Article

ADAPTING WATER FEDERALISM TO CLIMATE CHANGE IMPACTS: ENERGY POLICY, FOOD SECURITY, AND THE ALLOCATION OF WATER RESOURCES

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Climate change regulation has proven a fertile ground for debates on federalism. To date, however, these debates have concentrated on climate change mitigation and the “proper” roles of the states and the federal government in regulating to reduce greenhouse gas emissions.

This Article posits that climate change adaptation also has federalism implications for environmental regulation and natural resources management. In particular, the federal and state governments have always asserted overlapping—and sometimes conflicting—interests in water, and, as a result, water regulation and management have always been subject to an uneasy federalism balancing. For example, water allocation and water rights are generally considered issues of state law—but if the water crosses state lines, or state regulation affects navigation, the federal government asserts a superior and preemptive role. In between these endpoints, the federal Clean Water Act adopted an intricately structured cooperative federalism that imposes certain minimum federal requirements for water quality but allows states to choose water quality goals, while aquatic species protection remains a largely unstructured mishmash of overlapping state and federal interests and authorities.

In light of existing shortages of water and the imminent need to adapt to climate change impacts on water resources, reconsidering the proper federalism balance in water resources management is inevitable, as several congressional bills attest. Specifically, the traditional assumption of state superiority over matters of water allocation has come into question in light of the intimate connections between water availability and national energy policy, national food security, and interstate conflicts. This Article explores the potential for climate change and the increasing need to adapt to its impacts on water to alter traditional notions of water federalism, concluding that an increased federal role in water management is likely but could take many forms, some more attuned to the multiple interests in water than others.
INTRODUCTION

As a republic, the United States depends on the mutual workings of several layers of government—federal, state, local, and, in some circumstances, regional. “Federalism” describes the interactions of two of these layers: the federal government and the states. However, “federalism” does not describe a univalent relationship. Instead, the states can and do interact with the federal government in a variety of ways.

Nowhere is this fact more clear than in the management and regulation of water resources. This Article refers to the various relationships between the federal government and the states as water federalism, and water federalism is multifaceted and complex. Even without the complication of climate change, the regulation and management of water implicates the full spectrum of inter-governmental interactions, from fairly comprehensive assertions of federal supremacy (navigation), to fairly strong preservation of states’ rights (water allocation), to complex but unstructured workings of overlapping jurisdiction and dynamic federalism (species preservation and regulation), to a no less complex but far more structured cooperative federalism (water quality).

The interactions among these various regulatory foci are already the sources of numerous conflicts with respect to the overall management of water resources, but no one has (yet) seriously proposed a comprehensive shift of water management authority to one level of government or the other. Climate change, however, may well prompt a reconsideration of the “proper” federalism balancing surrounding the regulation and management of water, particularly with regard to freshwater allocation, management, and transportation.

Indeed, climate change has proven a fertile ground for debates on federalism and the proper roles of the state and federal governments. To date, however, these debates have

1. See Alden v. Maine, 527 U.S. 706, 748 (1999) (“Although the Constitution grants broad powers to Congress, our federalism requires that Congress treat the States in a manner consistent with their status as residuary sovereigns and joint participants in the governance of the Nation.”).
2. See discussion infra Part I.
4. Id. at 869–78.
5. E.g., Ann E. Carlson, Iterative Federalism and Climate Change, 103 NORTHWESTERN U. L. REV. 1097 (Summer 2009); Jared Snyder & Jonathan Binder, The Changing Climate of Cooperative Federalism: The Dynamic Role of the States in a National Strategy to Combat Climate Change, 27 UCLA J. ENVTL. L & POL’Y 231 (2009);
concentrated on the problem of climate change mitigation—how to regulate, and who should regulate, relevant sources to reduce emissions and atmospheric concentrations of greenhouse gases.6

This Article posits that climate change adaptation also has implications for federalism. In particular, climate change is expected to exacerbate existing and growing shortages of fresh water. While water allocation authority, including authority to address drought and other forms of water shortage, have traditionally rested primarily with the states, the widespread water shortages predicted under most climate change scenarios will have serious implications for several issues of national concern, including energy policy, food security, and interstate resource conflicts. Indeed, there is already evidence of increased federal government interest in national water supplies, especially with regard to national energy policy.

This Article examines the potential for climate change impacts to drive a re-balancing of traditional modes of federalism in the management and allocation of water as one facet of climate change adaptation. Part I reviews the spectrum of water federalism as it has traditionally been described, focusing on navigation, water allocation, species protection and regulation, and water quality regulation. Part II lays out the expected impacts from climate change on the nation’s water resources,


6. For examples of some of the very few articles that even mention adaptation in the context of climate change federalism, see Snyder & Binder, supra note 5, at 245 (highlighting New York City’s adaptation initiative); Rose, supra note 5, at 678–79 (noting that an “understated theme” in the University of Arizona’s symposium on climate change and federalism was the role of sub-national actors in climate change adaptation); Parber, supra note 5, at 915, 924 (advocating a national strategy for adaptation but noting that adaptation concerns cut across state and federal interests).
while Part III explores the national interests that these climate change impacts may threaten and the federal government’s possible responses to those threats. The Article concludes that increasing water shortages are already prompting federal interest in water allocation and that water’s connections to energy policy in particular are likely to shift the balance in water federalism toward the federal government.

I. THE TRADITIONAL SPECTRUM OF WATER FEDERALISM

As noted, the federalism surrounding management and use of water resources is already multivalent, covering the spectrum from nearly complete federal preemption over navigation issues, to a pervasive “states’ rights” mantra for water allocation, to the sometimes chaotic realm of overlapping and dynamic federalism with respect to species, to the structured cooperative federalism of the federal Clean Water Act. This Part explores each of these variations on water federalism in turn.

A. Separate Spheres Federalism

One of the oldest descriptions of federalism, dating back to James Madison,7 is the “separate spheres” model. According to this model, the federal government and the state governments operate in “mutually exclusive spheres of state and federal authority.”8 The separate spheres model resurfaces episodically

7. JAMES MADISON, THE FEDERALIST NO. 51, at 357 (Clinton Rossiter ed., 1961) (“In the compound republic of America, the power surrendered by the people is first divided between two distinct governments, and then the portion allotted to each subdivided among distinct and separate departments.”). See also Allan Erbsen, Horizontal Federalism, 93 MINN. L. REV. 493, 509–10 (Dec. 2008) (describing the separate spheres model and tracing it to Madison); Sovacool, supra note 5, at 443 (same).
8. Erin Ryan, Federalism at the Cathedral: Property Rules, Liability Rules, and Inalienability Rules in Tenth Amendment Infrastructure, 81 U. COLO. L. REV. 1, 9 (Winter 2010). “Separate spheres” federalism has a variety of names, as Benjamin Sovacool has explained: “dual federalism” posits that the federal government and the states should operate in different, mutually exclusive arenas. While not a conception of environmental federalism directly, advocates have predicated the theory on the concept that the state and national governments enjoy exclusive and non-overlapping spheres of authority in areas of environmental policy. Proponents of dual federalism attempt to preserve the balance between the states and the nation by dividing the country into a collection of distinct spheres: local and national, intrastate commerce and interstate commerce, manufacturing and commerce, and so on. Also called “layer cake,” “conjoint,” and “nationalistic” federalism, dual federalism attempts to assign each level of government its own distinct role. Sovacool, supra note 5, at 442. However, whereas Sovacool views dual federalism as distinct from centralized
in American constitutional jurisprudence, and separate spheres rhetoric appears recurrently in the U.S. Supreme Court’s federalism decisions. In legal scholarship, the separate spheres model became the foundation of the New Federalism in the late 1980s and 1990s.

Water management incorporates examples of this separate spheres model of federalism. At one end of the spectrum, navigation and its related interstate commerce are fairly definitively considered the nearly exclusive realm of the federal government. In this incarnation of what this Article calls supremacy federalism, sometimes referred to as centralized federalism, the states have little role to play in regulating interstate commerce or navigation. Indeed, most of their attempts to assert any independence in these spheres are preempted, and the limited roles that they can play are generally dictated by Congress.

At the other end of the spectrum is states’ rights or decentralized federalism—a recognition of states’ primacy in certain areas of law and regulation, with occasional back bending attempts on the federal government’s part to recognize, protect, and insulate those state roles from federal interference. With respect to water, states’ rights federalism is most prominent in and devolved federalism, id., this Article views centralized and devolved federalism as the two sides—federal and state, respectively—of the federalism coin.

9. Erbsen, supra note 7, at 509.
14. Gonzales, 545 U.S. at 16 (stating ‘The Commerce Clause emerged as the Framers’ response to the central problem giving rise to the Constitution itself: the absence of any federal commerce power under the Articles of Confederation. For the first century of our history, the primary use of the Clause was to preclude the kind of discriminatory state legislation that had once been permissible’).
the area of water rights allocation, where the federal government often goes out of its way to preserve—and, indeed, often submits itself to—state law schemes for assignment rights to use water.\footnote{16}

1. Supremacy Federalism: Navigation

Large waterways in the United States have long been important to navigation and commerce, and protection of these uses has equally long been deemed the province of the federal government.\footnote{17} Thus, navigation regulation represents an instance of supremacy federalism in water federalism: an area of water-related law where the federal government’s interests are deemed so superior that there is very little room for state action.\footnote{18}

This supremacy federalism is perhaps most obvious in the federal navigation servitude. The federal navigation servitude describes the federal government’s long-recognized paramount interest in maintaining the navigability of navigable waters.\footnote{19} This power derives from the federal government’s constitutional authority over commerce,\footnote{20} and it limits both the states’\footnote{21} and private rights\footnote{22} in navigable waters.

In addition, the interstate commerce aspects of navigation have been incorporated into several statutory regulatory regimes that solidify the federal government’s supremacy in this arena. For example, relying on the federal government’s interstate commerce authority,\footnote{23} the U.S. Supreme Court lodged final authority over navigation upon the navigable-in-fact waters in Congress.\footnote{24} Congress exercises this authority primarily through

\footnote{16} See discussion infra Part I.A.2 (explaining in detail the assignment to states of water allocation responsibilities).

\footnote{17} U.S. v. Rands, 389 U.S. 121, 122–123 (1967) ("The Commerce Clause confers a unique position upon the Government in connection with navigable waters. The power to regulate commerce comprehends the control for that purpose, and to the extent necessary, of all the navigable waters of the United States").


\footnote{19} Gibbons v. Ogden, 9 Wheat. 1, 196 (1824); Weber v. Board of Harbor Commissioners, 85 U.S. 57, 57 (1873). See also Submerged Lands Act, 33 U.S.C. § 1314(a) (2000) (explicitly preserving the federal navigation servitude in coastal waters despite an overall congressional intent to increase state authority in these waters).


\footnote{23} U.S. Const. art. I, § 8, cl. 3.

\footnote{24} Gibbons, 22 U.S. (9 Wheat.) at 3, 9–12, 22–28 (1824) (holding that the power to regulate commerce includes the power to regulate navigation and the navigable waters).
the various Rivers and Harbors Acts, culminating in the Rivers and Harbors Act of 1899 ("RHA").

The RHA prohibits the construction of actual obstructions in the navigable waters without Congress’s explicit consent. The building of lesser structures in the navigable waters requires a permit from the U.S. Army Corps of Engineers, as does excavation in and filling of these waters. Finally, the RHA also prohibits the disposal of refuse in the navigable waters and their tributaries.

