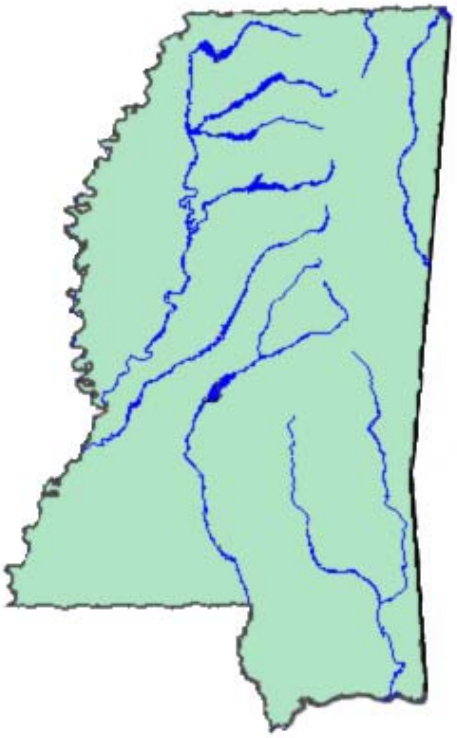
Opportunities for Protecting Instream Flows in Mississippi



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I. INTRODUCTION

Several states, including Mississippi, merely prevent stream flows from being reduced below the "7Q10 flow," or the average flow during the driest consecutive seven-day period that has a likelihood of recurring only once every ten years. The 7Q10 formula has faced considerable criticism across a variety of disciplines. There is overwhelming consensus among the scientific community that 7Q10 merely preserves water *quality* standards by calculating the concentration of pollutants in point source discharges, without considering water *quantity* and numerous other core principles of instream management.[1]

Specifically, a variety of studies suggests that the 7Q10 formula, applied uniformly throughout the year, fails to reflect the seasonally variable natural flow of rivers that is vital to fish habitat, feeding, and mating.[2] High flows are necessary to flush sediments and waste, as well as recharge the system's fertility by infusing the waterway

[1] *See, e.g.,* James M. Evans & Russell H. England, *A Recommended Method to Protect Instream Flows in Georgia,* 3 (Dec.1995).

[2] *See* The Instream Flow Council, INSTREAM FLOWS FOR RIVERINE RESOURCE STEWARDSHIP 131 (T. Annear ed., Revised ed. 2004); Georgia Department of Natural Resources, Interim Instream Flow Protection Strategy (June 2001) (declaring that 7Q10 "is not based on the science of how much water should remain in a stream to maintain a healthy aquatic community"); C.C. Estes & J.F. Orsborn, *Review and Analysis of Methods for Quantifying Instream Flow Requirements*, Water Resources Bulletin vol. 22, 389-98 (1986); J.S. Bulak & G.J. Jobsis III, *South Carolina Instream Flow Studies: A Status Report*, 1-51 (South Carolina Wildlife and Marine Resources Department 1989); D.J. Orth & P.M. Leonard, *Comparison of Discharge Methods and Habitat Optimization for Recommending Instream Flows to Protect Fish Habitat*, Regulated Rivers: Research and Management vol. 5, 124-38 (1990); Bradford Bowman, *Instream Flow Regulation: Plugging the Holes in Maine's Water Law*, 54 ME. L. REV. 287, 307 (2002) (describing Maine's interim policy of relying on 7Q10 as showing "no consideration for either the natural hydrograph or the seasonal needs of the riverine ecosystem").

with nutrients; intermediate flows prevent the stranding of eggs and provide adequate oxygenation for life development; and low, but not stagnant, flows preserve adequate waste capacity and prevent overcrowding of fish populations.

At the request of the Mississippi Department of Wildlife, Fisheries and Parks ("MDWFP"), the Mississippi-Alabama Sea Grant Legal Program reviewed the legal structure of Mississippi's water rights system, the current state of instream flow management, and opportunities for modification of the existing instream flow standards.

Part II of this report outlines Mississippi's current agency structure for managing instream flows in accordance with federal and state statutory and regulatory law. Part III suggests a need to reexamine Mississippi's minimum flow standards by reviewing the fundamental aspects of instream flow management and documenting the failures of the state's 7Q10 methodology in light of the contemporary and projected stresses on the state's waterways. Part IV presents several alternative methods employed by other states to preserve instream flows. Part V concludes that the existing legal framework in Mississippi provides opportunities for improvements in instream flow management, and suggests the state's duties under a common law principle known as the public trust doctrine may serve as supportive authority.

II. THE EXISTING WATER RIGHTS SYSTEM IN MISSISSIPPI

Different from the traditional water rights systems of appropriation or riparianism, Mississippi currently utilizes a regulated riparian regime for water allocation. Regulated riparianism bears some relationship to a system of public property, involving comprehensive statutory water withdrawal and water management permitting and planning programs. Under Mississippi's regulated riparian statute, the state has a duty to promote the general welfare of her people, which requires that the state's water resources be put to "beneficial use to the fullest extent of which they are capable."[3] In order that "the best interests and welfare of the people are served," the state must "effectively and efficiently manage, protect and utilize the water resources of Mississippi."[4] Maintenance of instream flow within Mississippi rivers and streams to protect fisheries and related riverine resources is dependent on the interplay of state statutory, regulatory, and common law.[5]

A. Agency Structure for Managing Instream Flows

The Mississippi Department of Environmental Quality ("MDEQ") is responsible for protecting the state's air, land, and water through conservation and the promulgation of environmental regulations that foster prudent, sustainable economic growth while improving and preserving the state's natural resources.[6] The Governor appoints an

[3] MISS. CODE ANN. § 51-3-1 (West 2008).
[4] *Id.*
[5] While a number of federal statutes, such as the Clean Water Act, Pub. L. No. 92-500, the National Environmental Policy Act, Pub. L. No. 91-190, and the Endangered Species Act, Pub. L. No. 93-205, play an important role in every state's water policy, the state of Mississippi derives her instream flow policies primarily from state statutes.
[6] MISS. CODE ANN. § 49-2-7 (West 2008).

