL. L. 1, 12–13 (2007) (describing the two most significant benefits of tradable permit programs as (1) economically viable promotion of environmental sustainability and (2) highest economic allocation of scarce resources).

[138] Heinmiller, *supra* note 129, at 447 (noting that in a cap-and-trade system, the "cap" achieves conservation, while the "trade" promotes economic efficiency); Salzman & Ruhl, *supra* note 25, at 620 ("If the cap is set appropriately, marketable permits achieve the same level of protection as command-and-control alternatives at a lower cost.").

[139] *See* Salzman & Ruhl, *supra* note 25, at 620 (using the air pollution permit system as an example of encouraging efficiency because more efficient users profit from being able to sell their excess use rights); Tietenberg, *supra* note 12, at 256 ("One of the most desirable aspects of tradable permits for resource users is the ability to raise income levels for participants.").

[140] Barton H. Thompson, Jr., *Conservative Environmental Thought: The Bush Administration and Environmental Policy*, 32 ECOLOGY L.Q. 307, 340 (2005) ("[P]ermit programs may encourage the development of new environmental technology and processes that can achieve better results at lower cost. Because individuals or companies can trade any reductions that they make in their regulated activities, the regulated community has an incentive to develop less expensive, more effective means of making those reductions."). One example of how economic incentives can encourage users to be more efficient is the EPA's acid rain reduction program, which has resulted in an overall level of actual sulfur dioxide emissions that is less than the total allowable amount. Salzman & Ruhl, *supra* note 25, at 621 (noting that actual emissions in 1995 were forty percent less than the allowed amount). Salzman and Ruhl also note that the costs of the reductions in the program were estimated to be forty percent lower than they would have been in a command-and-control system. *Id.*

[141] Tietenberg, *supra* note 12, at 260 (noting that tradable permit systems tend to increase the value of the traded resource or lower the cost of pollution control, as the case may be).

[142] *Id.* at 272–73.

[143] *Id.*

argues that politics influences the design, implementation, and ultimately the success of tradable permit programs.[144] Influential groups with valuable interests at stake may be able to use the public's lack of understanding of the issues to influence the policy decisions related to a water market system.[145] Stakeholders whose interests are not aligned with a water market may also try to prevent such a system from being implemented at all.[146]

2. Considerations in the Design of Tradable Permit Programs

Policy makers considering a tradable permit system must carefully consider how the system will be designed. Each aspect of the program can be tailored to accomplish specific goals.[147] The design choices, discussed in detail below, include (1) how the permits will be initially allocated among users, (2) whether the initial users will be given the permits for free, (3) how trading can be structured to encourage participation by all users, and (4) how to remedy problems arising from permits being used in circumstances different from those for which they were allocated.

First, when implementing a tradable permit system, policy makers must determine how the use permits initially will be allocated; this is one of the most difficult issues that must be resolved at the outset of a tradable permits system because of the established interests of existing participants.[148] Common initial allocation schemes include those based on the use of each user when the system is implemented, auctions,[149] a lottery, and a first-come-first-serve program.[150]

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144 *See* Heinmiller, *supra* note 129, at 445–46 (noting that because of political influence many cap-and-trade programs are not as economically beneficial as they might be). For example, Heinmiller notes that the 1997 emissions caps in the Kyoto Protocol are the result of a negotiated middle point between the interests of environmental and emitters and do not represent a scientifically optimal level. *Id.* at 455.

145 Esty, *supra* note 80, at 1548–49 ("[T]he complexity and opacity of many environmental issues and the public's difficulty in perceiving its own interest make the risk of special interest manipulation much more severe in the environmental realm than in other fields of regulation or government activity.").

146 *See* Huffman, *supra* note 12, at 436 ("Any interest believing that it can serve its interest through the political process is likely to oppose markets since the state will provide the resource to them for free.").

147 *See* Nash, *supra* note 120, at 483–85 (describing in the context of pollution-control systems, the decisions policy makers must make, including the geographic area of coverage, the nature and scope of the permit rights, and the method of initial allocation).

148 Tietenberg, *supra* note 12, at 269; *see also* Heinmiller, *supra* note 129, at 449 ("[C]ap and trade policies are most needed and most likely to be introduced in situations of resource scarcity and overexploitation where vested interests are already well established and cannot be ignored.").

149 *See* Nash & Revesz, *supra* note 15, at 575–76 (describing allocation systems for tradable emissions permit regimes, including an auction system and "grandfathering" in existing users).

150 Tietenberg, *supra* note 12, at 269–70.

Some commentators have noted that the initial allocation scheme is sometimes dictated by politics rather than considerations of public good, and one has stated that a free initial allocation based on existing use is "a necessary ingredient" to implementing a tradable permit system.[151] The initial allocation is extremely important to the stakeholders because it provides access to an economically valuable resource at potentially no cost, which could lead to a "windfall" for the recipients of initial permits.[152] For environmentalists or conservationists wishing to hold emission or consumption permits, the initial allocation may provide the most economically feasible way to do so; if the initial allocation in a water market were free, environmental groups could "retire" the permits without having to pay for them, assuming they were allowed to take part in the initial allocation.[153] Environmentalists in western states have already used this method of preservation by purchasing water rights and "retiring" them to protect downstream flow.[154] In a cap-and-trade system, the fact that the permit allocation is a "zero-sum" game—i.e., a system in which every permit obtained by a given party is one less permit available for all other parties—makes the initial allocation even more important.[155]

Likely because of the political influence of the existing users, most tradable permit programs use initial allocations that favor existing users.[156] One drawback of giving free permits to existing users in the initial allocation is that it will be more expensive for new users to access the system.[157] Another is that if users know the initial allocation is based on existing use, they may inefficiently increase their use to increase their initial permit allocation.[158] The inefficient depletion problem could be mitigated by using historical data going

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151 *Id.* at 254.

