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Joseph W. Dellapenna

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DEVELOPING A SUITABLE WATER ALLOCATION LAW FOR PENNSYLVANIA

BY JOSEPH W. DELLA PENNA*

I. OVERVIEW

In many respects, the Commonwealth of Pennsylvania is unusual. One of the original thirteen colonies, Pennsylvania continues to adhere more closely to the original common law legal system the colonists brought over in 1683. For example, plaintiffs in Pennsylvania still must denominate a complaint in the lowest level courts as sounding either in assumpsit (contract) or in trespass (tort), something few, if any, other states still require. Another unusual feature of Pennsylvania is that it sprawls across large parts of three major watersheds—the Delaware, the Ohio and the Susquehanna—as well as several smaller watersheds. Because of this geography, major water crises seem seldom to affect more than one-third of the Commonwealth at a time. As a result of the combination of legal conservatism and unusual geography, water law reform proponents in Pennsylvania have been unable to muster a majority in the legislature, leaving Pennsylvania as one of the largest states in which common law riparian rights remain the primary regime for water allocation. Its law governing other aspects of water is similarly

* Professor of Law, Villanova University; B.B.A., University of Michigan (1965); J.D., Detroit College of Law (1968); LL.M. in Public International & Comparative Law, George Washington University (1969); LL.M. in Environmental Law, Columbia University (1974). Professor Dellapenna is director of the Model Water Code Project of the American Society of Civil Engineers, and as such, led the drafting of the Regulated Riparian Model Water Code and the Appropriative Rights Model Water Code, as well as supervising the preparation of three model interstate compacts.


rooted in historical forms, although federal mandates have forced the Commonwealth to enact legislation regarding dams, drainage, pollution and the environment generally.\(^3\)

Pennsylvania received the common law, including the common law of riparian rights, early in its history.\(^4\) In Pennsylvania legal practice, the term “appropriation of water” refers to the condemnation of water rights rather than to the doctrine of prior appropriation found in western states.\(^5\) Pennsylvania follows the similar reasonable use theory for disputes over groundwater.\(^6\) Pennsylvania also recognizes the usual private remedies for water-related pollution.\(^7\) Pennsylvania bifurcates its law of diffused sur-

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4. See Beissell v. Sholl, 4 Dall. 211 (Pa. 1800) (stating every man in this country has unquestionable right to erect mill upon his own land and to use water passing through his land as he pleases, subject only to limitation that his mill must not be constructed so as to injure his neighbor’s mill and, after using water, he returns stream to its ancient channel); Chambers v. Furry, 1 Yeates 167 (Pa. 1792) (holding although right to bed of navigable river is presumed to belong to Commonwealth, right of adjoining landowner on low water mark was to give adjoining landowners river frontage on low water mark proportional to their frontage on original high water mark).

5. See Palmer Water Co. v. Lehighton Water Supply Co., 124 A. 747 (Pa. 1924) (holding appropriation of waters of stream without bona fide intent to apply to beneficial use or not following with effort within reasonable time to carry out purposes intended is not appropriation).

6. See, e.g., Burr v. Adam Eidemiller, Inc., 126 A.2d 403 (Pa. 1956) (holding in part that, in view of testimony by defendant’s vice president, admitting run-off water from slag could have been prevented based on facts that area involved was residential and particular activity of defendant construction company was neither suited to character of locality nor natural use of land).

7. See, e.g., Lerro v. Thomas Wynne, Inc., 301 A.2d 705 (Pa. 1973) (concluding corporate owner and operator of apartment house was negligent because should have known risk of corrosion to 10,000 gallon tank buried in ground and supplying fuel oil for heating of apartment house and should have provided for periodic inspections); Fleck v. Timmons, 543 A.2d 148 (Pa. Super. Ct. 1988) (holding plaintiffs not entitled to recover from owners of nearby service station who pumped kerosene into underground storage tanks); Hughes v. Emerald Mines Corp., 450 A.2d 1 (Pa. Super. Ct. 1982) (finding sufficient evidence of causation for jury to find loss of water was due to coal company’s activities in its mining operations and that loss was compensable and was not damage without legal wrong or legal liability).
face water, applying the common enemy doctrine to urban land and the natural servitude rule to rural land.\textsuperscript{8}

The relative lack of administrative regulation of water use in Pennsylvania perhaps reflects the Commonwealth's relatively wet climate. Recurring droughts (water use emergencies) in the eastern and central parts of the Commonwealth suggest that greater regulation is necessary.\textsuperscript{9} This pattern is only likely to become more pronounced in coming decades if the predictions of climate change are realized.\textsuperscript{10} In response to these developments, Pennsylvania's

\textsuperscript{8} See Bentz v. Armstrong, 8 Watts & Serg. 40 (Pa. 1844) (holding where several persons unite in purchase of piece of ground and divide same into smaller lots upon each of which house is built and then partition is made between them, each must regulate and grade own lot so water falling or accumulating upon it shall not run upon lot of neighbor). But see Taylor v. Harrison Constr. Co., 115 A.2d 757, 759 (Pa. Super. Ct. 1955) (expressing difficulty in finding distinction between rules actually applied to urban and rural property). See generally Joseph W. Dellapenna, The Legal Regulation of Diffused Surface Water, 2 \textsc{Vill. Envtl. L.J.} 285 (1991) (discussing evolving legal trends regarding regulation of both drainage and exploitation of diffused surface water).


\textsuperscript{10} See Gordon B. Bonan, Ecological Climatology (Cambridge Univ. Press 2002); Impact of Climate Change and Climate Variability on Hydrological Regimes (Jan C. Van Dam, Cambridge Univ. Press 1999); \textsc{Climate Change Impacts on the United States: The Potential Consequences of Climate Variability and Change} (National Assessment Synthesis Team, Cambridge Univ. Press 2000); R. Edward Beighley et al., \textit{Impacts of California's Climatic Regimes and Coastal Land Use Change on Streamflow Characteristics}, \textsc{39 J. Am. Water Resources Ass'n} 1419 (2003); Levi D. Brekke et al., \textit{Climate Change Impacts Uncertainty for Water Resources in the San Joaquin River Basin, California}, \textsc{40 J. Am. Water Resources Ass'n} 149 (2004); Heejung Chang et al., \textit{The Effects of Climate Change on Stream Flow and Nutrient Loading}, \textsc{37 J. Am. Water Resources Ass'n} 973 (2001); Woon Sup Choi, \textit{Climate Change, Urbanisation and Hydrological Impacts}, \textsc{4 Int'l J. Global Envtl. Issues} 267 (2004); Daniel Cluis & Claude Laberge, \textit{Climate Change and Trend Detection in Selected Rivers Within the Asia-Pacific Region}, \textsc{26 Water Int'l} 411 (2001); Joseph W. Dellapenna, \textit{Adapting the Law of Water Management to Global Climate Change and Other Hydropolitical Stresses}, \textsc{35 J. Am. Water Resources Ass'n} 1301 (1999); Gilberto Gallopin & Frank Rijsberman, \textit{Three Global Water Scenarios}, \textsc{1 Int'l J. Water} 16 (2000); J. Kevin Healy & Jeffrey M. Tapick, \textit{Climate Change: It's Not Just a Policy Issue for Corporate Counsel—It's a Legal Problem}, \textsc{29 Colum. J. Envtl. L.} 89 (2004); Brian H. Hurd et al., \textit{Climatic Change and U.S. Water Resources: From Modeled Watershed Impacts to National Estimates}, \textsc{40 J. Am. Water Resources Ass'n} 129 (2004); Katharine L. Jacobs et al., \textit{Climate Science and Drought Planning: The Arizona Experience}, \textsc{41 J. Am. Water Resources Ass'n} 437 (2005); Peter M. Kiffney et al., \textit{Climatic and Hydrologic Variabil-
legislature has considered, over the past fifteen years, a number of proposals to enact a regulated riparian state statute.\textsuperscript{11} Thus far, these proposals largely have failed, resulting only in legislation to create a statewide water planning system enacted in 2002.\textsuperscript{12} As part of the planning process, the legislature required that all large water users in the state register their uses,\textsuperscript{13} but it was careful to indicate that the new statute would not in any way affect private rights to use water.\textsuperscript{14} It is plausible that the planning process will eventually lead to a proposal to modify or replace the existing laws governing water use in Pennsylvania. This Article delineates the contours of the law that governs the allocation of water in Pennsylvania, the alternatives that might be substituted for the existing law and some of the problems that would be encountered in making such a change. Section II of this Article discusses riparian rights in Pennsylvania.\textsuperscript{15} Section III of this Article sets forth alternatives to riparian rights.\textsuperscript{16} Section IV discusses groundwater in Pennsylvania.\textsuperscript{17} Section V dis-


\textsuperscript{13}See id. § 3118 (stating large water users generally are water users who withdraw average of at least 10,000 gallons per day for thirty-day period).

\textsuperscript{14}See id. § 3136 (discussing limitations on department, water allocation authority, municipalities and relating to compacts).

\textsuperscript{15}For a discussion of riparian rights in Pennsylvania, see infra notes 21-104 and accompanying text.

\textsuperscript{16}For a discussion of alternatives to riparian rights, see infra notes 105-271 and accompanying text.

\textsuperscript{17}For a discussion of groundwater in Pennsylvania, see infra notes 272-310 and accompanying text.
cusses regulation and planning in Pennsylvania.18 Section VI discusses constitutional guarantees of environmental rights.19 Finally, Section VII addresses the future of Pennsylvania water rights.20

II. RIPARIAN RIGHTS IN PENNSYLVANIA

In most respects, Pennsylvania’s law of riparian rights is rather ordinary. What is unusual for such a large state is that riparian rights remain, for Pennsylvania, the primary body of law governing the allocation of surface waters to particular uses. This section explores the law of riparian rights as applied in Pennsylvania and why that body of law is no longer suitable to the needs of the Commonwealth.

A. Pennsylvania Version of Riparian Rights

Riparian rights attach to riparian land, i.e., to land that is bounded by a defined body of water on or across which a defined body of water lies or flows.21 The word “riparian” itself derives from the Latin word “ripa,” meaning a riverbank.22 Riparian rights derive from the natural availability of water to the land.23 Despite the importance of contiguity to water as the basis of riparian rights, the actual boundary of lands along water bodies usually has not been surveyed in Pennsylvania, leaving considerable uncertainty.24

18. For a discussion of planning and regulations in Pennsylvania, see infra notes 311-422 and accompanying text.
19. For a discussion of constitutional guarantees of environmental rights, see infra notes 423-30 and accompanying text.
20. For a discussion of the future of water rights in Pennsylvania, see infra notes 431-44 and accompanying text.
21. See Lord v. Meadville Water Co., 19 A. 1007 (1890) (holding where spring water flows off land in well defined course owner of land is entitled to rights of riparian owner only and may not divert its course but may dip it up and confine it in barrels); Chambers v. Furry, 1 Yeates 167 (Pa. 1792) (holding while right to bed of navigable river is presumed to belong to Commonwealth, right of adjoining land rests in owner of soil); Alburger v. Phila. Elec. Co., 535 A.2d 729 (Pa. Commw. Ct. 1988) (holding lower riparian owners had right to enjoin electric company as upper riparian owner from raising level of water course and increasing its flow by discharging imported and non-riparian water into water course). See generally Joseph W. Dellapenna, The Right to Consume Water Under “Pure” Riparian Rights, in 1 WATERS AND WATER RIGHTS § 7.02 (Robert E. Beck ed., replacement vol. 2001).
22. See Johnson v. McCowen, 348 So. 2d 357, 360 n.3 (Fla. Dist. Ct. App. 1977) (stating although often interchanged, riparian rights according to strict meaning of term are connected with ownership of banks and streams or rivers).
In Pennsylvania, riparian rights arise in relation to any natural water body, including underground streams and artesian basins. The navigability of a natural body of water affects ownership of the bed of the water body. Owners of land contiguous to a non-navigable lake are entitled to use only the water column overlying their own part of the lakebed, rather than the entire lake. Navigability does not affect other riparian rights.

In principle, riparian rights do not attach to artificial water bodies. Thus, the Pennsylvania Superior Court held that a landowner whose land abuts an artificial lake lying entirely over another Pennsylvania's lake shores, rivers and streams; many times boundaries between high water and extent or line of common law ownership are not marked and have never been included in survey).

25. See Kunkle v. Borough of Ford City, 158 A. 159 (Pa. 1931) (stating lot owner may not obstruct natural channel or channel having character or easement nor gather surface water into body and discharge it on adjoining land, but may shut out invading water as common enemy).

26. See Ross Common Water Co. v. Blue Mt. Consol. Water Co., 77 A. 446 (Pa. 1910) (stating water company will be temporarily enjoined from operating artesian wells where it is definitely shown that large spring whose waters are used by its owner for commercial purposes is thereby rendered entirely dry); Brown v. Kistler, 42 A. 885 (Pa. 1899) (holding water that percolates through earth but does not follow well defined channel belongs absolutely to owner of land over which it passes; but where it flows in well defined channel either above or below surface, owner of land over which it passes has only qualified right to use it).

27. See Moeller v. Metzger, 491 A.2d 1356 (Pa. Super. Ct. 1985) (holding proof of cause of death of landowner's flowers was not essential element in her cause of action where primary relief requested by landowner was order enjoining flooding of her land by water coming from neighbors' artesian well).


29. See Lakeside Park Co., 153 A.2d 486 (holding lake not navigable); Shaffer v. Baylor's Lake Ass'n, 141 A.2d 583 (Pa. 1958) (holding plaintiff established prescriptive rights to swim, boat and fish within reasonable distance of land, to maintain present stone dock, and to water cattle in front of land, but rights did not include right to use any part of lake for commercial boating or other commercial purposes); Mountain Properties, Inc., 767 A.2d 1096 (2001) (stating if water body or watercourse navigable to any extent, it is deemed navigable through its entire length).

other's land had no right to use the lake water for any purpose.\textsuperscript{31} Artificial water bodies are subject to riparian rights, however, when the artificial body replaces a natural body.\textsuperscript{32} Riparian rights also apply when the parties have, explicitly or implicitly, agreed to treat the artificial bodies as if they were riparians.\textsuperscript{33}

Most of the cases establishing the content of riparian rights in Pennsylvania are old. They therefore abound in dicta that seem to embrace the natural flow theory.\textsuperscript{34} Yet the cases seem to clearly establish that an owner of riparian land has a right to make a reasonable use of the water.\textsuperscript{35} The resulting confusion is found in decisions that define the right to use water in Pennsylvania in terms like "[t]he right to reasonable use of water in its natural flow, without diversion of it from its ordinary channel by artificial means, is incidental to the ownership of the land through which it flows . . . ."\textsuperscript{36} This confusion turns up in the most recent case in which a

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  \item \textsuperscript{31} See Intili v. Salak, 589 A.2d 761 (Pa. Super. Ct. 1991) (holding property owners did not have right to fish in lake from shoreline and admission in pleadings that owner had not used artificial lake for any purposes bound owners on issue of use of lake and defeated claim to prescriptive right to use lake).
  \item \textsuperscript{32} See Fiedler v. Coen, 505 A.2d 286 (Pa. Super. Ct. 1986) (holding lower owners asserting prescriptive easement against upper owners as bona fide purchasers for value not required to allege and prove man-made watercourse running through both properties open and apparent before entitled to order enjoining upper owners from diverting or obstructing watercourse and requiring them to maintain flow so water continued to reach lower property).
  \item \textsuperscript{33} See Miller v. Lutheran Conf. Ass'n, 200 A. 646 (Pa. 1938) (holding in case of non-navigable lake formed by building dam and where land under water owned by others, no riparian rights attach to property bordering water and attempt to exercise any such rights by invading water is trespass as if unauthorized entry made upon dry land of another).
  \item \textsuperscript{34} See, e.g., Fricke v. Quinn, 41 A. 737 (Pa. 1898) (holding right of riparian owner to have natural flow of stream reach land in natural channel and in natural condition); see also White v. Pennsylvania R.R., 47 A.2d 200 (Pa. 1946) (stating generally riparian owner has right to unobstructed flow of water in its natural channel).
  \item \textsuperscript{35} See Brown v. Kistler, 42 A. 885 (Pa. 1899) (holding each successive riparian owner has right to reasonable use of water for supply of natural wants or manufacturing purposes, even to extent of exhausting supply of stream in dry seasons); Whaler v. Ahl, 29 Pa. 98 (1857) (holding riparian owners have right to detain water for such time as is necessary for their purposes, but they are liable for improper use if injury of lower owners occurs); Hartzall v. Sill, 12 Pa. 248 (1849); Alburger v. Phila. Elec. Co., 535 A.2d 729 (Pa. Commw. Ct. 1988) (holding lower riparian owners had right to enjoin electric company as upper riparian owner from raising level of water course and increasing its flow by discharging imported and non-riparian water into water course).
  \item \textsuperscript{36} See Webb v. Bennett's Branch Imp. Co., 29 A. 260, 261 (Pa. 1894) (stating right to reasonable use of water in its natural flow without diversion from ordinary channel by artificial means is incidental to ownership of land through which it flows and extent to which it may be used and applied affects use and consequent value of land itself); Horn v. Miller, 20 A. 706, 707 (Pa. 1890); In re Octararo Water Co., 15 Pa. D. 767 (Lanc. Cty. C.P. 1906) (holding water company has no power by

*Alburger* was an unusual case concerning a riparian rights theory because it involved a plan to increase the flow of the Perkiomen Creek as a means of conveying water from one part of the Commonwealth to another, rather than a dispute over the withdrawal of water to use it, which forms the more common form of riparian dispute. A three-judge panel of the Commonwealth Court in *Alburger* delivered three different opinions, none of which was joined by more than one judge. The two opinions, that together produced a majority for the plaintiffs in the case, stated the basic premise of riparian rights in nearly identical terms: “[s]ubject to the right of reasonable use by other riparian owners, a riparian owner has a right to have the natural flow of a water course reach his land in its natural channel and its natural condition.” Only Judge Joseph Doyle, in his dissent, noted that this formulation combines two diametrically opposed theories that cannot be reconciled: “under the ‘reasonable use’ theory . . . every riparian owner can conduct reasonable uses even though they may affect the natural flow of water.”

What then is the proper theory of riparian rights in Pennsylvania? In every other state in which such confusion has appeared, courts invariably chose to apply the reasonable use theory

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38. See id. at 750 (stating case involves conduit that discharges Delaware River into East Branch of Perkiomen Creek).