Executive Director of the MDEQ[7] and the seven members of the Commission on Environmental Quality ("CEQ"), which serves as an "overseeing authority" for the MDEQ.[8]

The CEQ is empowered to formulate Department policy, enforce rules and regulations, receive funding, conduct studies for using the State's resources, and discharge duties, responsibilities and powers as necessary.[9] Specifically, the CEQ has the authority to issue water use warnings,[10] negotiate interstate water use compacts,[11] formulate the state's water management plan,[12] and address the timing of water withdrawals.[13]

Separate and apart from the CEQ, the Permit Board, as discussed in more detail in the next Section, takes action on permits administered through MDEQ under a variety of state and federal water resource, air, and mining laws.[14] By statute, seven members of the nine-member Permit Board serve by virtue of the State office they hold, while the Governor appoints the remaining two members.[15]

The Governor also appoints the executive director of the MDWFP,[16] as well as the five members to the Commission on Wildlife, Fisheries and Parks, for the purposes of conserving, managing and protecting Mississippi's outdoors, state parks, wildlife, and their habitats.[17]

The directors of several state agencies and commissions, including MDWFP and MDEQ, serve on the Mississippi Water Resources Advisory Council, which makes recommendations to the Governor and the state legislature on management of the state's water and water-related land resources.[18]

Both the CEQ and the MDWFP can conduct studies designed to determine alternative methods of managing the natural wildlife and fisheries resources of the state, in a manner to ensure efficiency and maximum productivity.[19] The Water Resources Advisory Council can also conduct "any studies, analyses or evaluations related to the state water management plan."[20]

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[7] *Id*. § 49-2-4(2).
[8] *Id*. § 49-2-5(1); Richard J. McLaughlin, *Mississippi*, in 6 WATERS AND WATER RIGHTS, 708 (Robert E. Beck, ed., 2007 repl. vol.).
[9] *Id*. § 49-2-9, § 51-3-55(1). *See also* American Sand and Gravel Company and MDEQ v. Tatum, 620 So. 2d 557, 558, n.2 (Miss. 1993) (describing respective duties of MDEQ and CEQ).
[10] MISS. CODE ANN. § 51-3-11 (West 2008).
[11] *Id*. § 51-3-41.
[12] *Id*. § 51-3-21(1).
[13] *Id*. § 51-3-25(b), (d).
[14] *Id*. § 49-17-28.
[15] *Id*.
[16] *Id*. § 49-4-6(2).
[17] *Id*. §§ 49-4-4, 8-9.
[18] *Id*. § 51-3-101.
[19] *Id*. §§ 49-2-9(d), 49-4-9(c).
[20] *Id*. § 51-3-103(5)(a).

Other agencies or departments that play smaller, yet significant roles, in the state's water policy include the Bureau of Land and Water Resources, the Mississippi Development Authority, the Department of Marine Resources, the Department of Agriculture and Commerce, the Soil and Water Conservation Commission, Tennessee-Tombigbee Waterway Development Authority, Soil and Water Conservation Districts, Watershed Districts, the State Department of Health, and the Forestry Commission. In addition, the voluntary cooperative programs under the Mississippi Scenic Streams Stewardship Program[21] and the Mississippi Natural Heritage Law of 1978[22] could conceivably provide further avenues for protecting instream flows.[23]

B. The Water Permit System

In Mississippi, while the MDEQ is charged with regulating the water supply and administering permits, every person who withdraws surface water must first obtain a permit from the Permit Board,[24] unless specifically exempted.[25] The specific exemptions include: (1) the continued use of surface water beginning prior to April 1, 1985, so long as the person filed a notice of claim with the CEQ between 1985 and 1988;[26] (2) domestic purposes, which are defined as "the use of water for ordinary household purposes, the watering of farm livestock, poultry and domestic animals and the irrigation of home gardens and lawns;"[27] (3) impoundments that are "not located on continuous, free-flowing watercourses;"[28] and (4) water drawn from a well with a surface casing diameter of less than six inches.[29] The Board can issue permits for beneficial uses[30] of water "only in excess of the established minimum flow."[31] "Established minimum flow" is "the

[21] MISS. CODE ANN. § 51-4-1 et seq. (West 2008).
[22] MISS. CODE ANN. § 49-5-141 et seq. (West 2008).
[23] Nonetheless, in spite of the apparent useful participation by multiple stakeholders as set forth in this Section, the responsibilities are divided among these numerous agencies with little formal coordination for dealing with what is a complex yet single hydrologic cycle. For example, the permitting agency is separate and distinct from the planning agency, impeding the effectiveness of any adopted plan. *See* MISS. CODE ANN. §§51-3-3(k-l) (permitting addressed by Permit Board), 51-3-21(1) (planning addressed by Bureau of Land and Water Resources). One scholar suggests that permitting agencies prefer not to manage water resources aggressively according to a prepared plan in light of litigation threats. *See* Dellapenna, *Developing a Suitable Water Allocation Law for Pennsylvania*, 17 VILLA. ENVTL. L.J. 1, 56 (2006).
[24] *See* MISS. CODE ANN. § 51-3-5(1) (West 2008). In accord with its authority under Miss. Code Ann. § 51-3-15, the Permit Board has delegated to the Executive Director of the MDEQ the power to issue, modify and revoke permits where controversy has not been exhibited through the public comment process. In turn, the Executive Director delegated his authority to the Director of the Office of Land and Water of the MDEQ.
[25] However, a permit is always required for (1) the resale of real property for persons who use water from a well of any size "for maintaining or enhancing an impoundment of surface water primarily for aesthetic purposes," and (2) withdrawals of more than 20,000 gallons of water per day, regardless of the use, if a water caution use area has been established. *Id*. § 51-3-7. A water use caution area gives the Permit Board even greater regulatory power over rivers and streams but can only be implemented in times of drought. *See Id*. § 51-3-11.
[26] *Id.* § 51-3-5(2).
[27] *Id.* §§ 51-3-3(c), 51-3-7(1).
[28] *Id.* § 51-3-7(1).
[29] *Id.*
[30] "Beneficial use" is broadly defined as "a useful purpose as determined by the Commission, but excluding waste of water." *Id.* § 51-3-3(e).
[31] *Id.* § 51-3-7(2).

minimum flow for a given stream at a given point thereon as determined and established by the [CEQ] when reasonably required for the purposes of this chapter."[32]

"Minimum flow" is defined as "the average stream flow rate over seven (7) consecutive days that may be expected to be reached as an annual minimum no more frequently than one (1) year in ten (10) years (7Q10), or any other stream flow rate that the commission *may* determine and establish using generally accepted scientific methodologies considering biological, hydrological and hydraulic factors."[33] If CEQ chooses to exercise this authority, it "shall consult with and shall consider recommendations from the MDFWP" and "give consideration to consumptive and nonconsumptive water uses, including, but not limited to, agricultural, industrial, municipal and domestic uses, assimilative waste capacity, recreation, navigation, fish and wildlife resources and other ecologic values, estuarine resources, aquifer recharge and aesthetics."[34]

As CEQ has not determined and established a minimum flow beyond that set by the legislature, current policy relies upon the 7Q10 minimum flow as the "established minimum flow."[35] Therefore, the Permit Board can grant permit applications for water withdrawals that would maintain flow above this low threshold.[36] In addition, the Permit Board can allow water withdrawals that draw a river or stream *below* the established minimum flow in two cases.