152 Heinmiller, *supra* note 129, at 450. The potential for a windfall has been cited as one reason water-market systems should not be implemented. *See, e.g.*, John L. Fortuna, Note, *Water Rights, Public Resources, and Private Commodities: Examining the Current and Future Law Governing the Allocation of Georgia Water*, 38 GA. L. REV. 1009, 1060 (2004).

153 *See* Heinmiller, *supra* note 129, at 450, 461. Environmentalists could hold the permit, thereby actively conserving the resource by leaving fewer water-use rights available for consumption. *Id.* at 461.

154 Thompson, *supra* note 140, at 340–41 (describing the increasing activity of "water trusts" in purchasing and "retiring" water rights). It should be noted that environmental groups that engage in "retiring" water-use rights in western prior appropriation regimes might face opposition because change-of-use rules are applied more rigorously to them than traditional users. Tarlock, *supra* note 99, at 902 (noting that this has been the case in Oregon as applied to the Oregon Water Trust).

155 Heinmiller, *supra* note 129, at 450 (noting that because of the nature of the process and the economic value at stake, "this process is quite clearly political").

156 Tietenberg, *supra* note 12, at 270 (stating that in "virtually all implemented tradable permit programs discussed in this article" existing users get free permits).

157 *See id.* at 271 (arguing that free initial allocations disadvantage new users).

158 *Id.*

back beyond the time that users knew their level of use would determine their initial permit allocation.[159]

Some commentators suggest that political and social influence in the trading of permits is a significant reason that tradable permit programs are not as successful in practice as they are in theory.[160] For example, in a tradable water permit system, agricultural water users in smaller communities may resist selling their water withdrawal rights because of sentimental feelings about the significance of the resource to their communities and families, even when those users could expect to receive an economic benefit from selling their withdrawal rights.[161] Because agricultural use is often such a large potion of water consumption,[162] policy makers must consider ways to encourage agricultural and other low-value users to participate in the market when it is economically beneficial for them to do so.[163]

On the other hand, some reluctance to trade by smaller users may be useful to the system by preventing a concentration of rights in too few users, which may create too much market power for the concentrated holder and reduce the efficiency of the market.[164] More proactive methods of dealing with the concentration problem have also been used, including placing limits on the percentage of rights any one user may hold, government restriction of trades that violate public policy, retaining a reserve to dilute the market if needed, and requiring an annual auction in which each user must put up a percentage of their rights for the auction.[165]

Finally, some commentators suggest that a tradable permit system must be designed to address issues arising when a permit is used in circumstances other

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159 *Cf. id.* (noting the problem exists when users know their allocation will be based on historical use).

160 *See, e.g.*, Heinmiller, *supra* note 129, at 461 (describing how political and social pressure may prevent lower value water users from participating in the market).

161 *See id.* (noting that these are typically low value users who could expect a financial gain from selling their rights). Heinmiller discusses water trading in Australia and explains that tensions that have developed between "buyers," states with low-value irrigators, and "sellers," states with higher value users. *Id.* at 463. *But see* Fortuna, *supra* note 152, at 1061 (noting the possibility of the opposite problem occurring—that a water market could entice farmers in smaller communities to sell their use rights because the rights will be more valuable to heavily populated areas).

162 Dellapenna, *Interstate Struggles*, *supra* note 1, at 838.

163 *See* Heinmiller, *supra* note 129, at 461–64 (noting the economic benefits of an open market, but observing that some users' reluctance to participate for social or political reasons can negate those benefits).

164 *See* Tietenberg, *supra* note 12, at 273 (describing how concentration in fishery permits has resulted in the decline of smaller fishing operations because they are being bought out by larger operations).

165 *Id.* at 273–74. The first two methods have been used in tradable permit markets for fisheries; the latter two methods have been used in the United States' sulfur pollution allowance program. *Id.*

than those under which it was initially allocated.[166] These issues are often referred to as "nonfungibilities,"[167] and they arise in "environmental trading markets" in three different ways: space, type, and time.[168] The most prevalent of the three is nonfungibility of space.[169] Nonfungibility of space can occur when, as a result of the trade, the right to use or emit is exercised in a different location than it would have been if it had not been traded, so the external effect of exercising the right on the environment and third parties changes.[170] Nonfungibility of space can result in "hot spots," which can occur when there is a concentration of an activity in one place.[171] When this happens, the same level of activity may have a greater marginal impact within the hot spot than it would outside of it because there are fewer units of space to absorb the activity.[172] Commentators have noted that nonfungibility of space can disrupt the economic efficiency of the market by introducing externalities and have suggested that one way to address this problem is to restrict the geographic area of trading.[173] Another, less restrictive, potential remedy is to require regulatory approval of trades to allow for assessment of nonfungibility.[174] However, both of these methods would likely decrease the economic efficiency

166 *See, e.g.*, Salzman & Ruhl, *supra* note 25, at 625 (noting that the currency of a tradable permit market needs to be designed to address this issue).