39. See generally Dellapenna, supra note 21, §§ 7.03(a), 7.03(c)-(c)(2) (describing conflicts between consumptive and non-consumptive uses, and between similar and dissimilar types of consumptive uses).

40. See *Alburger*, 535 A.2d at 731 (reciting rights of riparian owner under “reasonable use” riparian doctrine). The second version of this rule was phrased slightly differently: “. . . the course of the natural flow is subject only to reasonable use . . .” See also id. at 733-34 (Craig, J., concurring) (illustrating slight difference in second version of doctrine).

41. Id. at 737 (Doyle, J., dissenting) (noting riparian owner can conduct uses affecting natural flow of water under “reasonable use” doctrine). See also Allentown Portland Cement Co. v. Huy, 27 Pa. D. 396 (Berks Cty. C.P. 1917) (stating riparian owner can use water diminishing natural water flow to lower riparian owners).
rather than the natural flow theory when an actual choice became necessary.\textsuperscript{42} The natural flow theory is too restrictive on water uses for a modern economy.\textsuperscript{43} The only cases in which the natural flow theory was actually applied in the twentieth century involved actions against local governments that were required by state constitutions to compensate persons whose property (here, water rights) was taken by governmental action,\textsuperscript{44} or, as in \textit{Alburger}, where the dispute was over increased flows rather than water withdrawals.\textsuperscript{45}

B. Applying Riparian Rights to Particular Disputes

Even under the natural flow theory, a riparian owner has an unlimited right to use water to meet domestic needs.\textsuperscript{46} In Pennsylvania, priority for domestic needs extends even to persons living in a large institutional setting, such as a hospital for the mentally ill, as long as the water is consumed on the riparian tract on which the water is withdrawn.\textsuperscript{47} As for non-domestic uses, no riparian owner can safely make any use under the natural flow theory without a risk of being enjoined by a lower riparian claiming an infringement of a legal right even without proof of injury to the complainant.\textsuperscript{48}

\textsuperscript{42} See Dellapenna, \textit{supra} note 21, § 7.02(c) (asserting natural flow theory is disfavored and courts not likely to apply theory against private party).


\textsuperscript{44} See, e.g., Dimmock v. City of New London, 245 A.2d 569 (Conn. 1968). The Dimmock case is analyzed in Dellapenna, \textit{supra} note 21, § 7.02(a)(2) nn.124-36.


\textsuperscript{46} See Palmer Water Co. v. Lehighton Water Supply Co., 124 A. 747 (Pa. 1924) (holding "every riparian owner is entitled to use so much of a stream running by or through his lands as may be necessary for domestic needs or other similar purposes"). \textit{See generally} Dellapenna, \textit{supra} note 21, § 7.02(b)(1) (explaining how courts give preference to use of water for "natural wants" which include domestic needs).

\textsuperscript{47} See Filbert v. Dechert, 22 Pa. Super. 362 (Pa. Super. Ct. 1903) (holding domestic needs not confined to individual homeowners in residential setting and can be extended to persons living in hospital for mentally ill in large institutional setting).

\textsuperscript{48} See, e.g., Ulbricht v. Eufala Water Co., 6 So. 78 (Ala. 1889) (holding plaintiff could perpetually restrain defendant from consuming water even though plain-
The reasonable use theory is considerably more complex when applied to particular disputes. The reasonable use theory assures each riparian an equal claim to use the water, with a court allocating water in disputes in a way that maximizes the social benefit of the use of the water while minimizing the harm caused by one user to the others. The only firm rule regarding reasonableness is that because the right to use water arises from the riparian nature of the land, any use on non-riparian land is per se unreasonable. Even riparian owners have no right to use water on non-riparian lands. Pennsylvania courts, however, have limited the watershed rule (limiting riparian land to land within the watershed of the water source from which the water is withdrawn) to cases in which water use outside the watershed causes actual injury to the complaining party. See generally Frank Trelease, Coordination of Riparian and Appropriative Rights to the Use of Water, 33 TEX. L. REv. 24, 40 (1954) (describing that lower riparian could enjoin development by upper riparian without showing proof of injury). 49. See generally RESTATEMENT (SECOND) OF TORTS § 850 cmt. d (1977) (stating law promotes “greatest beneficial use by each with minimum harm to others”). 50. See Hartzall v. Sill, 12 Pa. 248 (1849) (determining reasonable use by looking at specific circumstances of case); Alburger v. Phila. Elec. Co., 535 A.2d 729 (Pa. Commw. Ct. 1988) (illustrating generally court’s weighing specific facts of case). See generally Dellapenna, supra note 21, §§ 7.02(d)-(e) (discussing “reasonableness” and ways courts have used concept to resolve conflicts). 51. See Dellapenna, supra note 21, § 7.02(d)(1) (stating courts have generally held any non-riparian use is unreasonable per se whenever it interferes with riparian use); Olivia S. Choe, Note, Appurtenancy Reconceptualized: Managing Water in an Era of Scarcity, 113 YALE L.J. 1909 (2004) (asserting courts have announced per se rule against any use by non-riparians). 52. See Lackawanna Mills v. Scranton Gas Co., 150 A. 633 (Pa. 1930) (holding landowner whose property is not riparian to brook holds no title or claim to its water merely because predecessor acquired contractual rights to its water). 53. See Belin v. Dept. of Envtl. Res., 291 A.2d 553 (Pa. Commw. Ct. 1972) (holding Department of Environmental Resources could allow for diversion of waters from one watershed to another when there is no showing of injury to neigh-
If there is not enough water to serve all needs, courts sometimes prefer *pro rata* sharing among competing users as the fairest resolution of a dispute under the reasonable use rule. Such sharing is not always possible, however. In such cases, choices must be made to cut off one user altogether so that another riparian might continue to use the water. An excellent example is *Harris v. Brooks*. The case involved a dispute between a commercial boat rental service (a boat livery) operating on a small lake and a rice farmer who drew water for his fields from the same lake. A severe drought made it impossible to satisfy both of their needs.

Applying the reasonable use theory, the Arkansas Supreme Court stressed that the goal was to assure the equal rights of each riparian "as near as may be." This is not simply a question of stopping one water user from interfering with or harming another water user. As economist Ronald Coase pointed out, in a case like this, each use necessarily interferes with the other, and whichever prevails necessarily destroys the other. The *Harris* court quoted from the *Restatement (First) of Torts* to explain its approach:


54. *See, e.g.*, Jones v. Oz-Ark-Val Poultry Co., 306 S.W.2d 111 (Ark. Ct. App. 1957) (holding competing users have "correlative right" to use of water to "extent of a reasonable share" when there is scant water supply); White v. East Lake Land Co., 23 S.E. 393 (Ga. 1895) (reasoning water is not severable proportionately); Bouris v. Largent, 236 N.E.2d 15 (Ill. Ct. App. 1968) (explaining that one riparian owner cannot use water in way that unreasonably impairs other owner's right to enjoy same water). *See generally* Dellapenna, *supra* note 21, § 7.03(c)(1) (describing remedy of "proportional sharing" as option courts have used, particularly in western states, in settling disputes of competing riparian rights).

55. 283 S.W.2d 129 (Ark. 1955). For a more detailed analysis of the case, see Dellapenna, *supra* note 21, § 7.02(d).

56. *See Harris*, 283 S.W.2d at 130-31 (describing effect of drought on boat rental service and rice farmer).

57. *Id.* at 133 (describing court's objective to achieve equitable distribution of rights).

58. *See* Ronald H. Coase, *The Problem of Social Cost*, 3 J. LAW & ECON. 1, 3-15 (particularly at 12-13) (1960) (arguing problem is of reciprocal nature in which avoiding harm to one will necessarily inflict harm to another). Bill Rodgers sought to make light of this insight by using a chicken farmer competing with a neighboring fox rancher as a model. *See* 1 WILLIAM H. RODGERS, JR., ENVIRONMENTAL LAW: AIR AND WATER § 1.1B at 6 (1986). "Causation-neutrality that attributes the spillover damage in equal parts to the hunger of foxes and the tastiness of chickens is a hard sell among people who can tell the difference between aggressor and victim." *Id.* In a contest between a rice farm and a boat livery, there is little of the intuitive sense of which use is the aggressor that is so appealing in the fox/chicken example; and if one philosophically favors the "natural outcome," does this make one unsympathetic to the fox? *See generally* Dellapenna, *supra* note 30, § 6.01(b)(1) nn.341-46.
The determination in a particular case of the unreasonableness of a particular use . . . should not be an unreasoned, intuitive conclusion on the part of the court or jury. It is . . . an evaluating of the conflicting interests of each . . . contestant[ ] before the court in accordance with the standards of society, and a weighing of those, one against the other . . . [I]t is only when one riparian[’s] . . . use of the water is unreasonable that another who is harmed by it can complain, even though the harm is intentional. Substantial intentional harm to another cannot be justified as reasonable unless the legal merit or utility of the activity [that] produces it outweighs the legal seriousness or gravity of the harm.59

This test requires a weighing of the social value of the two uses against each other to determine which is more socially valuable.60 The court enjoined Brooks’ pumping whenever the level of the surface of the lake fell below 189.67 feet above sea level, which the court described as the “normal level” of the lake.61 The court was careful to insist that it chose that level because it was the level at which Brooks’ pumping for his rice fields unreasonably interfered with the plaintiffs’ use of the lake, not because it was “normal.”

The Harris court provided only a vague discussion of how to balance uses against each other. Balancing requires a polycentric process that strains the capacity of courts to act according to the traditional model of disinterested umpire rather than actively involved manager.62 In such cases, courts give only minimal, if any, attention to non-economic questions such as the natural characteristics of the stream, general social concerns, or abstract justice.63 The key appears to be the economic value of the competing activi-

59. See Harris, 283 S.W.2d at 135 (quoting RESTATEMENT (FIRST) OF TORTS, supra note 43, § 852, cmt. c).
60. See generally Dellapenna, supra note 21, § 7.02(d)(2) (describing “reasonable use” theory as one that benefits of competing social values).
61. See Harris, 283 S.W.2d at 135-36 (concluding that pumping water for rice farming cannot unreasonably interfere with commercial boating activity). On very similar facts, the Arkansas Supreme Court favored the rice farmer when the boating and fishing were for personal, rather than commercial, recreation. Nilsson v. Latimer, 664 S.W.2d 447 (Ark. 1984).
62. See Lon Fuller, Adjudication and the Rule of Law, 1960 Proc. Am. Soc’y Int’l L. 1 (arguing that balancing interests requires court to act more as body with “managerial authority”).
63. These principles figure prominently in the RESTATEMENT even if they do not figure prominently in the cases. RESTATEMENT (SECOND) OF TORTS § 850A. See generally Dellapenna, supra note 21, § 7.02(d)(3) (arguing judicial problem of economic analysis lies in bringing in neglected, non-economic concerns).
ties. Because of this, a court would have to reopen a suit whenever market values of the products change significantly.

Litigation centering on individual claimants does not serve well for managing water crises or for protecting public values. Courts normally focus on the interests of the actual parties and are ill-equipped to consider the interests of riparians not involved in the suit, let alone the interests of the public generally. The lack of efficient, system-wide management creates a systematic bias in favor of large users. Small users are less able to afford litigation or to organize collectively for litigation if the water they need is taken by a more affluent riparian. Even if they succeed in organizing for litigation, the balancing process generally favors large users over smaller users because the economic value of the water to the large user usually outweighs the economic loss of the small users. While smaller users can aggregate their claims through reliance on a public system, legal doctrines generally limit the riparianness of public systems. Aggregation also requires submission to a large-scale enterprise.

64. See Dellapenna, supra note 21, § 7.02(d)(3) (discussing role of "economic and other values in determining reasonableness"); Phyllis P. Saarinen & Gary D. Lynne, Getting the Most Valuable Water Supply Pie: Economic Efficiency in Florida's Reasonable-Beneficial Use Standard, 8 J. Land Use & Envtl. L. 491, 500-04 (1993) (asserting riparian law is comparative system seeking to "maximize value of waterway" by favoring "new and higher uses").

65. The resulting instability has been used to explain the shift to appropriative rights in western states and the shift to regulated riparianism in eastern states. Coffin v. Left Hand Ditch Co., 6 Colo. 443 (1882) (holding Colorado adopts appropriative rights statute); Drake v. Earhart, 23 P. 541 (Idaho 1890); Jones v. Adams, 6 P. 442 (Nev. 1885) (upholding prior appropriative rights statute, not common law, provided protection of landowners' rights and privileges as to running waters in Pacific coast states). See also Frank E. Maloney et al., A Model Water Code: Text and Commentary 189-91 (Univ. of Florida Press 1972); Richard C. Ausness, Water Rights, the Public Trust Doctrine and the Protection of Instream Uses, 1986 U. Ill. L. Rev. 407, 416-18 (stating that "comprehensive administrative structure . . . which modifies the appropriation system . . . now typically regulates water users in the West"); M. Mason Gaffney, Economic Aspects of Water Resources Policy, 28 Am. J. Econ. & Sociology 131, 137-38 (1969).

66. See Dellapenna, supra note 21, § 7.05(a) (arguing reasonable use theory favors large users over small users or non-economic public interest users because process emphasizes economic values).


68. See Dellapenna, supra note 21, § 7.02(d)(3).

69. See Pernell v. City of Henderson, 16 S.E.2d 449 (N.C. 1941) (holding action by riparian owner against municipality for pumping its water supply from stream is not demurrable on its face); Town of Purcellville v. Potts, 19 S.E.2d 700 (Va. 1942) (holding municipality may be enjoined from diverting water away from riparian owner's property). See generally Dellapenna, supra note 21, § 7.05(c).
Finally, persons seeking to acquire a right to use water might want to "buy" riparian rights without buying riparian land to create a "non-appurtenant" riparian right.\textsuperscript{70} The Pennsylvania cases establish that riparian rights can be conveyed or condemned.\textsuperscript{71} Just what is acquired through conveyance or condemnation remains unsettled in Pennsylvania law, which probably explains the relative rarity of such transactions. In the late nineteenth century case of \textit{Irving's Executors v. Burgess of Borough of Media},\textsuperscript{72} the Supreme Court of Pennsylvania held that a riparian owner could not convey water for use on non-riparian lands, at least when another riparian complained of the non-riparian use.

In a more recent decision, the same court held that while a conveyance would bar an action by the grantor against the grantee of the riparian rights, even a conveyance in which the grantor expressly promised not to use the water would not bar the grantor from continuing to use the water so long as the continued use did not inflict a provable injury on the grantee in \textit{Borough of Media v. Edgmont Golf Club, Inc.}\textsuperscript{73} As against the grantor, a grantee could use the water conveyed so long as the use did not materially increase the burden contemplated in the grant.\textsuperscript{74} Some courts in other states have held that a buyer of a non-appurtenant riparian right acquires a right to make a reasonable use as against other riparian

\textsuperscript{70} See Dellapenna, \textit{supra} note 21, § 7.04(a)(3) (describing process used to create "non-appurtenant" riparian right).


\textsuperscript{72} 45 A. 482 (Pa. 1900); see also \textit{Lackawanna Mills v. Scranton Gas Co.}, 150 A. 633 (Pa. 1930) (stating purchasers of non-riparian land cannot assert title to water because predecessors were accustomed to receiving water); \textit{Lord v. Meadville Water Co.}, 19 A. 1007 (Pa. 1890) (holding corporation with right of eminent domain has no higher right than ordinary riparian owner).

\textsuperscript{73} 288 A.2d 803 (Pa. 1972); see also \textit{Zimmerman v. Union Paving Co.}, 6 A.2d 901 (Pa. 1939) (holding that license to receive water from another's property is not property right).

\textsuperscript{74} See \textit{E. Pa. Power Co. v. Lehigh Coal Co.}, 92 A. 47 (Pa. 1914) (stating grant of water power is not grant of riparian rights); \textit{Duncan v. Gheen}, 138 A.2d 168 (Pa. Super. Ct. 1958) (allowing easement to take water from spring to continue after owner of dominant estate improved pipe line).
owners. Whether such a right is measured by the reasonable needs of the seller (avoiding prejudice to other riparians) or of the buyer (treating the buyer as a full, equal riparian) is unclear. Conveyances of non-consumptive uses are less problematic, although the effect of such a conveyance on the rights of other riparians also remains unclear.

Riparian rights can also be lost to prescription. Prescription in Pennsylvania requires twenty-one years of open, notorious, continuous, adverse and undisputed use. A prescriptive right is measured by the extent of the least use actually made during the prescriptive period. This proposition can turn complicated because in effect there is a series of rolling prescriptive periods (each twenty-one year period of continuous prescriptive use), and once the property right is acquired it does not disappear just because the owner no longer uses it, unless a court finds an intent to abandon the property right.

C. Why Riparian Rights Cannot Be Expected to Survive in Pennsylvania

As the foregoing shows, riparian rights suffer from serious problems, including the vagueness and unpredictability of the criteria of decision, the instability of the resulting legal decisions, the lack of a process for managing water during shortages or for protecting

75. See Mianus Realty Co. v. Greenway, 193 A.2d 713 (Conn. 1963) (finding no grant of riparian rights are subject to inverse condemnation); Belvedere Dev. Corp. v. Dep’t Transp., 476 So. 2d 649, 653 (Fla. 1985) (holding riparian rights are transferable and condemnable); Pyle v. Gilbert, 265 S.E.2d 584, 589 (Ga. 1980) (finding that right to reasonable use of water on non-riparian land can be acquired by grant); Sundell v. Town of New London, 409 A.2d 1315, 1321 (N.H. 1979) (holding riparian rights are subject to inverse condemnation); Thomas v. Clark, 346 A.2d 189, 190-91 (Vt. 1975) (upholding dominant estate's right to use of spring that did not interfere with right of servient estate to use of spring).


public values, a systematic bias in favor of large users and the impracticality of markets under such a legal regime. Given the vague and unpredictable criteria of decisions, even long-established uses could be cut off without compensation if a court decides that a recently begun use is more reasonable. As water shortages become chronic, such problems could become a serious impediment to private investment in water facilities.