First, a municipal user can withdraw water that puts the river under the established minimum flow "upon written assurance, supported by any data and reporting requirements that the board deems appropriate, that the water will be immediately returned to the stream in substantially the same amount to insure the maintenance at all times of the established minimum flow."[37] The Permit Board may deny such a request by a municipal user to withdraw below the established minimum flow if the withdrawal

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[32] *Id.* § 51-3-3(i).
[33] *Id.* (emphasis added).
[34] *Id.*
[35] In 1994, the Mississippi legislature amended Miss. Code. Ann. § 51-3-3 to allow the CEQ to determine and establish a minimum stream flow different from 7Q10 under the procedures discussed in the text. *See* 1994 Miss. ALS 653. The amendment stated that it would be repealed in five years. *Id.* In 1999, the legislature acted to delete the repealer date of the 1994 amendment. *See* 1999 Miss. ALS 386. Nonetheless, the CEQ has not exercised this authority to date. At least a few regulated riparian states besides Mississippi adhere to a similarly low historic flow without protection for ecological values. *See, e.g.*, DEL. CODE ANN., 7 Del. C. § 6029(1) (West 2008) (based on 7Q10); IOWA CODE § 455B.261(15)(a) (West 2008) (based on review of selected historical data). Other states provide wide discretion to administrative agents in setting a minimum flow aimed at protecting human health, welfare and the proverbial "public interest." *See, e.g.*, HAW. REV. STAT. § 174C-71(1) ("necessary to protect the public interest").
[36] A public hearing must be "accorded any person whose rights may be adversely affected by such approval." MISS. CODE ANN. § 51-3-35(1) (West 2008).
[37] *Id*. § 51-3-7(2). "Municipal use" is defined as "the use of water by a municipal government and the inhabitants thereof, primarily to promote the life, safety, health, comfort and business pursuits of the inhabitants" and does not encompass the irrigation of crops within the corporate boundaries. *Id.* § 51-3-3(d).

would "violate the state's water quality standards or otherwise conflict with the public interest."[38]

Second, an industrial user may withdraw water that would put the river below the established minimum flow "when the water shall be returned to the stream at a point downstream from the place of withdrawal, where the board finds that the use will not result in any substantial detriment to property owners affected thereby or to the public interest."[39] Industrial users may be required to "conduct such studies or to provide such information as it deems necessary to determine the potential effect of the proposed use on the affected ecosystem and on the public interest" before withdrawing water below the established minimum flow.[40]

The Permit Board does have the authority to approve an application for withdrawal for a lesser amount than requested if "the full amount requested would interfere with a vested right or is against public interest."[41] It also may grant a permit subject to special conditions, such as the installation of a device to measure the flow of the river.[42] The Board must reject an application for withdrawal if "the proposed use of the water sought to be permitted is not for beneficial purposes, is not consistent with standards established by the commission, or is detrimental to the public interest."[43] Finally, it must reject any application for withdrawal that would violate pollution laws or would impair navigability.[44]

The Board also issues, reissues, denies, revokes, and modifies water quality certification applications pursuant to section 401 of the federal Clean Water Act.[45] State certification is required for federal licenses and permits regarding activities that could result in discharge into the waters of the United States. In reviewing 401 certifications, the Permit Board considers, among other factors, the impact on other uses of the water; the degree of physical, chemical, and biological impact on the water; the effect on circulation patterns and water movement; and the degree of alteration to the aquatic ecosystem.[46] If one of the following conditions is present, the Permit Board will not issue a 401 certification, unless it is "assured that appropriate measures will be taken to eliminate unreasonable degradation and irreparable harm to waters of the State:"

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[38] 08-020-001 MISS. CODE R. § 3(B)(1)(a)(iii) (Weil 2008).
[39] MISS. CODE ANN. § 51-3-7(2) (West 2008).
[40] 08-020-001 MISS. CODE R. § 3(B)(1)(b)(ii) (Weil 2008).
[41] MISS. CODE ANN. § 51-3-35(1) (West 2008).
[42] 08-020-001 MISS. CODE R. § 3(J) (Weil 2008). The Permit Board also has the authority to revoke a permit if (among other reasons) "the permit holder is using the water resources of the state in a manner deemed to be contrary to the public interest." *Id*. § 3(H).
[43] MISS. CODE ANN. § 51-3-13 (West 2008).
[44] *Id*. § 51-3-7. While Mississippi statutes define both "navigable waters" at Miss. Code Ann. § 51-3-13 and "public waterways" at Miss. Code Ann. § 51-1-4, the determinative factor for defining "navigable" in Mississippi has been and remains "navigability in fact." *See* Dycus v. Sillers, 557 So. 2d 486, 498-99 (Miss. 1990). Mississippi waters are "navigable-in-fact" when they "are used, or are susceptible of being used, in their ordinary condition, as highways for commerce, over which trade and/or travel are or may be conducted in the customary modes of trade and travel on water." Ryals v. Pigott, 580 So. 2d 1140, 1152 (Miss. 1990).
[45] MISS. CODE ANN. § 49-17-28 (West 2008).
[46] 08-030-007 MISS. CODE R. § 4(A) (Weil 2008).