167 Fungible is defined as "being of such a nature that one part or quantity may be replaced by another equal part or quantity in the satisfaction of an obligation." MERRIAM-WEBSTER'S COLLEGIATE DICTIONARY 507 (11th ed. 2004). Further, "oil, wheat, and lumber are *fungible* commodities." *Id.* (emphasis added).

168 Salzman & Ruhl, *supra* note 25, at 611, 625 (explaining fungibility as when "the things exchanged are sufficiently similar in ways important to the goals of environmental protection"); *see also* Tietenberg, *supra* note 12, at 280 (discussing breakdowns in theory when systems are implemented and noting as an example that tradable permits are not always homogenous because time and place of use matters).

169 Salzman & Ruhl, *supra* note 25, at 628.

170 *See* Nash, *supra* note 137, at 14 (describing "spatial differentiation" in the context of pollution control programs and habitat trading programs).

171 *See* Salzman & Ruhl, *supra* note 25, at 627–28. The authors cite as an example a hot spot resulting from a Los Angeles program that allowed industrial polluters to gain pollution credits by destroying older, heavily polluting cars. *Id.* at 628. But critics pointed out that the refineries were closely concentrated; thus, after the trades, the reduced emissions from the cars affected a 12,000-square-mile area, while the increased emissions from the industrial polluters were now concentrated in a twenty-square-mile area. *Id.*; *see also* Nash & Revesz, *supra* note 15, at 580–81 (discussing hot spots).

172 *See* Salzman & Ruhl, *supra* note 25, at 628 n.42 ("'[I]t is immediately pointed out that a ton of any particular kind of waste will do much more damage in some places than in others . . . .'" (quoting J.H. DALES, POLLUTION, PROPERTY & PRICES 79 (1968) (alteration in original))).

173 *E.g.*, Tietenberg, *supra* note 12, at 275 (discussing lack of homogeneity in transfers and geographic restrictions on trades).

174 *See* Nash & Revesz, *supra* note 15, at 573 (proposing a system that requires regulatory pre-approval to address nonfungibility in emission trading programs); *see also* Tietenberg, *supra* note 12, at 275 (noting that the U.S. Wetlands program deals with "harmful spatial aspects" by requiring regulatory approval of trades).

benefits of the market by disallowing some trades.[175] Requiring regulatory approval in a water market may also implicitly discourage trading because of increased bureaucracy, particularly for smaller users.

One commentator has explained fungibility of type as simply "[a]pples are traded for apples, not oranges."[176] Fungibility of type is most difficult to assess when the object of the tradable permit, such as a parcel of land in habitat trading, is not homogenous—i.e., no two parcels of land are exactly the same.[177] Finally, nonfungibility of time arises when a trade results in the activity occurring at a different time than that contemplated by the permit, causing the marginal effect to be different than the effect intended by the permit.[178]

Of the three nonfungibilities, nonfungibility of space is likely to pose the biggest problem in a tradable permit water market. Within the context of tradable emission permits, water use may be analogous to what have been termed "regional" pollutants—those that may travel many miles—"but the affected region is defined by reference to where the emissions come from."[179] Perhaps analogously, water can travel over a broad area, but water shortages experienced by downstream users may be related to upstream users' consumption, potentially depriving downstream users of adequate resources to fulfill their water-use rights.[180]

In addition, environmentalists believe that tradable permits increase the potential for hot spots[181] because existing users tend to be concentrated, which will likely result in the initial allocation of permits being concentrated.[182] This phenomenon may also occur in a tradable water permit system if large industrial users concentrated in cities purchase withdrawal permits from

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175 Tietenberg, *supra* note 12, at 275 (discussing geographic restrictions on trades and concluding that "[s]patial issues can be dealt with within the tradable permit scheme, but those choices typically make transfers more difficult").

176 Salzman & Ruhl, *supra* note 25, at 629.

177 *Id.* The authors also cite emission programs that bundle different types of polluting gases into one category as an example of nonfungibility of type. *Id.*

178 *Id.* at 630; *see also* Nash, *supra* note 137, at 17–19 (discussing "temporal differentiation" in environmental programs); Tietenberg, *supra* note 12, at 276 (discussing the "temporal flexibility").

179 Nash & Revesz, *supra* note 15, at 576.

180 *See* Tietenberg, *supra* note 12, at 277 (discussing issues that can affect the success of tradable permit programs and noting that water regulators "must cope with the consequences of trades on downstream users").

181 For a discussion of hot spots, see *supra* notes 171–72 and accompanying text.

182 Nash & Revesz, *supra* note 15, at 580–81. Nash and Revesz note that this problem also may stem from older polluters being less likely to convert to better pollution control technologies, forcing them to buy additional permits and worsening the hot spot. *Id.*

agricultural users. The marginal effect of those withdrawals in areas of concentration or water shortage would be greater than the effect of the same withdrawal in an area without a concentration or shortage.[183]

The easiest way to address spatial fungibility issues is to restrict trading within certain geographic zones.[184] In a water market system, geographic trading restrictions could prevent withdrawal permits that originate in rural areas from concentrating in cities, where the resources would be unable to fulfill the withdrawals that the permits prescribe.[185] However, these types of trading restrictions can undercut the economic efficiency gains of a market system.[186]

Nonfungibility of time may occur in a tradable permit system for water if, for example, many users purchased withdrawal permits when there was no shortage but did not use them until a shortage occurred, causing a greater impact at the time of use than would have occurred at the time of issuance.[187] Restrictions that tie the time of the withdrawal to the time of the sale would be one way to address nonfungibility-of -time issues in a water market.[188]

Of the three nonfungibilites, type is of the least concern in a water market. Nonfungibility of type could conceivably occur because of hydrological differences between groundwater and surface water; however, it is unclear whether this distinction would have real implications for a water market because there seems to be little practical difference between the two.[189] Thus, nonfungibility of type is of less concern than nonfungibility of space or time in water permit trading, but if it were determined to be a legitimate concern, it could be addressed by having a permit specific to each source.[190]

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183 *See* Barmeyer, *supra* note 17, at 237 (discussing interbasin transfers and their potential negative impact on "hydrologic capacity" in areas of shortage).