The federal government’s supremacy over navigation and interstate commerce in water is quite broad and occasionally reaches out to override areas of water regulation deemed to be the states’. For example, the federal paramount interest in navigation may, in extreme cases, limit the ability of water appropriators—and the state agencies assigning water rights—to destroy downstream navigability, even if the waters being appropriated are not navigable at the point of diversion. Thus, when the U.S. Supreme Court addressed the propriety of the complete diversion of the Rio Grande River in New Mexico, where it is not navigable, it concluded that such upstream diversions could not interfere with the federal government’s downstream interest in maintaining navigability. According to the Court, “the jurisdiction of the general [federal] government over interstate commerce and its natural highways vests in that government the right to take all needed measures to preserve the navigability of the navigable water courses of the country, even against any state action.” The Court has reaffirmed these potential limitations on state regulation of water in subsequent cases.

The federal navigation servitude also telegraphs the absolute national import of aquatic navigability by exempting the federal government from the normal operations of the Fifth Amendment’s “taking” clause: federal actions to maintain navigation do not require the government to compensate private

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26. 33 U.S.C. § 401; see also 33 U.S.C. § 403 (“The creation of any obstruction not affirmatively authorized by Congress, to the navigable capacity of any of the waters of the United States is prohibited . . . .”)
28. Id.
31. Id.
33. Under the Fifth Amendment, “[n]o person shall . . . be deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use, without just compensation.” U.S. CONST., amend 5.
persons and entities for injuries to their (state-based) private property rights.\textsuperscript{34} For example, as early as 1829 the U.S. Supreme Court noted:

Laws in relation to roads, bridges, rivers and other public highways, which do not take away private rights to property, may be passed at the discretion of the legislature, however much they may affect common rights; even private rights, if they are not those of property, may be taken away, if it be deemed necessary consequence of their construction, without making compensation.\textsuperscript{35} The Court has affirmed this aspect of the navigation servitude on several occasions.\textsuperscript{36}

Thus, the federal government’s supremacy in the realm of navigation is pervasive, raising the issue of why: Why is it that, with respect to navigation, nearly absolute federal control and dominance was early established and remains the norm? Benjamin Sovacool has created a typology of environmental federalism that suggests some answers. With respect to supremacy (or centralized) federalism, Sovacool notes that:

Those in favor of centralizing environmental decision making note that federal intervention brings with it a number of important benefits: (i) it is the most efficient way to address spillovers or transboundary pollution; (ii) it provides a degree of uniformity for manufacturers and investors; (iii) it produces economies of scale; and (iv) it promotes distributive justice and a minimum standard of environmental quality, thus preventing a race to the bottom among the states.\textsuperscript{37}

Federal domination of navigation generates many of these advantages. First, navigation in the oceans, major lakes, and the nation’s river system is inherently interstate, and federal supervision prevents individual states, local governments, and private individuals from blocking, controlling, and/or profiting from this interstate system. A federal layer of preemption thus operates as a means of protecting the general public welfare, as the Iowa Supreme Court’s outrage at the suggestion of private control over the Mississippi River suggests:

\begin{flushright}
37. Sovacool, \textit{supra} note 5, at 418.
\end{flushright}
Are we to be told that the Mississippi river is not a navigable stream, and its bed private property? The father of floods, private property! The great river, to see which the conqueror of Florida periled the lives of his followers, to find for himself a grave in its waters, instead of gold in its sands, belongs to every petty owner who pays a dime for the land on its banks! The river, which carries to sea the products of millions of people, the boundary of states without number, which carries to a single port commerce numbered by hundreds of millions of dollars, and numbers the ships which float on its waters by thousands, cannot be private property.\textsuperscript{38}

Second, and relatedly, federal preemption in this context assures free and maintained navigability, allowing predictability in business decisions. Third, through statutes such as the RHA, the United States can maintain navigability at the system scale, precluding overlapping, duplicative, or potentially disruptive state efforts to maintain and “improve” navigability. Finally, federal preemption again ensures that no one state or private entity can disrupt interstate navigation on water, preserving those avenues of commerce for use by all. Thus, centralized and pervasive federal control over navigation makes imminent sense, and it is unsurprising, that this aspect of water federalism has never seriously been subject to popular protest.

2. States Rights or Decentralized Federalism: Water Allocation

In sharp contrast to navigation, authority over water allocation—the law governing who has the right to remove fresh water from its natural watercourse and to use that water for some consumptive purpose, such as irrigation, drinking water, or industrial manufacturing—is deemed, sometimes obsessively, to belong to the states.\textsuperscript{39} Thus, this aspect of water management provides a quintessential example of states’ rights or decentralized federalism.

There is little question that water allocation is decentralized, with the exact principles and requirements governing the withdrawal and consumptive use of water varying considerably

\textsuperscript{38} McManus v. Carmichael, 3 Clarke 1, 1856 WL 139, at 6 (Iowa 1856).

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from location to location. When it comes to ground water regulation, for example, and even generalizing, the states have followed at least five different regulatory systems. With regard to surface water, the eastern states inherited from England the doctrine of riparianism, which ties the right to use water to ownership of the land adjoining the water source—i.e., the riparian landowners. Even so, many eastern states have since realized that the legal connection of consumptive use rights to riparian land ownership limits non-riparian development and have transitioned to “regulated riparianism” and administrative permitting. In contrast, the perpetually water-limited and drought-threatened western states generally rejected riparianism in favor of the prior appropriation doctrine. Prior appropriation operates on a principle of “first in time, first in right”—the first user to apply water to a beneficial use, without waste or abandonment, acquires a continued right to a water supply superior to that of later users drawing water from the same source. Nevertheless, Hawaii follows its own rules regarding the allocation of surface water in order to recognize Native Hawaiian traditions and rights with respect to water, while California, Nebraska, and Oklahoma combine riparian and prior appropriation rules in systems known as the California Doctrine.

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45. Benson, supra note 39, at 250–52; Gould, supra note 39, at 7; Ricci et al., supra note 43, at 38.


47. Haw. Const., art. XI, §§ 6, 7; art. XII, §§ 5–7; In re Water Use Permit Applications, 9 P.3d 409, 448 (Haw. 2000).

Of course, water allocation is not a pure example of decentralized federalism, as Reed Benson has discussed at length. Nevertheless, the federal government does go to significant effort to preserve states’ rights with respect to water allocation. For example, the Desert Land Act of 1877 applies to lands in California, Oregon, Nevada, Colorado, Washington, Idaho, Montana, Utah, Wyoming, Arizona, New Mexico, North Dakota, and South Dakota that were public (federal) at the time of enactment. As interpreted by the Supreme Court, in that statute Congress both severed non-navigable waters from the public lands, ending common-law riparian rights, and gave control over water rights in those waters to the states, effectively shifting the legal ability to water rights on those lands from the federal government to the states.

Similarly, in section 8 of the Reclamation Act of 1902, Congress declared that:

Nothing in this Act shall be construed as affecting or intended to affect or to in any way interfere with the laws of any State or Territory relating to the control, appropriation, use, or distribution of water used in irrigation, or any vested right acquired thereunder, and the Secretary of the Interior, in carrying out the provisions of this Act, shall proceed in conformity with such laws . . .

Thus, Congress not only sought to respect the states’ laws on water allocation but also to subject the Secretary of the Interior and its subsidiary, the Bureau of Reclamation, to them. As the Supreme Court explained in 1978, “[a] principal motivating factor behind Congress’ decision to defer to state law was thus the legal confusion that would arise if federal water law and state water law reigned side by side in the same locality.” However, “[b]oth sponsors and opponents of the Reclamation Act also expressed constitutional doubts as to Congress’ power to

49. See generally Benson, supra note 39; see also Huffman, supra note 18, at 679–83 (discussing the federal role in reclamation projects, especially in the West).
52. Id.
53. Id. at 163–64; see also Cappaert v. United States, 426 U.S. 128, 139 n.5 (1976); Nebraska v. Wyoming, 325 U.S. 589, 612 (1945); Ickes v. Fox, 300 U.S. 82, 95–96 (1937) (all confirming the import of the Desert Land Act).
56. Id. at 668–69. See also id. at 663–70 (explaining the history of these provisions of the Reclamation Act at length).
override the States’ regulation of waters within their borders.”

Notably, this predilection for preferring state law in the context of water allocation is so strong that Congress and the Secretary have followed the Reclamation Act’s model even when a particular project could have been justified on navigation grounds, potentially overriding the state’s rules.

Another example of federal preservation of state primacy in water allocation comes in the Clean Water Act. This statute explicitly states that:

“It is the policy of Congress that the authority of each State to allocate quantities of water within its jurisdiction shall not be superseded, abrogated or otherwise impaired by this chapter. It is the further policy of Congress that nothing in this chapter shall be construed to supersede or abrogate rights to quantities of water which have been established by any State. Federal agencies shall cooperate with State and local agencies to develop comprehensive solutions to prevent, reduce and eliminate pollution in concert with programs for managing water resources.”

While this provision makes it clear that the EPA and the Army Corps are not in the business of establishing water rights, the courts have done little to explicate its full meaning. In general, the federal courts have adopted a policy of accommodation, emphasizing that while this provision “preserve[s] the authority of each State to allocate water quantity as between users, [it does] not limit the scope of water pollution controls that may be imposed on users who have obtained, pursuant to state law, a water allocation.” However, more recent cases from the Supreme Court have stressed that “the Clean Water Act provides for a system that respects the States’

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57. Id. at 669.
60. PUD No. 1 of Jefferson County v. Washington Department of Ecology, 511 U.S. 700, 720 (1994). See also Catskill Mountains Chapter of Trout Unlimited, Inc. v. City of New York, 451 F.3d 77, 84 (2d Cir. 2006) (“The power of the states to allocate quantities of water within their borders is not inconsistent with federal requirements of water quality.”); United States v. Akers, 785 F.2d 814, 820–21 (9th Cir. 1986) (indicating that water quality requirements can incidentally affect water rights); Riverside Irrigation Dist. v. Andrews, 758 F.2d 508, 513 (10th Cir. 1985) (“A fair reading of the statute as a whole makes clear that, where both the state’s interest in allocating water and the federal government’s interest in protecting the environment are implicated, Congress intended accommodation.”).
and have read federal regulatory authority narrowly “to avoid significant constitutional and federalism questions . . . .”

Perhaps not coincidentally, the U.S. Court of Appeals for the Ninth Circuit recently expressed more definitive protection for state authority over water allocation, concluding that “[i]n the absence of state law to the contrary, water withdrawals are not subject to the requirements of the Clean Water Act.”

Congress’s repeated determination to preserve state authority over water allocation raises, from the opposite perspective from federal supremacy in navigation, the question of why? Why has the federal government generally been deferential to the states in the context of water allocation? Again, Benjamin Sovacool’s typology suggests answers. Sovacool argues that:

> [t]he case for devolution of environmental policy often rests on a set of four interconnected assumptions: (i) that decentralization induces experimentation and innovation; (ii) devolution provides more flexibility in responding to environmental problems; (iii) decentralization improves accountability and equity; and (iv) states will engage in welfare-enhancing competition to craft better environmental policies.

These assumptions ring true in the field of state water allocation. First, states have experimented with and evolved many aspects of their water law systems to suit local needs and conditions, from the rejection of common-law riparianism in the West, to the creation of regulated riparianism in the East, to the adoption of widely varying innovations such as instream flow rights and water banks, to large-scale experimentation with state public trust doctrines. Second, one reason for this experimentation is the wide range of ecological, social, and political conditions among the states and the resulting inappropriateness of a “one size fits all” approach to water

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63. Great Basin Mine Watch v. Hankins, 456 F.3d 955, 963 (9th Cir. 2006). See also National Wildlife Federation v. Gorsuch, 693 F.2d 156, 178 (D.C. Cir. 1982) (“Congress did not want to interfere any more than necessary with state water management . . . .”).
64. Sovacool, supra note 5, at 429–30.
allocation. \(^{66}\) Moreover, decentralization of water rights allocation leaves each set of state authorities accountable to the people of that state and to intrastate views of equity. Finally, the differences among the states’ water law systems often do reflect the states’ views regarding which water policies best serve state development or other aspects of state welfare, as can be seen, for example, in the wide variety of public interest considerations that states incorporate into their permitting procedures. \(^{67}\)

Thus, so long as the principal interests in and effects of state water allocation decisions are primarily local, a state’s rights approach to water allocation makes sense. As Parts II and III of this Article will discuss, however, the assumption that both the interests and effects will remain local in a climate change era is highly questionable. As a result, the traditional states’ rights federalism model for water allocation is the most likely to evolve as a result of climate change impacts.