1. The proposed activity permanently alters the aquatic ecosystem such that water quality criteria are violated and/or it no longer supports its existing or classified uses (e.g., the channelization of streams),
2. The proposed activity adversely impacts waters containing State or federally recognized threatened or endangered species,
3. The proposed activity adversely impacts a special or unique aquatic habitat, such as National or State Wild and Scenic Rivers and/or State Outstanding Resource Waters, or
4. The proposed activity results in significant environmental impacts that may adversely impact water quality.[47]

In 1994, the United States Supreme Court recognized the states' broad power to consider "any other appropriate requirement of state law" by allowing the state of Washington to impose a minimum stream flow requirement upon a 401 certification issued to a municipality constructing a hydroelectric power plant.[48] While 401 certification is not of broad usage, it is applicable to activities requiring federal National Pollutant Discharge Elimination System permits, wetlands dredge and fill permits, hydroelectric licenses, and licenses for nuclear power plants.[49] The state likely can condition these certifications with any limitations necessary to ensure compliance with the state's minimum flow requirements.[50]

C. Water Management Planning

In accord with Miss. Code Ann. § 51-3-21, the CEQ is charged with providing a comprehensive state water management plan that includes attaining the maximum beneficial use of water, maximizing economic development, fostering environmental protection, implementing flood control measures, preventing waste and unreasonable use, acknowledging existing water rights, preserving water quality and quantity, and preparing for emergency situations.[51] CEQ must also "give careful consideration to the requirements of public recreation and to the protection and procreation of fish and wildlife."[52]

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[47] *Id*. § 4(B).
[48] PUD No. 1 of Jefferson Co. v. Washington Dep't of Ecology, 511 U.S. 700, 708 (1994).
[49] Marc R. Poirier, Environmental Law Practice Guide § 18.12 (2008).
[50] The MDEQ, through the Permit Board and the Office of Land and Water Resources respectively, also may be able to offer limited instream flow protection through the regulation of underground injection controls and dams. See 08-030-007 MISS. CODE R. (Weil 2008) (concerning National Pollutant Discharge Elimination System permits and Underground Injection Control permits) and 08-020-003 MISS. CODE R. § 5 (Weil 2008) ("The Commission may prescribe minimum flow releases from any dam or reservoir, as necessary, to protect downstream uses or otherwise prudently manage available surface water…Any dam that impounds a watercourse with a continuous flow shall be designed so that the established minimum flow for the stream (as established by the Commission) is maintained.").
[51] MISS. CODE ANN. § 51-3-21(2) (West 2008).
[52] *Id*. § 51-3-21(6).

Although the legislature provided that the state water management plan was to be completed by 1997,[53] CEQ has not adopted such a plan to date, due, in part, to a lack of staffing and funding resources.[54] As an alternative, the state statute requires CEQ to analyze piecemeal any proposed water management plans submitted by local joint management districts under existing state water policy, though these joint management districts are primarily engaged in flood and erosion control projects as opposed to conservation measures.[55] One scholar posited, "[W]ithout real planning, one is hard put to justify any claim that regulated riparian statutes promise rational management in place of the haphazard controls that preceded the introduction of regulated riparianism."[56]

III. CURRENT USE OF THE 7Q10 METHOD FOR PRESERVING INSTREAM FLOWS

Since the adoption of a regulated riparian system in 1985, the minimum flow required for Mississippi's rivers and streams has been calculated using the 7Q10 formula. As described briefly above, 7Q10 preserves the mere flow one could expect during a week-long drought that occurs on average once every ten years. 7Q10 is recommended by the EPA for calculating water quality, and is currently used as the standard for National Pollutant Discharge Elimination System permits under the federal Clean Water

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[53] *Id*. § 51-3-8(1). For a detailed discussion of the limited statewide water management planning in Mississippi, see McLaughlin, *supra* note 8, at 716-720.

[54] Mississippi Commission on Environmental Quality, *Official Minutes* (May 25, 2006), http://www.deq.state.ms.us/MDEQ.nsf/pdf/About_MAY2006OFFICIALMINUTESMISSCOMMISSENVQUL/$File/May%202006%20minutes.pdf?OpenElement. Recommendations by the Mississippi Water Resources Management Planning Council (entitled *A Water Management Plan for the State of Mississippi*) were presented to the legislature in 1995, yet have not been acted upon in formulating an official state water management plan. Other states report difficulties with inadequate staff to monitor water resources. For example, in 2001, the Chairperson of the Hawaii Board of Land and Natural Resources and Hawaii Commission on Water Resource Management stressed the need for state agencies to have additional resources in order to fulfill their trust responsibilities. *See* Gilbert Coloma-Agaran, Proceedings of the 2001 Symposium on Managing Hawaii's Public Trust Doctrine 41, *available at* http://www.hawaii.edu/uhreview/publictrust.pdf.

[55] MISS. CODE ANN. § 51-8-31(o) (West 2008); McLaughlin, *supra* note 8, at 716-18. A local joint water management district is created by two or more counties or municipalities for the purpose of "establishing a water supply system, conserving water resources, developing additional water resources or any other water or wastewater management function not being performed by an existing water management district." *Id.* §§ 51-8-1, 51-8-3. The state legislature has also provided for the creation of local drainage districts for the purpose of "reclaiming wet, swamp, or overflowed lands for agricultural and sanitary purposes conducive to public health." *Id.* § 51-31-5. The board of commissioners (either local or county) has the power to "take necessary measures for prevention of erosion, floodwater, and sediment damage; to further the conservation, development, utilization, and disposal of water." *Id.* § 51-33-3. Further, "master water management districts," consisting of two or more existing drainage or water management districts, may be created for the limited purposes of carrying out improvements with respect to "drainage, prevention of floodwater damage, or the conservation, development, utilization, and disposal of water, including the impoundment, diversion, flowage, and distribution of waters for recreation, beautification, welfare, and other beneficial use" in cooperation with the U.S. Secretary of Agriculture or another federal agency. *Id.* § 51-7-1.

[56] Dellapenna, *Regulated Riparianism, in* 1 Waters and Water Rights § 9.05(b) (Robert E. Beck ed., 2007 repl. vol.). *See also* Jeremy Nathan Jungreis, *"Permit" Me Another Drink: A Proposal for Safeguarding the Water Rights of Federal Lands in the Regulated Riparian East*, 29 HARV. ENVTL. L. REV. 369, 410 (2005) (noting that "[b]efore a state can effectively develop a long term plan for a water resource, it must first determine how much water is available, what percentage is being used, and the manner of use").

Act.[57] In Mississippi, 7Q10 arose out of water quality planning and pollution abatement programs. It was established as the design criterion for pollution treatment plants to assure the effluent returning to the stream would be of acceptable quality.[58]

A. Importance of Maintaining a Relatively Natural Flow

The importance of maintaining a more natural flow regime has been confirmed by scientific research since at least the early 1990s.[59] This natural flow consists of flooding and regularly occurring high and low flows. Each type of flow provides different benefits to the river's overall health.