The problems with riparian rights arise because riparian rights are a form of common property. A common property system cannot survive in the face of growing shortages, as biologist Garrett Hardin explained nearly forty years ago in *The Tragedy of the Commons*. A common property system functions well only when the common resource is available in much greater supply than the demand for the resource. Because each common owner can decide for herself whether to increase her use, regardless of the effect on other common owners (except for instances of direct interference), each owner appropriates for herself the whole of each additional increment of use, but all owners share the cost imposed on the common resource. Hardin used cows grazing on a common pasture as his example. For each cow I add to the herd, I obtain the full benefit, while the common owners as a group share the burden of the reduced carrying capacity of the pasture.

Some scholars have criticized Hardin for over-simplifying how "commons" functioned in earlier times or in remote areas. These

80. See Dellapenna, supra note 21, §§ 7.02(d)(3)-(e). This is precisely what happened in *Harris v. Brooks*. For a discussion of *Harris*, see supra notes 55-65.


critics demonstrate that commons functioned successfully over extended periods even when use was close to the carrying capacity of the resource through informal limits imposed by the (small) communities sharing the commons. These examples are irrelevant to our larger society where most persons are strangers to each other, informal sanctions are not effective and formal law recognizes no real limits on any one person's exploitation of a commons. When common owners are strangers to each other and each user receives the full incremental value of the changes she induces while bearing only a small fraction of the costs, the only rational course is for each common owner to increase her use until the resource is exhausted.

Hardin's tragedy is not merely a theory. Users have destroyed common pool resources over and over again in the past


87. For attempts to describe optimal conditions under which a commons might function successfully in more developed economic settings, see Brett M. Frischmann, An Economic Theory of Infrastructure and Commons Management, 89 Minn. L. Rev. 917 (2005) (arguing for openly accessible resources in some cases); Steven Hackett et al., The Role of Communications in Resolving Commons Dilemmas: Experimental Evidence with Heterogeneous Appropriators, 27 J. Envtl. Econ. & Mgt. 99 (1994) (exploring communication and common-pool resources); Ethan Ligon & Urvashi Narain, Government Management of Village Commons: Comparing Two Forest Policies, 37 J. Envtl. Econ. & Mgt. 272 (1999) (investigating whether Joint Forest Management is preferred by either villagers of governments); Charles Mason & Owen Phillips, Mitigating the Tragedy of the Commons Through Cooperation: An Experimental Evaluation, 34 J. Envtl. Econ. & Mgt. 148 (1997) (examining influence of industry size on harvest rates); Charles Mason et al., Expectations, the Commons, and Optimal Group Size, 15 J. Envtl. Econ. & Mgt. 99 (1988); Carol M. Rose, Given-Ness and Gift: Property and the Quest for Environmental Ethics, 24 Envtl. L. 1 (1994) (developing theory of environmental ethics to prevent problem of commons).
century under the common property rule.\textsuperscript{88} We have witnessed the tragedy of the commons, precisely as Hardin predicted, for (to name just a few examples) fish in the sea,\textsuperscript{89} park


access and even national treasuries. I observed just such a tragedy, in a clear and memorable fashion, on a visit to Nova Scotia in 1995.

When I was planning a vacation to Nova Scotia, I looked forward to having lobster dinners there. Nova Scotia is practically next door to Maine, a place where one can always get a large lobster for a small price. Yet, the first restaurant I went to in Nova Scotia did not have lobster on the menu. The waitress suggested another restaurant, which we tried the next night. When I ordered the rather puny and expensive one-and-a-quarter-pound lobster that was on the menu, I was given two tiny lobsters that together weighed perhaps one-and-a-quarter-pounds—probably too small to reproduce. I undertook to discover what happened to Nova Scotia’s lobsters. The answer, it turned out, was that the lobstermen, anticipating announced government regulations on lobstering, had rushed to catch and sell them all.


94. I base this conclusion on personal interviews with Nova Scotia lobstermen and dealers. For a discussion of other reasons that lobsters might be in decline, at least further south off the coast of Rhode Island and New York, see Cornelia Dean, Lobster Boom and Bust, N.Y. Times, Aug. 9, 2005, at F1.
The Nova Scotia lobster situation was a classic tragedy of the commons. Each lobsterman determined for himself when, where and how small to catch the lobsters until the whole industry was reduced to capturing lobsters too small to reproduce. Suppose I were a Nova Scotia lobsterman who wanted to behave responsibly. I could make a voluntary choice to release lobsters smaller than a certain size estimated as providing the lobster a reasonable opportunity to reproduce before being caught. As long as the lobster fishery is a common property resource in which each lobsterman grabs as grab can, I would have done little or nothing to benefit the lobsters. Someone else would simply catch most or all of the lobsters I release. On the other hand, I would have reduced my income. I bear the entire cost of attempting to conserve the lobsters, but the benefit is shared by the less responsible lobstermen who capture the released lobsters. If I continue to grab every lobster I can, I maximize my income (I realize the benefit from increased “use” of the resource), while the costs are spread over all the lobstermen. The only rational course is to grab as many lobsters as I can—a course that apparently too many Nova Scotia lobstermen were all too willing to pursue.

Turning to Pennsylvania’s water resources, the likelihood of overexploitation of the Commonwealth’s water resources is already upon us. The Commonwealth has experienced more frequent drought emergencies in the last twenty-five years than in the previous 300 years. This reflects not so much a change in precipitation

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96. Apparently, many Maine lobstermen have informally agreed to mark some female lobsters with a notch in the tail, with the understanding that no one will catch them, leaving them to reproduce repeatedly. See Dean, infra note 94, at F4 (discussing reasons lobsters may be in decline). No one knows if this will be effective for preserving the large lobsters in the Maine fishery.

patterns as the exponential growth in demand for water since World War II—growth fueled by expanding demand for consumptive uses until 1980 and fueled by the growing recognition of demand for in-stream uses since 1980.\textsuperscript{98} The prospect of climate change is only likely to make such pressures stronger.\textsuperscript{99} In state after state, the pressure of such demands has led to the abandonment of riparian rights in favor of some other body of law.\textsuperscript{100} There is no reason to think Pennsylvania will not eventually follow them. This seems particularly likely given that two-thirds of the Commonwealth falls under one or another of two interstate compacts, in both of which all the other states have already implemented regulated riparian systems.\textsuperscript{101} The absence of such a system in Pennsylvania is at least cumbersome relative to the operations of the compact regimes, and could become truly problematic should a severe water crisis arise. A regulated riparian regime in Pennsylvania could prove particularly significant relative to federal claims to use water given the particular provisions in the two interstate compacts.\textsuperscript{102}
Experiences with riparian rights further suggest that if exploitation of common property requires significant capital investment, the inability of potential investors to keep others from preempting an investor's uses will cause under investment in the resource.103 This fear lay behind the rejection of riparian rights in the drier, western states in favor of an attempt to create a private property system such as Garret Hardin argued was necessary for all commons.104 Yet the West's system of appropriative rights is just as problematic as riparian rights. It is time to turn to the alternatives to riparian rights.

III. THE ALTERNATIVES TO RIPARIAN RIGHTS

In the United States, the climate becomes drier going from east to west, with truly arid regions between the Rocky Mountains and the Pacific coastal ranges, before reaching a narrow humid region right along the Pacific Coast, with predictable consequences for water allocation law.105 European settlers in the West, needing water for mining, irrigation, industrial and municipal uses, concluded that their need for water could not be satisfied under riparian rights.106 The newcomers generally displaced the existing Spanish-Mexican law.107 Aboriginal law was completely ignored.


103. See, e.g., In re Waters of Long Valley Creek, 599 P.2d 656, 666-67 (Cal. 1979) (discussing effect of uncertain water rights); Fennell, supra note 84, at 926-33; Jerome W. Milliman, Water Law and Private Decision-Making: A Critique, 2 J. LAW & ECON. 41, 47-51 (1959); Rose, supra note 81.


106. See, e.g., Coffin, 6 Colo. 443; Drake v. Earhart, 23 P. 541 (Idaho 1890); Jones v. Adams, 6 P. 442 (Nev. 1885).

107. See Dellapenna, supra note 104, § 8.02(a), § 8.02(b) nn.92-108, § 8.02(c) nn.200-22 (noting that any apparent survivals of Spanish-Mexican law seem actually to have been fictions invented by common-law judges). See generally NORRIS H. Hundley, JR., THE GREAT THIRST: CALIFORNIANS AND THEIR WATER, 1770s-1990s, at 1-77 (1992) (describing water policy issue facing Californians); DONALD J. PISANI, TO RECLAIM A DIVIDED WEST: WATER, LAW, AND PUBLIC POLICY, 1848-1902, at 38-46 (1992) (discussing federal reclamation); DANIEL TYLER, THE MYTHICAL PUEBLO RIGHTS DOCTRINE: WATER ADMINISTRATION IN HISPANIC NEW MEXICO (1990) (discussing disputes over water rights in Mexico); Peter L. Reich, Mission Revival Juris-
Instead, the settlers developed their own approach to water allocation—the regime of appropriative rights.

Appropriative rights have failed to catch on in the East.\textsuperscript{108} Nor have markets—whether tied to a system of appropriative rights or otherwise—solved the problems posed by appropriative or riparian rights, east or west.\textsuperscript{109} Instead, a new form of water allocation law called regulated riparianism has developed in the eastern states to displace traditional riparian rights.\textsuperscript{110} The following sections explore these topics and what they could offer to the Commonwealth of Pennsylvania if a decision were taken to replace riparian rights.

A. Appropriative Rights

Appropriative rights basically are a private property approach to water allocation in which the right to use water is defined as to quantity, time, place and manner of use,\textsuperscript{111} and most importantly, according to their priority relative to other uses.\textsuperscript{112} The legal regime of appropriative rights arose from the customs of the early mining camps in the West.\textsuperscript{113} For over 150 years, the miners’ rule has evolved into a complex and sophisticated system of water administration found, in one form or another, in every appropriation state.\textsuperscript{114}

\textsuperscript{108} See Dellapenna, supra note 104, §§ 8.05-8.05(b).


\textsuperscript{110} See generally Dellapenna, supra note 100, ch. 9; Jungreis, supra note 102, at 380-85 (discussing characteristics of riparian water rights).


\textsuperscript{112} For cases demonstrating water allocation based on priority relative to other uses, see Coffin v. Left-Hand Ditch Co., 6 Colo. 443, 446 (1882); State ex rel. Cary v. Cochran, 292 N.W. 239 (Neb. 1940).

\textsuperscript{113} See generally Dellapenna, supra note 104, § 8.01. Contra David B. Schorr, Appropriation as Agrarianism: Distributive Justice in the Creation of Property Rights, 32 ECOL. L.Q. 3 (2005) (demonstrating appropriation doctrine was intended to embody modern ideals of property distribution).

In significant respects, appropriative rights do not work well—failing to prevent wasteful practices and actually encouraging waste.\textsuperscript{115} Appropriative rights also exhibit more uncertainty than the principle of "first in time, first in right" suggests. The earliest priority dates in every appropriative rights state predate the administrative mechanisms.\textsuperscript{116} Despite statutes and legal proceedings to facilitate the recording of these claims, on at least some watercourses in each appropriative rights state the earliest, hence most valuable, rights to use water have never been quantified.\textsuperscript{117} Prescriptive, abandoned or forfeited rights also create gaps in the official record.\textsuperscript{118} These and other shortcomings of appropriative rights become more pronounced when less water remains unappropriated and with the growing recognition of the importance of non-consumptive uses of water.\textsuperscript{119}

The rule of "first in time, first in right" promotes premature development because water users seek to capture unappropriated


\textsuperscript{116} The first statute creating a formal administrative system was enacted in 1890 in Wyoming; the most recently enacted was in Alaska in 1966. See generally Dellapenna, supra note 104, § 8.02(c); Goplerud, supra note 114. Anglo settlement with claims of appropriative rights, began as early as 1848 in California, and at later dates in other states, always long before the creation of the administrative machinery. See id.


\textsuperscript{119} See generally Gaffney, supra note 65.
waters to enjoy the "later rents" of the waters. Withdrawing water creates a right to use the water in the future; in order to capture rents, appropriators use as much water as they possibly can. A cost to society from the investment of real social capital to divert, store and apply water becomes a private gain to the appropriator, who invests capital in capturing of sub-marginal resources. Excessive diversion capacity is usual under appropriative rights, yet most appropriations exhibit inadequate investment in the post-diversionary aspects of development, especially those designed to save water. Conditional rights make it even easier to capture rents, by establishing an intent to appropriate with actual use not following for many years.

Simply put, appropriators live in an environment where it is smart to waste water. Much of the water shortage in the western states would disappear if appropriators paid a realistic price for water and the shortage would abate substantially if appropriators simply started thinking in terms of a zero price, instead of, as now, regarding the cost as negative because of the gain realized by piling


122. For a discussion of the beneficial use doctrine, see Neuman, supra note 115.


up a "history" of "use."\textsuperscript{125} Even George Gould, in a spirited defense of appropriative rights, conceded that enforcement of the prohibition of waste has been intermittent because of a "lack of political will."\textsuperscript{126}

There are other serious problems under appropriative rights. Under the rule of "first in time, first in right," appropriators are senior and junior to one another along a scale from the very first user to the user who began most recently. When water is short, junior appropriators must stop using water first and lose everything before the next senior appropriator loses anything.\textsuperscript{127} Exaggerating the risk to junior appropriators protects senior appropriators. Two basic economizing principles are denied. One is marginal productivity.\textsuperscript{128} A junior appropriator who loses all access to water loses some marginal units of high productivity, while the senior appropriator retains marginal units of low productivity. The other ignored principle is the pooling of risk. Each water right is defined in a way that introduces great changes in the aggregate variability of supply beyond the natural variability and distributes these risks unequally.

Water is also transported wastefully from region to region to comply with the priority system because service areas from any given stream, when water rights are claimed by individuals or small water districts, are scattered.\textsuperscript{129} Wasteful practices arise because "first in time, first in right" puts a premium on jumping the gun. Typically, the first claimants on a source are scattered. Once a particular source of supply is fully claimed, included dry lands can never get water from that source.\textsuperscript{130} Landowners can, however, search for other, more remote sources. The results are easily observed: canals crisscross western states carrying water in opposite

\begin{itemize}
\item \textsuperscript{125} See Neuman, \textit{supra} note 115 (examining development and future of beneficial use doctrine).
\item \textsuperscript{127} For one of the most extreme examples, see \textit{State ex rel. Cary v. Cochran}, 292 N.W. 239 (Neb. 1940) (holding "use of water by a junior appropriator does not become adverse to or injure a senior appropriator until it results in a deprivation of his allotted amount, or some part thereof.").
\item \textsuperscript{129} When administered by large irrigation districts, appropriative rights often are administered in contained service areas.
\item \textsuperscript{130} See \textit{Cochran}, 292 N.W. 239 (allowing senior appropriators' rights to supersede those of junior appropriators).
\end{itemize}
directions as various appropriators exercise their rights. Laws to protect areas of origin had little impact on this problem.\textsuperscript{131}

Traditionally, no effort was made under appropriative rights to protect the public interest in the waters of a state or to distribute their fruits among the disadvantaged of society.\textsuperscript{132} Many appropriative rights states have now enacted statutes requiring consideration of the public interest in evaluating applications to make a new appropriation.\textsuperscript{133} These statutes do not apply to existing water rights and, thus, have little practical effect in the many water basins in which most or all available water has already been appropriated.\textsuperscript{134} Today, people debate whether society should use water for endangered species or for other public values rather than for irrigation and other private uses,\textsuperscript{135} but existing appropriations make it impossible to address such questions.


\textsuperscript{132} See Gaffney, supra note 65, at 138.


Even if one were to disregard the foregoing problems with appropriative rights and the difficulties with using markets to overcome those problems, there are good reasons why appropriative rights are not adaptable to Pennsylvania. Ten western states adopted appropriative rights to replace an earlier system of riparian rights. Generally, legislatures enacted this change, but without abolishing riparian rights completely because of an inability or unwillingness to compensate the owners of riparian rights. Instead, legislatures preserved riparian rights in use on the effective date of the first appropriative rights statute. Even though most transitions occurred when existing water uses were relatively few, the change produced a dual system that combined the worst features of both appropriative and riparian rights.

In 1956, Mississippi became the only eastern state to adopt a dual system. In 1985, Mississippi repealed its appropriative rights


136. See infra notes 153-207 and accompanying text (discussing markets generally and their ineffectiveness for water management).
137. See generally Dellapenna, supra note 104, §§ 8.02(a), 8.02(c).
138. See id. § 8.03.
140. See Dellapenna, supra note 104, §§ 8.03, 8.04.
141. See Miss. CODE ANN. §§ 51-3-3(g)(3) to 51-3-7 (1972). See generally William M. Champion, Prior Appropriation in Mississippi—A Statutory Analysis, 39 Miss. L.J. 1 (1967) (noting adoption of water appropriation legislation); Al Sage, Missis-
During the twenty-nine years Mississippi had appropriative rights, not one Mississippi court in deciding a water rights dispute, ever referred to the statute. Mississippi’s experience suggests why it would be futile to import appropriative rights into a hydrologically more developed eastern state. I have written at some length about Mississippi’s experience elsewhere and will not repeat it in detail here.

Basically, appropriative rights failed in Mississippi because of the innumerable consumptive uses of water that had begun before 1956. Claiming an appropriative right only concedes priority to an opponent claiming a riparian right for a use begun before 1956. Depending on the interpretation adopted by the dual system of water rights, either the riparian right would prevail as the earliest appropriation, or the appropriative right would be a permissive non-riparian use that fails in competition with a riparian use. The best an appropriator could hope would be that the appropriative use would be balanced against the complaining riparian’s use, which brings us full circle back to the reasonable use version of riparian rights. Nor, given the added uncertainty from the duality of the system, could one expect markets to remedy defects of the


144. See Dellapenna, supra note 104, §§ 8.05-8.05(b). See also Dellapenna, supra note 92, at 579-83 (noting ineffectiveness of Mississippi’s appropriation statute); 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, 78-82 (2002) [hereinafter Dellapenna, Southeastern States] (discussing process of obtaining permits under current Mississippi law). For critiques of an earlier version of my review of the Mississippi experience (answered in the writings just cited), see Gould, supra note 126, at 105-08 (questioning costs of permit system); Tarlock, supra note 10, at 520-30 (explicating lessons of regulated riparianism versus appropriation debate).