**B. The Dynamic Federalism of Overlapping Authority: Species**

Dynamic federalism often arises when federal interests in a given regulatory subject are limited or unarticulated, leaving the state and federal governments to jostle for regulatory and management authority according to the interests of each. \(^{68}\) As noted, given the lack of comprehensive federal leadership or

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67. Compare, e.g., ALASKA STAT. ANN. § 46.15.080(b) (listing eight specific public interest criteria) with FLA. STAT. ANN. § 373.223(c) (requiring only that the use of water be “consistent with the public interest”) with OR. REV. STAT. § 537.409(6) (emphasizing three factors in the public interest review: water availability, detriment to fisheries resources, and injury to other water rights).

68. In Sovacool’s terms:

Proponents of “interactive,” “dynamic,” “marble cake,” or “cooperative” federalism argue that the first three theories of environmental federalism ignore the true manner in which policy leadership constantly shifts between levels of government in a federal system. In contrast, they advance a notion of interactive federalism, also termed “collaborative,” “full-flavor,” and “polyphonic” federalism, to illuminate how local, state, and national governments have overlapping responsibilities. The metaphor of a matrix has been used to describe a “collaborative federalism” suggesting that “governmental actors [are] engaged in negotiated cooperation within multiple and interdependent networks.”

Sovacool, supra note 5, at 447–48.
legislation, the regulation of greenhouse gas emissions has so far been an example of dynamic federalism.69

In the realm of water, protection and regulation of aquatic species provides an example of this third kind of federalism. A variety of regulatory authorities, both state and federal, manage and regulate important aquatic species, and the regulation of wild animals in general has been the subject of repeated federalism analyses in the U.S. Supreme Court.

On the state side of those analyses, the Court has recognized that “[u]nquestionably the States have broad trustee and police powers over wild animals within their jurisdictions.”70 As one example of this authority, state fish, game, and wildlife agencies engage in varying levels of aquatic species regulation.71 Moreover, most states and territories have statutes to protect endangered, threatened, and sensitive species, including aquatic species.72 Finally, in much the same way that Congress has recognized in federal statutes state authority over water allocation, Congress has also recognized and helped to enforce state species-related laws through federal statutes such as the Lacey Act,73 which prohibits the transport or sale in interstate commerce of fish, birds, or wildlife killed or captured in violation of state law.74

Nevertheless, in response to repeated state arguments that authority over wild animals belongs exclusively to the states under the Tenth Amendment, the Supreme Court has concluded that “[a]lthough States have important interests in regulating wildlife and natural resources within their borders, this authority is shared with the Federal Government when the Federal Government exercises one of its enumerated constitutional powers . . . .”75 One such federal power is the

74. Id. § 3372(2).
Treaty Clause, which has supported federal intervention in species regulation both in support of Tribes and through congressional implementation of international treaties, limiting state regulatory authority in the process. For example, federal protection of tribal treaty rights to fish can directly affect state regulation of aquatic species such as salmon. Similarly, federal regulation to implement international treaties, such as through the 1918 Migratory Bird Treaty Act, can also limit state regulation of aquatic species, especially waterfowl. In upholding the Migratory Bird Treaty Act against Tenth Amendment challenges, the Supreme Court emphasized the federal interests both in international relations and in migratory birds:

Here a national interest of very nearly the first magnitude is involved. It can be protected only by a national action in concert with that of another power. The subject matter is only transitorily with the State and has no permanent habitat therein. But for the treaty and the statute there soon might be no birds for any powers to deal with. We see nothing in the Constitution that compels the Government to sit by while a food supply is cut off and the protectors of our forests and our crops are destroyed. It is not sufficient to rely upon the States.

More domestically, the Supreme Court has also upheld federal regulation of species—specifically, wild burros—pursuant to the Constitution’s Property Clause. In response to a federalism challenge to the Wild Free-Roaming Horses and Burros Act, the Court emphasized that the Act “does not establish exclusive federal jurisdiction over the public lands in New Mexico” but did preempt the application of the New Mexico Estray Act because the Property Clause, like the Treaty Clause, “gives Congress the power to protect wildlife on the public lands, state law notwithstanding.”

76. Under the Treaty Clause of the U.S. Constitution, the President “shall have Power, by and with the Advice and Consent of the Senate, to make Treaties, provided two thirds of the Senators present concur . . . .” U.S. CONST., art. II, § 2, cl. 2.
83. This clause states that “Congress shall have Power to dispose of and make all needful Rules and Regulations respecting the Territory or other Property belonging to the United States . . . .” U.S. CONST. art. IV, § 3, cl. 2.
85. Kleppe v. New Mexico, 426 U.S. at 545.
86. Id. at 546.
However, the most contentious federal intervention in species regulation on federalism grounds has been the Federal Endangered Species Act of 1973 ("ESA"). Application of this statute increasingly has implications not only for state aquatic species regulation but also for state water allocation decisions.

The USFWS implements the federal ESA for terrestrial species, including most freshwater species, while NMFS implements the Act for marine and anadromous species. The appropriate agency lists a species as "endangered" or "threatened" based on the best scientific evidence available, then is supposed to both designate critical habitat for the species and develop and implement a recovery plan. Once a species is listed, all federal agencies must "insure that any action authorized, funded, or carried out by such agency . . . is not likely to . . . result in the destruction or adverse modification of" critical habitat. Simultaneously, the Act prohibits all persons—including states—from "taking" listed species, and under the agencies' regulations, habitat destruction can constitute a prohibited "take."

Congress enacted the ESA pursuant to both its Treaty Clause and its Commerce Clause powers. While the U.S. Supreme Court has not ruled on the constitutionality of the Act, the Act’s Treaty Clause basis seems secure. Moreover, several of the federal Courts of Appeals have upheld the ESA against claims that Congress exceeded its Commerce Clause powers and violated federalism principles.

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89. Regulatory Fragmentation, supra note 3, at 875–78.
90. 16 U.S.C. § 1532(15); 50 C.F.R. § 402.02 (2002).
91. Id. § 1533(a)(1).
92. Id. § 1533(a)(9)(A).
93. Id. § 1533(f).
94. Id. § 1536(a)(2).
95. Id. § 1538.
96. 50 C.F.R. § 17.3 (2002) (defining “harm” in the definition of “take” for purposes of 16 U.S.C. § 1538(a)(1) to “include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering”); Babbitt v. Sweet Home Chapter of Cmties. for a Great Oregon, 515 U.S. 687, 696–703 (1995) (upholding the definition of “take” as promulgated in the Agency regulations).
Thus, while federal interventions into species regulation have been many, Congress has not comprehensively structured the federalism of species regulation. Instead, federal statutes regarding species are relatively limited in scope (generally by the types of species protected) and, day-to-day, state regulation often remains far more relevant to the average fishing, hunting, or recreating citizen. Dynamic federalism—the constant interplay and adjustment of state and federal interests—is thus the norm for aquatic (as for all) species.

Benjamin Sovacool, lumping unstructured dynamic federalism and structured cooperative federalism together under the label “interactive” federalism, has gleaned five advantages to this approach from the literature: “Proponents posit that the conception of interactive federalism holds five advantages to earlier theories: (i) plurality, (ii) dialogue, (iii) redundancy, (iv) accountability, and (v) economies of scale.” However, aquatic species regulation suggests that these rationales are less helpful in explaining the amorphous federalism that pervades species regulation than they will be in explaining the more structured cooperative federalism that governs water quality. For example, with respect to the plurality advantage, Sovacool indicates that “[a]dvocates of interactive federalism note that having multiple regulators means that different officials with differing perspectives review a problem.” Species regulation and protection, however, often are not a singular “problem” but rather multiple problems that vary with the species involved and its most immediate stressors. A wholly intrastate species put at risk almost exclusively from in-state fishing presents a different regulatory problem from migratory birds threatened by both hunting and habitat destruction occurring in multiple countries.

Thus, too, with respect to the dialogue advantage, federalism in species regulation is often less simultaneous than progressive, with a default rule being that a wild species is the states’ to regulate until Congress or a federal agency brings it within a federal regime. Until that point, there may be little dialogue at all between the levels of government. Nevertheless, once a federal regulatory regime applies, the dialogue advantage of interactive federalism may be relevant. The ESA in particular explicitly encourages cooperative federal-state management of federally listed species.

100. Sovacool, supra note 5, at 448.
101. Id.
For similar reasons, redundancy and accountability are infrequent advantages in aquatic species regulation, although species subject to both federal and state protective laws may benefit from the best of both worlds. Finally, with the notable exception of migratory and other interstate species, economies of scale are difficult to achieve because one-size-fits-all regulation is often an inappropriate approach to species regulation.

In other words, the law views species regulation as primarily a local problem, subject to several exceptional situations deserving of federal attention. As noted, the federal government’s interests are triggered when: (1) species are important to Tribes; (2) species are the subject of international treaties; (3) species are found on federal lands; or (4) species destruction and depletion has reached a level where it threatens national biodiversity or interstate commerce. Notably, these exceptions are diverse and difficult to harmonize to a single federal interest, as evidenced by the number of constitutional provisions that have been relevant in federal species regulation and the number of federal species-related statutes that Congress has enacted. Thus, one would expect the states to retain a prominent role in species protection despite climate change impacts and the need for adaptation measures.103

C. Structured Cooperative Federalism: Water Quality

In contrast to the unstructured dynamic federalism that characterizes aquatic species regulation, the federal Clean Water Act is generally considered the quintessential example of the fourth form of federalism relevant to water: cooperative federalism.104 In a cooperative federalism framework, the federal and state governments work together in structured, overlapping, and synergistic ways to achieve mutual goals—in the case of the Clean Water Act, improved water quality nationwide.105


105. E.g., United States v. Cooper, 482 F.3d 658, 667 (4th Cir. 2007); Rebecca S. Robison, Bringing the Floating Polluters to Port: Why the Minnesota Pollution Control Agency Has a Nondiscretionary Duty to Regulate Ballast Water is charge in Lake Superior and How to Avoid Impermissible Extraterritorial Effects, 31 HAMLINE L. REV. 773, 794–96 (Summer 2008).
Industries and municipalities have long exploited waterways’ capacities to dilute, disperse, and in some cases, to treat effectively industrial and municipal wastes and sewage. Abuse of these ecosystem services led to excessively polluted waterways and the enactment of the federal Clean Water Act, in which Congress very purposefully shifted control over water quality from the states to a state/federal balance.

The Clean Water Act divides regulatory authority over water quality among two federal agencies, the U.S. Environmental Protection Agency (“EPA”) and the Army Corps, and the states and territories. The federal agencies oversee implementation of the Act, engage in permitting, and set water quality requirements when the states fail to do so. However, the states retain primary authority over water quality requirements and exclusive authority over nonpoint source regulation and waters that do not qualify as “navigable waters” under the Act. The Act also encourages states to take over permitting within their respective borders.