184 Salzman & Ruhl, *supra* note 25, at 638.

185 *See* Nash & Revesz, *supra* note 15, at 573 (proposing a system that requires regulatory pre-approval to address nonfungibility in emission trading programs); Salzman & Ruhl, *supra* note 25, at 638–39 (discussing geographic trading restrictions).

186 Salzman & Ruhl, *supra* note 25, at 636 (discussing transaction costs and their negative effect on economic efficiency); *see also supra* notes 173–75 and accompanying text.

187 *See supra* note 178 and accompanying text.

188 *See* Salzman & Ruhl, *supra* note 25, at 642 ("Temporal nonfungibilities may be neutralized by restricting trades to narrow time periods.").

189 *See* Carol M. Rose, *From H_2O to CO_2: Lessons of Water Rights for Carbon Trading*, 50 ARIZ. L. REV. 91, 99 (2008) ("It has long been known that groundwater and surface water are hydrologically related, and there have long been calls to link their legal treatment.").

190 *See* Salzman & Ruhl, *supra* note 25, at 640 (noting that in emissions-trading schemes, trades are restricted to the same pollutant and mixing of pollutants does not occur).

B. Criticisms of Water Market Proposals

Commentators have noted more potential negative consequences of water markets than this Comment is able to address. However, it will discuss how a tradable permit system might be structured to address the following concerns: that (1) the states will be unable to control the sale of water resources to out-of-state buyers because of the dormant Commerce Clause;[191] (2) the agricultural industry may be damaged because it will become more lucrative to sell water rights than to use them for irrigation to harvest crops;[192] (3) the permits would increase water use as current users sell their excess rights;[193] and (4) transaction costs will negate economic gains from the system.[194] This section will discuss some ways a tradable permit system might be designed to address these concerns.

Commentators have noted that the Dormant Commerce Clause doctrine could prevent states that adopt a free market for water rights from transferring their water rights to out-of-state users.[195] The Dormant Commerce Clause doctrine holds that states may not enact policies that are economically protectionist or that discriminate against interstate trade in favor of intrastate trade.[196] The critics of the water market describe a scenario in which a private holder of a large water use permit sells its rights to use water within the state to the highest bidder, who happens to be out of state and plans to transfer the water out of state; they contend that the state would be powerless, with narrow exceptions, to stop such an interstate transfer.[197] The seminal case on the application of the Commerce Clause to water resources is *Sporhase v. Nebraska*.[198] In *Sporhase*, the Court held that groundwater is an article of commerce subject to Dormant Commerce Clause analysis[199] and struck down a

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191 *See* Barmeyer, *supra* note 17, at 234 ("[T]he dormant commerce clause . . . could limit the power of the state to prevent the export of its water resources to other states or countries . . . ."); Draper, *supra* note 10, at 53 (discussing the Commerce Clause's effect on tradable property rights for water); Fortuna, *supra* note 152, at 1051 (describing the "substantial constitutional implications" that a market for water-withdrawal permits would create).

192 *E.g.*, Fortuna, *supra* note 152, at 1061.

193 *E.g.*, *id.*

194 *See, e.g.*, Draper, *supra* note 10, at 51–52 (discussing transaction costs and "externalities").

195 *See supra* note 191.

196 *See, e.g.*, Philadelphia v. New Jersey, 437 U.S. 617, 623–24 (1978) ("The crucial inquiry, therefore, must be directed to determining whether [the statute] is basically a protectionist measure, or whether it can fairly be viewed as a law directed to legitimate local concerns, with effects upon interstate commerce that are only incidental.").

197 Draper, *supra* note 10, at 53.

198 458 U.S. 941 (1982), *see also* Draper, *supra* note 10, at 53.

199 *Sporhase*, 458 U.S. at 953–54.

Nebraska law restricting interstate transfers of Nebraska groundwater as unconstitutional.[200]

The *Sporhase* holding has several potential loopholes that might be used by states to restrict out-of-state transfers. The Court acknowledges that a state has a legitimate interest in conservation and preservation of its water resources "in times of severe shortage": A "State's power to regulate the use of water in times and places of shortage for the purpose of protecting the health of its citizens—and not simply the health of its economy—is at the core of its police power."[201] The law in *Sporhase* was constitutionally flawed because its reciprocity requirement did not further a legitimate interest—it would restrict the transfer of water to its most beneficial use if that use was out of state and would do so even when water was abundant at the point of withdrawal.[202] Thus, the Court noted that a "demonstrably arid State conceivably might be able to marshal evidence to establish a close means–end relationship between even a total ban on the exportation of water and a purpose to conserve and preserve water."[203] This statement from the Court seems to indicate that a state facing a severe shortage that threatens the health of its citizens could make a compelling case to strictly protect its resources from out-of-state transfers.