145. See Dellapenna, supra note 104, § 8.04(a).

146. See id. § 8.04(b).

bureaucratic system established to administer the appropriative rights.\footnote{148}

When Mississippi repealed its appropriative rights statute, it gave all claiming rights vested under the appropriation statute one year to file a document expressing intent to preserve their appropriative right.\footnote{149} No such documents were filed.\footnote{150} Mississippi did not, however, abandon the regulated system of water allocation that characterizes modern appropriative rights in favor of an unregulated system of traditional riparian rights. Mississippi replaced its abortive attempt to introduce the private property system of appropriative rights with another highly regulated system of water allocation—the public property system of regulated riparianism.\footnote{151}

The Mississippi example strongly suggests that adding appropriative rights to an economically mature, humid eastern state committed to riparian rights would gain little, if anything, in terms of rational water management at a cost of establishing and maintaining the considerable bureaucratic machinery that is an inherent part of appropriative rights today. This reality itself ought to preclude serious consideration of appropriative rights as an alternative to riparian-based systems in the eastern United States even without the further arguments about the monopolistic and environmentally unsound biases of appropriative rights.\footnote{152} As a result, eastern states making a sharp departure from the more or less pure riparian rights uniformly rejected the appropriative rights model.

\section*{B. Are Markets the Answer?}

Appropriative rights are a rather peculiar form of private property. In particular, if one justifies privatizing common property in order to avoid the tragedy of commons,\footnote{153} one finds that rather than assuring efficient use of the resource, appropriative rights ef-

\footnote{148 Oklahoma law). See Dellapenna, supra note 104, § 8.04(b) nn.441-47; Christopher L. Len, Synthesis—A Brand New Water Law, 8 U. DENV. WATER L. REV. 55 (2004).}

\footnote{149 See Miss. CODE ANN. §§ 51-3-5(2), (3) (noting abandonment if claim is not filed within three years of April 1, 1985); see id. §§ 51-3-29(a)-(c) (describing unpermitted waters).}

\footnote{150 See Dellapenna, Southeastern States, supra note 144, at 31 (discussing system change over).}

\footnote{151 See Miss. CODE ANN. §§ 51-3-1 to 51-3-55 (outlining general provisions of Mississippi’s Water Resources, Regulation and Control).}

\footnote{152 See supra notes 115-35 and accompanying text (discussing shortcomings of appropriative rights).}

\footnote{153 See supra notes 82-102 and accompanying text (describing how common property systems do not work with limited resources).}
fectively freeze uses in place, unless the state intervenes directly and dramatically to transfer water to other uses. To understand this, one must consider the reality of markets in this supposed private property system of property rights.

Begin with the currently prevalent ideology. Many economists and others today advocate markets as the best way to manage the environment generally, and water in particular. There are

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154. See MALONEY ET AL., supra note 65, at 159; Michael C. Blumm, Seven Myths of Northwest Water Law and Associated Stories, 26 ENVTL. L. 141, 145-46 (1996) (explaining that market-system with respect to system of water rights is only present in some western states). See also infra note 165.


156. See, e.g., TERRY L. ANDERSON & PAMELA SNYDER, WATER MARKETS: PRIMING THE INVISIBLE PUMP (Cato Inst. 1997); HARALD FREDERIKSEN ET AL., WATER RESOURCES MANAGEMENT IN ASIA (World Bank Tech. Pap. no. 212, 1993); CLAY J. LANDRY, SAVING OUR STREAMS THROUGH WATER MARKETS (1998); BONNIE COLBY SALIBA & DAVID B. BUSH, WATER MARKETS IN THEORY AND PRACTICE: MARKET TRANSFERS, WATER VALUES, AND PUBLIC POLICY (1987); RODNEY T. SMITH, TRADING WATER:
good reasons to question the extreme to which this idea is pushed. Some economists seem to advocate markets as the solution for all of society's difficulties, being so devoted to markets as the only real mechanism for social ordering that they could be termed "market fundamentalists." Market fundamentalists exhibit unreasoning devotion to the utility of markets comparable to religious fundamentalists of every stripe. Economics is certainly relevant, but it is not the only relevant mode of analysis.

The most dramatic debacle to result from such devotion was a proposal by the Department of Defense (the Department) to predict future political events in troubled areas by a "futures market" on events such as wars, terrorist attacks or assassinations. The Department dropped the plan with some embarrassment as soon as it

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became public. Commentators highlighted the severe problems, even in terms of economic theory, centering on the ease with which a heavy "investor" could manipulate such a market, for example, by staging a terrorist event at the right place and time. Still, a few market fundamentalists defended the proposal even after it was abandoned. Failure of this proposal did not cause market fundamentalists to become more cautious in the military field. Private contractors hired to interrogate prisoners in Iraq figured prominently in the subsequent scandal about prisoner abuse in Abu Ghraib prison. Why such private contractors were used is unclear. They were too few to justify as a significant increase in the personnel available in Iraq and too expensive to justify as a cost-

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saving measure. Perhaps, as some commentators noted, they were there just to set a precedent in the privatization of the military.163

Market fundamentalists have also suffered setbacks, without so much publicity, in attempts to privatize or marketize water management. In many parts of the world, public opposition has blocked such attempts.164 Such failures in the United States include laws and regulations to block the possibility of market transactions for bulk or raw water,165 and communities taking the expensive step of buying back water utility systems that had been privatized less than a decade earlier.166 None of these setbacks stopped the effort to

163. See Cha & Merle, supra note 162; Paul Krugman, Battlefield of Dreams, N.Y. TIMES, May 4, 2004, at A29 (explaining negative backlash due to heavy reliance on contractors in Iraq).


166. See, e.g., D.L. Bennett, Atlanta Water System: Back in City Hands, Agency Bogged Down, ATLANTA J.-CONST., June 12, 2003, at JN1 (describing hardships resulting from water system being reclaimed from private ownership); Kevin P. Con-
privatize or marketize water management, if only because public institutions often see that as the only way to raise new capital in an era of tight public budgets.167 Moreover, cognitive psychologists168


and economists who style their field of studies as "behavioral economics" or "socioeconomics" question the classical economic models of markets. Without delving too deeply into these alternative schools, the following describes why markets in fact do not work very well as a water management tool.


for water transfers in every area,\textsuperscript{171} yet appropriative rights simply are not bought and sold freely. The recognition and protection of third-party rights precludes true market transactions.\textsuperscript{172} Even the

(highlighting path-dependent nature of water allocation institutions and trading); Dellapenna, supra note 82; Eric T. Freyfogle, Water Justice, 1986 U. ILL. L. REV. 481, 510-14; Gould, supra note 126, at 100; Zachary L. McCormick, Institutional Barriers to Water Marketing in the West, 30 WATER RESOURCES BULL. 953 (1994); Thompson, Institutional Perspectives, supra note 156, at 723-39; Robert A. Young, Why Are There so Few Transactions Among Water Users?, 68 AM. J. AGRIC. ECON. 1143 (1986).


highly touted California Water Bank turns out to have been administrative reallocation masquerading as a market.\textsuperscript{173}

\textit{City and County of Denver v. Fulton Irrigating Ditch Co.}\textsuperscript{174} shows what happens when a would-be buyer seeks water for a use fundamentally different from, or considerably removed from, that of the seller.\textsuperscript{175} The City of Denver agreed that Coors Brewing Company would have the right to use unlimited quantities of Denver sewage water for its brewery in exchange for Coors giving Denver the right to Coors' "clear mountain stream" to augment its municipal supplies.\textsuperscript{176} The transaction failed not because of possible outrage by beer drinkers, but because farmers downstream from Denver (organized as the Fulton Irrigating Ditch Co.) obtained an injunction against the trade because it would deprive them of the water on which they were relying.\textsuperscript{177} The farmers won even though they had recognized the seniority of Denver's rights over their own in a contract settling an earlier dispute in exchange for Denver's promise not to reuse any water that "shall have been once used through its municipal water system."\textsuperscript{178} There could hardly be a clearer demonstration of the impact of the third-party rule on the potential for markets for bulk or raw water.


\textsuperscript{173} See Dellapenna, \textit{supra} note 82, at 358-65.

\textsuperscript{174} 506 P.2d 144 (Colo. 1972).


\textsuperscript{176} See Fulton Irrigating Ditch Co., 506 P.2d at 151. The swap involved a sale by each party of its water rights to the other; it is immaterial for this discussion which is considered the buyer and which the seller.

\textsuperscript{177} See \textit{id}. at 151-53 (noting injunction obtained to ensure supply of water for farmers).

\textsuperscript{178} See \textit{id}. at 151. Denver would have supplied Coors from "imported water," water from outside the watershed, over which the city had even greater rights than if it were merely claiming the rights of a senior appropriator. See \textit{id}. at 146-49. The decision in the case would not have depended on the contract if the water had not been imported water. See, e.g., Santa Fe Trail Ranches, 990 P.2d 46 (holding that diversions made pursuant to decreed water right may not be considered as establishing historical use for purpose of change of water right proceeding); \textit{Orr v. Arapahoe Water & Sanitation Dist.}, 753 P.2d 1217 (Colo. 1988) (holding that right to have changed point of diversion limited to historical use); C.F. & I. Steel Corp. v. Rooks, 495 P.2d 1134 (Colo. 1972) (pointing out reason that change in point of diversion be specified by trial court).
Advocates of giving free play to markets for bulk or raw water have insisted that the protection of third-party rights signals an overly rigid legal regime.\(^{179}\) They argue that if such restraints were removed, private property rights would have their due and markets would flourish. This is incorrect. Area-of-origin statutes, regulations prohibiting the export of water,\(^{180}\) interfere with private property and prevent market transactions. Protections of third-party rights prevent market-generated externalities from destroying the property rights of third parties. Rather than government intervention that prevents or distorts markets, such protections are the minimum necessary to assure that each person’s property rights are transferred only through markets.\(^{181}\)

Judge Richard Posner has fully described why such third-party rights must be protected if society is to ensure that water is used efficiently under a system that relies on markets as primary water management tools:

If the effects of return-flow were ignored, many water transfers would reduce overall value. Suppose A’s water right is worth $100 to him and $125 to X, [a] municipality; but whereas A returns one half of the water he diverted to the stream, where it is used by B, X will return only one


fourth of the water it obtains from A, and at a point far below B, where it will be appropriated by D. And suppose B would not sell his right to A's return flow for less than $50, while D would sell his right to the municipality's return flow for $10. Given these facts, to let A sell his water right to X because it is worth more to X than to A would be inefficient, for the total value of the water in its new uses (X and D's)—$135—is less than in its old uses (A and B's)—$150. The law deals with this problem by requiring the parties to show that the transfer will not injure other users. In practice this means that A and X in our example, in order to complete their transaction, would have to compensate B for the loss of A's return flow; they would not do so; and the transaction would fall through, as under our assumptions it should. 182

If a transfer increases return flows, the arrangements necessary to protect each water right are even more complex. 183 When one factors in the probability that much of the water sought to be transferred in the West was acquired through a Federal reclamation project, the complexities become greater still. 184 Nor can one overlook the structuring of access to water facilities owned by yet someone else not participating in the basic transaction. 185

Because of such concerns, small-scale transfers of water rights among farmers or ranchers, all of whom are making similar uses at more or less the same place, are the only ones that regularly occur under appropriative rights without state intervention. 186 Small-scale, like-kind transactions are unlikely to affect third parties. The only large-scale transactions involving a significant change in the place or manner of use that can be achieved purely by market trans-

182. See Posner, supra note 128, § 3.11, at 87-88. See also Jeffrey L. Jordan, Externalities, Water Prices, and Water Transfers, 35 J. AM. WATER RESOURCES ASS'N 1007 (1999).

183. See Posner, supra note 128, § 3.11, at 88.


186. See supra note 170; see also Asif M. Zaman, Brian Davidson, & Hector M. Malano, Temporary Water Trading Trends in Northern Victoria, Australia, 7 WATER POL'Y 429 (2005) (noting only small-scale, like-kind water transfers transpire on regular basis without state involvement).
actions would be when the transferor is the last possible beneficial water user.

Among other matters, distributive equity must be considered along with economic efficiency. The issue is central even though economists often are uncomfortable discussing it. In the nineteenth century, a time of limited and ineffective government in the United States, a transition from a private property system (which had the effect of freezing uses rather than creating a market) to a common property system at least introduced a measure of flexibility into the use of water, promoting social and economic development. The transition from private property to common property also, whether intended or not, imposed a massive, if haphazard, wealth redistribution. The same would be true if the law were to rely primarily on markets to allocate water to particular uses.

Generally, under markets, wealth is transferred from the poorest users of water (who hold the smallest water rights or no water right at all, and in either case are unattractive to potential buyers) to the wealthier members of society—those who can afford


to buy water rights but need no longer worry about compensating
the small water users who lose their expected return flows.191
To-

day, the transition to a common property system seems much less
prudent as the demands for water outstrip supplies, creating a real
risk of the tragedy of the commons for those parts of the United
States that follow traditional riparian rights.192 Given the probable
regressive distributive effects on the allocation of water rights, one
ought to be wary of any such transition in today’s world.193

One recent attempt to make a market for water pulls together
these several strands of thought. The attempt, during a five-year
drought at the turn of the millennium, to transfer Colorado River
water from several large irrigation districts in southern California to
large cities in southern California has been used as proof that mar-
kets will work.194 Careful examination of what happened, however,
suggests otherwise.

The city of San Diego sought to obtain 800,000 acre-feet of
water from the Imperial Valley Irrigation District (The District).195
That was about eleven percent of the District’s allocation from the
Colorado River. The District board voted 3-2 in December 2002 to
reject the proffered contract.196 The federal and state governments

191. See CARL J. BAUER, AGAINST THE CURRENT: PRIVATIZATION, WATER MAR-
KETS, AND THE STATE IN CHILE (1st ed. 1998); CARL J. BAUER, THE SIREN SONG:
CHILEAN WATER LAW AS A MODEL FOR INTERNATIONAL REFORM (2004); ROBERT R.
HEARNE & K. WILLIAM EASTER, WATER ALLOCATION AND WATER MARKETS: AN ANAL-
YSIS OF GAINS-FROM-TRADE IN CHILE 40 (1995); see also CARL J. BAUER, SLIPPERY PROPERTY
RESOURCES J. 109 (1998); K. WILLIAM EASTER & ROBERT R. HEARNE, WATER MARKETS AND
DECENTRALIZED WATER RESOURCES MANAGEMENT: INTERNATIONAL PROBLEMS AND OPPORTUNITIES, 31
WATER RESOURCES BULL. 9 (1995); STEVEN E. HENDRIX, MYTHS OF PROPERTY RIGHTS, 12
on society’s poorest members).

192. For further discussion of potential negative consequences of modern day
property system transformation, see supra notes 82-102.

193. See Schorr, supra note 113 (noting adverse effects of modern day common
property system transformation on allocation of water rights).

194. See, e.g., MEGAN HENNESSY, COMMENT, COLORADO RIVER WATER RIGHTS: PROPERTY
RIGHTS IN TRANSITION, 71 U. CHI. L. REV. 1661, 1672-75 (2004); SETH HETTENA, WESTERN
FARMERS TURN TO WATER SALES, CHARLESTON GAZETTE (W. VA.), Dec. 29, 2003, at 2A
discussing attempt to transfer water from large southern California irrigation
districts to large southern California cities).

195. See Michael Gardner, San Diego County Needs More Water, Imperial Valley
Has a Lot, SAN DIEGO UN.-TRIB., Dec. 8, 2002, at A1. One acre-foot of water—the
amount necessary to cover one acre of land to a depth of one foot—is 325,851
gallons.

196. See Michael Gardner, IMPERIAL REJECTS WATER TRANSFER, SAN DIEGO UN.-TRIB.,
Dec. 10, 2002, at A1; SETH HETTENA, WATER WAR? TINY IMPERIAL COUNTY SAYS NO TO BIG
NEIGHBORS, LONG BEACH PRESS-TELE., Dec. 12, 2002, at A17; DEAN E. MURPHY, CALIFOR-
NIA VOTE THREATENS DEAL ON COLORADO RIVER, N.Y. TIMES, DEC. 11, 2002, at A24; DANIEL
WOOD, IN WATER TRANSFER, FARMERS v. SPRAWL, CHRISTIAN SCI. MON., Dec. 11, 2002, at 1.
immediately put enormous pressure on the District. In particular, Secretary of the Interior Gail Norton cut the District's allocation of water by eleven percent, to be restored only if it was sold under the terms of the rejected contract. The Irrigation District continued to resist the deal, even initiating an ultimately unsuccessful lawsuit against Secretary Norton. The California legislature also threatened to intervene to take the water from the District. The District gave in and "accepted" the contract by another 3-2 vote. This was not a market transaction. It was government administration of the use of water masquerading as a market.

The Imperial Irrigation District-San Diego transaction also demonstrates the distributed effects and other externalities that characterize so-called water markets. The transaction provided an infusion of cash for the owners of the farms served by the District, but provided nothing but unemployment for farm workers on those farms as land was idled in order to free up water to transfer to San


198. See Jimenez, supra note 197; Kitz, supra note 197 (noting Secretary of Interior, Gail Norton's threat to decrease Imperial Valley Irrigation District's allocation of water).


200. See Bettye Wells Miller, Water Worries Intensify Dispute: Pressure on an Imperial County District and a Planned Bill Have Farmers Concerned, PRESS-ENTERPRISE (Riverside, CA), Jan. 23, 2003, at A1 (commenting on state legislature's response to Imperial Valley Irrigation District's response).

The transaction also promised disaster to the ecosystems that depend on return flow from the farms. And, despite the offered cash, most landowners felt they were being shortchanged, which led to the District’s initial refusal to consent to the transaction. Taking into account the effects on farm workers about to lose their jobs, once again it transferred wealth from the poor to the rich.

In contrast to the intense struggle with the Imperial Irrigation District over the “sale” of water to San Diego, the Coachella Valley Irrigation District reached a relatively quiet settlement to sell part of its water. This is hardly a better example of a true market, however, both in terms of process and in terms of effects. After all, with the Imperial Valley Irrigation District’s experience in front of their eyes, a vote by the directors of the Coachella District hardly proves that the transaction was, in a real sense, voluntary.

C. Regulated Riparianism

In the second half of the twentieth century, Hawaii and about half of the states east of Kansas City enacted administrative permit systems to replace traditional riparian rights. Rather than importing appropriative rights into the east, these states developed a

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204. See Harry Cline, Peace Elusive Along the Colorado River, WESTERN FARM PRESS (Cal.) Dec. 6, 2003, at 9 (noting landowners are discontent with Imperial Valley Irrigation District-San Diego water transaction).