Flooding deposits sedimentation such as gravel and cobble in spawning areas, flushes organic material that serves as food for many wildlife creatures into the river, triggers insects to start a new life cycle phase, and offers cues to fish to spawn and mate.[60] Regularly occurring high flows determine the physical shape of the river, as well as its pools and riffles, and ventilate fish eggs that have been deposited in spawning gravels.[61] Low, but not stagnant, flows shape the amount of available habitat, maintain water temperature and water quality, and allow fish to move to feeding and spawning areas.[62]

Environmental problems arise when the natural flow regime is not considered. An absence of flooding leads to conditions in which fish cannot reach the floodplain to mate and feed, riparian plants encroach into the river, insect habitats are covered with sedimentation, and birds are unable to use the area once plant species change.[63] An inadequate low flow leads to conditions in which fish are overcrowded in poor-quality water and cannot reach feeding areas, riparian plants wilt because groundwater tables are too low, insects on which fish feed die off, and birds cannot feed, rest, or breed in the area.[64]

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[57] *See* Clean Water Act § 303(d), 33 U.S.C. § 1313(c) (2000); Protection of Environment, 40 C.F.R. § 130-31 (2003); Water Quality Standards Handbook: Second Edition, EPA-823B-94-005a (Aug. 1994).
[58] *See* Ron Garavelli, Chief of Fisheries, Miss. Dep't of Wildlife, Fisheries and Parks, Presentation on Minimum Flows and Fishery Resources to the Environmental Protection Council Advisory Committee (Oct. 28, 1993) (on file with author).
[59] *See* Dana W. Seerley, James E. Kundell, & Margaret Myszewski, Carl Vinson Inst. of Gov't, Univ. of Ga., *Balancing Instream and Offstream Uses: Instream Flows, Surface Storage and Aquifer Management* 30 (2006), http://www.cviog.uga.edu/services/policy/environmental/policyreports/balanceinstream.pdf (citing National Research Council of the National Academies, The Science of Instream Flows: A Review of the Texas Instream Flow Program (2005)).
[60] *See* SANDRA POSTEL & BRIAN RICHTER, RIVERS FOR LIFE: MANAGING WATER FOR PEOPLE AND NATURE 20 (Island Press 2003).
[61] *Id*.
[62] *Id*.
[63] *Id*.
[64] *Id*. at 23. *See also* Harold M. Tyus, *Effects of Altered Stream Flows on Fishery Resources*, FISHERIES 15(3):18-20 (1990).

B. Principles of Instream Flow Protection

Researchers at the University of Georgia's Carl Vinson Institute of Government have identified seven principles of instream flow protection that go well beyond the basic water quality standard of mitigating the impact of pollution discharge into streams and rivers. They include:

1. Preserving whole functioning ecosystems rather than focusing on single species.
2. Mimicking, to the greatest extent possible, the natural flow regime, including seasonal and inter-annual variability.
3. Expanding the spatial scope of instream flow studies beyond the river channel to include the riparian corridor and floodplain systems.
4. Conducting studies using an interdisciplinary approach.
5. Using reconnaissance information to guide choices from among a variety of tools and approaches for technical evaluations in particular river systems.
6. Practicing adaptive management, an approach for recommending adjustments to operational plans in the event that objectives are not being achieved.
7. Involving stakeholders in the process.[65]

7Q10 deviates markedly from these principles by considering one and only one factor—water quality. A river's *overall* health, however, depends on a wide variety of factors, of which water quality is but one. While 7Q10 preserves a flow only expected during a week-long drought that occurs once in every ten year period, it is applied year-round to valuable instream resources that serve as important fish and wildlife habitats, without consideration or adjustment for seasonal variations.[66] Minimum flows such as 7Q10 tend to become the objective, or target, flow, rather than a true limitation.[67] When this occurs, the aquatic habitat is "eventually reduced to the worst case or drought condition in perpetuity."[68]

In Mississippi, regularly occurring high flows can be seen in February and March.[69] Flows begin decreasing in April and May through a low flow season from June through September.[70] Flows increase from October through the commencement of the following high flow season in February.[71] Despite these fluctuations in natural flow, the required 7Q10 flow remains the same year-round, providing minimal protection to aquatic life in only the driest segments of the driest months of the year. One group of authors asserted, "The 7Q10 should never be used to make instream flow prescriptions

[65] *See* Seerley, et al., *supra* note 59, at 31.
[66] For a graph depicting these varied flow periods, see POSTEL & RICHTER, *supra* note 60, at 105.
[67] *See* Garavelli, *supra* note 58.
[68] C.B. Stalnaker, *Low Flow as a Limiting Factor in Warmwater Streams*, *in* Warmwater Streams Symposium, 193 (American Fisheries Society 1981).
[69] *See generally*, United States Geological Survey, *available at* http://ms.water.usgs.gov.
[70] *Id.*
[71] *Id.*

for riverine stewardship . . . Making such a low flow the norm is like recommending the sickest day of your life as a satisfactory level for future well-being."[72]

Further, the Instream Flow Council stated that as "a minimum flow standard to sustain aquatic life, 7Q10 lacks any scientific or common sense foundation and can be expected to result in severe degradation of riverine biota and processes."[73] Although the 7Q10 method may protect water quality in many instances, it fails to consider the natural flow of rivers necessary for the consistent survival-level protection of fish and wildlife.[74] One natural resource manager described the 7Q10 method as "statistically based with no consideration of chemical, biological or environmental-ecosystem considerations."[75]

C. Documented Failures of 7Q10 in Protecting Instream Flows

Aquatic biologists have come to a clear consensus that more water needs to be reserved for instream habitat than is provided under the 7Q10 method.[76] An extensive field study by prominent expert D.L. Tennant found that 10% mean annual flow ("MAF") was the minimum flow required for "short-term survival of most aquatic life."[77] Tennant described the conditions exhibited at 10% MAF:

1. Short-term survival of most aquatic life.
2. Fifty percent or more of the stream bottom is likely to be dewatered.
3. Side channels (important for early life stages of many fish species) are likely to be severely or totally dewatered.
4. Riparian vegetation may suffer.
5. Stream bank cover will be severely diminished.

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[72] The Instream Flow Council, INSTREAM FLOWS FOR RIVERINE RESOURCE STEWARDSHIP 179 (T. Annear ed., Revised ed. 2004).

[73] *Id.* at 131.

[74] Georgia Department of Natural Resources, *Interim Instream Flow Protection Strategy* (June 2001) (declaring that 7Q10 is "is not based on the science of how much water should remain in a stream to maintain a healthy aquatic community").