Some commentators have noted states might also restrict out-of-state transfers without running afoul of the Dormant Commerce Clause analysis by using a "basis of origin" rule,[204] which would restrict transfers out of the water's geological base or "watershed."[205] Such a rule would seem to apply equally to anyone out of the basis, whether they were in or out of state.[206] Analysis of the constitutionality of such a rule is beyond the scope of this Comment, but commentators have noted that it is unlikely that the rule would be upheld under a Dormant Commerce Clause analysis because protectionist policies within subdivisions in a state are no more constitutional than if they

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[200] *Id.* at 960. The Nebraska law required any person or entity that wanting to transport water from Nebraska for use in another state to apply for a permit, which would only be granted if the state to which the water was being transported granted reciprocal rights to transfer water to Nebraska. *Id.* at 944.

[201] *Id.* at 956.

[202] *Id.* at 958.

[203] *Id.*

[204] *E.g.*, Matthews & Pease, *supra* note 9, at 619.

[205] Barmeyer, *supra* note 17, at 235–36 (proposing that Georgia could impose transfer restrictions based on watersheds for the purpose of protecting "hydrologic integrity").

[206] *See* Matthews & Pease, *supra* note 9, at 619 ("Proponents argue that there is no discrimination because all potential users outside the boundaries of the watershed are treated alike . . . .").

were implemented by the state.[207] And a basis-of-origin restriction may also lessen the viability of a water market if transfers could not be made from areas with excess water resources to areas with shortages.[208]

Even if *Sporhase* leaves states completely unable to prevent out-of-state transfers of their water resources, interstate transfers would help promote the highest economic use of water resources by expanding the potential market and providing an economic benefit to the selling permit holder.[209] If each state participating in the market were to allow tradable permits for water use, each would stand to benefit from the economic efficiency promoted by a free-market system, even if those tradable permits flow across state lines.[210] The economic efficiency that is realized by free trade across state borders is the basis underlying the Commerce Clause's invalidation of protectionist state policies.[211] Under the proposed system, a state would at the very least be able to regulate the total depletion of its resources through management of the allowable withdrawal attached to each permit, while still gaining the economic benefit from maximizing the efficient use of its resources.[212]

Next, some commentators argue that the force of supply and demand, which could drive prices for water in the market higher, would harm the ability of individual households and agricultural users to obtain, or retain, water-use rights, and further, that, aside from the basic human need for water, this could lead to destruction of smaller communities that rely on small agricultural operations.[213] However, each municipality would receive an initial allocation

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[207] *Id.* at 619–20 (discussing *Fort Gratiot Sanitary Landfill, Inc. v. Michigan Department of Natural Resources*, 504 U.S. 353 (1992), which invalidated a state law that isolated its counties from solid waste produced outside of the county).

[208] *Cf.* Barmeyer, *supra* note 17, at 236 (noting that in Georgia permit transfers from agricultural areas to Atlanta could violate a prohibition against interbasin transfers).

[209] *See* Nash, *supra* note 120, at 484–85 (noting that geographic restrictions reduce the potential number of participants, thus increasing the cost of finding trading partners). For a discussion of the economic benefits of a market system, see *supra* note 15 and accompanying text.

[210] *See* Matthews & Pease, *supra* note 9, at 607 ("Reducing the size of a market area by limiting water exports constrains the ability to move water from inefficient uses to more efficient ones.").

[211] *See* Philadelphia v. New Jersey, 437 U.S. 617, 623 (1978) ("'This principle that our economic unit is the Nation . . . has as its corollary that the states are not separable economic units. . . . [W]hat is ultimate is the principle that one state in its dealings with another may not place itself in a position of economic isolation.'" (quoting H.P. Hood & Sons, Inc. v. Du Mond, 336 U.S. 525, 537–38 (1949)).

[212] *See* Matthews & Pease, *supra* note 9, at 604 (arguing that limiting a market geographically sacrifices possible gains from efficient allocation).

[213] *E.g.*, Fortuna, *supra* note 152, at 1058, 1061; Neuman, *supra* note 15, at 463 (noting that water markets can lead to a concentration of rights in the wealthy). *But see* Huffman, *supra* note 12, at 435–36 (noting this argument from critics, but dismissing it as an "[un]persuasive reason to oppose the creation of water markets"). For a discussion of how this issue has been addressed in tradable permits for fisheries, see

of withdrawal permits sufficient to supply its citizens with water for domestic use under the proposed system. In times of severe shortage, sufficient water to meet basic human needs would take precedent. In *Sporhase*, the Court indicates that state governments have wide latitude to ensure the availability of water for its citizens.[214] If a water provider were forced to pay high prices to increase its supply and were forced to pass those increases to domestic consumers, water subsidies could be implemented to ensure that those who may not be able to afford higher prices have access to water.[215] Such policies recognize the conflict between ultimate economic efficiency and the desire for all users to have an equal ability to utilize the market for their benefit. Policy makers are allowed to make judgments that strike the appropriate balance between those goals.[216]

A related argument against tradable permits is that because agricultural users typically do not use their full allocation of water rights under current laws, overall use would increase if they were allowed to sell excess use rights on an open market and the shortage problems would be exacerbated.[217] However, in a system where the initial allocation is not based on the current withdrawal rights, but rather on a reasonable amount actually needed to sustain current operations, the overall withdrawal amount would not increase by a large margin.[218] Agricultural users would then be encouraged to increase the efficiency of their water use[219] so that they could sell the remaining withdrawal

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Tietenberg, *supra* note 12, at 274. For a discussion and examples of how a price or value can be determined for water in a market, see Willey & Graf, *supra* note 65, at 331–34.