205. See Elaine Robbins, Winning the Water Wars: In the West, They Say that Water Flows Uphill to Money, 69 PLANNING no. 6, at 69 (2003) (highlighting disproportionate benefits of Imperial Valley Irrigation District-San Diego water transaction).


207. See Michael Gardner, River Entitlement Cut in Region Is Affecting Coachella Valley First, SAN DIEGO UN.-TRIB., May 10, 2003, at A3 (questioning voluntary nature of Coachella Valley Irrigation District’s approval to sell its water).

208. See generally Dellapenna, supra note 100 (discussing use of administrative permit systems).
system of water administration based on riparian principles that is best described as a system of public property. This system has come to be called "regulated riparianism." Because the transition from limited regulatory intervention to more or less comprehensive regulation occurred incrementally, rather than from a conscious design to revolutionize the system of water rights, there is some disagreement about when a true regulated riparian system actually emerged. Even today, there are debates about whether certain states have, in fact, crossed the line from relying largely on unregulated common law riparian rights to a regulated riparian system. In addition to the eighteen states that apply regulated riparianism to surface waters and groundwater in the state, four states apply a regulated riparian system to groundwater.

209. See Dellapenna, supra note 30, § 6.01(b)(1) (addressing public property systems); Dellapenna, supra note 82, at 337-42, 365-77 (describing public property option).


water without applying it to surface waters. The Delaware Basin Water Commission and the Susquehanna Basin Water Commission also operated a limited sort of regulated riparian system in the parts of states to which they apply, especially within parts of Pennsylvania.

Little has been written about regulated riparianism, and most of what has been written on the topic describes regulated riparian statutes as a set of minor modifications superimposed on the riparian rights that the authors saw as the remaining core of the law in these states. Others have construed regulated riparian statutes as inartfully drafted appropriative rights statutes. Few commentators realized that regulated riparianism represents a truly different


See, e.g., Anthony Scott & Georgina Coustalin, The Evolution of Water Rights, 35 Nat. Resources J. 821, 899-901 (1995) (describing statutory, i.e., regulated riparian—permit systems, as hastily enacted and not fitting with other bureaucratic systems in state or province of enactment, as well as being of little consequence and not robust enough to deal with any true crisis). See also Richard C. Ausness, Water Rights Legislation in the East: A Program for Reform, 24 Wm. & Mary L. Rev. 547, 554-76 (1983) (describing eastern states' efforts to supplement or replace common law rules with statutory water allocation system); Peter N. Davis, Eastern Water Diversion Permit Statutes: Precedents for Missouri, 47 Mo. L. Rev. 429, 465-70 (1982) (discussing form Missouri water permit statute should take).

model of water law, although that is lately being recognized.\textsuperscript{216} The following summary description of regulated riparianism is based on the common core of principles found in the actual regulated riparian statutes and articulated in the Regulated Riparian Model Water Code (\textit{MODEL CODE}) of the American Society of Civil Engineers (the Society).\textsuperscript{217} The \textit{MODEL CODE} is an official standard of the Society, meaning that the Society endorses it as the proper approach to water law in states operating within the riparian tradition. No state has a system precisely like the one described here or in the \textit{MODEL CODE}, although several come fairly close.\textsuperscript{218} Most references here are to the \textit{MODEL CODE} and to the relevant chapter of the treatise \textit{WATERS AND WATER RIGHTS}.\textsuperscript{219} Both include detailed commentaries explaining the various provisions and exhaustive references to actual regulated riparian statutes and are the most convenient sources for understanding the structure and application of regulated riparianism.

Regulated riparianism's most central requirement is that water is not to be withdrawn from a water source without a time-limited permit from the state where the withdrawal occurs.\textsuperscript{220} There are some exemptions, generally for small users.\textsuperscript{221} A few of these exemptions are large. Georgia and Kentucky, at the extreme, exempt

\begin{itemize}
  \item \textsuperscript{216} See, e.g., Jungreis, \textit{supra} note 102, at 371 (explaining that regulated riparianism combines eastern and western water doctrines and adds commands and controls regulation).
  \item \textsuperscript{219} See Dellapenna, \textit{supra} note 100 (providing information on regulated riparianism).
  \item \textsuperscript{220} See \textit{MODEL CODE, \textit{supra} note 217, § 6R-1-01; Dellapenna, \textit{supra} note 100, §§ 9.03(a)-(a)(2) (explaining permit requirements).
  \item \textsuperscript{221} See \textit{MODEL CODE, \textit{supra} note 217, § 6R-1-02 (setting levels for exemption where users whose withdrawals do not exceed specific amounts are not required to obtain permit); Dellapenna, \textit{supra} note 100, § 9.03(a)(3) (providing examples of statutes with preferences exempting some users from permit requirement).
virtually all agricultural uses from the permit process.²²² Given that in both states, the substantial majority of the withdrawals of water for consumptive uses are for agricultural uses, such an exemption is self-defeating.²²³

Under regulated riparianism, the permit determines the water right, not the riparian nature of the use.²²⁴ The new system connects to riparian rights through the criterion by which permit applications are judged—whether the proposed use is “reasonable.”²²⁵ Yet, the criterion of “reasonable use” is applied very differently from common law. Moreover, an administering agency decides whether a use is reasonable before the use begins, both in terms of general social policy and in terms of the effects of the proposed use on other permitted uses.²²⁶ Unlike traditional riparian rights, water users are able to know, for the duration of the permit, whether their use is reasonable; they cannot be caught unaware by a judicial


²²⁴. See Model Code, supra note 217, §§ 2R-1-01, -02 (stating obligation to make only reasonable use of water and prohibition of use not based on location); Dellapenna, supra note 100, §§ 9.03(a), 9.03(a)(2) (describing sometimes arbitrary nature of riparian rules).

²²⁵. See Model Code, supra note 217, §§ 2R-2-20, 6R-3-01, -02 (describing criteria of reasonable use, specifically standards of permit dictate that use must be reasonable and how to determine whether use is reasonable); Dellapenna, supra note 100, §§ 9.03(b)-(b)(3) (describing role of reasonableness and substitutes for concept). Some jurisdictions would substitute the terms “beneficial,” “reasonable-beneficial,” or “equitable” for the term “reasonable.” See generally McDougal, supra, note 210 (using term “reasonable-beneficial”); Kevin E. Regan, Balancing Public Water Supply and Adverse Environmental Impacts Under Florida Water Law: From Water Wars Towards Adaptive Management, 18 J. Land Use & Envtl. L. 123 (2003) (describing reasonable and beneficial use standards); Saarinen & Lynne, supra note 64 (giving history and evolution of reasonable use doctrine).

²²⁶. See Model Code, supra note 217, §§ 6R-2-01 to 6R-2-08, 6R-3-02, 6R-3-05 (specifying contents of application, including basis of water right such as criteria for determining reasonable use); Dellapenna, supra note 100, §§ 9.05(a)(5)(A), 9.05(b)(1)-(b)(3) (describing typical statutory requirements for issuing permit). In most states, the majority of permits appear to be awarded almost automatically, that is, without careful and extensive examination. See Alexander Lane, N.J. Too Generous with Water, Critics Say—State Permits for Big Users Rose Last Year, Star Ledger (Newark, N.J.), Sept. 28, 2003, at 21 (describing extent of water-allocation permits to gold courses, commercial complexes and growing communities); Gary D. Lynne et al., Water Permitting Behavior Under the 1972 Florida Water Resources Act, 67 Land Use Econ. 340, 345-46 (1991).
decision wiping out their investment without compensation.\textsuperscript{227} The permit allows a potential investor to gauge whether the investment can be profitable and the proper scale of investment.

The administering agency responsibility is to impose conditions on permits to protect other lawful uses and public values.\textsuperscript{228} Regulated riparian statutes often contain preferences for certain classes of uses.\textsuperscript{229} Temporal priority, on the other hand, has a strictly limited role in the permit process.\textsuperscript{230} And uses on non-riparian land are no longer unreasonable per se, often, one of the principle motives for enacting a regulated riparian statute was to authorize the use of water on non-riparian land.\textsuperscript{231} Finally, the administering agency usually issues permits only for a period of time, ranging from three to twenty years.\textsuperscript{232} When a permit expires, the administering agency reexamines the reasonableness of the use, introducing a desirable flexibility into the development, use and pro-

\textsuperscript{227} See, e.g., Joslin v. Marin Mun. Water Dist., 429 P.2d 889, 891-92 (Cal. 1967) (granting defendant water district summary judgment in case where plaintiffs with rock and gravel business had interruption in business due to upstream dam defendant had built); see Harris v. Brooks, 283 S.W.2d 129 (Ark. 1955) (granting injunctive relief to owner of lakeside cabin operation; defendant was pumping water from lake for rice crop). See supra notes 55-56 and accompanying text.

\textsuperscript{228} See Model Code, supra note 217, § 7R-1-01 (detailing permit terms and conditions); Dellapenna, supra note 100, §§ 9.03(a)(5)(A), 9.05 - 9.05(c) (considering public use and public interest planning in light of permit process); see, e.g., In re Water Use Permit Applications, 9 P.3d 409, 445-72 (Haw. 2002), remanded after further proceedings, 93 P.3d 643 (Haw. 2004) (stating water code does not suppl plant public trust doctrine). See generally McDougal, supra note 210, at 3 (describing balance of permitting plus public values); Regan, supra note 225, at 162 (suggesting regulators establish guidelines based on reasonable and beneficial use factors).

\textsuperscript{229} See Model Code, supra note 217, §§ 6R-1-02, 6R-3-04 (indicating that small withdrawals are exempt from permit requirements and detailing preferences among water rights); Dellapenna, supra note 100, §§ 9.03(a)(5), 9.05(c) (describing various state priority schedules).

\textsuperscript{230} See Model Code, supra note 217, §§ 6R-1-03, 6R-3-02 (setting levels of exemption from permit requirements and detailing preferences among water rights); See Dellapenna, supra note 100, § 9.03(a)(b)(3) (explaining role of temporal priorities in regulated riparianism).

\textsuperscript{231} See Model Code, supra note 217, § 2R-1-02 (indicating there is no prohibition based on location of water use); Dellapenna, supra note 100, § 9.03(a)(2) (explaining common law versus regulated riparian takes on authorizing water use on non-riparian land).

\textsuperscript{232} See Model Code, supra note 217, § 7R-1-02 (specifying duration of permits); Dellapenna, supra note 100, § 9.05(a)(4) (explaining reasoning for limiting permit to certain time period).
tection of water resources.\textsuperscript{233} The Model Code sets twenty years as the permit duration.\textsuperscript{234}

Regulated riparian statutes contain a full panoply of enforcement mechanisms, including actions for public and private damages, administrative orders, civil penalties, criminal penalties and injunctions.\textsuperscript{235} The administering agency is charged to provide hearings and is subject to judicial review for its decisions.\textsuperscript{236} Criminal prosecutions are rare under regulated riparian statutes, and most enforcement is achieved through civil or administrative reme-

\textsuperscript{233} See Freyfogle, \textit{supra} note 170, at 515 (suggesting agency limits maintain maximum social flexibility).

\textsuperscript{234} See Model Code, \textit{supra} note 217, § 7R-1-02. For an analysis of the merits of possible durations for the permits, see Maloney \textit{et al}., \textit{supra} note 65, at 173-77 (explaining possible results of various permit lengths); Ausness, \textit{supra} note 214, at 584-87 (suggesting differences between various permit duration limitations); Dellapenna, \textit{supra} note 100, § 9.03(a)(4) (comparing time periods chosen by some states to twenty year span of Model Code).

\textsuperscript{235} See Model Code, \textit{supra} note 217, §§ 4R-3-03 to 5R-4-04 (stating specific rules such as duty to cooperate, special water management areas and judicial review of regulations including agency's authority to inspect place of permit, give notice of violation, order permit holders to cease or restore, issue injunctions); Dellapenna, \textit{supra} note 100, § 9.03(a)(5)(B) (describing various enforcement options).

\textsuperscript{236} See Model Code, \textit{supra} note 217, §§ 5R-1-01 to 5R-1-03 (hearing), 5R-3-01 to 5R-3-03 (judicial review). Courts have generally been very deferential in reviewing decisions under regulated riparian statutes. See, \textit{e.g}., City of Fort Smith v. River Valley Regional Water Dist., 37 S.W.3d 631, 639 (Ark. 2001) (explaining water district's rights and duties under water act); Southwest Fla. Water Mgmt. Dist. v. Charlotte City, 774 So. 2d 903, 909 (Fla. Dist. Ct. App. 2001) (deferring to DEP); Southwest Fla. Water Mgmt. Dist. v. Save the Manatee Club, Inc., 773 So. 2d 594 (Fla. Dist. Ct. App. 2000) (discussing Florida statute establishing what constitutes agency rule that exceeds delegated legislative authority); \textit{In re Water Use Permit Applications}, 9 P.3d 409 (Haw. 2000) (affirming in part and reversing in part case involving Commission on Water Resource Management); Oxon Hill Recreation Club, Inc. v. Water Res. Admin., 375 A.2d 567, 569 (Md. 1977) (limiting review to whether Department of Natural Resources acted with illegality, arbitrariness or unreasonableness); Urban Council on Mobility v. Minn. Dep't of Nat. Res., 289 N.W.2d 729, 733 (Minn. 1980) (using substantial evidence test to review administrative decision); \textit{In re City of White Bear Lake}, 247 N.W.2d 901, 906-07 (Minn. 1976) (holding that commissioner's decision to deny city's application to encroach upon bay of lake in order to construct roadway not arbitrary and capricious); \textit{In re Erickson Lake}, 392 N.W.2d 636, 639 (Minn. Ct. App. 1986) (holding commissioner's refusal to grant unrestricted permit for development of lake not clearly erroneous); \textit{In re Comm'r's Order Denying Permit Application}, 527 N.W.2d 173, 177 (Minn. Ct. App. 1995) (holding commissioner's denial of permit for water supply project not untimely or impermissible); \textit{In re N. Jersey Dist. Water Supply Comm'n}, 417 A.2d 1095, 1108 (N.J. Super. Ct. 1980), \textit{cert. denied}, 427 A.2d 539 (N.J. 1980) (holding that town opposing water diversion project approved by Environmental Protection Agency (EPA) and Water Policy and Supply Council was not deprived of due process rights through approval procedure used by EPA and Council); High Rock Lake Ass'n v. North Carolina Envtl. Mgmt. Comm'n, 276 S.E.2d 472, 474 (N.C. Ct. App. 1981) (using "whole record" test to affirm agency declaratory ruling regarding river basin classification).
dies. The Model Code also includes provisions designed to support alternative dispute resolution and the administrative resolution of disputes among permit holders\textsuperscript{237}—provisions not generally found in actual regulated riparian statutes.\textsuperscript{238}

Traditional water law, whether riparian rights or appropriative rights, has treated water as a "free good," that is, a good provided without charge to all with lawful access to the good.\textsuperscript{239} As economists and others have been arguing for decades, treating water as a "free good" creates a perverse incentive to waste water, or at least not to consider the social costs of consuming water.\textsuperscript{240} Users pay fees to the administering agency for regulated riparian permits, but such fees cannot be considered payment for the water itself. Statutes setting a uniform charge regardless of the nature of the use or the amount of water used clearly are not charging for the water as such. And even when the fee is variable, however, it is set according

\textsuperscript{237} See Model Code, supra note 217, §§ 5R-2-01 to 5R-2-03 (detailing dispute resolution requirements); Dellapenna, supra note 100, § 9.05(c) (noting regulated riparian statutes say little about dispute resolution).


\textsuperscript{239} See Anderson & Snyder, supra note 156, at 114-16; Kaiser & Binion, supra note 171, at 169-73 (describing water rights acquisition methods).

to the presumed ability of the user to pay, rather than according to the value that could be created through water use.241

The Model Code breaks new ground regarding fees, requiring that water use fees be set to compensate the state for the reasonable value of the water consumed.242 The Model Code fees for water use are designed to provide economic incentives for the efficient use of water in a setting where markets are not likely to be effective.243 The administering agency can vary such fees by class,244 with the fees going into the general funds of the state.245 Any surviving fiscal preferences should be seen as a form of distributive equity. The result, however, will be the continued use of water for low-valued uses rather than its transfer to higher valued uses that, in extreme cases, might find no water available for their needs.

Regulated riparian systems are based on a state's police power to regulate the withdrawal and use of water in order to protect the public health, safety and welfare.246 The political, and perhaps the legal repercussions of such radical interference with traditional water rights has led state legislatures to exempt from the permit

241. See Dellapenna, supra note 100, § 9.03(a)(5)(C) (explaining how to finance permit process).

242. See Model Code, supra note 217, § 4R-1-08 (explaining how water use fees vary according to purpose and quantity of use).

243. See id. (noting water use fees are to be charged to every person using water under permit issued pursuant to Regulated Riparian Model Water Code). For further discussion about the likely ineffectiveness of markets, see supra notes 153-207 and accompanying text.

244. See Model Code, supra note 217, § 4R-1-08(3). Any surviving preferences should be based on relative inability to pay, as a form of distributive equity. See Dellapenna, supra note 100, § 9.03(a)(5)(C). See also Frank E. Matthews & Gabriel E. Nieto, Florida Water Policy: A Twenty-Five Year Mid-Course Correction, 25 FLA. ST. U. L. REV. 365, 373-75 (1998) (discussing budget oversight process in Florida).

245. See Model Code, supra note 217, § 4R-1-08(4) (stating purpose and quantity use water fees are to be paid to state).

246. See State v. Braun, 378 A.2d 640, 644-45 (Del. 1977) (holding owner was not entitled to compensation when water taken for public purposes); Village of Tequesta v. Jupiter Inlet Corp., 371 So. 2d 663, 672 (Fla. 1979), cert. denied 444 U.S. 965 (1979) (holding diversion of water was not "taking" and owner did not have constitutionally protected right in water); Iowa Natural Res. Council v. Van Zee, 158 N.W.2d 111, 119 (Iowa 1968); Crookston Cattle Co. v. Minnesota Dep't of Natural Res., 300 N.W.2d 769, 775 (Minn. 1980) (holding city pumping water from company's site was not unconstitutional taking); Herschman v. State, 225 N.W.2d 841 (Minn. 1975) (holding state did not lose its police power when landowner previously registered title to land beneath lake); State v. Kulvar, 123 N.W.2d 699 (Minn. 1963); Omernik v. State, 218 N.W.2d 734 (Wis. 1974). See generally Dellapenna, supra note 100, § 9.04(a) (holding statute requiring permit for water diversion was not unconstitutional taking); Joseph L. Sax, The Constitution, Property Rights, and the Future of Water Law, 61 U. COLO. L. REV. 257 (1990) (discussing how changed economy will impact American water law and property rights); Tarlock, supra note 10, at 510 (discussing common law legacy of water law in eastern states).
requirement users who were using water when the new statute came into effect. This introduces a significant temporal element. The MODEL CODE follows a more sophisticated solution to the problem by guaranteeing existing users an initial permit subject to renewal on the same basis as any other permit, limiting the temporal preference to a single permit cycle. Existing users who refuse to apply for a permit within a short period of time can then conclusively be presumed to have abandoned their claim.