[75] Mississippi Water Resources Planning Council, *Official Minutes* (September 21, 1993). *See also, e.g.*, Bowman, *supra* note 2, at 307 (Maine's use of 7Q10 "show(ed) no consideration for either the natural hydrograph or the seasonal needs of the riverine ecosystem").

[76] Evans & England, *supra* note 1, at 3 (citing D.L. Tennant, *Instream Flow Regimens for Fish, Wildlife, Recreation and Related Environmental Resources, in* Proceedings of the Symposium and Special Conference on Instream Flow Needs, 359-373 (J.F. Orsborn & C.H. Allman, eds., American Fisheries Society 1976)); C.B. Stalnaker, *The Use of Habitat Structure Preferenda for Establishing Regimes Necessary for Maintenance of Fish Habitat, in* The Ecology of Regulated Streams, 321-37 (J.R. Ward & J.S. Stanford, eds., Plenum Press 1979); T.A. Wesche & P.A. Rechard, *A Summary of Instream Methods for Fisheries and Related Research Needs, in* Eisenhower Consortium Bulletin vol. 9, 1-121 (Eisenhower Consortium for Western Environmental Forestry Research 1980); C.C. Estes & J.F. Orsborn, *Review and Analysis of Methods for Quantifying Instream Flow Requirements*, Water Resources Bulletin vol. 22, 389-98. (1986); J.S. Bulak & G.J. Jobsis III, *South Carolina Instream Flow Studies: A Status Report*, 1-51 (South Carolina Wildlife and Marine Resources Department 1989); D.J. Orth & P.M. Leonard, *Comparison of Discharge Methods and Habitat Optimization for Recommending Instream Flows to Protect Fish Habitat*, Regulated Rivers: Research and Management vol. 5, 124-38 (1990); North Carolina Division of Water Resources, *Protecting Instream Flows in North Carolina*, 1-58 (Division of Water Resources, Apr. 1992)).

[77] *See* Donald Leroy Tennant, *Instream Flow Regimens for Fish, Wildlife, Recreation, and Related Environmental Resources*, FISHERIES 1(4):6-10 (1976).

6. Fish will have difficulty migrating upstream over and through riffle areas.
7. Fish are crowded into pools and vulnerable to over-harvest.
8. Water temperatures may become too high for some fish species.[78]

A later study, considering river hydraulic geometry characteristics, concluded, "(R)iver width, depth, and velocity rapidly decrease toward zero at flows below 10% MAF, thus severely limiting or eliminating fish habitat."[79] These types of studies indicate that a river flowing under 10% MAF is unhealthy, offering insufficient living conditions to fish and wildlife. Tellingly, in Tennant's study, streams with only 10% MAF still exceeded the 7Q10 flow more than three-fourths of the time.[80]

D. Contemporary Stresses on Surface Waters

Approximately twenty percent of the world's 10,000 known freshwater fish species are now endangered, threatened, or already extinct.[81] The Nature Conservancy estimates that twelve percent of the animals known to science live in freshwater habitats, and many more depend on them for survival.[82]

Reduced instream flows have had a devastating effect on fish across North America. At least forty freshwater fish species in North America have recently become extinct due to man-induced alterations of physical habitat.[83] A 1990 study classified 28% of North America's native fish species as rare or extinct.[84] The American Fisheries Society reported an increase of 45% in the number of North American freshwater fish species considered endangered, threatened, or of special concern.[85] The primary cause of this increase was alteration of natural stream flows.[86]

Historically, Mississippi has relied more on groundwater resources than on surface water.[87] Due to a relatively sizeable supply of groundwater and rainfall, Mississippi has not experienced the severe statewide droughts and ensuing water

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[78] *See id.*; Tennant, *Instream Flow Regimens for Fish, Wildlife, Recreation and Related Environmental Resources, in* Proceedings of the Symposium and Special Conference on Instream Flow Needs, 359-73 (J.F. Orsborn & C.H. Allman, eds., American Fisheries Society 1976).
[79] Daniel Caissie et al., *Comparison of Hydrologically Based Instream Flow Methods Using a Resampling Technique*, 34 CANADIAN J. OF CIVIL ENG'G 66, 72 (2007) *see also* Daniel Caissie & Nassir El-Jabi, *Comparison and Regionalization of Hydrologically Based Instream Flow Techniques in Atlantic Canada*, 22 CANADIAN J. OF CIVIL ENG'G 235–246 (1995).
[80] *See* Tennant, *supra* note 77, at 6-10; Tennant, *supra* note 76, at 359-373.
[81] *See* The Nature Conservancy, "Rivers & Lakes: Cover Story – The Threats to Freshwater Wildlife," *available at* http://www.nature.org/earth/rivers/coverstory.html (last visited on November 8, 2008); POSTEL & RICHTER, *supra* note 60, at 27.
[82] *Id.*
[83] Evans & England, *supra* note 1, at 2.
[84] *Id.*
[85] *Id.*
[86] *Id.*
[87] As of 1995, groundwater accounted for 73% of the total freshwater withdrawals and supplied the needs of 90% of the state's population. *See* The Mississippi Water Resources Management Planning Council, A Water Management Plan for the State of Mississippi 10, 12 (June 30, 1995). Mississippi's surface water resources include 84,000 miles of streams and rivers, including six major rivers: Tombigbee, Pascagoula, Pearl, Big Black, Yazoo, and Mississippi. *Id.*

shortages that many of the other southern states, including Georgia, Florida and Alabama, have endured in the past decade. Still, for example, 90% of the water needs of the state capital of Jackson, the state's most populated metropolitan area, are met by diverted surface flows from the Pearl River and the Ross Barnett Reservoir, and surrounding areas are interested in developing a surface water supply from these same sources.[88] Mississippi must move proactively to conserve and protect her healthy yet depletable natural surface water resources.

Water usage in Mississippi has increased in recent decades, and it exceeded the national average for growth from 1950-1980 and from 1985-1990.[89] This is due in large part to increased rice farming, catfish production, and thermoelectric power plants, along with steady population growth.[90] In fact, localized drought conditions in the western portion of the state between the Yazoo and Mississippi Rivers (known as the Mississippi Delta), coupled with increased water withdrawals, have caused the base flows of most streams in the area to decrease.[91]

Since groundwater no longer recharges streams in the Delta, the MDEQ has been unable even to calculate 7Q10 for a Delta stream since 1975.[92] These extremely low flows directly impact fish and wildlife habitat, while also threatening the streams' use as a reliable source for agricultural irrigation.[93] As these stresses increase statewide, it is only a matter of time before Mississippi's opportunity to adopt a proactive instream protection approach turns into a reactive necessity.