214 Sporhase v. Nebraska, 458 U.S. 941, 956 (1982) ("[A] State's power to regulate the use of water in times and places of shortage for the purpose of protecting the health of its citizens . . . is at the core of its police power.").

215 *See* Huffman, *supra* note 12, at 436 ("If society cares about fairness, it is possible to create needs-tested subsidy programs to assure that the poor get the water they need for basic human survival.").

216 *See* Esty, *supra* note 80, at 1572 ("[E]ffective environmental procedures may not take full cognizance of other social values such as justice or equity. If all the [resources] are owned by the rich, a property rights-based allocation system may be efficient, but it will not be just. Optimal environmental governance must therefore be understood to be both relative and contextual. A theory of optimal governance defines a theoretical goal and a process, but does not offer a definitive answer to every policy question.").

217 Fortuna, *supra* note 152, at 1061.

218 The initial allocation cap based on current use would also alleviate concerns that tradable permits based on current rights, which often allow withdrawal amounts much greater than those actually used, would provide a "windfall" to current users. *See id.* at 1060 (arguing that a windfall would result for current permit holders). Profit for permit holders would come from efficiency gains in their operations or reduced use—not from selling excess use initially allocated to them. For additional discussion of why the "windfall" criticism of water markets is unfounded, see Huffman, *supra* note 12, at 435.

219 Inefficient agricultural uses may include irrigation that produces relatively low-value crops, unlined ditches used for water diversion and low-technology flood irrigation. *See* Matthews & Pease, *supra* note 9, at 603 n.5.

rights for a profit to users with increasing demand, such as growing population centers.[220] Because agriculture is such a large portion of consumptive uses of water,[221] the improvements in efficiency that would be promoted by a cap on withdrawal would free up water for other uses.[222] One commentator argues that this excess water would allow agricultural businesses at once to continue their operations and sell remaining water rights.[223] Further, these gains in conservation through more efficient use may outweigh the potential threat to the agricultural industry.[224]

As with any market system, there is a risk that transaction costs may erode any economic gains.[225] Generally, transaction costs include not only the transacting parties' costs, but also costs to third parties that are not reflected in the price of the transaction.[226] The more that the system and permits are tailored to address nonfungibilities,[227] are restricted by geographic area,[228] or are regulated to protect certain users,[229] the more economic efficiency is lost to transaction costs because increased regulation increases the costs of the

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[220] Barton H. Thompson, Jr., *Markets for Nature*, 25 WM. & MARY ENVTL. L. & POL'Y REV. 261, 263–64 (2000) ("The government can allocate reductions based on historical use or seniority and rely on the market for meeting economic needs and changing demands."). Professor Thompson notes that in western states, "the transfer of merely a tenth of current agricultural water can more than double the water available for growing metropolitan areas." *Id.* at 264; *see also* Thompson, Jr., *supra* note 15, at 195 ("Tradable permits . . . encourage entities to find ways of further improving their performance since the entities can then sell their unneeded permits . . . ."); *supra* notes 138–40 and accompanying text.

[221] Dellapenna, *Interstate Struggles*, *supra* note 1, at 838 (stating that irrigation is "generally the most heavily consumptive use of water"); Thompson, Jr., *supra* note 220, at 264 (stating that agricultural use composes eighty percent of water use in the western part of country).

[222] *See* Neuman, *supra* note 15, at 468 (stating that smaller agricultural users, who are often the most inefficient, currently do not have an economic incentive to improve).

[223] *Id.* at 473 ("[I]nsisting that urban or conservation-driven water demands are a threat to the agriculture industry's viability ignores the tremendous potential for conserving water in the agricultural sector.").

[224] *Id.*

[225] *See* Draper, *supra* note 10, at 51–52 (discussing potential transactions costs in a water market and stating that "[t]he most serious direct economic consequence of for-profit water trading is the inability of bilateral water transactions between sellers and buyers to consider the effects of the transaction on *third parties*"); Nash, *supra* note 120, at 485 ("[G]overnment must be careful that the transaction costs do not become so high that they preclude the establishment and maintenance of a viable market.").

[226] Draper, *supra* note 10, at 51; Willey & Graff, *supra* note 21, at 335.

[227] See Part II.A.2 for a discussion of nonfungibilities.

[228] Nash, *supra* note 120, at 484–85 (noting that geographic restrictions reduce the potential number of participants, thus increasing the cost of finding trading partners).

[229] *See supra* Part II.A.2. For example, constructing regulatory barriers to trade that are designed to protect agricultural communities from loss of resources.

trade.[230] Transaction costs occurring outside of the trade noted by commentators include depleted resources for downstream users caused by upstream use[231] and the potential damage to the agricultural industries and the small communities they support because those users may find it more profitable to sell water rights than to use them for irrigation.[232] Because of this tradeoff between economic efficiency on the one hand and an optimal system design to protect against nonfungibility and harm to third-parties on the other, "the policy instrument's viability rests on a balance."[233] In a tradable permit water market, policy makers would have to determine the point at which the non-economic and third-party costs of the market are outweighed by the benefits of water conservation and efficient allocation, a determination that might itself be deemed a transaction cost.[234]

III. WHAT WOULD A MARKET FOR TRADABLE WATER PERMITS LOOK LIKE?

As described in Part II, tradable permit systems are typically structured in one of two forms: credit trading and cap and trade.[235] This Comment argues that water markets are needed to conserve and efficiently allocate a scarce resource through a market system that caps aggregate use and that tradable permits should be the currency of such a system because they can be structured as secure property rights that are freely tradable. This system would allow policy makers to determine and impose a sustainable level of use and, through

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230 Salzman & Ruhl, *supra* note 25, at 636 (explaining that increased cost in design and management of the system may lessen participation in trading); Tietenberg, *supra* note 12, at 273 ("[A]dditional restrictions tend to raise transaction costs and to limit the cost-effectiveness of the program.").