Regulated riparian statutes include extensive provisions for protecting or promoting the public interest in water resources, beginning with long-term planning. A major purpose of the regulated riparian permit system is to assure the gathering of necessary information to enable planning to occur on an on-going basis. The MODEL CODE would establish a particularly comprehensive statewide data system. Using this system, the administering agency can incorporate permit conditions based on its plans. Regulated riparian statutes also protect or promote the public interest by protecting minimum flows and levels, assuring water for public

247. See Dellapenna, supra note 100, § 9.03(a)(3) (noting riparian states have history of preferences for different private users of water).
248. See MODEL CODE, supra note 217, § 6R-1-03; Dellapenna, supra note 100, § 9.05(b)(3) (listing contents of permit application). This approach originated in the MODEL CODE put together by Frank Maloney, Dick Ausness and Scott Morris in 1972. See Maloney et al., supra note 65, at 182-85 (discussing permit application and usage).
250. See MODEL CODE, supra note 217, §§ 4R-2-01 to 4R-2-04 (outlining planning responsibilities); Dellapenna, supra note 100, § 9.05(a) (describing long-term riparian statute planning).
251. See MODEL CODE, supra note 217, § 4R-2-03 (explaining statewide data system, in which state agency gathers and maintains info regarding availability, distribution, quality and use of waters).
252. See id. § 7R-1-01 (describing terms and conditions that must be included in each permit).
253. See id. §§ 3R-2-01 to 3R-2-05 (describing protected minimum levels); Dellapenna, supra note 100, § 9.05(b) (explaining protection of instream flows historically has been central feature of riparian statutes); Lee P. Breckenridge, Can Fish Own Water?: Envisioning Nonhuman Property in Ecosystems, 20 J. LAND USE & ENVTL. L. 293 (2005) (discussing suggestions for understanding and shaping property regimes to deal with modern science); Breckenridge, supra note 210 (using Massachusetts as example of how water is managed in riparian jurisdiction).
uses\textsuperscript{254} and providing measures for water emergencies\textsuperscript{255}. Some regulated riparian statutes authorize yet other kinds of conditions designed to protect aesthetic or ecological concerns. For example, the \textit{Model Code} requires the protection of the biological, chemical and physical integrity of the water source, defined in terms of federal and other relevant legal standards\textsuperscript{256}.

Regulated riparianism has not solved every problem relating to water allocation and management. In particular, problems exist relating to the security of investment and to the transfer of water to higher valued uses. Investment security could be a problem if the permit duration is too short, leaving too little time for the initial cost of a project to be recovered before permit expiration\textsuperscript{257}. Additional uncertainty arises from the authority of an administering agency to modify permits to respond to water shortages or water emergencies\textsuperscript{258}. As to the transfer of water rights, regulated riparian statutes usually make no express provision for such transfers between potential users\textsuperscript{259}.

The \textit{Model Code} charges the administering agency to encourage market transfers of water\textsuperscript{260}. Given the problems with markets for water, however, it is unlikely that a market will develop to facilitate the transfer of water under regulated riparian permits to higher valued uses\textsuperscript{261}. Indeed, one can see regulated riparian stat-

\begin{itemize}
\item \textsuperscript{254} \textit{See Model Code}, supra note 217, § 2R-2-15 (defining “public interest” as “any interest in waters of State . . . shared by the people of the State as a whole and capable of protection or regulation by law”); Dellapenna, supra note 100, § 9.05(c) (providing explanations regarding public uses and how most extreme preference would be to completely exempt public uses from obtaining permits).
\item \textsuperscript{255} \textit{See Model Code}, supra note 217, § 7R-3-01 (outlining restrictions that apply during water shortages or emergencies); Dellapenna, supra note 100, § 9.05(d) (illustrating how to cope with water emergencies).
\item \textsuperscript{256} \textit{See Model Code}, supra note 217, §§ 3R-2-01 to 3R-2-05 (describing protected minimum flows or levels standards and effects of water shortages).
\item \textsuperscript{257} \textit{See Maloney et al.}, supra note 65, at 175-77 (discussing lengthening of permit duration); Ausness, supra note 214, at 568, 584-87 (discussing permit duration); Dellapenna, supra note 100, § 9.03(a)(4) (noting permits expire periodically); Gould, supra note 126, at 109-10 (discussing short term and variable term permits).
\item \textsuperscript{258} \textit{See Ausness, supra note 214, at 581-84 (discussing allocation schemes during water shortages); Dellapenna, supra note 100, §§ 9.03(d), 9.05(d) (discussing transferring water rights and planning for emergency situations); Gould, supra note 126, at 110, 117-21 (discussing shortage responses).
\item \textsuperscript{259} \textit{See Dellapenna, supra note 100, § 9.03(d) (outlining multiple scenarios in which water rights can or cannot be transferred).}
\item \textsuperscript{260} \textit{See Model Code}, supra note 217, §§ 1R-1-07, 7R-2-01 to 7R-2-04, 7R-3-05, 9R-1-01 to 9R-1-02 (explaining modification of permits).
\item \textsuperscript{261} \textit{See supra} notes 153-207 and accompanying text (discussing likely ineffectiveness of markets). Regarding the likely dearth of markets for water permits under regulated riparianism, see Gould, supra note 126, at 110.
utes as enacted to enable administering agencies to force such transfers through the non-renewal of permits. The agencies actually free up less water through the renewal process than theory suggests because the agencies prefer to tighten conditions on existing uses rather than to deny renewals outright. Non-renewal of permits probably will remain an infrequent and cumbersome device unless a state is willing to create a good deal of investment insecurity.

In the actual operation of regulated riparian systems, however, neither investment insecurities nor transfer problems seem to have caused much actual difficulty. Such evidence suggests that the real problem is the opposite—agencies fail to exercise their managerial powers sufficiently rather than too aggressively. Authorities in eastern states generally consult major water users in responding to water emergencies rather than making their own expert determinations regarding the matter. States can minimize these dangers by limiting their regulated riparian system only to certain water basins or other areas of the state where the competition for water is most intense, avoiding the imposition of these uncertainties and the other costs of the regulatory system on parts of the state where it is unnecessary. The MODEL CODE provides a

262. See MODEL CODE, supra note 217, § 7R-1-02 (stating state agency evaluates application for approval of modification).

263. See Dellapenna, supra note 100, § 9.03(a)(4) nn.428-32 (citing several states' riparian statutes).

264. See id. § 9.03(a)(4) (suggesting there is no empirical evidence to prove inhibition on investment in water).

265. See, e.g., Lane, supra note 226 (reporting increases in authorized water withdrawals during major drought).

266. See, e.g., Avril, supra note 97; Avril & Colimore, supra note 97; Bouwer, supra note 97; Dahlburg, supra note 97; Lesley-Ann Dupigny-Giroux, Towards Characterizing and Planning for Drought in Vermont, 37 J. AM. WATER RESOURCES ASS'N 505 (2001); Lane, supra note 226.

middle-of-the-road model for such an arrangement compared to the extremes of a completely centralized or completely decentralized system found in the various actual regulated riparian statutes.268

Is such a system worth its costs?269 There are significant financial costs in administering a regulated riparian system as well as the costs of the tendency of government bureaucracies to replicate their errors throughout the state. Yet, given the increasing failure of traditional riparian rights (a common property system) to cope with the needs of modern societies,270 and the similarly troubling performance of appropriative rights (as close to a private property system as we are likely to achieve),271 there seems little choice but to move to a regulated riparian system (a public property system). Regulated riparianism is not a perfect system, but it would appear to be the best suited to the cultural, economic, legal, hydrologic and political settings of eastern states such as Pennsylvania.
IV. GROUNDWATER IN PENNSYLVANIA

Two hundred years ago, people used little groundwater and knew even less about how to find it or how it behaved.272 The best technique they had for deciding where to dig a well was a divining rod.273 A successful well might provide water for a brief period or for centuries. No one seemed to know why, when or under what conditions a well would produce water. The idea of a body of law addressing the management of groundwater was, at that time, literally unthinkable. With groundwater now providing the drinking water for about fifty percent of the population of the United States (about 140 million Americans),274 and with about two-thirds of all groundwater pumped being used for irrigation (contributing about one-third of all water used in irrigated agriculture),275 governments cannot remain indifferent to the ways in which groundwater is used.276

The creation of the common law of groundwater in England and the United States in the nineteenth century was steeped in ignorance.277 The twentieth century saw the growth of the science of groundwater and the emergence of technologies for the greater ex-


exploitation of groundwater.\textsuperscript{278} This led to an explosive growth in the extractions of groundwater as well as its increasing contamination.\textsuperscript{279} By the time we learned a good deal more about groundwater, unfortunately, it was too late for the legal community to deal easily with the information, if only because courts treated the early groundwater precedents as rules of property. Courts, therefore, often were reluctant to change the rules to bring them into conformity with later scientific knowledge. The law relating to groundwater thus long remained relatively undeveloped and confused.\textsuperscript{280} As Mark Goodman, commenting on the state of groundwater law in Arizona in 1978, summed it up, "[t]he history of [groundwater law] is as thrilling as ignorance, inertia, andtimidity could have made it."\textsuperscript{281}


\textsuperscript{280} See Dellapenna, supra note 272, §§ 19.05-19.05(b)(4) (discussing history of groundwater law).

\textsuperscript{281} See Mark N. Goodman, Current Groundwater Law in Arizona, 1978 Ariz. St. L. J. 205, 224 (1978) (discussing Arizona's new Groundwater Act and problems which arise in application). One is also reminded of the remark by journalist Peter Passell that "California's water system might have been invented by a Soviet bu-
Foremost among the scientific realities to which most existing common law legal regimes still have not responded is that groundwater and surface waters are just two stages of a single hydrologic cycle.282 What is the one today will be the other tomorrow. To scientists, the relationship of groundwater to surface waters is merely a well-known phenomenon,283 but to lawyers and jurists "[t]he implications with respect to water rights in these physically interconnected sources of supply" are profound.284 Followed rigor-
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ously to its logical conclusion, this reality makes many existing legal regimes dysfunctional.285

Eventually, some courts began to redefine the relations of parties concerning their interests in groundwater consistently with scientific opinion,286 despite resistance to change the law for allocating groundwater because it is more complex than for surface water. Today, different states apply one of five forms of law for the allocation of groundwater. Three of the bodies of law for groundwater correspond rather closely to the three bodies of law applied to surface water sources: the reasonable use rule (corresponding rather closely to traditional riparian rights),287 appropriative


286. See Maerz v. United States Steel Corp., 323 N.W.2d 524 (Mich. Ct. App. 1982) (holding landowner may use right to extract underground water up to point extraction interferes with similar right of neighbor); Higday v. Nickolaus, 469 S.W.2d 859 (Mo. Ct. App. 1971) (holding landowner has absolute rights to water under his land and may withdraw any quantity of that water, even if result is draining water from neighbor’s land, with liability); Cline v. American Aggregates Corp., 474 N.E.2d 324 (Ohio 1984) (holding proprietor of land is not liable for drawing water from his land unless: (1) withdrawal causes unreasonable harm to neighbor; (2) withdrawal exceeds proprietor’s reasonable share; and (3) withdrawal causes harm to person entitled to use of water); State v. Michels Pipeline Const., Inc., 217 N.W.2d 339 (Wis. 1974) (holding English or common law rule is no longer controlling).

rights and regulated riparianism. The other two bodies survive from the earlier era of little information and limited exploitation: the absolute dominion rule and correlative rights. Such survivals continue in part at least because the expense and difficulty of obtaining the relevant knowledge impedes the full rationalization of groundwater law. Moreover, these differing bodies of groundwater law do not exhibit a straightforward correlation to patterns of supply and demand as do the bodies of water allocation law for surface waters, as is readily seen by comparing the body of law as applied to surface waters within a state to the radically different body of law applied in the same state to groundwater.

Under the absolute dominion rule, sometimes called the rule of capture, a landowner can extract water almost without limit for any purpose and use it on or off the land above the aquifer of its withdrawal. Under appropriative rights, a landowner can extract

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288. See Beck et al., supra note 104, § 11.06 (providing background information on appropriative rights); Goplerud, supra note 117, § 16.03 (discussing appropriative rights); Goplerud, supra note 118, §§ 17.04, 17.05 (discussing rights within appropriative rights system).


292. See Dellapenna, supra note 291, § 21.03(b)(3); Dellapenna, supra note 287, § 22.04(d).

293. For example, Arizona applies appropriative rights to surface waters and regulated riparianism to groundwater. California and Nebraska apply a dual appropriative-riparian system (with appropriative rights predominating) to surface waters and correlative rights to groundwater. Illinois and South Carolina apply traditional riparian rights to surface waters and regulated riparianism to groundwater. Indiana and Maine apply traditional riparian rights to surface waters and the absolute dominion rule to groundwater. Texas applies a dual appropriative-riparian system (with appropriative rights predominating) to surface waters and the absolute dominion rule to groundwater.

294. See, e.g., Wiggins v. Brazil Coal Co., 452 N.E.2d 958 (Ind. 1983) (holding lost water that percolates underground in hidden recesses and with no known channel or course is part of land under which it is found); Maddocks v. Giles, 728 A.2d 150 (Me. 1999) (stating absolute dominion rule is based on premise that underground water is absolute property of landowner); Sipriano v. Great Springs Waters of America, Inc., 1 S.W.5d 75 (Tex. 1999) (stating rule of capture provides that, absent malice or willful taste, landowners have right to take all water under their land and use as they see fit); South Plains Lamesa RR., Ltd. v. High Plains Underground Water Conserv. Dist., 52 S.W.3d 770 (Tex. Ct. App. 2001) (recognizing rights of landowners to groundwater); see Dellapenna, supra note 290, § 20.05 (explaining absolute dominion rule); Opiela, supra note 285.
groundwater consistent with a water right defined by amount, time, place, purpose and temporal priority of the use. 295 Under the correlative rights rule, landowners must share the yield of an aquifer in proportion to the extent of their land holdings. 296 Under the reasonable use rule, the groundwater may be used reasonably and only on the land from beneath which it had been withdrawn, thus limiting the property rights in the aquifer of the overlying owners. 297 For the regulated riparian approach, anyone can withdraw water pursuant to a time-limited state permit authorizing uses that an administering agency determines are reasonable. 298

Pennsylvania law follows the reasonable use rule by two different routes. Underground streams, seldom found in Pennsylvania, are subject to riparian rights. 299 The same is true as to artesian basins. 300 While a few early cases held that percolating groundwater is subject to the rule of absolute dominion, 301 even the earliest cases espousing the absolute dominion theory recognized the possibility

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296. See, e.g., Tehachapi-Cummings Cty. Water Dist. v. Armstrong, 122 Cal. Rptr. 918, 924-25 (Cal. Dist. Ct. App. 1975) (stating where there is insufficient water for reasonable needs of all overlying owners, solution of problem must be based on numerous factors, including: (1) amount of water available; (2) extent of ownership of basin; and (3) nature of projected use); Prather v. Eisenmann, 261 N.W.2d 766, 771 (Neb. 1978) (holding all domestic users of water are entitled to fair share of water in aquifer); see Dellapenna, supra note 291, § 21.05(a) (discussing uses under correlative rights rule).

297. See, e.g., Nolte v. Michels Pipeline Const., Inc., 256 N.W.2d 482 (Wis. 1978) (holding landowners will not be liable for interference with another’s use of water absent unreasonable harm). See generally Dellapenna, supra note 287, § 22.04(d) (describing reasonable use rule).

298. See Village of Tequesta v. Jupiter Inlet Corp., 371 So. 2d 663 (Fla. 1979), cert. denied, 444 U.S. 965 (1979) (providing examples of uses administering agencies deem reasonable); In re Water Use Permit Applications, 9 P.3d 409 (Haw. 2000), aff’d in part, vacated in part 94 Haw. 97 (2004); Crookston Cattle Co. v. Minn. Dep’t of Natural Res., 300 N.W.2d 769 (Minn. 1981) (holding Department of Natural Resources Commissioner’s denial of order granting city permit to pump water from site twelve miles from city was not unconstitutional taking); In re Application U-2, 413 N.W.2d 290 (Neb. 1987). See generally Dellapenna, supra note 289, §§ 23.03(b)-(b)(7) (describing uses under regulated riparianism).

299. For examples of cases demonstrating underground streams are subject to riparian rights see, Ross Common Water Co. v. Blue Mt. Consol. Water Co., 77 A. 446 (Pa. 1910); Brown v. Kistler, 42 A. 885 (Pa. 1899).


301. See, e.g., Appeal of Lybe, 106 Pa. 626 (1884) (holding percolating groundwater subject to absolute domain).
of liability based on malice or neglect.\textsuperscript{302} Pennsylvania courts now follow the reasonable use rule.\textsuperscript{303} Deciding either the unreasonableness of a use or a claim of negligent withdrawal involves a court weighing competing modes of activity against each other. The withdrawal of percolating groundwater for use off the overlying land, however, is never a lawful use of the water.\textsuperscript{304} This rule is similar to the rule that non-riparian uses of water taken from defined surface water bodies are \textit{per se} unreasonable.\textsuperscript{305}

Of the five bodies of law, the reasonable use rule is the most constricting because water use is limited to the premises overlying the aquifer from which the water is withdrawn and is also limited to use for beneficial purposes incidental to the enjoyment of that land.\textsuperscript{306} Yet, the reasonable use rule, like the absolute dominion rule, leads to the tragedy of the commons for the same reasons that the reasonable use rule as applied to surface waters leads to such a tragedy: because each owner is free to decide when, where, how and how much to use without regard to the effects on others sharing the resource, and the only rational course of conduct as the resource begins to be exhausted is to increase one's exploitation until the resource is gone.\textsuperscript{307} The correlative rights rule in theory

\textsuperscript{302} For cases demonstrating property owner is not liable for damage to another's wells or springs absent malice or negligence, see Rothrauff v. Sinking Spring Water Co., 14 A.2d 87, 90 (Pa. 1940); Williams v. Ladew, 29 A. 54, 55 (Pa. 1894); Haldeman v. Bruckhart, 45 Pa. 514 (1863); Wheatley v. Baugh, 25 Pa. 528 (1855).