IV. STATE DEPARTURES FROM 7Q10

Calculating 7Q10 is a process that can be performed through data analysis in front of a computer screen, as opposed to requiring extensive fieldwork, making it inexpensive and easily applicable on a statewide basis. However, the insufficiency of this minimum flow in protecting aquatic habitat, as documented above, necessitates a review of alternative methods for managing instream flows in Mississippi. This Part documents several alternative methods in place in other states.

A. Variations of the Tennant Method

Many of these other states rely upon the "Tennant Method," which protects a percentage of the river's MAF based on seasonal fluctuations and allows streams to remain connected with their floodplains.[94] As the MAF can be calculated easily with

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[88] *See* Pearl River Basin Team, MDEQ, "Pearl River Basin Status Report 2000" 6, 24 (on file with author).
[89] *See* The Mississippi Water Resources Management Planning Council, *supra* note 87, at 10-11.
[90] *Id*. at 11. Mississippi's population increased by 706,517 from 1960 to 2000, representing a 32.44% increase. If Mississippi's population increases at the same rate, as it did from 1990 to 2000, the 2010 population will be 3,144,769. Mississippi census data is available at http://www.censusscope.org/us/s28/chart_popl.html.
[91] The Mississippi Water Resources Management Planning Council, *COMPENDIUM to A Water Management Plan for the State of Mississippi*, 67 (June 30, 1995).
[92] Letter, Dennis Riecke, Department of Wildlife, Fisheries and Parks, to Lloyd Long, Department of Environmental Quality, August 14, 2003, on file with author.
[93] The Mississippi Water Resources Management Planning Council, *supra* note 87, at 20.
[94] *See* Tennant, *supra* note 77, at 7.

adequate records and accurately applied with limited field work, the Tennant Method is desirable for its efficiency and has been adopted in some form in several jurisdictions. The Tennant Method and its prodigy reflect the natural flow regime by making serial adjustments across seasons and protect aquatic habitat by keeping the flow above 10% MAF.[95] States can choose the level of protection they wish to pursue and draft a minimum flow percentage requirement based thereon. Specific rivers may garner greater protection due to special qualities such as endangered species, natural beauty, or need for restoration.

i. Georgia

After recognizing the deficiencies associated with the 7Q10 method, which the state of Georgia originally adopted for calculating minimum flows in 1977, Georgia adopted an interim modified Tennant Method in 2001.[96] Although Georgia did not enact all of the recommendations from the 1995 Wildlife Resources Division report,[97] Georgia's current approach preserves flows by seasonal variation, unlike the 7Q10 method. Applicants seeking water withdrawal permits in Georgia are allowed to choose from three options:

1. For water supply reservoirs, permittees are required to release from the reservoir the lesser of the monthly 7Q10 (thus more seasonally specific than 7Q10) or the inflow to the reservoir. For direct withdrawals from streams, permittees must allow the lesser of the monthly 7Q10 or the inflow to pass the withdrawal point.
2. Applicants can choose to perform a site-specific instream flow study approved by Georgia's Department of Natural Resources ("DNR") to determine what minimum flows must be maintained to protect aquatic habitat of that specific locale. DNR then evaluates the study results and, with the state's Environmental Protection Division Director, either concurs or recommends an acceptable minimum flow.
3. Applicants can also choose MAF options:
    a. For direct withdrawals from an unregulated stream, the applicant must allow the lesser of 30% of the MAF or the inflow to pass the stream withdrawal point (thus, if the inflow is less than 30% of the MAF, the permittee cannot withdraw water).
    b. For regulated water supply reservoirs, the applicant is required to release from the reservoir the lesser of: 30% of the MAF or inflow from July to Nov. (low flow season), 60% of the MAF or instream flow from Jan. through April (high

[95] *Id.* at 8.
[96] *See generally* Evans & England, *supra* note 1, at 21.
[97] A 1995 study performed by Georgia's Department of Natural Resources (DNR) recommended several methods to protect instream flow that would supplant 7Q10, including a flow rate of 30% of the MAF for unregulated streams, a seasonal tiered approach calling for higher percentages for dammed streams, and special protections for trout streams. *Id.* at 26. The recommendations were made as an interim measure before further testing could be performed, and the study noted that its recommendations would only provide some protection, not enhance, fish habitat. *Id.* at 27. In fact, the report specifically did not recommend monthly 7Q10, which Georgia ultimately adopted as part of its new state policy.

flow season), and 40% of the MAF or inflow from May-June and Dec. (intermediate flow seasons).[98]

ii. Arkansas

Arkansas subscribes to a stream flow protection plan that identifies seasonal percentages, though they are based on mean monthly, as opposed to mean annual, flows. Arkansas divides the year into three distinct components, based upon the biological process. From November through March, the recommended (but not mandatory) minimum flow is 60% of the mean monthly flow to flush sediments and waste, as well as recharge the system's fertility through infusing the waterway with nutrients. From April through June, the recommended minimum flow is 70% of the mean monthly flow to prevent the stranding of eggs and provide adequate oxygenation for life development. From July through October, the recommended minimum flow is 50% of the mean monthly flow to reserve adequate waste capacity and prevent overcrowding of fish populations.[99]

iii. South Carolina

In March 2008, the Surface Water Withdrawal, Permitting, Use and Reporting Act was introduced in the South Carolina legislature.[100] Although the bill did not come to a vote in 2008, it is expected to in 2009.[101] While South Carolina currently only requires reporting of surface water use for statistical purposes,[102] the proposed legislation would require permits for surface water withdrawals.[103]

Under the legislation, the minimum flow for unregulated rivers would be 20% of the MAF or 7Q10, whichever is greater.[104] If a party requests a lower or higher required minimum flow, the Department of Health and Environmental Control (DHEC) can perform a site-specific study, and such studies are addressed in more detail below.[105] This minimum flow would be an improvement over 7Q10 by requiring that the river never drops below 20% MAF. However, the DHEC has proposed an alternative minimum flow requirement for all rivers in response to the legislation: the greater of (1) the monthly 7Q10 flow, or (2) 60% of the mean annual flow for January through April, 20% of the mean annual flow for July through November, and 40% of the mean annual flow for the months of May, June, and December.[106]

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[98] Georgia Department of Natural Resources, *Interim Instream Flow Protection Strategy*, 2001, on file with author.
[99] *See* 014 04 ARK. CODE R. § 002 (Weil 2008).
[100] J. Blanding Holman IV, *The Advent of Modified Riparianism in South Carolina*, 16 SOUTHEASTERN ENVTL. L. J. 291, 334 (2008).
[101] *Id*. at 352.
[102] *Id*. at 321-22.
[103] *Id*. at 334.
[104] *Id*. at 346.
[105] *Id*. at 347-48.
[106] *Id*. at 353-54.