The Act makes “the discharge of any pollutant by any person” unlawful, meaning that it is illegal for any person to add pollutants (broadly defined in the statute) to “the waters of the United States” or the oceans from “point sources,” defined as “any discernible, confined, and discrete conveyance,” without a permit. In addition, the Act establishes national

109. 33 U.S.C. § 1251(d) (designating the Administrator of the EPA responsible for administering the stated objectives of the chapter).
110. Id. § 1344(d) (declaring the Secretary of the Army, acting through the Chief of Engineers, is responsible for issuing permits for dredged or fill material).
111. Id. §§ 1342(a), 1344(a).
112. Id. § 1311(a).
113. Id. § 1313(c)(d).
115. Id. §§ 1311(a), 1362(7).
116. Id. §§ 1342(b), 1344(g); see also 33 U.S.C. § 1251(g) (describing policy of state and federal cooperation in managing water resources).
117. Id. § 1311(a).
118. Id. § 1362(5) (defining “person”).
119. Id. § 1362(6) (defining “pollutant” as “dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal and agricultural waste discharged into water”).
120. 33 U.S.C. § 1362(10) (defining “ocean”).
121. Id. § 1362(14) (defining “point source”).
122. See id. §1342 (describing the permitting process of the national pollutant discharge elimination system).
goals that “the discharge of pollutants into the navigable waters be eliminated” and, in the interim and where attainable, that “water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water be achieved . . . .” In federalism terms, the Act sets a federal “floor” for water quality degradation—the minimal water quality protections that dischargers and states must both observe. However, through their water quality standards, states remain free to impose more stringent water quality protections within their respective borders and all dischargers—including the federal government—must observe these requirements. States often set their water quality standards to reflect local needs, such as drinking water, fish production, or sewage and industrial waste dilution.

If, as Erin Ryan has postulated, cooperative federalism “is mostly composed of areas where the federal government could but does not choose to fully preempt state involvement,” then structured cooperative federalism in water quality raises two questions: (1) why did the federal government intervene at all; and (2) having decided to regulate at the federal level, why did Congress explicitly and extensively leave roles for the states? Returning to Benjamin Sovacool’s five advantages for interactive federalism, we find that they do indeed help to explain why Congress would move to a cooperative federalism structure to regulate water quality.

Implementation of water quality regulation benefits from the plurality of governments involved, especially as a result of the interaction of federal water quality “floors” and state

123. Id. § 1251(a)(1).
124. Id. § 1251(a)(2).
125. See Regulatory Fragmentation, supra note 3, at 31–32 (describing the federal standards for dischargers).
128. See, e.g., COMMITTEE ON THE CLEAN WATER ACT AND THE MISSISSIPPI RIVER, NATIONAL RESEARCH COUNCIL, MISSISSIPPI RIVER WATER QUALITY AND THE CLEAN WATER ACT: PROGRESS, CHALLENGES, AND OPPORTUNITIES 104 (2008) (noting that “[s]tate water quality standards authority is analogous to zoning, because the setting of these standards involves determination of whether a particular segment of a stream should be usable, for example, for human contact recreation or as a cold water fishery.”) (hereinafter NRC MISSISSIPPI RIVER REPORT); id. at 106–08 (table showing the differences among the Mississippi River states’ water quality criteria for the River); id. at 109 (figure showing the differences among the Mississippi River states’ designated uses for the River).
129. Ryan, supra note 8, at 72.
130. Sovacool, supra note 5, at 448.
131. Id.
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tailoring of water quality standards to local desires and requirements. The dialogue between state and federal regulatory authorities can produce more effective overall results, as is arguably the case for the new numeric nutrient water quality criteria for Florida.\textsuperscript{132} The redundancy of overlapping authority ensures that water quality is protected, as again evidenced by the Florida nutrient standards: it was lawsuits against the EPA alleging a failure to ensure the effectiveness of state regulation that led to the new standards.\textsuperscript{133} Similar lawsuits against the EPA jumpstarted the implementation of the Act's total maximum daily load (TMDL) provisions.\textsuperscript{134} As for accountability, states and the federal government share enforcement authority under the Act, increasing the resources available to ensure compliance.\textsuperscript{135} Finally, water quality regulation certainly benefited from the economies of scale that the federal government could achieve by setting national technology-based effluent limitations for all dischargers in specific industrial categories all at once, rather than by having states establish similar standards for similar dischargers 50 different times.\textsuperscript{136}

Nevertheless, federally structured cooperative federalism differs, in ways that may become important in the climate change adaptation era, from unstructured dynamic federalism. As a result, this Article—unlike many studies of federalism—distinguishes the two in order to highlight differences in federal involvement.\textsuperscript{137}

To return to the questions that Erin Ryan's summary raises, Congress intervened in water quality regulation only after a long series of attempts to encourage states to regulate more stringently and the states' failures to do so.\textsuperscript{138} Moreover, Congress repeatedly figured federal intervention in water quality regulation as an intrusion into the states' spheres of authority.\textsuperscript{139} The comprehensively structured cooperative federalism approach to water quality regulation embodied in the contemporary Clean Water Act came into being only after Congress recognized and

\textsuperscript{132} 75 Fed. Reg. 4174, 4214–16 (Jan. 26, 2010).
\textsuperscript{133} Id. at 4175.
\textsuperscript{134} 33 U.S.C. § 1313(d); Stationarity Is Dead, supra note 103, at 886.
\textsuperscript{136} 33 U.S.C. § 1311(b).
\textsuperscript{137} See, e.g., Sovacool, supra note 5, at 447–48 (lumping cooperative federalism in with dynamic and interactive federalism).
\textsuperscript{139} CRAIG, supra note 138, at 12–15.
would articulate countervailing federal interests in water quality—first in coastal and interstate waters, then in surface waters more generally.  

Thus, for example, in the Federal Water Pollution Control Amendments of 1961, Congress extended federal enforcement authority to the coastal and interstate waters, but it also recognized that:

Water has become the No. 1 resource problem confronting the United States today. The water problem is directly related to our country’s rapid population and economic growth. This growth is creating a major impact on water resources from a rapidly growing demand for water to produce the things we need to eat, wear, and use, and for an ample supply of clear, safe water for drinking and recreation.

For the Nation as a whole, ... water quality management can best be affected by the prevention and control of pollution.... Pollution control has the advantage of permitting the use of an already available distribution system, the waterways of the country, to deliver water of satisfactory quality to the points where it is needed.

By 1971, Congress deemed state water quality efforts inexcusably inadequate and found that national interests were at stake, justifying the more comprehensive intervention of the federal government:

[The national effort to abate and control water pollution had been inadequate in every vital aspect:

—Many of the Nation’s navigable waters are severely polluted, and major waterways near the industrial and urban areas are unfit for most purposes;
—Rivers are the primary sources of pollution of coastal waters and the oceans, and many lakes and confined waterways are aging rapidly under the impact of increased pollution;
—Rivers, lakes, and streams are being used to dispose of man’s wastes rather than to support man’s life and health; and

140. Id. at 15–16.
142. Id. at 2078.
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—The use of any river, lake, stream, or ocean as a waste treatment system is unacceptable.

The Committee believes the restoration of the natural chemical, physical, and biological integrity of the Nation's waters is essential.144

The Clean Water Act’s structured cooperative federalism thus represents a conscious and deliberate federal intervention in an area of water-related law that was traditionally deemed the states’. The Act’s retention of state roles in water quality regulation recognizes the states' traditional dominance in this field, and the Act actively encourages states to pursue water quality regulatory programs145—but now subject to federal approval and oversight.146 The history of the Clean Water Act therefore demonstrates that changes in water federalism do occur, and they occur when the federal government perceives national interests that are threatened by state action (or inaction). Climate change could provide another such impetus for re-balancing water federalism in favor of structured cooperative federalism, particularly with regard to water allocation.

II. CLIMATE CHANGE IMPACTS ON WATER RESOURCES

Climate change is altering water resources in the United States and will continue to do so for several centuries.147 Climate change is the result of increasing concentrations of greenhouse gases, especially carbon dioxide (CO₂), in the atmosphere. Concentrations of these gases have been building since the Industrial Revolution.148 Their most immediate effect is increased air temperatures, but those increasing air

144. Id. at 3674.
145. 33 U.S.C. §§ 1251(b), 1342(b), 1344(g).
146. 33 U.S.C. §§ 1313(c)(2)–(4), (d)(2), 1342(b), (d), (h), (i), 1344(g)–(k), (n).
148. 2007 IPCC SYNTHESIS REPORT, supra note 147, at 5.
temperatures lead fairly immediately to changes in water resources.\textsuperscript{149}  

Climate change is apt to lead to water shortages in many parts of the nation, which could contribute to a rethinking of the federalism implications for water. As early as July 2003, the U.S. Government Accountability Office’s (“GAO’s”) survey of the states revealed that “even under normal water conditions, water managers in thirty six states anticipate water shortages in localities, regions, or statewide within the next 10 years. Under drought conditions, 46 managers expect shortages in the next 10 years. Such shortages may be accompanied by severe economic, environmental, and social impacts.”\textsuperscript{150} Notably, drought-plagued California and New Mexico did not respond to the survey,\textsuperscript{151} suggesting that the totals should actually be thirty eight and forty eight states, respectively: California is already facing water shortages,\textsuperscript{152} and New Mexico is vulnerable to water stress.\textsuperscript{153}  

The end of the GAO’s ten-year predictive window—2012—is quickly approaching, and drought conditions have persisted in many regions of the country.\textsuperscript{154} Now, however, climate change impacts are likely to exacerbate the extent and severity of water shortages and their attendant problems. Indeed, even in 2003 the GAO acknowledged that “[t]he potential effects of climate

\textsuperscript{149} U.S. ENVIRONMENTAL PROTECTION AGENCY, DRAFT: NATIONAL WATER PROGRAM STRATEGY: RESPONSE TO CLIMATE CHANGE 6–7 (2008), available at http://www.epa.gov/ow/climatechange/docs/3-27-08_ccdraftstrategy_final.pdf [hereinafter 2008 EPA DRAFT NATIONAL WATER PROGRAM STRATEGY]. As the U.S. Global Change Research Program (USGCRP) has noted:

Substantial changes to the water cycle are expected as the planet warms because the movement of water in the atmosphere and oceans is one of the primary mechanisms for the redistribution of heat around the world. . . . A warmer climate increases evaporation of water from land and sea, and allows more moisture to be held in the atmosphere. For every 1˚F rise in temperature, the water holding capacity of the atmosphere increases by about 4 percent. In addition, changes in atmospheric circulation will tend to move storm tracks northward with the result that dry areas will become drier and wet areas wetter.

2009 U.C. Climate Change Impacts Report, supra note 147, at 41–42.


\textsuperscript{151} Id. at 3.


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change create additional uncertainty about future water availability and use.”155

Climate change is already affecting water resources in the United States and is likely to continue to do so for several decades, perhaps centuries.156 These impacts threaten the availability of water not just for the traditional state interests of drinking water, agricultural irrigation, local and industrial uses, and recreation, but also the availability of water for decidedly federal interests, such as the military and power generation.157

The U.S. Global Change Research Program (“USGCRP”) recently detailed many of the expected climate change impacts on water resources in the United States. Changes to the water cycle, for example, will include: “changes in precipitation patterns and intensity”; “changes in the incidence of drought”; “widespread melting of snow and ice”; “increasing atmospheric water vapor”; “increasing evaporation”; “increasing water temperatures”; “reductions in lake and river ice”; and “changes in soil moisture and runoff.”158 In addition, across the country more precipitation will fall as rain rather than snow, decreasing snowpack “storage” and late summer flows from snowmelt.159

The U.S. Environmental Protection Agency (EPA), in turn, has emphasized the problems of sea-level rise, changes in ocean chemistry, warming water temperatures and consequent changes in pollutant concentrations and aquatic ecosystems, new patterns of rainfall and snowfall that could affect drinking water supply and pollution levels, and increased intensity of storms.160

Of course, climate change impacts on water resources will not be uniform across the United States. As the USGCRP has noted, “the arid Southwest is projected to experience longer and more severe droughts from the combination of increased evaporation and reductions in precipitation.”161 In these regions, reductions in the amount of precipitation and winter snowpack are already bringing increasingly severe threats to already stressed water supplies,162 a fact of which California in particular

155. 2003 GAO STATE WATER SURVEY REPORT, supra note 150, at 48.
156. 2009 U.S. CLIMATE CHANGE IMPACTS REPORT, supra note 147, at 41. The USGCRP concluded:
Climate change has already altered, and will continue to alter, the water cycle, affecting where, when, and how much water is available for all uses”; in addition, “[c]limate change will place additional burdens on already stressed water systems.