\textsuperscript{305} \textit{See} Dellapenna, \textit{supra} note 21, \S 7.02(d)(1) (explaining rule regarding non-riparian uses of water from defined surface).


\textsuperscript{307} For further discussion of the reasonable use rule and absolute dominion rule, \textit{see} supra notes 82-102 and accompanying text. For one take on the problems arising for groundwater from a related application of the reasonable use rule, see Wendy B. Davis, \textit{Reasonable Use has Become the Common Enemy: An Overview of the
requires limiting the extraction of water from an aquifer to a proportionate share of the safe yield of the aquifer; it would appear to avoid this problem, yet the practical difficulties in determining that safe yield often produces the same results. Switching to appropriative rights would involve a different, but predictable set of problems. Here, too, the best alternative to existing law, if an alternative is sought, would appear to be regulated riparianism.

V. REGULATION AND PLANNING IN PENNSYLVANIA

Pennsylvania basically relies on traditional common law regimes centering on the reasonableness of competing uses to allocate both surface water and groundwater. These regimes no longer work well in light of the growing competition for water within the Commonwealth. Pennsylvania already has taken some small steps in the direction of greater government involvement in making water allocation decisions. In Pennsylvania, public regulation of water use exists, but is very limited. Somewhat more developed regulation exists in slightly over half of the state through the interstate mechanisms of the Delaware River Basin Commission and the Susquehanna River Basin Commission. Additionally, the Commonwealth has not undertaken a comprehensive statewide planning process that could lead to more developed public regulation of water uses within the Commonwealth. The following subsections briefly analyze each of these developments.

A. Public Regulation of Water Use in Pennsylvania

Pennsylvania has enacted significant regulations for pollution and other activities relating to water in order to meet applicable federal standards, including: the Clean Stream Act; the Dam Safety and Encroachments Act; the Flood Plain Management Standards Applied to Diffused Surface Water and the Resulting Depletion of Aquifers, 9 ALB. L. ENVTL. OUTLOOK J. 1 (2004). On the consequences of adhering to the absolute dominion rule, see Opeila, supra note 285; Tarlock, supra note 10, at 514-15.

308. See Dellapenna, supra note 291, § 21.03(b)(3); Dellapenna supra note 287, § 22.04(d).

309. For further discussion highlighting appropriative rights problems, see supra notes 111-52 and accompanying text.

310. For further discussion noting advantages of regulated riparianism, see supra notes 208-71 and accompanying text.

311. See 35 PA. STAT. ANN. §§ 691.1-.1001 (West 1997).

312. See 32 PA. STAT. ANN. §§ 693.1-.27 (West 1997).
Act; and the Pennsylvania Safe Drinking Water Act. None of these, however, directly addresses the allocation of water to particular uses. They affect water allocation decisions indirectly, if at all, through altering the costs of particular uses and thus either encouraging or discouraging their location at particular places within the Commonwealth.

Pennsylvania has enacted some regulatory requirements for certain aspects of water usage in the Commonwealth. Thus, since 1923 the Commonwealth has regulated public utilities for generating power or for providing water supplies. Public water systems must obtain a permit from the Department of Environmental Protection (DEP) authorizing reliance on a particular supply source. DEP is to issue a permit only upon finding that the proposed use will not interfere with existing uses or future needs by another public water supply agency and will not interfere with navigation, jeopardize public safety or otherwise injure the Commonwealth. DEP can impose conditions necessary to protect the environment. The permit itself does not confer a legal right to withdraw water from a water source; a public water system still must obtain a water right pursuant to common law riparian rights for surface sources and pursuant to the reasonable use theory for groundwater, or by purchasing or condemning affected private rights.

Public water supply systems must also obtain a certificate of convenience from the Public Utility Commission (the Commis-

313. See id. §§ 679.101-601.
316. See id. § 636 (requiring permit for acquisition of water rights by public water supply entity).
317. See id. § 637 (authorizing Water and Power Resources Board to investigate any new water source or supply).
The authority of the Commission to regulate public water systems extends even to suppliers of bottled water, but, as with all public water supply systems, only if they serve at least twenty-five customers on a regular basis year-round. The Commission is to determine the need for, and the rates to be charged for, the delivery of water to consumers within the utility's service area. Moreover, a public water supply utility cannot discontinue service without approval by the Commission. Generally, Pennsylvania courts defer to the expertise of the Commission in its proceedings.

Several court decisions delineate the relationships between public water systems. Perhaps the most important decision upholds the authority of the Commission to require a permit for one public water system to purchase water from another public water system—water that had already been subject to the permit process when the selling system obtained a permit to use the water for public supply. The Commission, which is authorized to impose conditions necessary to improve water quality and otherwise necessary to provide for the public convenience, does not have the authority to require one public supply system to sell water in bulk to another public supply system when the proposed seller is unwilling to enter into the agreement.


323. See Warwick Water Works, 699 A.2d at 770 (describing process for discontinuing service).


If a statute specifically defines a service area for a municipal or other public water authority, no one else may supply water within that area.\textsuperscript{327} One court enjoined a township water authority against continuing to deliver water within an established service area of another water utility, but under a provision of the Municipal Authorities Act\textsuperscript{328} rather than pursuant to the state’s regulatory authority over public water systems.\textsuperscript{329} Apart from these limited situations, public water supply agencies are free to compete for customers.\textsuperscript{330} In such settings, ordinary principles of contract law apply to disputes that arise between public water supply authorities and their customers.\textsuperscript{331}

The rates a public water supply system charges must be reasonable and uniform.\textsuperscript{332} That requirement does not apply, however, to sales between public water systems; the two systems are bound only by the price fixed in their contract as was held in \textit{Raccoon Township v. Aliquippa Municipal Water Authority}.\textsuperscript{333} In that particular case, the court upheld the seller’s use of a commodity demand method of pricing the water as within the contracts’ specification of actual costs as the basis of the price.\textsuperscript{334}

Local governments in Pennsylvania increasingly base their land use zoning decisions upon the availability of water for the proposed project, the need to protect water resources from the consequences of land development or otherwise to assure wise management of


\textsuperscript{329} See \textit{Lower Bucks Joint Mun. Auth.}, 586 A.2d 512 (noting state has authority to regulate public water systems).


\textsuperscript{332} See 66 PA. CONS. STAT. § 1301 (2003).


\textsuperscript{334} See \textit{id.}
the waters of the state. Purely state regulations do not always preempt local zoning authority under Pennsylvania law. The zoning decisions must be consistent with the standards established in the statute delegating zoning authority to local governments. Local governments cannot use their zoning authority to preempt the authority vested in state agencies under, for example, the Clean Streams Law.

B. The Delaware and Susquehanna River Basin Compacts

The Delaware River Basin includes parts of Delaware, New Jersey, New York and Pennsylvania. This basin contains one of the largest metropolitan areas in the United States (Philadelphia) and is close to an even larger metropolitan area (New York City), along with rural and relatively undeveloped areas. In 1926, New York City declared its intent to make the Delaware River, to which


339. See generally Dellapenna, supra note 213; Joseph W. Dellapenna, Interstate Struggles over Rivers: The Southeastern States and the Struggle over the 'Hooch, 12 NYU Envtl. L.J. 828, 840-50 (2005) [hereinafter Dellapenna, The 'Hooch] (outlining development of Delaware Compact). Maryland actually includes a tiny corner of the basin but has neither sought nor been invited to participate in the compact or commission.
the city is not even remotely riparian, its major source of municipal water.\textsuperscript{340} This set the stage for a long, drawn-out confrontation between the State of New York (the uppermost riparian on the Delaware) and the lower-basin States of New Jersey and Pennsylvania.\textsuperscript{341} This in turn eventually led to an interstate compact to regulate and develop the waters of the basins.\textsuperscript{342} The success of that compact led ten years later to a very similar second compact for the Susquehanna River Basin, which includes parts of Maryland, New York and Pennsylvania.\textsuperscript{343}

While none of Pennsylvania's statutory schemes actually regulates the right to use water as such, Pennsylvania has achieved something like a regulated riparian system through the river basin commissions created by the Delaware and Susquehanna Compacts. The two river basin commissions were comprised of representatives of the participating states and the federal government with comprehensive authority to regulate all obstructions of, withdrawals from, and discharges into the waters of the respective basins, as well as the power to plan for and respond to water emergencies.\textsuperscript{344} The commissions thus have the authority to operate a system for regulating and managing individual withdrawals or diversions of either surface waters or groundwater anywhere in the basin.\textsuperscript{345}

The most unusual feature of the two commissions is the congressional consent to the subordination of all new federal projects in the basins to the planning authority of the commissions.\textsuperscript{346} As

\textsuperscript{340} See New York City Bd. of Water Supply, Annual Report 5, 104-05 (1927) (setting out results of study of possible sources for increasing water supply of New York City).


\textsuperscript{342} See Delaware Compact, supra note 102 (discussing conservation agreement by states to protect Delaware River Basin). See generally Dellapenna, The 'Hooch, supra note 339, at 841-45 (discussing background of Delaware Compact).

\textsuperscript{343} See Susquehanna Compact, supra note 102 (discussing state involvement with commission). See generally Dellapenna, The 'Hooch, supra note 339, at 849-50 (discussing Delaware Compact as model for Susquehanna Compact).

\textsuperscript{344} See Delaware Compact, supra note 102, arts. 2-4 (discussing organization powers and duties of commission); Susquehanna Compact, supra note 102, arts. 2, 6 and 11 (noting organization, flood protection and regulation).

\textsuperscript{345} See Delaware Compact, supra note 102, art. 10 (regulating withdrawals); Susquehanna Compact, supra note 102, art. 11 (noting powers of commission to regulate withdrawals and diversions of water). See generally Dellapenna, The 'Hooch, supra note 339, at 845-49 (describing regulatory authority of commission).

\textsuperscript{346} See Delaware Compact, supra note 102, art. 11, § 11.1 (noting intergovernmental relations of federal projects); Susquehanna Compact, supra note 102, art. 12, § 12.1 (discussing rules regarding federal agencies and projects).
the commissions make their decisions by a simple majority vote,\textsuperscript{347} the presence of a voting federal delegate on the Commission does not avoid the subordination of new federal projects to local control.\textsuperscript{348} The \textit{Delaware Compact} is more protective of federal prerogatives than the \textit{Susquehanna Compact}. In the \textit{Delaware Compact}, Congress limited federal subordination by requiring a unanimous vote for certain decisions\textsuperscript{349} and by requiring that the federal delegate approve any comprehensive plan and certain other decisions.\textsuperscript{350} No comparable powers are found in the \textit{Susquehanna Compact}, but perhaps it was realized that such powers were not necessary: Congress reserved the right in both compacts to amend them without the consent of the participating states.\textsuperscript{351} Thus far, Congress has not attempted to exercise this power. So unusual is the federal subordination in these compacts that they are sometimes described as a new and different type of arrangement—a "Federal-Interstate Compact."\textsuperscript{352}

The two compacts created regulatory systems much like any regulated riparian system with two important limitations. First, the need for a permit to withdraw or divert water only applies in "protected areas"—areas where demands upon water create a shortage or interfere with the respective commissions' comprehensive plans for the basin.\textsuperscript{353} Second, the compacts delegate the authority to issue permits to those states with a permit system for withdrawals or

\begin{footnotes}
\item[347] See Delaware Compact, supra note 102, art. 2, § 2.5 (describing voting power of commission); Susquehanna Compact, supra note 102, art. 2, § 2.5 (noting three of four members must vote for action).
\item[348] See, e.g., R.C. Albert, \textit{Damming the Delaware: The Rise and Fall of Tocks Island Dam} (1st ed. 1987).
\item[349] See Delaware Compact, supra note 102, art. 3, § 3.3 (requiring unanimous vote for variant of commission decisions).
\item[350] See Delaware Compact, supra note 102, art. 11, § 1.4 (requiring federal delegate to approve any comprehensive plan).
\item[351] See Delaware Compact, supra note 102, art. 1, § 1.4 (allowing Congress to withdraw from commission); Susquehanna Compact, supra note 102, art. 1, § 1.4 (describing power of Congress to withdraw).
\item[353] See Delaware Compact, supra note 102, art. 10, §§ 10.2-4 (determining protected areas); Susquehanna Compact, supra note 102, art. 11, §§ 11.2-4 (discussing protected areas, permits and emergencies).
\end{footnotes}
diversions within protected areas in those states.\textsuperscript{354} State permits are to be superseded when the commissions declare a drought emergency,\textsuperscript{355} although in practice, even in Pennsylvania, the commissions defer to the state authorities, provided the states proceed consistently with the commission-adopted plans. Commission permits are judicially reviewable “in any court of competent jurisdiction.”\textsuperscript{356}

Pennsylvania, the only basin state participating in either commission, has not adopted a comprehensive regulated riparian system to enable the Commonwealth to capture back the regulatory authority of the commissions.\textsuperscript{357} Pennsylvania, therefore, is still dependent on the two commissions to a degree that Delaware, Maryland, New Jersey and New York are not. The two commissions operate for those regulated riparian states as a coordinated planning agency rather than as a water-permitting agency. For Pennsylvania, however, the commissions operate as the permitting authority for users in their respective basins within the Commonwealth.

The Delaware River Basin Commission requires permits for groundwater withdrawals from an area of southeastern Pennsylvania that the Commission has declared to be a “protected area” under its authority.\textsuperscript{358} As under regulated riparian statutes generally, the commissions are charged to grant, modify or deny permits according to their compatibility with the commissions' comprehensive plan and consistent with the reasonableness of the use (“just and equitable interests and rights of other lawful users from the

\begin{itemize}
\item \textsuperscript{354} See Delaware Compact, \textit{supra} note 102, art. 10, §§ 10.1, 10.3(ii), 10.8 (granting states authority to issue permits); Susquehanna Compact, \textit{supra} note 102, art. 11, §§ 11.1, 11.3(2), 11.8 (discussing regulatory powers).
\item \textsuperscript{355} See Delaware Compact, \textit{supra} note 102, art. 10, §§ 10.4, 10.8 (superseding state power in cases of emergency); Susquehanna Compact, \textit{supra} note 102, art. 11, §§ 11.4, 11.8 (noting emergencies supersede state permits).
\item \textsuperscript{356} Delaware Compact, \textit{supra} note 102, art. 10, § 10.6 (discussing standards of judicial review); Susquehanna Compact, \textit{supra} note 102, art. 11, § 11.6 (noting acceptable jurisdictions for judicial review).
\item \textsuperscript{358} See Berkowitz, \textit{supra} note 303, at 250 (discussing Delaware River Basin Commission’s permit requirement).
\end{itemize}
Generally, the two basin commissions act as surrogates for Pennsylvania’s government, but there is always a risk that a commission on which Pennsylvania has only one vote will be swayed by the interests of the other participants. It is no accident, however, that all but one of the cases in which a litigant challenged a regulation or decision of the commissions arose in Pennsylvania. None of these challenges succeeded.

The most important challenge to the regulatory authority of either of the two interstate commissions was *Dublin Water Co. v. Delaware River Basin Commission*. The Water Company challenged the Delaware River Basin Commission’s authority to regulate individual water withdrawals within the basin. In Pennsylvania, the Public Utilities Commission exercises basic regulatory authority over public utilities like the Water Company, while the Secretary of the Department of Environmental Resources exercises regulatory authority over the construction of waterworks suitable for supplying

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359. See *Delaware Compact*, *supra* note 102, art. 10, § 10.5 (discussing standards for issuing permits); *Susquehanna Compact*, *supra* note 102, art. 11, § 11.5 (noting standards to issue permits).


potable water to the general public, yet, the Delaware River Basin Commission has regulatory authority over the actual diversion or withdrawal of water within the basin. The Water Company sued all three agencies, claiming that the Water Company's obligation under state law to provide adequate, efficient, safe and reasonable service to its customers preempted the authority of the other agencies to protect the resources necessary for that service. The court granted summary judgment for all the defendants and questioned the plaintiff's good faith in filing the complaint.

A number of persons or entities other than direct water users have attempted to challenge the regulatory authority of the Delaware River Basin Commission. These challenges also failed. The central role of the two river basin commissions in regulating water use in Pennsylvania was further underlined in two cases decided in 1995 relating to the authority of the Susquehanna River Basin Commission. The courts held that the Susquehanna River Basin Commission's authority preempted municipal authority to regulate water usage through zoning decisions. Even the apparent consent of the water user to the zoning decision did not preclude its later challenge to the legality of the decision.

Notwithstanding the apparently comprehensive authority vested in the two compact commissions, they do not have sufficient staff to adequately police all water users within the areas they regulate in Pennsylvania. Thus, reliance on the compact commissions to provide regulatory oversight to water users in place of a Pennsylvania regulatory regime is misplaced. In fact, it leaves Penn-


364. See Delaware Compact, supra note 102, art. 10 (noting commission's power to regulate).


368. See Levin, 669 A.2d at 1079 (explaining consenting water user does not prevent challenges to decision).

369. See Berkowitz, supra note 303, at 250 (noting lack of sufficient resources to regulate and monitor all water use).
syltavia with very little in the way of regulation or even of planning for water use, at least at the statewide level. If thoroughgoing regulation is necessary for the effective management of water use in Pennsylvania, the Commonwealth must enact its own regulated riparian system. It cannot continue to rely on these two interstate commissions to cope with the Commonwealth's regulatory needs.