B. Field Methods

A wide variety of field methods exist requiring site-specific measurements that are predictably more accurate than the "office" methods most often utilized in states such as Georgia and Arkansas. Florida, for example, employs a progressive program where five distinct regional water management districts establish their minimum flow levels by site-specific study, taking into account not only water quality but non-consumptive uses, including fish passage, recreational activities, and scenic attributes.[107] If a Floridian waterway falls below or is projected to fall below the minimum flow requirements, a recovery or prevention strategy must be implemented.[108] At least for certain waters that include exceptional resources, wild trout or threatened or endangered species, North Carolina also requires on-site evaluation for determining minimum flows.[109]

In 2007, Texas created a system of scientists and citizen councils to recommend a specific minimum flow for each of the state's 15 river basins.[110] While the science team focuses on biological and chemical issues, the councils attempt to balance industrial and municipal concerns.[111] After considering these recommendations, the final minimum flow is established by the Texas Commission on Environmental Quality.[112]

V. CONCLUSION

Proactive steps on instream flow management in Mississippi may be warranted, as any hesitation could put the state in the reactive position of so many of her southeastern neighbors.[113] Opportunities exist for Mississippi to alter instream flow policy in light of the legal framework detailed above, and the state may be well-served to strengthen minimum flow requirements through further regulatory amendments to clarify broad phrases, such as "beneficial use" and "maximizing economic development" when viewed concurrently with strong environmental protection language.

In addition to the statutory and regulatory authority detailed herein, the common law public trust doctrine could serve as additional support for ecosystem protections. The public trust doctrine recognizes that the public has particular inalienable rights to certain natural resources and provides that these resources are held in trust for the benefit and use of all people.[114] In a landmark 2000 decision by the state's Supreme Court in In re *Water*

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[107] *See* FLA. ADMIN. CODE ANN. r. 62-40.473 (Weil 2008).
[108] *See* FLA. STAT. ANN. § 373.0421(2) (West 2008).
[109] See 15A N.C. ADMIN. CODE 02K.0501 (Weil 2008). North Carolina also provides a complex set of mathematical manipulations of the 7Q10 flow based on the classification of the dammed river as poor, moderate, or good. *Id*. For example, a "moderate" or "good" stream in the piedmont region with a MAF of 6% or less requires a minimum flow of 3.0 times the 7Q10 flow. 15A N.C. ADMIN. CODE 02K.0503.
[110] Andrew K. Jacoby, Comment, *Water Pressure: The Eightieth Texas Legislature Attempts to Protect Instream Flows of Rivers and Streams, and Freshwater Inflows to Bays and Estuaries*, 20 TUL. ENVTL. L.J. 381, 397 (2007).
[111] *Id*. at 400-01.
[112] *Id*. at 397.
[113] *See, e.g.*, 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, 20-21 (2002) (suggesting fundamental changes in water allocation law are unlikely except in response to crises as perceived by most interest groups).
[114] *See, e.g.*, Joseph L. Sax, *The Public Trust Doctrine in Natural Resources Law: Effective Judicial Intervention*, 68 MICH. L. REV. 471 (1970), the seminal work addressing the modern day public trust.

Use Permit Applications ("Wai'ahole"),[115] Hawaii became the first regulated riparian state to recognize explicitly that the public trust doctrine operates independently of the state's legislatively pronounced water code.[116]

Since that time, several commentators have suggested that Hawaii's approach could assist mainland states facing an urgent need to move proactively, rather than wait to react to imminent water conflicts and crises.[117] However, there is little evidence that the decision has played any appreciable role in addressing water quantity issues in the many regulated riparian jurisdictions in the eastern United States.[118] Nonetheless, Mississippi conceivably could look to the Hawaii high court's decision as the foundation for a conceptual framework where the public trust doctrine serves as an independent operative in instream flow protection.[119]

Should the State choose to alter the 7Q10 standard, the policies of Georgia, Arkansas, and South Carolina could serve as excellent starting points in forming the minimum stream flow plan that is best suited to Mississippi. While more accurate and effective, the implementation of field methods is often limited in many states by available personnel hours and the expensive nature of such testing. While 7Q10 is inexpensive and easy to apply, it fails to provide sufficient flows, and other methods offer greater fish and wildlife protections, while retaining affordability, speed of computation, and wide applicability.

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[115] 9 P.3d 409 (Haw. 2000).
[116] *See id.*
[117] *See, e.g.*, Denise E. Antolini, *Water Rights and Responsibilities in the Twenty-First Century: a Foreword to the Proceedings of the 2001 Symposium on Managing Hawaii's Public Trust Doctrine*, 24 Hawaii L. Rev. 1,3 (2001); Timothy Johns, Proceedings of the 2001 Symposium on Managing Hawaii's Public Trust Doctrine 39, available at http://www.hawaii.edu/uhreview/publictrust.pdf (suggesting future applications of public trust doctrine will demonstrate that the Hawaii Supreme Court's decision in *Wai'ahole* was "cutting edge"); Keala C. Ede, *He Kanawai Pono no ka Wai (A Just Law for Water): The Application and Implications of the Public Trust Doctrine in* In re Water Use Permit Applications, 29 ECOLOGY L.Q. 283 (2002) (suggesting Hawaii case may have significant influence in expanding public trust doctrine in other jurisdictions).
[118] *See, e.g.*, Henry E. Smith, *Governing Water: The Semicommons of Fluid Property Rights*, 50 Ariz. L. Rev. 445, 454 (2008); Joseph W. Dellapenna, *Special Challenges to Water Markets in Riparian States*, 21 Ga. St. U. L. Rev. 305, 336-37 (2004); JOSEPH L. SAX ET AL., LEGAL CONTROL OF WATER RESOURCES 76-80 (3d ed. 2000).
[119] *See* Timothy M. Mulvaney, *Instream Flows and the Public Trust*, 22 TUL. ENVTL. L.J. __ (forthcoming 2009).