Id.
158. 2009 U.S. CLIMATE CHANGE IMPACTS REPORT, supra note 147, at 41.
159. Id. at 42.
160. 2008 EPA DRAFT NATIONAL WATER PROGRAM STRATEGY, supra note 149, at Forward.
161. 2009 U.C. CLIMATE CHANGE IMPACTS REPORT, supra note 147, at 41–42.
162. Id. at 44, 45.
is already well aware.\textsuperscript{163} Both mid-continental areas and the Southeast are also “particularly threatened by future drought.”\textsuperscript{164}

Scientists project overall precipitation increases in the Northeast, Midwest, and Alaska.\textsuperscript{165} However, more overall rainfall does not mean that water allocation problems will not arise. Even in these regions, “extended dry periods have become more frequent,” and rain, when it comes, is already tending to come in less frequent but heavier events.\textsuperscript{166} Moreover, areas in both the West and Northeast depend on winter snowpack for summer water supply, and winter snowfall has already been both decreasing in amount and melting sooner in the spring throughout the U.S.\textsuperscript{167} As the USGCRP noted, “Earlier runoff produces lower late-summer streamflows, which stress human and environmental systems through less water availability and higher water temperatures.”\textsuperscript{168}

Summarizing the USGCRP’s findings, the National Association of Clean Water Agencies emphasized in 2009 that most regions of the U.S. will experience “greater uncertainty in water supply.”\textsuperscript{169} Water demand is also likely to increase as a result of climate change impacts. Increasing temperatures are likely to increase demand for water for drinking, cooling, and recreation, while drying soils will require more water for irrigation.\textsuperscript{170}

Climate change impacts are also changing the quality of water resources. Most directly, “[i]ncreased air temperatures lead to higher water temperatures, which have already been detected in many streams, especially during low-flow periods.”\textsuperscript{171} Increasing temperatures, in turn, can lead to water stratification and reductions in dissolved oxygen levels, stressing aquatic organisms and reducing water bodies’ self-purification capacities.\textsuperscript{172} In addition, “[t]he negative effects of water...
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pollution, including sediments, nitrogen from agriculture, disease pathogens, pesticides, herbicides, salt, and thermal pollution, will be amplified by observed and projected increases in precipitation intensity and longer periods when streamflows are low.”

As a result, water planning needs to change to accommodate climate change impacts. Traditionally, such planning has quite rationally been based on historical fluctuations in water supply. However, as the USGCRP pointed out, “[b]ecause climate change will significantly modify many aspects of the water cycle, the assumption of an unchanging climate is no longer appropriate for many aspects of water planning. Past assumptions derived from the historical record about supply and demand will need to be revisited for existing and proposed water projects.” Moreover, this planning is likely to make obvious that federal interests are implicated in the uncertainties climate change is creating for water supply.

III. RETHINKING WATER FEDERALISM IN A CLIMATE CHANGE ERA: THE FEDERALISM IMPLICATIONS OF CLIMATE CHANGE IMPACTS ON WATER

As Part II discussed, climate change is likely to affect water resources in ways that are detrimental to current water resource management and use, even in areas of the country that experience greater precipitation. Such changes, but especially water shortages and water stress, are likely to implicate at least three areas of law and policy where the federal government already asserts strong interests: resolution of interstate water conflicts; national food security; and national energy policy. Each of these interests, moreover, is likely to increase federal attention to water allocation and management as an adaptation to climate change.

A. Emerging Federal Priorities with Water Impacts

1. Water Shortage and Interstate Water Conflicts

One consequence of water shortages along interstate rivers is interstate conflict, and the federal government has long asserted a strong role in resolving interstate water conflicts.

173. Id.
174. 2009 U.S. CLIMATE CHANGE IMPACTS REPORT, supra note 147, at 46.
175. Id.
Perhaps most famously, the U.S. Supreme Court has deemed itself the final arbiter of interstate apportionment conflicts—although, in fact, it has apportioned only three interstate rivers to date. Nevertheless, to the Court, the federal interest in equitable apportionment was clear, and “[t]he primary question is, of course, of national control.”

Congress also plays a role in the apportionment of interstate rivers. First, on rare occasions, Congress directly apports rivers itself. More commonly, Congress approves, through its powers under the Constitution’s Interstate Compacts Clause, interstate compacts to apportion interstate waters among the relevant states. Once approved by Congress, interstate compacts become federal law, occasionally sending states to the Supreme Court for compact interpretation and enforcement.

As climate change has been increasingly impacting water resources and as demands for fresh water have been increasing, interstate conflicts over water have intensified. This intensification is most obvious in the East, which has traditionally escaped the “water wars” that have been a regular feature of western water law. Florida, Georgia, and Alabama have been locked in a twenty-year battle over the waters of the Apalachicola-Chattahoochee-Flint River (ACF) Basin. The consolidation of multiple lawsuits pursuing various aspects of the conflict into the U.S. District Court for the Middle District of Florida led to a recent victory for Florida and Alabama, who

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180. “No State shall, without the Consent of Congress . . . enter into any Agreement or Compact with another State, or with a foreign Power . . . .” U.S. CONST., art. I, § 10, cl.3.


are seeking to prevent the City of Atlanta’s acquisition of water in the system. Since February 2005, Mississippi has been litigating the issue of whether the City of Memphis, Tennessee, has been stealing Mississippi’s groundwater,186 while in 2008, Georgia sought to change its border with Tennessee so that Georgia would have access to part of the Tennessee River.187 In between, South Carolina sought and received the U.S. Supreme Court’s permission to sue North Carolina for an equitable apportionment of the Catawba River.188 Moreover, in a development that underscores the close connection of water and energy policy, the Court’s first decisions including allowing Duke Energy to intervene in the case, because its energy interests at eleven facilities along the river could be affected by the apportionment decision.189

Thus, the federal government looks to play a larger role in resolving interstate water conflicts. Moreover, those resolutions may require the federal government to make allocation decisions, ranging from Congress enacting legislation (or not) to re-allocate portions of Lake Lanier to Atlanta’s water supply in the ACF Basin, to the Supreme Court apportioning the Catawba River between South Carolina and North Carolina, and deciding whether Memphis has been stealing Mississippi’s groundwater. In the interstate context, therefore, the federal government has long been in the water allocation business, and climate change is only likely to intensify that role.

2. National Food Security and Water

Food security refers, loosely, to the availability of a country to feed itself.190 Scientists have concluded that, world-wide, “[c]limate change will affect all four dimensions of food security, namely food availability (i.e., production and trade), access to food, stabilization of food supplies, and food utilization.”191 The impacts of climate change on agriculture are many, ranging from

187. Id.
190. “The term ‘food security’ means access by all people at all times to sufficient food and nutrition for a healthy and productive life.” 7 U.S.C.A. § 1732(6) (West 2008); see also 7 U.S.C.A. § 1736(b)(6)(West 2008) (enacting the same definition).
“changes in land suitability and crop yields” as a result of changes in temperature and precipitation, increased crop production as a result of increasing carbon dioxide concentrations in the atmosphere, and “greater fluctuations in crop yields and local food supplies and higher risks of landslides and erosion damage” as a result of more variable weather patterns. By 2008, the USGCRP had concluded that “[c]limate changes—temperature increases, increasing CO₂ levels, and altered patterns of precipitation—are already affecting U.S. water resources, agriculture, land resources, and biodiversity.”

U.S. agriculture products were valued at over $200 billion in 2002, with 52 percent of the total sales value coming from livestock, 21 percent from fruits and nuts, 20 percent from grain and oilseed, and 5 percent from other commodities. All of that agricultural production requires water, whether in the form of precipitation or of irrigation, and climate change will affect the availability of both forms for agriculture.

Irrigation is already a substantial source of water consumption in the United States, accounting for about 31 percent of the total withdrawals and 37 percent of freshwater withdrawals in the United States in 2005. About 85 percent of these withdrawals occur in the western United States.

Climate-change-induced alterations to precipitation were initially expected to contribute to an overall reduction in agricultural irrigation of 5-10 percent by 2030 and 30-40 percent by 2090. Even then, however, scientists acknowledged that,
“[a]t the regional level, there is the possibility that overall water use will increase in response to climate change.”\textsuperscript{198}

However, more recent analyses suggest that, while predicting crop water consumption in the face of climate change impacts is a complex task,\textsuperscript{199} overall “the lengthening growing seasons due to global warming likely will increase crop water requirements.”\textsuperscript{200} To take corn as one example, regional irrigation requirements are projected to change anywhere from a reduction of 1 percent in the Lower Colorado Basin to an increase of 451 percent in the Lower Mississippi Basin as a result of climate-change-induced rainfall variation.\textsuperscript{201} Overall, however, the need to irrigate corn in the United States is expected to increase 35-64 percent, while irrigation of alfalfa is expected to increase nationally by 20-50 percent.\textsuperscript{202} These increased needs for irrigation will result from “the decrease in rainfall during the growing season and the reduction in soil water availability.”\textsuperscript{203}

Of course, projecting increased use of water for irrigation assumes that water will in fact be available for irrigation in the correct locations. As just one example, a sizeable percentage of U.S. agriculture is concentrated in drought-plagued California,\textsuperscript{204} where climate change impacts are already reducing the available supply of water and impacts are expected to worsen for several decades.\textsuperscript{205} As one climate change adaptation strategy, California is already encouraging agriculture to adopt recommended agricultural water efficiency management practices.\textsuperscript{206}

Water-shortage threats to agricultural production at the national level could prompt increased federal interest in water allocation in order to protect national food security. Indeed, the federal government already has substantial interests in food security.\textsuperscript{207} Moreover, it has already invested heavily in building


198. \textit{Id}.
199. 2008 USGCRP AGRICULTURE REPORT, \textit{supra} note 193, at 39–42 (analyzing several variables).
200. \textit{Id}.
at 39.
201. \textit{Id}.
at 42.
202. \textit{Id}.
203. \textit{Id}.
204. 2008 USGCRP AGRICULTURE REPORT, \textit{supra} note 193, at 22 fig.2.1.
206. \textit{Id}.
at 14.
irrigation projects throughout the United States, but especially in the West, and “[m]anagement of Western reservoir systems is very likely to become more challenging as runoff patterns continue to change.” Finally, demand for additional storage projects to manage changing precipitation and runoff patterns is likely to occur across the country regardless of what the actual regional climate change impacts are, because such projects can both store water from wet years (West and Midwest) and control the runoff from larger and more violent storm events (East and South). Therefore, it is not unreasonable to expect food security concerns to prompt increased interest in water management and allocation at the national level.

3. National Energy Policy and Water

Although both the federal governments and state governments have long ignored this basic fact, water policy and energy policy are inextricably intertwined. Some examples are obvious: water generates power at hydroelectric facilities, and energy converts salt water to fresh water at desalination plants. The federal government’s decision to encourage biofuels in the early 21st century generated significant concern over the potential impacts on water. Other intersections of energy and water, however, are not so obvious.

As of 2005, thermoelectric power generation accounted for approximately 49 percent of all water withdrawals in the United States. Because western states rely heavily on hydropower (which can also, of course, be affected by water shortages), 84 percent of thermoelectric power withdrawals occur in the eastern United States.