231 *See, e.g.*, Sinden, *supra* note 106, at 579 ("One right holder's diversion of surface water can have important impacts on downstream users.").

232 *See, e.g.*, Draper, *supra* note 10, at 51; Sinden *supra* note 106, at 581.

233 Salzman & Ruhl, *supra* note 25, at 636. Salzman and Ruhl note that some level of nonfungibility is desirable, if not critical, to a functioning market; otherwise there would be no need for the participants to trade. *Id.* at 645. The more nonfungible the currency (the permit), the more active the market will be. *Id.* at 645–46; *see also* Draper, *supra* note 10, at 51 ("[I]f the rights and costs of third parties are included in the water rights transfer, transaction costs rapidly become exorbitant.").

234 *See* Draper, *supra* note 10, at 51 ("In any large and complex hydrologic system, the difficulty and expense of structuring the necessary third-party transaction costs frustrates the development of markets unless the law chooses to disregard the externalities."); Salzman & Ruhl, *supra* note 25, at 637 (noting that "aggressive market construction" aimed at reducing external effects is dangerous because it can cause even more problematic flaws in the ability of the market to function); Sinden, *supra* note 106, at 582 ("[W]hen ecological and community impacts are added to the mix, the government's role in approving trades must necessarily shift from one of simply facilitating bargaining among affected parties to making substantive judgments about the level of impact that is acceptable or desirable.").

235 *See supra* notes 125–27.

the use of the market, would encourage users to consume the resource more efficiently.[236]

Both cap and trade and credit trading tend to promote economic efficiency,[237] but credit trading does not cap use.[238] In areas with rapidly growing populations and industry,[239] the inability of regulators to cap the aggregate level of consumption would decrease their ability to maintain the desired level of conservation as new users are added to the system.[240] Therefore, credit trading is not as effective as a cap-and-trade system for maintaining sustainable levels of water use. Under this proposed system, policy makers would determine an annual level of sustainable use and then divide the use rights, which would automatically renew each year among the users.[241]

For a cap-and-trade system to effectively regulate aggregate use, all water users must be accounted for within the system.[242] Therefore, current permit systems under regulated riparian[243] and prior appropriation[244] systems, which exempt some large-scale users from permit requirements, must be expanded and modified to eliminate wide-ranging exemptions. In many states, this would require currently exempted users—often agricultural users—to be brought into the permit system.[245] Continuing to allow a large portion of water use to be largely unregulated cripples the ability of the system to conserve resources because often the largest categories of use are the ones out of the

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236 *See supra* notes 15 & 220 and accompanying text.

237 Credit trading promotes more efficient use of resources because users can sell credits they have accumulated by becoming more efficient. *See* Tietenberg, *supra* note 12, at 265.

238 *See generally* Heinmiller, *supra* note 129, at 445–48.

239 For example, it has been estimated that metro-Atlanta's population will double over the next twenty-five years. Shelton, *supra* note 9.

240 *See* Heinmiller, *supra* note 129, at 447 ("[I]f the number of users in a credit program increases, aggregate resource use will also increase . . . .").

241 *Cf.* Nash, *supra* note 137, at 14 (noting that in pollution programs, the level is usually set on an annual basis).

242 For a discussion of how exempting certain users from the permit system impairs the ability of the system to effectively conserve water, see *supra* notes 57–66 and accompanying text.

243 *See supra* Part I.A.2.

244 *See supra* Part I.B.1.

245 *See supra* Part I.A.2. There may be a level of use at which it is no longer productive to regulate the consumption by a user. For example, the cost of regulating a rural household withdrawing water from a ground well might be greater than the benefit. However, this Comment takes the position that such decisions should be made on the basis of value added to the goals of the system—not on the basis of political influence. *See supra* notes 142–46.

reach of regulators.[246] The system proposed by this Comment would bring most users[247] within the permit system so that all water use would be regulated.

Water rights that are traded in an active market must be secure property rights so that participants can be certain of what rights they are buying and selling, and they must be transferable.[248] As described in Part I, water rights under current laws are often uncertain, as is their transferability.[249] Under the proposed system, a use permit would specify how much water the owner is entitled to withdraw within a given time period, and it would not be subject to the rights of any other users or permits. The permit would automatically renew annually.[250] Thus, once a permit is obtained, the user would be certain that his property right in the permit's allowable use would remain secure.[251]

Under the proposed system, permits initially would be allocated through a free distribution to existing users based on existing and historical use.[252] As noted in Part II.B, one criticism of water markets has been that overall consumption would actually increase because users who do not currently use all the water to which they have a common law right would sell their excess use rights once a market is available to do so.[253] However, if the initial allocation of use permits were based on existing or historical use, rather than on available common law or current permit use rights, overall water consumption would not increase.[254] Basing allocation on actual use also alleviates the problem of giving existing users a windfall because they will not have an initial excess of rights available for sale; rather, they will have to reduce use or become more efficient in their use to realize profits from selling permits.[255]

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246 *See* Dellapenna, *Interstate Struggles*, *supra* note 1, at 838 (noting that irrigation use is generally one of the most consumptive uses).