Even if Pennsylvania were to enact a comprehensive regulated riparian system for the Commonwealth, it would not render the two interstate commissions superfluous. The river basins transcend the boundaries of any one state, and numerous questions therefore arise that cannot be resolved satisfactorily solely through the regulatory efforts of one state. When Maryland sought to impose its water allocation preferences for the Potomac River unilaterally on a public water supply system in Virginia, the United States Supreme Court ruled that Maryland had no authority over water users in Virginia.\textsuperscript{370} The Court reached this decision even though it recognized the Potomac River was within Maryland up to the low-water mark on the Virginia bank, and that the Virginia water system would have to place its water intakes on the bed of the river within the state of Maryland.\textsuperscript{371} Such trans-boundary concerns can be adequately addressed only if the interested states reach cooperative decisions, although even then there will be intense disputes over whether the interests of each community have been effectively considered.\textsuperscript{372} The need for cooperative trans-boundary decision-making assures the continued relevance of the two interstate commissions in which Pennsylvania participates.

C. Planning in Pennsylvania

The Commonwealth of Pennsylvania has been engaged in statewide planning regarding some aspects of water management for decades. The Flood Plain Management Act essentially is a zoning statute for lands subject to flooding that creates little, if any,


\textsuperscript{371} See id. at 62, 66-67 (discussing state boundary lines); see also Maryland v. West Virginia, 217 U.S. 577, 582 (1910) (establishing boundary lines between Maryland and West Virginia); Wharton v. Wise, 153 U.S. 155, 176 (1894) (determining Pocomoke Sound and Pocomoke River are separate bodies of water).

\textsuperscript{372} See Lane Harvey Brown, \textit{Group Sues over Decision Allowing Use of Creek Water: Let Aberdeen Have Emergency Access}, BAL. SUN, Mar. 13, 2003, at 6B (discussing dispute over Baltimore's plan to increase diversions from Susquehanna River for use outside watershed of river, and regulatory oversight by Susquehanna River Basin Commission).
authority over the use of water as such.\textsuperscript{373} The Commonwealth’s Storm Water Management Act requires counties to adopt storm water management plans in the county.\textsuperscript{374} These plans are incorporated into the local communities’ general zoning ordinances.\textsuperscript{375} Persons who can show injury from the failure to adopt and implement such plans can sue to enforce the statutory duty so long as their injuries are different from those of the general public. In \textit{Merlino v. Delaware County},\textsuperscript{376} the court awarded damages against the county for its failure to implement the Storm Water Management Act that resulted in flooded and dangerous streets, flooded property, reduced property values, inflated sewer fees and even aesthetic losses from facing an unsightly creek and flooded park.\textsuperscript{377}

Still, the sort of planning provided for in such statutes did not begin to approach questions regarding the allocation of water within the Commonwealth. Pennsylvania took a big step forward in 2002 when the legislature authorized the creation of a statewide water planning process under the auspices of the DEP.\textsuperscript{378} The process includes a statewide water planning committee, the State Water Resources Committee and six regional planning committees.

Regional committees, defined generally according to the major watershed of the Commonwealth,\textsuperscript{379} are composed of persons appointed by the Governor.\textsuperscript{380} Four of those persons are representatives of county conservation districts, planning commissions or


\textsuperscript{374} See id. § 680.5 (West 1997) (setting forth requirements).


\textsuperscript{377} See id. at 1107-08 (explaining Delaware County’s failure to implement plan).


\textsuperscript{379} See 27 PA. CONS. STAT. ANN. § 3113(a) (defining regional committees). The major exception to defining the regions by watershed is the creation of separate regional committees for the upper and lower Susquehanna basins.

\textsuperscript{380} See id. § 3113(b) (providing structure for appointment).
similar local governmental bodies. The Governor appoints seventeen other members to each regional committee, broken down to represent various stakeholders interested in water management. Additional representatives of local government and interstate compact commissions serve as non-voting members. The statute is careful to indicate that the authority of the regional committees does not affect municipal zoning or other powers.

The Statewide Water Resources Committee consists of eighteen members. Six of the members are representatives of the six regional committees, appointed by the majority and minority leaders of the Commonwealth's Senate and House of Representatives. The Governor appoints the other twelve members, six to represent water users and six to represent local governments, environmental and conservation interests, and professions that relate to water resource management. Additionally, the Secretaries of (or representatives of the Secretaries) six departments or commissions of the Commonwealth shall serve as voting members of the statewide committee, and representatives of two other commissions and of each interstate compact commission shall serve as non-voting members of the statewide commission.

The members of the regional and the statewide committees serve without pay, but receive reimbursement for their expenses.

381. See id. § 3113(b)(1)(i) (stating background of representatives).
382. See id. § 3113(b)(1)(ii) (explaining Governor’s appointment process).
383. See id. § 3113(b)(iii), (iv) (providing requirements for non-voting members).
385. See id. § 3114(b)(1) (setting limit on committee membership).
386. See id. § 3114(b)(2)(i) (explaining procedure for appointing representatives).
387. See id. § 3114(b)(2)(ii) (instructing representation of cross section of water user interests including agriculture, conservation districts, industrial and commercial enterprises, mining, energy development and production and public water supply).
388. See id. § 3114(b)(2)(iii) (noting Governor shall seek suggestions and recommendations for Statewide committee membership from representative organizations).
390. See id. §§ 3113(b)(6), 3114(b)(10) (considering member’s reasonable expenses as necessary and reasonable travel and other expenses incurred during performance of their duties).
The statewide committee is to supervise the work of the regional committees and incorporate the resulting regional water plans into the state water plan. Ultimately, each water plan, for the geographic region within the scope of the plan is to include:

1. an inventory of surface and underground water resources;
2. assessment and projection of existing and future water uses and needs;
3. identification of potential problems and conflicts (including the identification of areas where demand exceeds, or is likely to exceed, the safe yield of the sources);
4. assessment of the current and future ability of public water supply agencies to fulfill their responsibilities;
5. assessment of floodplain, storm water and navigation needs and problems;
6. assessment of the water needed to service important natural, scenic, environmental or recreational values;
7. identification of projects or practices for conserving water or increasing the efficiency of its use;

391. See id. §§ 3111, 3115(a)(2)(i) (instructing DEP, in consultation with state-wide committee, to develop policies and guidelines for preparing or amending regional plan components and state water plan).
392. See id. § 3112(a)(1), (2) (including identification criteria for surface and underground water resources).
393. See id. § 3112(a)(3), (4) (identifying specifically non-withdrawal use needs and withdrawal use demands).
394. See id. § 3112(a)(5), (6) (addressing problems or conflicts among water uses and users, as well as identifying critical water planning areas).
395. See id. § 3112(a)(7) (emphasizing assessment of public water supply agencies in providing adequate quantity and quality of water to their service areas).
396. See id. § 3112(a)(8), (9) (specifying assessment of means for restoration, development and improvement of transportation by water).
397. See id. § 3112(a)(10) (covering areas of national, regional, local or state-wide significance, including national and state parks; designated wild, scenic and recreational rivers; national and state wildlife refuges; and habitats of federal and state endangered or threatened species).
398. See id. § 3112(a)(11) (including identifying projects and practices to provide for reuse and recycling of water, increase supply or storage of water or preserve or increase groundwater recharge and recommended process for providing appropriate positive recognition of such projects or practices in actions, programs, policies, projects or management activities).
8. identification of practical alternatives for meeting water needs within the Commonwealth;409
9. review and evaluation of statutes, regulations, policies and institutional arrangements relating to water management;410 and
10. Proposal of methods for implementing recommended actions, programs, policies, projects or management activities.401

The statute provides a similarly detailed list of the elements to be considered in developing each plan.402 The statewide committee is specifically charged to "provide serious and deliberative consideration" to the regional plans and their recommendations as well as federal and interstate plans and priorities.403

The statewide plan must be completed within five years of the effective date of the statute, with periodic review every five years thereafter.404 The statute requires public hearings and various other procedures to be followed at both statewide and regional levels.405 The plans are to serve as "a policy and guidance document," and not as legally binding regulations.406 The statute reinforces this intent by declaring expressly that nothing in the Act is to be construed as authorizing, diminishing or expanding the author-

399. See 27 PA. CONS. STAT. ANN. § 3112(a)(12), (13), (15) (focusing on identifying practical alternatives for adequate supply of water to satisfy existing and future reasonable and beneficial uses, assessing both structural and nonstructural alternatives to address identified water availability problems, adverse impacts on water uses, or conflicts between water users, and review and evaluation of water resources management alternatives and recommended programs, policies, institutional arrangements and projects).
400. See id. § 3112(a)(14), (15) (specifying water management as development, conservation, distribution and emergency management of water resources).
401. See id. § 3112(a)(16) (relating to identifying projects and practices for conserving water or improving efficiency of water use in note 398 and accompanying text).
402. See id. § 3112(b) (addressing considerations for both state and regional plans).
403. See id. §§ 3112(c), 3115(c) (noting statewide committee will also reconcile differences or conflicts among regional plans).
404. See 27 PA. CONS. STAT. ANN. § 3115(a)(1), (d) (noting periodic review includes amendments and updates to statewide plan, and any determination, including recommendations for revisions to regional plans, shall be set forth in writing).
405. See id. § 3115(b), (c) (establishing regional committee procedures for development of regional plan components to be used in statewide plan, as well as regional and statewide procedures for recommendations and adoption of regional plan components and statewide plan).
406. See id. § 3116(a) (noting plans serve purpose of providing information, objectives, priorities and recommendations to be considered and weighed in broad range of state, local and private decisions).
ity of any governmental agency to regulate, control or require permits for the withdrawal or use of water.\textsuperscript{407}

In connection with the planning process, DEP is charged with creating and maintaining a statewide data system on water resources, in cooperation with federal, interstate, state and local agencies.\textsuperscript{408} In order to ensure the accuracy of the statewide data system and to facilitate the planning process, all large water users in the state are required to register their uses.\textsuperscript{409} Except for certain protected confidential information,\textsuperscript{410} the information in the statewide data system is a matter of public record.\textsuperscript{411} The statute also creates a technical assistance center within DEP to provide assistance for persons voluntarily undertaking to conserve water\textsuperscript{412} and authorizes grants to encourage voluntary water conservation.\textsuperscript{413}

The regional and state plans are to designate critical water planning areas, which is any area containing a significant hydrologic unit within which existing or future demands exceed or threaten to exceed the safe yield of available water resources.\textsuperscript{414} Such a designation can come even before the completion of the relevant water plan.\textsuperscript{415} For each critical water planning area, the regional committee is to appoint a critical area advisory committee

\begin{itemize}
\item \textsuperscript{407} See id. § 3136(a) (establishing limitations to actions of any governmental agency under statute, and regulations adopted under statute, or in statewide plan).
\item \textsuperscript{408} See id. § 3117 (stating data system purpose is gathering, processing and distributing information on availability, distribution, quality and use of water resources in Commonwealth). Registration fees from users of the statewide data system are to be used to defray the costs of the data system and of the registration system required under section 3118. See id. § 3131 (a).
\item \textsuperscript{409} See 27 Pa. Cons. Stat. Ann. § 3118 (listing information to be registered as source, location and amount of withdrawal or use or both). Large water users generally are water users who withdraw an average of at least 10,000 gallons per day for a thirty-day period. See id. § 3118(b)(1).
\item \textsuperscript{410} See id. § 3119 (requiring that person submitting confidential information to identify information that is confidential information and provide justification for its confidential nature).
\item \textsuperscript{411} See id. § 3131(b) (advising that information of public record shall be available for inspection and review at offices of DEP, state-wide committee or appropriate regional committee).
\item \textsuperscript{412} See id. § 3120 (stating technical assistance center will provide technical assistance on water resources uses issues, including methods for efficient water use, including reduction of unaccounted-for water loss and replenishment and conservation of water resources).
\item \textsuperscript{413} See id. § 3121 (authorizing grants for purposes of reimbursement of up to seventy-five percent of cost of preparing voluntary water use reduction plan, and for water resources education, technical assistance and water conservation, including promotion of voluntary reduction of unaccounted-for water loss).
\item \textsuperscript{415} See id. § 3112(d)(1) (describing designation of critical water planning areas and preparations and approval of critical resource plans).
\end{itemize}
to evaluate policy, program and management alternatives for the area. The DEP is charged with developing a critical area resource plan for the area, with the advice and assistance of the critical area advisory committee and the appropriate regional committee and the statewide committee. The critical area resource plan must be adopted through the same process whereby the statewide or regional plans are adopted. The statute, however, only makes provision for voluntary implementation of the critical area resource plan.

The statewide and regional committees must cooperate with the interstate compact commissions as well as with federal, state and local agencies involved in water management. DEP is specifically charged to enter into cooperative agreements with those agencies to avoid duplication of effort and to coordinate planning and monitoring activities.

VI. CONSTITUTIONAL GUARANTEES OF ENVIRONMENTAL RIGHTS

Under the public trust doctrine, states have powers and responsibilities relating to water resources. In 1972, Pennsylvania incorporated its public trust doctrine into an environmental rights amendment to the Commonwealth's constitution:

The people have a right to clean air, pure water, and to the preservation of the natural, scenic, historic and esthetic values of the environment. Pennsylvania's public natural resources are the common property of all the people, including generations yet to come. As trustee of these resources, the Commonwealth shall conserve and maintain them for the benefit of all the people.

416. See id. § 3112(d)(2) (discussing creation and duties of critical areas advisory committee).
417. See id. § 3112(d)(3), (5) (describing how to devise critical area resource plan and what it shall include).
418. See id. § 3112(d)(4) (noting critical area resource plan is to be adopted as area plans are adopted).
420. See id. §§ 3103, 3136(b), (d) (stating with whom state and regional committees must cooperate).
421. For further discussion on the cooperation of committees and federal and state sub-divisions, see supra notes 339-73 and accompanying text.
The import of this provision remains unclear. It seems generally agreed that it is not self-executing against private actors, although the case cited for this proposition was decided by a badly fractured court that leaves the actual result of the case, apart from its failure to stop a particular private project, far from clear. The provision has been used to sustain particular environmental legislation at the state and local level.

The provision is self-executing against public agencies. Yet even against public agencies, the import of the provision remains far from clear. Furthermore, few cases have involved water resources. In one case, a company was held to have a cause of action invoking the environmental rights amendment seeking to enjoin the relocation of a highway when the project threatened to cause water pollution that would adversely affect the ability of the complainant to serve its customers. That is about as close as we get to a court's actual application of the amendment to a water management issue.

Reading the environmental rights amendment as constitutionalizing the public trust doctrine does not advance one's understanding of the provision very much given the fluidity of that doctrine. Moreover, occasional Pennsylvania decisions apply the

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public trust doctrine without referring to the amendment. Whether the most ambitious attempt to develop a coherent rationale for applying the amendment to actual situations will gain acceptance in the courts remains to be seen.

VII. CONCLUSION: WHAT NEXT?

Despite the disclaimer that the creation of the state water plan and the registration of uses does not affect private water rights, one cannot rule out the possibility that the state water plan will ultimately lead to changes in those rights. After all, there are good reasons to conclude that major reform of existing water law is, or soon will be, necessary for the Commonwealth. Moreover, the primary argument that opponents of water law reform in Pennsylvania mustered was that without a comprehensive inventory and plan, no one could really know whether water law reform is necessary in the state. Once the plan is created, that argument at least will be gone. Moreover, the water plan statute expressly requires


433. See, e.g., Pennsylvania Farm Bureau President Speaks to Legislators, PR NEWSWIRE, Apr. 8, 2002 (discussing need for water reform in Pennsylvania).
the State Water Resources Committee to review and evaluate existing laws, regulations, policies and institutional arrangements in the preparation of the state water plan. While the statute does not specifically require the state water plan to include recommendations for new statutes or regulations, the requirement that the plan include recommendations regarding "programs, policies, institutional arrangements, projects and other provisions" necessary to achieve the purposes of the regional and state plans appears broad enough to encompass recommendations for legal reforms.

In a number of states, the registration of water rights and the creation of a state water plan has often been the first step on the road to a regulated riparian system. Should a decision be made to move in that direction, not only will the Commonwealth have ample models to draw upon in crafting such a regime, but the water planning statute already addresses some of the basic issues to be resolved in creating such a regime in the form of a full panoply of enforcement measures. Unauthorized use of water is declared a public nuisance and is subject to an administrative enforcement order and civil and criminal penalties issued by DEP. DEP is authorized to undertake administrative investigations and inspections to enforce the obligations under the planning process statute. Fines for violations of the statute (that is, for failure to register) or for violation of the Clean Water Act are to be used to defray the costs of the planning process.

The panoply of enforcement measures seems like regulatory overkill for a statute that only imposes one narrow obligation on water users in the Commonwealth—that they register their uses and keep that registration up to date—and that is only for larger

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435. See id. § 3112(a)(15) (discussing what state and regional plans shall include).
438. See id. §§ 3133, 3134(b), (c), 3135 (describing enforcement orders, civil remedies and penalties).
439. See id. § 3131(c) (authorizing reasonable inspections by DEP).
440. See id. § 3131(d) (discussing fines and penalties under statute).
Indeed, on reading the statute for the first time, one might gain the impression that it was drafted as a regulated riparian statute, but that the regulatory core of the statute had been dropped without revising the enforcement measure. That, in fact, appears to have been precisely what happened.

On the other hand, some observers have concluded that the Pennsylvania planning process is dominated by business and industry. Such dominance might be the best guarantor that the process will not lead to a significant new regulatory system, particularly if the severe drought that prompted the creation of the planning process does not recur before the process is complete. As in other states, change in the legal situation in Pennsylvania simply is not likely unless a crisis occurs that creates serious public dissatisfaction with the interstate regime.

441. See id. § 3118 (describing water use registration and reporting). Large water users generally are water users who withdraw an average of at least 10,000 gallons per day for a thirty-day period. See id. § 3118(b)(1).


443. See Brubaker, supra note 9 (discussing effect of droughts); Carrie Caldwell, Drought May Force Pennsylvania to Address Water Use Planning, INTELLIGENCER J. (Lancaster, PA), May 17, 2002, at 1 (discussing effects of droughts in Pennsylvania); Myers, supra note 9 (discussing water regulatory system); PA DEP Discusses Importance of Water-Resources Legislation, PR NEWswire, June 24, 2002 (examining water resources legislation); PA DEP Secretary Underscores Need for Water-Resources Legislation, PR NEWswire, Feb. 16, 2002 (discussing need for water resources regulation); Shea & Blanchard, supra note 9 (commenting on effects of droughts in Pennsylvania and New Jersey); State Must Take More Steps to Save Water Supplies, Official Says, LANCASTER NEW ERA, May 17, 2002, at 5 (discussing water resource management). See also Jim Hook, Plenty of Water, But for How Long?, PUB. OPINION, Jan. 7, 2004, at 1 (commenting on water resources and regulation).