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209. 2008 USGCRP AGRICULTURE REPORT, supra note 193, at 3.
210. See, e.g., CALIFORNIA DEPT. OF WATER RESOURCES, MANAGING AN UNCERTAIN FUTURE: CLIMATE CHANGE ADAPTATION STRATEGIES FOR CALIFORNIA’S WATER 23 (Oct. 2008) (making improved water storage one of California’s 10 adaptation strategies for water management.
211. Michael E. Webber, Catch 22: Water vs. Energy, SCIENTIFIC AMERICAN SPECIAL ISSUE: EART H 3.0, at 35 (2008) (noting that “each of these precious commodities might soon cripple our use of the other. We consume massive quantities of water to generate energy, and we consume massive quantities of energy to deliver clean water.”).
212. See generally Wilkose, supra note 40; GOVERNMENT ACCOUNTABILITY OFFICE, ENERGY-WATER Nexus: Many Uncertainties Remain About National and Regional Effects of Increased Biofuel Production on Water Resources (Nov. 2009).
214. Id.
Energy production is water-intensive. To produce one megawatt-hour of electricity, gas/steam combined cycle plants need 7,400 to 20,000 gallons of water, while coal- and oil-fired power plants require 21,000 to 50,000 gallons and nuclear power plants require 25,000 to 60,000 gallons.\(^\text{215}\) To be sure, most of this water is used for cooling and much is returned to the waterbody for reuse\(^\text{216}\)—but the water must be there in the first place, and water supply is a factor in locating new power plants.\(^\text{217}\) Moreover, based purely on population growth alone, the Department of Energy projects that “[i]f new power plants continue to be built with evaporative cooling, consumption of water for electrical energy production could more than double by 2030 from 3.3 billion gallons per day in 1995 to 7.3 billion gallons per day[.]”\(^\text{218}\)

The energy demands for water supply are also high. Pumping water from aquifers to supply cities with drinking water requires approximately 1,800 kilowatt-hours per million gallons delivered; treating wastewater requires 2,350 to 3,300 kilowatt-hours, while desalinating seawater requires 9,780 to 16,500 kilowatt-hours.\(^\text{219}\) Moving water around is also energy-intensive: “The California Aqueduct, which transports snowmelt across two mountain ranges to thirsty coastal cities, is the biggest electricity consumer in the state.”\(^\text{220}\)

Climate change will exacerbate already growing problems at the water-energy interface. Water shortages, for example, have already threatened power production in Georgia, North Carolina, and at the Hoover Dam.\(^\text{221}\) In 2006, the U.S. Department of Energy reported to Congress that “[o]peration of some energy facilities has been curtailed due to water concerns, and siting and operation of new energy facilities must take into account the value of water resources.”\(^\text{222}\)

Climate-change-induced water shortages will almost certainly make things worse. As the World Business Council recently noted, “Climate change acts as an amplifier of the already intense competition for water and energy resources.”\(^\text{223}\)

\(^{215}\) Webber, supra note 211, at 38.

\(^{216}\) Id.

\(^{217}\) 2006 DOE ENERGY-WATER REPORT, supra note 195, at 9.

\(^{218}\) Id. at 10–11.

\(^{219}\) Id. at 37.

\(^{220}\) Id. at 35–36.

\(^{221}\) 2006 DOE ENERGY-WATER REPORT, supra note 195, at 9; see also id. at 30 fig. IV-2 (listing 14 energy-water conflicts that had already arisen by 2006).

\(^{222}\) WORLD BUSINESS COUNCIL FOR SUSTAINABLE DEVELOPMENT, WATER, ENERGY, AND CLIMATE CHANGE: A CONTRIBUTION FOR THE BUSINESS COMMUNITY 3 (March 2009), available at http://www.wbcsd.org/web/WaterEnergyandClimateChange.pdf. See also
In the United States, drought has already proven its ability to affect energy production. For example, “[d]uring California’s energy crisis in the summer of 2001, the state faced the risk of even larger, more frequent blackouts because a severe drought in the Pacific Northwest had drained hydroelectric power resources.”\(^{224}\) Climate change impacts on the Colorado River, Lake Mead, and Hoover Dam provide examples of a potentially very conflicted future:

Research scientist Gregory J. McCabe of the U.S. Geological Survey reiterated the message to Congress in June. He noted that an increase in average temperature of even 1.5 degrees Fahrenheit across the Southwest as the result of climate change could compromise the Colorado River’s ability to meet the water demands of Nevada and six other states, as well as that of the Hoover Dam. Earlier this year scientists at the Scripps Institution of Oceanography in La Jolla, Calif., declared that Lake Mead could become dry by 2021 if the climate changes as expected and future water use is not curtailed. \(^{225}\)

There are also likely to be direct correlations between energy consumption and water demand as a result of increasing temperatures. The USGCRP reported in 2009 that “[h]igher temperatures are projected to increase cooling water withdrawals by electrical generating stations. In addition, greater cooling requirements in summer will increase electricity use, which in turn will require more cooling water for power plants.”

Congress has a long history of addressing energy policy at the national level.\(^{227}\) Given the impacts on energy from water shortages and climate change, this national-level interest in energy policy suggests that the federal government will be paying increasing attention to water resources and water allocation. Indeed, the Department of Energy emphasized in 2006 that state-level protests and “[t]he lack of integrated energy and water

Water Energy Technology Team, Lawrence Berkeley National Laboratory, *Climate Change*, http://water-energy.lbl.gov/node/11 (last visited Feb. 12, 2010) (“Global climate change directly affects both the energy and water sectors. Changes in climate have forced cities and regions to choose between energy production and water distribution”).


225. Webber, *supra* note 211, at 36.


planning and management has already impacted energy production in many basins and regions across the country.\textsuperscript{228}


Recognizing that the federal government may take an increasing interest in how water is managed and allocated does not dictate any particular federal role, or even a re-balancing of water federalism. For example, a bill introduced into the U.S. House of Representatives in October 2009 acknowledges that “supplying water is highly energy-intensive and will become more so as climate change forces more utilities to turn to alternative supplies” and that “energy production consumes a significant percentage of fresh water resources of the United States.”\textsuperscript{229} However, its responses are to fund the EPA to conduct research on the effects of climate change on the nation’s drinking water utilities.\textsuperscript{230} Funding and carrying out research is a traditional federal role in water management (among other areas), and hence this approach can hardly be deemed to shift water federalism in any significant way. A bit more ambitiously, but again without creating any real shift in the federalism balance surrounding water, a bill introduced the next day would: (1) establish a WaterSense labeling program within the EPA “to identify and promote water efficient products, buildings, landscapes, facilities, processes, and services”\textsuperscript{231}; (2) create a federally funded, state-based residential water efficiency and conservation incentives program\textsuperscript{232}; and (3) create a direct federal funding program (the “Blue Bank”) to implement mitigation and adaptation measures in water systems.\textsuperscript{233}

Nevertheless, more radical federal responses are also possible. This section discusses six of those possibilities: federalization of rivers; federal eminent domain over specific water rights for specific projects; a national water inventory; national water planning; a national water market and/or water transportation at the national level; and federalized priorities in water rights permitting and transfers of water rights.

\textsuperscript{228} U.S. DEPT OF ENERGY, REPORT TO CONGRESS ON THE INTERDEPENDENCY OF ENERGY AND WATER (Dec. 2006).
\textsuperscript{230} Id. § 3.
\textsuperscript{231} H.R. 3747, 111th Cong. § 4 (2009).
\textsuperscript{232} Id. § 5.
\textsuperscript{233} Id. § 6.
1. Federalization of Rivers

Several rivers—generally larger interstate systems—already have such a strong federal presence that the rivers can be deemed effectively federalized. Such federalization occurs on major interstate rivers and generally works to support federal interests in navigation and flood control. As such, the federalization of rivers that has so far occurred can be considered an extension of the supremacy federalism that has dominated navigation and interstate waterways.

In terms of case law, the Missouri River is the most determinedly federalized river in the United States. Several U.S. Army Corps of Engineers dams dominate the flow of the Missouri River, overriding many prerogatives that states would otherwise enjoy regarding the river’s allocation and management. Thus, when North Dakota sued the Army Corps to enjoin it from releasing water from the Garrison Dam and draining Lake Sakakawea, which would have violated the state’s Clean Water Act water quality standards for cold-water fisheries, the U.S. Court of Appeals for the Eighth Circuit concluded that the Army Corps did not have to acknowledge the state’s water quality standards in its operation of the dam.234

Ordinarily, the Clean Water Act requires all federal agencies to certify that their water-related activities (so long as the activity involves a discharge) comply with state water quality standards.235 However, the Act also states that it “shall not be construed as . . . affecting or impairing the authority of the Secretary of the Army [] to maintain navigation . . . .”236 Because the Army Corps proposed to release water to maintain navigation, the Eighth Circuit seized upon the latter statutory provision to declare that the Clean Water Act “exempts the Corps, which operates under the authority of the Secretary of the Army, from complying with the CWA when its authority to maintain navigation would be affected.”237

Beyond this issue of statutory interpretation, however, the Eighth Circuit also clearly perceived proper water federalism balancing to be at issue, and it clearly sought to rebalance this federalism in favor of the federal government. Thus, the states became sources of interference in the river’s management:

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234. In re Operation of Missouri River System Litigation, 418 F.3d 915, 918 (8th Cir. 2005).
236. Id. § 1371(a).
237. In re Operation of Missouri River System Litigation, 418 F.3d at 918.
North Dakota suggests that the construction of new outflow structures at Garrison Dam to siphon warmer water from the top of Lake Sakakawea, rather than colder water from the bottom, might allow the Corps to comply with North Dakota’s water-quality standards for a cold-water fishery while still providing the requisite water releases to maintain navigation. If we allowed North Dakota to enforce its water-quality standards on this basis, there is no discernible limit to the new structures and new operational plans that other states with main-stem reservoirs could demand to force the Corps to comply with their own water-quality standards. If each state is allowed to use its reservoir water-quality standards as a tool to control how the Corps must release water from the main stem reservoirs, the “authority of the Secretary of the Army . . . to maintain navigation” will obviously be affected, in violation of § 1371(a). 238

Moreover, state water quality standards would also conflict with Congress’s goals for the Missouri River’s management:

Congress established the goals for the Missouri River main stem reservoir system in the [Flood Control Act of 1944]. The dominant functions of the project are flood control and downstream navigation, and secondary interests include irrigation, recreation, fish and wildlife. Congress also set forth the method by which the federal statute was designed to reach those goals—the FCA vests the Corps with the duty to balance navigation with other water-use interests, including the interests of the reservoir states. Allowing individual states to use their water-quality standards to control how the Corps balances water-use interests would frustrate the design of the FCA. Accordingly, the enforcement of state water-quality standards against the Corps’ release of water from Lake Sakakawea is preempted. 239

Thus, management of the Missouri River has effectively been federalized.

Other river systems can also be deemed effectively federalized. Like the Missouri River, for instance, management of the flow regimes in the ACF Basin has become far less a matter of state law than of managing the Army Corps’ operation of two federal dams—the Buford Dam near the top of the

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238. Id. at 919.
239. Id. at 919–20.
Chattahoochee River and the Woodruff Dam near the Florida-Georgia border. While state-focused claims based on Florida’s water quality standards and coastal zone management plan have yet to be decided in the consolidated litigation, the ACF system is well on its way to becoming a federalized river system like the Missouri.

The Mississippi River is another candidate for federalization, although for different reasons. In 2008, a National Research Council committee concluded that, “[a]s a result of limited interstate coordination, the Mississippi River is an ‘orphan’ . . . .” It advocated a stronger federal role in managing the river, including increasing federal attention to the use of water in agriculture.