247 *See supra* note 245.

248 *See supra* notes 80 & 81 and accompanying text.

249 *See supra* Part I.A.3 & Part I.B.2.

250 *See supra* note 241 and accompanying text.

251 *See* Salzman & Ruhl, *supra* note 25, at 617 (discussing environmental trading markets and stating that the rights attached to the tradable permit compel "the government [to] create[] a new form of property," which can be characterized as the right to engage in a certain activity or use a common resource).

252 *See supra* notes 218–20 and accompanying text for a discussion of why the initial allocation is based on historical use.

253 Fortuna, *supra* note 152, at 1061.

254 *See supra* note 218 and accompanying text.

255 *See supra* notes 217–20 and accompanying text.

A water market should be structured to attempt to alleviate any nonfungibilities that exist. As discussed in Part II.A.2, nonfungibility of space is most likely to present a problem in water markets, although nonfungibility of time and type may also be issues, but to a lesser extent.[256] Nonfungibility of space should be prevented to the extent that it creates harmful hot spots that occur when permits are concentrated in an area where the marginal effect of use in the hot spot is greater than it would be if the use were to occur where the permit originated.[257]

In the proposed system, nonfungibility-of-space issues could be managed by monitoring all trades.[258] Geographic zones would be delineated by matching levels of use with available resources, and trades would be tracked to determine the concentration of permits in each area. For example, permits flowing from rural agricultural areas to cities would be monitored because they would be moving to an area of greater consumption.[259] Regulators would then be able to block trading activity if it appeared that hot spots were going to strain the water resources in the concentrated area or if overuse in the concentrated area would deprive downstream users of their use rights.[260] However, the level at which trades would be blocked must be carefully considered so as not to prevent the market from functioning inefficiently and imposing burdensome transactions costs that negate the efficiency gains; this calls for a balance that policy makers ultimately will have to determine—a task that admittedly is a difficult one.[261]

Nonfungibility of time seems to be most troublesome in times of severe water shortage. For example, adequate resources may not be available to fulfill a withdrawal permit during a severe water shortage even though there may have been adequate resources at the time of the trade. Nonfungibility of time has been addressed in other tradable permit systems by imposing time limits on tradable permits.[262] However, in the proposed water market,

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256 *See supra* Part II.A.2.

257 *See* Salzman & Ruhl, *supra* note 25, at 628 n.42. For a discussion of hot spots, see *supra* notes 171–72 & 181–82 and accompanying text.

258 *Cf.* Nash & Revesz, *supra* note 15, at 573 (proposing an emission-trading system that requires pre-approval of trades based on a model that assesses the marginal effect of the trade).

259 For a discussion of the possible effects of transfers from agricultural areas to cities, see Fortuna *supra* note 152, at 1062–63.

260 For a discussion of hot spots, see *supra* notes 171–72 & 181–82 and accompanying text.

261 For a discussion of transaction costs, see *supra* notes 225–34.

262 For example, in emissions-trading programs, an emission permit may have a time limit attached within which the allowable emission must occur. *See, e.g.*, Salzman and Ruhl, *supra* note 25, at 642 (describing temporal limits in trading programs).

imposing time limits would be impractical because withdrawal rights would be measured by the amounts withdrawable within each year, and the right to would renew annually.[263]

One possible solution would be to review the problem arising from nonfungibility of time before each renewal period begins, allowing for an adjustment in use amounts if, at that time, resources were inadequate for the amount of existing permitted use. However, as noted above, the tradable permit grants a right to water withdrawal that must be secure and certain; it must continue to renew at the same amount in each new period.[264] Thus, it may not be possible to impose time limits on the use of water permits while still maintaining their value to market participants. A perfect solution to this difficult issue may not exist; regulators will need to have an accurate forecast of resources at the program's outset to avoid permitting too much use in the market during times of shortage. But the value of having use rights attached to the permit that are certain outweigh the risks of nonfungibility of time.

This proposed system allows regulators and policy makers to achieve a sustainable level of overall water use by placing a cap on total use. It also provides incentive for water resources to be used more efficiently because users who use less water can benefit economically by selling their unused rights. Rights to use water resources, and the ability to transfer those rights, will be secure and free from the vagaries of riparian rights and prior appropriation regimes, allowing participants in the market to buy and sell a secure asset freely.

CONCLUSION

This Comment has argued that a market system for water-withdrawal rights, using tradable permits as its currency, should be implemented by states to address water shortages. A cap-and-trade structure would allow policy makers to determine a sustainable level of water use and to impose that sustainable limit by requiring all water use to be accounted for within the permit system. Implementing a cap-and-trade permit system would allow regulators to set conservation goals and implement long-term strategies rather than the short-term measures that traditionally have been used during

263 *See supra* note 241 and accompanying text.
264 *Supra* notes 250 & 251 and accompanying text.

shortages.[265] This system also would promote efficient allocation of water resources through the market structure.

This Comment has argued that current water-rights regimes do not provide adequate property rights or alienability of those rights to support a market for tradable water permits. Therefore, a tradable-permit system for water use would have to be implemented within a new water-rights system that would ensure secure property rights and full transferability among users. These permits would be issued to current users at no charge and would be based on the user's current and historical use level. By capping aggregate water use and promoting more efficient use of water resources through a market structure, water shortages can be addressed with long-term planning and conservation through permanent systems, rather than with inadequate short-term measures.

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[265] *See supra* notes 3 & 4 and accompanying text.

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