As noted, these examples of federalization have all so far arisen at the intersection of navigation or hydropower production and water quality, all areas where the federal government has asserted its interests. Nevertheless, given the number of dams and federal reclamation projects that already exist in the United States, a similar federalization process could also arise with respect to water allocation and larger issues of water management, should Congress choose to declare a national interest and national priorities in those areas of regulation.

Most likely, such federalization would begin in the water management and allocation context as an extension of the federal government’s acknowledged role in apportioning interstate waters. Indeed, this process is arguably almost complete on the Colorado River, where the so-called “Law of the River” is dominated by a congressional apportionment of its waters, congressionally approved interstate compacts, a system of federal dams, and a bilateral treaty with Mexico. These federal-level rules and projects for managing the river’s flow dominate state-
level decisions regarding water allocation and management. Moreover, the increasing assertion and quantification of reserved tribal water rights, protected through federal treaties and the federal government’s tribal trust role, have significantly affected state water management decisions in the Colorado River states.

Interestingly for the future of other rivers, the GAO reported in 2003 that twenty-nine states that participate in water management agreements with federal agencies would find greater federal participation in those agreements helpful. In particular, “lack of coordinated federal actions—such as the failure to establish federal priorities in a river basin—have created uncertainty for state participants in water management agreements.” Thus, in places where the federal government already participates in cooperative water management as a result of federal projects and facilities such as dams, states already find a shifting of the water federalism balance toward the federal government desirable.

2. Federal Eminent Domain over Specific Water Rights

On rivers, streams, and lakes where neither navigation nor interstate concerns provide relatively easy justifications for increased federal involvement in water resource management, exercise of the federal government’s eminent domain authority could provide for rather limited federal supersession of state regulatory authority over water rights. Nevertheless, exercise of this authority would re-balance water federalism by shifting the decentralized states’ rights model of federalism toward a system more akin to what currently dominates species regulation: a presumption that states regulate until the federal government asserts a specific interest in particular water sources.

Notably, Congress so far has been reluctant to grant federal agencies explicit authority to condemn water rights. Indeed, the three most prominent examples of such authority arise in connection with federally approved hydropower facilities251 and federal flood control and navigation, the latter two in terms of “flowage rights.”252

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247. Id.
250. Id.
wetlands for waterfowl production areas requires the relevant state’s permission, while the Reclamation Act of 1902 requires the Secretary of the Interior and the Bureau of Reclamation to follow state rules regarding condemnation of water rights.

Nevertheless, in the face of climate-change-driven water shortages and the potential impairment of national policies, the federal government might choose to allow federal agencies to condemn water rights for specific federal or federally-permitted projects, such as power plants or alternative energy facilities. While both the proponents of and the opposition to the Reclamation Act of 1902 expressed doubts that Congress could, as a constitutional matter, override state regulation of nonnavigable streams, the U.S. Supreme Court has repeatedly acknowledged that, “in the absence of federal legislation to the contrary,” the federal government can condemn property without state consent. Indeed, in one of its earliest decisions on the subject, the Court emphasized that the federal government’s eminent domain authority “is the offspring of political necessity; and it is inseparable from sovereignty, unless denied by its fundamental law.” Thus, project-specific water condemnation appears to be a constitutionally viable mechanism for rebalancing water federalism in the climate change adaptation era, especially if the federal government is willing to pay, in prior appropriation state especially, for priority of use as well as the right to use water.

3. National Water Inventory

More radical federal interventions in water allocation and management would involve “nationalizing” water resources in some way—that is, refiguring the streams, rivers, and lakes of the United States as a singular and national natural resource rather than a collection of state and local resources. This kind of

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254. Reclamation Act of 1902, § 8, 43 U.S.C. § 383; California v. United States, 438 U.S. 645, 674–75 (1978). Nevertheless, these agencies do not have to comply with all state water requirements if federal statutes dictate requirements contrary to state law. City of Fresno v. California, 372 U.S. 627, 630–31 (1963) (holding that § 8 did not require the Secretary of the Interior to ignore Congress's use preferences for the sale of project water); Ivanhoe Irr. Dist. v. McCracken, 357 U.S. 275, 291–92 (1958) (holding that § 8 did not require the agencies to ignore Congress's limitation that project water be sold to parcels no bigger than 160 acres).
255. See California, 438 U.S. at 668–70 (discussing these debates as part of the Reclamation Act’s legislative history).
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refiguration would rebalance federalism for water management and allocation in much the same way that the Clean Water Act rebalanced water federalism for water quality, when Congress declared the objective “to restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.”

To the extent that Congress continues, even in a climate change era, to want to preserve states’ roles in water management and allocation, the least intrusive form of water nationalization would be a federal water inventory. National water inventories are not a new idea, but “[n]ational water availability and use was last comprehensively assessed in 1978,” when the U.S. Water Resources Council completed a federal survey pursuant to the Water Resources Planning Act of 1965.

It is significant, therefore, that as part of one of Congress’s very first forays into climate change adaptation policy, a new national water inventory is already largely underway. In March 2009, Congress enacted the Omnibus Public Land Management Act of 2009, creating a National Water Availability and Use Assessment Program (NWAUAP) in the Department of the Interior. The goals of this program are:

1. to provide a more accurate assessment of the status of the water resources of the United States;
2. to assist in the determination of the quantity of water that is available for beneficial uses;
3. to assist in the determination of the quality of the water resources of the United States;
4. to identify long-term trends in water availability;
5. to use each long-term trend described in paragraph (4) to provide a more accurate assessment of the change in the availability of water in the United States; and
6. to develop the basis for an improved ability to forecast the availability of water for future economic, energy production, and environmental uses.

Under this Program, among other duties, the Secretary of the Interior will create and maintain “a comprehensive national water use inventory” and “conduct an ongoing assessment of water availability.” Thus, the NWAUAP represents a substantial federal intervention into the assessment of the

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258. 33 U.S.C. § 1251(a) (emphasis added).
259. 2003 GAO STATE WATER SURVEY REPORT, supra note 150, at 44 (citing Pub. L. No. 89-80, 79 Stat. 244 (1965)).
261. Id. § 9508, codified at 42 U.S.C. § 10368.
262. Id. § 10368(a).
263. Id. § 10368(b)(1)(A), (b)(2).
nation’s water resources, and energy production is a prominent justification.

New bills in Congress seek to build on this program. For example, in April 2009, the National Water Research and Development Initiative Act of 2009 was introduced into the House of Representatives. If enacted as introduced, that bill would establish a federal interagency committee to develop a National Water Research and Assessment Plan. More specifically highlighting the new importance of water to national energy policy, legislation introduced into the House in December 2009 proposes the Energy and Water Research Integration Act, acknowledging that the future of national energy policy will depend upon the continued availability of water for energy production.

4. National Water Planning

Moving one step beyond a national water inventory in the spectrum of water nationalization possibilities, national water planning could become a federal climate change adaptation strategy in response to increasing water stress and shortage, shifting water management authority away from the states. Energy policy is the most likely driver of national water planning. Indeed, in 2006, the Department of Energy explicitly suggested greater federal involvement in water planning as a means of ensuring energy supply. Similarly, Scientific American concluded two years later that “[s]olving the [energy-water] dilemma requires new national policies that integrate energy and water solutions and innovative technologies that help to boost one resource without draining the other.”

As James Huffman has discussed, the federal government has already moved to a cooperative federalism model for water planning in the context of federal reclamation projects. In March 2009, Congress took its initial steps toward comprehensive national water planning in the climate change adaptation provisions of the Omnibus Public Land Management Act of 2009.

These new provisions are still limited in scope, in the sense that they focus on the water resources that could affect federal

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265. Id. § 2(b)(3)(A), 2(b)(12).
268. Webber, supra note 211, at 36 (emphasis added).
269. Huffman, supra note 18, at 683–85.
reclamation and hydropower projects. Nevertheless, Congress suggested that national interests in water planning could extend far beyond those projects. Specifically, it found that “adequate and safe supplies of water are fundamental to the health, economy, security, and ecology of the United States,” 271 that “global climate change poses a significant challenge to the protection and use of the water resources of the United States . . . which may have a substantial effect on the supplies of water for agricultural, hydroelectric power, industrial, domestic supply, and environmental needs,” 272 and that “although States bear the primary responsibility and authority for managing the water resources of the United States, the Federal Government should support the States, as well as regional, local, and tribal governments,” in their efforts. 273 Thus, these findings signal a shift away from state primacy in water resource planning, with both agriculture and energy providing prominent rationales for increased federal involvement.

In providing federal support to water resources planning, the Act requires the Secretary of the Interior to establish a climate change adaptation program for water. 274 Specifically, the Secretary is required:

1. to assess each effect of, and risk resulting from, global climate change with respect to the quantity of water resources located in a [reclamation project] service area; and
2. to ensure, to the maximum extent possible, that strategies are developed at watershed and aquifer system scales to address potential water shortages, conflicts, and other impacts to water users located at, and the environment of, each service area. 275

The Secretary also “assess[es] specific risks to the water supply of each major reclamation river basin,” 276 and, “with respect to each major reclamation river basin, analyze[s] the extent to which changes in the water supply of the United States will impact—”

(A) the ability of the Secretary to deliver water to the contractors of the Secretary;
(B) hydroelectric power generation facilities;
(C) recreation at reclamation facilities;

272. Id. § 10361(3).
273. Id. § 10361(4).
274. Id. § 10363(a).
275. Id.
(D) fish and wildlife habitat;
(E) applicable species listed as an endangered, threatened, or candidate species under the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.);
(F) water quality issues (including salinity levels of each major reclamation river basin);
(G) flow and water dependent ecological resiliency; and
(H) flood control management.\textsuperscript{277}

Moreover, “in consultation with appropriate non-Federal participants,” the Secretary must “consider and develop appropriate strategies to mitigate each impact of water supply changes . . ., including strategies relating to—”

(A) the modification of any reservoir storage or operating guideline in existence as of the date of enactment of this Act;
(B) the development of new water management, operating, or habitat restoration plans;
(C) water conservation;
(D) improved hydrologic models and other decision support systems; and
(E) groundwater and surface water storage needs.\textsuperscript{278}

Finally, the Secretary can conduct studies “to determine the feasibility and impact on ecological resiliency of implementing each mitigation and adaptation strategy described . . ., including the construction of any water supply, water management, environmental, or habitat enhancement water infrastructure that the Secretary determines to be necessary to address the effects of global climate change on water resources located in each major reclamation river basin.”\textsuperscript{279}

At the same time, the Secretary of Energy must “assess each effect of, and risk resulting from, global climate change with respect to water supplies that are required for the generation of hydroelectric power at each Federal water project that is applicable to a Federal Power Marketing Administration.”\textsuperscript{280} At the end of the process, a federal intergovernmental panel on climate change and water is authorized:

[i] to develop any strategy that the panel determines to be necessary to improve observational capabilities, expand data acquisition, or take other actions—

\textsuperscript{277} Id. § 10363(b)(3).
\textsuperscript{278} Id. § 10363(b)(4).
\textsuperscript{279} Id. § 10363(d)(1).
\textsuperscript{280} Id. § 10365(a)(1).
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(A) to increase the reliability and accuracy of modeling and prediction systems to benefit water managers at the Federal, State, and local levels; and
(B) to increase the understanding of the impacts of climate change on aquatic ecosystems.281

Thus, as part of a national climate change adaptation strategy, federal legislators are already beginning to envision a greater federal role in predicting potential conflicts as changing water supplies impact federal projects and priorities in water resource planning and management. It is not difficult to envision a day when climate change impacts on water resources will prompt Congress to expand the federal role in water planning beyond existing federal facilities and truly nationalize water planning and management.

5. National Water Market and/or Nation-Wide Water Transportation

A fifth form of water nationalization could be the establishment of a national water market. Water markets are non-regulatory mechanisms to encourage the transfer of water rights from lower value or lower priority uses to higher value/higher priority uses.282 As scholars have noted, “[w]ater marketing is a silver bullet for many economists and businessmen (and some environmentalists) who view voluntary transfers as the ideal mechanism to redress supply and demand imbalances that result from variable water supplies and long-term shifts in demands.”283 However, without careful evaluation, water marketing can result in injury to other water users and, especially when water is transferred out of basin, to the environment.284 In addition, water markets depend on well-defined property rights in water, which is less of a problem in western prior appropriation regimes but is a significant problem in eastern states where water law is based on riparian rights—even in the so-called “regulated riparian” states that have transitioned to permitting.285

Nevertheless, federal involvement in, and perhaps even control over, water markets could increase in the near future. For example, in the Omnibus Public Land Management Act of 2009, Congress chose to allow the Secretary of the Interior to award grants to states “to facilitate water markets.”\(^\text{286}\) While this grant program admittedly maintains the states’ dominance in the creation and operation of water markets, its creation suggests an increasing congressional interest in promoting water markets generally.

In addition, the federal government already influences water economics through water subsidies, especially to agriculture, in many of its reclamation projects, and these water subsidies repeatedly have been singled out as distortions in both the markets for and the regulation of water.\(^\text{287}\) One possibility for federal intervention, therefore, is that Congress would end these federal water subsidies in order to encourage modernization, conservation, and, ultimately, the availability of more water for federal priorities such as energy policies and food security. At the same time, federal laws governing the various reclamation projects could be amended to allow people receiving water from these projects to sell any conserved water into existing water markets.

Nevertheless, there have also been calls for regional\(^\text{288}\) and national\(^\text{289}\) water markets to facilitate the movement of water across state lines. James Huffman, for example, has called for a national water market, coupled with federal preemption of state laws that would otherwise limit interstate transportation of water.\(^\text{290}\) He argues that, with a national market, “the location of water use will gradually come to depend on the market rather than state boundaries.”\(^\text{291}\)

The legal basis for a national water market is already fairly secure, so long as the federal scheme respects (or pays for) existing state property rights in water. In 1982, in *Sporhase v. Nebraska ex rel. Douglas*,\(^\text{292}\) the U.S. Supreme Court declared that ground water is an article of commerce, subject both to dormant Commerce Clause restrictions on state regulatory authority and resource hoarding and to congressional

\(^\text{289}.\) Huffman, *supra* note 18, at 700.
\(^\text{290}.\) Id.
\(^\text{291}.\) Id.
regulation. There is no principled basis, given the Court’s reasoning, for distinguishing ground water and surface water for Commerce Clause purposes, and hence the *Sporhase* decision should apply to all forms of fresh water. Finally, the *Sporhase* Court specifically addressed the federal government’s potential interests in transfers in terms of re-balancing water federalism:

The Western States’ interests, and their asserted superior competence, in conserving and preserving scarce water resources are not irrelevant in the Commerce Clause inquiry. Nor is [Nebraska’s] claim to public ownership without significance. Like Congress’ deference to state water law, . . . these factors inform the determination of whether the burdens on commerce imposed by state ground water regulation are reasonable or unreasonable. But [Nebraska’s] claim that Nebraska ground water is not an article of commerce goes too far. It would not only exempt Nebraska ground water regulation from burden-on-commerce analysis, it would also curtail the affirmative power of Congress to implement its own policies concerning such regulation. . . . If Congress chooses to legislate in this area under its commerce power, its regulation need not be more limited in Nebraska than in Texas and States with similar property laws. *Ground water overdraft is a national problem and Congress has the power to deal with it on that scale.*

Thus, to a considerable extent, the Court has already cleared the legal path for a national water market, should Congress choose to create one. The creation of a national water market would operate as a shift in water federalism, given Congress’s general deference to state water law.

Of course, the creation of a national water market would also likely arouse the politics of water. For example, such a market would effectively endorse widespread transportation of water geographically—for example, it might encourage farmers in California to buy Great Lakes water from willing sellers in Michigan or Wisconsin. Given the history of opposition to even

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293. *Id.* at 953–54.
294. See, e.g., Tarrant Reg’l Water Dist. v. Hermann, 2009 WL 3922803, at *2 (W.D. Okla. 2009) (“A requirement of legislative approval of an interstate water transfer, when in-state transfers are not similarly conditions, implicates Commerce Clause concerns.”).
296. See discussion supra Part I.A.2; see also *Sporhase*, 458 U.S. at 958–59 (acknowledging 37 different statutes in which Congress had deferred at the federal level to state water law).
in-state, inter-basin transfers, the proposal of a national water market would thus almost certainly generate considerable opposition at the state and local levels. Such opposition will probably thwart or limit, as a political matter, federal attempts to create a national water market in the absence of fairly significant national problems with energy supply, food supply, and/or other basic water-dependent commodities.

Nevertheless, it is worth recognizing that climate change has the potential to make those problems—reduced food supply and food choices, reduced dependability of electricity, and so forth—immediately palpable at the consumer level. Tangible interference with consumer expectations, especially at the level of “necessities,” could in turn radically change the political viability of a national water market.

6. Federalized Priorities in State Water Rights Permitting

The Constitution’s Supremacy Clause provides a sixth vehicle for the federal government to nationalize water management and allocation and hence re-balancing water federalism. Most states already engage in water permitting. Given that water is an article of commerce subject to congressional regulation, Congress could enact federal legislation that, at least for new water permits and new transfers of water rights, would effectively require states to adopt federal preference requirements—for example, by requiring that applicants seeking water for power generation or for “critical” food supplies be allowed to move to the head of the line for new permits or water transfers.

Of course, the Supreme Court’s Tenth Amendment jurisprudence dictates that Congress structure such legislation in particular ways. Congress could not, for example, directly require states to issue water rights according to federal dictates without running afoul of the constitutional prohibition on “commandeering” the mechanisms of state government. However, Congress could possibly—as it did in the Clean Water

297. Neuman, supra note 66, at 475–79.
298. The Supremacy Clause states:
This Constitution, and the Laws of the United States which shall be made in Pursuance thereof; and all Treaties made, or which shall be made, under the Authority of the United States, shall be the supreme Law of the Land; and the Judges in every State shall be bound thereby, any Thing in the Constitution or Laws of any State to the Contrary notwithstanding.
U.S. CONST., art. VI, cl. 2.
Act and other environmental statutes—simply take over the processes of permitting water rights, returning permitting authority to states if they complied with federal standards.\footnote{300}{See Hodel v. Virginia Surface Mining & Reclamation Ass'n, Inc., 452 U.S. 264, 288 (1981) (upholding such permitting schemes against federalism challenges because the federal government did not compel the states to regulate). Under \textit{Sporhase}, state declarations that they “own” the water within their borders would not be an impediment to federal regulation, in much the same way that state declarations of ownership of wild animals and fish do not preclude federal regulation. \textit{Sporhase}, 458 U.S. at 953–54.}

Nevertheless, nationwide federal permitting of water rights would likely be deemed impracticable. As a result, the most likely structure for inducing states to adhere to federal priorities in water permitting and transfers of water rights would be through congressional bribes—more formally, through the imposition of conditions on federal grants of money to states.\footnote{301}{See Arlington Cent. Sch. Dist. Bd. Of Educ. v. Murphy, 548 U.S. 291, 296 (2006) (“Congress has broad power to set the terms on which it disburses federal money to the States, . . . but when Congress attaches conditions to a State’s acceptance of federal funds, the conditions must be set out ‘unambiguously[,]’” (citations omitted)); South Dakota v. Dole, 483 U.S. 203, 206–07 (1987) (similarly upholding Congress’s broad authority to condition disbursement of federal money to the states).}

The federal government might, for example, offer money for water infrastructure improvement and upgrade\footnote{302}{As the GAO has documented, infrastructure needs for both water supply and water treatment are substantial. For example, in 2003 it emphasized that the states' highest priority for federal assistance in water supply management was federal financial assistance, because infrastructure upgrades in the form of reservoirs and pipelines was likely to cost billions of dollars per state—for example, Texas in 2002 estimated that it would be spending $17.9 billion over 50 years to meet its water supply infrastructure needs. 2003 GAO \textit{STATE WATER SURVEY REPORT}, \textit{supra} note 150, at 77. States already invest $40 billion per year into water treatment infrastructure, but the estimated deficit in needed spending could be $150 to $400 billion in the next decade. GOVERNMENT ACCOUNTING OFFICE, CLEAN WATER INFRASTRUCTURE: A VARIETY OF ISSUES NEED TO BE CONSIDERED WHEN DESIGNING A CLEAN WATER TRUST FUND 1–2 (May 2009).}

or for conservation measures\footnote{303}{As one example, California has incorporated comprehensive water conservation into its state Water Plan. In the 2009 updates to that plan, the state estimated that water savings in both the agricultural and urban contexts could be considerable, but the implementation costs were also considerable. For example, the costs of lining canals bearing irrigation water in the Colorado River Hydrological Region at the southern end of the state were estimated to be $219.30 million, while the costs of implementing urban conservation strategies state-wide were estimated to total $3.6 billion through 2010. \textit{STATE OF CALIFORNIA, CALIFORNIA, CALIFORNIA WATER PLAN: 2009 Updates}, vol. II, at 2–6 to 2–7, 3–16 (2009), \textit{available through} http://www.waterplan.water.ca.gov/cwpu2009/index.cfm#highlights.} to states that agreed to adhere to federal priorities in water rights permitting and water rights transfers. Especially in conjunction with nationalized water planning, such a federalization of water rights priorities could significantly shift water federalism toward the federal government.
Scholars have devoted much time and energy to the task of describing a first-best model of federalism in the United States. However, the multiplicity of issues and perspectives involved in water management make clear that the “proper” model of federalism is itself fluid and context-specific, contributing to the polyphonic complexity that is the state of the law governing water.

In light of that complexity and the uncertainties that climate change is likely to bring to water management, this Article has sought not to prescribe the “proper” water federalism for the climate change adaptation era. Rather, it has engaged in an attempt to “read the tea leaves” regarding the direction water federalism appears to be trending and to suggest particular means through which the impetus for an increased federal role in water resource management and water allocation might manifest itself.

That said, however, the prospect of whole scale nationalization and federalization of water resources should give pause. Water serves local ecological and economic needs that could easily be sacrificed to national interests, particularly if Congress pursues a few specific national priorities—national energy security, national food security—with tunnel vision. Moreover, at the extreme, large-scale water transportation on a national scale will be incredibly expensive, creating a cost-benefit issue that suggests that more efficient means of addressing national water priorities, such as national investment in upgraded water infrastructure and water conservation, probably exist and should be looked for.

The overriding danger that climate change poses for water law and policy is that governments at all levels will avoid making the hard decisions that climate change demands until they are regulating in a panicked and reactive emergency mode, eliminating the opportunity to make those decisions in a proactive and reasoned disaster-avoidance planning mode. The former, panicked, mode is far more likely to result in last-minute nationalization and federalization of water to ensure the viability of a few priorities. The latter emergency planning mode, in contrast, would allow for longer-term identification and balancing of multiple priorities at multiple scales. Thus, where

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304. See, e.g., Neuman, supra note 66, at 472–75 (discussing the related concern that water in markets can flow towards money, to the detriment of other interests).
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exactly the balance of authority in water management and allocation actually ends up in the climate change era will, I suspect, depend far more on how soon all levels of government choose to start planning for climate change's impacts on water resources than any theoretical notions of "proper" governmental roles—and we are all more likely to end up with a more optimal balance of water federalism if they all start sooner rather than later.